Wildland Fire and Erosion (on Pacific Islands)



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The Joint Fire Science Program (JFSP) & Fire Science Exchange Network



JFSP: Research Supporting Sound Decisions

www.firescience.gov

The Fire Science Exchange Network



The Pacific Fire Exchange

Founding Partners:



UNIVERSITY OF HAWAI'I AT MĀNOA College of Tropical Agriculture and Human Resources

The Pacific Fire Exchange



Goal: Reduce wildfire threats to ecosystems and communities in the Pacific

- Facilitate knowledge exchange
- Enable collaborative relationships
- Leverage best available research

Products & Activities:

- Webinars
- Field Trips
- Workshops
- Fact Sheets
- Research Briefs
- Newsletter & Website

www.PacificFireExchange.org @PacificFireSci



Visit us online!

What drives soil loss in the Pacific?

- Short-term
 - Fire
- Long-term
 - Grassland Expansion
 - Badland expansion



Fire Science on a single slide



Moritz et al. 2005. Proc. Natl. Acad. Sci.



Central Oahu 2013

Why we care...



Mauna Kea 33 Fire 2010. Photo: Jay Hatayama

Fire Intensity vs Fire Severity

- <u>Fire intensity</u> = energy output
 - heat yield * biomass * rate of spread
 - Metrics flame height, temperature
- <u>Residence time</u> = how long an area burns

• <u>Fire severity</u> = impact of fire on soil and vegetation



Fire and Erosion: Mechanisms

- Combustion
 - Plant mortality and consumption
 - Litter, duff, humus consumption
- Heating of Soil Organic Matter
 - Nutrient release & volatilization
 - Water repellency



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Fire and Erosion: Effects

- Increased Erodibility
 - **U** Vegetation & litter cover
 - 🛃 Soil aggregation
- Increased Surface Runoff
 - 🛃 Evapotranspiration
 - 🕓 Surface roughness
 - 🚺 Repellency



Fire and Erosion: RESPONSE

- Assess fire severity & erosion potential
- Prioritize management areas
- Consider erosion control options
- Monitor?



Hawaii/Pacific Bare Area Emergency Response (BAER) Team?



College of Tropical Agriculture and Human Resources University of Hawai'i at Mānoa Forestry and Natural Resource Management May 2015 RM-19

Post-Fire Vegetation and Soil Monitoring in Hawai'i



Assessing fire severity

- Vegetation Burn Severity Indicators:
 - crown scorch
 - Plant mortality
 - Litter/duff consumption (soil exposure)

- Soil Burn Severity Indicators:
 - burn depth
 - Color
 - Texture
 - aggregation
 - infiltration



HIGH

MODERATE





Prioritizing management areas

- High burn severity
- Steep slopes
- Resources/Assets at risk





Erosion Control Options

- Short-term Post-fire
 - **Direct Seeding** Little short-term effect (JFSP Project Number 08-2-1-13)
 - Erosion Treatments mixed outcomes, well studied in Western US

TREATMENT	High intensity Rainfall	Low intensity Rainfall	Large quantity of rainfall	Feasibility* (Cost/materials)
Straw Mulch	Good	Good	Good	Low?
Wood Mulch	Good	Good	Good	Moderate?
Hydro-mulch	Not Good	Good	ОК	Moderate
Contour Felling (logs)	Not Good	Good	ОК	High
Straw wattles	Not Good	Good	ОК	Moderate

EFFECTIVENESS (GOOD, OK, NOT GOOD)

From: Robichaud and Ashmun 2013. Tools to aid post-wildfire assessment and erosion-mitigation treatment decisions. *International Journal of Wildland Fire*, *22*(1), pp.95-105. *Feasibility based on anecdotes

Erosion Control Options

- Long-term
 - Reforestation



Soil depth: Tree Plot (TP) vs. Tree Reference (TR)



Shelton and Richmond 2016. Estuarine Coastal and Shelf Science

Observations and Questions from the Field

Jack

Actions on the fireline to prevent erosion Fireline rehabilitation (post-fire) Dozer line management/rehabilitation Integrating BAER (Bare Area Emergency Response) with fire suppression operations Funding for post-fire work?

Observations from the Field

Willie

Fire break/fuel break management
e.g. Spraying vs mowing vs green breaks
Use of dessicants?
Pre-planning ("Working Circles")
Allowing areas to burn?
Preparing for post-fire conditions

Break Planning – Land Planning

Intention of fire/fuel breaks

- 1. Stop the fire
- 2. Defensible space
- 3. Fire road
- 4. Minimize the risk of ignitions
- 5. Do something when no one is present

Relates to adjacent management area

- Asset protection
- Forest/natural area protection
- Is a fire in this area okay?
- Land reconciliation, Working Circles



Best Practices based on substrate

Lava or gravel

- bulldoze
- Spray, no mow
- Incorporate w/ other land use i.e. fencing, roads

On dirt

- bulldoze
- Mow, no spray
- Graze
- Calcium carbonate











Maintenance – Maintenance - Maintenance

- Do a good job recording work and costs so that you can make an annual budget
- Its something you WANT every year, but the boss is always going to ask for it cheaper
- Spend the \$\$ to make a good break, so that it will be accessible later, there are always hidden problems down the track
- Mowing is cheap!
- Not grass than broadleafs are on their way



Observations from the Field

Audience turn: Observations? Questions? Ideas?





Please take a brief survey afterwards and help us do better MAHALO

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