

Fire Ecology Zones of the California Desert

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Management Need

- Fire management plans require the delineation of fire management zones.
- These zones define how fire should be managed based on historical fire regimes and current fire ecology.
- There are currently no references indicating what appropriate fire management zones should be for desert regions.

Presentation Outline

- Describe the historical and current characteristics of fuels, fire regimes, and fire/vegetation dynamics in the California Desert.
- Specifically discuss salt desert scrub, creosotebush scrub, blackbrush, great basin sagebrush, pinyon-juniper, and interior chaparral.

Salt Desert Scrub

- Occurs on moderately saline, arid soils typically not capable of producing substantial fine fuels.
- Areas that are too arid for sagebrush, and too alkaline for blackbrush.
- Shadscale (*A. confertifolia*) and budsage (*A. spinescens*) killed by fire, recruitment from seed.
- Greasewood (*S. vermiculatus*), winterfat (*K. lanata*), alkali sacaton (*S. airoides*) resprout after burning.
- Postfire succession: forbs \Rightarrow shrubs



Salt Desert Scrub – *Historical Fire Regime*

Temporal

Seasonality

Late spring to early Fall

Fire Return Interval

>100s of years

Spatial

Size

<10 hectares

Complexity

High, patchy burns

Magnitude

Intensity

Low

Severity

Moderate

Fire Type

Surface to passive crown fire

Salt Desert Scrub

Management Considerations

- 1983 El Niño produced large amounts of cheatgrass resulting in a profusion of wildfires during 1983-1985 in the Great Basin.
- Native species composition recovers slowly, and recurrent fire caused by cheatgrass fuel beds shifts landscape to Condition Class 2 and 3.
- Greenstripping with *Kochia* or other low flammability plants may be needed to help increase fire return intervals (e.g. inset photo).



Creosotebush Scrub

- Occurs on flats, fans, and upland slopes.
- Creosotebush (*L. tridentata*) and white bursage (*A. dumosa*) may resprout when only partially burned, mostly recover from seed.
- Postfire succession: forbs \Rightarrow white bursage and other sub-shrubs \Rightarrow creosotebush and subshrubs



Creosotebush Scrub – *Historical Fire Regime*

Temporal

Seasonality

Late spring to early Fall

Fire Return Interval

100 to >100s of years

Spatial

Size

<10 hectares

Complexity

High, patchy burns

Magnitude

Intensity

Low

Severity

Moderate

Fire Type

Surface to passive crown fire

Creosotebush Scrub

Management Considerations

- Years of high rainfall produce large amounts of red brome (*B. rubens*) and split-grass (*Schismus* spp.), resulting in increased fire frequency in creosotebush scrub.
- Native species composition recovers slowly, especially after passive crown fire, and recurrent fire caused by red brome and split-grass shifts landscape to Condition Class 2 and 3 (e.g. inset photo).
- Need to prevent new alien plants from invading that could further increase fuel loads (e.g. *Cenchrus ciliaris*, *Pennisetum setaceum*, and *Brassica tournefortii*)



Blackbrush

- Occurs on well drained, sandy to gravelly often calcareous soils, mid-slope on mountain ranges.
- Blackbrush (*C. ramosissima*), killed by fire, recruitment very slow from animal dispersed seed.
- Joint fir (*Ephedra*) and Galleta (*Pleuraphis*) can resprout.
- Snakeweed (*Gutierrezia*), may resprout, but can also recruit quickly via wind-dispersed seeds.
- Postfire succession: forbs \Rightarrow perennial grasses and sub-shrubs \Rightarrow blackbrush (may take >100 years)



Blackbrush – *Historical Fire Regime*

Temporal

Seasonality

Summer to early Fall

Fire Return Interval

>100s of years

Spatial

Size

10s to 100s hectare

Complexity

Low, complete burns

Magnitude

Intensity

High

Severity

High

Fire Type

Active crown fire

Blackbrush

Management Considerations

- Rangeland improvement burns during the mid-1900s and the invasion of red brome and cheatgrass have contributed to the shift of landscapes to Condition Class 2 and 3 (e.g. inset picture).
- Postfire rest from livestock grazing may help perennial grasses establish as early successional components, and possibly minimize the establishment of red brome and cheatgrass
- Fire should be definitely be suppressed in Condition Class 2 and 3 landscapes.



Great Basin Sagebrush

- Occurs on fertile soils capable of producing substantial fine fuels (perennial grasses and forbs)
- Ecotonal between salt desert and pinyon-juniper.
- Big sagebrush (*A. tridentata*), killed by fire, recruitment from seed
- Cliffrose (*Purshia mexicana*) is typically killed by fire, whereas its close relative, antelope bitterbrush (*Purshia tridentata*), exhibits highly variable responses to fire, often resprouting
- Postfire succession: forbs \Rightarrow perennial grasses \Rightarrow shrubs



Great Basin Sagebrush – *Historical Fire Regime*

Temporal

Seasonality

Summer to Early Fall

Fire Return Interval

**15 years (mountain sagebrush)
100 years (Wyoming sagebrush)**

Spatial

Size

**10 to 100s (possibly 1,000s) of
hectares**

Complexity

**Moderate/patchy to complete
burns**

Magnitude

Intensity

High

Severity

Moderate to High

Fire Type

Active to passive crown fire

Great Basin Sagebrush

Management Considerations

- In the past, sagebrush was considered a weedy range species and it was burned to promote the growth of perennial grasses and forbs.
- Today, sagebrush it is often considered an imperiled vegetation type, caused largely by the the invasive grass cheatgrass which has reduced FRIs from 50+ to 5 years in some areas, especially at lower elevations.
- Active management is required to prevent the widespread type-conversion of Great Basin sagebrush.
 - Management of FRIs by reducing fuelbed flammability though restoration of perennial grasses and shrubs that can compete with cheatgrass and by fire supression.



Pinyon – Juniper

- Utah Juniper – single-leaf pinyon association is the most widespread
- California Juniper – Single-leaf and Four-leaf pinyon associations along the western edge of the Mojave and Colorado deserts.
- Pinyon pine (*Pinus monophylla*, *P. edulis*) and juniper (*Juniperus osteosperma*, *J. californica*) are typically killed by fire, but the 100+ years it takes for fuels to build up to levels that could carry fire allow enough time for trees to re-establish in most cases.
- Juniper typically re-establishes from seed sooner than pinyon.
- Postfire succession: forbs \Rightarrow perennial grasses \Rightarrow shrubs \Rightarrow trees



Pinyon Juniper – *Historical Fire Regime*

Temporal

Seasonality

Summer to Early Fall

Fire Return Interval

>100 years

Spatial

Size

100s (possibly 1,000s) of hectares

Complexity

Moderate/patchy to complete burns

Magnitude

Intensity

High

Severity

High

Fire Type

Active to passive crown fire

Pinyon – Juniper

Management Considerations

- Reduction of fine fuels (from livestock grazing) and fire suppression has increased FRI allowing encroachment of pinyon-juniper woodland into sagebrush steppe, especially at higher elevations.
- Thinning young (“post-settlement”) size classes of PJ can increase Great Basin sagebrush cover (shrubs, perennial grasses, and forbs) relatively quickly (e.g. inset photos).



Shivwitz plateau pre-treatment



Three years after cut, buck, and scatter PJ thinning treatment.

Interior Chaparral

- Mostly found in AZ and NM (Arizona Chaparral) and UT and CO (Mountain Brush).
- In CA, restricted to the middle slopes of the mountains adjacent to the western Mojave and Colorado deserts, and on some mountaintops within the desert.
- Birchleaf mountain mahogany (*C. betuloides*), hairy mountain mahogany (*C. breviflorus*), Gambel oak (*Q. gambelii*), Shrub live oak (*Q. turbinella*), Yerba santa (*E. angustifolium*). Resprouts, except after very high intensity fire.
- Curleaf mountain mahogany (*C. ledifolius*), resprouts after low intensity fire, also regenerates from seed.
- Desert ceanothus (*C. greggii*) and pointleaf manzanita (*A. pungens*), non-sprouters, regenerate from seed.
- Postfire succession: sprouters and/or forbs \Rightarrow non-sprouters



Interior Chaparral – *Historical Fire Regime*

Temporal

Seasonality

Summer to Early Fall

Fire Return Interval

50 to 100 years

Spatial

Size

10 to 100s (possibly 1,000s) of hectares

Complexity

Low, complete burns

Magnitude

Intensity

High

Severity

Moderate to high

Fire Type

Active crown

Interior Chaparral

Management Considerations

- Interior chaparral presents a more complex management challenge than the forests above or the deserts below, facing some of the challenges of both.
- Like the ponderosa pine forests, chaparral communities are fire-dependant. Exclusion of fire from interior chaparral can lead to encroachments by woodland species.
- Like the desert shrublands, alien annual grasses can increase fire frequency to the point where even the fire-adapted interior chaparral species cannot recover.
- Thus, interior chaparral requires fire, but not too much fire.
- Fire can also increase habitat complexity (e.g. photo inset), potentially increasing biodiversity.



Summary

- There are general vegetation characteristics related to soil and climate conditions for each of these fire ecology zones, but the potential natural vegetation at the ecotones between them can be difficult to determine.
- Attempts to identify the “natural range of variation” in vegetation types, fuel conditions, and fire regimes must consider local information about fire and land use histories, along with general information about the environmental tolerances of native plants.
- Much of the information presented was inferred from studies in other ecosystems, and there is a very real need for information derived directly from the Mojave and Sonoran deserts in particular.