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Introduction

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As I write this Introduction to the *Fish and Wildlife Journal*'s Special Issue on Wildland Fire, fire fighters are battling 22 wildfires across the State, five of the top ten largest wildfires (e.g., August, SCU Lightning, LNU Lightning, and North complexes and the Creek Fire) have already occurred this year, and over four million acres have burned. To put the last fact into perspective, the previous top acreage burned in a single wildlife season was just over 1.7 million acres. Additionally, you should know that 17 of the State's 20 largest wildfires have occurred since 2000, and since 2017, 151 Californians have lost their lives in wildfires. Eighty-five people perished in the 2018 Camp Fire alone.

Wildland fires are burning across the western United States in 2020. It is not the first time, but the scale of wildfires, along with the until-recently inconceivable destruction of property, human communities, and human lives, have gotten the attention of the entire nation. And the entire community of fire scientists and fire ecologists.

California may have the greatest range and variation in wildfire behavior, regime, and effects. Most of the State's ecological regions, including oak woodlands, conifer forests, chaparral, and native grass communities are adapted to wildfire. Their very existence and functioning depends on particular attributes of wildfire, often referred to as fire regime. Hundreds of plant species, including those that are key to ecological health (i.e., *Arctostaphylos* ssp., *Ceanothus* spp., *Quercus* spp., *Pinus* spp.) are adapted and dependent on wildfire. Many of the State's rare and endemic species co-exist with wildfire.

Where plants and plant communities go, animals follow. Though animals are not adapted to fire, they do have effective mechanisms to respond to fire. Some animals, included species of birds, rodents, and beetles, prosper for various periods of time only after wildfires occur.

Ecologically, wildfire may be the second in importance only to water in California. Without fire or with greatly altered fire regimes, native plant and animal communities are greatly impacted. Then again, wildfire is an ever-growing concern and impact not only to public lands and wildlife but human communities. The current trajectory of trends in extreme wildfire behavior and larger wildfires has been expected by the fire-fighting community, fire scientists, and fire ecologists. And as our climate continues to change, the future is one of great concern and uncertainty.

This Special Issue is particularly impressive, for several reasons. You will be exposed to 1) the wide range of land management (e.g., water quality, vegetation condition, fire breaks), ecological processes (i.e., post-fire sediment transfer), and biological issues (i.e., effects to native animals, response of native plants) entwined with wildfire, and 2) the wide range of authorship (i.e., forestry, private consultants, environmental organizations, transportation, fire and fuel management, universities and colleges, state and out-of-state field scientists), representing the vast of array of folks involved in wildfire in California. Please read the entire issue. Only then can you begin to understand the complexities of wildfire in California.

I would be remiss not to direct you to other amazing resources addressing wildfire science and management, including the California Fire Science Consortium, http://www.cafiresci.org/, the California Fire Safe Council, https://cafiresafecouncil.org/, the California Department of Forestry and Fire Protection, https://www.fire.ca.gov/, the Department's Wildfire webpage, https://wildlife.ca.gov/Science-Institute/Wildfire-Impacts, UC Press' Fire in California's Ecosystems, Second Edition, van Wagtendonk et al., https://www.ucpress.edu/book/9780520286832/fire-in-californias-ecosystems, and the Association of Fire Ecology, https://fireecology.org/.

I think it is appropriate to end the Introduction to this Special Edition with a huge thank you and accommodation to Angela Baker, Editor-in Chief of the *California Fish and Wildlife Journal*, her associate editors, and the authors. Ange has positioned the Journal in a vital and amazing position to put forth the dynamic sciences necessary to address wildfire in California. No research is more difficult in wildfire science than fire ecology and animal/plant response to fire. She has put together the first issue to tackle this vital subject. And I hope not the last. Thank you, Ange, editors, and authors, for putting the Department and its journal squarely at the center of the role of wildfire to California's fish and wildlife.

Introduction—continued

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California's ecosystems evolved with fire. Lightning and ignitions by Native Americans were the cause of periodic fire with estimates of 4.4 million acres burning annually prior to 1800 in California (Stephens et al. 2007). Many plants developed traits that respond in unique ways to recurrent fire, and various animals evolved to utilize burned habitats. Native Californians understood fire as a dynamic process and intentionally set fires periodically to revitalize and regenerate various plants and the land supporting them (Tripp 2020). With the arrival of explorers and settlers in the 1700s this dynamic began to shift (Taylor et al. 2016). Fire was seen by these new peoples as a destructive process and fire suppression emerged as the dominant response. Other practices like livestock grazing, mining, and logging further shaped California's landscape in ways never before experienced. Over the years, people flooded into California and the population grew from less than 0.5 million before 1800 (Library of Congress 2020) to over 39 million people now. This brings us to the California of today – a frequent-fire landscape in which many, many people live.

The 2020 fire year has been like nothing seen in California's recent history. As of mid-October, wildfire burned over 4.1 million acres, resulted in the death of 31 people, and damaged or destroyed 9,247 structures (CALFIRE 2020). These impacts combined with the weeks to months of smoke impacts affecting most of our population literally takes one's breath away. Clearly, action needs to be taken to better protect people and communities and lower their fire risk. The California legislature is working on solutions now, and we should expect to see investments and policy initiatives in the coming year targeted at reducing human exposure to fire risk and improving the resilience of communities. This special issue of the *Journal* though, is focused on the ecology of California's frequent fire landscape and explores how wildlife, fish and plants respond to fire and fire-related management actions. At the heart of this exploration is the drive to understand how natural resources benefit from fire and what actions can be taken to support these benefits. This exploration also links us back to the demands that people place on the landscape and how best to live with fire while protecting biodiversity.

California is a globally recognized hotspot of biodiversity; this stems from its "exceptional variation in landscape features, latitudinal range, geological substrates and soils, and climatic conditions, resulting in a wide range of ecosystems to support plant and animal species" (CSWAP 2015). Place-based disturbance regimes, whether it be fire, flooding, or some other periodic event, also influence and shape biodiversity. Among the 22 vegetation communities identified in California, scientists have described 56 different fire regimes reflecting the variability in periodicity and severity between and within these communities (Fryer and Luensmann 2012). Evaluation of the expected fire regime of a vegetation community and its current condition is essential to identifying management practices that align with this disturbance process and enhance biodiversity. A case in point is the surplus of fire identified in southern California vegetation communities compared to the deficit of fire in forests and woodlands in northern California (Safford and Van de Water 2014). These patterns help inform where management practices, like prescribed fire, will be beneficial to biodiversity as opposed to creating atypical and less diverse habitats.

It is certain that California will experience wildfires in the years to come. Our challenge is to learn how to live in this frequent-fire landscape. Deepening our understanding about ecological systems and the drivers that enhance native biodiversity, as illustrated by several articles presented in this issue, is one critical element. Another is designing management practices that both reduce the wildfire risk to people while conserving biodiversity. And of equal, and possibly greater importance, is how we site, design, and build our communities to be resilient to wildfire. The good news is that progress on all fronts is possible. What it will require though is increased investment and cooperation between government agencies and stakeholders to ensure success.

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