

Fire and Invasives in Hawaii: How grasses have changed the Hawaiian Landscape



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Critical Habitats



Clermontia grandiflora
subsp. *munroi*
Campanulaceae
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Invasive plants in Hawaii

- > 8,000 introductions
- > 1,000 naturalized
- Many invasive
- Some fire-tolerant and fire-adapted

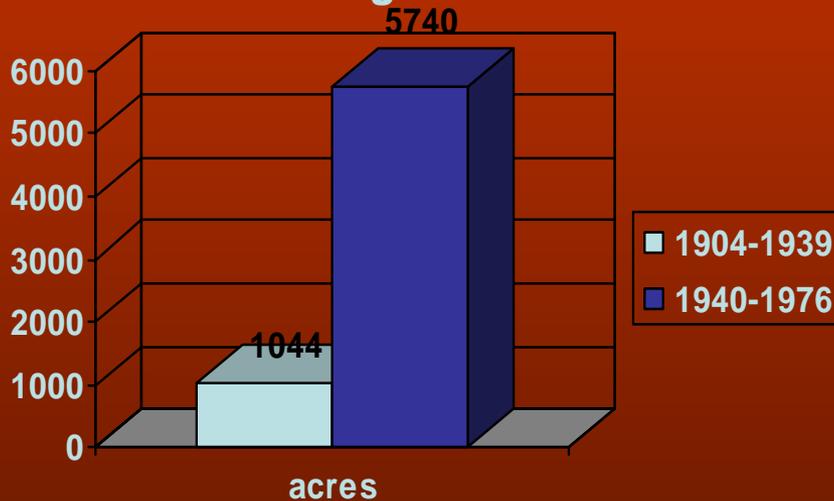


Islands born of fire

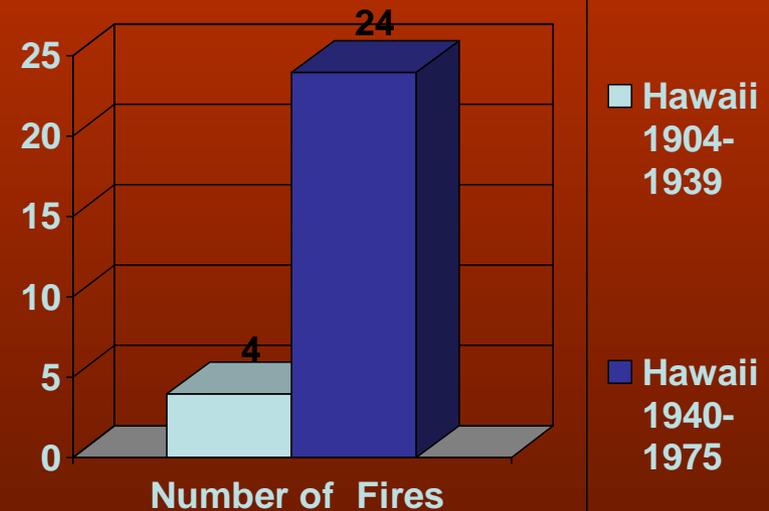


Increase in Fires in 20th Century

Average acres burned per year throughout state



Average Number of fires per year



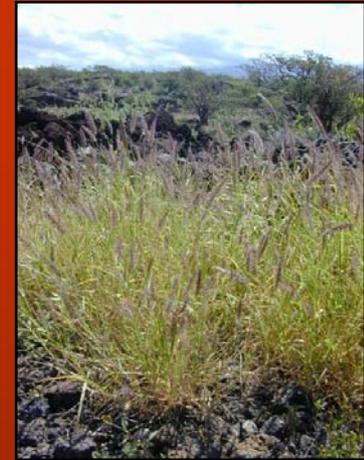
Non-native grasses carry fires



Molasses grass
Melinis minutiflora



Broomsedge
Andropogon virginicus



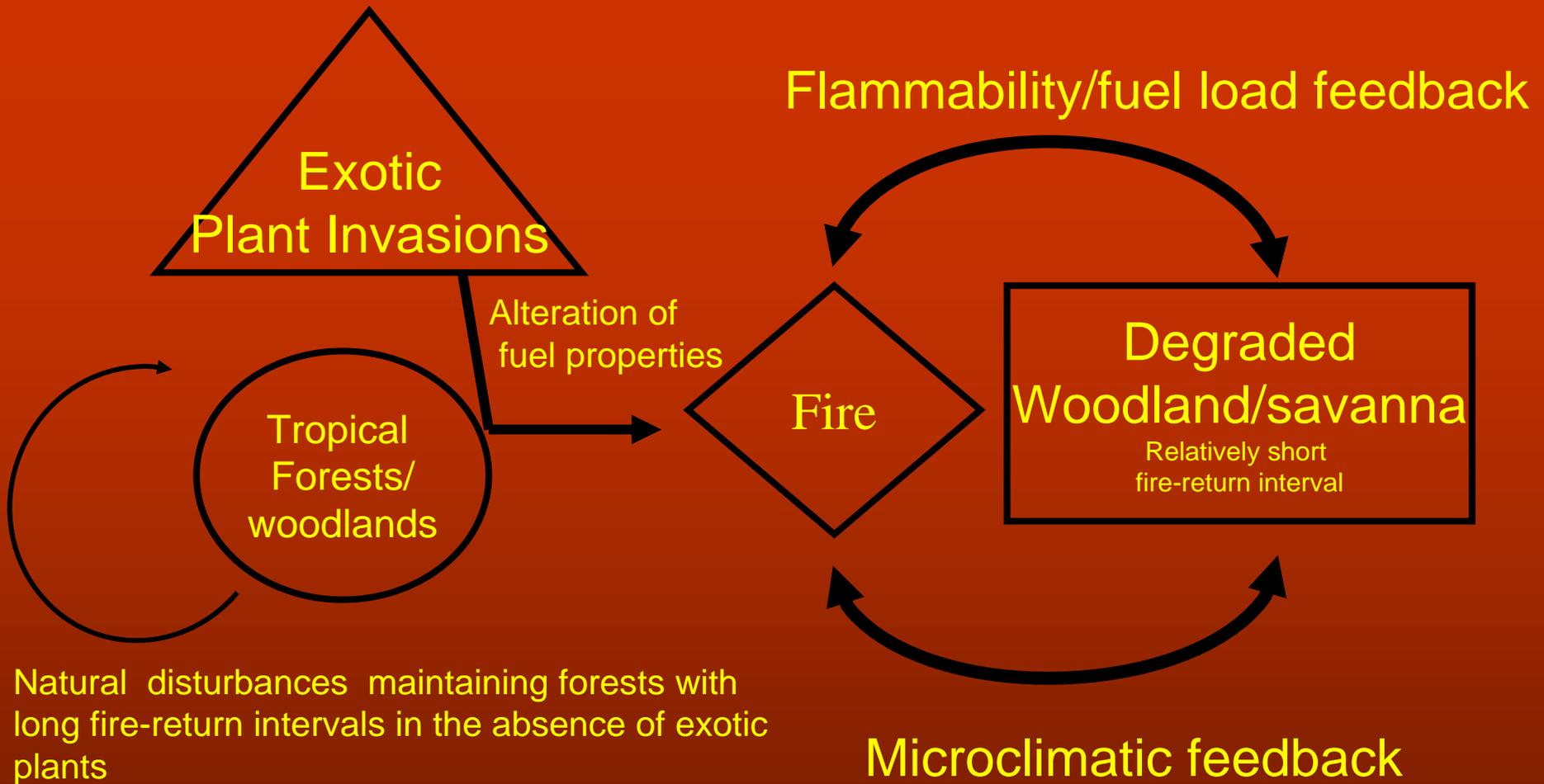
Buffel grass
Pennisetum ciliare



bush beardgrass
Schizachryium condensatum



Fountain grass
Pennisetum setaceum



Hypothesized alterations of fuel properties

- Increased Fine fuel loads
- Decreases in Surface: volume ratio of surface fuels
- Decreases in Fuel moisture content

Where are all the studies?



- Early 1990's
 - Tunison
 - D'Antonio
 - Hughes
 - Vitousek
- 2000 +
 - Kauffman
 - Ainsworth
 - Daehler
 - Loh

Grasslands



- Nonnative grasslands maintained
- Nonnative grasses compete in post fire environment

Shrublands



Coastal shrublands



Subalpine shrublands. Before & after fire

- Grasses decrease slightly in coastal
- Woody plants increase or decrease
- Grasses increase in subalpine
- Most woody plants decrease initially
- Woody plants recover

`Ōhi`a woodland conversion



- Fires 10 X more frequent and 175 times larger
- > grass cover by 1/3
- > grass biomass 2-3X
- < Native species cover
- Loss of native species

Grass Competition



- Low light levels under thatch inhibit germination
- Molasses grass replaces bush beardgrass

Mesic and Wet Forests



Nephrolepis multiflora



Unburned 'ohi'a-tree fern forest



'ohi'a sprouting



Hilo grass understory after fire

Fire tolerant native communities

- Major fire promoting grasses absent
- Koa respouts
- Canopy closes
- Forest regenerates
- Grass persists in understory



Challenges and Needed Research: Breaking the Grass Fire Cycle

- Fire behavior of invasive grasses
- Link fuels, fire weather and fire behavior
- Decrease flammability in the system



Challenges and Needed Research: Short term and long term competitive interactions of native and nonnative species



Challenges and Needed Research: Restoration



Native Dry Forest invaded by
Fountain Grass



Ōhi`a woodland restoration - HVNP

Better Prevention and Detection



Painting by Ann Rathburn