MISSION CANYON WATERSHED HEALTH AND FIRE SAFETY RECOMMENDATIONS

September 2023

Natalie Blackwelder, Watershed Program Intern

Brian Trautwein, Environmental Analyst / Watershed Program Coordinator

ENVIRONMENTAL DEFENSE CENTER

Acknowledgements

Funders of EDC's Mission Creek Watershed Protection and Fire Safety Project

The following generous funders of the Environmental Defense Center's ("EDC") Mission Creek Watershed Protection and Education Project enabled EDC to identify problem areas, fire hazards, and opportunities for environmental enhancement, and prepare the Mission Creek Watershed Health and Fire Safety Recommendations Report to guide creek and watershed restoration, management actions, and fire safety projects in Mission Canyon, along Mission Creek, and in Rattlesnake Canyon.

UCSB Coastal Fund ** Clif Family Foundation
Santa Barbara Foundation ** MUFG Union Bank, NA

COASTAL FUND
UC SANTA BARBARA
ASSOCIATED STUDENTS

MUFG

MUFG Union Bank, N.A.

CLIF FAMILY FOUNDATION

SANTA BARBARA FOUNDATION

EDC is deeply appreciative of the support provided by these partners!

Cover Photo: Nonnative plants, including palm trees (shown above), eucalyptus trees, pine trees, and acacia trees, can increase fire hazards and reduce the health of Mission Creek's riparian habitat. Mission Creek at De la Guerra Street, Santa Barbara. Natalie Blackwelder. November 16, 2021.

environmental
DEFENSE CENTER

Table of Contents

Index of Problems and Recommendations

Mission Canyon 11. Page 45

- Replace eucalyptus trees with native coast live oaks, western sycamores, or California bay laurels. Secure eucalyptus trunk to creek bank.

Mission Canyon 12. Page 47

- Underground the powerlines and/or prune the trees closest to the power lines.

Mission Canyon 13. Page 48

- Remove eucalyptus and acacia trees in a phased manner while simultaneously replacing them with native trees such as California bay laurels.

Mission Canyon 14. Page 49

- Ensure Southern California Edison ("Edison") removes rubble from Creek unless removal would result in a net adverse impact.
- Remove or reduce height of the berms along Tunnel trail.
- Ensure Edison implements erosion control measures and plants native species along Trail.
- Ensure that Edison mitigates all damage done to Mission Canyon onsite. Ensure that Edison collaborates with the Mission Canyon Association ("MCA") on all future projects, that future Edison projects are subject to robust environmental review, and that Edison obtains permits before implementation.
- Ensure that Edison implements fire safety measures when working in Mission Canyon.

Mission Canyon 15. Page 53

- Support recommendations in Urban Creeks Council's Upper Mission Canyon Hydrology Study to mitigate the Mission Tunnel's impacts to Mission Creek and Rattlesnake Canyon Creek flows.
- Release water from the Tunnel into Mission Creek.
- Eradicate nonnative sunfish from the Tunnel.
- Consider lining the inside of the Tunnel with impervious material to prevent infiltration of groundwater to the Tunnel.
- Curtail groundwater pumping and water diversions, if any.
- Develop alternative water supplies such as wastewater treatment to offset Tunnel releases into Mission Creek. Use recycled water for irrigation when feasible. Inject fully treated wastewater into Santa Barbara-area groundwater basins.
- Evaluate and consider the removal of the old Mission Tunnel.

Mission Canyon 16. Page 56

- Replace nonnative, invasive plant species with natives, starting with areas along Tunnel Trail.

Mission Canyon 17. Page 58

- Cut down the eucalyptus trees, leaving the roots intact to provide support for the Creek bank. Remove the other nonnative understory riparian plants and replace them with natives.
- Remove the concrete from the Creek bed and bank and plant natives.
- Replace storm drains with bioswales containing native wetland plants.

Mission Canyon 18. Page 61

- Install a bioswale with native wetland plants along street gutter.
- Remove all nonnative plants including eucalyptus.
- Remove fallen trees. Remove concrete from eastern bank of the Creek. Replace it with a live willow crib wall.

Mission Canyon 19. Page 63

- Remove the concrete embankment and eucalyptus trees from the western bank of the Creek and replace them with sycamores and coast live oaks.

Mission Canyon 20. Page 66

- Replace the eucalyptus trees with coast live oaks, California bay laurels, western sycamores, or other native riparian trees.

Mission Canyon 21. Page 65

- Replace the eucalyptus trees with coast live oaks, California bay laurels, western sycamores, and native riparian understory species.

Mission Canyon 22. Page 66

- Replace the eucalyptus trees with coast live oaks, California bay laurels, western sycamores, and/or other native riparian trees, and understory species.

Mission Canyon 23. Page 68

- Remove the invasive *Arundo donax* and large palm tree in the Creek near West De La Guerra. Replace them with native riparian plants.
- Lay the banks back, consistent with the Mission Canyon Flood Control Project to provide flood protection.

Mission Canyon 24. Page 70

- Remove the eucalyptus and replace it with a coast live oak tree that is further from the power lines.

Mission Canyon 25. Page 72

- Replace eucalyptus with coast live oaks or other native trees.

Mission Canyon 26. Page 73

- Cut eucalyptus down to roots and treat stumps to prevent regrowth.

Mission Canyon 27. Page 74

- Replace the red river gum eucalyptus with native coast live oaks and/or western sycamores.

Mission Canyon 28. Page 75

- Replace the eucalyptus trees with coast live oak and/or western sycamore trees.

Rattlesnake Canyon 1. Page 76

- Phased replacement of eucalyptus trees with native coast live oak and western sycamore trees.

Rattlesnake Canyon 2. Page 78

- Remove the eucalyptus trees and any eucalyptus saplings in a phased manner and replace with native coast live oaks and/or western sycamore trees.

Rattlesnake Canyon 3. Page 80

- Remove the pine trees starting with diseased trees first in a phased manner and replace with native coast live oaks or California bay laurel trees.

Global 1. Page 82

- Remove flammable invasive nonnative plant species and replant with native species. Conduct education regarding the fire safety and ecological impacts caused by invasive nonnative plants. Maintain a list and map of invasive plant species in the Mission Creek Watershed. Restrict or ban the propagation and sale of invasive plant species.

Global 2. Page 87

- Clean trash and debris from unoccupied homeless camps. Eradicate flammable invasive species such as *Arundo donax*. Plant unoccupied camp sites with low-flammability native

brambles to discourage camping, and fence and monitor areas during vegetation establishment.

- Monitor homeless camps, develop relationships with residents experiencing homelessness, provide services, and expand programs to provide transitional housing.

Global 3. Page 88

- Rezone, downzone, purchase, and acquire easements over parcels in high fire hazard and WUI locations.

Global 4. Page 90

- Protect chaparral and require mitigation for unavoidable chaparral loss.

Global 5. Page 96

- Support increased CalFire and grant funding for Santa Barbara County Fire Department ("SBCFD") and Santa Barbara City Fire Department to conduct defensible space inspections, for hand crews to work fire lines, and to purchase and operate equipment, implement a home-hardening program in rural and WUI areas, for WUI defensible space maintenance, and to remove invasive flammable nonnative vegetation in rural, wildland, and WUI areas.

I. INTRODUCTION AND EXECUTIVE SUMMARY

A. Executive Summary

The Mission Creek Watershed Health and Fire Safety Recommendations Report ("Report") identifies recommendations to local, state, and federal agencies, land managers, landowners, and nonprofit organizations regarding actions to reduce the growing wildfire threats caused by climate change and other human activities while enhancing the Mission Creek Watershed and its associated riparian woodlands and fish and wildlife habitats located in the City of Santa Barbara and unincorporated portions of Santa Barbara County, California. Fire protection and land management agencies face increasingly dangerous conditions because of more frequent, faster-spreading, and more intense wildfires due to climate change, droughts, desiccated woodlands, chaparral, and riparian forests, increased public access to wildlands, and increasing camping in wildlands and Wildland-Urban Interfaces ("WUI"), including people currently experiencing homelessness in the region. These challenges are most evident in the Santa Ynez Mountains and peripheries of urban areas adjacent to natural habitats such as the Los Padres National Forest LPNF ("LPNF"). Recommended actions will mitigate the growing fire threat and enhance natural habitats and watershed values during the twenty- to fifty-year implementation horizon and beyond.

1. Values and Benefits of a Healthy Mission Creek Watershed

The Mission Creek Watershed provides important uses, benefits, and values treasured by residents and visitors to Santa Barbara. The Watershed collects, directs, and filters stormwater runoff to recharge Santa Barbara's parched groundwater basins[1] with clean drinking water to serve a growing population during frequent droughts intensified by climate change. Mission Creek acts as a flood control channel to safely convey floodwaters to the ocean. The Creek and Watershed offer exceptional recreational opportunities, including parks, open spaces, and trails. The Mission Creek basin also harbors tremendous biodiversity, including rare species, such as federally endangered southern California steelhead. (Figures 1 and 2) Students and teachers utilize Mission Creek, Rattlesnake Canyon Creek, and the Watershed as natural outdoor laboratories to study earth sciences. The Watershed and Creeks provide scenic backdrops to Santa Barbara's neighborhoods, including Mission Canyon and the Westside, increase property values[2], offer quiet places to reflect and appreciate nature, and improve the quality of life in our community. This Report identifies opportunities to preserve and enhance these values through actions which reduce fire, flood, and debris flow hazards, thereby protecting life, property, aesthetic values, habitats, and wildlife.

[1] Michael C. McFadden, Keith G. Polinoski, and Peter Martin, Measurement of Streamflow Gains and Losses on Mission Creek at Santa Barbara, California, July and September 1987, U.S. Geological Survey, Water Resources Investigations Report 91-4002 (1991).

[2] John B. Loomis and Carol F. Steiner, *Estimating the Benefits of Urban Stream Restoration Using the Hedonic Method* (1996); *See also* Maya Jarrad, *et al*., *Urban Stream Restoration Projects: Do Project Phase, Distance, and Type Affect Nearby Property Sale Prices?* Land Economics • 94 (3): 368–385 ISSN 0023-7639; E-ISSN 1543-8325 (August 2018).

Figure 1. Resident steelhead in Rattlesnake Canyon Creek.

Figure 2. Steelhead spawning in Mission Creek. David Pritchett.

2. Purpose, Approach, and Expected Outcome

EDC surveyed the Mission Creek Watershed in Fall 2021 to identify environmental problems and develop conceptual recommended solutions. The Report summarizes the results of these surveys and EDC's findings regarding the existing values, uses, and conditions in accessible portions of the Watershed. It describes the intricately linked worsening threats to fire safety and Watershed health. The Report sets forth thirty-one site specific recommendations and five global recommendations to improve fire safety in the WUI and enhance native forest health. The Report suggests programmatic solutions that would lessen these broad-based problems, and identifies prospective partners, funding sources, and next steps to advance conceptual actions into on-the-ground projects. EDC believes that these extremely difficult issues and interrelated threats can be mollified through collaboration by non-traditional partners to protect life, property, natural habitats, and the Watershed's many functions, values and ecological services enjoyed by residents, businesses, and visitors. By working together, local, state, and federal agencies, nonprofits, academic organizations such as the University of California, Santa Barbara ("UCSB"), private businesses, landowners, and citizens can protect, preserve, and restore public safety and natural resources in Mission Creek, Rattlesnake Canyon, and the Watershed.

3. Key Findings and Recommendations

The Report's key findings include:

I. Feasible measures to minimize the threat of fires, floods, and debris flows to public safety and private property also protect watersheds and habitats. For example, replacing invasive, flammable, nonnative plant species with native plants minimizes fire, flood, and debris flow threats and enhances native plant communities and fish and wildlife habitats.

II. Our community can reduce fire threats and impacts to the Watershed and riparian forests by protecting, respecting, and uplifting people experiencing homelessness. Providing unhoused community members currently living along the Creeks assistance transitioning to permanent housing promotes public safety and Watershed health while advancing social justice and equity.

III. Protecting and restoring the natural hydrology of Mission Creek, the Watershed, and groundwater basins can lessen fire hazards and enhance Mission Creek, its tributaries, riparian and oak forests, and fish and wildlife.

The Report's site-specific and global recommendations fall into seven broad categories:

1. Replace invasive flammable nonnative plants with native plants.
2. Reduce water extractions and increase groundwater recharge and infiltration.
3. Restore degraded habitats and protect natural habitats.
4. Transition unhoused community members to permanent housing.

5. Increase funding, equipment, and staff for defensible space inspections and wildfire response.
6. Acquire land and conservation easements in WUIs and wildlands.
7. Downzone properties in WUIs and wildlands.

B. Vision Statement: Enhancing Fire Safety, Protecting Watersheds, and Restoring Ecosystem Health in the Mission Creek Watershed

This Report is guided by EDC's vision of restored, functioning Watersheds, streams, and riparian corridors which (1) support healthy ecosystems, (2) minimize the threat of wildfires, (3) promote community well-being by providing clean water, opportunities for nature study, passive recreation, public access, and (4) enhance public safety. EDC's vision is informed by the local communities' interest in the Watershed, Creeks, wildlands, WUI, and desire for a safe environment and protection of natural resources. The Mission Creek Watershed faces increased droughts and temperatures,[3] a year-round fire season, and growing threats to public safety, habitats, and streams. This Report serves as a blueprint for increasing public safety and creating healthier streams and native habitats in the Mission Creek Watershed.

EDC's and partner organizations' missions shape the following vision statement.[4] The vision reflects cooperating agencies' goals and objectives, concern over the increasing threat of wildfires, the deterioration of local creeks and watersheds, and a unifying goal of reducing the effects of climate change on society and the environment. The underlying vision of this report is:

> *Mission Creek and its Watershed should be ecologically healthy to reduce the threat of wildfires and provide multiple community benefits such as passive recreation, habitat for fish and wildlife, clean water, neighborhood aesthetics, protection from flooding, and economic vitality. The Watershed should be protected from environmental harms which increase wildfire threats, pollute streams, harm fish or wildlife, reduce groundwater levels, impair flows, accelerate runoff, erosion, debris flows, and flooding, and degrade scenic views. Ecosystems should be preserved and restored as valuable community assets and to minimize fire threats. Mission Creek, Rattlesnake Canyon Creek, and the surrounding riparian areas should be quiet, undisturbed, natural areas where community members and visitors can feel safe and enjoy quiet time away from urban disturbances, for learning, contemplation, and reflection. The Creeks and Watershed should be used as outdoor classrooms to educate and inspire people of all ages and from all walks of life about the natural world, and to reconnect residents and visitors to nature.*

[3] Santa Barbara County's temperatures have increased by 2.3 degrees Fahrenheit which is faster than almost every County in the lower forty-eight states other than Ventura County. Santa Barbara County Sustainability Division Staff, *Climate Action Plan Workshop* (March 25, 2021).

[4] EDC's Mission Statement is: "The Environmental Defense Center works to protect and enhance the local environment through education, advocacy, and legal action." EDC Website available at https://www.environmentaldefensecenter.org/mission/ (December 11, 2021).

C. The Increasing Threat of Climate Change: Drought, Wildfires, Floods, and Debris Flows in the Mission Creek Watershed.

The many community and ecological values provided by the Mission Creek Watershed are increasingly threatened by a combination of climate change and resulting fires and debris flows, spread of nonnative species, development, hydromodification, water supply projects, encampments created by community members experiencing homelessness, and other factors. The interrelated effects of climate change, higher temperatures, more frequent fires, longer and more severe droughts, surface water and groundwater extractions, declining live fuel moisture levels, increased spread of flammable nonnative plants, and the growing number of encampments along Mission Creek synergistically degrade natural resources within the Watershed and decrease public safety. Climate change and increased fire frequency may threaten to replace protective chaparral within the Mission Creek Watershed with nonnative annual weeds which heighten wildlife ignition risks. Chaparral conversion opens formerly impenetrable areas to human access and camping. The recent increase in people experiencing homelessness camping along creeks, woodlands, and wildlands adds to the growing sources of ignition in an increasingly arid landscape.

Increased storm severity accompanying climate change poses a related set of safety concerns: flooding, erosion, landslides, and debris flows. Increasing droughts, hotter temperatures, and increasing human access and camping result in increased fire hazards. When followed by increasingly severe storms, neighborhoods near the Creeks and floodplains are at risk. More frequently denuded hillsides caused by fires, erosion, and debris flows may be subject to future type-conversion of chaparral. This could increase fire ignition threats, resulting in shorter fire frequencies, creating a feedback loop which increases fire, flood, and debris flow threats in the Mission Creek Watershed, and denigrate the habitat values of streams, chaparral, oak, and riparian forests in the Watershed.

In addition, measures taken to reduce fire, flood, and debris flow impacts can potentially result in incidental impacts to the Watershed and special-status species present in Mission Creek. Climate change, type-conversion, increased access, camping, fires, floods, and debris flows may pose increasing threats in Mission Canyon, Rattlesnake Canyon, and Mission Creek. This Report sets forth recommendations to minimize wildfires, floods, and debris flows, and protect and enhance public safety and the natural qualities of Mission Creek and the Watershed. These impacts and mitigation actions for them are summarized below.

1. Hotter Temperatures and Longer Droughts Associated with Climate Change Increase Fire Frequency.

Climate change is increasing the average temperature, resulting in more hot days and heat spells even in winter, with the Southwest experiencing a significant increase.[5] (Figure 3) Santa Barbara County has already increased by 2.3 degrees Fahrenheit.[6] Droughts are predicted to become more common in the southwestern United States, including Santa Barbara County.[7] The last decade has been the driest in Santa Barbara County's history.[8]

As temperatures rise, wildfires are also projected to increase in frequency and severity.[9] "Global warming has occurred rapidly over the past half-century. In the arid U.S. Southwest, this will mean that future droughts will likely be more severe, and it will mean a change in the timing and type of precipitation.[10] In California, less precipitation will occur as snow, meaning that less water can be stored in the snowpack, and that dry summers could see even less water availability.[11] Summertime peak temperatures will increase in many places. Fire "seasons" may become even longer."[12]

As a result of increasing temperatures in Santa Barbara County and worsening droughts, such as the 2011-2018 drought (considered the worst drought in five hundred years), fire threats are increasing.[13] The South Coast of Santa Barbara County has experienced an increasing frequency and severity of fires. The 1990 Painted Cave Fire burned 423 structures. In the last twelve years, an increasing number of fires burned in the County. The 2007 Zaca Fire is the largest fire in the County's history and at the time was the second largest fire in California's

[5] Washington Post. *2°C: Beyond the Limit: Fires, floods and free parking: California's unending fight against climate change* available at https://www.washingtonpost.com/graphics/2019/national/climate-environment/climate-change-california/ (December 5, 2019).
[6] Santa Barbara County Sustainability Division, *Climate Action Plan Webinar* (March 25, 2021).
[7] Climate Reality Project, 2016.
[8] Nick Welsh, Santa Barbara County's 10-Year Rainfall Average at 'All-Time Low' Santa Barbara Independent available at https://www.independent.com/2021/04/08/santa-barbara-countys-10-year-rainfall-average-at-all-time-low/ (April 8, 2021).
[9] Kendra Pierre-Louis, and Nadja Popovich, *Climate Change Is Fueling Wildfires Nationwide, New Report Warns*, New York Times available at https://www.nytimes.com/interactive/2018/11/27/climate/wildfire-global-warming.html (November 27, 2018).
[10] Michael E. Mann, *Climate change and California drought in the 21st century*, Proceedings of the national Academy of Sciences of the United States of America available at https://www.pnas.org/content/112/13/3858 (March 31, 2015).
[11] Diana Leonard, *Snow may vanish for years at a time in Mountain West with climate warming*, The Washington Post available at https://www.washingtonpost.com/weather/2021/12/03/snow-water-resources-california/ (December 3, 2021).
[12] University of California Cooperative Extension ("UC Coop"), *Climate, Fire, and Habitat in Southern California* Website available at https://ucanr.edu/sites/SAFELandscapes/Fire_in_Southern_California_Ecosystems/ (February 21, 2021); *See also* Williams, A. P., Abatzoglou, J. T., Gershunov, A., Guzman-Morales, J., Bishop, D. A., Balch, J. K., & Lettenmaier, D. P. *Observed impacts of anthropogenic climate change on wildfire in California.* Earth's Future, 7, 892– 910. https://doi.org/10.1029/2019EF001210 (2019).
[13] Valerie Trouet, Associate Professor, University of Arizona, *Study says California drought is worst in 500 years California is in a fourth year of a severe drought* available at https://www.tradeonlytoday.com/industry-news/study-says-california-drought-is-worst-in-500-years (July 28, 2017).

history.[14] Since 2007, the south County has experienced the 2008 Gap Fire, the 2008 Tea Fire, the 2009 Jesusita Fire, the 2016 Sherpa Fire[15], the 2017 Whittier Fire, the 2017-18 Thomas Fire, which consumed 281,893 acres and which at the time was the largest in California's history, the 2018 Holiday Fire, and the 2019 Cave Fire.[16]

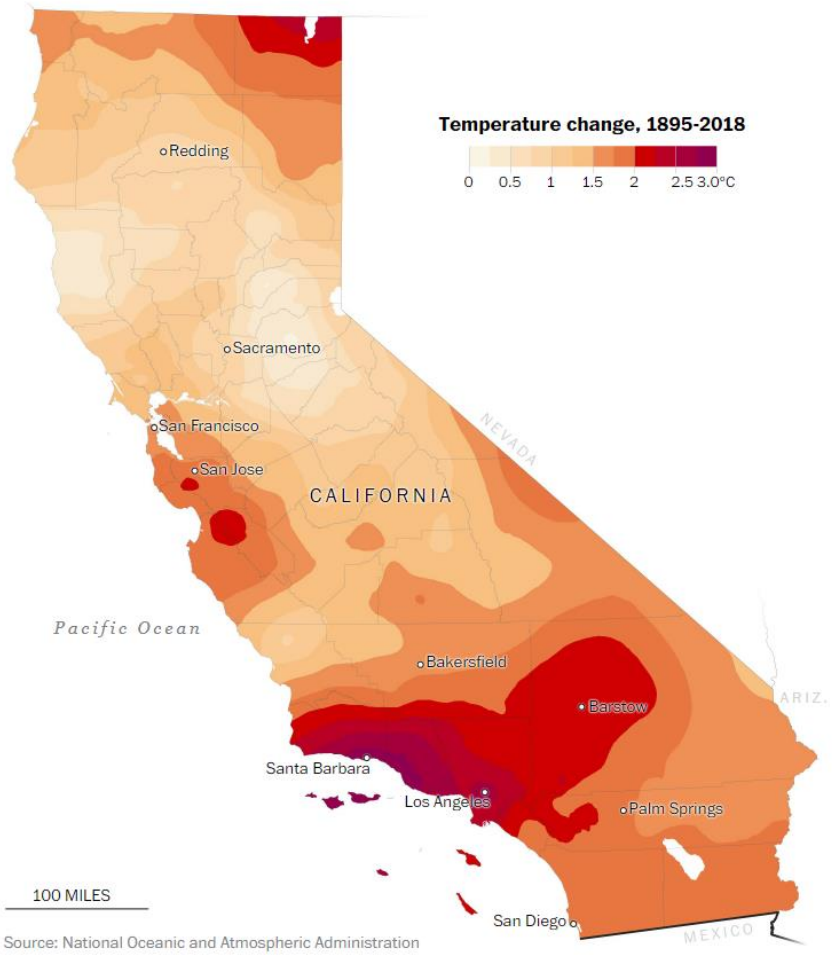

Figure 3. Santa Barbara is warming more rapidly that the rest of California and the continental United States. Washington Post. *2°C: Beyond the Limit: Fires, floods and free parking: California's unending fight against climate*

[14] Bryan Walton, Lompoc Record, *$17 million Zaca Fire costs repaid* available at https://lompocrecord.com/news/local/million-zaca-fire-costs-repaid/article_42dde75a-0ff6-11e1-80a3-001cc4c002e0.html#:~:text=The%20Zaca%20Fire%20burned%20228%2C000,in%20Santa%20Barbara%20County%20history. (November 15, 2011).

[15] Santa Barbara County, *Sherpa Fire Information and Updates* Webpage available at https://www.countyofsb.org/scherpa-fire.sbc (Updated July 12, 2016).

[16] Judith Dale, *Wildfires in Santa Barbara County, 2008 to 2015* available at https://lompocrecord.com/lifestyles/columnist/judith-dale-wildfires-in-santa-barbara-county-2008-to-2015/article_c082070f-7f7a-5a87-b8ff-ceb4357c21e5.html (October 24, 2020); *See also* Wikipedia, *Thomas Fire* available at https://en.wikipedia.org/wiki/Thomas_Fire#:~:text=It%20burned%20approximately%20281%2C893%20acres,California%20history%20at%20the%20time.&text=By%20January%202%2C%202018%2C%20the,over%20104%2C607%20residents%20to%20evacuate (April 7, 2021).

change. https://www.washingtonpost.com/graphics/2019/national/climate-environment/climate-change-california/ December 5, 2019.

2. Hotter Temperatures and Longer, More Severe Droughts Increase Water Demand, Lower Groundwater Tables, and Diminish Creek Flows and Riparian Woodland Moisture Levels.

Higher temperatures and longer, more severe droughts such as the 2011 – 2018 California Drought reduce the frequency and amount of rainfall, runoff into local creeks, and groundwater recharge, causing the Creek and riparian areas to become increasingly desiccated.[17] Droughts and warmer temperatures increase water demand for agriculture and landscapes.[18] Increased groundwater extraction and creek and spring diversions can negatively affect creek baseflows and biological resources.[19] "Groundwater is generally banked during wet years and primarily used as a supply during drought as surface water supplies decrease."[20] Increased groundwater extraction, coupled with reduced rain and runoff, reduces groundwater levels and prevents groundwater basin recovery following droughts. Groundwater depletion causes "reduction of water in streams and lakes."[21] Thus, during droughts, agencies and landowners extract more water from groundwater basins due to increased water demand and reduced surface flows, and less water recharges the basins, resulting in a net decrease of groundwater, which reduces water available for riparian habitats and aquatic stream habitats, desiccating creeks and riparian forests.

Sections of upper Mission Creek and Rattlesnake Canyon Creek in the LPNF and County jurisdictions flow perennially due to high groundwater levels.[22] (*See e.g.*, Figure 4.) However, the Mission Tunnel routinely dewaters Mission Creek via groundwater mining.[23] Groundwater wells in Mission Canyon may also lower water tables and Creek flows by creating a "cone of depression" around wells.[24] Dewatering the Creek and riparian habitats reduces live fuel moisture levels, desiccates riparian forests, and increases fire hazards.[25]

---

[17] University of Merced Newsroom, *Scientists Explain Mechanisms Affecting Runoff Levels During Drought*, available at https://news.ucmerced.edu/news/2018/scientists-explain-mechanisms-affecting-runoff-levels-during-drought (April 7, 2021).
[18] Pena-Guerrero, A. Nauditt, C. Munoz-Robles, L. Ribbe, and F. Meza, *Drought impacts on water quality and potential implications for agricultural production in the Maipo River Basin, Central Chile* available at https://www.tandfonline.com/doi/full/10.1080/02626667.2020.1711911 (February 21, 2020).
[19] Santa Barbara County, *Environmental Thresholds and Guidelines Manual Groundwater Resources Section* at 69 available at http://santabarbaracounty.ca.gov/ceo/asset.c/479 (2008) ("Santa Barbara County (2008)").
[20] City of Santa Barbara, *Groundwater* Webpage available at https://www.santabarbaraca.gov/gov/depts/pw/resources/system/sources/groundwater.asp (December 19, 2021).
[21] USGS, *Groundwater Decline and Depletion* Webpage available at https://www.usgs.gov/special-topic/water-science-school/science/groundwater-decline-and-depletion?qt-science_center_objects=0#qt-science_center_objects (March 29, 2021).
[22] US Geological Survey, *Santa Barbara Quad Topo Map*.
[23] See e.g., Dr. Edward Keller, Professor, Earth Surface Processes and Environmental Geology, Department of Geological Sciences, UCSB, *Land of Dynamic Beauty* (2011) ("Keller (2011)"); *See also* Walker Thompkins, *History of Mission Canyon* (undated).
[24] USGS, *Cone of depressions* webpage available at https://www.usgs.gov/media/images/cone-depression-pumping-a-well-can-cause-water-level-lowering (January 21, 2021).
[25] City of Goleta, *Creek and Watershed Management Plan* (November 2020) at 221.

Figure 4. Perennial pool in Rattlesnake Canyon. Trautwein. September 2021.

Figure 5. Three adult female steelhead over twenty inches-long, many resident steelhead, and steelhead eggs were killed when groundwater pumping apparently dried Carpinteria Creek overnight. Photo Credit: Mauricio Gomez. 2008.

When groundwater is pumped, such as during droughts, the water tables may drop below the elevation of stream beds, causing significant impacts to biological resources and potentially harming special-status species.[26] For example, in 2008, groundwater pumping is believed to be responsible for drying up a deep pool on Carpinteria Creek, killing three adult steelhead, numerous resident steelhead, and steelhead eggs.[27] (Figure 5) Desiccated riparian forests and

[26] Santa Barbara County (2008) at 69.
[27] Moe Gomez, Director, South Coast Habitat Restoration, personal communication with Brian Trautwein, Environmental Analyst / Watershed Program Coordinator, EDC (2008); *See also* email from Lawrence Hunt, Hunt

creeks threaten hydrophytic riparian vegetation such as white alder, which requires year-round water.[28] Riparian corridors that are over-drafted by wells and diversions on the South Coast lack high live fuel moisture levels.[29] Absent this moisture in riparian vegetation, riparian forests are becoming increasingly desiccated. Instead of acting as natural fire inhibitors, dewatered riparian forests with standing dead wood enable fires to move down canyons, consuming dry riparian woodland plants, and enter the WUI and urban neighborhoods, especially during sundowner wind conditions. For example, at 6:02 pm on June 27, 1990, on the heels of a significant drought, the Painted Cave Fire was propelled by "some of the worst sundowner winds ever recorded" and a temperature of 109 degrees Fahrenheit. The fire was funneled down Maria Ygnacio Creek, devouring riparian trees from Highway 154 at San Marcos Pass Road into residential neighborhoods in the WUI by 7:00 pm, and across Highway 101 at 7:42 pm, taking out 463 structures and killing one person.[30] The Tea Fire in the Mission Creek Watershed was also driven by sundowner winds.[31]

3. Increasing Fire Severity Damages Riparian and Aquatic Habitats in Streams.

Climate change is increasing fire severity.[32] "Climate change threatens to increase the frequency, extent, and severity of fires through increased temperatures and drought."[33] Studies have shown that riparian habitats are sensitive to the influences of fire.[34] In one study, fires had the "strongest total effect" on floodplain vegetation which influenced vegetation more than stream power and geomorphic position.[35] Fires alter microclimatic regimes, and when fires are compounded with seasonal stormwater runoff, they increase runoff and stream discharges, erosion, sediment inputs, and deposition in streams.[36] Water quality and stream chemistry, including oxygen levels, pH, turbidity, nutrient load such as nitrogen, and specific conductance can change dramatically in pulses following wildfires and subsequent floods and debris flows,

---

and Associates Biological Consulting Services to Brian Trautwein, Environmental Analyst / Watershed Program Coordinator, EDC (January 5. 2022).

[28] Jason Nelson, Student, *UCSB Environmental Studies Report* (1993) ("Nelson (1993)").

[29] City of Goleta (2020) at 221.

[30] Robert Bernstein, Santa Barbara EdHat, *Painted Cave Fire 30th Anniversary* available at https://www.edhat.com/news/painted-cave-fire-30th-anniversary (June 27, 2020); *See also* Wikipedia, *Painted Cave Fire*, available at https://en.wikipedia.org/wiki/Painted_Cave_Fire (March 28, 2021).

[31] Montecito Fire Protection District, *Tea Fire Sparked 13 Years Ago* available at https://www.edhat.com/news/tea-fire-sparked-13-years-ago (November 13, 2021).

[32] Alejandra Borunda, *The Science Connecting Wildfires to Climate Change* stating "California and Oregon's 2020 fire season has the highest fire intensity of the past 18 years," National Geographic available at https://www.nationalgeographic.com/science/article/climate-change-increases-risk-fires-western-us (September 17, 2020).

[33] US EPA, Climate Change Indicators: Wildfires Webpage available at https://www.epa.gov/climate-indicators/climate-change-indicators-wildfires (October 18, 2021).

[34] Bixby, Rebecca J., Scott D. Cooper, Robert E. Gresswell, Lee E. Brown, Clifford N. Dahm, and Kathleen A. Dwire, *Fire Effects on Aquatic Ecosystems: An Assessment of the Current State of the Science,* Freshwater Science, The Society for Freshwater Science at 1342, available at https://www.fs.fed.us/rm/pubs_journals/2015/rmrs_2015_bixby_r001.pdf (September 2015) ("Bixby, *et al.* (2015)").

[35] *Id.*

[36] *Id.*

with less dramatic changes occurring further downstream from burn areas.[37] Fire severity can play a significant role in watershed impacts. "The Thomas Fire showed the effect of extreme fire severity on both riparian and surrounding chaparral areas. Everything burned off, including most of the riparian vegetation. We saw the horrible aftermath of resulting debris flows."[38] Fires increase dissolved and particulate carbon (ash and charcoal), decrease organic inputs (leaf litter), increase sunlight exposure, and increase the rate of leaf litter decomposition in stream habitats.[39]

When strong storm events occur following a recent wildfire there is potential for increased erosion, sedimentation, mud flows, debris flow, and damaging floods. Fires and post-fire floods can radically change stream communities. Decreased riparian canopies increase algae growth in streams.[40] Macroinvertebrate recovery after fires and debris flows may be delayed by drought.[41] Wildfires remove logs and woody vegetation which contribute to stream habitat diversity and health.[42] Native steelhead and chub can be eliminated from burned watersheds due to hypoxia, elevated ammonia, metals, and/or ferrocyanides.[43] Resident steelhead were nearly extirpated from the Mission Creek Watershed following the Jesusita which burned approximately two-thirds of the watershed in 2008-2009.[44] Migratory barriers may prevent recolonization by native fish.[45] Fires may threaten native fish more than nonnative warmwater fish and crayfish, although post-fire storms eliminated nonnative sunfish from Mission Creek in 2009-2010.[46] One study demonstrated cutthroat trout[47] resiliency to post-fire debris flows, likely due to recolonization from "headwater streams and lakes."[48] Unfortunately, the 2018 Montecito debris flows likely eliminated resident steelhead from two creeks in southeastern Santa Barbara

[37] *Id*. at 1343.
[38] Email from Rob Hazard, Division Chief/ Fire Marshal, Fire Prevention Division, SBCFD to Brian Trautwein, Environmental Analyst / Watershed Program Coordinator (October 5, 2021) ("Hazard (2021)").
[39] Bixby *et al.* at 1344.
[40] *Id*.
[41] *Id. at 1344 and 1345. See also* Daniel Swain, Weather West, *Modest April Showers, but Worsening Drought Continues*, EdHat available at https://www.edhat.com/news/weather-west-modest-april-showers-but-worsening-drought-continues?qt-right_side_tab=2 (April 24, 2021).
[42] *Id*.
[43] *Id*.; *See also* Kristi Klose, PhD, BAER Team Fisheries Biologist, LPNF, Casey Horgan, Michael Morales, Kyle Evans, Sam Bankston, Teagan Partin, and Katie Carmody, Pacific States Marine Fisheries Commission and California Department of Fish and Wildlife, *Assessment of Steelhead Habitat and Migration Barriers within Watersheds Impacted by the Thomas, Whitter, and Topanga Wildfires* (September 10, 2019) ("Klose *et al.* (2019)").
[44] Scott F. Cooper, Henry M. Page, Sheila Wiseman, Kristie Klose, Danuta Bennett, Thomas Even, Steven Sadro, Craig E. Nelson, and Thomas Dudley, *Physiochemical and biological responses of stream to wildfire severity in riparian zones*, Freshwater Biology 60, 2600–2619; doi:10.1111/fwb.12523 (2015); *See also* Email from Jill Murray, PhD, Creeks Water Quality Analyst, City of Santa Barbara to Cameron Benson, Creeks Restoration and Water Quality Manager, City of Santa Barbara (July 28, 2023).
[45] Bixby, *et al*. (2015) at 1345.
[46] Bixby, *et al*. (2015) at 1344 – 1345; *See also* email from Matt McGoogan, Fisheries Biologist, NMFS, to Rebecca Bjork, Water Supply Manager, City of Santa Barbara (August 31, 2010).
[47] This is informative regarding the effects of fire on steelhead because cutthroat trout are anadromous like steelhead but they do not occur in Mission Canyon.
[48] Rebecca J. Bixby, Scott D. Cooper, Robert E. Gresswell, Lee E. Brown, Clifford N. Dahm, and Kathleen A. Dwire, *Fire effects on aquatic ecosystems: an assessment of the current state of the science* DOI: 10.1086/684073; Freshwater Science. 2015. 34(4):1340–1350. © 2015 by The Society for Freshwater Science. (September 22, 2025).

County, underscoring the threats of wildfires on Mission Creek's and Rattlesnake Canyon Creek's ecology.[49]

4. Increasing Fire Frequencies May Result in Type-conversion of Chaparral to Nonnative Annual Vegetation Which Increases Fire Ignition Risks, and Further Desiccates Watersheds.

In addition to the effects of fire and post-fire debris flows on stream ecosystems, wildfire impacts on watershed vegetation pose an additional threat to creek ecosystems. Increased fire frequency associated with climate change, drought, and increased anthropogenic ignitions as discussed above may cause type-conversion of chaparral, currently the dominant vegetation community in the upper portions of the Mission Creek Watershed.[50] Chaparral in the Mission Canyon does not currently appear to be undergoing type-conversion, but it may in the future.

> "The one factor all types of chaparral have in common, however, is that they are all sensitive to fire intervals shorter than 30 years. A fire return interval ten years or less has been shown to guarantee ecological loss. Ten year (sic) is the minimal amount time it takes for a burned chaparral stand to mature enough to set enough seed in the soil to create a healthy, pyrogenic habitat after the next fire. As fire frequencies increase due to human-caused ignitions, the intervals between fires have been contracting, causing the complete elimination of chaparral in some areas and serious degradation in others. This is happening in both southern and northern California.[51]

However, according to Rob Hazard, SBCFD Division Chief / Fire Marshal, fire return intervals along the south coast of Santa Barbara generally remain high so far (between nineteen and sixty-two years).[52] "While we have experienced an unusual number of major fires along the front country, the majority of burnt acreage has not overlapped."[53] Two recent examples are noteworthy:

> "One exception we have seen is the 2019 Cave Fire. The Cave Fire initially displayed extreme fire behavior as it burned through 55-year-old chaparral driven by 50 plus mph winds. The resulting extremely intense flaming front burning through old age class chaparral generated a large amount of fire brands and

[49] Bixby, *et al.* (2015) at 1345; *See also* Klose *et al.* (2019) at 107 sating, "Zero *O. mykiss* were observed in these streams during the habitat and barrier assessments conducted for this report. It is unlikely San Ysidro Creek and Carpinteria Creek continue to support a resident *O. mykiss* population at this time considering the numerous negative impacts on stream habitat conditions from persistent drought, wildfire, and subsequent sediment influxes."
[50] Alexandra D. Syphard, Teresa J. Brennan, and Jon E. Keeley, *Extent and drivers of vegetation type conversion in Southern California chaparral* available at https://esajournals.onlinelibrary.wiley.com/doi/full/10.1002/ecs2.2796 (July 2019) ("Syphard *et al.* (2019)"); *See also* Google Earth (2019).
[51] California Chaparral Institute Website, *What is Type Conversion* Webpage, available at https://www.californiachaparral.org/threats/too-much-fire/ (October 18, 2021).
[52] Hazard (2021).
[53] *Id.*

> embers which were driven down-wind into receptive fuels resulting in numerous spot fires. As the fire burned into the 2009 Jesusita in its southern half the fire intensity was dramatically reduced, what we call a "dirty burn" with many unburned islands of chaparral, some places where only the understory burned, and the primary mechanism of fire spread was wind-driven embers spotting in lighter grass and sage fuels."[54]

The 2021 Alisal Fire burned into the footprint of the 2016 Sherpa Fire. However, the Alisal Fire "diminished on the east side after reaching younger vegetation in the 2016 Sherpa fire burn scar."[55] Nevertheless, climate change, drought, hotter temperatures, and increasing fire ignitions may shorten the future fire frequency in local chaparral stands.

If chaparral stands were to burn too frequently, obligate chaparral seeders such as ceanothus, which require fire for seeds to germinate, never get a chance to set seed because they are burned too frequently, and they disappear, allowing weedy plant communities dominated by annuals such as thistles and nonnative annual grasses to displace the scrub and chaparral.[56] Herbaceous annual plants such as thistles and annual grasses which replace chaparral die and dry out each year.[57] This transition from dense, woody perennial chaparral vegetation to herbaceous and grassy annual plants exacerbates fire ignition threats by physically allowing easier human access into wildland and WUI areas, which increasingly support nonnative annual plants that die and dry out every year. In areas where type-conversion is occurring, conversion of chaparral to nonnative plants (Figures 53 and 54) creates a negative feedback loop with increasingly frequent fire ignition, accelerating type-conversion of chaparral to nonnative annual weeds, and intensifying the impacts of increasingly frequent fires.[58] If fire frequency increases in Santa Barbara County due to climate change and/or increased anthropogenic ignitions, the impacts of fire, floods, erosion, sedimentation, and debris flows on Mission Creek, the Watershed, and its riparian forests would occur more frequently, decreasing public safety and increasing damage to the Watershed, riparian forests, aquatic habitats, and special-status species, including steelhead.

Loss of chaparral and coastal sage scrub to type-conversion also reduces fog-drip and groundwater recharge because the nonnative weeds are smaller and less effective at capturing and infiltrating fog droplets and rain drops, reducing moisture available for steams and steelhead.[59] Reduced fog drip dries out vegetation, making it more prone to wildfire, exacerbating the negative feedback loop between increasing temperatures, type-conversion, fog-

---

[54] *Id.*
[55] Dave Minsky, *Alisal fire containment reaches 41%; 3 residences destroyed*, Lompoc Record available at https://lompocrecord.com/news/local/alisal-fire-containment-reaches-41-3-residences-destroyed/article_4c68be9e-4552-598f-aff5-72ec472ac9b7.html (October 16, 2021).
[56] Syphard *et al.* (2019).
[57] *Id.*
[58] California Chaparral Institute, *Type-Conversion – the Impact of Excessive Fire* Webpage available at https://www.californiachaparral.org/threats/too-much-fire/ (February 21, 2021) ("Chaparral Institute (2021)").
[59] Alicia Torregrosa, Lorraine E. Flint, Alan L. Flint, *Hydrologic Resilience from Summertime Fog and Recharge: A Case Study for Coho Salmon Recovery Planning* https://onlinelibrary.wiley.com/doi/full/10.1111/1752-1688.12811 (November 20, 2019).

drip, moisture levels, wildfire ignition frequency and fire spread, and adverse effects on creeks, riparian forests, and watersheds.

5. Climate Change Causes More Severe Storms, Which Increase Erosion, Flooding, and Debris Flows.

Climate change also impacts weather patterns. Stronger storm events are expected to become more commonplace, which increases the likelihood of creek flooding.[60] Increasingly frequent fires may denude the Mission Creek Watershed, and when followed by more powerful storms lead to increased erosion, sedimentation, and mud flows, debris flows, and damaging floods. As an example, the 2017 Thomas Fire burned from Santa Paula to Santa Barbara.[61] The fire was fully contained on January 12, 2018. However, prior to containment on January 9, 2018, intense rainfall led to widespread debris flows killing at least twenty-two people and destroying "around 100 homes."[62] The 2018 Montecito Debris Flows caused substantial damage to creek and riparian habitats and appears to have extirpated steelhead from several important watersheds, including Carpinteria and San Ysidro Creeks.[63]

6. Fire and Flood Prevention Measures Can Cause Incidental Damage to Watersheds, Streams, and Riparian Habitats.

Implementation of measures to protect homes, communities, and watersheds from wildfires and subsequent debris flows, including fuel breaks and debris basins, are increasing due to the profound number of damaging wildfires in Santa Barbara County during 2007-2021. While necessary to control fire spread and protect property and natural resources from fires and debris flows, these measures can result in incidental adverse effects to watersheds, including spread of invasive plant species, increased erosion, sedimentation, reduced infiltration, and impacts on aquatic habitat and species. Fire retardant is often necessary to halt the spread of wildfires but is toxic to steelhead as illustrated by a fish kill reported by EDC in Maria Ygnacio Creek in Goleta during the Jesusita Fire in 2009.[64] Flood prevention measures necessitated by increasing fire frequency, such as debris basins, creek clearing, and ring nets[65] pose additional impacts to fish, wildlife, and riparian habitats.[66]

---

[60] Amir AghaKouchak, Elisa Ragno, Charlotte Love, Hamed Moftakhari, *Projected Changes in California's Precipitation Intensity-Duration-Frequency Curves* available at https://www.energy.ca.gov/sites/default/files/2019-11/CCCA4-CEC-2018-005_ADA.pdf (August 2018).

[61] Klose *et al.* (2019).

[62] Greta Mart, KCBX, *Thomas Fire scars still pose risk, one year later* available at https://www.kcbx.org/post/thomas-fire-scars-still-pose-risk-one-year-later#stream/0 (December 4, 2018). *See also* Nasa, Earth Observatory Webpage available at https://earthobservatory.nasa.gov/images/91573/deadly-debris-flows-in-montecito (March 29, 2021).

[63] Klose *et al.* (2019).

[64] Mark Capelli, South-Central / Southern California Steelhead Recovery Coordinator, NMFS Memo to File Re: *Maria Ygnacio O. mykiss Mortalities, Jesusita Fire, Santa Barbara* (May 15, 2009). ("Capelli (2009")).

[65] The Partnership for Resilient Communities Website available at https://www.partnershipsb.org/net-project (October 19, 2021).

[66] See e.g., NMFS, *Biological Opinion for Flood Control Operations including Annal Stream Maintenance, Debris Basin Maintenance, Goleta Slough Dredging and Long-term Atascadero Creek Channel Maintenance permitted by*

As discussed further below, protecting Creek hydrology and healthy, hydrated riparian vegetation by minimizing groundwater extraction and stream diversions may reduce the spread of fires, reducing the fire hazards in the WUI, the resulting impacts on the Watersheds, and the added incidental impacts of fire and flood mitigation measures on the Watershed, Creeks, and fish and wildlife (See Problem Mission Creek 15 below.) Figure 6 shows Arroyo Hondo Creek after the 2004 Gaviota Fire and demonstrates that moist riparian habitats can function as fuel breaks during fires.

Figure 6. Arroyo Hondo Creek functioned as a natural firebreak during the 2004 Gaviota Fire. Note the burned vegetation on the left (west) side of Figure 6 and the dark green vegetation on the upper right (east) side of Figure 6. The light-colored barren area on the right side of Figure 6 is the Tajiguas Landfill. Google Earth. 2005.

the US Army Corps of Engineers, and implemented by the Santa Barbara County Flood Control District in designated waters occurring within (March 11, 2014) ("NMFS (2014)").

7. Invasive Exotic Vegetation Increases Wildfires, Reduces Streamflow, and Desiccates Riparian Habitats.

People have historically installed and continue to plant exotic landscaping in public and private areas, including along Mission and Rattlesnake Canyon Creeks' riparian woodlands and in other locations in the Watershed. Plants such as giant reed (*Arundo donax*),[67] pampas grass, and eucalyptus trees were introduced to the South Coast and have become naturalized. (See Problem Global 1 on page 82 below.) These exotic species can form dense, uniform stands of flammable vegetation in the Watershed, worsening the trend of increasing fire hazards. Eucalyptus, acacia, and Algerian ivy are among the nonnative plants which increase fire hazards.[68] Eucalyptus, Arundo, and Tamarisk identified during EDC's surveys grow rapidly and utilize vast amounts of water during evapotranspiration, further desiccating riparian areas.[69] EDC found numerous homeless camps within Arundo and eucalyptus stands in riparian areas, increasing the threat of wildfires, as discussed below.

8. A Growing Number of Homeless Community Member Camps Increase Fires in Mission Creek's Riparian Woodlands.

Homeless camps in South Coast watersheds contribute to the growing number of fires in riparian forests.[70] This problem has been increasing since the COVID-19 Pandemic began and homelessness increased.[71] Wildfires in and near encampments have become very common due to an increase in cooking and warming fires.[72] Fires at encampments may also be increasing due to drier riparian woodland vegetation caused by droughts, hotter temperatures, decreased water tables, and reduced streamflow wrought by climate change and increased water extraction from riparian areas as discussed above.

In summary, climate change is causing hotter temperatures and longer droughts, which have the potential to increase the frequency and severity of fires on the South Coast. It is also causing a reduction in groundwater recharge from rainfall and streamflow. At the same time, hotter temperatures and droughts may cause increased groundwater and Creek diversions for

[67] California Invasive Plant Council, *Arundo donax* webpage available at https://www.cal-ipc.org/plants/profile/arundo-donax-profile/ (February 19, 2021).
[68] Lisa Hallett Taylor, *Flammable Plants to Avoid Having in Your Garden* available at https://www.thespruce.com/firescaping-the-most-flammable-plants-4107522 (June 5, 2020) ("Taylor (2020)").
[69] *Id.*
[70] EdHat Staff, *Multiple Brush Fires Near Homeless Camp on Highway 101 in Goleta* Available at https://www.edhat.com/news/multiple-brush-fires-near-homeless-camp-on-highway-101-in-goleta (November 27, 2020); *See also* EdHat Staff, *Brush Fire at Homeless Camp in Goleta* available at https://www.edhat.com/news/brush-fire-at-homeless-camp-in-goleta (December 20, 2020); *See also* Jean Yamamura, Santa Barbara Independent, *Homeless Camps and Fires a Challenge for Goleta During COVID* available at https://www.independent.com/2020/07/17/homeless-camps-and-fires-a-challenge-for-goleta-during-covid/ (July 17, 2020) ("Yamamura (2020)").
[71] Email from Chuck Flacks, Homeless Services Coordinator, City of Goleta to Brian Trautwein, Senior Analyst / Watershed Program Director, EDC (July 28, 2023) ("Flacks (2023)").
[72] Yamamura (2020).

water supplies. As a result, groundwater tables may drop, the Creeks and riparian habitat may become more desiccated, and fires would then start and spread more readily. Once desiccated, riparian corridors can transform from natural fire breaks to corridors for fire to travel down canyons. Climate change also results in more intense storms. Erosion, flooding, and debris flows are increasing due to the increase in fires, resulting in denuded hillsides, and increasingly severe storms. In the future, the increase in flammable nonnative vegetation caused by type-conversion of chaparral may alter the fire regime and exacerbate this Watershed hazard. Increased presence of eucalyptus, Arundo, and other exotic plants along Mission Creek and the increasing number of homeless community member camps contribute to this fire-flood-watershed degradation cycle. Taken together, these related processes driven by climate change and anthropocentric activities are increasingly threatening human life and property, while devastating the Mission Creek Watershed, riparian forests, and aquatic habitats. This Report offers solutions which will minimize these impacts, protect the Mission Creek Watershed and riparian forests, and improve fire safety in the Watershed.

D. Goals and Objectives: Enhancing Fire Safety and Riparian Forest Health

The coequal overarching visions of this report are to increase public safety and environmental health in the Mission Creek Watershed by reducing the threat that wildfires pose to the public and the natural functions and values of the Watershed.

Objective: Create safer neighborhoods complemented by restored creeks and riparian forests, by reducing the number, extent and impacts of wildfires, floods, and debris flows, and protecting and enhancing the natural functions and values of healthy watersheds.

Strategies:

- Develop interagency, non-profit, and public-private partnerships to mitigate the threat of wildfires and restore degraded streams and watersheds.

- Adapt to the effects of climate change through nature-based measures that improve conditions of local watersheds.

- Increase the resiliency of neighborhoods in the WUI and watersheds to climate change-induced droughts, rising temperatures, fires, and intensified storms.

  Actions:

  - Retain and restore watershed hydrology to protect natural resources and watershed functions and values and ensure that riparian corridors can serve as natural impediments to wildfire spread.
  - Seek to eradicate or curtail the spread of flammable nonnative plants that damage local watersheds and exacerbate fire dangers.

- Provide alternative living situations to homeless community members to provide for their safety in a socially just and equitable manner and reduce their contribution to fires.

In addition to these broader actions, this report recommends site-specific and global implementation actions and projects with the dual objectives of watershed enhancement and preservation and WUI fire safety. (See Section II below.) Santa Barbara City, Santa Barbara County, cooperating agencies and jurisdictions, nonprofits, and private partners should initially focus on projects achievable in the short-term. Each project should set forth measurable performance standards, such as acres of flammable exotic vegetation removed, number of native trees planted and surviving, acres of riparian forest restored, increased live fuel moisture levels, and stream baseflows recovered and protected in order to continually gauge the success of implementation projects, assess program effectiveness, and allow for adaptive management to concurrently maximize fire safety in the WUI and enhance creeks in the Watershed.

E. Implementation Timeframe

The agencies, organizations, and community members should set a timeframe for achieving specific milestones, goals, and objectives of this plan. Many of the environmental problems and fire hazards caused by climate change and improper watershed management have accrued for over one hundred years. It may take several decades of focused work to implement the actions necessary to begin to reverse these problems and increase fire safety and the health of the Mission Creek Watershed for future generations.

The planning and implementation timeline for the actions recommended in this report is twenty to fifty years. The rationale for this timeframe accounts for the difficulty of minimizing the increasing impacts of climate change as well as the length of time it can take to undertake large projects, such as eradicating exotic species, managing groundwater, rezoning high fire hazard areas, and mitigating flow impairments. It can take years to obtain project funding. It can take decades to improve groundwater management, increase reuse of wastewater, change land and stream management practices, and prioritize and purchase properties and protect water rights for instream values. It takes decades for planted riparian trees to mature. Therefore, it will take decades to implement the projects recommended in this report to lessen the fire hazards in the Mission Creek Watershed and WUI neighborhoods and to Mission Creek. However, with funding and community support, some actions, such as increased enforcement of defensible space, home hardening, and improved stream hydrology may begin to result in increased fire safety and watershed health within a few years.

F. Use of Local Native Genotype Plants

This report includes numerous recommendations to plant native riparian and oak woodland species to enhance riparian and oak woodland plant communities and reduce fire hazards. When conducting restoration by planting native plants, it is imperative that the new plants be grown from local seed stock collected from native plant populations collected at or near

the site to be planted to protect the genetic integrity of the local native plant populations, ensure successful establishment of the native plant species, and ensure compatibility with local ecosystem functions and structure.[73] For example, using non-local native plants, such as plants from the appropriate species but from different locations, may alter the flowering time from the site-specific variety, triggering cascading effects with respect to pollinators. As a general rule, seeds and plant materials such as cuttings and propagules must be collected from the site being restored, enhanced, or created, or if the plant is being reintroduced to a site it formerly occurred, plant materials must be collected from within the seed dispersal footprint for each native plant species. The rule of using local native plant materials applies to all recommendations for enhancing, creating, or restoring native vegetation in this report.


Figure 7A. Canyon Sunflower near Mission Canyon. Trautwein. 2011. Figure 7B. Humboldt lily. Trautwein. 2020.

[73] *See e.g.*, Jayne Belnap, *Genetic Integrity: Why Do We Care? An Overview of the Issues* at 1, available at https://www.fs.fed.us/rm/pubs/int_gtr315/5_belnap.pdf (December 16, 2021).

II. RECOMMENDATIONS TO ENHANCE WATERSHED HEALTH AND REDUCE FIRE HAZARDS IN MISSION CANYON, RATTLESNAKE CANYON, AND MISSION CREEK

A. Mission Canyon Recommendations (Mission Creek, Tunnel Road, and parts of Mountain Drive)

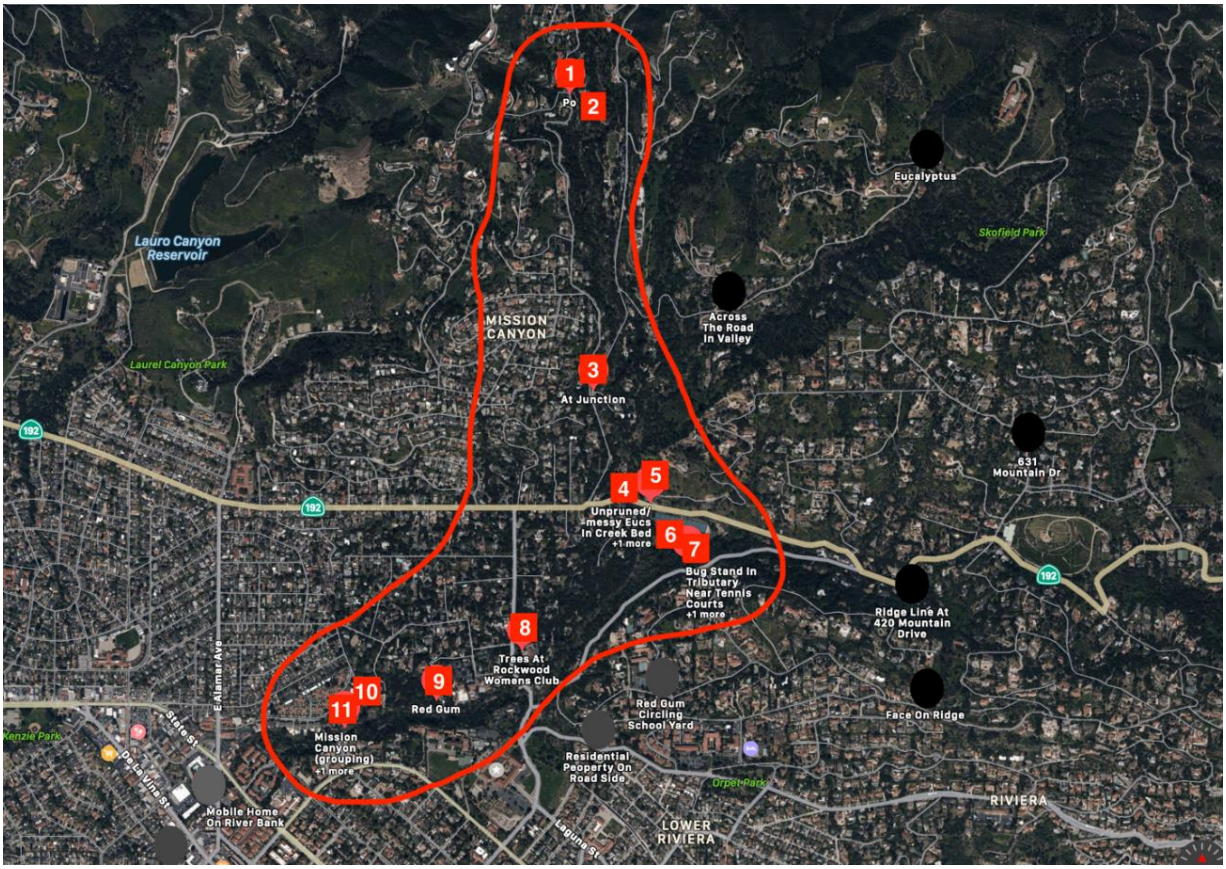

Figure 8. Map of eleven recommended eucalyptus replacement sites in Mission Canyon (denoted by red numbered boxes) in Mission Canyon and along Mission Creek. Apple Maps. 2021.

In general, community efforts to manage vegetation in Mission Canyon have already lessened fire threats. In conjunction with stakeholders such as MCA, the SBCFD prepared the Mission Canyon Community Wildfire Prevention Plan in 2011.[74] The MCA and SBCFD host an annual brush chipping day.[75] The MCA and SBCFD encourage neighbors to leave cut vegetation at designated locations where a chipping crew can convert it into wood chips.

[74] Santa Barbara County Fire Department, *Mission Canyon Community Wildfire Protection Plan* available at https://s3.amazonaws.com/siteninja/multitenant/assets/29038/files/original/MC-CWPP_7.15.2011_final.pdf (July 15, 2011).
[75] MCA, *Canyon News* available at https://www.missioncanyon.org/2021/05/21/brush-chipping/ (May 21, 2021).

- **Mission Creek Problem 1:** Two groupings of nonnative Tasmanian blue gum (*Eucalyptus globulus*) and lemon-scented gum trees (*Eucalyptus citriodora*) occur west of Mission Creek near Tunnel Road and Holly Road. (Figures 9 and 10) The eucalyptus trees may pose a fire hazard because of their oily residues and flaky bark.[76] Additionally, as seen in the photo below (Figure 9), many of the trees at this location are very close to power lines, potentially increasing the fire hazard during windy conditions, and increasing the risk to Mission Canyon residences. A blue gum eucalyptus fell into power lines in Montecito sparking a small fire in December 2021.[77] Eucalyptus trees invade riparian areas, displacing native plants, reducing soil moisture, changing soil chemistry, and degrading bird and wildlife habitat and diversity,[78] and can desiccate streams and riparian areas due to high evapotranspiration rates.[79]

Figure 9. A stand of Tasmanian blue gum eucalyptus trees east of Tunnel Road near Holly Road. Google Earth. 2016

[76] Taylor (2020).
[77] EdHat Staff. *Fallen Tree Sparks Small Fire in Montecito* available at https://www.edhat.com/news/fallen-tree-sparks-small-fire-in-montecito (December 17, 2021).
[78] Tererai, F., Gaertner, M., Jacobs, S. M., Richardson, D. M., Centre for Invasion Biology, Department of Botany & Zoology, Stellenbosch University, Stellenbosch, South Africa, *Eucalyptus camaldulensis invasion in riparian zones reveals few significant effects on soil physico-chemical properties* (2015); *See also* Sjirk Geerts and Joy Mangachena, *Eucalyptus invasions reduce bird diversity in riparian habitat* (August 11, 2017); *See also* Liza Gross, *Eucalyptus: California Icon, Fire Hazard and Invasive Species* https://www.kqed.org/science/4209/eucalyptus-california-icon-fire-hazard-and-invasive-species (June 12, 2013).
[79] S. Ren, D. A. White, D. XiangT. M., Short, W. Xiao, J. Chen, *Simple model of evapotranspiration by Eucalyptus plantations for data poor areas and tested using water balance data from a small catchment in Guangxi, China* available at https://www.tandfonline.com/doi/full/10.1080/00049158.2018.1555733 (February 5, 2019) ("Ren *et al*. (2019)").

Figure 10. Blue gum and lemon-scented eucalyptus at Tunnel Road and Holly Road. Trautwein. October 19, 2021.

- **Jurisdiction**: Santa Barbara County and City of Santa Barbara.

- **Recommendation Mission Creek 1:** Replace the eucalyptus with coast live oak (*Quercus agrifolia*) or other appropriate native trees, depending on the landowner's preference. Replace the trees in a phased manner to minimize disruption of the ecology and neighborhood.

- **Community Benefits:** Replacing eucalyptus trees with more fire-retardant native species would reduce fire hazards, prevent further spread of eucalyptus into riparian, oak woodland, and chaparral areas, and protect wildlife habitat.

- **Next Steps:** Coordinate with SBCFD and the landowners to discuss the potential replacement of eucalyptus trees to reduce fire hazards and prevent the spread of eucalyptus in the Watershed. If the landowners support replacement, work with potential partners including SBCFD, Cachuma Resource Conservation District ("CRCD"), the California Coastal Conservancy ("Conservancy"), MCA, Santa Barbara Botanic Garden ("SBBG"), and University of California Cooperative Extension ("UC Coop") to seek funding to replace the eucalyptus trees with coast live oaks or other native trees.

- **Problem Mission Creek 2:** EDC discovered several blue gum eucalyptus saplings during a field survey on October 19, 2021, in chaparral east of Tunnel Road, in Mission Canyon. (Figure 11) Eucalyptus are flammable trees that increase fire hazards. These saplings indicate that invasive eucalyptus trees are outcompeting native plants and spreading in the area.

Figure 11. Blue gum eucalyptus saplings in chaparral east of Tunnel Road. Trautwein. October 19, 2021.

  - **Jurisdiction:** Santa Barbara County
  - **Recommendation Mission Creek 2:** Remove saplings before they get larger and begin dropping seeds.
  - **Community Benefits:** Removing eucalyptus saplings would protect native plant communities and prevent these invasive trees from spreading and altering native ecology. Lastly, it is a preventative measure against fires and therefore increases fire safety in this area.
  - **Next Steps:** Coordinate with SBCFD and the landowners, to discuss the potential replacement of eucalyptus trees to reduce fire hazards and prevent the spread of eucalyptus in the Watershed. If the landowner supports replacement, work with SBCFD, CRCD, the Conservancy, MCA, SBBG, UC Coop, and other potential partners to seek funding to replace the eucalyptus trees with coast live oak trees.

- **Mission Creek Problem 3:** Several large blue gum and lemon scented gum trees occur along Mission Creek and sandwiched between residential properties and power lines east and west of the junction of Mission Canyon Road and Tunnel Road west of Mission Creek and along the Creek, increasing fire hazards. Nonnative Peruvian pepper (*Schinus molle*) and Algerian ivy (*Hedera canariensis*) also threaten native vegetation and increase fire hazards. (Figure 12)

    - **Jurisdiction:** Santa Barbara County

    - **Recommendation Mission Creek 3:** Replace all eucalyptus with natives such as coast live oak (*Quercus agrifolia*) or sycamore (*Platanus racemosa*) trees in a phased manner.[80] A combination of these trees would increase biodiversity at this location. Remove Peruvian pepper trees and Algerian ivy.

    - **Community Benefits:** Replacing the eucalyptus trees with more fire-retardant native species, eradicating Algerian ivy, and removing the pepper trees would reduce fire hazards, protect the sycamore trees, prevent spread of eucalyptus and pepper trees into oak and riparian woodlands, and improve the ecological value of the area.

    - **Next Steps:** Coordinate with SBCFD and the landowners to discuss the potential replacement of eucalyptus trees to reduce fire hazards and prevent the spread of eucalyptus in the Watershed. If the landowners support replacement, work with SBCFD, CRCD, the Conservancy, and UC Coop to seek funding to replace the eucalyptus trees with coast live oak and/or sycamore trees and remove the pepper trees and ivy.

[80] When planting natives, use local sources, i.e., plants grown from seeds or cuttings collected from wild native plants in the Mission Canyon Watershed in order to avoid hybridization and genetic introgression and preserve the genetic identify of local plant populations. Belnap, Jayne, *Genetic Integrity: Why Do We Care? An Overview of the Issues*, https://www.fs.fed.us/rm/pubs/int_gtr315/5_belnap.pdf (April 12, 2021).

Figure 12. Upper Left: Blue gum eucalyptus in Mission Creek. Note Algerian ivy climbing over ten meters into sycamore trees. Note pepper trees in foreground. Upper Right: Blue gum eucalyptus tree on west bank of Mission Creek. Bottom: Stand of lemon-scented eucalyptus at the corner of Tunnel Road and Mission Canyon Road. Trautwein. 2021.

- **Mission Creek Problem 4:** There are several unkept blue gum eucalyptus trees near Mission Creek at Foothill Road. (Figure 13) Eucalyptus trees are very flammable. Their leaf and bark litter could become kindling for a fire and their roots deplete water levels in the Creek.[81]

Figure 13. Blue gum eucalyptus tree on west bank of Mission Creek at Foothill Road. Blackwelder. 2021.

  - **Jurisdiction:** Santa Barbara County

  - **Recommendation Mission Creek 4:** Remove eucalyptus trees and replace them with native, fire resistant coast live oak, western sycamore, California bay laurel (*Umbellularia californica*) or black cottonwood (*Populus trichocarpa*) trees.

  - **Community Benefits:** Replacing the eucalyptus trees will protect Mission Creek's base flows and reduce fire hazards in the neighborhood. Replacing eucalyptus with native coast live oak or other native riparian

[81] Ren *et al*. (2019).

trees will increase the overall health of the Watershed and the Mission Creek ecosystem.

- **Next Steps:** Coordinate with SBCFD and the landowner to discuss the potential replacement of eucalyptus trees to reduce fire hazards and prevent the spread of eucalyptus in the Watershed. If the landowner supports replacement, work with SBCFD, Santa Barbara City Fire Department, CRCD, the Conservancy, MCA, SBBG, UC Coop, and other prospective partners to seek funding to replace the eucalyptus trees with coast live oak, California bay laurel, or western sycamore trees.

- **Mission Creek Problem 5:** There are several blue gum and lemon scented gum eucalyptus stands on a hillside within a private residential community across Foothill Road from the Santa Barbara Tennis Club. (Figures 14A and 14B) These trees are well-groomed with little leaf litter on the ground; however, they still may pose a fire hazard. The hillside they are on lacks significant understory vegetation which makes it less at risk for fire spread, however, it lacks biodiversity. The lack of ground cover and leaf litter exposes the soil to increased erosion which may threaten water quality in Mission Creek.

Figure 14A. Numerous eucalyptus tree stands occur along a private driveway to residences north of Foothill Road near Mission Creek. Blackwelder. 2021.

Figure 14B. Eucalyptus stands near the Tennis Club of Santa Barbara and Foothill Road. Google Earth. 2022.

- **Jurisdiction:** Santa Barbara County

- **Recommendation Mission Creek 5:** Replace the eucalyptus trees in a phased manner with coast live oak trees. Replant barren portions of the hillside with fire-resistant native plant species such as California fuchsia (*Epilobium canum*),[82] yucca (*Yucca whipplei*), buckwheat (*Eriogonum fasciculatum*),[83] lemonade berry (*Rhus integrifolia*),[84] and California

[82] See Cal Fire website for list of Fire-Resistant Plants: https://www.readyforwildfire.org/prepare-for-wildfire/get-ready/fire-resistant-landscaping/.
[83] Summer Winds Nursery, *Protect Your Home by Landscaping with Fire Resistant Plants* Webpage https://summerwindsnursery.com/blog-ca/protect-your-home-by-landscaping-with-fire-resistant-plants (August 5, 2019) ("Summer Winds (2019)").
[84] *Id.*

brome (*Bromus carinatus*) to increase biodiversity and stabilize the hillside to prevent erosion in the event of heavy rains.

- **Community Benefits:** Replacing the eucalyptus with coast live oak trees and other native plants would improve the ecological value in this area. This would reduce fire hazards for the residents in this community and simultaneously reduce erosion. Reducing erosion is important because runoff flows into Mission Creek and can negatively impact water quality.

- **Next Steps:** Coordinate with SBCFD and the landowners to discuss the potential replacement of eucalyptus trees to reduce fire hazards and prevent the spread of eucalyptus in the Watershed. If the landowners support replacement, work with SBCFD, CRCD, the Conservancy, MCA, SBBG, and UC Coop to undertake community outreach and seek funding to replace the eucalyptus trees with coast live oak trees and plant fire-resistant native groundcovers to control erosion.

- **Mission Creek Problem 6:** There is a big stand of blue gum eucalyptus along a tributary that sits in a small valley between Mountain Drive and the Tennis Club of Santa Barbara. (Figure 15) These trees are large and unkept and pose a fire hazard to native plant communities, wildlife habitat, and surrounding residents. Further, these trees may deplete water levels in the tributary.[85]

  - **Jurisdiction:** Santa Barbara City

  - **Recommendation Mission Creek 6:** Replace the eucalyptus trees with coast live oak trees and western sycamore trees in a phased manner.

  - **Community Benefits:** Replacing the eucalyptus trees with native trees would reduce fire hazards, enhance native plant communities and wildlife habitats, and enhance the health of the Mission Creek Watershed.

  - **Next Steps:** Discuss the potential replacement of eucalyptus trees Coordinate with the Santa Barbara City Fire Department, SBCFD, and the landowner(s). Work with SBCFD, CRCD, the Conservancy, UC Coop, and nonprofits such as MCA, SBBG, Channel Islands Restoration ("CIR"), California Native Plant Society, and Santa Barbara Audubon to conduct neighborhood outreach and seek funding to replace the eucalyptus trees with coast live oak and western sycamore trees.

[85] Ren, *et al*. (2019).

Figure 15. Large eucalyptus tree (center of image) and eucalyptus stand (horizon, left side of image) in tributary to Mission Creek between Mountain Drive and Tennis Club of Santa Barbara. Blackwelder. 2021.

- **Mission Creek Problem 7:** A stand of blue gum eucalyptus trees grows on the northwest side of the road at the corner of Mountain Drive and Tremonto. (Figure 16) They are unkept and located in a WUI adjacent to a residential neighborhood posing an increased fire hazard. These trees also degrade native plant communities and wildlife habitat and threaten to spread into Mission Canyon's riparian and oak woodlands.

    - **Jurisdiction:** Santa Barbara City

Figure 16. Large blue gum eucalyptus trees at Mountain Drive and Tremonto. Blackwelder. 2021.

- **Recommendation Mission Creek 7:** Replace eucalyptus trees with coast live oak trees in a phased manner.

- **Community Benefits:** Replacing eucalyptus trees with native oak trees will reduce fire hazard and improve the ecological value of the area.

- **Next Steps:** Coordinate with SBCFD and the landowners to discuss the potential replacement of eucalyptus trees to reduce fire hazards and prevent the spread of eucalyptus in the Watershed. Work with SBCFD, CRCD, the Conservancy, UC Coop, and nonprofits, such as CIR, SBBG, and MCA to conduct community outreach and seek funding.

- **Mission Creek Problem 8:** Large blue gum eucalyptus trees grow near Mission Creek in Rocky Nook Park near the Rockwood Women's Club. (Figure 17) Numerous other native and nonnative trees surround the eucalyptus increasing fire hazards in Mission Canyon.

Figure 17. Left: Large blue gum eucalyptus near Rockwood Women's Club. Blackwelder. 2021. Middle: Lemon-scented eucalyptus trees near entrance to Rocky Nook Park. Right: Blue gum eucalyptus in Rocky Nook Park. Trautwein. 2021.

  - **Jurisdiction:** Santa Barbara County

  - **Recommendation Mission Creek 8:** Replace the eucalyptus trees with coast live oak, California bay, and/or western sycamore trees in a phased manner.

  - **Community Benefits:** Replacing eucalyptus with native trees would prevent the spread of eucalyptus trees, improve the ecological value of the area, and reduce fire hazards in Mission Canyon.

  - **Next Steps:** Coordinate with Santa Barbara County Parks Department, Santa Barbara Rockwood Women's Club, and SBCFD to discuss the potential replacement of the eucalyptus trees to reduce fire hazards and prevent the spread of eucalyptus in the Watershed. If the parties support replacement, work with SBCFD, the County Parks Department, CRCD,

the Conservancy, UC Coop, and nonprofits, including MCA, CIR, and SBBG to undertake community education and outreach, develop a tree replacement plan, and seek funding.

- **Mission Creek Problem 9:** Several nonnative blue gum and red gum eucalyptus trees (*Eucalyptus camaldulensis*) on both sides of Mission Creek next to the Santa Barbara Museum of Natural History ("SBMNH") increase fire hazards and reduce Watershed health by displacing native plants and depleting water levels in the Creek. (Figures 18A and 18B)

Figure 18A. Red river gum eucalyptus tree near SBMNH. Figure 18B. Blue gum eucalyptus trees across Mission Creek from the Museum (looking south). Blackwelder. 2021.

  - **Jurisdiction:** Santa Barbara County
  - **Recommendation Mission Creek 9:** Replace the eucalyptus trees with coast live oak and sycamore trees in a phased manner.
  - **Community Benefits:** Replacing the eucalyptus trees with native trees would reduce fire hazards, protect baseflows in Mission Creek, and

improve Watershed health, benefitting both humans and natural resource values.

- **Next Steps:** Coordinate with SBMNH, landowners, and SBCFD to discuss the potential replacement of eucalyptus trees to reduce fire hazards and prevent the spread of eucalyptus in the Watershed. If the SBMNH and landowners support replacement, work with SBCFD, CRCD, the Conservancy, UC Coop, and nonprofits, including SBBG, CIR, and MCA to conduct community education, seek funding to replace the eucalyptus trees, and develop a tree replacement plan.

- **Mission Creek Problem 10:** During a field survey between State Street and the SBMNH on November 2, 2021, several invasive species, including eucalyptus, Algerian ivy (*Hedera canariensis*), Shamel ash tree (*Fraxinus uhdei*), umbrella plant (*Cyperus involucratus*), and tamarisk (*Tamarix ramosissima*) were found in the bed and on the banks of Mission Creek. (Figure 19) Bougainvillea is also spreading into the Creek in this location. (Figure 19) These nonnative and invasive species can outcompete natives for water, light, nutrients, and space.[86] They pose a threat to the health of the Watershed. Eucalyptus and Algerian ivy are prone to ignition and eucalyptus and tamarisk may deplete water levels in the Creek.[87]

  - **Jurisdiction:** Santa Barbara County and Santa Barbara City

  - **Recommendation Mission Creek 10:** Remove the nonnative eucalyptus, Algerian ivy (*Hedera canariensis*), bougainvillea, Shamel ash tree (*Fraxinus uhdei)*, umbrella plant (*Cyperus involucratus*) and Tamarisk (*Tamarix ramosissima*). Replace the nonnative plants with coast live oak trees, sycamore trees and/or California bay laurel trees, and native oak woodland and riparian understory plants.

[86] U.S. Forest Service, *Nonnative Invasive Plant Species – Problem and Solution* Webpage available at https://www.fs.usda.gov/detail/r8/forest-grasslandhealth/invasivespecies/?cid=stelprdb5326137 (December 19, 2021).
[87] Ren *et al.* (2019).

Figures 19. Top Left: Invasive nonnative Algerian ivy (*Hedera canariensis*). Top Right: Nonnative bougainvillea. Bottom Left: Invasive nonnative Shamel ash tree (*Fraxinus uhdei)*. Bottom Right: Invasive nonnative umbrella plant (*Cyperus involucratus*). Blackwelder. 2021.

- **Community Benefits:** Removing these nonnative and invasive species will improve the ecological values in the Watershed and reduce fire hazards.

- **Next Steps:** Work with the Santa Barbara City Creeks Restoration and Water Quality Improvement Division ("Creeks Division"), MCA, SBCFD, CRCD, the Conservancy, SBMNH, and UC Coop to conduct public outreach and seek funding to replace the nonnative plants with native coast live oak, western sycamore, California bay laurel, and native understory species.

- **Mission Creek Problem 11:** Two large blue gum eucalyptus trees and one sapling are growing in Mission Creek downstream from the SBMNH. (Figure 20) Eucalyptus trees are flammable and increase fire hazards in Mission Canyon and the WUI. The eucalyptus trees may decrease flows in the Creek due to high rates of evapotranspiration.[88] The two larger trees have exposed roots and could be uprooted during high flows posing a flood risk. If the trees were to fall, they could obstruct flows in the Creek which could be dangerous in the event of heavy rains or floods.

Figure 20. Large Eucalyptus in the bed of Mission Creek with roots exposed, suggesting a history of erosion. Blackwelder. 2021.

  - **Jurisdiction:** Santa Barbara City

  - **Recommendation Mission Creek 11:** Replace the eucalyptus trees on the Creek bank with coast live oak trees, sycamore trees, black cottonwood, and/or bay laurel trees. Remove the exposed eucalyptus in the Creek bed

[88] Ren, *et al*. (2019).

(foreground of Figure 20). Consider securing the trunk to the bank to create a log deflector to maintain channel complexity and habitat.[89]

- **Community Benefits:** Replacing these trees would increase Watershed and riparian woodland health, could improve baseflows in Mission Creek, and would reduce the risk of floods and fires in this area. The log deflector would encourage retention of the scour pool presently located in the Creek bed.

- **Next Steps:** Work with the Santa Barbara City Creeks Division, landowners, MCA, Santa Barbara City Fire Department, CRCD, the Conservancy, UC Coop, and nonprofits, including the SBNMH and SBBG to undertake public outreach and seek funding to replace the eucalyptus trees.

[89] Nova Scotia Salmon Association, *Fish Habitat Restoration n Methods Concept Specification Deflectors* available at http://adoptastream.ca/sites/default/files/Deflectors%202014.pdf (December 19, 2021).

B. Upper Mission Canyon Recommendations

Figure 21. Map of Upper Mission Canyon, Mission Tunnel and Fern Falls. Apple Maps. 2022.

- **Mission Creek Problem 12:** Edison's powerlines in Mission Canyon, including those spanning Mission Creek near the north end of Mission Canyon Road, may pose a fire threat to the ecosystem and residents living nearby. Several large eucalyptus trees could impact the power lines during windy conditions. High winds or bird strikes could also cause the lines to arc, potentially sparking a fire in the chaparral and oak woodlands below the lines.
    - **Jurisdiction:** California Public Utilities Commission and Santa Barbara County
    - **Recommendation Mission Creek 12:** Underground the powerlines. As an interim measure, remove or trim the eucalyptus trees near power lines.
    - **Community Benefits:** Undergrounding the powerlines or trimming the trees could reduce fire hazards in Mission Canyon and protect the Watershed from fire and resulting erosion, flooding, and debris flows. Removing eucalyptus will protect and enhance Watershed health and native vegetation communities.

- **Next Steps:** Coordinate with Edison and MCA to evaluate the feasibility of undergrounding powerlines. If feasible, develop a plan to underground the powerlines. Coordinate with landowners, MCA, SBCFD, and SBBG to discuss the potential removal of eucalyptus trees to reduce fire hazards. If the landowners support removal, work with SBCFD, Edison, CRCD, the Conservancy, UC Coop, and interested parties to seek funding to remove the trees.

- **Mission Creek Problem 13:** There is at least one large eucalyptus tree, several saplings, and a stand of nonnative acacia growing in or near the Rowny Nature Preserve near the north end of Mission Canyon Road. (Figure 22) The saplings demonstrate that eucalyptus trees are propagating. This is problematic because eucalyptus and acacia trees are invasive nonnatives and increase fire hazards. "The leaves from some species of Acacia contain resin and flammable oils, which can encourage fires."[90] The nonnative acacia trees appear to be spreading and may threaten native plant communities such as coast live oak woodlands and riparian habitat located to the west.

Figure 22. Eucalyptus (small red polygon) and acacia trees (large red polygon; approximate location) in Mission Canyon near the Rowny Preserve. Google Earth. 2022.

- **Jurisdiction:** Santa Barbara County

[90] Taylor (2020).

- **Recommendation Mission Creek 13:** Remove the eucalyptus trees. Remove the acacia trees in a phased approach that allows for simultaneous replacement with coast live oak and California bay laurel to reduce short-term ecological and aesthetic impacts.

- **Community Benefits:** Removal of eucalyptus and acacia trees would reduce fire hazards and increase Watershed and ecosystem health. Replacing the acacia with coast live oak trees, bay laurels, and oak woodland understory species would result in long-term improvements to ecosystem health and biodiversity.

- **Next Steps:** Coordinate with potential partners SBCFD, Santa Barbara Land Trust which manages the Preserve, MCA, FOMC, SBBG, landowners, and residents, to discuss the potential replacement of eucalyptus and acacia with live oak woodlands. If landowners and interested parties support replacement, work with SBCFD, CRCD, the Conservancy, UC Coop, SBBG, and the MCA to conduct neighborhood outreach and seek funding to develop and implement a tree replacement plan and oak woodland restoration.

- **Mission Creek Problem 14:** In Fall 2019, Edison cleared native vegetation, graded steep slopes, and side-casted soil, boulders, and vegetation off Tunnel Trail / Mission Canyon Access Road some of which came to rest in Mission Creek on land owned by the City of Santa Barbara. (Figures 23A and B) EDC reported the work to the City of Santa Barbara which issued a Stop Work Order, and to the County of Santa Barbara, Central Coast Regional Water Quality Control Board, California Department of Fish and Wildlife ("CDFW"), and U.S. Army Corps of Engineers which issued Notices of Violation. Edison failed to obtain County, state, and federal permits.[91] Edison left uncompacted dirt berms on the outside edge of the Trail perched atop a steep slope leading down to the Creek; the berms were eroding sending sediment into Mission Creek adversely affecting water quality.[92] (Figure 23B) These berms will likely serve "as a vector for invasive species movement along the roadside into the Forest Service Lands, and down canyon along the road boundary,", including flammable plants such as mustard.[93] Edison is reluctant to remove the berms or plant them with native

[91] Santa Barbara County Planning and Development Department (January 16, 2020), Central Coast Regional Water Quality Control Board (February 21, 2020), CDFW (February 25, 2020), and Army Corps of Engineers (January 8, 2020) Notices of Violation.
[92] Figure 23A (left) depicts sediment eroded from berms entering Mission Creek. Figure 23B (right) shows soil berms which were eroding sending sediment into Mission Creek.
[93] Steve Windhager, Ph.D., Executive Director, Santa Barbara Botanic Gardens email to Brian Trautwein, Senior Analyst / Watershed Program Director, EDC (July 28, 2023).

plants to stabilize them.[94] "Significant environmental damage" and "geomorphic impacts" resulted from Edison's work.[95] Edison plans additional work in this area.[96] Friends of Mission Canyon ("FOMC") and the MCA have filed appeals of Edison's Land Use Permit.[97]

Figure 23A. Left: Edison dumped dirt and rock from Tunnel Trail into Mission Creek and constructed berms eroded sending sediment downslope into the Creek below. Right: Rocks dumped by Edison block the Creek. Edison's dumping of rocks damaged numerous native trees. Trautwein. 2020.

- **Regulatory Jurisdiction:** Santa Barbara County, CDFW, Central Coast Regional Water Quality Control Board, and U.S. Army Corps of Engineers ("Regulatory Agencies").

[94] Nancy Weiss, Vice President, Mission Canyon Association, personal communication with Natalie Blackwelder, Watershed Program Intern, EDC, and Brian Trautwein, Environmental Analyst/Watershed Program Coordinator, EDC (October 26, 2021) ("Weiss (2021)").
[95] Letter from Thomas H. Leroy, Certified Engineering Geologist #2593, Pacific Watershed Associates, Inc to Marc Chytilo, Law Office of Marc Chytilo (October 6, 2021).
[96] *Id.*
[97] Letter from Marc Chytilo, Law Office of Marc Chytilo, to Larry Ferini, Chair, Santa Barbara County Planning Commission (October 7, 2021); *See also* MCA Appeal of 20LUP-00000-00165 (October 7, 2021).

Figure 23B. Left: Edison dumped boulders exceeding three feet wide which buried the Creek bed. Trautwein. 2020. Right: Edison replaced uncompacted fill from its unpermitted grading with engineered, compacted two-foot to three-foot tall berms on the edge of Tunnel Trail atop slopes near Mission Creek. Berms were eroding with sediment carried downslope by water and gravity into Mission Creek below. Note rock drapery installed by Edison after grading near-vertical slopes during winter 2019. Nancy Weiss. 2021.

- **Recommendation Mission Creek 14:** Ensure that Edison removes the dumped boulders from the Creek bed immediately downstream from the Tunnel Trail bridge only if doing so would not further damage the Creek bed or bank, or the slope. Remove or reduce the height of the berms. Require Edison to install, maintain, and repair erosion control measures as needed to minimize erosion and sedimentation in the Creek to the maximum extent feasible. Edison should install native plants along the Trail, including the outer edge adjacent to the steep slope to mitigate erosion, biological impacts, and impacts on recreation and views. Pursue complete mitigation of all impacts to geology, soils, water quality, recreation, and aesthetics onsite in Mission Canyon before Edison conducts future work.

  Ensure that Edison develops future projects in collaboration with the MCA and FMOC and that projects are subject to thorough environmental review considering past visual, recreational, geologic, water quality, and

biological impacts of the violations together with impacts of future proposals, and that projects are permitted before implementation. Ensure Edison's projects throughout the whole Watershed are planned, reviewed, and implemented holistically with the trail system, Watershed, and ecosystems considered in their entirety rather than piecemeal planning. Ensure Edison coordinates with MCA and FOMC to monitor Edison's projects, and complies with all mitigation measures before, during, and after project implementation. Ensure that Edison restores habitat, protects water quality, mitigates erosion, removes invasive weeds, protects views, and avoids recreational conflicts along Tunnel Trail as ongoing requirements.

- **Community Benefits:** Removing dumped debris and berms created by Edison and installing and maintaining erosion control would reduce erosion and sedimentation in Mission Creek and enhance the Creek as a steelhead migration corridor, spawning, and rearing habitat. Controlling invasive plants and installing native plants along the Trail and within areas damaged by grading and dumping would reduce fire hazards, enhance aesthetic values, and restore and protect native plant communities and wildlife habitat near Tunnel Trail. Ensuring Edison coordinates future projects with the MCA, develops a fire prevention plan in coordination with MCA, obtains permits, undergoes environmental review, and implements mitigation measures in Mission Canyon would minimize impacts to the recreational experiences of Trail users, to the health of Mission Canyon and Mission Creek, to water quality in the Creek, and to the quality of life for Canyon residents.

- **Next Steps:** Meet with the City of Santa Barbara, Santa Barbara County, Regulatory Agencies, MCA, and Edison to discuss onsite mitigation of the impacts of Edison's prior work. Work with the City, County, Edison, CDFW, and MCA to ensure Edison properly mitigates impacts from prior work by removing debris, berms, and invasive nonnative plants, installing erosion control, and planting native plants in a timely manner. Establish specific protocols for Edison to coordinate with the Regulatory Agencies, SBCFD, FOMC, and MCA before undertaking future road and powerline work in Mission Canyon and nearby watersheds. Ensure that future work properly avoids whenever possible then minimizes environmental, recreational, visual, fire, and neighborhood impacts.

- **Mission Creek Problem 15:** The City of Santa Barbara's 110-year-old, 3.7-mile-long Mission Tunnel delivers water from Gibraltar Reservoir on the Santa Ynez River through the Santa Ynez Mountains to the City of Santa Barbara. (Figure 24) The unlined Tunnel appears to be acting as a French drain, siphoning water from the Watershed and potentially reducing flows in Mission Creek.[98] Water infiltrates the Tunnel from surrounding bedrock aquifers.[99] Excluding water piped from Gibraltar Reservoir, Mission Tunnel delivers an average of approximately 1,000 acre-feet per year of infiltrated groundwater to the City of Santa Barbara.[100] Around 500 gallons per minute infiltrates into the Tunnel.[101]

Figure 24. Workers inspecting Mission Tunnel. Unknown photographer. From EdHat. February 26, 2019.

[98] Keller (2011); *See also*, Santa Barbara Urban Creeks Council, Upper Mission and Rattlesnake Creeks: Hydrogeologic and Biologic Investigation, Santa Barbara, California available at https://www.sburbancreeks.org/mission-canyon-study (March 15, 2023); *See also* Letter from Anthony P. Spina, Supervisor, Steelhead Regulatory Team, National Marine Fisheries Service to Cameron Benson, Creeks Restoration/Water Quality Manager, City of Santa Barbara (October 20, 2009); *See also* Walker Thompkins, *History of Mission Canyon* (undated).
[99] Dr. Hugo Lociaga, Hydrologist, Geography Department, UCSB. Personal communication with Brian Trautwein, Environmental Analyst/Watershed Program Coordinator, Environmental Defense Center (2021).
[100] City of Santa Barbara Website, Mission Tunnel Webpage available at https://www.santabarbaraca.gov/gov/depts/pw/resources/system/sources/misstunnel.asp (December 14, 2021).
[101] EdHat Staff, *Inspecting the Mission Tunnel*, Video available here https://www.edhat.com/news/inspecting-the-historic-mission-tunnel (February 26, 2019).

The Tunnel was also responsible for introducing nonnative green sunfish from Gibraltar Reservoir into Mission Canyon circa 2008 - 2009.[102]

A section of the old obsolete Mission Tunnel Pipeline (an approximately thirty-six-inch diameter metal pipe) still stands on ten-foot-high concrete support structures and spans the Creek. It is possible that this old infrastructure may collapse and may obstruct fish and wildlife passage or flows. Removal of the obsolete Tunnel and support structures would be tricky as it would require large equipment that would likely damage the riparian habitat.

- **Jurisdiction:** County of Santa Barbara

- **Recommendation Mission Creek 15A:** Support implementation of recommendations in Santa Barbara Urban Creeks Council's ("UCC") Upper Mission Canyon Hydrology Study. Coordinate with potential partners, including UCC, EDC, FOMC, and MCA to document impacts to Creek flows and advocate for releases of water from the Tunnel into Mission Creek or other measures to offset the apparent desiccation of upper Mission Canyon by Tunnel infiltration. Consider working with the City to eradicate nonnative sunfish currently believed to be living in the Tunnel, to establish proper screening of the Tunnel intake to prevent sunfish entrainment, and to ensure voluntary water releases from the Tunnel into the Creek. Consider advocating for the City to pay residents to release dechlorinated water into the Creek as an interim measure until the City begins releasing water voluntarily. If the City does not release water voluntarily, consider regulatory involvement by agencies such as CDFW, NMFS, and State Water Resources Control Board.

  Consider the feasibility and effectiveness of lining the inside of the bedrock Tunnel, filling and abandoning the Tunnel, and/or constructing an impervious pipeline through the Tunnel to prevent or minimize infiltration of water from the Mission Canyon Watershed, including evaluating loss of infiltration from the aquifer into the Tunnel and exfiltration from the Tunnel into the aquifer.

[102] Email from Matthew McGoogan, National Marine Fisheries Service to Rebecca Bjork, Water Supply Manager, Public Works Department, City of Santa Barbara, Brian Trautwein, Environmental Analyst/Watershed Program Coordinator, EDC, Natasha Lohmus, CDFW, Mary Larson, CDFW, Cameron Benson, Manager, City of Santa Barbara Creeks Restoration and Water Quality Improvement Division, Bill Ferguson, City of Santa Barbara, Anthony Spina, Steelhead Regulatory Team, National Marine Fisheries Service, and George Johnson, City of Santa Barbara Creek Restoration and Water Quality Improvement Division re Flow in Mission Creek (August 31, 2010).

- **Recommendation Mission Creek 15B:** Evaluate the relative impacts of removing versus retaining the old Mission Tunnel Pipeline crossing of Mission Creek, including the potential impacts of access, demolition, equipment, disturbance, pollution, and physical impediments in the Creek.

  Recommendation Mission Creek 15C: Curtail groundwater pumping and water diversions, if any, in and near Mission Creek and its tributaries. Use recycled water whenever feasible for landscaping, greenbelts, and agricultural areas in the WUI.

  Develop alternative water supplies which do not deplete watersheds or adversely affect Mission Creek. This could include tertiary wastewater treatment, indirect potable reuse, and recycling powered by solar photovoltaic or wind energy to conserve freshwater resources. Inject properly treated recycled water into Santa Barbara-area groundwater basins to increase groundwater levels, protect, enhance, and rehydrate Mission Creek and riparian woodlands, and reduce fire hazards.[103] The Montecito Water District and Montecito Sanitary District are teaming up to explore wastewater recycling as an alternative water supply.[104] Indirect potable reuse has been ongoing in California for over fifty years, including the Montebello Forebay Spreading Grounds in Los Angeles County and the Talbert Gap in Orange County.[105] Carpinteria's Advanced Purification Project will "replenish the groundwater basin with purified recycled water" and could serve as a model for Santa Barbara City.[106] Numerous laws, including SB 918, SB 322, and SB 574, define and seek to advance direct potable reuse in California.[107]

- **Community Benefits:** Water releases from the Tunnel or private residences would increase flows and aquatic habitat for the endangered steelhead population[108] (Figure 2), other aquatic species, and water-oriented recreation at Mission Creek's Seven Falls. Releases could help

[103] State Water Resources Control Board, *A Proposed Framework for Regulating Direct Potable Reuse in California* available at https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/direct_potable_reuse/dprframewk.pdf (2018).
[104]Montecito Water District *Montecito Water and Sanitary Districts Team Up*, EdHat, available at https://www.edhat.com/news/montecito-water-and-sanitary-districts-team-up (October 16, 2021).
[105] *Id*. at 1.
[106] Carpinteria Valley Water District, CAPP Webpage available at https://cvwd.net/capp/ (August 9, 2023).
[107] *Id*. at 2 – 5.
[108] The resident steelhead population expanded and the City and other agencies documented adult ocean-run steelhead in the Creek during seven of the ten years when the City Water Resources Department voluntarily released water from the Tunnel into the Creek to benefit steelhead.

mitigate potential impacts of water infiltration into the Tunnel and resulting reduced flows downstream from the point of release. This would benefit the ecological values of the Watershed as a whole and benefit people who recreate and enjoy the natural beauty of the area. Rewatering Mission Creek would rehydrate the riparian corridor, increase live fuel moisture levels, and reduce fire hazards in Mission Canyon. Lining the inside of the bedrock Tunnel could lessen groundwater seepage into the Tunnel allowing it to instead augment Creek flows. These actions could increase groundwater recharge in the City's aquifers. Removing the old Tunnel and/or the coating could improve aesthetics, enhance the Creek, and protect fish and wildlife habitat.

- **Next Steps:** Work with potential partners, including the City of Santa Barbara, UCC, EDC, Santa Barbara Channelkeeper, MCA, FOMC, SBBG, and other potential partners to develop an approach for evaluating and mitigating the potential impacts of Mission Tunnel on aquatic resources, riparian vegetation, fire safety, and recreation in Mission Canyon.

  Document private and public wells and water diversions, if any, located in and near Mission Creek. Ascertain the status of permitting for any wells and diversions. Assess the effects of wells and diversions, if any, on streamflow. Report unpermitted wells and diversions to CDFW, SWRCB, and local planning agencies. Work with landowners and agencies to reduce the effects of permitted wells and diversions on stream flows.

  Meet with City leaders, the City of Santa Barbara Public Works Department Water Resources and Wastewater Divisions, and potential partners, including MCA, FOMC, Heal the Ocean, and other nonprofits, to address technical, financial, and legal issues associated with direct and indirect potable reuse. Develop a working team to pursue tertiary treatment and potable reuse. Identify funding sources**.**

- **Mission Creek Problem 16:** There are large populations of nonnative, invasive plant species, such as mustard, throughout Mission Canyon, particularly in the areas graded by Edison along Tunnel Trail. (Figure 25) (See Problem Mission Creek 14 above and Problem Global 1 below.) These plants can outcompete native plants for limited resources, including water. The more they dominate the ecosystem the more they can alter the ecosystem, including the fire regime. Annuals, such as mustard, increase fire ignition hazard because they die every year providing kindling for wildfires to start along the Trail.

Figure 25. Common mustard, *Brassica rapa*. Angelique Herman. 2018.

- **Jurisdiction:** Santa Barbara County

- **Recommendation Mission Creek 16:** Replace nonnative, invasive species with natives, starting with areas along Tunnel Trail.

- **Community Benefits:** Removing nonnative, invasive plants will protect native plant communities, minimize the potential for type-conversion of native plant communities such as chaparral, improve Watershed health, increase the recreational enjoyment for visitors and residents, and reduce fire ignition hazards.

- **Next Steps:** Work with potential partners, including SBBG, which is actively documenting invasive nonnative plants in Mission Canyon, the City of Santa Barbara, Santa Barbara County Weed Management Area, UCC, FOMC, and MCA to develop a plan to remove and replace invasive nonnative plants with native plant species.

C. Lower Mission Creek Recommendations

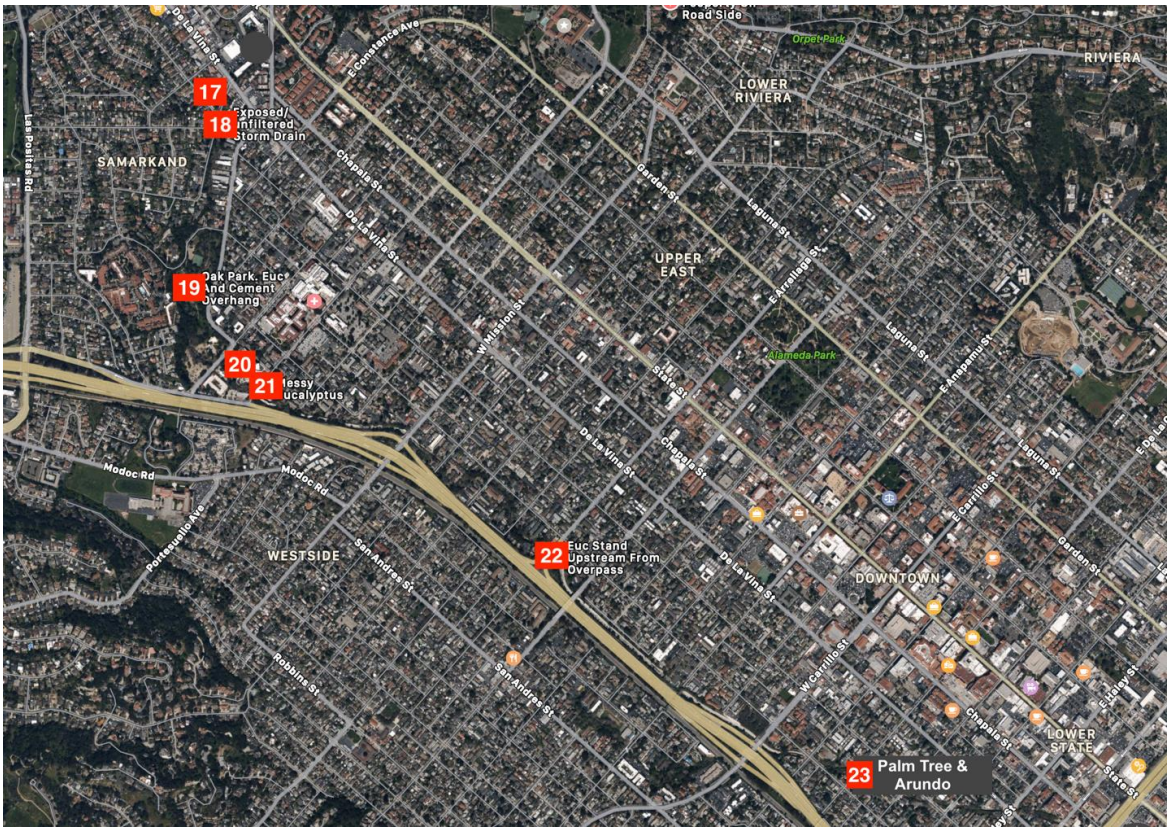

Figure 26. Map of lower Mission Creek. Recommendations for seven sites (denoted by the red numbered box) to improve the health and safety of the Watershed for both the ecology and the human residents living nearby. Apple Maps. 2021.

- **Mission Creek Problem 17:** There is a mobile home park located on De la Vina Street within inches of Mission Creek's east bank. (Figure 27A) Several eucalyptus trees on the Creek bank stabilize the embankment but are prone to fire and may pose a threat to the nearby homes. (Figure 27A) The eucalyptus trees also pose a hazard to the homes if they were to fall. The trees can deplete the water levels in the Creek leading to further ecological degradation. There are several other nonnative plant species along the Creek bed and banks, including palm trees and Algerian ivy (*Hedera canariensis*) which is growing over ten meters up into native sycamore trees, killing them, and thereby increasing fire hazards.[109] (Figure 28) Additionally, there is a storm drain leading from the

[109] La Jolla Light, *Listing of Good and Bad Plants for Southern California* stating, "Some ivy species in the Hedera genus are a problem in California. They can smother understory vegetation, kill trees, and harbor non-native rats and snails. It's difficult to distinguish problem species from less invasive ones. Do not plant ivy near natural areas." Available at https://www.lajollalight.com/sdljl-listing-of-good-and-bad-plants-for-southern-calif-2008aug06-story.html (August 6, 2008)

parking lot of Presto Pasta and Grocery Outlet directly into Mission Creek. (Figure 26B) This drain acts as a direct source of pollution to the Creek. Lastly, an unknown entity poured concrete over portions of the Creek bed and east bank potentially reducing groundwater recharge and restricting plant growth. (Figures 26C and D.)

Figure 27A. Mobile home hanging over the Eastern bank of Mission Creek. The large eucalyptus tree is providing support as it is rooted into the bank. Figure 27B. Unfiltered storm drain from the parking lot of Presto Pasta and Grocery Outlet, is leading straight into Mission Creek. Figures 27C and 27D. Cemented bed and bank of Mission Creek. Blackwelder. 2021.

- **Jurisdiction:** City of Santa Barbara

- **Recommendation Mission Creek 17:** Cut down the large eucalyptus tree on the Creek bank and other eucalyptus trees in the vicinity of the Creek. Treat the stumps so the trees do not grow back. Leave the eucalyptus trees' roots intact so they can continue to support the Creek bank. Remove other nonnatives such as Algerian ivy (Figure 28) and palm trees. Replant the bank with arroyo willow trees (*Salix lasiolepis*), black cottonwood

trees (*Populus trichocarpa*), and/or sycamore trees (*Platanus racemosa*) and riparian understory species such as wild blackberry (*Rubus ursinus*), and California wild rose (*Rosa californica*) to stabilize the Creek bank. Remove concrete from the Creek bed and bank and plant native trees and understory plants on the Creek bank. Replace storm drains (Figure 27B) with bioswales containing native wetland plants.

- **Community Benefits:** Planting native trees and understory plants in place of eucalyptus, palms, and ivy would reduce the fire hazard, reduce potential hazards associated with tree fall, restore the riparian woodland, enhance bird and wildlife habitat, and may enhance the Creek's flows. Installing bioswales would improve water quality and result in ecological improvements in Mission Creek.

Figure 28. Algerian ivy growing over ten meters up into native sycamores on Mission Creek downstream from De la Vina Street. Blackwelder. 2021.

- **Next Steps:** Work with property owners, CIR, Santa Barbara County Flood Control and Water Conservation District ("SBCFCWCD"), Santa Barbara City Fire Department, and nonprofits to conduct public outreach and host neighborhood meetings to seek input regarding Recommendation 17A, develop a restoration plan, and seek funding.

- **Problem Mission Creek 18:** Downstream from De la Vina Street**,** Mission Creek runs adjacent to homes, businesses, and streets and is subject to point and nonpoint sources of pollution. For example, several exposed and unfiltered storm drains discharge stormwater directly from the streets into Mission Creek. There are also several fallen dead trees in the Creek that can contribute to fire and flooding hazards. (Figure 29) Further, as with most of these sites, there are nonnatives such as eucalyptus, Acacia, Algerian ivy, and palms which exacerbate fire hazards.[110] An unknown entity lined the eastern bank of the Creek with concrete. The concrete embankment may disrupt flows and redirect them to the opposite bank potentially resulting in an erosion cascade down the Creek.

    - **Jurisdiction:** City of Santa Barbara

    - **Recommendation Mission Creek 18:** Install a bioswale to filter the nonpoint source of stormwater pollution coming from the storm drain. Native vegetation growing in the bioswale would filter out the toxins so that water discharged from the bioswale would be cleaner. This would simultaneously slow the influx of water into the Creek bed and may better recharge the groundwater in a more controlled and sustaining manner. Remove all nonnative plants, including eucalyptus, Acacia, Algerian ivy, and palms. Remove the fallen trees. Remove the concrete from the eastern bank and install willow poles or a live willow crib wall.[111] Live willow crib walls consist of live willow branches that are woven together and buried within embankments for structural stability. The branches take root in moist soil growing into trees, providing habitat, water quality benefits, carbon capture, and structural integrity. (Figure 30.)

    - **Community Benefits:** Installing the bioswales would replace gutters with vegetated waterways, reducing stormwater pollution and beautifying the streets and neighborhood. This could increase groundwater recharge, enhancing riparian habitat and Creek flows and benefitting the ecosystem and the human residents living nearby. Removing the nonnatives would improve the ecological values in this area. Replacing eucalyptus trees with natives could reduce the trees' withdrawal of groundwater enhancing Creek flows. Lastly, removing the concrete from the Creek bank and replacing it with willow poles or a live willow crib wall would stabilize the bank, could reduce deflection of flows and erosion of the opposite bank, enhance the riparian habitat, and improve neighborhood aesthetics.

[110] Taylor (2020).
[111] Salix. *Live Willow Revetment* Webpage, available at https://www.salixrw.com/product/live-willow-revetments/ available at https://www.salixrw.com/product/live-willow-revetments/ (January 31, 2021).

- **Next Steps:** Work with the Santa Barbara City Creeks Division, Santa Barbara City Fire Department, SBCFD, CRCD, the Conservancy, UC Coop, the landowners, and nonprofits to seek funding, conduct neighborhood outreach, build community support, and develop a plan to remove and replace the eucalyptus trees and other nonnatives with coast live oak, sycamore and/or bay laurel and native understory plants. Work with the City to seek funding and develop a plan to replace the current storm drains with bioswales where feasible, remove the concrete bank, and install the willow poles or live crib wall.

Figure 29. Fallen dead tree in Mission Creek just downstream of the De La Vina Street Bridge. Blackwelder. 2021.

Figure 30. A live willow crib wall. *Salix*. January 31, 2021.

- **Problem Mission Creek 19:** There are several eucalyptus trees lining the western Creek bank atop a small concrete embankment at Oak Park. (Figure 31A) The concrete embankment could redirect stream flows and increase erosion. Further, the nonnative eucalyptus trees increase fire hazard and compete with native vegetation for limited resources such as water.[112] These trees are directly next to the Creek bed and may deplete water levels in the Creek.
    - **Jurisdiction:** City of Santa Barbara
    - **Recommendation Mission Creek 19:** Remove the concrete shelf and eucalyptus trees and replace them with sycamores and coast live oaks.

Figure 31A. Three large eucalyptus trees on the west bank of Mission Creek in Oak Park. Concrete embankment indicated by the red arrow. Figure 31B. Mission Creek bank stabilized by sycamore tree roots. Blackwelder. 2021.

[112] Ren *et al*. (2019).

- **Community Benefits:** Removing the eucalyptus trees will improve the Creek's riparian habitat and ecological values, enhance stream flows by reducing evapotranspiration, and reduce fire hazards. Removing the concrete embankment in the Creek bed would enhance the Park's and Creek's aesthetics. Planting oaks and sycamores would stabilize the Creek bank. (Figure 31B)

- **Next Steps:** Work with the Santa Barbara City Parks and Recreation Department, Creeks Division, SBCFCWCD, Santa Barbara City Fire Department, CRCD, the Conservancy, UC Coop, and nonprofits, such as CIR to conduct public outreach and seek funding to replace the eucalyptus trees with native oak and sycamore trees. Work with the City to remove the concrete embankment.

- **Problem Mission Creek 20:** There is a large nonnative blue gum eucalyptus tree shedding dead leaves, branches, and bark downstream from Oak Park in Mission Creek. (Figure 32) Eucalyptus trees are oily and can catch fire very easily.[113] In addition, eucalyptus actively deplete scarce water resources from the Watershed.[114] As an invasive species, eucalyptus outcompete native plants such as oaks and sycamores and threaten the riparian community.

Figure 32. Blue gum eucalyptus with dead branches in Mission Creek downstream from Oak Park. Blackwelder. 2021.

- **Jurisdiction:** Santa Barbara City
- **Recommendation Mission Creek 20:** Replace the eucalyptus tree and other nonnative plants in the area with oak, sycamore, and/or California bay laurel and native riparian understory species.
- **Community Benefits:** Replacing the eucalyptus with natives will improve Watershed health, reduce fire hazards for residents living nearby, and protect water resources.
- **Next Steps:** Work with the Santa Barbara City Creeks Division, SBCFCWCD, Santa Barbara City Fire Department, the Conservancy, UC Coop, and nonprofits to undertake community outreach and seek funding to replace the eucalyptus trees and other nonnatives with native oaks, sycamores, California bay laurels, and riparian understory species.

- **Problem Mission Creek 21:** The section of Mission Creek between West Pueblo Street and West Los Olivos Street contains nonnative plants, including several invasive eucalyptus trees close to residential buildings. (Figure 33) This is of concern because eucalyptus are oily trees that can catch fire very quickly. Further, these trees may deplete Creek water levels due to high evapotranspiration rates.
- **Jurisdiction:** Santa Barbara City
- **Recommendation Mission Creek 21:** Replace the eucalyptus trees and other nonnative plants on and near the Creek banks with oaks, sycamores, California bay laurels, and native riparian understory plants.
- **Community Benefits:** Replacing eucalyptus with natives would improve the Watershed health, reduce fire hazard for residents living nearby, and may improve Creek flows.

Figure 33. Large blue gum trees adjacent to apartments. Blackwelder. 2021.

- **Next Steps:** Work with the landowner, Santa Barbara City Creeks Division, SBCFCWCD, Santa Barbara City Fire Department, the Conservancy, nonprofits, and UC Coop to seek funding to replace the eucalyptus trees and other nonnatives with native oak, sycamore, and/or California bay laurel, and riparian understory species.

- **Problem Mission Creek 22:** There is a large stand of blue gum eucalyptus trees upstream from the Arrellaga Street northbound Highway 101 Onramp sandwiched between Mission Creek and residential properties. (Figure 34) Eucalyptus trees are generally more flammable than native riparian plants and therefore increase fire threats to the residents. Eucalyptus also outcompete native plants in the Watershed for scare water resources, may deplete the streamflow, and can spread throughout the riparian corridor.

Figure 34. Stand of blue gum eucalyptus trees along Mission Creek west of the Arrellaga Street On-ramp to northbound Highway 101. Blackwelder. 2021.

- **Jurisdiction:** City of Santa Barbara

- **Recommendation Mission Creek 22:** Replace the eucalyptus trees and other nonnative plants with oaks, sycamores, California bay laurels, and native riparian understory plants.

- **Community Benefits:** Replacing eucalyptus and other nonnative plants with native riparian plants would improve the Watershed health, reduce fire hazards for residents living nearby, and may enhance streamflow.

- **Next Steps:** Work with the landowners, Santa Barbara City Creeks Division, SBCFCWCD, CRCD, the Conservancy, UC Coop, and nonprofits, such as CIR to conduct neighborhood outreach, develop a plan, and seek funding to replace the eucalyptus trees and other nonnatives with native oak, sycamore, and/or California bay laurel, and riparian understory species.

- **Problem Mission Creek 23:** Flammable invasive *Arundo donax* (Figure 34A) and a palm tree with dead palm fronds (Figure 35B) occur upstream and downstream of the De La Guerra Street Bridge over Mission Creek. These plants are prone to fire ignition posing a threat to nearby residents.[115] Further, the Arundo is an invasive nonnative that outcompetes native vegetation for scarce resources such as water.[116] There are other nonnative flora in the Creek bed such as umbrella plant and castor bean (*Ricinus communis*).

Figure 35A. Overgrown *Arundo donax* on the Creek bank upstream from De la Guerra Street. Figure 35B. Overgrown and unkept palm with dead fronds in Creek bed downstream from De la Guerra Street. Blackwelder. 2021.

  - **Jurisdiction:** City of Santa Barbara

  - **Recommendation Mission Creek 23:** Remove the invasive *Arundo donax* (Figure 35A) and the large palm (Figure 35B) up- and downstream of the West De la Guerra Street Bridge. Consider alternatives to Roundup and other glyphosate-based herbicides, per residents' requests.[117] For example, excavate the Arundo using care to remove all rhizomes and minimize disturbance to the Creek and native vegetation. Eradicate other nonnatives such as umbrella plant and castor bean that in the Creek corridor. Lay the banks back consistent with the Mission Creek Flood Control Project to provide increased flood protection and plant the banks with natives such as arroyo willows (*Salix lasiolepis*) and western sycamore trees.

[115] Council for Watershed Health, *Arundo donax Eradication in the LA River Watershed* Webpage available at https://www.watershedhealth.org/arundo (December 20, 2021).
[116] *Id.*
[117] Neighbor south of Mission Creek, east side of De la Guerra Street. Personal communication with Natalie Blackwelder, Watershed Program Intern, EDC and Brian Trautwein, Environmental Analyst / Watershed Program Coordinator, EDC. November 16, 2021.

- **Community Benefits:** Removal of the nonnatives will improve Watershed health and water flows. Removing the Arundo and palm tree will decrease fire hazard and increase safety for the residents nearby.

- **Next Steps:** Work with the residents along this section of Mission Creek, as well as the Santa Barbara City Creeks Division, SBCFCWCD, Santa Barbara City Fire Department, the Conservancy, UC Coop, and nonprofits, such as CIR to undertake public outreach. Seek funding to replace the nonnative plants with native willows, oaks, sycamores, bays, and native riparian understory species such as mugwort (*Artemisia douglasiani*), wild blackberry (*Rubus ursinus*), and California wild rose (*Rosa californica*).

D. Mission Ridge Road and Riviera Recommendations

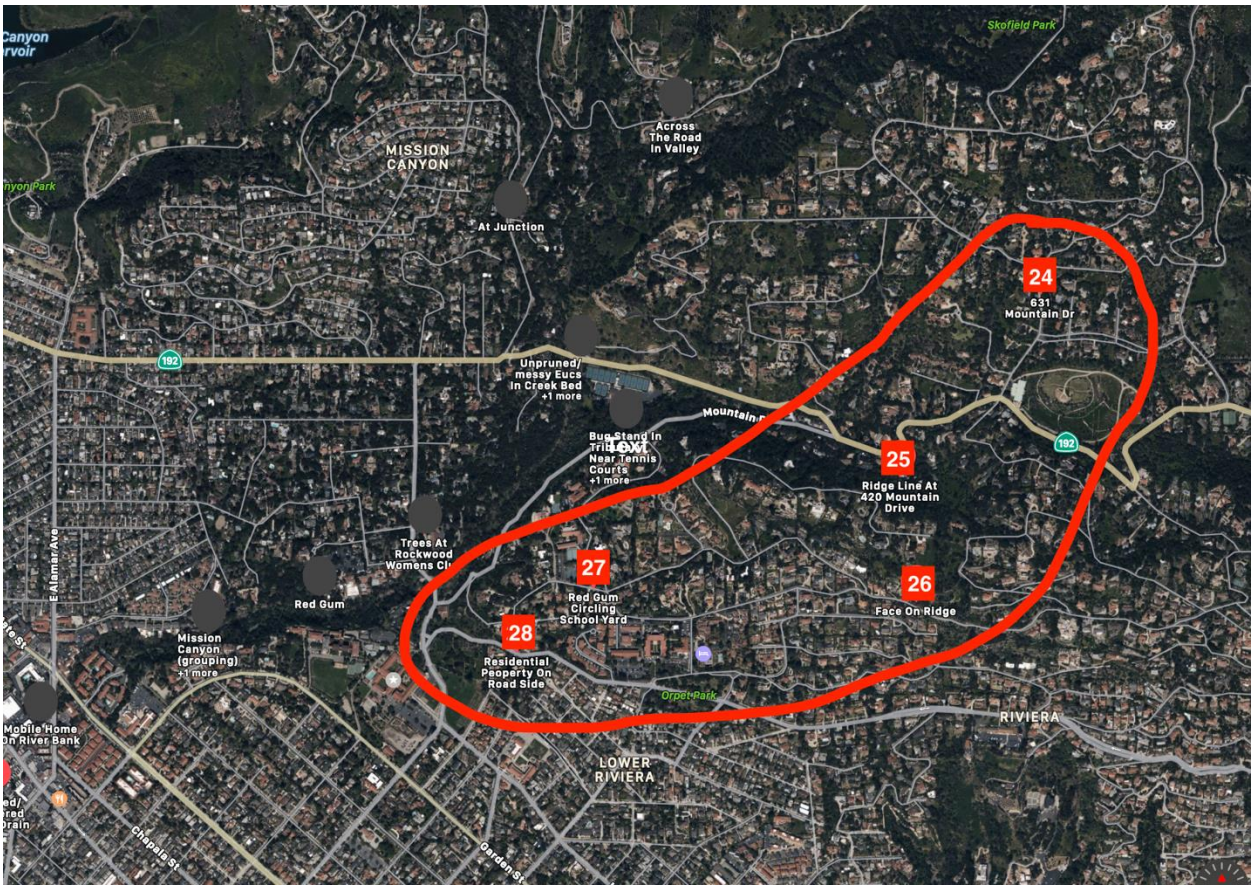

Figure 36. Map of identified eucalyptus locations along Mission Ridge and in the eastern portion of the Mission Creek Watershed. Apple Maps. 2021.

- **Problem Mission Creek 24:** A large eucalyptus tree occurs near 631 Mountain Drive. (Figure 37) This is a problem because eucalyptus trees are oily and prone to fires. This tree is directly next to power lines making it even more of a fire hazard. The leaf litter below it is well-kept and there are succulent plants all around the base of the tree, reducing the fire risk.
    - **Jurisdiction:** Santa Barbara City
    - **Recommendation Mission Creek 24:** Replace this eucalyptus tree with a coast live oak tree located farther from the power lines.

Figure 37. Large eucalyptus tree next to power lines on private property on Mountain Dr. Google Earth. 2019.

- **Community Benefits:** Removal would reduce fire risk, reduce the threat of eucalyptus spreading into natural areas such as oak woodlands or riparian habitats, and enhance wildlife habitat.[118]

- **Next Steps:** Coordinate with Santa Barbara City Fire Department and the landowner to discuss the potential replacement of the eucalyptus tree to reduce fire hazards and prevent the spread of eucalyptus in the Watershed. If the landowner supports replacement, work with City Fire Department, the Conservancy, and UC Coop to seek funding to replace the eucalyptus tree with one or more coast live oak trees.

[118] Santa Barbara County *Comprehensive Plan, Conservation Element – Oak Tree Protection in the Inland Rural Areas of Santa Barbara County* at 5 stating, "California's native oak woodlands provide habitat for approximately 2,000 species of plants, 170 birds, 100 mammals (approximately one-third of all mammals native to California), 60 amphibians and reptiles, and 5,000 species of insects (University of California 1993 and 1996)" available at https://cosantabarbara.app.box.com/s/eby129a068jv1tjlzijcbnhjysiqybtz (May 2009).

- **Problem Mission Creek 25:** Several eucalyptus trees occur in an oak woodland on a ridge line near 420 Mountain Drive. (Figure 38) Other native and nonnative plants surround these trees which are located close to residences. The eucalyptus could spread wildfire in the WUI and may propagate and displace coast live oak woodland.

Figure 38. Several eucalyptus trees along ridge next to 420 Mountain Drive. Blackwelder. 2021.

  - **Jurisdiction:** Santa Barbara City
  - **Recommendation Mission Creek 25:** Replace these trees with coast live oak trees.
  - **Community Benefits:** Replacing the eucalyptus could reduce fire hazard, protect the residents nearest this site, and protect native plant communities in the Watershed.
  - **Next Steps:** Coordinate with Santa Barbara City Fire Department and the landowners to discuss the potential replacement of eucalyptus trees to reduce fire hazards and prevent the spread of eucalyptus in the Watershed. If the landowners support replacement, work with SBCFD, the City Fire Department, the Conservancy, UC Coop, and CIR to conduct public outreach, develop a plan, and seek funding to replace the eucalyptus trees with coast live oak trees.

- **Problem Mission Creek 26:** Several eucalyptus trees are located on a steep hillside next to 1704 Mission Ridge Road below Franceschi Park. (Figure 39) The trees are younger, making removal relatively easy. However, because they are growing on a steep hillside right next to the road, complete removal may destabilize the slope. Cutting the trees down to stumps and treating the stumps with herbicide may ensure they do not spread within the Watershed while maintaining slope stability.

Figure 39. Several eucalyptus trees on steep slopes directly above Mission Ridge Road. Trautwein. 2021.

  - **Jurisdiction:** Santa Barbara City

  - **Recommendation Mission Creek 26:** As mentioned above, these trees' roots are providing stability to the slope, so complete removal may disturb the hillside and cause erosion and traffic issues. We recommend cutting these eucalyptus trees down to stumps and treating them to prevent the stumps from regrowing. Plant coast live oak trees on the slopes to stabilize them.

  - **Community Benefits:** Replacing the eucalyptus with oak trees would ensure the hillside remains stable, reduce fire risk, and protect native plant communities in the Mission Creek Watershed.

  - **Next Steps:** Coordinate with Santa Barbara City Fire Department, the City Public Works Department, and the Santa Barbara Parks and Recreation Department to discuss the potential replacement of eucalyptus trees to reduce fire hazards and prevent the spread of eucalyptus in the Watershed. If agencies support replacement, work with Santa Barbara City Fire Department, City Public Works, the Conservancy, UC Coop, neighborhood groups, and nonprofits to undertake community outreach and education, develop a plan, and seek funding to replace the eucalyptus trees with coast live oak trees.

- **Problem Mission Creek 27:** There are at least twenty red river gum eucalyptus trees encircling the field at Marymount Santa Barbara located at 2130 Mountain Ridge Road. (Figure 40) These trees are well-pruned with little tree litter on the ground, reducing fire concerns. However, given the location in a dense neighborhood and schoolyard, and due to the potential tree fall hazard, these trees still may pose a fire and treefall hazard.

Figure 40. Over twenty red river gum eucalyptus trees encircling the field at Santa Barbara's Marymount School. Blackwelder. 2021.

  - **Jurisdiction:** Santa Barbara City

  - **Recommendation Mission Creek 27:** Replace the red gum eucalyptus trees and native coast live oak and/ or sycamores trees.

  - **Community Benefits:** Reduce fire and treefall hazards.

  - **Next Steps:** Coordinate with Santa Barbara City Fire Department and Marymount School to discuss the potential replacement of eucalyptus trees to reduce fire and treefall hazards and prevent the spread of eucalyptus in the area. If Marymount supports replacement, work with Santa Barbara City Fire Department, SBCFD, the Conservancy, and UC Coop to conduct public outreach and seek funding to replace the eucalyptus trees with coast live oak or western sycamore trees.

- **Problem Mission Creek 28:** There are several eucalyptus trees along Alameda Padre Serra Road. (Figures 41A, 41B, and 41C) These fire-prone trees are located near many residences.

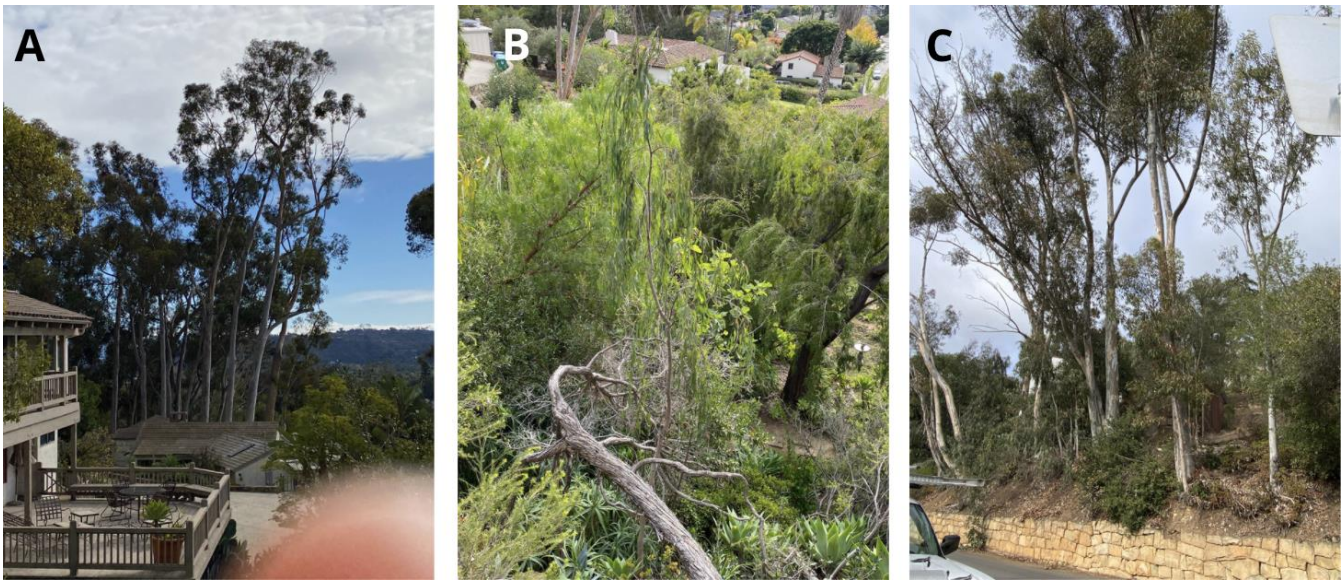

Figure 41A. Large stand of tall eucalyptus trees adjacent to residences on Alameda Padre Serra Road. Figure 41B. Young eucalyptus sapling in front of pepper trees. Figure 41C. Several eucalyptus trees on a slope side above Alameda Padre Serra Road. Blackwelder. 2021.

  - **Jurisdiction:** Santa Barbara City

  - **Recommendation Mission Creek 28:** Replace the eucalyptus trees with coast live oaks and/or western sycamores.

  - **Community Benefits:** Removing these trees would reduce fire hazards and improve the safety of the residents along this road while simultaneously improving the ecology by planting native species that are better fit for this environment.

  - **Next Steps:** Coordinate with Santa Barbara City Fire Department, and landowners, to discuss the potential replacement of eucalyptus trees to reduce fire hazards and prevent the spread of eucalyptus in the area. If the residents support replacement, work with Santa Barbara City Fire Department, CRCD, the Conservancy, and UC Coop to seek funding to replace the eucalyptus trees with oak and/or sycamore trees.

E. Rattlesnake Canyon Recommendations (Las Canoas Road)

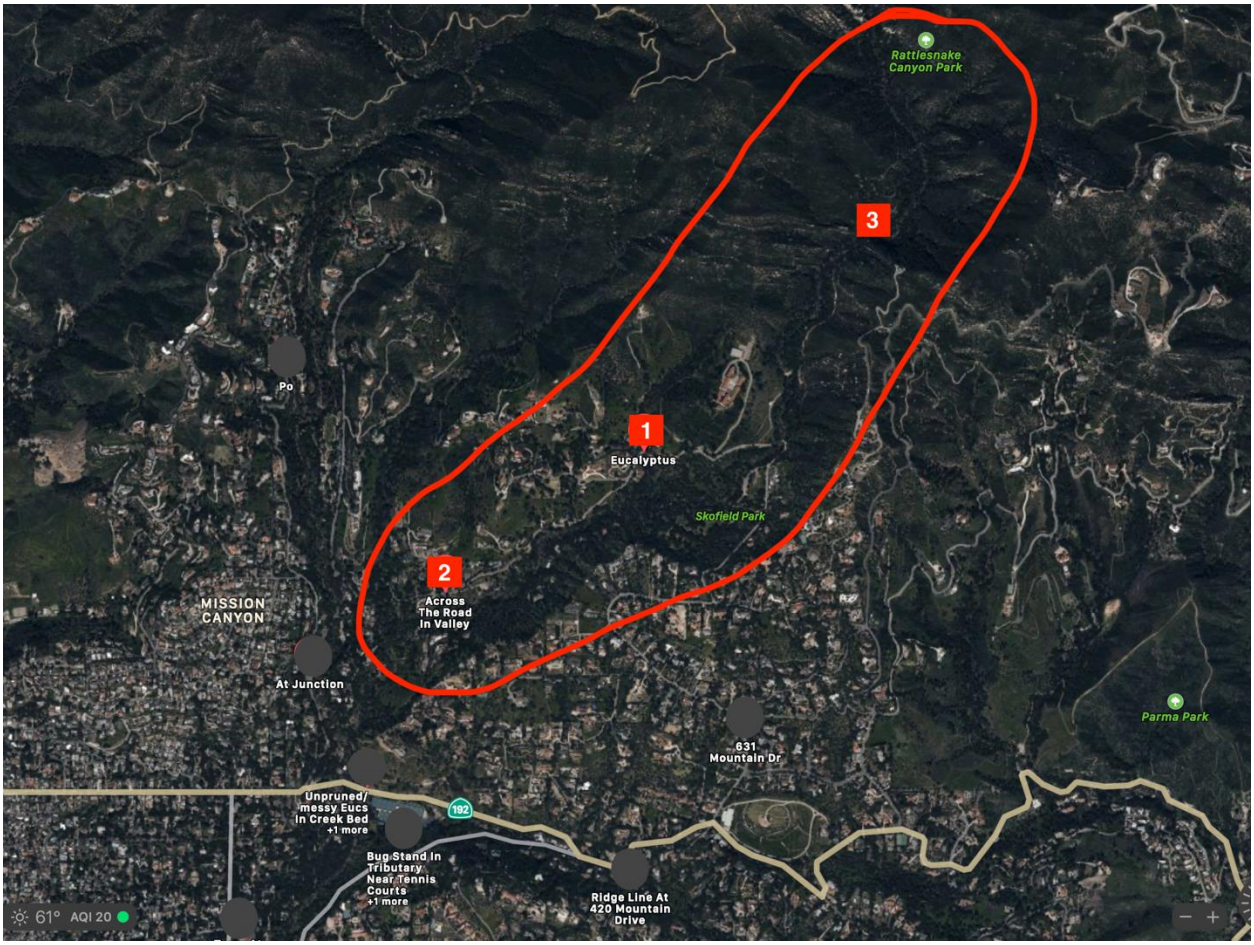

Figure 42. Map of Recommendations for the Rattlesnake Canyon Watershed. Apple Maps. 2021.

- **Problem Rattlesnake Canyon 1:** Large eucalyptus trees are growing near power lines in the vicinity of 2255 Las Canoas Road. A stand of several eucalyptus occurs across the Road and in Rattlesnake Canyon. (Figure 43) Eucalyptus are oily trees that can catch fire very easily. This poses a threat to the surrounding residents and the greater ecology in Rattlesnake and Mission Canyons. The trees in the valley are in the riparian corridor close to Rattlesnake Canyon Creek. Eucalyptus are nonnative trees that compete with natives for water and space and can deplete flows in the Creek, thus negatively impacting Watershed health. As an invasive species, eucalyptus can displace native riparian vegetation thereby harming the ecological values in the Canyons.

Figure 43. Left: The image on the left shows one large eucalyptus tree next to power lines. Right: The image on the right is a zoomed in picture of the eucalyptus stand identified by the second, smaller arrow in the left image. Blackwelder. 2021.

- **Jurisdiction:** Santa Barbara County

- **Recommendation Rattlesnake Canyon 1:** Replace these eucalyptus trees in a phased manner with natives such as coast live oak and western sycamore trees. Residents can potentially take advantage of the City Creek Division's program which provides residents with free native trees to replace nonnative trees such as eucalyptus growing alongside creeks. These large trees have been here for a long time and have provided homes for other organisms. Therefore, we suggest a phased removal of the trees to minimize effects on ecological communities and neighborhood aesthetics. Remove eucalyptus seedlings, saplings, and seeds to suppress the regrowth of these trees and monitor the area.

- **Community Benefits:** Replacing the eucalyptus with native trees would reduce fire hazards protecting residents and properties and improve the health of Rattlesnake Canyon and the Mission Creek Watershed.

- **Next Steps:** Coordinate with Santa Barbara City Fire Department, SBCFD, and the landowners to discuss the potential replacement of eucalyptus trees with oak, bay laurel, and sycamore trees to reduce fire hazards and prevent the spread of eucalyptus in the Watershed. If the landowners support replacement, work with Santa Barbara City Fire Department, SBCFD, CRCD, the Conservancy, CIR, and UC Coop to undertake community outreach, develop a plan, and seek funding to replace the eucalyptus trees with native trees.

- **Problem Rattlesnake Canyon 2:** There are several blue gum and lemon-scented eucalyptus (*Eucalyptus globulus*) trees scattered along Las Canoas Drive near the Rattlesnake Canyon Trailhead. (Figures 44 and 45) Many of them are located on private residences surrounded by homes and other vegetation. Eucalyptus is an invasive nonnative species that is highly flammable due to its oily residues. It also sheds bark and dead plant matter, providing fire kindling. If not removed, these trees will spread into natural areas, including oak and riparian woodlands (Figure 44), providing greater fire risk, depleting Rattlesnake Canyon Creek's flows, and causing ecological disturbance.

Figures 44. 1972 Las Canoas Road. Left: Eucalyptus trees along a private driveway extending north from Las Canoas Road. Right: Eucalyptus sapling growing along the south side of Las Canoas Road demonstrating that eucalyptus trees are spreading into natural areas within Rattlesnake Canyon. Trautwein. 2021.

  - **Jurisdiction:** Santa Barbara County and Santa Barbara City

  - **Recommendation Rattlesnake Canyon 2:** Remove eucalyptus trees in a phased manner to minimize residential and ecological disturbances. Remove seeds, seedlings, and saplings to prevent regrowth of these trees. Replace eucalyptus with coast live oak and sycamore trees.

Figure 45. Several Tasmanian blue gum and lemon-scented eucalyptus trees along Las Canoas Road in Rattlesnake Canyon. Blackwelder. 2021.

- **Community Benefits:** Replacing these trees with native trees would reduce fire risk and improve safety for residents while simultaneously restoring riparian and oak woodlands and improving the Watershed's health.

- **Next Steps:** Coordinate with Santa Barbara City Fire Department, SBCFD and the landowners to discuss the potential replacement of eucalyptus trees to reduce fire hazards and prevent the spread of eucalyptus in the Watershed. If the landowners support replacement, work with Santa Barbara City Fire Department, SBCFD, Santa Barbara City Creeks Division, CRCD, the Conservancy, CIR, and UC Coop to conduct neighborhood outreach and education, develop a tree replacement plan, and seek funding to replace the eucalyptus trees with coast live oak and sycamore trees.

- **Problem Rattlesnake Canyon 3:** A stand of nonnative pine trees were planted between oak woodlands and chaparral, approximately seven-tenths of a mile up Rattlesnake Canyon Trail. (Figure 46) Pine trees are prone to fire.[119] The chaparral in Rattlesnake Canyon is dry most of the year and with climate change, we are seeing less rainfall and warmer temperatures, further increasing fire concerns. As a result, the pine trees may incrementally increase fire hazards in the area.

Figure 46. Red circle encompasses a stand of nonnative pine trees located along Rattlesnake Canyon Trail. Google Earth. 2021.

- **Jurisdiction:** Santa Barbara County

- **Recommendation Rattlesnake Canyon 3:** Remove the pine trees in a phased manner to minimize ecosystem disturbance. Remove the diseased and unhealthy trees first. Every time a pine is removed, replace it with a native coast live oak or California bay laurel tree.

- **Community Benefits:** Replacing these pine trees with natives would likely reduce fire hazards and improve the natural ecology in the area.

[119] Taylor (2020).

- **Next Steps:** Coordinate with Santa Barbara City Fire Department, SBCFD, Santa Barbara City Parks and Recreation, CRCD, the Los Padres Council of the Boy Scouts of America, the LPNF, the Conservancy, CIR, and UC Coop to undertake public education, develop a tree replacement plan, and seek funding for phased replacement of the pine trees with native oaks and bay laurels.

F. Global Watershed Recommendations

Invasive Nonnative Plants

- **Problem Global 1:** Invasive nonnative plants, including but not limited to the following species, occur within riparian and upland communities in the Mission Creek Watershed and/or nearby watersheds. These species degrade riparian forests, oak woodlands, and chaparral stands. Many, including eucalyptus, Algerian ivy, *Arundo donax*, pampas grass, pine trees, broom, and Mexican fan palm increase fire hazards.[120]

    - Shamel (or evergreen) ash trees (*Fraxinus uhdei*)
    - blue gum eucalyptus trees (*Eucalyptus globulus)*
    - lemon-scented eucalyptus trees (*Eucalyptus citriodora*)
    - red river gum eucalyptus trees (*Eucalyptus camaldulensis*) (Figure 40)
    - acacia trees (*Acacia* spp.)
    - giant reed (*Arundo donax*) (Figure 35A)
    - castor bean (*Ricinus communis*) (Figure 47)
    - pampas grass (*Cortaderia jubata*)
    - tree tobacco (*Nicotiana glauca*)
    - umbrella plant (*Cyperus involucratus*)
    - vinca (*Vinca major*)
    - yellow star thistle (*Centaurea solstitialis*)
    - fennel (*Foeniculum vulgare*)
    - ice plant (*Carpobrotus edulis*)
    - English ivy (*Hedera helix*)
    - Algerian ivy (*Hedera canariensis*)
    - Himalayan blackberry (*Rubus armeniacus*)
    - tamarisk (*Tamarix* spp.)
    - cape ivy (*Delairea odorata*)
    - Mexican fan palm (*Washingtonia robusta*)
    - Spanish broom (*Spartium junceum*)
    - French broom (*Genista monspessulana*)
    - mustard (*Brassica* spp.)
    - fountain grass (*Cenchrus setaceus*)[121]

These invasive nonnative species - many of which are documented in preceding sections - continue to proliferate from the uppermost elevations in the Mission Creek Watershed and nearby watersheds along East Camino Cielo and Gibraltar Roads to the Mission Creek Lagoon.

Many of these pest plants increase wildfire ignition and wildfire spread, consume valuable water, impair stream baseflows, reduce live fuel moisture and soil moisture levels in riparian forests, outcompete and displace native plant species, eliminate and degrade wildlife habitats, force wildlife into shrinking native plant communities, increase the potential for flooding, denigrate recreational

[120] Taylor (2020).
[121] Epic Gardening, *The 39 Most Invasive Plant Species in California* available at https://www.epicgardening.com/invasive-plant-species-in-california/ (May 20, 2019) ("Epic Gardening (2019)").

opportunities such as wildlife viewing, photography, hunting, and fishing, adversely impact water quality and soil quality, and cause significant economic damage.[122] "Invasive plants cost California at least $82 million each year."[123] In one study, seventy-three "percent of the threatened and endangered species reviewed are threatened by exotic species."[124] "Nationally, invasive species are the second-greatest threat to endangered species, after habitat destruction."[125]

Figure 47. Castor bean plant in Creek bed. Castor bean is a very invasive plant species with poisonous seeds. Max Kalber. November 18, 2020.

[122] California Department of Fish and Wildlife, *Native Plants and Invasive Species* webpage, available at https://wildlife.ca.gov/Conservation/Plants/Invasives#:~:text=Invasive%20plants%20not%20only%20crowd,to%20California's%20native%20plant%20species. (January 27, 2021); *See also* California Invasive Plant Council, *About Invasive Plants* Webpage available at https://www.cal-ipc.org/plants/impact/ (January 27, 2021) ("Cal-IPC (2021)").
[123] (*Id*.)
[124] Lawler JJ, Campbell SP, Guerry AD, *et al*. *The scope and treatment of threats in endangered species recovery plans*. Ecol Appl 12: 663–67 (2002) available on CDFW's website at https://wildlife.ca.gov/Conservation/Plants/Invasives#:~:text=Invasive%20plants%20not%20only%20crowd,to%20California's%20native%20plant%20species (January 27, 2021).
[125] Cal-IPC (2021).

- **Jurisdictions:** City of Santa Barbara, County of Santa Barbara

- **Recommendation Global 1:**

(1) Physically remove the most invasive, fire-prone, and detrimental plant species where feasible, including Arundo and eucalyptus. Solarization,[126] herbicides, and manual control are methods for eradicating and controlling these harmful species. Where complete removal is infeasible, or where the community wishes to retain nonnative plants due to their role in maintaining native bird and wildlife species (e.g., eucalyptus supporting raptor nests), control the spread of invasive species, e.g., by removing saplings to reduce adverse effects of nonnatives on the native plant communities associated with the Mission Creek Watershed, including riparian forest, oak woodland, native grasslands, coastal sage scrub, and chaparral communities. Where eucalyptus serve as important habitat for raptors and eradication is infeasible, take actions to reduce their proliferation and reduce fire hazards and other impacts, for instance by removing downed wood and bark in eucalyptus groves.[127] Where large invasive plants (e.g., pine, acacia, and eucalyptus trees) are prominent, phase removals to reduce visual and environmental disturbance.

(2) Replant native plants from local (i.e., Mission Creek Watershed or nearby watersheds) seed sources to restore habitat, prevent re-establishment of exotic plants, and control erosion.

(3) Implement a highly visible, community-wide education campaign to train residents to avoid buying and planting invasive plant species. Create, update, and maintain a list of invasive nonnative pest plants specific to the Mission Creek Watershed (or southern Santa Barbara County watersheds) and use the list to proactively educate residents about the harm caused by invasive exotic pest plants.[128] Urge people not to plant such species. For example, the CDFW actively discourages Californians from planting invasive exotic plant species.[129]

(4) Create, update, and maintain a working map of locations of exotic invasive species in the Mission Creek Watershed (or southern Santa Barbara County). Establish and publicize a method for field biologists to contribute newly identified patches of invasive nonnatives, e.g., utilizing

[126] Andrew Harrison Fraser, University of Washington Master of Science Thesis, *Use of Solarization to Kill the Root Crown and Reduce the Seed Bank Viability of Rubus armeniacus* Focke *and Cytisus scoparius (L.)* Link available at https://depts.washington.edu/uwbg/research/theses/Andrew_Fraser_2013.pdf (2013).
[127] City of Goleta (2012) at 21.
[128] *See e.g.*, Epic Gardening (2019).
[129] California Department of Fish and Wildlife, *Don't Plant Me* webpage, available at https://wildlife.ca.gov/Conservation/Plants/dont-plant-me (January 27, 2021).

I-Naturalist.[130] Prioritize sites based on fire hazard and ecological threat levels. Report locations of invasive plant species to Santa Barbara County Weed Management Area ("SBCWMA").[131]

(5) Ban the sale of the most fire-prone and ecologically problematic species by local nurseries, and/or educate and incentivize nursery owners to stop purchasing and propagating these species.[132] Provide educational materials to nurseries, including posters, brochures and the invasive plant list and map, and display this information at nurseries. Create a "Wildlife Friendly Nursey" program that rewards nurseries to halt the sale of invasive nonnatives, including an online registry of such nurseries, assistance with advertising participating nurseries' actions to combat invasive exotic plant proliferation, and stickers for the businesses' windows highlighting their cooperation and qualification as a "Wildlife Friendly Nursery."

- **Community Benefits:** Recommendation Global 1A would reduce fire hazards, protect, and enhance riparian forest, wetland, oak woodland, coastal sage scrub, chaparral, and native grasslands in the Mission Creek Watershed and surrounding areas, preserve and improve habitats for wildlife and native plant species, including rare, threatened, and endangered species, protect creeks' baseflows, preserve water resources, and benefit water quality and soil health. Recommendations Global 1A would slow the decline of natural habitats and reduce invasive plant infestations. It would help improve fire safety in the WUI, protect agricultural operations, protect instream flows, preserve and enhance nature-based recreational opportunities, and minimize economic costs caused by pest plants in watersheds near the City of Santa Barbara.

[130] iNaturalist webpage, available at: https://www.inaturalist.org/

[131] "The Santa Barbara County Weed Management Area is an association of state and local public agencies, non-governmental organizations, non-profit groups, and private citizens who are concerned about the problem of invasive and noxious weeds in Santa Barbara County and California. Invasive and noxious weeds are plants that are non-native and lower the value of agriculture, threaten natural habitats, and create flood and fire risks for infrastructure." Santa Barbara County Agricultural Commissioner's Office, *Weed Management Area* webpage available http://www.countyofsb.org/agcomm/WMA/ (December 17, 2021).

[132] John Seewer, Associated Press, *Plant lovers want nurseries to stop selling invasive plants*, available at https://www.nwitimes.com/lifestyles/home-and-garden/plant-lovers-want-nurseries-to-stop-selling-invasive-plants/article_64b1c19e-5bc5-5d2b-b325-99bc9c41894a.html (May 31, 2017).

- **Next Steps:** Meet with the SBCWMA, CRCD, UC Coop, the Conservancy, and nonprofit partners such as SBBG, Audubon Society, and CIR to coordinate efforts and seek funding. Develop an interactive online nonnative pest plant map, and other resources,[133] establish educational and incentive-based programs, and conduct outreach to nurseries.

  Develop a cooperative working relationship with the Santa Barbara County Agricultural Commissioner, SBCWMA, Santa Barbara City Creeks staff, Santa Barbara City Parks and Recreation Department, Santa Barbara City Fire Department, SBCFD, CRCD, UC Coop, the Conservancy, nonprofits, and local nurseries. Devise regulatory and/or incentive-based programs to curtail sales of invasive exotic plant species. Monitor nursery sales and nonnative plant infestations.

  Contact SBFCWCD, City of Goleta Public Works, City of Santa Barbara Creeks Division, CDFW, and USACOE to discuss expanding or redirecting SBCFCWCD's annual maintenance plans to include mitigation involving removing the invasive plant species identified above. Work with SBCFCWCD to identify and map exotic species during annual creek walks, and remove plants, patches, and stands during annual creek maintenance implementation. Update SBCFCWCD's CDFW permit conditions and EIR mitigation measures to include invasive species removal as mitigation to offset the impacts of creek maintenance on native plants and habitats. Solicit support from regulatory agencies, such as CDFW, Army Corps of Engineers, and Coastal Commission, seek funding for community education programs and invasive species eradication efforts, and enlist nonprofit groups, such as CIR and SBBG.

[133] For example, the CRCD, which staffs the SBCWMA, has a website entitled *Invasive Plant Assistance Program* available at https://www.rcdsantabarbara.org/invasive-plant-assistance-program (December 17, 2021). This site has information on pest plants to avoid planting, alternatives to invasive pest plants, a *Guide to Native and Invasive Streamside Plants*, and a *Kids Invasive Weeds Book*.

Homeless Community Member Encampments

- **Problem Global 2:** Homeless community members' camps have proliferated significantly along Mission Creek. (Figure 48) The rate of homelessness and occurrence of encampments has substantially increased in the last two years during the COVID-19 pandemic.[134] Impacts include frequent fires caused by warming and cooking fires.[135] Other problems resulting from homelessness include increased litter and fecal matter in and near campsites and creeks, including Mission Creek, increased water pollution in creeks, estuaries, and the ocean and related public health concerns, discarded drug paraphernalia, vegetation and habitat removal, deterrence of wildlife and bird use of riparian areas, increased noise, nighttime lighting, and a perceived decrease in public safety.[136]

    - **Jurisdictions:** City of Santa Barbara, County of Santa Barbara, Caltrans, and UPRR

    - **Recommendation Global 2A:** Remove the accumulated trash and fecal material from unoccupied camps. Plant and establish native brambles such as wild blackberry (*Rubus ursinus*), California wild rose (*Rosa californica*), and poison oak (*Toxicodendron diversilobum*) at unoccupied homeless community encampments to deter future camping and restore damaged riparian habitats.[137]

Figure 48. Some of the garbage at a homeless camp has fallen into the Creek channel. Trautwein. 2019.

[134] Heal the Ocean, *Homeless Camp Map* (January 2021); See also Flacks (2023).
[135] Jean Yamamura, Santa Barbara Independent *How to House Goleta's Homeless? Housing Workshop Asks Residents for Comment* available at https://www.independent.com/2019/12/10/how-to-house-goletas-homeless/ (December 10, 2019) ("Yamamura (2019)"); *See also* EDC (2019) at 109; *See also* Smith (2021).
[136] EDC has received reports of drug deals at homeless camps.
[137] City of Goleta, *Homelessness Strategic Plan* at 43 available at https://www.cityofgoleta.org/home/showpublisheddocument/25147/637550421133800000 (2021).

- **Recommendation Global 2B:** Regularly monitor occupied camps. Develop a rapport with homeless community members. Work with social service agencies, medical,[138] and nonprofit organizations to canvass creek-side homeless encampments to educate and offer services to our homeless neighbors. Identify and provide services to assist homeless community members to help transition them out of homelessness. Install and service port-a-potties on public lands near creeks with homeless camps. Work with Showers of Blessing to provide regular opportunities for homeless community members to bathe.[139] Expand programs to provide medical assistance. Develop a program to provide Covid testing and vaccinations. Continue to provide bags for homeless residents to bag trash for collection and disposal by Caltrans and other agencies.

- **Community Benefits:** Recommendations Global 2A and 2B would help support homeless community members and transition them toward permanent housing. It would reduce fires, litter, and biohazards, improve the health and well-being of homeless community members, improve public health, enhance aesthetics, rehabilitate riparian woodland habitats, and improve water quality in Mission Creek and at local beaches by reducing the amount of human feces in local creeks.

- **Next Steps:** Meet with City and stakeholders to develop a plan and seek funding to implement these recommendations.

Residential Development

- **Problem Global 3:** Residential development in rural and WUI Areas increases fire hazards and threatens the Mission Creek Watershed.

  - **Jurisdiction:** Santa Barbara County and City of Santa Barbara

  - **Recommendation Global 3:** Acquire fee title or conservation easements and/or downzone rural and WUI areas to lessen buildout.

  - **Community Benefits:** Rezoning WUI and high fire hazard sites to open space or recreation, securing conservation easements, and/or acquiring sites for parks or natural open spaces, and creating passive recreational opportunities, would reduce fire hazards to existing and future WUI residents, properties, species, and vegetation communities, and enhance passive recreation in the Mission Creek Watershed.

[138] NCBI (2021); *See also* JEMS (2020).
[139] Showers of Blessing. https://showersofblessingiv.org/ (January 28, 2021).

- **Next Step:** Discuss this Recommendation with City and County decision-makers, Santa Barbara City Fire Department, SBCFD, Santa Barbara County Planning and Development Department, Santa Barbara City Community Development Department, land conservancies, City and County park and open space agencies, and other partners. Request general plan amendments to downzone undeveloped WUI and rural properties located in or adjacent to high fire hazard areas. Coordinate with partners to initiate and support downzones, easements, and acquisitions, and to raise funds to acquire properties and easements from willing landowners. Conduct outreach to state and federal funding agencies and legislators.

Chaparral Type-Conversion

Figure 49A. A masticator clears old growth chaparral above Santa Barbara. Trautwein. 2009.

- **Problem Global 4:** various landowners are removing chaparral from watersheds on the South Coast, posing a threat to the health of local creeks including Mission Creek. (Figures 49A and 49B.) Chaparral is the most common and perhaps most important plant community in the Mission Creek Watershed. It supports numerous rare plant and animal species. "Of the 4846 native vascular plant species found in the California, 24% (1177 spp.) occur in chaparral (Table 2) and 44% (516 spp.) of these are considered rare (Keeley, 2005)."[140] Chaparral in the Santa Barbara area supports many rare plant and animal species, including the Santa Ynez Mountains walking stick (*Timema cristanae*) (Figure 50), late-flowered Mariposa lily (*Calychortus fimbriatus*) (Figure 51), Santa Barbara honeysuckle (*Lonicera subspicata subspicata*), mountain lion (*Puma concolor*), and ringtail (*Bassariscus astutus*).[141] (Figure 52)

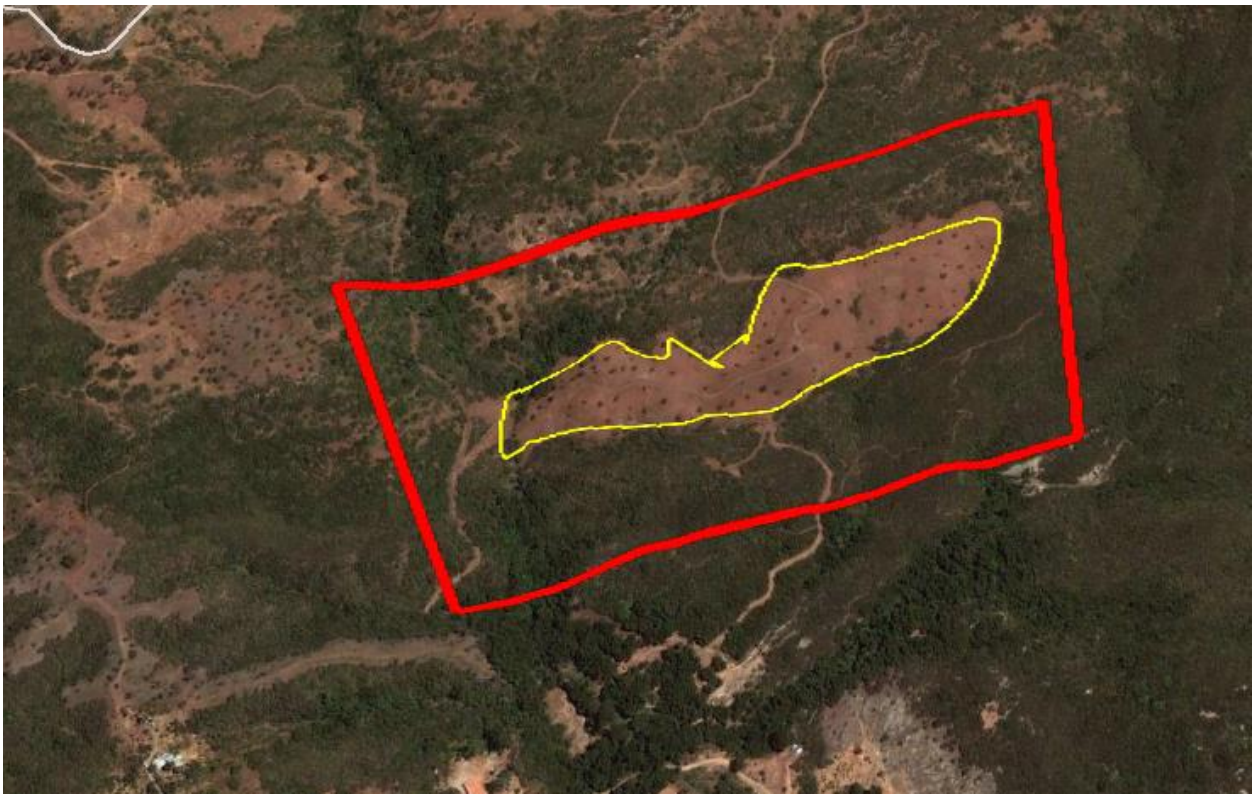

Figure 49B. Aerial view of the same location as Figure 4A. Google Earth. 2020.

[140] RW Halsey, California Chaparral Institute, Escondido, CA, United States, and JE Keeley, U.S. Geological Survey, Three Rivers, CA, United States *Conservation Issues: California Chaparral* available at https://www.californiachaparral.org/__static/fea8c75bc95c015706d40af2bf07f8aa/halsey_and_keeley_chaparral_diversity_-2016-b-1.pdf?dl=1 (2016).

[141] CalFlora website, *Calochortus fimbriatus* webpage identifying late-flowered Mariposa lily as "California Rare Plant Rank 1B.3 (rare, threatened, or endangered in CA and elsewhere)" available at https://www.calflora.org/app/taxon?crn=11230 (April 16, 2021).

Chaparral in portions of the South Coast is Environmentally Sensitive Habitat Area ("ESHA" or "ESH") where it contains rare or vulnerable native plant alliances or sensitive native plant and/or animal species. The Mission Canyon Community Plan maps chaparral as ESH where it supports rare plants such as Santa Barbara honeysuckle (*Lonicera subspicata subspicata*), California walnut (*Juglans californica*), or Nuttall's scrub oak (*Quercus dumosa*).[142] Despite being considered ESHA/ESH where it supports rare vegetation or plant or animal species, chaparral is rarely protected pursuant to the County's Environmentally Sensitive Habitat Ordinance (e.g., ESH-GOL Ordinance).[143] Chaparral is frequently cleared on the South Coast. EDC's 2014 Report, *Chaparral Removal Projects – Southern Santa Barbara County* identified twelve recent clear cuts, and EDC's 2016 *Chaparral Clear Cut Report* identified six newer clearings.[144]

Increased fire frequency brought about by climate change, combined with chaparral clearing, is eliminating chaparral in southern California through the process of type-conversion.[145] Chaparral is being replaced by a community of mostly nonnative invasive annual species such as thistles and exotic annual grasses.[146] (Figures 53 and 54) Loss of chaparral destroys habitat for birds and wildlife and eliminates a vast diversity of plant and animal species, and it threatens humans. Loss of the deep-rooted plants such as ceanothus, chamise, and manzanita decreases infiltration and ground water recharge, increases erosion,[147] sedimentation, flooding, and potential debris flows, and may decrease baseflows in Mission Creek. Weedy annual vegetation that replaces chaparral increases the fire ignition threat by reducing live fuel moistures and allowing greater access to high fire hazard areas.[148]

[142] Santa Barbara County, *Mission Canyon Community Plan* Figure 19 at 83 available at https://cosantabarbara.app.box.com/s/128fmpp888vii7psxsosvzuph4jfx1uc (April 2014).
[143] Santa Barbara County, *Land Use Development Code*, Section 35.28.100 at 2-149 – 2-158, available at https://cosantabarbara.app.box.com/s/6hrqg4blorc7zjyh2hklhsl3pv2j2tad (January 2021).
[144] Jacob Hesse, EDC Chaparral Program Intern, *Chaparral Removal Projects Southern Santa Barbara County* (September 2014); *See also* Will Buddu, Chaparral Program Intern, *EDC Chaparral Clear Cut Report* (October 3, 2016).
[145] Syphard *et al.* (2019); *See also* Goleta (2020) at 33; *See also* Chaparral Institute (2021).
[146] *Id.*
[147] US Forest Service, *Publication gtr-067* available at https://www.fs.fed.us/psw/publications/documents/gtr-067/gtr-67-section1.pdf (April 29, 2021).
[148] California Chaparral Institute (2021).

Figure 50. Santa Ynez Mountain walking stick (*Timema cristanae*). Getty images.

Figure 51. Late-flowered Mariposa lily (*Calochortus fimbriatus*). Aanjelae Rhoads. 2018.

- **Jurisdiction**: Santa Barbara City, Santa Barbara County, and USFS

- **Recommendation 4:** Require new development and vegetation clearing to avoid impacts to chaparral whenever feasible.[149] Require habitat compensation to mitigate the loss of chaparral whenever avoidance is infeasible and intact chaparral is removed. Adopt requirement to create or restore chaparral onsite at a 3:1 ratio. If onsite replacement is not feasible, require replacement offsite in the same watershed or as close as feasible to the area of impact.[150] If restoration or creation is not feasible for a given project, mitigation should entail permanent preservation of existing chaparral at a 4:1 or higher ratio (for each acre removed permanently preserve four acres of existing chaparral by deed restriction or in a conservation easement held by a third-party conservation organization).

[149] Santa Barbara County (2008) at 32 – 33.
[150] *Id*.

Figure 52. The ringtail is a member of the raccoon family and a Fully Protected Species under the California Fish and Game Code. Wikipedia https://en.wikipedia.org/wiki/Ring-tailed_cat. February 23, 2021.

- **Community Benefits:** Recommendation Global 4A would protect diverse plant communities and many special-status species, maintain infiltration, groundwater recharge, fog drip, and baseflows in Mission Creek and Rattlesnake Canyon Creek, reduce erosion, sedimentation, flooding, and debris flows, and protect the scenic backdrop for the Mission Creek Watershed. Preventing type-conversion of chaparral to weedy annual plants would reduce fire ignition threats.

- **Next Steps:** Create a working group, including the City of Santa Barbara Fire Department, SBCFD, USFS, Caltrans, the California Chaparral Institute, Santa Barbara County Planning and Development Department, Santa Barbara City Community Development Department, UCSB Botanists and ecologists, UC Coop, and local conservation groups such as CIR, SBBG, and Los Padres ForestWatch. Strive to develop a conservation program that ensures no net loss of chaparral in the Mission Creek Watershed.

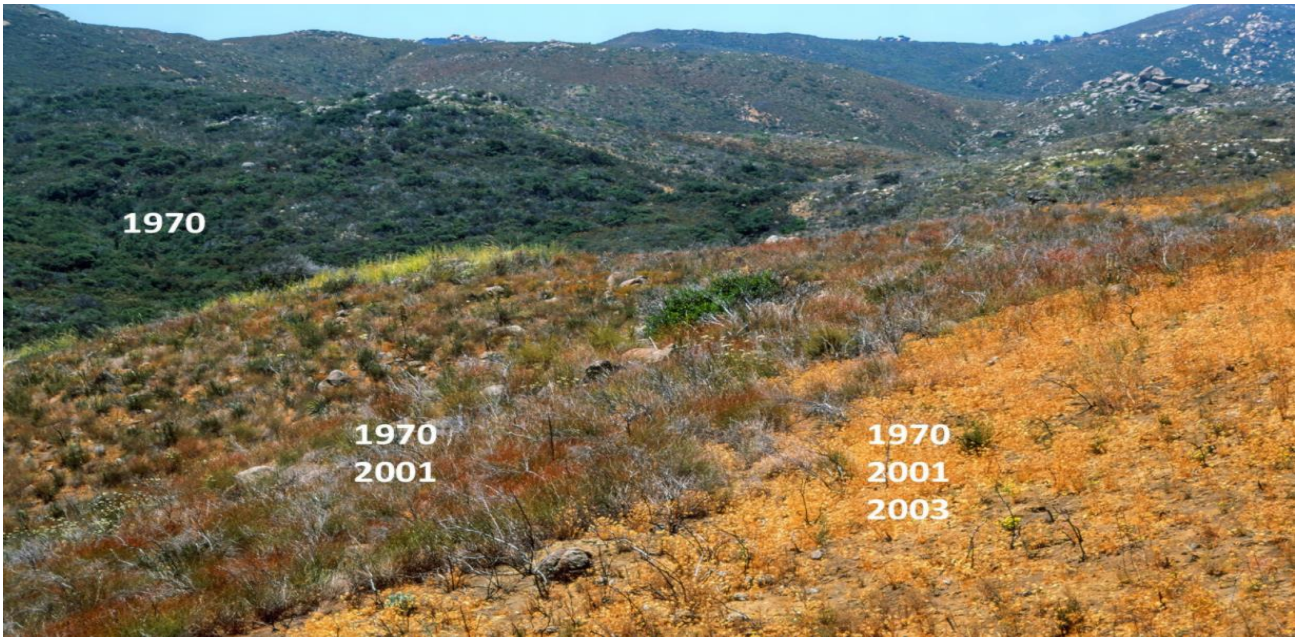

Figure 53. Frequent chaparral fires can replace chaparral with nonnative weeds through the process of type-conversion. California Chaparral Institute. https://www.californiachaparral.org/threats/too-much-fire/#:~:text=Type%20conversion%20is%20the%20ecological,to%20a%20non%2Dnative%20grassland.&text=Chaparral%20is%20not%20a%20simple%2C%20homogenous%20ecosystem.

Insufficient Support for Defensible Space Programs

- **Problem Global 5:** Current funding for SBCFD to annually inspect and enforce defensible space requirements but is unable to complete inspections on all of the approximately 14,000 properties that require defensible space maintenance.[151] Given recent fires, more prevention and suppression is needed now to allow for recovery of watersheds and vegetation.[152] Current funding supports insufficient staffing, equipment, and fire stations to most effectively prevent, respond to, and limit spread of all wildfires that threaten life, property, watersheds, fish, wildlife, habitat, and native plant communities such as chaparral. There has been a decrease in the use of inmates to fight fires, further reducing available resources to suppress wildfires, increasing the need for more hand crews.[153] SBCFD may not have sufficient funds to provide grants or incentives to property owners to conduct hardening of structures to reduce the risk associated with wildfire spread

[151] SBCFD has funding and staff to inspect approximately seventy-nine to ninety percent of the 14,000 properties that require defensible space maintenance. The County achieves "really good compliance" as demonstrated by "the low structure loss on the most recent fires." Increasing the number of inspections would be valuable to helping reduce wildfire threats. Email from Rob Hazard, Division Chief/Fire Marshall, Fire Prevention Division, SBCFD to Brian Trautwein, Environmental Analyst / Watershed Program Coordinator (April 8, 2021); *See also* Rob Hazard, SBCFD, phone call with Brian Trautwein, Environmental Analyst / Watershed Program Coordinator, EDC, (August 9, 2021).
[152] *Id*.
[153] *Id*.

to homes in WUIs. The County increased property tax funding from 13% and locked it in at 17%, and it is unlikely to change in the near future.[154] However, funding from CalFire could potentially be increased, which would help prevent and suppress wildland and WUI fires, augment hand crews, and fund operation of the County's new Blackhawk helicopter.[155]

- **Jurisdiction:** Santa Barbara County

- **Recommendation Global 5:** Support increased CalFire and grant funding for SBCFD to (1) hire dedicated staff to conduct defensible space inspections for all properties in the WUI and rural areas before the height of fire season, (2) increase resources, including money for hand crews to work fire lines, and to fund operation of Blackhawk helicopter, (3) implement a home-hardening program in rural and WUI areas, (4) work with landowners to acquire grants and/or low interest loans for WUI defensible space maintenance and home hardening projects, and (5) systematically remove invasive flammable nonnative vegetation such as eucalyptus and trees and Arundo stands in rural, wildland, and WUI areas, consistent with many of the recommendations in this report.

- **Community Benefits:** Recommendation Global 5A could reduce fire ignitions and fire spread into rural, wild, and WUI areas, protecting life and property, while simultaneously reducing the effects of fire and subsequent sedimentation, floods, and debris flows in the Mission Creek Watershed. Recommendation Global 5A would reduce impacts on water quality, air quality, vegetation communities, and fish and wildlife, including endangered species, and retain scenic vistas. By lessening the frequency and extent of wildfires and WUI fires, this recommendation could lessen economic impacts of fires in the Mission Creek Watershed, protecting homes, tourism-related businesses, property values, and jobs.

- **Next Steps:** Meet with SBCFD and partners to discuss strategies for increasing funding and wildfire preparedness. Meet with and lobby state legislators to seek increased CalFire and grant funding for the above purposes.

[154] *Id.*
[155] *Id.*

III. IMPLEMENTATION FUNDING AND PARTNERS

A. Funding Sources

Cachuma Resource Conservation District

The Cachuma Resource Conservation District works in partnership with the USDA Natural Resource Conservation Service, a branch of the federal government, and many other agencies, organizations, business, and landowners. One of our primary purposes is to support and promote economically viable and environmentally sustainable farming and ranching operations. We have a dedicated team of partners, staff, and professional experts available to assist the community. The CRCD is almost entirely self-supporting, relying on grants and fee-for-service work to fund operations. As a special district of the State, we can also accept private, tax-deductible donations. Our Office is located in the USDA Service Center in Santa Maria.

Mission

The mission of the Cachuma Resource Conservation District (CRCD) is to promote land ethics that results in long-term use of natural resources while protecting and enhancing its unique natural habitats. Founding principles include total resource management, effective technical services, diverse community partnerships, and strong grower relationships.

https://www.rcdsantabarbara.org/what-we-do

California Coastal Conservancy

The Conservancy funds projects that help it achieve the goals and objectives of its **Strategic Plan** (2018-2022). The goals are listed below; refer to the plan for additional detail on specific objectives. Projects that help achieve multiple objectives will receive higher priority for funding. The Conservancy will fund most stages of a project, including pre-project feasibility studies, property acquisition, planning (for large areas or specific sites) and design, environmental review, construction, monitoring, and, in limited circumstances, maintenance.

Strategic Plan Goals (partial list)

- Expand the system of coastal public accessways, open-space areas, parks, and inland trails that connect to the coast.
- Revitalize coastal and inland waterfronts that provide significant public benefits and promote sustainable economic development.
- Expand environmental education efforts to improve public understanding, use, and stewardship of coastal resources.
- Protect significant coastal resource properties, including farmland, rangeland, and forests.
- Enhance biological diversity, improve water quality, habitat, and other natural resources within coastal watersheds.
- Enhance coastal working lands, including farmland, rangeland, and forests.

- Enhance the resiliency of coastal communities and ecosystems to the impacts of climate change.
- Ensure that the work of the Conservancy promotes environmental equity and justice.

California Coastal Conservancy Grant Program
Grant Opportunity: Forest Health & Wildfire Resilience Program

https://scc.ca.gov/2021/04/14/grant-opportunity-forest-health-wildfire-resilience-program/

Intent: The Conservancy's Forest Health and Wildfire Resilience Program will fund approximately $12 million in grants for ready-to-implement projects that reduce the risk of wildfire on public and protected lands. There are no maximum or minimum grant amounts for this funding.

Eligible Applicants: Public Agencies, Nonprofit organizations with 501(c)(3) status, Federally Recognized Indian Tribes

Eligible Projects: The goal of these grants is to take immediate action to improve fire safety of California's communities and to restore the health and resilience of California forests, grasslands, and natural places. Proposed projects must be on public or protected lands. Planning projects are not eligible for this funding.

California Fire Safe Council

California Fire Safe Council administers U.S. Forest Service State Fire Assistance (SFA) Grant Programs and offers a variety of other federal and private funding opportunities.
https://cafiresafecouncil.org/grants-and-funding/apply-for-a-grant/

CAL FIRE Grant Program

CAL FIRE offers several grant opportunities, each with its own scope and funding priorities.

- Fire Prevention or Forest Health Grants: SharePoint User Guide
- Forest Health Grants: https://www.fire.ca.gov/grants/forest-health-grants/
- Urban and Community Forestry Grants: https://www.fire.ca.gov/grants/urban-and-community-forestry-grant-programs/
- Fire Prevention Grants: https://www.fire.ca.gov/grants/fire-prevention-grants/

California Fire Foundation

The California Fire Foundation offers grant opportunities to fire departments, firefighter associations, fire safe councils and other community organizations, which are based in California and serve our state's residents in preventing, preparing and/or responding to major events, including wildfires, floods, and climate-caused disasters.
https://www.cafirefoundation.org/programs/fireprevention/

California Ready-For-Wildfire

Many state and federal agencies have grant programs that administer funds for projects that help support their direct mission and the state of California's mission to reduce greenhouse gas emissions, improve public health and the environment.
https://www.readyforwildfire.org/prevent-wildfire/landowners-assistance/grants/

CDFW

CDFW plans to implement three new grant opportunities as passed by voters on Proposition 68 in 2018: The Rivers and Streams Grants, the Southern Steelhead Grants, and Fish and Wildlife Improvement Grants. The Rivers and Streams grant program will allocate funds for the restoration of rivers and streams. The Southern Steelhead grant program will allocate funds for the specific restoration of Southern California Steelhead habitat. The Fish and Wildlife Improvement grant program will allocate funds for the improvement of conditions for fish and wildlife in streams, rivers, wildlife refuges, wetland habitat areas, and estuaries. Each program is open to public agencies and local non-profit organizations. CDFW will award grants to planning, implementation and acquisition projects.

Proposition 68 Grant Guidelines:[156]
https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=161006&inline

CDFW also offers the annual Fisheries Restoration Grant Program, providing funds to projects that restore, enhance, or protect anadromous habitat in California. The program awards funds to projects under four focuses: Fisheries Restoration Grant Program, Steelhead Report and Restoration Card Program, Forest Land Anadromous Restoration, and Commercial Salmon Stamp Program. Priority will be given to projects that address the threats of climate change and wildfires. Public agencies and non-profit organizations are eligible to apply.
Website: https://www.wildlife.ca.gov/Grants/FRGP

California Department of Water Resources

Since 1985, the Urban Streams Restoration Program provided more than 270 grants in accordance with California Water Code Section 7048, ranging from $1,000 to $1 million to communities throughout California. This USRP table (PDF) lists all projects funded partially or completely by the Program from 1986 to 2016.

The projects have included:

- Stream cleanups
- Bank stabilization projects
- Revegetation efforts

[156] In addition to CDFW, several other state agencies disburse Proposition 68 funds.

- Recontouring of channels to improve floodplain function
- Occasional acquisition of strategic floodplain properties or easements

Visit the USRP's Grants Page to learn about the Program or contact us. Learn more about the current solicitation on the Riverine Stewardship Program – Grants webpage.

California Wildlife Conservation Board

The California Wildlife Conservation Board provides several grant opportunities, including the Riparian Habitat Conservation Program, the Habitat Enhancement and Restoration Program, and the Proposition 1 Stream Flow Enhancement Program. The Riparian Habitat Conservation Program aims to protect, preserve, restore, and enhance native riparian habitat in California. The Habitat Enhancement and Restoration Program is the Board's general restoration program. It includes funding for projects that remove fish passage barriers in streams. The Proposition 1 Stream Flow Enhancement Program provides funds to projects that protect enhanced stream flow especially in habitats of native, threatened fish species like steelhead. Each program is open to public agencies and non-profit organizations.

Riparian Habitat Conservation: https://wcb.ca.gov/Programs/Riparian
Habitat Enhancement and Restoration: https://wcb.ca.gov/Programs/Habitat-Enhancement
Prop 1 Stream Flow Enhancement: https://wcb.ca.gov/Programs/Stream-Flow-Enhancement

California Natural Resources Agency Department of Water Resources Division of Integrated Regional Water Management Implementation Grant

California State Proposition 1 recently allocated $510 million for the Integrated Regional Water Management ("IRWM") grant program. Approximately $400 million of this will fund the Implementation Grant Program. Statewide priority actions for this program include protecting and restoring important ecosystems, expanding water storage capacity, and improving groundwater management, and increasing flood protection. The IRWM grant program is open to public agencies and non-profits.

Website: https://water.ca.gov/Work-With-Us/Grants-And-Loans/IRWM-Grant-Programs/Proposition-1/Implementation-Grants

California River Parkways Program

Projects must involve natural creeks, streams and/or rivers, even if they flow only during the rainy season, or channelized or culverted creeks, streams and/or rivers.

Please direct questions to (916) 653-2812 or riverparkways@resources.ca.gov

Caltrans Environmental Enhancement and Mitigation Program

The Environmental Enhancement and Mitigation Program (EEM) was established by the Legislature in 1989 to fund environmental enhancement and mitigation projects directly or indirectly related to transportation projects. EEM Program projects must fall within one of three categories: highway landscape and urban forestry; resource lands; or roadside recreation. Projects funded under this program must provide environmental enhancement and mitigation over and above that otherwise called for under the California Environmental Quality Act (CEQA).

For questions refer to the FAQ or contact the agency at **eemcoordinator@resources.ca.gov** or by calling (916) 653-2812 or (916) 654-2940.

David and Lucile Packard Foundation Conservation and Science Grants

Traditional philanthropy and government funding have played a key role in conserving and restoring our rivers and streams. Ultimately, however, this funding has not been sufficient to combat the depletion of these valuable resources which has taken place over the past several decades. In fact, it is unlikely that such funding will ever be adequate, making it critical to begin looking for new ways to pay for river and stream restoration.
https://www.packard.org/grants-and-investments/for-grantseekers/

Environmental Protection Agency ("EPA") 5-Star Wetland and Urban Waters Restoration Grants

The Five Star and Urban Waters Restoration Program brings together students, conservation corps, other youth groups, citizen groups, corporations, landowners, and government agencies to provide environmental education and training through projects that restore wetlands and streams. The program provides challenge grants, technical support, and opportunities for information exchange to enable community-based restoration projects. Funding levels are modest, from $10,000 to $40,000, with $20,000 as the average amount awarded per project.

For more information on the Five Star and Urban Waters Restoration Grant Program, see the National Fish and Wildlife Foundation webpage and the Five Star Restoration Factsheet.

EPA Wetland Program Development Grants

Wetland Program Development Grants ("WPDGs") assist state, tribal, local government agencies, and interstate/intertribal entities in developing or refining state/tribal/local programs which protect, manage, and restore wetlands. The primary focus of these grants is to develop and refine state and tribal wetland programs. A secondary focus is to develop and refine local (e.g., county or municipal) programs. Projects must be performed within one or more of the states of EPA Region 9 -- specifically California, Hawaii, Nevada, Arizona, and the Pacific Islands -- to

be eligible to apply for funding. In the case of inter-jurisdictional watershed projects, they must be primarily implemented in EPA Region 9. This document describes the grant selection and award process for eligible applicants interested in applying for WPDGs under this announcement:
https://www.epa.gov/wetlands/region-9-wetland-program-development-grant-request-applications

FEMA

FEMA's Pre-Disaster Mitigation Grant Program provides funding to support hazard mitigation programs in local communities. Funding is awarded to planning and project proposals that aim to increase awareness of potential disasters like floods as well as develop a Hazard Mitigation Plan for future disasters.

FEMA's Flood Mitigation Assistance Grant Program awards grants to planning and project proposals that aim to reduce long-term flood damage risks in communities. Public agencies are eligible to apply.

Pre-Disaster Mitigation Grant Program: https://www.fema.gov/pre-disaster-mitigation-grant-program
Flood Mitigation Assistance Grant Program: https://www.fema.gov/flood-mitigation-assistance-grant-program#

Fire Safe California Grants Clearinghouse

The Fire Safe California Grants Clearinghouse (AKA Grants Clearinghouse) was created by the members of the California Fire Alliance (now called preventwildfireca.org) in order to facilitate the process of applying for Federal grants to do wildfire prevention projects on private lands in California. This process is also referred to as "one-stop shopping."
https://en.wikipedia.org/wiki/Fire_Safe_California_Grants_Clearinghouse

FishAmerica Foundation

Since 1983, the FishAmerica Foundation has awarded $12.1 million to 1,007 projects in all fifty states and Canada to enhance fish populations, restore fishery habitats, improve water quality, and advance fishery research to improve sportfishing opportunities and help ensure recreational fishing's future.

The FishAmerica Foundation has had tremendous success in leveraging a myriad of funding sources to support nationwide fisheries conservation and habitat restoration projects, especially grant dollars.

With each dollar being leveraged nearly nine times, the foundation demonstrates its important role in collaborating with community-based conservation organizations, along with state and federal biologists, to help improve recreational fishing and boating opportunities. Additionally, the FishAmerica Foundation involves and educates community volunteers on the conservation and recreational benefits for each project awarded funding. Over the years, the foundation, along with its federal, regional, state and community partners, have made great strides in both small and large, urban, and rural communities to improve habitat for fisheries conservation, creating more recreational fishing opportunities along the way.
For grants information or partnership opportunities, contact fafgrants@asafishing.org or (703) 519-9691.

Montecito Fire Department

During a wildfire, most homes burn from the inside out. This means embers make their way into the home through vents and other crevices and ignite combustible material inside the home and attic. The Montecito Fire Department and our partnering agencies stand ready to quickly respond to fires, but recent events have reinforced the importance of implementing as many wildfire mitigations as possible before an incident occurs. During post fire assessments, hardened structures proved to have over three times the likelihood of surviving compared to non-hardened structures. Watch this video demonstrating windblown embers to see how homes ignite during a wildfire.

In 2019, the Montecito Fire Department amended the Community Wildfire Protection Plan to include recommendations considering lessons learned from the 2017 and 2018 fire seasons. Two of these recommendations relate directly to structure hardening:

- Seek innovative structure hardening programs and methods to enhance structure defensibility.
- Consider seeking opportunities to develop a cost-share grant program to share the costs of structure hardening or replacing flammable vegetation with more fire-resistant vegetation.

To meet these recommendations, the Montecito Fire Department set aside funds from the 2021 Fire Defense Zone Budget to initiate a Home Hardening Assistance Program (HHAP). This year's HHAP will focus on vent replacement and upgrades. Ordinary vents are designed for ventilation through a simple mesh screen. This design allows flames, sparks, and embers to pass through the vent and enter the home. Vents designed specifically for homes in very high wildfire danger areas will offer protection against flames and embers while still providing adequate ventilation.

To learn more about the Vent Retrofit Program, including how to apply, visit the programs webpage at https://www.montecitofire.com/hhap-vent-retrofit . Please contact one of our Wildland Fire Specialists, Maeve Juarez or Nic Elmquist at (805) 969-7762, if you have any questions or to schedule a complimentary property survey.

https://www.montecitofire.com/hhap-vent-retrofit

National Fish and Wildlife Foundation ("NFWF")

NFWF provides funding on a competitive basis to projects that sustain, restore, and enhance our nation's fish, wildlife, and plants and their habitats.

As an example, NFWF's "Bring Back the Natives" Program provides funding to efforts to "restore, protect and enhance native populations of sensitive or listed fish species across the United States." Partners include the U.S. Fish and Wildlife Service, the Bureau of Land Management, the USFS, Bass Pro Shops, and the Brunswick Foundation. Priority funding may be given to native steelhead populations. The program funds activities such as the removal of passage barriers and riparian habitat restoration. Public agencies and non-profit organizations are eligible to apply.

Search NFWF's conservation programs and learn how to apply for a grant.

National Oceanic and Atmospheric Association Community-based Restoration Program Coastal and Marine Habitat Restoration Grants

During Habitat Month, NOAA is recommending $8.2 million in funding to fifteen partners through the Community-based Restoration Program Coastal and Marine Habitat Restoration Grants. These investments will restore habitat in ten states and Puerto Rico and leverage a total of $13 million of non-federal funds over the next three years to maximize the impact and lead to lasting results for communities, the economy, and the environment.

For more information see: https://www.fisheries.noaa.gov/feature-story/noaa-announces-funding-sixteen-coastal-and-marine-habitat-restoration-projects

Natural Resources Conservation Service

NRCS offers voluntary programs to eligible landowners and agricultural producers to provide financial and technical assistance to help manage natural resources in a sustainable manner. Through these programs the agency approves contracts to provide financial assistance to help plan and implement conservation practices that address natural resource concerns or opportunities to help save energy, improve soil, water, plant, air, animal and related resources on agricultural lands and non-industrial private forest land.
https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/

Santa Barbara County Fish and Game Commission

The Santa Barbara County Fish and Game Commission awards grants funded by code violations in Santa Barbara County to be utilized "for the protection, conservation, propagation,

preservation, or education as they pertain to fish and wildlife." Non-profit organizations are eligible to apply. Grants awarded are typically less than $2,000.

Grant Guidelines and Application:
http://www.sbcountyplanning.org/pdf/boards/fish_game/SBCFG%20grant%20application%20Final.pdf

Natural Resources Conservation Service

NRCS provides America's farmers and ranchers with financial and technical assistance to voluntarily put conservation on the ground, not only helping the environment but agricultural operations too.

- NRCS
  https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/about/
  - Environmental Quality Incentives Program
  https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/eqip/
  - Conservation Programs
  https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/
  - Wetland Reserve Program
  https://www.nrcs.usda.gov/wps/portal/nrcs/detail/null/?cid=nrcs143_008419

Santa Barbara County Coastal Resource Enhancement Fund

Santa Barbara County has awarded 297 grants for a total of approximately $22.4 million from its Coastal Resource Enhancement Fund ("CREF"). The County established CREF in 1987 to help mitigate significant impacts of offshore oil and gas development to coastal aesthetics, coastal recreation, coastal tourism, and environmentally sensitive coastal resources. In effect, the County awards grants from CREF to enhance these specific coastal resources pursuant to the Board-approved CREF Guidelines. A description of these and other grants can be found in the annual CREF Status Report.

Santa Barbara County Fish and Game Commission

https://www.countyofsb.org/uploadedFiles/plndev/Content/Hearing_Bodies/SBCFG%20grant%20application%20Final.pdf

As determined by the Fish and Game Code of the State of California, all fines, monies derived from code violations shall be equally divided between the Department of Fish and Game and the county in which the violation occurred. The Santa Barbara County Fish and Game Commission (SBCFGC) is charged with recommending expenditures of fine revenues to the Santa Barbara County Board of Supervisors. State law requires that grants of such monies must be utilized for the protection, conservation, propagation, preservation, or education as they pertain to fish and wildlife. Non-profit organizations with an IRS 501 (c) (3) tax-exempt status or purpose consistent with the definition of 501 (c) (3) status are eligible to apply. A proposed

project or program must clearly qualify for funding under section 13103 of the California Fish and Game Code - (Please Refer to Attachment A). Projects funded under this Section must be expended for the protection, conservation, propagation, preservation, or education pertaining to fish and wildlife within or outside the County.

Santa Barbara Foundation

Conservation, Environment, and Public Trails Grant Program

The Santa Barbara Foundation is excited to announce the creation of the Conservation, Environment, and Public Trails Grant Program made possible by the Hollis Norris Fund for Conservation, Environment, and Public Trails. This grant program will support conservation, environment, and public trails projects across Santa Barbara County, with a preference given to those on the South Coast of Santa Barbara County from Point Conception to the Ventura County line and the Santa Ynez Valley. Grant amounts: up to $25,000.
https://www.sbfoundation.org/nonprofits/grant-opportunities/

State Wildlife Grant Program

The California State Wildlife Grant Program provides Federal grant funds to State fish and wildlife agencies for developing and implementing programs that benefit wildlife and their habitats, including species that are not hunted or fished.

Grant funds may be used to address a variety of conservation needs--such as research, fish and wildlife surveys, species restoration, habitat management, and monitoring—that are identified within a **State's Wildlife Action Plan**. These funds may also be used to update, revise, or modify a State's Plan.

Learn about State Wildlife Grant Program **accomplishments**.
See more information here: https://wsfrprograms.fws.gov/subpages/grantprograms/swg/swg.htm

Local Taxes

Sales Tax can be earmarked for specific projects. A sales tax has the benefit of being voter approved. Voters understand that the increase in sales tax is going toward enhancing their local communities.

UCSB Coastal Fund

The Coastal Fund ("CF") is a student initiative dedicated to the conservation of the UCSB coastline. The student body recognizes that the coast is at the heart of the campus' culture and character and must be protected. In response, each undergraduate student contributes $5.75 per quarter, and each graduate student $3.00 per quarter, into a fund that provides over $350,000 each year to protect and enhance our coastline. Since Fall of 1999, CF has allocated over $3

million to countless local projects or programs. CF accepts proposals during three funding cycles throughout the year (one per academic quarter) and critically reviews them for consistency to the CF Mission Statement vision and principals, relevance to the student community, adherence to UCSB and Regental policy and benefit to the UCSB shoreline. Applicants present their proposals at regular meetings, which gives Board Members opportunities to ask specific questions to each applicant and learn about the project in detail. The proposals are denied, funded entirely, or modified as needed.
https://coastalfund.as.ucsb.edu/

UC Cooperative Extension

UC's 64 Cooperative Extension offices are local problem-solving centers. More than four hundred campus-based specialists and county-based farm, home, and youth advisors work as teams to bring the University's research-based information to Californians. CE is a full partnership of federal, state, county, and private resources linked in applied research and educational outreach. CE tailors its programs to meet local needs. CE's many teaching tools include meetings, conferences, workshops, demonstrations, field days, video programs, newsletters, and manuals. Thousands of volunteers extend CE's outreach, assisting with the 4-H youth development and Master Gardener education programs.

http://cesantabarbara.ucanr.edu/

Urban Greening Program

The Urban Greening Program funds projects that reduce greenhouse gases by sequestering carbon, decreasing energy consumption, and reducing vehicle miles traveled, while also transforming the built environment into places that are more sustainable, enjoyable, and effective in creating healthy and vibrant communities. These projects will establish and enhance parks and open space, using natural solutions to improve air and water quality and reduce energy consumption, and create more walkable and bike-able trails.

In order to quantify GHG emission reductions, projects must include at least one of the following project activities:

- Sequester and store carbon by planting trees
- Reduce building energy use by strategically planting trees to shade buildings
- Reduce commute vehicle miles traveled by constructing bicycle paths, bicycle lanes or pedestrian facilities that provide safe routes for travel between residences, workplaces, commercial centers, and schools.

US Endowment for Forestry and Communities

The Healthy Watersheds Consortium is a partnership between the US Endowment for Forestry and Communities, the Environmental Protection Agency, and the USDA Natural

Resources Conservation Service. Their grant program aims to protect land within watersheds from deterioration, and awards grants in three categories: watershed action projects, building watershed protection capacity, and advancing the state of practice. The emphasis is on long-term watershed protection through the development of programs and procedures rather than short-term restoration or research. Non-profit organizations and public agencies are eligible to apply.

Website: http://www.usendowment.org/rfps/healthywatersheds.html
2019 Request for Proposals:
http://www.usendowment.org/images/HWC_RFP_Yr_4_2019_7.18.2018.pdf

Unites States Department of Agriculture

The US Department of Agriculture annually funds the Watershed Protection and Flood Prevention Program, providing financial assistance to local governments in the protection of their watersheds. The program aims to address issues like water quality, erosion, flood control, habitat restoration, etc. A watershed plan must be created and approved to access grant funding. The program requires that at least 20% of the total benefits of the plan must directly relate to and benefit agriculture in the region.

Watershed Protection and Flood Prevention Operations Program:
https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/landscape/wfpo/

United States Fish and Wildlife Service

The United States Fish and Wildlife Service administers a wide variety of financial assistance through programs that are authorized by Congress and address the Service's mission. The U.S. Fish and Wildlife Service (Service) issues financial assistance through grants and cooperative agreement awards to commercial organizations, foreign entities, Native American tribal governments, individuals, institutions of higher education, non-profit organizations, and state and local governments.
https://www.fws.gov/grants/programs.html
For questions related to Service financial assistance policy and oversight, contact us at fwsgrants@fws.gov

- National Coastal Wetland Conservation Grant Program: https://www.fws.gov/coastal/pdfs/NCWCGP-Factsheet-2019-12-10-508-compliant.pdf
- Endangered Species Grants: https://www.fws.gov/endangered/grants/index.html
- North American Wetlands Conservation Act Grants: https://www.fws.gov/birds/grants/north-american-wetland-conservation-act.php
- Partners for Fish and Wildlife: https://www.fws.gov/grants/programs.html

B. Potential Cooperating Partners

- Audubon Society
- Cachuma Operations and Maintenance Board
- Cachuma Resource Conservation District
- California Coastal Conservancy
- California Conservation Corps
- California Department of Fish and Wildlife
- Caltrans
- CalTrout
- Channel Islands Restoration
- Cheadle Center for Biodiversity and Ecological Restoration
- Federal Emergency Management Agency
- Friends of Mission Creek
- Landowners
- Mission Canyon Association
- National Marine Fisheries Service
- Private Businesses
- Santa Barbara Botanic Garden
- Santa Barbara Channelkeeper
- Santa Barbara City Airport
- Santa Barbara City Fire Department
- Santa Barbara County Fire Department
- Santa Barbara City Creeks Restoration and Water Quality Improvement Division
- Santa Barbara County Flood Control and Water Conservation District
- Santa Barbara County Project Clean Water
- Santa Barbara County Public Works Department
- Santa Barbara County Transportation Division
- Santa Barbara Museum of Natural History
- Santa Barbara Unified School District
- Sierra Club
- South Coast Habitat Restoration
- Surfrider Foundation
- The Goodland Coalition
- UCSB
- Union Pacific Railroad
- US Bureau of Reclamation
- United States Fish and Wildlife Service
- University of California Cooperative Extension
- Urban Creeks Council

Appendix I

Acronyms

Cachuma Resource Conservation District	CRCD
Channel Islands Restoration	CIR
Mission Canyon Association	MCA
Friends of Mission Canyon	FOMC
Santa Barbara County Flood Control and Water Conservation District	SBCFCWCD
Santa Barbara County Fire Department	SBCFD
Santa Barbara County Weed Management Area	SBCWMA
University of California Cooperative Extension	UC Coop
Urban Creeks Council	UCC

Appendix II

References

- AghaKouchak, Amir, Elisa Ragno, Charlotte Love, Hamed Moftakhari, *Projected Changes in California's Precipitation Intensity-Duration-Frequency Curves* https://www.energy.ca.gov/sites/default/files/2019-11/CCCA4-CEC-2018-005_ADA.pdf August 2018.
- Belnap, Jayne, *Genetic Integrity: Why Do We Care? An Overview of the Issues* https://www.fs.fed.us/rm/pubs/int_gtr315/5_belnap.pdf December 26, 2021.
- Bernstein, Robert, Santa Barbara EdHat, *Painted Cave Fire 30th Anniversary* https://www.edhat.com/news/painted-cave-fire-30th-anniversary June 27, 2020.
- Bixby, Rebecca J., Scott D. Cooper, Robert E. Gresswell, Lee E. Brown, Clifford N. Dahm, and Kathleen A. Dwire, *Fire Effects on Aquatic Ecosystems: An Assessment of the Current State of the Science*, Freshwater Science, The Society for Freshwater, https://www.fs.fed.us/rm/pubs_journals/2015/rmrs_2015_bixby_r001.pdf September 2015.
- Borunda, Alejandra, *The Science Connecting Wildfires to Climate Change*, National Geographic available at https://www.nationalgeographic.com/science/article/climate-change-increases-risk-fires-western-us September 17, 2020.
- CalFlora Website
- California Chaparral Institute, *Type Conversion – The Impact of Excessive Fire* Webpage https://www.californiachaparral.org/threats/too-much-fire/ December 19, 2021.
- California Department of Fish and Wildlife. Notice of Violation to Edison. 2020.
- California Invasive Plant Council, *Arundo donax* Webpage https://www.cal-ipc.org/plants/profile/arundo-donax-profile/ February 19, 2021.
- California State Water Resources Control Board, *A Proposed Framework for Regulating Direct Potable Reuse in California* https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/direct_potable_reuse/dprframewk.pdf 2018.
- Capelli, Mark, South-Central / Southern California Steelhead Recovery Coordinator, NMFS Memo to File Re: *Maria Ygnacio O. mykiss Mortalities, Jesusita Fire, Santa Barbara.* May 15, 2009.
- Central Coast Regional Water Quality Control Board, Notice of Violation to Edison. 2020.
- City of Goleta, *Creek and Watershed Management Plan*, November, 2020.
- City of Santa Barbara, *Groundwater* Webpage https://www.santabarbaraca.gov/gov/depts/pw/resources/system/sources/groundwater.asp December 19, 2021.
- City of Santa Barbara, *Mission Tunnel* Webpage https://www.santabarbaraca.gov/gov/depts/pw/resources/system/sources/misstunnel.asp December 14, 2021.
- Climate Reality Project. 2016.
- Council for Watershed Health, *Arundo donax Eradication in the LA River Watershed* Webpage https://www.watershedhealth.org/arundo December 20, 2021.

- Dale, Judith, *Wildfires in Santa Barbara County, 2008 to 2015* https://lompocrecord.com/lifestyles/columnist/judith-dale-wildfires-in-santa-barbara-county-2008-to-2015/article_c082070f-7f7a-5a87-b8ff-ceb4357c21e5.html October 24, 2020.
- Earth Observatory Webpage https://earthobservatory.nasa.gov/images/91573/deadly-debris-flows-in-montecito March 29, 2021.
- EdHat Staff, *Brush Fire at Homeless Camp in Goleta* https://www.edhat.com/news/brush-fire-at-homeless-camp-in-goleta December 20, 2020.
- EdHat Staff. *Fallen Tree Sparks Small Fire in Montecito* https://www.edhat.com/news/fallen-tree-sparks-small-fire-in-montecito December 17, 2021.
- EdHat Staff, *Inspecting the Mission Tunnel*, Video https://www.edhat.com/news/inspecting-the-historic-mission-tunnel February 26, 2019.
- EdHat Staff, *Multiple Brush Fires Near Homeless Camp on Highway 101 in Goleta* https://www.edhat.com/news/multiple-brush-fires-near-homeless-camp-on-highway-101-in-goleta November 27, 2020.
- Environmental Defense Center Website. December 19, 2021.
- Friends of Mission Canyon, Letter from Marc Chytilo, Law Office of Marc Chytilo, to Larry Ferini, Chair, Santa Barbara County Planning Commission re *Appeal of Southern California Edison's "Santa Barbara – Goleta Access Road Maintenance Project," 20LUP-00000-00165* (October 7, 2021).
- Gomez, Moe, Director, South Coast Habitat Restoration, personal communication with Brian Trautwein, Environmental Analyst / Watershed Program Coordinator, EDC. 2008.
- Hazard, Rob, Division Chief/ Fire Marshal, Fire Prevention Division, Santa Barbara County Fire Department. October 5, 2021.
- Keller, Dr. Edward A, Professor, Earth Surface Processes and Environmental Geology, Department of Geological Sciences, UCSB, *Land of Dynamic Beauty*. 2011.
- Klose, Kristi, PhD, BAER Team Fisheries Biologist, LPNF, Casey Horgan, Michael Morales, Kyle Evans, Sam Bankston, Teagan Partin, and Katie Carmody, Pacific States Marine Fisheries Commission and California Department of Fish and Wildlife, *Assessment of Steelhead Habitat and Migration Barriers within Watersheds Impacted by the Thomas, Whitter, and Topanga Wildfires.* September 10, 2019.
- La Jolla Light, *Listing of Good and Bad Plants for Southern California* https://www.lajollalight.com/sdljl-listing-of-good-and-bad-plants-for-southern-calif-2008aug06-story.html August 6, 2008.
- Leonard, Diana, *Snow may vanish for years at a time in Mountain West with climate warming*, The Washington Post https://www.washingtonpost.com/weather/2021/12/03/snow-water-resources-california/ December 3, 2021.
- Lociaga, Hugo, PhD, Hydrologist, Geography Department, UCSB. Personal communication with Brian Trautwein, Environmental Analyst/Watershed Program Coordinator, Environmental Defense Center. 2021.
- Loomis, John B. and Carol F. Steiner, *Estimating the Benefits of Urban Stream Restoration Using the Hedonic Method* 1996.

- Maya Jarrad, *et al*. *Urban Stream Restoration Projects: Do Project Phase, Distance, and Type Affect Nearby Property Sale Prices?* Land Economics • 94 (3): 368–385 ISSN 0023-7639; E-ISSN 1543-8325 August 2018.
- Mann, Michael E., *Climate change and California drought in the 21st century*, Proceedings of the national Academy of Sciences of the United States of America https://www.pnas.org/content/112/13/3858 March 31, 2015.
- Mart, Greta, KCBX, *Thomas Fire scars still pose risk, one year later* https://www.kcbx.org/post/thomas-fire-scars-still-pose-risk-one-year-later#stream/0 December 4, 2018.
- McFadden, Michael C., Keith G. Polinoski, and Peter Martin, *Measurement of Streamflow Gains and Losses on Mission Creek at Santa Barbara, California, July and September 1987*, U.S. Geological Survey, Water Resources Investigations Report 91-4002. 1991.
- McGoogan, Matthew, Fisheries Biologist, NMFS, Email to Rebecca Bjork, Water Supply Manager, City of Santa Barbara re *Mission Creek Flows*. August 31, 2010.
- Minsky, Dave, *Alisal fire containment reaches 41%; 3 residences destroyed*, Lompoc Record https://lompocrecord.com/news/local/alisal-fire-containment-reaches-41-3-residences-destroyed/article_4c68be9e-4552-598f-aff5-72ec472ac9b7.html October 16, 2021.
- Mission Canyon Association, *Appeal of 20LUP00000-00165* (October 7, 2021).
- Montecito Fire Protection District, *Tea Fire Sparked 13 Years Ago* https://www.edhat.com/news/tea-fire-sparked-13-years-ago November 13, 2021.
- Montecito Water District, *Montecito Water and Sanitary Districts Team Up*, EdHat, https://www.edhat.com/news/montecito-water-and-sanitary-districts-team-up October 16, 2021.
- National Marine Fisheries Service, *Biological Opinion for Flood Control Operations including Annal Stream Maintenance, Debris Basin Maintenance, Goleta Slough Dredging and Long-term Atascadero Creek Channel Maintenance permitted by the US Army Corps of Engineers, and implemented by the Santa Barbara County Flood Control District in designated waters occurring within*. March 11, 2014.
- Nelson, Jason, Undergraduate Student, *UCSB Environmental Studies Report*. 1993.
- Nova Scotia Salmon Association, *Fish Habitat Restoration Methods Concept Specification Deflectors* http://adoptastream.ca/sites/default/files/Deflectors%202014.pdf December 19, 2021.
- Pacific Watershed Associates, letter from Thomas H. Leroy, Certified Engineering Geologist #2593 to Marc Chytilo, Law Office of Marc Chytilo (October 6, 2021).
- Partnership for Resilient Communities Website https://www.partnershipsb.org/net-project October 19, 2021.
- Pena-Guerrero, A. Nauditt, C. Munoz-Robles, L. Ribbe, and F. Meza, *Drought impacts on water quality and potential implications for agricultural production in the Maipo River Basin, Central Chile* https://www.tandfonline.com/doi/full/10.1080/02626667.2020.1711911 February 21, 2020.
- Pierre-Louis, Kendra, and Nadja Popovich, *Climate Change Is Fueling Wildfires Nationwide, New Report Warns*, New York Times

https://www.nytimes.com/interactive/2018/11/27/climate/wildfire-global-warming.html November 27, 2018.

- Ren, S. , D. A. White, D. XiangT. M., Short, W. Xiao, J. Chen, *Simple model of evapotranspiration by Eucalyptus plantations for data poor areas and tested using water balance data from a small catchment in Guangxi, China* https://www.tandfonline.com/doi/full/10.1080/00049158.2018.1555733 February 5, 2019.
- Salix. *Live Willow Revetment* Webpage, https://www.salixrw.com/product/live-willow-revetments/ December 15, 2021.
- Santa Barbara County Planning and Development Department, *Environmental Thresholds and Guidelines Manual Groundwater Resources Section* http://santabarbaracounty.ca.gov/ceo/asset.c/479 2008.
- Santa Barbara County Planning and Development Department, *Comprehensive Plan, Conservation Element – Oak Tree Protection in the Inland Rural Areas of Santa Barbara County* https://cosantabarbara.app.box.com/s/eby129a068jv1tjlzijcbnhjysiqybtz May 2009).
- Santa Barbara County, *Sherpa Fire Information and Updates* https://www.countyofsb.org/scherpa-fire.sbc Updated July 12, 2016.
- Santa Barbara County, *Mission Canyon Community Wildfire Protection Plan* https://cosantabarbara.app.box.com/s/j6isog79h1lh2vupl2u5fw7zpjwd6gmd July 15, 2011.
- Santa Barbara County Sustainability Division Staff, *Climate Action Plan Workshop* March 25, 2021.
- Santa Barbara County, *Mission Canyon Community Plan* available at https://cosantabarbara.app.box.com/s/128fmpp888vii7psxsosvzuph4jfx1uc April 2014.
- Spina, Anthony, P., Supervisor, Steelhead Regulatory Team, National Marine Fisheries Service, Letter to Cameron Benson, Manager, Santa Barbara City Creeks Restoration and Water Quality Improvement Division, City of Santa Barbara. October 20, 2009.
- Santa Barbara County Planning and Development Department Notice of Violation to Edison. 2020.
- Swain, Daniel, *Weather West, Modest April Showers, but Worsening Drought Continues*, EdHat https://www.edhat.com/news/weather-west-modest-april-showers-but-worsening-drought-continues?qt-right_side_tab=2 April 24, 2021.
- Syphard, Alexandra D., Teresa J. Brennan, and Jon E. Keeley, *Extent and drivers of vegetation type conversion in Southern California chaparral* https://esajournals.onlinelibrary.wiley.com/doi/full/10.1002/ecs2.2796 July 2019.
- Taylor, Lisa H., *Flammable Plants to Avoid Having in your Garden*. 2020.
- Thompkins, Walker, *History of Mission Canyon* (Undated).
- Torregrosa, Alicia, Lorraine E. Flint, Alan L. Flint, *Hydrologic Resilience from Summertime Fog and Recharge: A Case Study for Coho Salmon Recovery Planning* https://onlinelibrary.wiley.com/doi/full/10.1111/1752-1688.12811 November 20, 2019.

- Trouet, Valerie, Associate Professor, University of Arizona, *Study says California drought is worst in 500 years* https://www.tradeonlytoday.com/industry-news/study-says-california-drought-is-worst-in-500-years July 28, 2017.
- United States Army Corps of Engineers, Notice of Violation of Clean Water Act to Edison. 2020.
- United States EPA, *Climate Change Indicators: Wildfires* Webpage https://www.epa.gov/climate-indicators/climate-change-indicators-wildfires October 18, 2021.
- United States Forest Service, *Nonnative Invasive Plant Species – Problem and Solution* Webpage https://www.fs.usda.gov/detail/r8/forest-grasslandhealth/invasivespecies/?cid=stelprdb5326137 December 19, 2021.
- United States Geological Survey, *Cone of depressions* webpage https://www.usgs.gov/media/images/cone-depression-pumping-a-well-can-cause-water-level-lowering January 21, 2021.
- United States Geological Survey, *Groundwater Decline and Depletion* Webpage https://www.usgs.gov/special-topic/water-science-school/science/groundwater-decline-and-depletion?qt-science_center_objects=0#qt-science_center_objects March 29, 2021.
- United States Geological Survey, *Santa Barbara Quad Topo Map*.
- University of California Cooperative Extension, *Climate, Fire, and Habitat in Southern California* Website *https://ucanr.edu/sites/SAFELandscapes/Fire_in_Southern_California_Ecosystems/* February 21, 2021.
- University of Merced Newsroom, *Scientists Explain Mechanisms Affecting Runoff Levels During Drought* https://news.ucmerced.edu/news/2018/scientists-explain-mechanisms-affecting-runoff-levels-during-drought April 7, 2021.
- Walton, Bryan, Lompoc Record, *$17 million Zaca Fire costs repaid* https://lompocrecord.com/news/local/million-zaca-fire-costs-repaid/article_42dde75a-0ff6-11e1-80a3-001cc4c002e0.html#:~:text=The%20Zaca%20Fire%20burned%20228%2C000,in%20Santa%20Barbara%20County%20history. November 15, 2011.
- Washington Post. *2°C: Beyond the Limit: Fires, floods and free parking: California's unending fight against climate change* https://www.washingtonpost.com/graphics/2019/national/climate-environment/climate-change-california/ December 5, 2019.
- Weiss, Nancy, Vice President, Mission Canyon Association, Personal Communication with Natalie Blackwelder, Watershed Program Intern, EDC and Brian Trautwein, Environmental Analyst / Watershed Program Coordinator, EDC. October 26, 2021.
- Welsh, Nick, *Santa Barbara County's 10-Year Rainfall Average at 'All-Time Low'*, Santa Barbara Independent https://www.independent.com/2021/04/08/santa-barbara-countys-10-year-rainfall-average-at-all-time-low/ April 8, 2021.

- Western Monarch Count, *Find an Overwintering Site* Webpage available at https://www.westernmonarchcount.org/find-an-overwintering-site-near-you/ December 17, 2021.
- Wikipedia, *Painted Cave Fire*, https://en.wikipedia.org/wiki/Painted_Cave_Fire March 28, 2021.
- Wikipedia, *Thomas Fire*, https://en.wikipedia.org/wiki/Thomas_Fire#:~:text=It%20burned%20approximately%20281%2C893%20acres,California%20history%20at%20the%20time.&text=By%20January%202%2C%202018%2C%20the,over%20104%2C607%20residents%20to%20evacuate April 7, 2021.
- Williams, A. P., Abatzoglou, J. T., Gershunov, A., Guzman-Morales, J., Bishop, D. A., Balch, J. K., & Lettenmaier, D. P. *Observed impacts of anthropogenic climate change on wildfire in California.* Earth's Future, 7, 892– 910. https://doi.org/10.1029/2019EF001210 2019.
- Steve Windhager, Ph.D., Executive Director, Santa Barbara Botanic Gardens
- Yamamura, Jean, Santa Barbara Independent, *Homeless Camps and Fires a Challenge for Goleta During COVID* https://www.independent.com/2020/07/17/homeless-camps-and-fires-a-challenge-for-goleta-during-covid/ July 17, 2020.