

Table 1. Descriptions of fire occurrence for presettlement, Hawai'ian settlement, and European settlement time periods

Plant community group	Plant community	Time period*	Description of fire occurrence	Evidence of fire occurrence	References
Lowland dry and mesic	Closed and open dry forest	Presettlement	Fires unlikely except for "localized, totally consumptive burns" caused by periodic lava flows	Presettlement vegetation lacked fine fuels to carry fire	Mueller-Dombois (1981) [37]
Lowland dry and mesic	Leeward xerophytic and mesophytic vegetation	Hawai'ian settlement	Extensive vegetation removal and conversion to grassland via agricultural burning	Burn layers with associated deposits of endemic land snails; observations by early European explorers	Kirch (1982) [26]
Lowland dry and mesic	Lowland dry to mesic forest conversion to grasslands	Late Hawai'ian settlement, early European settlement	"Destruction of the native vegetation and its associated land snail fauna may be the result of burning during or prior to the early to mid 19th century"	Burn layers with associated deposits of land snails and animal remains	Christensen (1983) [8]
Lowland dry and mesic	Grasslands	Hawai'ian settlement	Vegetation was frequently burned and was "in adjustment with fire"	Reports of Hawai'ian use of fire; abundance of fire-adapted pili grass	Egler (1947) [17]

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Upland dry and mesic	Montane-subalpine dry shrubland	Presettlement	Radiocarbon ages of charcoal fragments ranged from modern to 7,730 yr BP, with 13 pieces > 1,500 yr BP. Most of the charcoal dates occur prior to estimates of human arrival.	Radiocarbon ages of 18 charcoal fragments from 5 soil pits	Kinney (2012) [25] ; Hall and others (2012) [20]
Upland dry and mesic	Montane seasonal forest and woodland	Presettlement	"Fire occurred in this environment before man ever arrived"	Vegetation characteristics: abundance of matrix-forming fine fuels; native trees with high postfire sprouting capacity	Mueller-Dombois (1981) [37]
Upland dry and mesic	Dry mixed forest	Presettlement	Charcoal fragments dated at 2,170 ± 200 years (~ 220 years BCE)	Charcoal fragments from soil pits	Mueller-Dombois and Lamoureux (1967) [36]
Lowland and upland wet areas	Bog, montane rain forest	Presettlement	Carbon found "at depth in a core from an O'ahu bog revealing a 26,000-year record of fire occurrence", and on Hawai'i, "undated carbon burned at a depth of 0.5 m...in a location that suggests wildfire rather than volcanic activity"	Personal communications about carbon found in soil cores	Smith and Tunison (1992) [43]
Lowland and upland wet areas	High elevation bog	Presettlement through European settlement	Charcoal shows evidence of fire throughout the Holocene; these fires were likely volcano-ignited fires in montane forests. In the last 200 years, charcoal particles greatly increased; these particles are derived from graminoids rather than from woody plants.	Sediment core with pollen analysis and carbon dating	Burney and others (1995) [6]

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Lowland and upland wet areas	Montane tree-fern rainforest	Presettlement	Charcoal dated at 340, 1,040, and 2,080 years (± 200 years). Interval between fires: 1,040 and 700 years; average of 870 years. Fire periods correlate with volcanism rather than drought.	Sediment core with carbon dating	Mueller-Dombois (1981) [37]
Lowland and upland wet areas	Upland bog	Presettlement through European settlement	Charcoal present throughout the core (beginning at 1600 radiocarbon years). Gradual transition from arboreal to herbaceous pollen may be related to Hawai'ian modification or post-European vegetation change.	Sediment core with pollen analysis and carbon dating	Juvik and Lawrence (1982) [24]
Lowland and upland wet areas	Lowland wet forest	Hawai'ian settlement	Charcoal dated at 772 ± 90 years BP (~1100-1320 AD)	Charcoal and subfossil land snail deposit at base of alluvial fan	Kirch (1975) [28]
Lowland and upland wet areas	Conversion of lowland wet forests to grasslands	Hawai'ian settlement	Slash and burn agriculture probably created and maintained the open grassland mixed with pioneering species and species that tolerate light and regenerate after a fire.	Observations of vegetation characteristics and burning practices	McEldowney (1979) [35]
Lowland and upland wet areas	Rain forest	Presettlement through European settlement	Fires occur infrequently. Flammability of rain forests under drought conditions, apparent fire adaptations of dominant species, and periodic occurrence of lightning implies that fires occurred in wet communities.	Fire records and observations; vegetation characteristics, climatic attributes	Vogl (1969) [50]

*Approximate dates of each time period are as follows: Presettlement was prior to 400 CE; Hawai'ian settlement was between 400 and 1800 CE; and European settlement was after 1800 CE.