



Big Basin Redwoods State Park: Climate Resilient Park Planning, Design, and Management



California Department of Parks and Recreation

CLIMATE CHANGE AND WILDFIRES IN CALIFORNIA

For thousands of years, seasonal fires have shaped California's landscape. Native flora and fauna have evolved along with these fires, which included fires set by natural phenomena such as lightning, and those intentionally set and managed by native Californians. Many of California's native ecosystems need fire and will recover quickly after a wildfire event. **However, wildfires have increased in intensity and extent throughout California** and the Western United States in recent years due to a changing climate at the global scale as well as over a hundred years of land management that emphasized fire suppression. The result is that while wildfires are and have been a natural phenomenon in California, the changed nature of those fires – against the backdrop of a century of urban and suburban development both locally and globally – pose new dangers and risks to many of California's residents and ecosystems. **The impacts of climate change on California's ecosystems are clear and are expected to continue in future decades.** To learn more about the climate change, visit climateassessment.ca.gov/state/overview/

In addition to rising temperatures and sea levels, other climatic changes that impact Big Basin Redwoods State Park include:



Reduced snowpack in the Sierras and longer periods of drought



More erratic precipitation patterns including coastal and inland flooding



More instances of extreme heat, reduced coastal fog that increase fire risk and extend the fire season

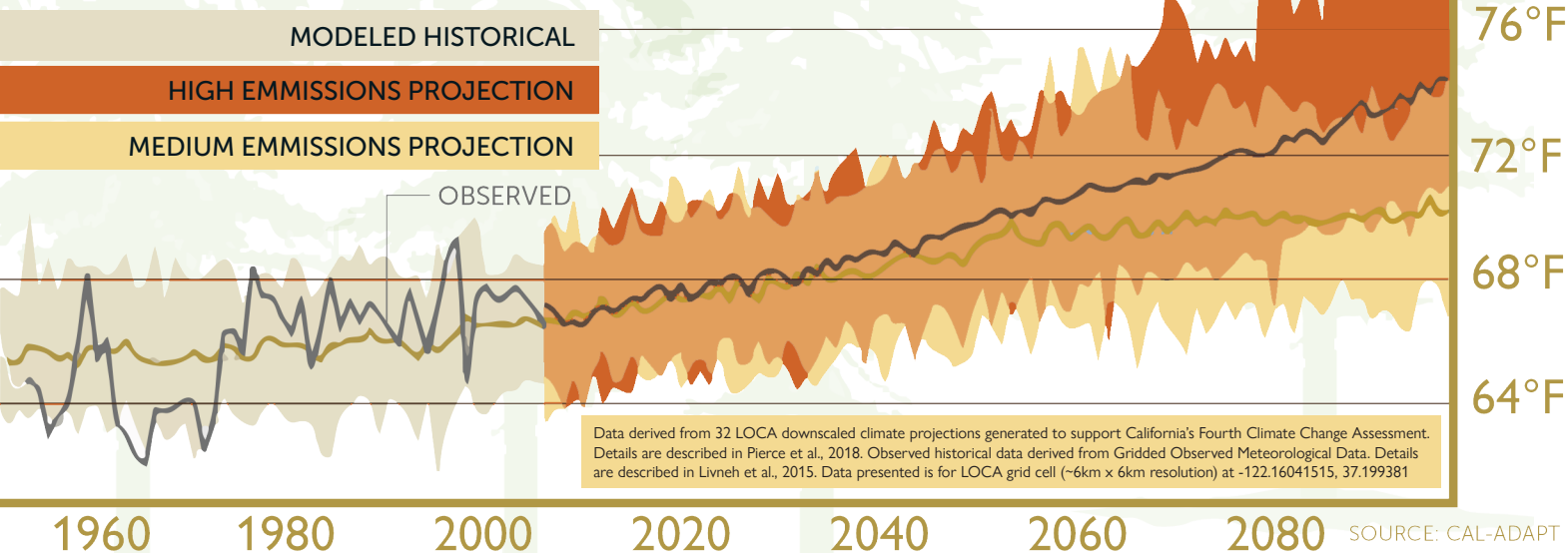


More frequent high wind events that speed the spread of wildfires

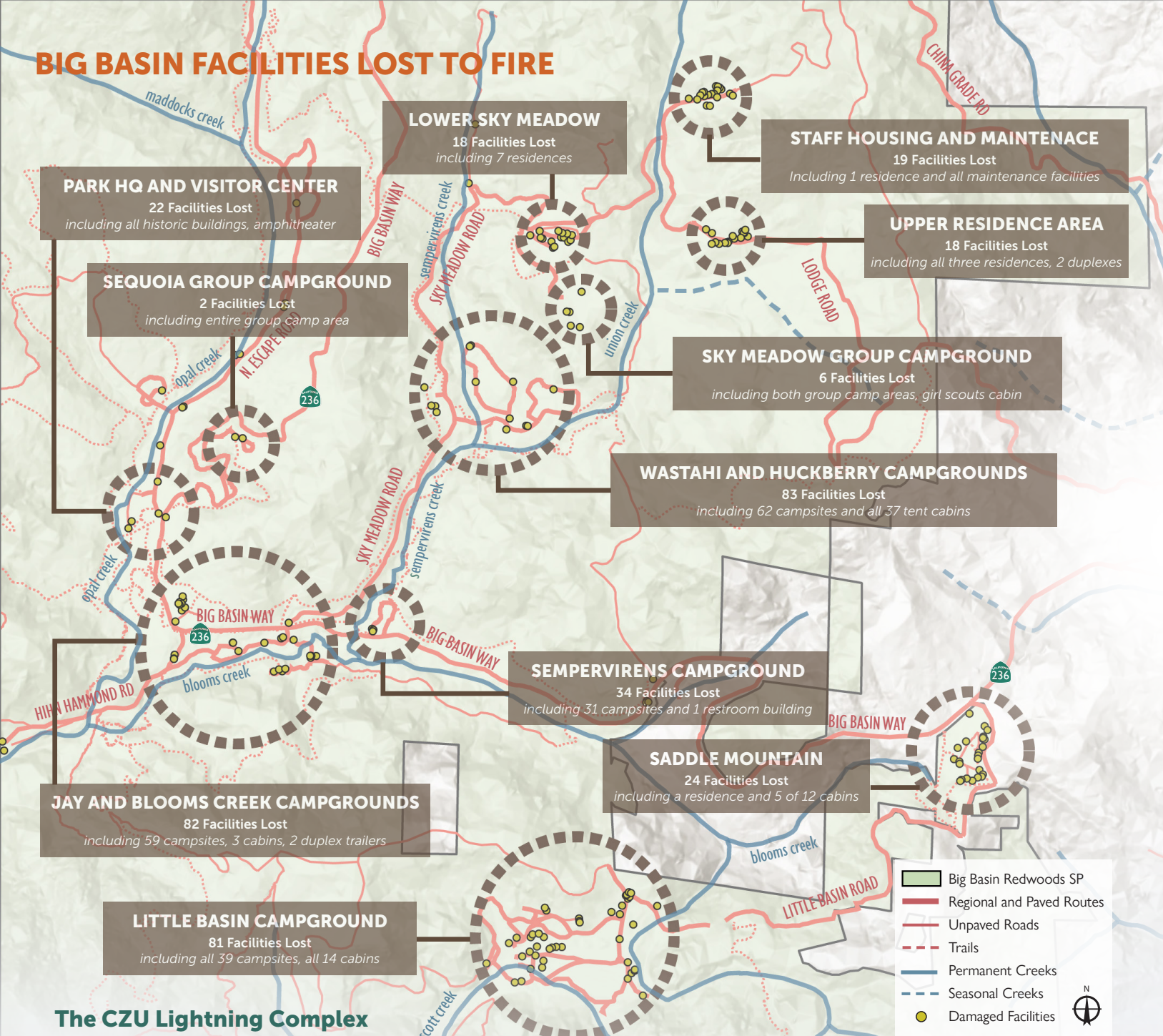


Increase in pests and pathogens that can kill trees, providing additional tinder for wildfires

Localized Climate Change Snapshot for Big Basin Redwoods State Park: Annual Average Maximum Temperature



BIG BASIN FACILITIES LOST TO FIRE



The CZU Lightning Complex fire of August 2020 burned almost all (97%) of Big Basin Redwoods State Park.

21 other parks were also impacted in the 2020 wildfires, which burned over 115,000 acres of State Park lands and ultimately burned over 4.2 million acres across California.

Resilience is “the capacity of any entity—an individual, a community, an organization, or a natural system—to prepare for disruptions, to recover from shocks and stresses, and to adapt and grow from a disruptive experience. A community’s resilience is determined by its ability to survive, adapt, and thrive no matter what acute shock or chronic stressor it experiences.” resilientca.org

Climate Neutrality means that “all greenhouse gas (GHG) emissions emitted into the atmosphere are balanced in equal measure by GHGs that are removed from the atmosphere, either through carbon sinks or carbon capture and storage.”

‘Achieving Climate Neutrality in California’, California Air Resources Board Report, 2020.

BEST PRACTICES IN RESILIENT, PARK PLANNING, DESIGN, AND MANAGEMENT



Park planning, design, and management are advancing quickly to incorporate changing climate considerations. Employing strategies to make the park less vulnerable, safer, and better able to rebound after future wildfire events is a foundational consideration of the Reimagining Big Basin effort. Effective resilience planning at Big Basin will serve as a model to guide other park planners and managers that face similar current and future climate stresses.

PARK MANAGEMENT

Park management strategies must be the cornerstone of a resilient Big Basin in the context of future wildfire threats. Such management strategies include:

- **Forest and vegetation management**, including reintroducing and replicating natural fire regimes while reducing fuel loads through prescribed burns.
- **Ongoing maintenance of facilities**, defensible space zones, utility lines, and other necessary infrastructure.
- **Park mapping and monitoring** using methods such as satellite and aerial remote sensing along with cameras and other sensors to monitor wildlife and habitat conditions.
- **Partnerships** among federal, state, regional, local, and tribal entities to incorporate traditional ecological knowledge into management activities
- **Education and stewardship programs** to broaden public understanding and train the next generation of park and land management professionals.
- **Adaptive management approach** for facilities and infrastructure to respond to changing conditions or major climatic events such as wildfire.

PARK PLANNING AND DESIGN

Balancing visitor experience, visitor safety, and resource protection is critical to ensuring resilient parks. Strategies include:

- **Creating management zones.** An initial step in planning a park is to determine which areas of the park offer the greatest opportunities for various types of recreational, educational, or operational uses, and whether there are areas of park that would benefit from restricted access due to sensitive resources or high potential for hazards. Based on analysis of resources as well as visitor demand, distinct zones can be created through the park to facilitate distinct management strategies
- **Appropriate siting of facilities and infrastructure.** Facilities and infrastructure should be sited to foster rich recreational and educational experiences, while also facilitating protection of public safety and sensitive resources under current and projected future conditions.
- **Protection of Ecological and Hydrological Systems.** Planning should consider how future facilities, roads and infrastructure work to complement and enhance natural systems and site hydrology to ensure long-term function and resilience of the park's natural resources.
- **Achieving climate neutrality.** California has set a goal of net-zero carbon emissions by 2045 to forestall the most extreme impacts of climate change. Reimagining Big Basin as California's first net zero carbon park will require new ways of thinking but will also help park professionals demonstrate a pathway to a sustainable future for all Californians.

EXAMPLE PROJECTS

Rethinking visitor facilities, access, and forest management have been effective strategies for the National Park Service (NPS) to improve visitor experience and resource protection at parks with high visitation.

The **Mariposa Grove Restoration Project** (2015-2018) in Yosemite National Park sought to improve visitor experience and giant sequoia habitat by reconfiguring park access features and facilities. Improvements included establishing a shuttle route to the Lower Mariposa Grove Arrival Plaza with expanded parking capacity at the Mariposa Grove Welcome Plaza, replacing paved roads with pedestrian trails, installing boardwalks, improving signage, and incorporating sculptures and interpretive elements.

Protecting the Giant Forest sequoia Grove in **Sequoia and Kings Canyon National Park** also involved rethinking long-established visitor facilities in order to enhance visitor experience, protect resources, and improve management efficiencies. The **Giant Forest Restoration effort** (late 1990's) involved removing commercial activities and overnight accommodations from the grove, demolishing 282 buildings, and ecological restoration of 231 acres. In 2007, a shuttle system was established to further reduce congestion and encourage visitors to experience the giant sequoias from trails rather than roads. NPS also began using prescribed burns in the 1960s, and has seen benefits of this preparation and maintenance. During the KNP Fire Complex that threatened the world-famous General Sherman giant sequoia, walls of flame dropped to just a few feet in height when they reached the grove's entrance because of a recent prescribed burn in the area.



Lower Mariposa Grove Arrival Plaza



Low intensity prescribed burn in Sequoia National Forest

ARCHITECTURE AND INFRASTRUCTURE

The latest architectural technologies can increase the durability of park facilities and minimize the potential risk to such facilities and decrease the likelihood that infrastructure may ignite a wildfire event. Best practices in the field of architecture and infrastructure are shared in resources that include Firewise Design Principles, Salmon-Safe Design Principles, and Universal Design for Accessibility. Some of the best practices that will inform design efforts for Big Basin are illustrated below:

design to support renewable energy production and storage

ensure high performance building envelopes and systems

optimize siting and massing to enhance passive performance and daylight harvesting

ensure defensible space during fire events

use durable and fire-resistant material such as metal roofing and siding

place utility lines underground

use stormwater capture

