

Shrub Encroachment in Tilden Park. Historical, ecological, and management considerations

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1. History¹

Pre-Native American Period (before 8,000 BC)

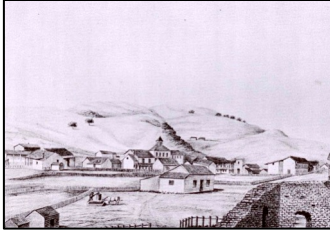
Baccharis brushlands cover much of the East Bay

Native American Period (8,000 BCE to 1800 AD)

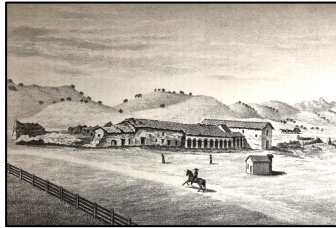
burning of Baccharis brushland to expand area of grassland

Spanish/Mexican Period (1776 to 1848)

grazing replaced burning as a factor in maintaining grasslands



Mission San Juan Batista



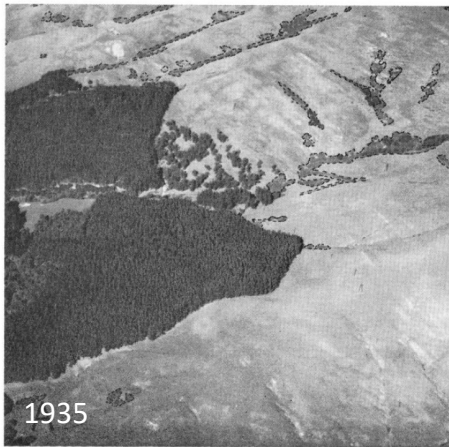
Mission San Miguel Arcangel

20th Century

Reduction of grazing and increased fire return intervals

Establishment of East Bay Regional Park District (1934)

Initiation of grazing exclusion from some parks



2. Invasion of Baccharis into grasslands in East Bay Regional Parks²

Seed dispersal and seedling establishment

Seed dispersal study - reverse S-shaped curve 100+ seeds at edge of Baccharis; 0 seeds at 100')

Establishment on landslides (exposed soil) vs. undisturbed grassland

Landslide = 3.4 seedlings/m² ;

Grassland = 0.02/m²

Invasion of Baccharis into adjacent grassland

Characteristics of Baccharis – grassland boundaries

Remeasurement of Heady transects (1952 - 1965) Invasion average 1.3'/year

Limits to Baccharis establishment in grasslands

Cattle (pulling, trampling)

Rodent herbivory

Slug herbivory (Zavaleta, 2006)³

Desiccation of seedlings due to grass competition

Desiccation of seedlings due to dry soil, dry weather

South-facing slopes

Shallow soils

Biodiversity in Baccharis brushland vs. California coastal annual grassland

Plants (30 x 30 m plots)

Baccharis brushland = 25 species

Annual grassland = 50 species

Statewide (Grassland) = more than 2000 (Bartolome et al. 2014)⁴

Animals (mammals, birds, reptiles, amphibians)⁵

Baccharis brushland = 111 species (great use = 56 species)

Annual grassland = 131 species (great use = 24 species)

Species of special interest (rare, endangered, threatened) using annual grassland

Statewide (Grassland) = 55 vertebrates, 46 invertebrates, 479 plants)⁴

East Bay Regional Parks⁶

Alameda whipsnake – Annual Grassland/Baccharis Brushland

San Joaquin kit fox – Annual Grassland

California tiger salamander – Annual Grassland, Oak Woodland, Aquatic Habitats

California red-legged frog – Riparian zones, Annual Grasslands, Oak woodland

3. Comparison of area of Baccharis brushland in sequential maps or aerial photographs

Maps³ (1927 and 1942) with aerial photographs (1961)

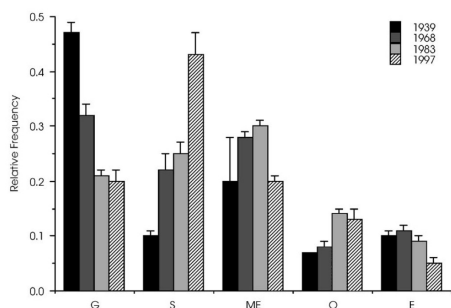
Percentage increase in Baccharis brushland

Tilden = 398%; Redwood = 263%; Grass Valley = 177% ;

Round Top = 0%– Only Round Top grazed during the study period

Aerial photographs⁷

Comparison of aerial photographs taken in 1939, 1968, 1983, and 1997



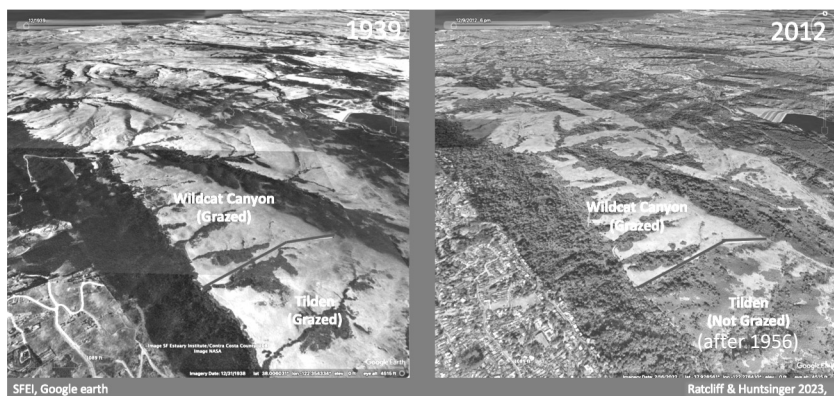
Decrease in grassland area from 1939 to 1997 = 57%

Increase in Baccharis area from 1939 to 1997 = 377%

Fig. 4. Relative frequency of five vegetation types, (G: grass, S: shrub, ME: mixed evergreen, O: oak woodlands and savannas, E: eucalyptus), in Tilden Regional Park. Error bars indicate 1 S.E.

Google Earth Images⁸

Comparison of aerial images using Google earth



4. Fuel Loading⁷

Annual Grassland(ungrazed) = 1340 lbs/acre

Baccharis brushland = 16,700 lbs/acre

References

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3. Zavaleta E.S. 2006. Shrub establishment under experimental global changes in a California grassland. Plant Ecology 184: 53-63.
4. Bartolome, J. W., B. Allen-Diaz, S. J. Berry and L. D. Forde. 2014. Grazing for Biodiversity in Californian Mediterranean Grasslands. Rangelands 36(5):36-43.
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8. Ratcliff and Huntsinger 2023