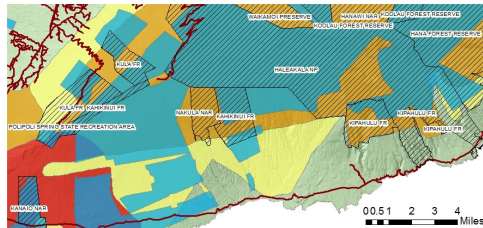
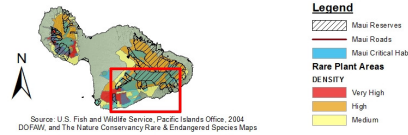


WILDFIRE ON LEEWARD MAUI: A HOT CONSERVATION THREAT

By Christa Seidl



Critical Wildlife Habitat on Leeward Maui

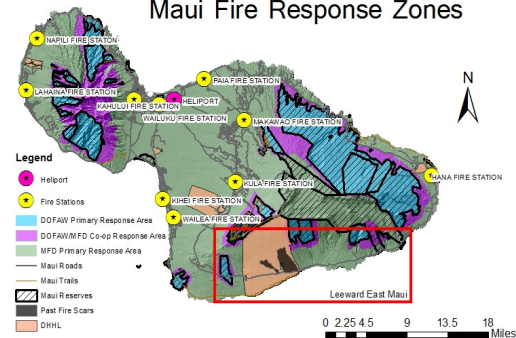


Map 1. Leeward Maui contains some of the highest concentrations of critical wildlife habitat and is currently the focus of a number of restoration and reforestation projects.



A landscape view of Nakula NAR and the mixed grassland/dry forest that typifies higher elevation Leeward Maui. Photo credit: Maui Forest Dry Recovery Project

Maui Fire Response Zones



Source Department of Land and Natural Resources, Division of Forestry and Wildlife, Fire Management Program, 2007-2014

Map 2. The fire response zones and responders to wildfire on Leeward Maui. Note the distance of fire stations from study area.

Introduction

The Hawaiian Islands are home to some of the world's most unique flora and fauna, and of the nearly 10,000 native species, 90 percent are found nowhere else¹. This high level of endemism has made Hawaii both a biodiversity hotspot and an "extinction capital of the world," as increased human activities often come into conflict with native ecosystems^{2,3}. Perhaps the ecosystem that best illustrates this discrepancy is the tropical Hawaiian dry forest, reduced to less than 10 percent of its original extent but home to over 200 native and endemic species⁴. The recent introductions of grazing ungulates, alien plant species and fire-resistant grasses have drastically changed the dryland ecosystems structure, and introduced grasses in particular have increased the incidence of wildfire around species that are not adapted to high fire-frequency. On Maui this has turned much of the island's eastern leeward side from dryland forest into a fire-spreading mixed pasture grassland. Wildfire on this part of the island threatens 25 percent of Hawaii's endangered species, at least 6 state reserves, the agricultural production of major ranching landowners, wind power alternative energy resources and Kahikinui Hawaiian homelands⁵. The use of Geospatial Information Systems and satellite imagery analysis is a great resource to help better understand wildfire risk and its impacts on these communities.

Goals

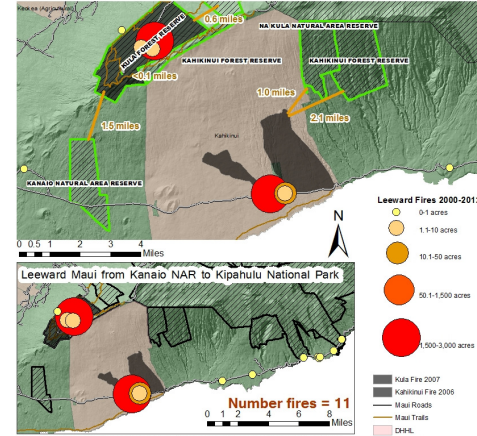
Therefore, the goal of this analysis is to explore the history of wildfire and imagine future fire threats for leeward East Maui, considering a number of environmental factors, past fires, fuel loads, land use, municipal facilities, and land cover using GIS. In particular, this analysis will focus on the risk past fires have posed to "valuable lands" which are defined as state reserves or Hawaiian Homelands. The resulting maps can provide land managers, the county, and other interested parties with information they can use to better protect important lands and natural resources.

Methodology

ESRI's ArcGIS suite was the main GIS analysis platform used in this review. A number of existing shape and raster files were sourced from the state of Hawaii's Office of Planning, the University of Hawaii-Hilo's geography department, the Department of Land and Natural Resources, the LANDFIRE program, and the Pacific Disaster Center. Attribute tables, the identify, and other geoprocessing tools were then used to create and analyze data. Leeward Maui for this analysis is defined as the land below Haleakala National Park and the ocean, on the leeward slope of Maui between and including Kanao Natural Area Reserve to Kipahulu Forest Reserve. Kula Forest Reserve was considered in this analysis for its threat potential to nearby Leeward reserves. Maui's reserves and the Department of Hawaiian Homelands locations were denoted as "Threatened Places" and used to create a historical threat rating for fires from 2000-2012. The rating was created to establish a basis for gauging the biological and cultural risk of certain fires, and was given weight by comparing size of fire, number of threatened places, and proximity to closest threatened place.

Map 3. The fuels and fire regimes of Leeward Maui. These designations are in accordance with the U.S. LANDFIRE Program, where in L.N, and T Vegetation models burn the fastest.

Leeward Maui Fires from 2000-2012



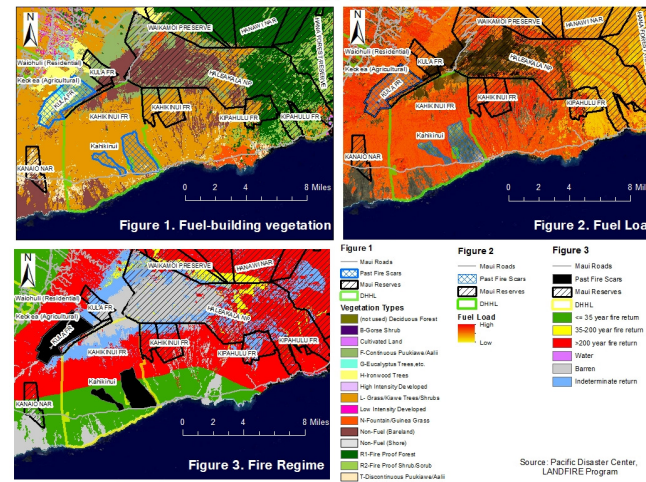
Map 4. Ignition locations and their comparable size. Note the location of fires along the road and inside reserves/Hawaiian homelands.

Results

The table below shows the 11 fires and this project's determined threat ratings. Note: a proximity value of 0 means the fire was located within a "threatened place."

Fire Date	Acres Burned	Threatened Places	Nearest Place Threatened (mi)	Threat Rating
9/21/2006	2819	4	0	High
12/29/2007	2295	5	0	High
3/22/2007	8	3	0	Medium
7/2/2012	4	4	0	Medium
7/18/2007	3	3	0	Medium
2/25/2010	1	1	0	Medium
3/21/2008	0.1	5	0	Medium
3/26/2010	0.25	2	0.5	Low
2/12/2010	0.12	2	0.5	Low
2/22/2010	0.1	2	0.5	Low
4/18/2012	0.01	1	1.7	Low

Leeward Maui Fire Potential



Discussion

In the period between 2000 and 2012, 11 fires have been reported in Leeward Maui, about 1 per year. These fires have ranged in size from 0.1 acres or less to nearly 3,000 acres. Over half have burned less than an acre and all but two have burned less than 10 acres. The average wildfire, not including the two largest, was 5 acres. The two largest fires have burned more than 130 times as much land as all others combined. This large statistical jump in fire size, slightly screwed the rating system to everything above 10 acres as a high threat, and medium threats usually defined as more than 1 acre. More fire data would be needed to adjust this rating system, but it still shows that capability of wildfire with the right fuel load getting out of control quickly. This gap was none-the-less strange more research could be done as why. Seven of the 11 fires burned within state reserves or Hawaiian homelands, including the largest fires which burned critical wildlife habitat and highly diverse rare plant zones. All 11 fires were within 2 miles of a reserve or Hawaiian homelands, which shows just how at risk these resources have been during almost every fire event. Most burned along roads, in high fuel load areas whose vegetation type is mostly Grass/Kiawe Trees/Shrubs, capable of burning 88 feet per minute. The fire regime in these areas is most often classified as regime 1 with a less than 35 year return interval. However, the Kula fire of 2007 burned in regime 3, with a >200 year return interval in a vegetation type that needed dry conditions for a sustained burn. This fire illustrates the potential for large-scale fire habitats whose environmental parameters may be affected by climate change or drought. Furthermore, this analysis showed that the nearest fire stations are in Kula and Hana, about 20 miles away from center of Leeward Maui, determined to be the Kahikinui 2006 burn zone. Helicopter wildfire fighting is the timeliest but most costly wildfire manager for this zone.

Conclusion

Leeward Maui will continue to experience increased wildfire risk into the future, and given the investment of valuable resources in this region, response plans and wildfire mitigation programs are of the utmost importance. Though Leeward Haleakala has a comparatively low population density to the rest of the island, the cultural and economic importance of intact dryland forests cannot be underestimated⁶. This analysis particularly calls to attention the necessity of timely fire response and having well-trained crews for DOFAW when fires spread to Natural Area Reserves, many of which are difficult to access. Land managers and owners should consider evacuation protocols, training more employees in Wildland fire-fighting techniques, and fire-wise development plans. Reducing the incidence of manmade fire through outreach and land management techniques is also recommended. Hopefully through greater wildfire threat knowledge we can protect leeward Maui for generations to come.

Citations

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