

## M E M O R A N D U M

**TO:** Local Agency Formation Commission

**FROM:** Stephen Lucas, Executive Officer

**SUBJECT:** **Agenda Item 6.1 - Executive Officer's Report**

**DATE:** September 30, 2021 for the meeting of October 7, 2021

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### **ADMINISTRATION:**

1. The terms of Special District Commissioners McGreehan (Regular Non-Enterprise) and Bradley (Alternate) technically ended on May 31, 2021. Staff issued ballots to each Special District in February with an initial due date of May 14, 2021 at which time Staff had received only 14 ballots. The election was extended to July 2, 2021, again to September 3, 2021 and again to November 5, 2021. At present we have received 22 ballots which is a quorum, however, we will not conclude the election until the close of the current ballot period.

### **PROJECT/GENERAL NOTES:**

The following issues/proposals are at various stages of being reviewed, discussed and/or considered:

- ***Paradise Water Group*** - A new citizens committee has been formed in Paradise called Hold Our Water (HOW). The reported goal of this committee is to bring together the Town of Paradise, its residents, and the Paradise Irrigation District (PID) to prevent a takeover of PID water assets by state or private interests who want to control our "Stranded Asset", and constrain our ability to recover from the destruction caused by the fire. The Executive Officer was asked to assist the Committee with understanding the LAFCo process and the various reorganization option available to the PID and Town. This subject is closely related the ongoing Paradise Irrigation District Options Study. **\*\*NEW\*\*** A representative of the group has inquired about the process to petition LAFCo directly to initiate the reorganization of the PID as a subsidiary district of the Town and requested the Notice of Intent to Circulate a petition. Such a petition would need the signatures of 5% of the registered voters within the district.
- **\*\*NEW\*\* *City of Chico Annexation Plan*** - Staff has been working with City staff to develop an annexation plan for the remaining four island areas within the City. It is our goal to see the island annexation plan completed in the next few months with fixed dates for annexation to be implemented over a period of four years, or an island area every year.
- ***Town of Paradise/City of Chico Sewer Line*** – The Town of Paradise is exploring options to provide wastewater treatment services to its existing commercial land uses that are limited from expanding due to sewage disposal constraints. The preferred option is conveying the Town's wastewater directly to the City of Chico's existing Water Pollution Control Plant. This alternative would represent an extension of services (GC56133) by the City of Chico outside of its jurisdictional and sphere of influence boundaries requiring LAFCo approval. Staff recognizes that this proposed project is of significant value to the Town and has been a long standing goal and it is important to have the Commission's involvement at the earliest stages of consideration. The Town staff have presented the proposal to the Chico City Council, the Board of Supervisors and LAFCo and the City of Chico has agreed to proceed with the sewer options study. The *Paradise Sewer Regionalization Project Advisory Committee* consisting of 2 councilmembers

each from the Town of Paradise and City of Chico and guided by State Water Board staff will be evaluating the proposal as it proceeds. The Committee's efforts can be tracked at <https://paradisewer.com>. The group initially met on March 8, 2021 and again on April 12, 2021 via Zoom. Most of the discussion to date has involved logistics and expectations for the project. Shown below are both the *Project Schedule* and the anticipated *Project Costs*. Staff is concerned that the "Project Schedule" does not show a step in the process for LAFCo review and consideration. The Committee meets again on May 10, 2021. Projected costs are estimated to be approximately \$184 million: \$2M for environmental studies, \$ 30M for design and right-of-way acquisition, \$152M for construction. The Town has released a Notice of Preparation (NOP) for the Environmental Impact Report (EIR) with comments due by June 3, 2021. Staff prepared and submitted NOP comments on May 20, 2021 and met with Town staff and consultants on May 24, 2021 to discuss the comments and the process ahead. **\*\*NEW\*\*** Town staff have provided the September 2021 monthly written update. (**Attachment 1**) and the City of Chico and Town engineering staff continue to develop a sewer agreement that will be the backbone of the proposal.

- **Proposed Tuscan Water District** – On September 2, 2020, Executive Officer circulated a Notice of Intent to Circulate Petition submitted by the proponents of the proposed Tuscan Water District formation. The proponents submitted the petitions to the Executive Officer for review on February 22, 2021. The Executive Officer and Legal Counsel thoroughly reviewed each petition and its supporting ownership documents and determined the petition to be sufficient to support an application to LAFCo and Certificate of Sufficiency was issued on April 8, 2021. The petitioners subsequently submitted an application to LAFCo on June 22, 2021. The application is in the review stage as comments are received. The Butte County Water Commission met on September 1 and voted 6-3 to recommend the BOS support the proposal. **\*\*NEW\*\*** The Vina Groundwater Sustainability Agency met on September 8, 2021 and decided to not comment on the proposal as it has yet to adopt its Groundwater Sustainability Plan. Of interest at that meeting was a discussion of the role of the VGSA, the VGSA legal counsel (Sept 8 regular agenda – 50 minute mark) stated “*not to mistake the GSA for a water supply provider, it’s not really what we are and not a position the GSA should take on*”. The Butte County Board of Supervisors discussed the TWD proposal at its September 28, 2021 meeting and voted 3-1 to support the TWD proposal and provide a letter to LAFCo with recommended terms and conditions.
- **Paradise Irrigation District/Options Study - Financial Recovery** – The State Water Resources Control Board (SWRCB) in cooperation with Sacramento State University, Office of Water Programs (CSUS-OWP), continues to proceed with the Options Study for the Paradise Irrigation District. The group of stakeholders, including LAFCo, meets regularly to discuss the process and the path forward. Possible options include, the District merging with the Town of Paradise, reorganizing with another public or private water purveyor, expanding the District's customer base (Miocene residents, Butte Valley, Chico), temporary raw water transfers, Chico intertie, new businesses (bottled water, hydro power, fisheries help), partnership with the Town to operate the proposed sewer system, and rate increases. On 2/5/21, GEI Consultants, Inc. was selected to prepare the Options Study and the OWP is completing contract negotiations with GEI. Work is underway with an anticipated completion date of November 2021. Staff will keep the Commission apprised of this process. **\*\*NEW\*\*** See Agenda Item 4.6.
- **City of Oroville – Contractual Services Agreement with CALFIRE**. At its March 2, 2021 meeting, the City of Oroville directed its staff to sign a Letter of Intent with CALFIRE to begin negotiations for the possible transfer of fire protection services from the Oroville Fire Department to CALFIRE. This contractual agreement is required to be approved by LAFCo pursuant to Government Code Section 56134. Staff met with representatives of CALFIRE and the City of Oroville on April 12, 2021 to discuss the necessary steps to consider a contractual agreement. The City held a public hearing in August and formally requested CALFire make application to LAFCo for the extension of fire services to the City of Oroville. CALFire is currently preparing the necessary documents for submittal to LAFCo.

- **City of Biggs – Annexation Plan** – The City of Biggs has utilized its share of SB2 planning funds to develop a long range annexation plan that is anticipated to occur in three phases and be driven by market demand for new homes. City staff have worked very cooperatively with LAFCo staff during this process.
- **Miocene Canal** - The destruction of the upper Miocene Canal by the Camp Fire has dewatered the middle and lower Miocene, causing great disruption to landowners dependent on the water supply for their farms/residences and the environment dependent on canal leakage over the decades to thrive. PG&E initially refused to repair the canal infrastructure, but entered a plea agreement for its criminal actions resulting in PG&E providing up to \$15 million over five years to restore water to the middle canal. A number of options were considered to restore the Miocene flow and PG&E has tentatively decided to replace the destroyed upper Miocene ditch/flumes with pipes to carry the Feather River water to Kunkle Reservoir. This effort is anticipated to be completed by November 2021. It remains an open question as to how this water flow will be managed/maintained in the future with one possible scenario being to form a special district to finance and manage any future facilities. Staff continues to participate in discussions. Staff will continue to monitor and assist this effort towards the universal goal of re-establishing water flow in the Miocene Canal. Staff participated in the Miocene Working Group monthly call on May 20, 2021 which covered emergency water deliveries from Paradise Irrigation District (PID) which would require LAFCo review, the ongoing design of a replacement project for the Upper Miocene and the belief by PG&E that they are not legally bound to redevelop the destroyed Miocene facilities, but only required to restore water deliveries (by any means possible).
- **Oroville Region Sewer and Water Service Providers MSR** - The State Department of Housing and Community Development (HCD) has awarded a \$100,000 SB2 Planning Grant to Butte County to contract with LAFCo for the development of a MSR update for backbone service providers in the Oroville region, including the SFWPA, LOAPUD, TWSD and SCOR. LAFCo entered into an Agreement with SWALE Inc. to conduct the study and prepare the documents. A kick-off meeting was held on March 17, 2021 with all the affected Districts staff. The final MSR is expected to be completed in October 2021. The Consultants have now met with staff with from TWSD, SFWPA, SCOR and LOAPUD one on one and completed Requests for Information.
- **County of Butte - Tuscan Ridge Planned Development (PUD21-0001)** ) - The 163 acre site on the south side of Skyway about 3 miles west of Paradise and 4 miles east of Chico which was used as staging area for Camp Fire workers in 2018/19 and was previously the former Tuscan Ridge Golf Course. The proposal includes a 98 acre planned development he PUD of 165 homes, limited commercial space, golf related facilities and open space. The site is to be served by an existing on-site well for domestic water and an existing permitted on-site wastewater treatment system, both of which are proposed to be managed by a newly formed Community Service District (CSD) that would require LAFCo approval. At this time, the County informs us that the application submittal is incomplete and comments will be requested once all documents are received. Given the issues related to a conceptual potable water pipeline and sewer line to Chico along the Skyway, this proposal does cause concerns related to service provisions, growth inducement and logical/orderly development patterns.
- **City of Gridley MSR/SOI Update** – The City has expressed an interest in updating its MSR and SOI Plan in anticipation of new development proposals being considered. Staff anticipates that the City and LAFCo may enter into a Letter Agreement to conduct this effort, similar to agreements with the City of Chico and City of Oroville.

- El Medio Fire Protection District*** – LAFCo was contacted by the County of Butte and City of Oroville in August 2020 to discuss concerns about the functionality of the El Medio Fire Protection District (EMFPD), primarily a lack of adequate funding. The EMFPD tax measure failed in November, 2020, and the District Board met on November 11, 2020 and unilaterally decided to “shut the doors” and lay-off its employees, under the belief they could self-dissolve. The Board met on November 19 and issued lay-off notices that took effect on Dec 25 at which time the District reasonably ceased to provide its empowered services. As directed by the Commission, Staff has engaged all parties to explore the issues at hand and the options available for District reorganization including contractual agreements, converting to a subsidiary district (governed by City Council) and dissolution. The EMFPD Board requested the City of Oroville to execute a contract for services and both the local fire unions have provided written support for a contractual agreement. Staff coordinated a meeting on December 4, 2020, with representatives from the District (Board Chair, Chief, Fire Captain), the County (Fire Chief, Deputy Administrative Officer) and the City of Oroville (Public Safety Director, Battalion Chief). Staff discussed various options that could be considered by all parties. There seemed to be preliminary concurrence that the City and the District would - prior to the December 25 shutdown - approve a contractual agreement or MOU that would allow the City to provide services to the District for payment. This effort was unsuccessful and the District effectively shut down operations on December 25, 2020. The Oroville City Council held a special meeting on January 28, 2021 to receive a presentation from CALFIRE related to the City contracting for fire services similar to Paradise, Biggs, Gridley and the County. This presentation included contingencies to address the issue of the EMFPD. The resolution of this concern will take considerable effort by all parties to find a reasonable outcome that results in both effective fire protection services and respects the concerns of the residents of all agencies. The issue cannot be solved alone by LAFCo, but most likely will require LAFCo action to resolve. Staff will remain actively involved and update the Commission regularly.
- Butte County Upper Ridge Community Plan (URCP)*** - The URCP would be an extension of the Butte County General Plan and provide policy guidance for the areas within the unincorporated portion of Butte County north of the Town of Paradise, including Magalia and Paradise Pines, collectively known as the *Upper Ridge*. The 2018 Camp Fire destroyed 2,158 homes within the area, especially in the lower Paradise Pines subdivision. The Upper Ridge Community Council (URCC) has identified benefits from a community plan, such as fire safety, evacuation routes, land use planning, community and economic development, affordable housing, infrastructure, recreation, and quality of life. Past interactions with the URCC have included questions concerning governance options and service provision options such as community services district or county service area, which would require LAFCo action to accomplish. Staff will continue to monitor the process for LAFCo interests. More information can be found at [www.buttecounty.net/dds/urcp](http://www.buttecounty.net/dds/urcp)
- County of Butte, North Chico Village Vision Plan*** – The County in cooperation with the City of Chico, is developing an update to the "Village Core" in the 1995 North Chico Specific Plan (NCSP). The mixed-use North Chico Village, known as the heart of the NCSP, is a 484-acre portion of the larger 2,980-acre NCSP. The site is relatively flat and extensively planted with orchards at this time. Current zoning would support approximately 2,000 dwelling units, the area has been identified for urban development by both the City and County's General Plans since 1995, but has yet to be developed due to a lack of infrastructure and financing. The planning effort includes a “re-visioning” of the North Chico Village with an emphasis on increased residential development and density. The project will update existing constraints, provide for a mix of housing types, including multi-family and low-income. Staff will be tracking this project as it will require annexation to the City of Chico in order to build-out with full City services provided. More information can be found at [www.northchicovillage.com](http://www.northchicovillage.com)

- **Drainage/Reclamation District MSR Actions** – The Drainage and Reclamation Districts MSR/SOI Plan adopted in 2018 called for a number of possible reorganizations among drainage districts. Staff has met with district staff and initiated a process to consider the dissolution of Drainage District No. 2 as it is completely overlaid by Butte Creek Drainage District and the detachment of territory from Butte Creek Drainage District that is overlaid with District 100. These actions will have no impact to current services, but will rather clean-up old boundaries that no longer make sense.
- **Thermalito Sewer and Water District** - Sphere of Influence Amendment and Annexation of the state owned clay pits recreation area southeast of the Oroville airport along Larkin Road. The State has yet to resolve a conflict between the State Parks Department and Department of Fish and Wildlife who share authority over the affected territory.
- **County of Butte** - Expansion of Powers for CSA 164 to add fire protection services. The County has placed this effort on hold.
- **City of Oroville MSR Update** – The City of Oroville is starting the process to evaluate its growth goals and has determined that the City needs to update its SOI to accommodate new development goals and at the same time update its MSR to reflect its current service capabilities and financial position. The City has requested LAFCo update its MSR at City expense and executed a Letter Agreement with LAFCo to prepare the MSR update. The City has entered into a contract with Policy Consulting Associates to complete the project under LAFCo supervision. The administrative draft is currently being prepared.

#### **CALAFCO:**

- The CALAFCO Special Events calendar is provided for review (**Attachment 2**). Of particular interest are:
  - November 3 - The New Era: State of the State in Terms of Extreme Water & Fire Issues and What it Means for LAFCo (webinar) @ 10:30 am – 12:00 pm
  - December 8, 2021 from 8:30 – 10:00 - CALAFCO Northern Region Roundtable
- The Executive Officer, on the behalf of CALAFCO, was a panelist for the Wildfire and Water Supply in California webinar hosted by the University of California at Los Angeles, Institute for Water Resources on September 29, 2021. The discussion paper *Wildfire and Water Supply in California: Advancing a Research and Policy Agenda* (**Attachment 3**) was the focus of discussion.

**LEGISLATION:** The 2021/22 Legislative session is approaching and the CALAFCO Legislative Committee has been formed to guide CALAFCO legislative priorities and initiatives. Commissioner Connelly, the Executive Officer and Legal Counsel are voting members of the Legislative Committee. CALAFCO priorities for the coming year include:

- Clarifications to GC56133 (service extensions) that will specifically direct that all service extension exemptions are approved by each local LAFCo as opposed to local agencies “self-exempting” from the law; and
- Sponsoring a bill to re-write the protest provisions in CKH so that they are consolidated and simplified; and
- Continuing our efforts to amend the protest provisions in CKH to allow LAFCo initiated proposals to be treated the same as all others by changing the protest threshold from 10%

to 25% and establish some guardrails to ensure the LAFCo process offers local agencies a path to corrections before a dissolution or other reorganization.

**APPLICATION ACTIVITY:**

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<i>Project Status As of Sept. 30, 2021</i>								
File	Applicant	Project Name	Date Application Received	Certificate of Filing	LAFCO Hearing Date	Certificate of Completion	SBE Submittal Date	Additional Comments
11-06	Butte County	CSA No. 114 - Expansion of Powers	02/02/11	N/A	pending	N/A	N/A	Incomplete - On Hold
18-09	TWSD	Clay Pit State Recreation Area Annexation						On hold. Incomplete Application
19-12	County	CSA 158 - Mandville Park Subd. Annex	05/02/19	05/29/19	10/03/19			Approved w/ conditions - 218 Hearing
20-06	OMAD	Dissolution / Annexation to BCMVCD	01/21/20	02/06/20	08/06/20	08/17/21		Waiting for TRA Statement
20-08	Oroville	Municipal Service Review Update (MSR)	05/20/20	N/A				In progress
20-09	LAFCO	Oroville Region Sewer & Water MSR	N/A	N/A				In progress
21-05	Oroville	Feather Avenue Annexation No. 2	02/25/21	06/10/21	09/02/21			Approved
21-06	Landowners	Tuscan Water District Formation	02/22/21					In progress
22-01	SFWPA	Dunstone Drive Annexation No. 1	08/06/21	09/08/21	10/07/21			In progress
22-02	SFWPA	Long Bar Road Annexation No. 1	08/06/21	09/08/21	10/07/21			In progress
22-03	SFWPA	Pioneer Trail Annexation No. 1	08/06/21	09/08/21	10/07/21			In progress

**Attachments:**

1. Town of Paradise Sewer Update Memorandum – September 30, 2021
2. CALAFCO Special Events Calendar
3. Wildfire and Water Supply in California: Advancing a Research and Policy Agenda

# Memorandum

## *Paradise Sewer Project*



**Subject:** September 2021 Monthly Status Report for Paradise Sewer Project to Butte County Agencies  
**Date:** September 29, 2021  
**Authors:** Marc Mattox (Town of Paradise), John Buttz (HDR)

This monthly memo is intended to be a high level summary of activities for the purpose of regular communication with Butte County agencies and to identify any need for formal Board presentations. For project information, please see [www.paradisesewer.com](http://www.paradisesewer.com).

### **Efforts for Past Month:**

- The Central Valley Regional Water Quality Control Board (Regional Board) hosts meetings of the Sewer Regionalization Project Advisory Committee (SRPAC). The last SRPAC was on August 9, 2021 at 1:00 pm. The meeting was held in-person at the City of Chico's council chambers.
- Continued analysis and writing efforts for the Draft EIR, including the Project Description and Alternatives sections.
- Continued to update public website ([www.paradisesewer.com](http://www.paradisesewer.com)).
- The City of Chico, through its consultant Carollo Engineers, continued its analysis of the potential to treat Paradise wastewater at the Chico Water Pollution Control Plant.

### **Efforts for Next Month:**

- At its June 14<sup>th</sup> meeting, the SRPAC decided to shift to a meeting frequency of once every two months, with the next meeting planned for October 11, 2021 at 1:00 pm at the Town of Paradise's council chambers. Information about SRPAC meetings can be found at [www.paradisesewer.com](http://www.paradisesewer.com).
- Continue analysis efforts on the Draft Environmental Impact Report (EIR).
- The City of Chico, through its consultant Carollo Engineers, will continue its analysis of the potential to treat Paradise wastewater at the Chico Water Pollution Control Plant.

### **Requests/Interactions with County Agencies:**

- The Town will contact Butte LAFCo and Butte County staff to schedule an informational meeting on the project's EIR.

THE CALIFORNIA ASSOCIATION OF LOCAL AGENCY FORMATION COMMISSIONS



## Events Calendar – Special Sessions

### MARK YOUR CALENDARS NOW!

### Session details will be announced soon

#### CALAFCO BUSINESS & BOARD

##### OCTOBER

- 7 CALAFCO Elections (virtual) @ 8:00 a.m.
- 7 CALAFCO Annual Business Meeting (virtual) @ 9:00 am
- 8 CALAFCO Board of Directors Meeting (virtual) @ 11:00 am
- 22 CALAFCO Legislative Committee (virtual)

##### NOVEMBER

- 5 CALAFCO Legislative Committee (virtual)
- 12 CALAFCO Board of Directors Meeting (Sacramento)

##### DECEMBER

- 3 CALAFCO Legislative Committee (virtual)
- 8 Northern Region Roundtable (virtual) @ 8:30 – 10:00 am
- 8 Central Region Roundtable (virtual) @ 10:30 am – 12 pm
- 15 Southern Region Roundtable (virtual) @ 1:00 – 2:30 pm
- 15 Coastal Region Roundtable (virtual) @ 3:00 – 4:30 pm

#### SPECIAL EDUCATION SESSIONS FROM THE CONFERENCE PROGRAM

##### OCTOBER

- 8 **Infrastructure and Cyber Security: What You Need to Know (webinar) @ 9:00 – 10:30 am**  
*Featuring speakers from the Department of Homeland Security*
- 28 **Post-pandemic Workforce Best Practices for Hiring Staff (webinar) @ 1:00 – 2:30 pm**  
*Featuring speakers from Staffing/Recruiting firm and LAFCo legal counsel*

##### NOVEMBER

- 3 **The New Era: State of the State in Terms of Extreme Water & Fire Issues and What it Means for LAFCo (webinar) @ 10:30 am – 12:00 pm**  
*Featuring speakers from DWR, OPR, CAL Fire and LAFCo legal counsel*

##### DECEMBER

- 6 **Throw Out the Historic Water Framework: What do LAFCos Do Now? (webinar) @ 1:30 – 3:00 pm**  
*Featuring speakers from the Water Board, LAFCo Commissioner and LAFCo Executive Officer*

##### JANUARY 2022

- 10 **You Can't Always Get What You Want – But You Can Make Sure You Got What You Agreed to Receive (webinar) @ 1:00 – 2:30 pm**  
*Featuring speakers from HdL Coren & Cone, Former Asst. City Manager and Special District Board member/LAFCo Commissioner*

##### Sharing Information and Resources

CALIFORNIA ASSOCIATION OF LOCAL AGENCY FORMATION COMMISSIONS  
1020 12<sup>th</sup> Street, Suite 222, Sacramento, CA 95814  
916-442-6536

For current information and other CALAFCO resources  
please visit [www.calafco.org](http://www.calafco.org)

Updated 9/16/21





**Wildfire and Water Supply in California: Advancing a Research and Policy Agenda**  
**September 29th, 2021, 9AM – 1PM PT**

**UC Agriculture and Natural Resources (UC ANR), California Institute for Water Resources &  
UCLA Luskin Center for Innovation**

**Overview**

The linkages between wildfire and water are numerous and include relatively well-researched issues like the effects of wildfire on riparian areas, for example. However, in recent years, a newer issue has emerged: the relationship between wildfire and water supply. Even within this topic, some areas are relatively better understood such as how higher elevation wildfires might impact water storage reservoirs through siltation.

However, during the [Tubbs](#) (2017), [Camp](#) and [Woolsey](#) (2018), and [CZU Complex](#) (2020) fires, in particular, community water systems were affected in various ways, presenting a new set of issues. For example, the Tubbs and Camp fires “are the first known wildfires where widespread drinking water chemical contamination was discovered in the water distribution network and not in the source water after the fire” ([Proctor et al. 2020](#)).

Given the recent emergence of this issue, we ask this group of interdisciplinary and cross-sector participants to provide input and review on a research and policy agenda for how California can more proactively address the ways in which wildfire is increasingly putting water supply systems at risk. Workshop sessions are focused on four different research and policy issues and related questions at the intersection of wildfire events and water supply provision:

1. [Upstream Wildfire Effects on Water Supply](#)
  - a. How can forest and other ecosystem management help mitigate fire’s effect on downstream water flows? [link](#)
  - b. Should we expect upstream post-fire water quality impacts to evolve qualitatively or just quantitatively? [link](#)
  - c. How can disaster management efforts in the state better address post-fire water supply impacts upstream? [Link](#)
  - d. How can research efforts better support Indigenous leadership, knowledge, and practice to help manage healthy ecosystems? [link](#)
  - e. What are the most effective methods to support long term forest management to adapt to upstream effects? [link](#)
2. [Water Supplier Planning](#)
  - a. What can be done to proactively mitigate and reactively address damage to water reservoirs? [link](#)
  - b. How can water systems be supported to maintain power and continuous supply during a fire? [link](#)
- c. How should water systems be expected to finance fire-fighting efforts? [link](#)
3. [Water Supply, Fire, and Housing](#)

- a. What are the impacts of new fire-sensitive building codes and regulations on long term residents? [link](#)
  - b. How can displaced communities (re)gain access to affordable housing and essential services? [link](#)
  - c. How do we rebuild damaged plumbing infrastructure that is resilient to fire/reduces the contamination impacts experienced in communities? [link](#)
4. [End-use Water Quality and Public Health Impacts after Fire](#)
- a. Are new or enhanced drinking water regulations for testing and treatment needed to better address near or at point of use drinking water quality impacts from wildfire? [link](#)
  - b. Who should provide emergency water supply and what scale is feasible given the cost? [link](#)
  - c. How can we improve post-fire response guidance and testing support to communities that improves trust? [link](#)

This document contains a high-level summary of *initial* research and policy gaps, as well as key questions to be answered, identified by UC ANR and UCLA. The text serves as an agenda for conversation, and will be refined in a short report released post-workshop, but does not contain final answers. We also recognize that the organization of and dividing lines between topics as presented here are somewhat arbitrary and fuzzy, and thus welcome feedback on their reframing.

## 1. Upstream Wildfire Effects on Water Supply

California's drinking water supply has been reliant on the health of upstream alpine forests, chaparral, and grasslands to collect, filter, and deliver rainfall and snowmelt to groundwater, rivers and streams, and reservoirs. However, the unprecedented frequency, scale, and intensity of wildfires in recent years -- as well as a return to extreme drought conditions -- can damage the health of these critical environments.

Headwater ecosystems in particular play a critical, initial role in the water supply which is ultimately delivered to communities through piped infrastructure. In California, 60 percent of potable water is sourced from forested watersheds, the majority of which flows from the forests of the Sierra Nevada mountain range ([Uzun et al. 2020](#); [McCann et al. 2020](#)).

The rapid onset of the impacts of climate change via drought, severe heat, and wildfire are disrupting the health and stability of upstream ecosystems. These landscape-scale disturbances can cause downstream impacts -- including changes in water quantity and quality as well as hazardous debris flows -- that can be costly for water suppliers to manage and recover from. Mitigating future impacts of wildfires on downstream community water supplies invites new policies supported by research and policy questions in the following key areas.

- a. How can forest and other ecosystem management help mitigate fire's effect on downstream water flows?

The quantity and predictability of water flow delivered downstream is impacted by changes in upstream environments. High intensity fires like California has experienced in recent years can decrease transpiration by removing vegetation. They may also create a hydrophobic pyrogenic organic matter (POM) layer that increases runoff volume. Additionally, Maina & Siirila- Woodburn

(2019) found that burned landscapes in the Sierra Nevada may accumulate more snowpack; increasing the runoff during a summer melt and altering timing of runoff due to the amount of water stored in snowpack. The timing of a return to “normal” flow regimes varies. Flint et al. (2019) found a return to pre-fire stream flows in two to four years in burned landscapes studied.

Large burn areas from intense fires also produce high risk conditions for erosion, debris flows, and landslides, imperiling local communities and downstream water infrastructure. A recent study suggests that there can be water supply improvements of up to 14 percent to be found through prescribed burns, cultural burns, and mechanical thinning (McCann et al. 2020).

However, more evidence is needed on this front, both in terms of predictability of estimates of interventions and to restore flow at more meaningful levels as we see increased fire activity.

b. Should we expect upstream post-fire water quality impacts to evolve qualitatively or just quantitatively?

Hotter, faster, and bigger fires have altered upstream ecological processes and impact downstream water supply operations, motivating new ways of thinking about managing and remediating upstream environments. There is a history of researching burned areas in California that provides insight into predicting and planning for post-fire water quality impacts downstream (Hohner et al. 2019).

High intensity fires turn biomass into pyrogenic organic matter (POM) on the surface of the forest floor. During post-fire rains, severely burned areas deliver higher levels of precursors to disinfectant byproducts, dissolved organic nitrogen, and dissolved organic matter with higher turbidity, color, and suspended particles downstream.

These constituents all require intensive treatment to meet potable water standards and thus higher cost. High concentrations of contaminants are also not present only immediately post-fire. They can be detectable for up to two years, depending on the scale of the fire and precipitation patterns the following years (Uzun 2020).

c. How can disaster management efforts in the state better address post-fire water supply impacts upstream?

Natural disasters occurring in California can cascade like a set of dominos, passing the effect of each disaster to the next, compounding impacts on frontline communities. Drought increases risk of fire in forests and wild lands leading to larger, faster, and hotter fires that burn at higher elevations, destabilizing snowpack and snowmelt cycles, and leave large burn scars with damaged soils that leads to increased and unpredictable runoff (AghaKouchak et al. 2018).

The increase in runoff from burned landscapes increases the risk of erosion, debris flows, and flooding in steep, mountainous watersheds during California’s heavy rainy season. A study of Southern California burned slopes indicates landslide risk remains up to three years after a fire (Rengers et al. 2020).

Debris flows threaten infrastructure near and far. Communities in the wildland urban interface face immediate risk, while water supply infrastructure further downstream may be damaged by debris carried over long distances if upstream debris catchment solutions are not adequately deployed. Research on catchment basins in Los Angeles County in areas burned by the Colby and

Fish fires suggests that as vegetation returns to burned landscapes, sediment flows reduce. Continued research into the relationship between burned landscapes and catchment basins can aid policy makers in preparing for future impacts ([Gray 2019](#)).

A number of state and federal agencies respond to natural disasters in California today including the California Office of Environmental Services (Cal OES), local OES offices, the Federal Emergency Management Agency, California Department of Forestry and Fire Protection (CAL FIRE), California Highway Patrol, and non-profit volunteer organizations like the Red Cross respond to disasters in California ([UCANR 2020](#)).

The deadly mudslides in Montecito in 2018 after the Thomas fire are a grim call for researchers and policy makers to conduct further research to understand the impacts of and how best to prepare and respond to the cascading natural disasters in California today. A Los Angeles Times investigation details decades of tensions between the U.S. Forest Service, Army Corps of Engineers, Santa Barbara County officials, and the general public over the appropriate deployment and maintenance of debris catchment basins and disaster preparedness interventions; none believing the devastation Montecito experienced was possible ([Mozingo 2018](#)).

d. How can research efforts better support Indigenous leadership, knowledge, and practice to help manage healthy ecosystems?

Indigenous communities have long practiced ecosystem management strategies which mimic California's natural fire cycles, cultivating healthy ecosystems with, for example, widely spaced trees and low levels of forest floor flora. As colonial peoples displaced Indigenous peoples, cultural fire practices were largely disregarded and replaced with a forest management strategy of fire suppression, which in turn resulted in forest densification and left forests vulnerable to fire, diseases, and pests (Hankins 2015).

Today, many tribal communities, who are disproportionately impacted by climate change, retain little to no autonomy over the stewardship of their ancestral lands. This lack of sovereignty and practical management authority limits their access to culturally important resources and spaces and has left them unable to use ancestral land management practices in many cases, in turn leaving them and ecosystems more vulnerable than they would otherwise be to large scale fires.

Potential, albeit very limited, signs of progress and restorative equity have been made to engage cultural practitioners in ecosystem restoration in some contexts. For instance, the Karuk Tribe has developed a framework for a return to traditional management (Norgaard 2014). The Karuk Tribe now co-leads the Western Klamath Restoration Partnership, restoring a 1.2 million acre area, in partnership with the U.S. Forest Service (Durglo 2018). Moreover, the Yurok tribes are leading the Cultural Fire Management Council, which is a non-profit with a mission to increase cultural burning on the Yurok Reservation and ancestral lands. These are potential examples for how the state can dramatically expand work with tribal leaders to achieve its aggressive goals for sustainability-managed forest acreage (Buono 2020).

e. What are the most effective methods to support long term forest and other ecosystem management to adapt to upstream effects?

To limit the growth of large wildfires, an estimated 20-30 percent of California's 33 million acres of forested wildland must be managed and actively maintained through a mix of prescribed fire, managed wildfire, and mechanical thinning ([McCann et al. 2020](#)). Achieving the state's goals for managed forest requires intergovernmental and cross-sector cooperation. State and local governments only own three percent of forested lands in California with the majority owned by the federal government and private landowners. Forest management tactics like controlled burns must also align with other agencies regulating regional air quality, and policy makers must consider the equity implications for small landowners and tribal communities.

In 2020, California and the federal government signed a stewardship agreement that set a goal of treating one million acres of wildland in California each year. However, the state burned only 32,000 acres of wildland in 2020, well below the one million acre goal. An obstacle moving forward is matching funding and resources. California's final 2021 budget includes a recently approved \$1.5 billion for fire prevention ([Beam 2021](#)). Increasing wildland management means a long term investment in personnel, training, and knowledge. However, the total amount of funding needed to implement long term mitigation strategies is unknown (Feo et al. 2020).

To overcome the high cost of forest and other ecosystem management, agencies, non-profit organizations, and private companies are coming together to pool resources. There are examples of promising local and regional capacity building such as the involvement of the Yurok Tribe with the Cultural Fire Management Council, and the formation of the Sierra Nevada Conservancy Watershed Improvement Program. Collaborative projects like the French Meadows Partnership managed by the Sierra Nevada Conservancy and the Forest Resilience Bond by Blue Forest are additional creative mechanisms for potentially scaling up the raising and directing of forest management funds ([Olick 2021](#)).

#### Potential recommendations:

- Invest in debris management basins, particularly in rocky and mountainous areas close to highly urbanized areas like those found in many Southern California communities.
- Support Indigenous leadership, knowledge, and practice to help manage healthy ecosystems.
- More research is needed to determine with more precision how headwater forests and other ecosystem management affects the quantity and quality of downstream water supplies.

## **2. Water Supplier Planning**

Wildfires bring new challenges to water system planning including protecting infrastructure, treatment for increased contamination loads post-fire, cleaning water reservoirs, rebuilding destroyed infrastructure, and maintaining the ability to keep the power on and water flowing during a fire to, among other things, provide critical support to fire fighters. Water systems may also need to support their customers with interim drinking water during recovery from a fire and must work to restore and ensure trust from the community that the tap water is safe as families and businesses return home. We need to identify policy and funding solutions to mitigate the impact of future fires on water systems, their ability to quickly recover water quality, provide water to displaced families, and restore trust in the tap.

California's current and expected intensity in future fire regimes presents new challenges for community water supply planners in many parts of the state. Wildfire is one of several climate threats, including drought, sea level rise, and extreme heat, which water utility planners are

expected to account for, and the approximately 2,800 community water systems in the state have vastly different planning and operational capacities. Wildfire may threaten the processes to secure, store, treat, and deliver reliable water supplies to both first responders and communities dependent on community water systems. To give a sense of the scale of the problem, a recent Department of Water Resources report estimates that “over half of the top at-risk [water] suppliers are in high or very high-risk zones for wildfire, as defined by CalFire” ([2020 Water Resilience Portfolio](#)).

The ability of water systems to maintain power during wildfires is critical for supporting firefighting efforts and minimizing damage to infrastructure. As water supply is diverted to aid in fighting wildfire and water sources are contaminated due to fire, water suppliers face impairments to both water quantity and quality in their mandate to maintain reliable water delivery to communities. As noted above, the runoff and debris flows after a fire also deliver sediment and contaminant loads downstream that can critically impair water reservoirs.

Moreover, the direct and indirect financing of firefighting activities by water suppliers is little understood or supported by specific policy, despite the outsized portion of water supplier budgets which fireflow sometimes represents. The Governor’s Office of Planning and Research, the Department of Water Resources, and the State Water Board have begun working on monitoring and support for this issue, but more attention and resources may be needed.

a. What can be done to proactively mitigate and reactively address damage to water reservoirs?

Large water suppliers often rely on reservoirs to store surface water for delivery to end-users. Rainfall on expansive wildfire burn scars washes excess contaminants and sediment downstream into reservoirs that can clog water system filters or fuel algal blooms in reservoirs ([Chow 2021](#)). Erosion and debris flows can also carry sediment into reservoirs, thus accelerating the decline of reservoir capacity. This is an especially troubling trend considering the reliance on water storage in California during droughts ([Sankey et al. 2017](#)). Research by Becker et al. ([2018](#)) provides recommendations to water systems for treatment technologies and techniques needed for varied wildfire impact and contamination scenarios, a useful resource for water systems in wildfire prone areas.

Moreover, reactively cleaning impaired reservoirs is costly with a common price tag of \$5-10 million per reservoir cleaning ([SNC 2021](#)). Proactive investments can help to avoid these accumulating reservoir cleanup costs. For instance, the French Meadows Project, a \$10.6 million collaborative effort between The Sierra Nevada Conservancy, Placer County Water Authority (PWCA), The Nature Conservancy, the American River Conservancy, and the Tahoe National Forest to restore 28,000 acres of headwater forest, is cost effective and proof that proactive management and investment can prevent future wildfire damage to PCWA reservoirs and avoid (USFS 2021).

b. How can water systems be supported to maintain power and continuous supply during a fire?

During a wildfire, emergency firefighting teams rely in part on operable water pumps, or otherwise have to take more ad hoc measures to secure water supply such as occurred in the Woolsey Fire of 2018 ([Griffith 2018](#)). The loss of water service to local hospitals and other vital facilities can also compound the impacts of wildfire on a community. Additionally, loss of pressure in water service lines can allow soil and contaminants in the surrounding area to enter the distribution system.

Keeping water systems operable during a wildfire emergency can be difficult as fire may damage water system infrastructure, spreading fire can leave key parts of water system infrastructure inaccessible, and backup power generators may fail.

Water systems need to invest in backup power supply to maintain operation of treatment facilities and pump stations during an emergency. Yet publicly-regulated water systems have expressed concern with complying with California Air Resources Control Board Rule 1470 which limits the allowable hours of testing diesel powered backup generators many systems rely on during fires, due to emissions concerns. However, limits on testing and maintenance hours during the year raise concern from water managers, who are advocating for the ability to test backup systems regularly to ensure they operate effectively while under stress during a wildfire emergency ([Carlson 2019](#)). Compliant, lower-emission, generators can cost \$100,000 each (and are not often eligible for existing public subsidy funds from the State Board as opposed to the Department of Water Resources), take time to deliver and install, and require additional costs for regular maintenance which water systems say is a constraint on their ability to upgrade.

Additionally, asking water supplier staff to access water infrastructure as wildfires encroach place their health and safety of staff at risk from the fire and associated air quality. Innovations in remote operation of water system infrastructure and backup power systems like solar and battery technology, paired with building and site design to reduce fire damage allow for some degree of offsite operation of water systems located in active fires that reduces risk to water system employees and maintains water operations for emergency use ([Heaney 2020](#)). However, access to technology, the cost of these upgrades, and the managerial knowledge for implementation may be a limiting factor in water systems deploying these tactics, as these factors are more broadly constraining especially for small water system operation ([Water Boards 2021](#)). To protect the health and safety of their workforce, investments in air filtration and PPE are also recommended but may need centralized support.

More broadly, Tran recommends water systems develop specific wildfire mitigation plans as part of their required emergency response plans (ERP) that include local or regional partnerships with surrounding water systems or water wholesalers with intertying supply connections ([Tran et al. 2021](#)). Developing these mutual aid relationships can lead to sharing of resource and critical staff and expertise support during an emergency. However, ERPs are only required for water systems with 3,300 or more connections. Finding ways to extend emergency planning support to small water systems in wildfire prone areas is critical to ensuring water supply to the communities they serve.

### c. How should water systems be expected to finance fire-fighting efforts?

A large part of the way in which water systems are designed engineering-wise is to meet fire- flow requirements. The cost of this compliance is necessary, but can represent a large percentage of a water system's budgets, and is not always called out as a specific expense in utility budgets ([Tiger 2012](#)). To the extent that water utilities face differential costs, they are usually obligated to pass on these costs to customers (see AWWA M1 Manual, 2017), especially among publicly-owned utilities in California due to [Proposition 218](#).

The idea that the price of a good or service should reflect the cost of delivering that service to the user is referred to as cost causation or the benefit principle; this principle has been enshrined in

internal drinking water utility practice to determine how to charge different users with different impacts on water supply production within a utility pricing structure (García- Valiñas, Martínez-Espiñeira, & González-Gómez, 2010-b). However, the connection between the cost of providing water supply for firefighting and specific charges on customers is lacking (Beecher 2020), and may be undermining awareness of the need for additional revenue for water systems, especially in light of increased expectations that they serve on the front lines of supporting wildfire fighting efforts.

#### Potential recommendations:

- Provide recommendations to water systems for current and expected treatment technologies and techniques needed to treat runoff contamination
- Further invest in targeted support for water systems' continuous service in wildfire events
- Clarify at the state level the financing authorities and constraints of fire-fighting efforts by water systems

### **3. Water Supply, Fire, and Housing**

With a year-long fire “season” and fires increasing in frequency, size, and intensity, communities are facing challenging planning decisions required to keep people safe. Not only must they consider the risk to housing from fire, they must also prepare for the risks of flooding and debris flows after the flames have been extinguished. Questions remain around the strategies and costs of providing adequate temporary housing for displaced families and rebuilding equitability.

Addressing the housing affordability crisis while also actively planning for housing supply that takes sufficient account of water availability and wildfire risk is a tall order in California. In the past several decades, in part due to higher affordability, housing has grown dramatically in the “Wildland Urban Interface,” where fire risk is high. This has in part been facilitated by local decisions regarding the designation of fire severity zones (Miller et al. 2020), which parallel local variation in implementation of “show me the water” laws (Hanak 2010) in California.

More specifically, post-fire housing recovery efforts in California have revealed major gaps in comprehensive short-term and long-term support for impacted households, especially those that are vulnerable ([Gabbe et al. 2020](#)). People who have lost homes and have been displaced by wildfire struggle to access immediate housing and livelihood relief programs, including bottled water, and secure affordable housing options that include access to clean drinking water infrastructure.

Communities who want to rebuild in fire-prone areas face feasibility challenges when trying to satisfy updated building codes which take account of both drought and fire risks. Agencies from the federal (FEMA), state (Housing and Community Development/HCD), and local levels (Local Agency Formation Commission/LAFCO, county and city housing authorities and planning departments, water systems) all have a role to play in this process.

#### a. What are the impacts of new fire-sensitive building codes and regulations on long term residents?

During fires where entire communities are displaced and large numbers of housing units are destroyed or damaged by fire, the search for or rebuilding of new, long-term affordable housing is challenging for many. Burned homes leave behind toxic materials that pose a threat to the



environment and local drinking water. Before homeowners are allowed to rebuild or reside on their property, the federal Environmental Protection Agency must complete a survey and removal of hazardous materials. Some types of housing such as mobile home parks must also show that in a re-build they have come up to current state Housing and Community Development code to be officially habitable.

Additional local mandates such as those imposed by the Santa Cruz County Board of Supervisors following the CZU Complex fire require property owners to either hire a contractor or enroll in a government sponsored program to clean their property following the EPA inspection. However, owners who enrolled in the government program were subject to long wait times and had to find temporary housing in the meantime ([Hagemann 2020a](#)).

Other broader regulations, intended to make communities safer during a fire, are also making it harder for long term residents to rebuild. For instance, in Santa Cruz county proposed State Minimum Fire Safe Regulations impose new standards for road width for rebuilding to ensure emergency vehicle access, water supply, and defensible space. Property owners wishing to return to remote parcels and to rebuild would be faced with the additional costs of funding road widening ([Hagemann 2021](#)).

b. How can displaced communities (re)gain access to affordable housing and essential services?

Temporary housing is also a direct lifeline to access to water for many displaced by fire. In Santa Cruz county federal Federal Emergency Management Agency funds provided hotel stays for 300 survivors of the CZU complex fire, with roughly one third of the enrollees extending their stay because they lacked access to clean water otherwise ([Hagemann 2020b](#)).

There is also increased concern around the impact of populations displaced as the result of wildfire on surrounding communities and their infrastructure, including drinking water systems ([Spearing and Faust 2020](#)). An associated, open question is who should bear the cost of this impact on infrastructure, especially if displaced populations are served via temporary connections.

Some households, uninsured and unable to afford rebuilding or relocating to new housing have turned to camping or moving into mobile homes with no running water or electricity connection as they wait for relief from state or federal agencies, options that are technically illegal in some counties. Those that did have fire insurance still struggle to find housing as displaced families across the region compete for housing and haggle with insurance providers over housing options and payments ([Mozingo 2021](#)).

The state legislature and Governor's office have taken steps to boost insurance relief for impacted families, however a study in 2017 found two thirds of fire victims were underinsured, leaving them without sufficient resources to rebuild or rehome ([Swindell 2020](#)). Particularly hard hit are residents of mobile home parks who can see housing costs more than triple when having to relocate or temporarily house themselves ([Rode 2019](#)).

c. How do we rebuild damaged plumbing infrastructure that is resilient to fire/reduces the contamination impacts experienced in communities?

One of the major obstacles to displaced populations returning to their property long-term is the cost of repairing water infrastructure, whether in fairly sizable or small communities. Following

the Camp Fire of 2018, the town of Paradise faced a bill to repair its drinking water system alone of \$300 million for a pre-fire population of 27,000 ([Associated Press 2019](#)). A cost of \$10 million to replace all utility infrastructure was estimated following the Woolsey Fire, also in 2018, burning through Seminole Springs Mobile Home Park in the Santa Monica Mountains ([Sharp 2019](#)).

As noted above, the costs of repairing water and broader utility infrastructure are high, but so are the costs of repairing or replacing private water infrastructure up to code. Homes with damaged or destroyed septic systems face high costs of permits and construction and inspections. The cost of restoring a septic system, for households not attached to sewer lines, can reach \$8,000 ([Hanson, 2020](#)).

#### Potential recommendations:

- Continue to refine (re)building and infrastructure regulations to allow for three-fold objectives of: fire protection, affordability and flexibility in compliance.
- Ensure that displaced households find emergency and temporary housing is coordinated with efforts to provide sufficient water supply
- Conduct more research on reducing infrastructure costs of buildback

#### **4. End-use Water Quality and Public Health Impacts after Fire**

Restoring the quality of and public trust in tap water after a fire is a critical step in community recovery. Wildfire can damage water quality at the source and within the water system. Burned areas deliver higher levels of sediment and contaminant loads to water sources and reservoirs. Fires can damage or destroy water system, private well, or household plumbing infrastructure, introducing contaminants or aesthetic impairments to the water supply. Moreover, displaced families need interim water and attention must be paid to ensuring they can trust the water in their homes when they are able to return.

Restoring the quality of and public trust in tap water after a fire is a critical step in a community's ability to recover. As noted above, water quality impacts from wildfire occur at multiple points along the water delivery system. A wildfire can damage water quality at the source. Burned areas deliver higher levels of sediment and contaminant loads to water sources and reservoirs which require extensive treatment to meet potability standards.

Of increasing concern, however, is the damage or destruction of near or at point of use publicly-regulated water system infrastructure, as well as private well and household plumbing infrastructure. In non-emergency situations, the maintenance of private well and household plumbing infrastructure is the responsibility of property owners, not water systems, not regulators (for instance see [Pierce et al. 2019](#)). These point of use impacts range from emerging, volatile contaminants of immediate health concern to aesthetic impairments. Moreover, households displaced by fires or who have contaminated in-home supplies need high quality interim water and attention to ensuring they can trust and use the water in their homes when they are able to return or have their contamination issue remediated.

- a. Are new or enhanced drinking water regulations for testing and treatment needed to better address near or at point of use drinking water quality impacts from wildfire?

Water runoff from areas burned by wildfires carries elevated levels of contaminants, precursors to disinfectant byproducts, and sediments into drinking water systems and private well supplies. These upstream contaminants may require additional treatment technologies to meet federal and state safe drinking water standards ([Uzun et al. 2020](#)). Wildfires can also introduce dangerous levels of contaminants throughout the water distribution system or from impacts to premise plumbing.

Burned or melted water infrastructure, particularly those components made from Cross-linked polyethylene (PEX) or polyvinyl chloride (PVC), including some storage tanks, distribution pipes, meters, and domestic well infrastructure, can release dangerous levels of volatile organic compounds like benzene into drinking water supplies. Moreover, this damaged infrastructure can cause water pipes to depressurize and introduce bacteria or spread volatile organic compounds (VOCs) from damaged parts of the network to undamaged areas. These VOCs may linger in the distribution and premise infrastructure for extended periods of time ([Proctor et al. 2020](#)). The question of where point of use treatment technologies are effective for use by water suppliers and households in post-fire contexts, among other emergency situations, also requires extensive clarification from regulators ([Hacker and Binz, 2021](#)).

**b. Who should provide emergency water supply and what scale is feasible given the cost?**

After a wildfire, residents may need emergency drinking water supplies for a period of days to months following displacement from their homes in an evacuation, if fire damage has caused contamination in water supply or introduced contamination into the distribution system, or if a water system is damaged and inoperable. The primary interim emergency water provided by state and federal agencies to families in need in California is bottled water.

State and Federal emergency planning guidelines list bottled water as an emergency water source when traditional supplies are unsafe ([US EPA 2011](#)). The California Office of Emergency Services Emergency Drinking Water Procurement & Distribution Planning Guidance contains a standing contract that local governments may use to purchase emergency bottled water supplies ([Cal OES 2014](#)). Further, authorized by water code section 13442, the California State Water Resources Control Board may use the California Cleanup and Abatement (CAA) account to address drinking water needs in emergency situations. During 2012-2016 drought, the majority of funding distributed by the CAA for emergency interim water supplies was spent on providing bottled water to county and local governments or water systems for distribution to households ([CAA Tracking](#)).

Despite the widespread use of bottled water as an emergency drinking water source the State government has not been able to take advantage of any economies of scale to reduce the cost of bottled water, purchasing bottled water at market rates from local retail establishments.

Bottled water retail costs are up to 156 times the cost of tap water and leave local governments and residents vulnerable to local retail supply. The State Water System Needs Assessment found the cost of providing only 60 gallons per month per connection, far below the State goal of 55 gallons per person per day, in systems on the State's Human Right to Water List would reach \$1 billion annually (Water Boards 2021).

An alternative emergency water supply delivery mechanism for communities and water systems impacted by wildfire is hauled water to communal supply points. Based on internal UCLA Luskin research of projects authorized by CAA funds, hauled water is potentially less expensive to provide

than bottled water with a cost of \$0.10 – \$0.25 per gallon at the allocation of 60 gallons per month. Further cost reductions are possible if a community filling station model, that reduces the cost and frequency of deliveries, is used. However, there has been no analysis of the water hauling industry's timing, capacity, or reach in the context of emergencies.

c. How can we improve post-fire response guidance and testing support to communities that improves trust?

As households in California recover from wildfire events, return home, and come together to rebuild communities, their trust in the safety of their drinking water often wanes ([Odimayoni et al. 2021](#)). As the presence of benzene and other VOCs in drinking water became apparent, and water systems worked to determine how widespread the contamination was, residents received changing warnings and boil advisories and shifting recommendations on point of use or point of entry filtration from local officials.

Unclear communication from state and local officials on what type of at home filter is appropriate in each circumstance was made worse by insurance policies that reportedly covered the costs of filters that may not adequately address VOCs found in drinking water (Olsen 2020). Mixed messaging from local or state officials can decrease trust in the safety of drinking water and increased reliance on more expensive bottled water for drinking, cooking, bathing, and brushing teeth, which in turn greatly impairs the quantity of water consumed and imposes its own environmental impact ([Wang et al. 2019](#)). One resident, frustrated after the CZU Complex Fire, was quoted saying, “If the water is messed up, we understand. We had a catastrophic fire up here, we understand that. But just let us know why” ([Becker 2020](#)). There is also a question of whether employing better public communication or science outreach can solve the issue ([Roy and Edwards 2019](#)), or if broader distrust must be addressed.

Some residents interviewed turned to private testing labs after purchasing at home water quality test kits out of pocket. It is unclear whether the state or counties can muster sufficient responses to resident concerns and information gaps in these contexts or whether new resources need to be made available to public agencies. Given widespread distrust in the government, especially in rural areas often affected by wildfire, a more effective alternative may be supporting the expansion of the capacity of researchers, non-profit organizations, and community based organizations to provide information, technical assistance with testing, and an appropriate return to trust in a disaster recovery context. For instance, in some other emergency contexts, public officials have only admitted water safety concerns related to tap water once external experts were engaged ([Lambrinidou 2018](#)).

Potential recommendations:

- Bring regulations and technology for POU treatment more pointedly to be informative and deployable in post-wildfire contexts
- Proactively fund and deploy emergency water supplies pre-wildfire event.
- Determine who is best suited to communicate and what communication style and content helps people appropriately trust their water supply post-fire.

## Reference List

AghaKouchak, A., Huning, L. S., Chiang, F., Sadegh, M., Vahedifard, F., Mazdidasni, O., Moftakhari, H., & Mallakpour, I. (2018). How do natural hazards cascade to cause disasters? *Nature*, 561(7724), 458–460. <https://doi.org/10.1038/d41586-018-06783-6>

Associated Press. (2019, April). Cancer-causing chemical taints water after California wildfire. NBCNews.com. Retrieved from <https://www.nbcnews.com/news/us-news/cancer-causing-chemical-taints-water-after-california-wildfire-n1000136>.

Beam, A. (2021, September 9). California oks new spending on drought, wildfire prevention. *AP NEWS*. Retrieved September 20, 2021, from <https://apnews.com/article/business-health-fires-climate-california-eec48e6279099449851b3c7f150cda33>.

Becker, R. (2020, October 6). Unsafe to drink: Wildfires threaten rural California towns with tainted water. *The Press Democrat*. <https://www.pressdemocrat.com/article/news/unsafe-to-drink-wildfires-threaten-rural-towns-with-tainted-water/>.

Becker, W.C., Hohner, A., Rosario-Ortiz, F., & DeWolfe, J. (2018). Preparing for wildfires and extreme weather: Plant design and operation recommendations. *Journal - American Water Works Association*, 110(7), 32–40. <https://doi.org/10.1002/awwa.1113>

Benjemaa, F., Benin, N., Campagna, J., Ekstrom, J., Alarcon, J., Lichti, B., Frederick, M., Crisologo, J., Frevert, K., & Balazs, C. (2021). (rep.). Small Water Systems and Rural Communities Drought and Water Shortage Contingency Planning and Risk Assessment. California Department of Water Resources Water Use Efficiency Branch. Retrieved from <https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Water-Use-And-Efficiency/Urban-Water-Use-Efficiency/CDAG/PART-2-CDAG-Report-Final.pdf>.

Buono, P. (2020, November). *Quiet Fire Indigenous tribes in California and other parts of the U.S. have been rekindling the ancient art of controlled burning*. The Nature Conservancy.

Carlson, C. (2019, May 16). Water agencies: Air quality rules need changing to keep water flowing to fight wildfires. VC *Star*. <https://www.vcstar.com/story/news/local/2019/05/16/water-agencies-say-air-pollution-rule-change-needed-keep-water-fight-wildfires/1193297001/>.

Chow, A. T.-S. (2021, August 12). Wildfires are threatening municipal water supplies. *Eos*. <https://eos.org/science-updates/wildfires-are-threatening-municipal-water-supplies>.

Durglo, J. (2018). *Cross Boundary Collaboration Between Tribes and the United States Forest Service: Success Stories from Forest Systems Using the Tribal Forest Protection Act*. Intertribal Tinder Council.

Feo, T., Mace, A., Brady, S., & Lindsey, B. (2020). (rep.). *The Costs of Wildfire in California: An Independent Review of Scientific and Technical Information*. California Council on Science and Technology.

Flint, L. E., Underwood, E. C., Flint, A. L., & Hollander, A. D. (2019). Characterizing the influence of fire on hydrology in Southern California. *Natural Areas Journal*, 39(1), 108-121.

Gabbe, C J., Pierce, G., & Oxlaj, E. (2020). Subsidized households and wildfire hazards in California. *Environmental Management*, 66(5), 873-883.

Gray , A. (2019). (rep.). Debris flow and debris basin management impacts on water quality. University of California Agriculture and Natural Resources . Retrieved from <http://ciwr.ucanr.edu/files/298040.pdf>

Griffith, K. (2018, November). Video: Firefighter fills helicopter water bucket from Malibu Swimming Pool. Daily Mail Online. Retrieved from <https://www.dailymail.co.uk/video/news/video-1800800/Video-Firefighter-fills-helicopter-water-bucket-Malibu-swimming-pool.html>.

Hacker, M. E., & Binz, C. (2021). Institutional Barriers to On-Site Alternative Water Systems: A Conceptual Framework and Systematic Analysis of the Literature. *Environmental Science & Technology*.

Hagemann, H. (2020a, October 20). Santa Cruz County property owners must clean up fire damaged properties. *Santa Cruz Sentinel*. <https://www.santacruzsentinel.com/2020/10/20/santa-cruz-county-property-owners-must-clean-up-fire-damaged-properties/>.

Hagemann, H. (2020b, October 24). As hotel funds dry for fire survivors, a new housing crisis emerges. *Santa Cruz Sentinel*. <https://www.santacruzsentinel.com/2020/10/24/as-hotel-funds-dry-for-fire-survivors-a-new-housing-crisis-emerges/>.

Hagemann, H. (2021, February 23). Proposed fire safe regulations could impact Santa Cruz County landowners. *Santa Cruz Sentinel* . <https://www.santacruzsentinel.com/2021/02/23/proposed-fire-safe-regulations-could-impact-santa-cruz-county-landowners/>.

Hanak, E. (2010). Show me the water plan: urban water management plans and California's water supply adequacy laws. *Golden Gate University Environmental Law Journal*, 4(1), 5.

Hankins, D.L., 2015. Restoring Indigenous Prescribed Fires to California Oak Woodlands. In Standiford, Richard B.; Purcell, Kathryn L., tech. cords. 2015. *Proceedings of the seventh California oak symposium: managing oak woodlands in a dynamic world*. Gen. Tech. Rep. PSW-

GTR-251. Berkeley, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station. 579 p.

Hanson, N. (2020, October 17). Grant for septic system repairs coming to aid Camp Fire rebuild. *Enterprise Record*. <https://www.chicoer.com/2020/10/17/grant-for-septic-system-repairs-coming-to-aid-camp-fire-rebuild/>.

Heaney, Y., Wollbrinck, J., & Macler, B.A. (2020). What can a water system do to prepare for a power outage? *Opflow*, 46(12), 10–15. <https://doi.org/10.1002/opfl.1469>

Hohner, A.K., Rhoades, C.C., Wilkerson, P., & Rosario-Ortiz, F.L. (2019). Wildfires alter forest watersheds and threaten drinking water quality. *Accounts of Chemical Research*, 52(5), 1234-1244.

Lambrinidou, Y., 2018. When Technical Experts Set Out to “Do Good”: Deficit-Based Constructions of “the Public” and the Moral Imperative for New Visions of Engagement. *Mich. J. Sustain.* 6. <http://dx.doi.org/10.3998/mjs.12333712.0006.102>

Maina, F.Z., & Siirila-Woodburn, E.R. (2019). Watersheds dynamics following wildfires: Nonlinear feedbacks and implications on hydrologic responses. *Hydrological Processes*, 34(1), 33–50. <https://doi.org/10.1002/hyp.13568>

McCann, H., Bustic , V., Battles , J., Cisneros, R., Jim, Y., Kocher, S., Potts, M., & Stephens, S. (2020). (rep.). *The Benefits of Headwater Forest Management*. Public Policy Institute of California. Retrieved from <https://www.ppic.org/wp-content/uploads/the-benefits-of-headwater-forest-management-april-2020.pdf>.

Miller, R.K., Field, C.B., & Mach, K.J. (2020). Factors influencing adoption and rejection of fire hazard severity zone maps in California. *International Journal of Disaster Risk Reduction*, 50, 101686.

Mozingo, J. (2018). Santa Barbara County knew mudslides were a risk. It did little to stop them. *Los Angeles Times*. Retrieved from <https://www.latimes.com/local/california/la-me-montecito-debris-basins-20181220-htlmstory.html>

Mozingo, J. (2021, August 4). California's climate nomads: The 2018 Camp Fire left them homeless, struggling to survive. *Los Angeles Times*. <https://www.latimes.com/california/story/2021-08-04/displaced-by-camp-fire-california-nomads-fear-eviction>.

Norgaard, K.M. (2014). (rep.). *Karuk Traditional Ecological Knowledge and the Need for Knowledge Sovereignty: Social, Cultural and Economic Impacts of Denied Access to Traditional Management*. Odimagami, T.O., Proctor, C.R., Wang, Q.E., Sabbaghi, A., Peterson, K.S., David, J Y., ... & Whelton, A.J. (2021). Water safety attitudes, risk perception, experiences, and education for households impacted by the 2018 Camp Fire, California. *Natural Hazards*, 1-29. <https://link.springer.com/article/10.1007/s11069-021-04714-9>

Olick, D. (2021, September 2). *Wildfires are putting water supplies at risk, and corporate America is scared*. CNBC. [https://www.cnbc.com/2021/09/02/companies-investing-in-forest-protection-to-secure-water-supplies.html?utm\\_term=Autofeed&utm\\_medium=Social&utm\\_content=Main&utm\\_source=Twitter#Echobox=1630585830](https://www.cnbc.com/2021/09/02/companies-investing-in-forest-protection-to-secure-water-supplies.html?utm_term=Autofeed&utm_medium=Social&utm_content=Main&utm_source=Twitter#Echobox=1630585830).

Olsen, S. (2020). *Implications of the California wildfires for health, communities, and preparedness: Proceedings of a workshop*. National Academies Press.

Proctor, C.R., Lee, J., Yu, D., Shah, A.D., & Whelton, A.J. (2020). Wildfire caused widespread drinking water distribution network contamination. *AWWA Water Science*, 2(4). <https://doi.org/10.1002/aws2.1183>

Rengers, F.K., McGuire, L.A., Oakley, N.S., Kean, J.W., Staley, D.M., & Tang, H. (2020). Landslides after wildfire: Initiation, magnitude, and mobility. *Landslides*, 17(11), 2631–2641. <https://doi.org/10.1007/s10346-020-01506-3>

Rode, E. (2019, November 5). The Woolsey Fire destroyed 110 homes in this mobile home park. No one has moved back yet. *VC Star*. <https://www.vcstar.com/story/news/2019/11/05/woolsey-fire-seminole-springs-mobile-home-park-california-wildfire/3909997002/>

Roy, S., Edwards, M.A., 2019. *Citizen Science During the Flint, Michigan Federal Water Emergency: Ethical Dilemmas and Lessons Learned*. <https://doi.org/10.5334/cstp.154>

Sankey, J.B., Kreitler, J., Hawbaker, T.J., McVay, J.L., Miller, M.E., Mueller, E.R., Vaillant, N.M., Lowe, S.E., & Sankey, T.T. (2017). Climate, wildfire, and EROSION Ensemble foretells more sediment in western Usa watersheds. *Geophysical Research Letters*, 44(17), 8884–8892. <https://doi.org/10.1002/2017gl073979>

SNC. (2021, March 8). *Megafires create risks for water supply*. Sierra Nevada Conservancy. <https://sierranevada.ca.gov/2020-megafires-create-risks-for-californias-water-supply/>.

Spearing, L. A., Faust, K. M. (2020). Cascading system impacts of the 2018 Camp Fire in California: The interdependent provision of infrastructure services to displaced populations. *International Journal of Disaster Risk Reduction*, 50, 101822. <https://doi.org/10.1016/j.ijdrr.2020.101822>

Swindell, B. (2020, October 11). Santa Rosa firm helps wildfire victims navigate battles with insurance companies. *Press Democrat*. <https://www.pressdemocrat.com/article/business/santa-rosa-firm-helps-wildfire-victims-navigate-battles-with-insurance-comp/>.

Tiger, M., September, August, & April. (2012, August). Public Fire Service Water Charges – on the water bill or on the tax roll? *Environmental Finance Blog*. Retrieved from



<https://efc.web.unc.edu/2012/08/16/public-fire-service-water-charges-on-the-water-bill-or-on-the-tax-roll/>.

Tran, T., Baribeau, H., & Sullivan, L. (2021). Mitigate wildfire impacts on drinking water quality and operations. *Opflow*, 47(5), 10–15. <https://doi.org/10.1002/opfl.1543>

USFS. (n.d.). *American River Headwaters and French Meadows*. Region 5 - land & resource management. <https://www.fs.usda.gov/detail/r5/landmanagement/?cid=fseprd568828>.

UCANR. (2020). (rep.). *Disasters Happen We Can and Will Be Prepared*. Davis, CA: University of California Division of Agriculture and Natural Resources.

US EPA. (2011). (rep.). *Planning for an Emergency Drinking Water Supply*. United States Environmental Protection Agency. Retrieved from [https://www.epa.gov/sites/default/files/2015-03/documents/planning\\_for\\_an\\_emergency\\_drinking\\_water\\_supply.pdf](https://www.epa.gov/sites/default/files/2015-03/documents/planning_for_an_emergency_drinking_water_supply.pdf).

Uzun, H., Dahlgren, R.A., Olivares, C., Erdem, C.U., Karanfil, T., & Chow, A.T. (2020). Two years of POST-WILDFIRE impacts on dissolved organic Matter, nitrogen, and precursors of DISINFECTION By-products in California stream waters. *Water Research*, 181, 115891. <https://doi.org/10.1016/j.watres.2020.115891>

Wang, T., Kim, J., & Whelton, A.J. (2019). Management of plastic bottle and filter waste during the large-scale Flint Michigan lead contaminated drinking water incident. *Resources, Conservation, and Recycling*, 140, 115-124. <https://www.sciencedirect.com/science/article/abs/pii/S0921344918303136>

Water Boards. (2021). (rep.). *2021 Drinking Water Needs Assessment*. California State Water Resources Control Board. Retrieved from [https://www.waterboards.ca.gov/drinking\\_water/certlic/drinkingwater/documents/needs/2021\\_needs\\_assessment.pdf](https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/needs/2021_needs_assessment.pdf).

California Water Resilience Portfolio (2020). In response to the Executive Order N-10-19. See [https://waterresilience.ca.gov/wp-content/uploads/2020/07/Final\\_California-Water-Resilience-Portfolio-2020\\_ADA3\\_v2\\_ay11-opt.pdf](https://waterresilience.ca.gov/wp-content/uploads/2020/07/Final_California-Water-Resilience-Portfolio-2020_ADA3_v2_ay11-opt.pdf)