

Prehistoric and historic fire in the Mojave Desert

Matthew Brooks

US Geological Survey, Western Ecological Research Center
Yosemite Field Station



Prehistoric Fire

Since the early Quaternary Period (approximately 2 million years ago) the deserts of North America have been situated on the leeward side of a “double rain shadow” (Axelrod, 1995) created by the uplift of the Cascade, Sierra Nevada, Transverse, and Peninsular mountain ranges, which blocked storms moving eastward from the Pacific Ocean, and the uplift of the Sierra Madre and southern Rocky Mountain ranges, which blocked storms moving northwestward from the Gulf of Mexico.

The combined effects of this rain shadow and a continental climate created the desert conditions we are familiar with today.

Vegetation and fire regimes consisted of grasslands and shrublands at lower elevations, and woodlands and forests at higher elevations.

Desert Fire Ecology Zones

(Brooks and Minnich 2006)

low elevation shrubland



middle elevation shrubland



high elevation woodland

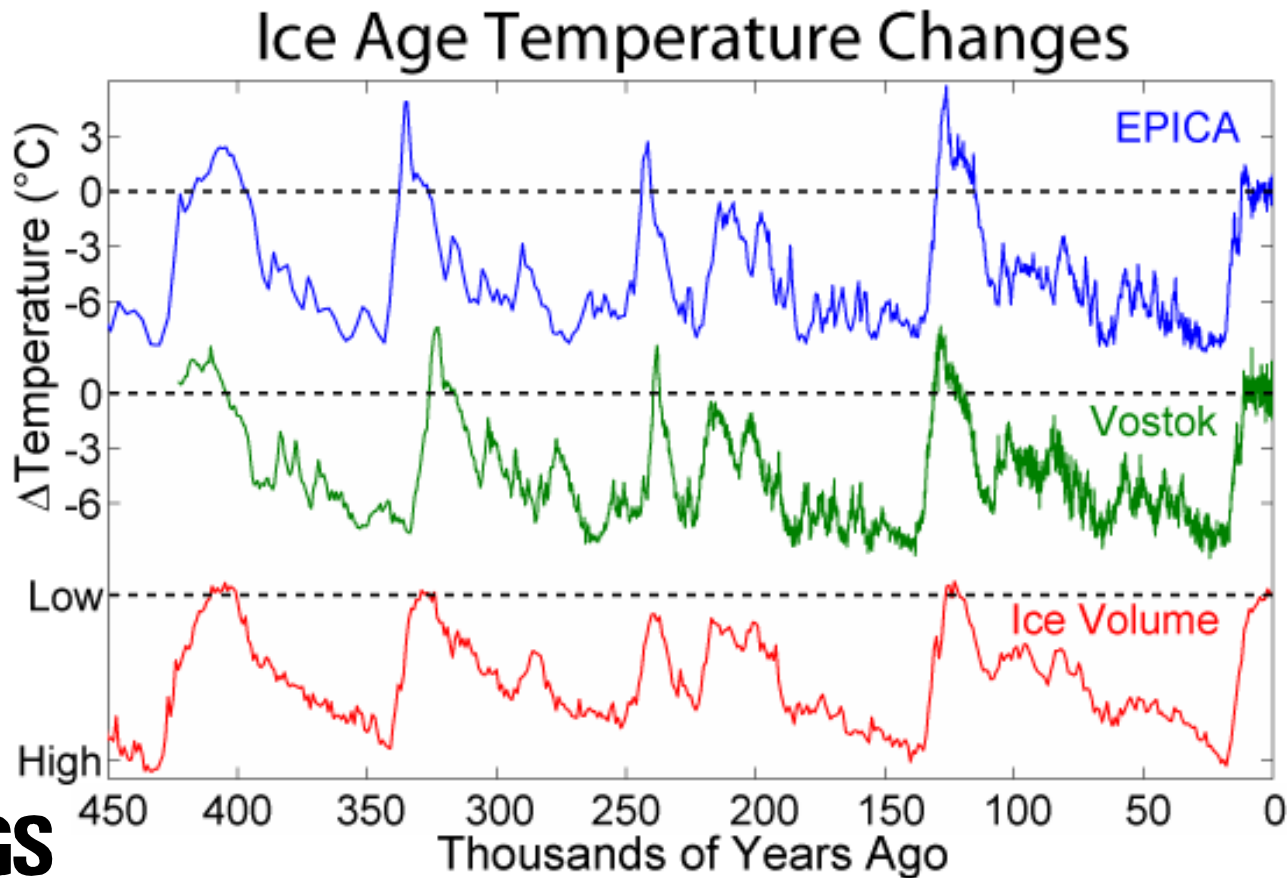


desert montane



Prehistoric Fire

However, the distributions of these vegetation formations and their associated fire regimes have moved upslope and downslope coincident with Quaternary glacial and interglacial periods.

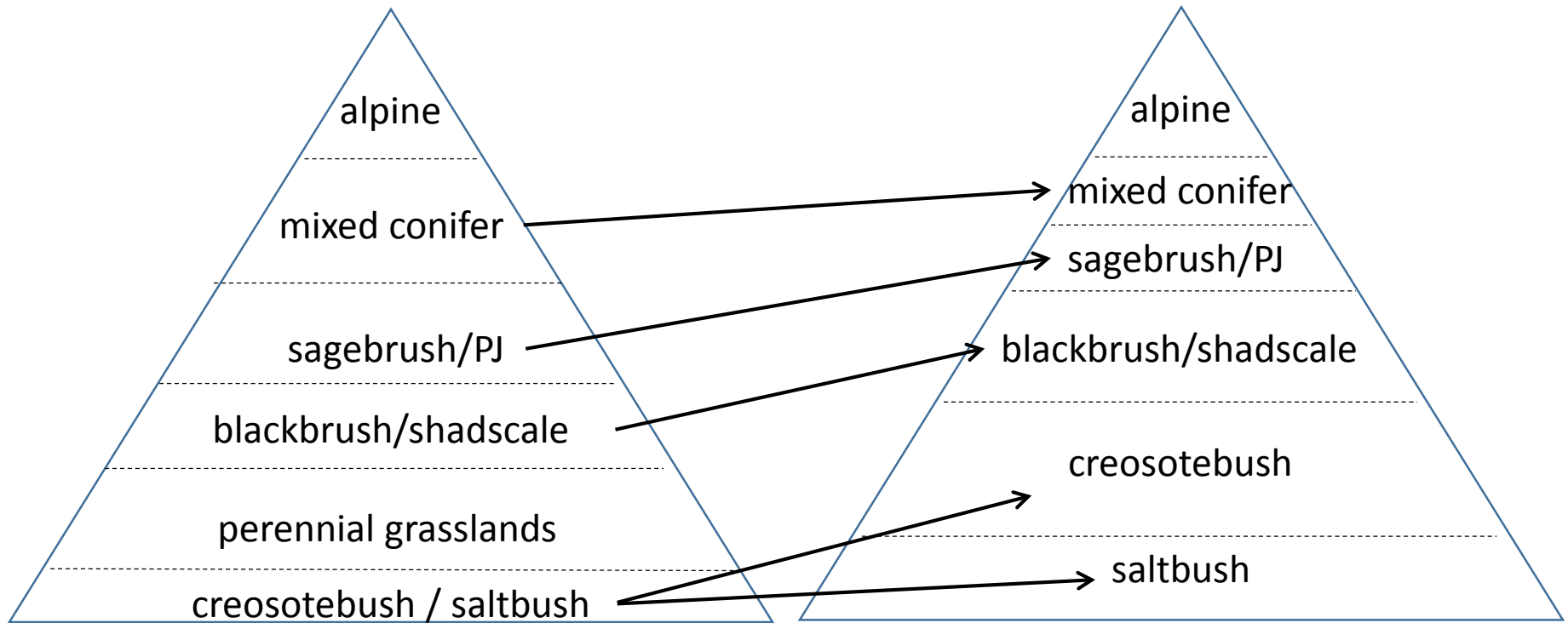


Prehistoric Fire

In addition, during the Holocene Epoch (past 10,000 years) conditions have become increasingly arid in the Mojave Desert, resulting in general upslope shifts in vegetation formations (McKlinley et al. in press). For example, in the Sheep Range of Clark County, mesic juniper woodlands were replaced by xeric juniper woodlands 9,500 years ago, which were then replaced by blackbrush 7,500 years ago that still persist at middle elevations (Spaulding, 1990).



Vegetation types and their associated fire regimes have experienced a net shift upslope in the Mojave Desert during the Holocene





Early Holocene
More are conducive to burning



Late Holocene
Less area conducive to burning



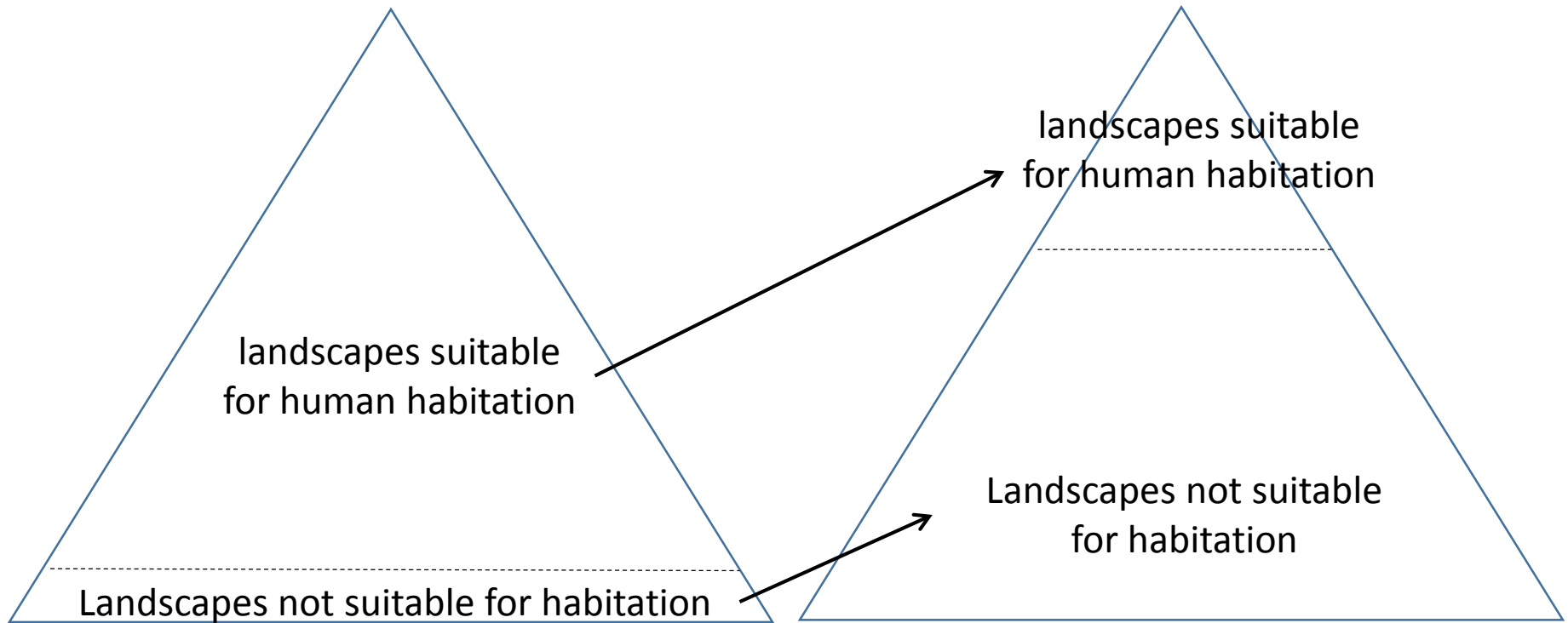
Prehistoric Fire

Across western North America, indigenous humans used fire for hunting game, clearing vegetation to grow food and open pathways of travel, management of pest species, and management of vegetation for desirable properties (for example, basket materials, game forage, fuel breaks) (Williams, 2000).



However, because native vegetation in the Mojave Desert was insufficient to carry fire at lower elevations **throughout most of the Holocene, fire use by humans was probably a factor only at higher elevations and in the more mesic riparian areas** (McKinley et al. in press).

Human presence on the landscape has experienced a net shift upslope in the Mojave Desert during the Holocene



Current Implications of Prehistoric Fire Patterns

Vegetation types that experienced periodic fire in the past and are somewhat resilient to its effects are currently isolated in disjunct high elevations areas within the basin and range topography of the Mojave Desert.



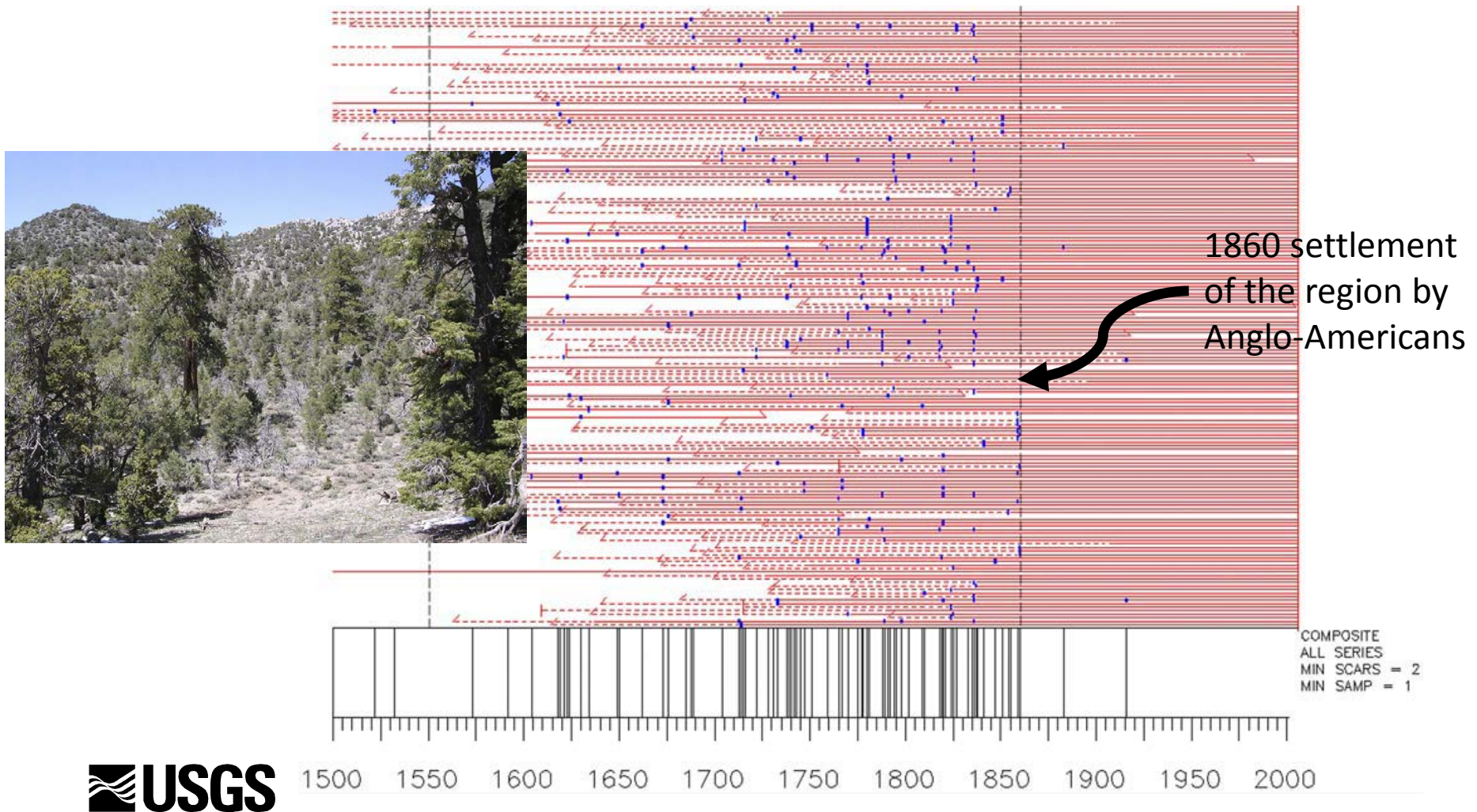
Historic Fire

The historic period in the Mojave Desert began with settlement by Anglo-Americans in the in the 1800s

Land use regimes changed dramatically as livestock were introduced and traditional Native American practices were halted or curtailed.



Composite time-series graph showing fire scars dated to a single year (blue tickmarks) on individual pine trees (red horizontal lines) and inferred fire events (vertical grey bars) from 1500 to 2006 at a 1.6 km² site near Mt Irish at the Great Basin Mojave Desert ecotone in southern Nevada (Biondi et al. 2011, Fig. 9).



Historic Fire

The oldest first-hand account of extensive historic fire in the Mojave Desert was reported by Croft (1950) and colleagues who estimated that 20 percent of the blackbrush that were present in southern Nevada burned during the late 1930s and early 1940s.



Long term effects of a single fire in a mesic blackbrush stand showing red brome and lack of blackbrush recovery



Photos by A. Croft, 12 May 1946 and D. Oldershaw, 9 May 2002. The view is looking SW inside the mouth of Horse Spring Basin, in the northeastern Mojave Desert, Lincoln County, NV.

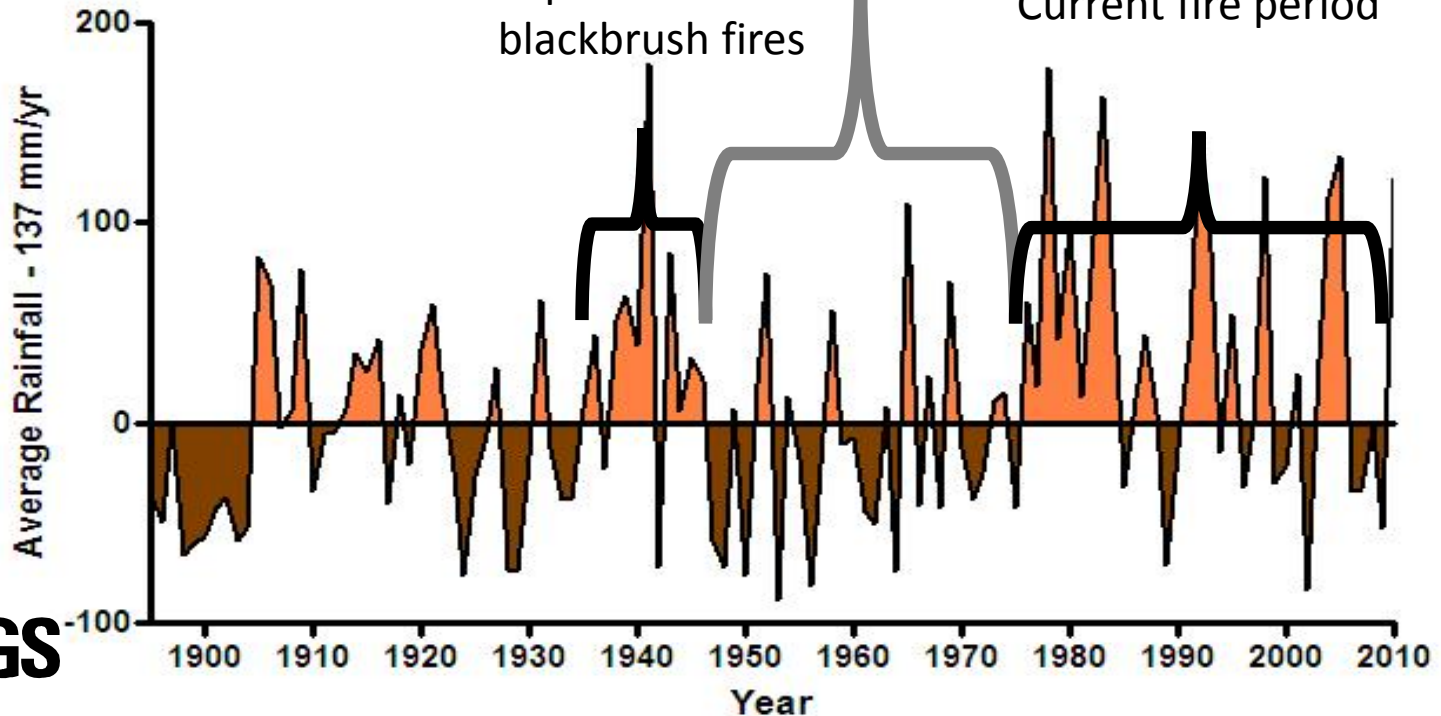
Historic Fire

The 1930-1940 period of extensive fire was associated with a period of high rainfall. That was followed by mid-century period when almost no fires were reported.

Historic period of almost no reported fires

Historic period of extensive
blackbrush fires

Current fire period



Fire History Summary

- The current range of grassland, shrubland, conifer woodland, and forest vegetation and fire regimes have been present in the Mojave Desert region since at least the early Holocene (10,000 years ago).
- Climatic conditions are currently drier than they were at the beginning of the Holocene, and upland vegetation zones are at higher elevations with some present as disjunct and sometimes very small high elevation stands (e.g. conifer woodlands and forests).
- During the 1900s, fire activity covaried with precipitation at multidecadal time scales (early and late century high, and mid century low)
- Native Americans undoubtedly influenced fire regimes, but only where vegetation types were conducive to fire spread (e.g. high elevations and riparian zones). These practices ended with the settlement of the region by Anglo Americans in the 1800s.
- Currently, high elevation and riparian vegetation types contain many species that evolved with fire, whereas lower elevation vegetation is characterized by species that evolved with very little fire.