Pacific Fire Exchange FY22 Annual Report (Project 20-3-01-5)

FY22 Overview

On March 7, 2022, the Pacific Fire Exchange program re-emerged out of COVID-19 pandemic restrictions when Hawai'i's state government lifted all travel and public gathering restrictions (some of which were the country's most stringent). As a result, PFX program personnel (Hawai'i Wildfire Management Organization's Nani Barretto, Elizabeth Pickett, Melissa Chimera and University of Hawai'i's Clay Trauernicht) planned for more in-person workshops, field tours, while continuing wildfire virtual events and communications. We continued producing our carefully curated series of theme-based fact sheets, webinars, and presentations, while refining our monthly communications among our primary audience of 329 Wildfire Communications list-serv members (wildfire professionals). A huge undertaking was the PFX website overhaul in response to the invisibility of our content due to search engine problems on the Joint Fire Science Program (Squarespace) site from 2014. This year, we created an elegant, easily readable and usable site. Finally, we expanded our social media audience while simultaneously building our PFX Steering Committee to a robust 11 member group.

Metric 1: Conceptual

How have exchange activities or products contributed to changes in people's knowledge about or awareness of an issue related to wildland fire management?

New digital content focusing on weeds and Hawai'i's changing climate in FY22 included two new fact sheets (Weed Fire Risk Assessment for Hawai'i and Changing Climate and Wildfire in Hawai'i: Current Observations and Future Projections). We also rebranded and re-designed the Pacific Fire Exchange website while disseminating a new curated review of the latest partner and program news, fire science, policy, news and information–our monthly "Resources Roundup."

Wildfire on Pacific islands requires an understanding of how invasive weeds, which are a predominant fuel type, spread and what their impacts are. Pacific islanders also need to predict how the climate crisis might exacerbate fuels buildup and create more wildfire potential. To that end, practitioners have repeatedly requested more information on both topics.

As to the first need, we published the two-page fact sheet *Weed Fire Risk Assessment for Hawai'i* and hosted a hands-on webinar demonstration of the tool. Both the fact sheet and webinar summarizes the results of University of Hawai'i authors Curt Daehler and Kevin Faccenda's research which is the Weed Fire Risk Database for Hawai'i. This database assesses 360+ weeds for their fire-promoting traits. The fact sheet we created provides examples of fire-promoting weeds (many of which are already known to Hawai'i managers) such as invasive grasses and shrubs. Some of these are already widely established in natural and residential areas; however some are newly introduced. These newly introduced species are of great concern to conservationists and land managers precisely because the fire risk is unknown. By inferring fire risk based on traits of species with known fire-promoting weeds, this new database provides critical information on how managers should prioritize weeds for early detection and control.

As a result, the PFX website now permanently houses this important information. The Weed Fire Risk Database is where users can search by weed species and/or geographic location. The weed fire risk data project proved to be the most sought after information on our website, with 358 unique page views lasting an average of 3 mins 44 sec each, the most and longest visits anywhere on our site.

In response to a 2020 Steering Committee's decision to prioritize better information regarding the climate crisis and associated vegetation shifts, we published the second fact sheet in the Climate Change Series: *Changing Climate and Wildfire in Hawai'i: Current Observations and Future Projections*. This fact sheet outlines fire risk predictions based on historical data and future climate scenarios (with new data analysis until now unpublished by authors Clay Trauernicht and Nathan DeMaagd). These include future mid- and late-century projections in which wildfire potential is increasing in higher (than present) elevations. Increased fire risk in these areas would have potentially catastrophic consequences for the remaining native ecosystems which are already under pressure from massive landscape changes and extinction pressures over the past 240+ years.

The new analyses also highlight the effect of increasing fire risk due to the combination of sporadic deluges followed by droughts. These conditions are already observable under current climate variability. Heavy rainfall events increase tropical grassy fuel loads–a unique aspect of fire risk on Pacific islands which is expected to increase in the future. In short, the science presented here is both a warning and a guide in considering how the climate crisis may impact Hawaiian high islands now and into the future. The work here underscores the importance of reducing the quantity and continuity of grass-dominated fuel types.


PFX FACT SHEET

Intended Audience: land managers & researchers

Pacific Fire Exchange | Climate Change Series | September 2022

Changing Climate and Wildfire in Hawai'i:
Current Observations and Future Projections

As the climate crisis intensifies, weather extremes such as drought, intense rainfall and wildfires are expected to increase in Hawai'i with the most drastic effects expected by mid-century.

As our climate warms, Hawai'i as we know it is changing.

Weather extremes such as drought and intense rainfall are already happening and are expected to become more frequent as the climate warms, causing fires to be more frequent, widespread & last longer lasting.

More than 25% of the state is covered in non-native grasses, making our landscape especially sensitive to more variable and unpredictable rainfall. Vegetation "green-up" after rainy events followed by drought creates high fire risk in both leeward and windward areas.

The largest increase in future fire risk is expected across upper elevation areas. This may pose challenges for both ecosystem conservation and fire suppression since road and water access in these areas are typically limited.

Regional spotlight
Maui 2019 fires

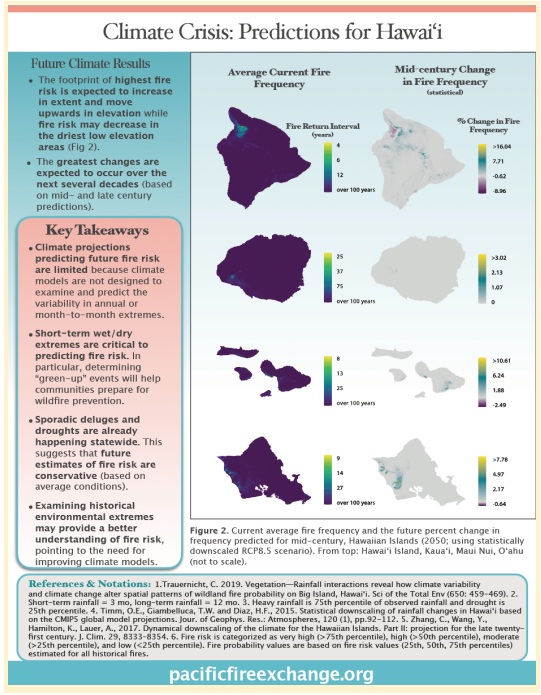
With little rain and record-breaking heat, more than 25,000 acres burned on Maui in 2019. This marked the island's worse fire year ever.

Specifically, multiple fire responders pointed to climate change, in particular, when discussing the 9,000 acre Waiko Road Fire. They said that the speed and intensity of this grassland fire was something they "had never experienced before." Along with high winds, the temperature topped 93 degrees at Kahului, 9 degrees above average, with very low relative humidity (34%).

As a result, the fire growth was explosive with little chance for containment and incredibly dangerous conditions for fire responders and the community. The Waiko Road Fire also threatened Maui Electric Co.'s Ma'alaea Power Plant that supplies electricity to 80% of the island.

This fact sheet was co-produced by Hawai'i Wildfire Management Organization and University of Hawai'i Cooperative Extension Wildland Fire Program on behalf of the Pacific Fire Exchange project, which is funded by the Joint Fire Science Program. Photo credits: U.S. Drought Monitor and The Maui News/Matthew Thayer.

HWMO


Climate Crisis: Predictions for Hawai'i

Future Climate Results

- The footprint of **highest fire risk is expected to increase in extent and move upwards in elevation** while **fire risk may decrease in the driest low elevation areas** (Fig 2).
- The **greatest changes are expected to occur over the next several decades** (based on mid- and late century predictions).

Key Takeaways

- **Climate projections predicting future fire risk are limited** because climate models are not designed to examine and predict the variability in annual or month-to-month extremes.
- **Short-term wet/dry extremes are critical to predicting fire risk.** In particular, determining "green-up" events will help communities prepare for wildfire prevention.
- **Sporadic deluges and droughts are already happening statewide.** This suggests that **future estimates of fire risk are conservative** (based on average conditions).
- **Examining historical environmental extremes may provide a better understanding of fire risk,** pointing to the need for improving climate models.

Average Current Fire Frequency | Mid-century Change in Fire Frequency (statistical)

Fire Return Interval (years) | % Change in Fire Frequency

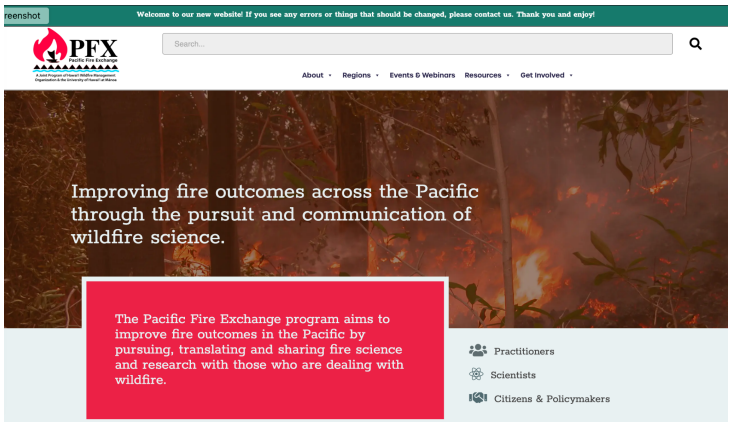
Figure 2. Current average fire frequency and the future percent change in frequency predicted for mid-century, Hawaiian Islands (2050; using statistically downscaled RCP8.5 scenario). From top: Hawai'i Island, Kaua'i, Maui Nui, O'ahu (not to scale).

References & Notations: 1.Trauernicht, C. 2019. Vegetation—Rainfall interactions reveal how climate variability and climate change alter spatial patterns of wildland fire probability on Big Island, Hawai'i. Sci of the Total Env (650: 459–469). 2. Short-term rainfall = 3 mo, long-term rainfall = 12 mo. 3. Heavy rainfall is 75th percentile of observed rainfall and drought is 25th percentile. 4. Timm, O.E., Giambelluca, T.W. and Diaz, H.F., 2015. Statistical downscaling of rainfall changes in Hawai'i based on the CMIP5 global model projections. Jour. of Geophys. Res.: Atmospheres, 120 (1), pp.92–112. 5. Zhang, C., Wang, Y., Hamilton, K., Lauer, A., 2017. Dynamical downscaling of the climate for the Hawaiian Islands. Part II: projection for the late twenty–first century. J. Clim. 29, 8333–8354. 6. Fire risk is categorized as very high (>75th percentile), high (>50th percentile), moderate (>25th percentile), and low (<25th percentile). Fire probability values are based on fire risk values (25th, 50th, 75th percentiles) estimated for all historical fires.

pacificfireexchange.org

Finally, we undertook a reorganization, re-design and revamping of the [Pacific Fire Exchange website] (based on a blend of the Great Basin's and Southern Rockies Fire Science Network's websites). Our strong website visitation with nearly 9,000 unique page views averaging almost 2 minutes per view in FY22 necessitated a fix to inherent problems stemming from the 2014 Squarespace design. The weed risk pages followed by our maps, tools and infographic pages were top billing. However many other products were difficult to find as the search engine was constantly breaking. The volume of visitors required a complete overhaul.

The new PFX website now includes a much more elegant interface including searchable content (by geography, topic and resource type) and a research library (which is still in progress). Great care was paid to explaining our values and reason for existing, as well as using simplified, non-technical language that would appeal



to casual browsers, practitioners and researchers alike. A simplified homepage menu means that one can now understand who we are, the scope of our program, find some of our most popular products, and discover how to get involved.

Finally, a new monthly resource newsletter, the "[Resources Roundup]" goes out to 329 Wildfire Communication list-serv members. The monthly roundup offers much more than links to wildfire news,

policy, research, and events. It includes highlights of our community members, our partnerships in action and digs into the PFX product archive (both new and old) to re-introduce our wildfire community to relevant information that they may have previously missed.

Metric 2: Connectivity

How have exchange activities or products led to new or strengthened relationships, partnerships, or networks that endure after the project ends related to wildland fire management?

PFX resumed in-person field tours and workshops–this time focusing on farmers and landowners to reduce wildfire in arid agricultural areas. We also expanded our knowledge base by filling critical expertise (such as social science and private utility representation) on the PFX steering committee.

This past year, Pacific Fire Exchange continued to serve as a key hub for connecting scientists with land managers and communities–while also expanding to farmers and farming interns in Waiʻanae, West Oʻahu. These communities are challenged by decades of socio-economic and environmental hardships, not the least of which is repeated wildfire, sometimes reoccurring year after year. Adding to the complexity is that Waiʻanae is considered a food desert in which fresh produce and nutritious food is scarce. As a result, local farms which are ever vulnerable to wildfire in this arid region offer a critical food source.

For example, in West Oʻahu, the most recent large-scale wildfire event impacted three valleys simultaneously in 2018, destroying structures, crops and related infrastructure on multiple farms. An important outcome of these wildfires has been ongoing direct requests for PFX involvement with agricultural extension program outreach and youth education as well as active engagement by farmers in fuels mitigation projects (such as green strips, grazing, and youth education). These audiences continue to use and refer to PFX resources. Similarly, larger fires (e.g.,15,000-40,000 acres) on Hawaiʻi Island in 2021 and 2022 has resulted in grazing operation managers seeking input and using PFX products for wildfire planning and alternative fuel mitigation strategies in the past fiscal year.

To support West Oʻahu farmers, two in-person workshops were held. The first, “Fire and Agriculture” at Maʻo Farms for land stewardship interns introduced fourteen would-be young farmers to the basics of wildfire in the Pacific while giving them hands-on experience in pre-fire hazard identification and planning for six farm sites across Oʻahu (right). Feedback from students included one who said,

“I can better identify better practices in preventing wildfires. I like the fact that I can now apply these ideas to my everyday life and do a better job preventing fires.”

PFX then supported a two-day "Grazing and Wildfire Mitigation Best Practices Workshop" hosted by Ka'ala Farms with Dr. Mark Thorne, University of Hawai'i's State Range and Livestock Extension Specialist, and co-PIs Clay Trauernicht and Elizabeth Pickett. The workshop arose in response to farmer concerns following the extremely destructive West O'ahu fires described above and the growing interest in grazing as a fuels management strategy. In addition to learning critical skills for animal care and husbandry, one of the major outcomes of this workshop was connecting new farmers with far more experienced ranchers versed in animal management. This resulted in increasing herd sizes and therefore more effective fuels management on the ground.

PFX engagement with the Western Pacific continued with two virtual workshops. A three-hour workshop in November 2021 presented PFX materials on fire planning and fuels mitigation to a group of 20 people convened by the Palau Protected Areas Network and the Ebiil Society working to develop a national fire plan for the Republic of Palau. A two-hour workshop held in February 2022 presented similar material to 28 participants from within the U.S.-affiliated Pacific islands and beyond, including Guam, Saipan, Fiji, Vanuatu and the Solomon Islands. (This workshop was requested by the US Forest Service's Pacific Islands Forest Restoration Initiative project)

Our PFX Steering Committee continued to meet quarterly with strong attendance this year. In recognition of the Pacific region's lack of social science research and expertise vis-a-vis wildfire, we sought out and filled two key positions on the PFX steering committee: Kim Burnett, an economist with University of Hawai'i Economic Research Organization, and Lisa Gollin, Adjunct Faculty, University of Hawai'i, Anthropology Department. We rounded out the 11-member Steering Committee with David Kurohara, a business and community consultant for Hawaiian Electric, thereby addressing the relative lack of private utility representation.

Metric 3: Socio-environmental

How have exchange activities or products led to changes in social and/or ecological systems (such as improved health and wellbeing or ecosystem structure and function) related to wildland fire management?

We continued to harness the virtual environment through the expansion of our social science offerings (webinars), monthly list-serv communications and stayed strong with our social media presence to retain and attract new members.

Even as our in-person workshops and field tours resumed, we continued to offer webinars–this year opting for new social science content and a landscape-level, island-wide discussion of fire: (1) Fuzzy Cognitive Mapping: a decision-making tool for land stewardship and wildfire management and (2) A Landscape Perspective on Fire & Invasive Species in Hawai'i. University of Hawai'i's Rachael Cleveland presented a decision support tool (Fuzzy Cognitive Mapping or FCM) to managers, scientists and others called which enables all stakeholders to create a "mental map" to aid in complex decision making. She also addressed the Wai'anae community in her research by engaging them with this inclusive tool which methodically considers various stakeholders' perspectives and values. In the second webinar, co-PI Trauernicht presented the problems of the Pacific island grass-fire cycle at the landscape scale. To a

virtual audience of 60, he described the contributions of historical and social change, and examples of how people are working together to deal with these vegetation and fire regime changes.

As to the dissemination of wildfire information, beginning in FY21 we opted to forgo the quarterly newsletter blast-out to the broader Hawai'i Wildfire audience which includes both non-practitioners and practitioners alike. Rather, we instead focused on more frequent and direct contact with our Wildfire Communications (WC) list-serv presently at 329 members who are the "core" professionals, responders, landowners and stewards involved with all aspects of wildfire. By being targeted in this approach, we encourage members to share with us (and thereby the whole group) any questions or offer information. While direct exchange between members is yet-to-be realized, we hope that the WC can evolve into a dynamic and responsive Pacific-wide learning network.

Similarly, we have continued our social media presence across Facebook, Twitter and Instagram. Admittedly, the Meta Platform (which controls Facebook and Instagram) has been difficult to navigate, causing disconnects with the Hootsuite (scheduling) interface responsible for sending out all social media. As a result, we mistakenly lost our Facebook (FB) page in September, but then reinstated a new page, thereby having to rebuild our FB audience from scratch. Fortunately, prior to this loss, the PFX FB had no significant PFX audience growth in the past year before its deletion. Instead, we have seen a 300% increase in our Instagram audience and a 25% increase in our Twitter followers since 2019. In total, the PFX program now reaches a social media audience of more than 1,442 people.

Challenges and conclusions

In the western Pacific, travel restrictions due to COVID remain in place on some islands including Palau and the Federated States of Micronesia. Many of these islands are maintaining relatively strict quarantine rules, even for vaccinated travelers and residents. This contributed to the ongoing challenge of how to effectively engage PFX audiences in the western Pacific in a meaningful and sustained way. PFX involvement with the national fire planning in Palau presents a good example of an opportunistic approach to supporting this region.

Coincidentally, an assessment of regional needs funded by the US Forest Service (USFS) is pointing to ways in which the exchange can address needs more proactively as well as identify potential members for the PFX Steering Committee. In addition, USFS has recently (September 2022) filled two critical positions to assist in the coordination of fire-related activities across the region. These staff have been in direct contact with PFX, opening up the possibility of more information transfer and collaboration. Finally, with travel restrictions relaxing on Guam and CNMI, PFX is looking to organize in-person events in the next funding cycle.

Table 1 - Participation by Organization (as shown from your mailing list subscribers)	
Organization	Unique Total Number of Participants
States	51
Counties/Burroughs/Parishes	27
Cities and Local Communities	397
Regional Authorities	30
Private Landowner	75
Private Associations	54
Companies	60
Consultants	2
International	11
University and College Faculty or Researchers	59
University and College Students	14
Fire Learning Network and The Nature Conservancy	13
Non-Governmental Organization (not listed above)	100
Bureau of Land Management	1
Fish and Wildlife Service	14
Forest Service (National Forests, Grasslands, State and Private Forestry)	49
Forest Service Research	5
Geological Survey	3
National Park Service	16
Natural Resources Conservation Service	13
Department of Defense including Coast Guard	12
Media	2
Other: Firefighters (County)	104

Table 2 - Participation by Activity		
Activity (conducted, hosted, organized, facilitated, sponsored or produced)	Completed Activities (current year)	Estimated Total Number of Participants (current year)
Talks and Personal Briefings About The Exchange	18	160
Newsletters or List-serv emails Produced	7	635
Fact Sheets and Handouts Produced	2	827
Tweets	151	1027
Facebook Postings	157	87
Other Social Media (please identify) - Instagram	267	755
Webinars	3	296
Database	1	141
Conferences/Workshops	7	162
Requests for Information, Assistance, or Referrals	30	45
Field Trip, Tour, Demonstration or Roadshow	1	35
Field Consultations and Expert Cadres	3	35
Leadership Briefings	3	87
Other: Steering Committee governance	4	11
Other: PFX steering committee guest speaker talks	2	27