FIRE AND DROUGHT IN PARADISE—SAY IT ISN'T SO, SMOKEY

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The last two summers have resulted in historic wildfire activity on the US mainland – 8.2 and 9.1 million acres burned in 2011 and 2012, respectively (National Interagency Fire Center 2012). Unfortunately for Smokey Bear, who may be looking for an opportunity to hang up his shovel for a surfboard for a few months, a trip way out west to the Hawaiian Islands would not serve as a vacation. In fact, Smokey would find "paradise" to have a hornet's nest of fire issues. Indeed, there is fire in paradise even during the "winter" or vacation months, thanks largely to a tropical climate that supports year-round fire potential and a veritable smorgasbord of nonnative plants that provide continuous and highly flammable fuels. Because of the uninterrupted threat for anthropogenic and natural ignitions, which have been compounded by drought conditions over the past five years, Smokey's message of "Stop wildfires" is welcome in Hawaii. In fact, his widely recognized wildfire awareness campaign may be more appropriate in the Aloha State as compared to western states.

Fire in Paradise

Fire has always been a part of the Hawaiian Islands and other tropical ecosystems across the Pacific thanks to primal ignition sources of lava and lightning (Picture 1). However, since the introduction of nonnative invasive species and human ignitions sources, the nature of this historic disturbance has been transformed. For example, Hawaii Volcanoes National Park recorded 35 fires with an average size of ~6 acres per fire between 1924 and 1963. Whereas, 97 fires were recorded with an average size of ~356 acres per fire between 1964 and 1995 (Tunison et al., 2001). This 3- and 60-fold increase in number of fires and average fire size has been contributed to the increased occurrence of nonnative, invasive grasses. Altered fire regimes are also the current storyline in most western forests.

Tropical ecosystems, similar to western forests, have their own "fire storm" brewing, or growing, as it may be better characterized. Comparing Island vs. mainland novel fire regimes reveals certain parallels as well as deviations. Both regions are compromised by a volatile combination of drought, untimely ignitions – natural and otherwise – and a fuel bed that is primed to burn at high intensities. Overgrown western fuel beds are generally characterized by fuel densities and continuities outside the historic range of variability as a result of fire suppression. However, the trees and shrubs that make up the fuel bed are typically native species.

In contrast, the fuel bed of concern across the Pacific is primarily non-native in origin. Dry tropical forests and coastal lowlands, in particular, have been invaded by non-native grasses such as fountain (Cenchrus setaceus), molasses (Melinis minutiflora), and Guinea grass (Megathyrsus maximus). The fact that these grasses

PICTURE 1: LIKE NO PLACE ELSE ON EARTH – LAVA IGNITES INVASIVE GRASSES IN THE FOREGROUND AND CREATES NEW LAND IN THE BACKGROUND AS IT RELEASES STEAM WHEN IT COOLS IN THE PACIFIC OCEAN. PHOTO BY GREG FUNDERBURK.

are non-native is significant for two reasons: 1) these species are prolific reproducers following fire due to their adaptations to frequent and often intense fire; and 2) the native species they are competing with in the post-fire environment are less adapted to frequent and intense fire.

For example, it is not uncommon for Guinea grass to out compete all other vegetation and grow in near monotypic stands up to seven feet tall (Picture 2). Lisa Ellsworth, a graduate student at the University of Hawaii at Manoa, recently measured and reported a Guinea grass pasture contained 15 tons of fine fuels per acre. From a management, suppression, and community safety perspective, the fire hazard created by these grasslands approaches the unmanageable. The competitive advantage for non-native grasses is further exacerbated to the detriment of native species following multiple fires in what is commonly referred to as the invasive "grass-fire cycle." In this process, native trees and shrubs are killed or damaged by fire. During the recovery or re-vegetation period, fire adapted grasses become established. As this process repeats itself, native trees and shrubs are eliminated or outcompeted and in a relatively short period of time these native ecosystems are converted to non-native fire-prone grasslands. A similar phenomenon has been reported in the southwestern US where ecosystem type conversions are being driven by drought and fire. Specifically, shrublands have replaced over-stocked, fire suppressed ponderosa pine forests that burned at high severities across large spatial scales. As a result, restoration of native communities and control of invasive grasses is a priority in Hawaii, thanks in large part to frequent wildfires over the past several decades (Picture 3).

What is the Solution?

To help find solutions and answers to pre and post fire challenges, the Joint Fire Science Program, a collaborative, multi-federal agency funding and science delivery partnership, recently awarded the Pacific region with a grant to establish a knowledge exchange consortium. This follows the funding of 13 other regional consortia across the country with similar missions (visit the Joint Fire Science Program on the Web at firescience.gov – find the regional consortia in your area).

The Pacific Fire Exchange is the newly established fire science consortium in the Pacific (visit the website at (pacificfireexchange.org). The vision of the PFX is

"LISA ELLSWORTH, A GRADUATE STUDENT AT THE UNIVERSITY OF HAWAII AT MANOA, RECENTLY MEASURED AND REPORTED A GUINEA GRASS PASTURE CONTAINED 15 TONS OF FINE FUELS PER ACRE. FROM A MANAGEMENT, SUPPRESSION, AND COMMUNITY SAFETY PERSPECTIVE, THE FIRE HAZARD CREATED BY THESE GRASSLANDS APPROACHES THE UNMANAGEABLE."

PICTURE 2: A UNIVERSITY OF HAWAII AT MANOA GRADUATE STUDENT WORKING HER WAY THROUGH A GUINEA GRASS FIELD ON THE ISLAND OF O'AHU. PHOTO BY LISA ELLSWORTH.

PICTURE 3: RESTORATION OF NATIVE TREES AND SHRUBS AT PU'U WA'AWA'A ON THE BIG ISLAND OF HAWAII. THIS PICTURE PROVIDES A STRIKING CONTRAST BETWEEN A "CARPET" OF NON-NATIVE GRASS AND A 1/10 ACRE RESTORATION AREA THAT HAS BEEN CLEARED OF NON-NATIVE SPECIES AND REPLANTED WITH NATIVE TREES AND SHRUBS (LEFT SIDE OF PHOTOGRAPH). THE GREEN "CARPET" IN THIS PHOTOGRAPH IS KIKUYU GRASS (PENNISETUM CLANDESTINUM). THE LARGE DIAMETER TREES ARE NATIVE O'HIA (METROSIDEROS TREMULOIDES), WHILE THE SMOOTH-BARK TREES ARE NATIVE KOA (ACACIA KOA) – THE RESULT OF AN EARLIER OUTPLANTING EFFORT. PHOTO BY DOUGLAS CRAM.

a reduced threat to ecosystems and communities in the Pacific from wildfire. The mission is to facilitate fire knowledge exchange and enable collaborative relationships among Pacific stakeholders including resource managers, fire responders, researchers, landowners, and communities. To achieve this goal, the PFX has partnered with Hawaii Wildfire Management Organization, the University of Hawaii at Manoa, the Institute of Pacific Islands Forestry of the USDA Forest Service, and other private, local, state, and federal partners. Through education, outreach, and research, these partners will bridge the worlds between researchers and managers through diverse knowledge exchange methods including web-based tools, workshops, and face-to-face site visits. Ultimately, the PFX hopes to facilitate the community of fire managers and researchers to answer the most pressing fire management questions facing Hawaii today, and into the future.

Pack Your Bags Smokey

Mainland communities located in western forests have increasingly come to appreciate over the last 12 years – sometimes with painful and swift acuity – that while fire behavior can be modified through proactive forest management, wildland fires cannot be "prevented." The time has come for Smokey to take his campaign to Hawaii and other tropical US affiliated Pacific Islands where non-native fuel beds, frequently ignited by anthropogenic means, are having negative impacts on native ecosystems while threatening communities and visitors to the islands. Ninety percent of Hawaii's native dry forest has already been lost, in large part due to wildfire. Managing the remaining 10 percent, as well as rehabilitating once forested landscapes, is a high priority. Smokey is needed in paradise.

The Economic Impacts of Large Wildfires

BY AUTUMN ELLISON, MAX NIELSEN-PINCUS, EMILY JANE DAVIS, CODY EVERS, AND CASSANDRA MOSELEY

The 2012 wildfire season was one of the worst on record. As firefighters battled record blazes in many states, the fires disrupted the lives of nearby workers, employers, and families. For affected communities, large wildfires can present a mixed bag of positive and negative impacts. Losses in recreation, tourism, forestry, and other natural resource industries may occur with large tracts of burnt land (Kent et al., 2003; Butry et al., 2001). In contrast, the money spent on suppression and support services in the communities can contribute to positive growth in local employment and wages, and support existing local business capacity.

Federal spending on wildfire suppression in the United States has grown since the 1970s as wildfires have grown in size and cost. During the last decade the federal government spent $1.5 billion annually on wildfire suppression – a 250 percent increase from the decade before (Gebert and Black, 2012). There has been little research on the effect of this growing spending on nearby communities. Our research investigated the impacts of large wildfires and associated spending on the economies located near them.

We looked at 346 wildfires that occurred between 2004 and 2008 and cost more than $1 million each in Forest Service suppression costs to show how large wildfires affected local economic growth. We also examined where wildfire suppression spending was distributed from a subset of 135 of these large wildfires representing $1.2 billion