Rapid Assessment of Fuel Load Using the GLOBE Observer Fire Fuel App

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Climate Change Has Increased Wildfire

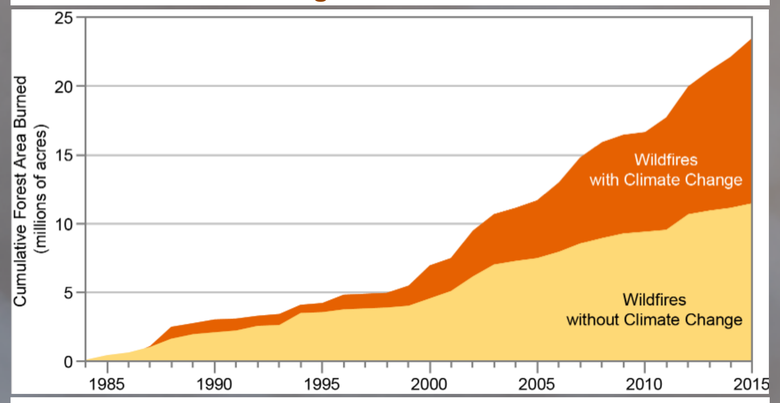

Fig. 1 The total area burned by wildfire in the Western U.S. has doubled due to climate change (National Climate Assessment, 2018).

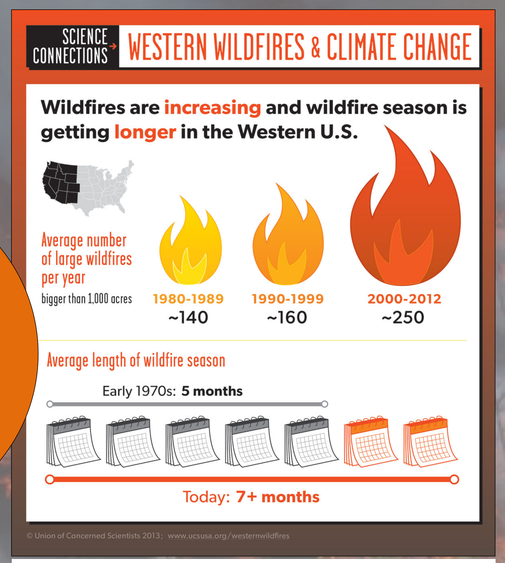

Fig. 2 The number of wildfires and the length of the wildfire season is increasing in the Western U.S. (Union of Concerned Scientists, 2013).

Citizen Science & Fuel Load Monitoring
Involving the public to survey fuel loads allows for widespread and ample data collection to support forest management with critical data while providing public outreach about wildfire risks and prevention.

The GLOBE Fire Fuel Protocol

The current GLOBE (Global Learning and Observations to Benefit the Environment) Fire Fuel protocol is a paper-based survey using the standard Brown's planar intercept method. Because this methodology is complex and time-consuming, no data have been recorded. **The goal of this project is to develop a simplified protocol as both a paper-based version and a new correlated GLOBE Observer app to enable citizen scientists to efficiently collect viable fire fuel data.**

The GLOBE Fire Fuel protocol will be part of the GLOBE Observer app (Fig. 3). Users follow adapted Photoload method screen prompts (Fig. 6) to enter data for 1-hr, 10-hr, and 100-hr fuels, plus forbs and grasses in 1m x 1m plots. Users photographically document the plots and the surrounding land (for additional perspective and to estimate 1000-hr and shrub fuel loads). Data and plot photos can be stored and uploaded to the GLOBE Database when an Internet connection is available. Step-by-step instructions guide the paper-based-protocol user (Fig 7).

The GLOBE Observer Fire Fuel App
The GLOBE Observer team based at NASA Goddard is developing the GLOBE Fire Fuel protocol as a component of the GLOBE Observer app. Planned release: summer 2019

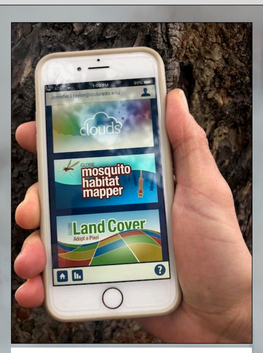

Fig. 3 GLOBE Observer App

Fig. 4 Photoload 1m x 1m Plot Example

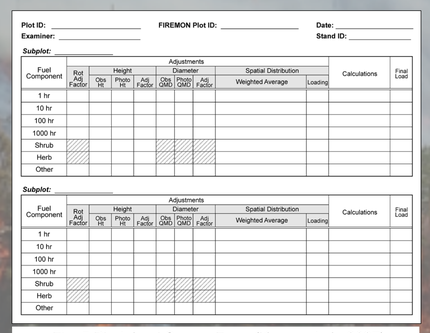

Fig. 5 Photoload Survey Form (Keane et al., 2007)

Benefits of the Photoload Method

Photoload monitoring is a more intuitive way to teach and estimate fuels, compared to traditional fuel monitoring methods (e.g., Brown's planar intercept method—see Fig. 8), which require in-depth training, a high-level of expertise, and often prohibitively long field time to implement. By using the Photoload method, the GLOBE Observer Fire Fuel protocol app will guide users through the different fuel types; from a menu of images, users select the one that most closely represents the fuel density at their location.

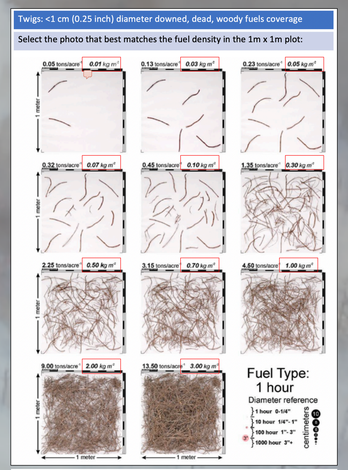

Fig. 6 Fire Fuel App Wire Frame Concept Draft (Image: Keane et al., 2007)

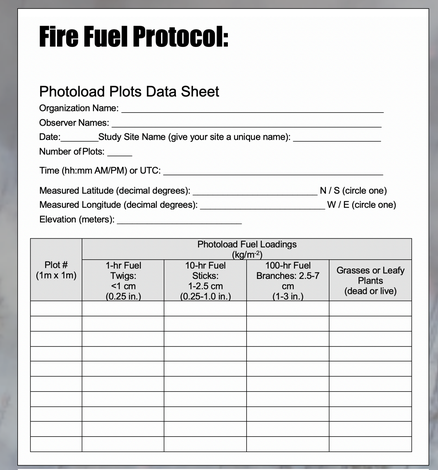

Fig. 7 Fire Fuel Protocol Concept Draft

Wanted: Fire Fuel App Pilot Partners
Researchers, resource managers, and communities are needed to pilot the GLOBE Observer Fire Fuel app.
Contact:
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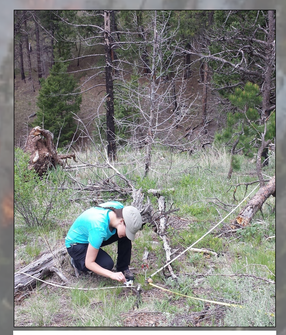

Fig. 8 Using Brown's planar intercept method to assess fuel loads.

Why Fuel Load Monitoring is Important

Over the past 20 years in the U.S., 84% of all wildfires were human-ignited, which more than tripled the length of the fire season (Balch, et al., 2017). In 2017, wildfires burned more land than the previous 10-year annual average in the U.S. (III, 2017). Although fire is necessary to maintain forest health, fire suppression efforts over the past century have resulted in an unnatural buildup of fuel loads (e.g., trees, needles, shrubs, grasses), increasing wildfire hazard (NPS, 2015). Despite increasing risks to ecosystems and communities, collection of fuels data critical to fire and resource management is sparse and far below an adequate level for monitoring; only a few isolated data points exist. Leveraging the power of citizen science will enable expanded data collection to inform fuels management.

Photoload Sampling Technique

The Photoload method utilizes visual data collection to rapidly identify and quantify the types and percent coverage of fuel loads. Keene (2007) has shown that this photo-based method has proven to be a quick, efficient, and accurate monitoring method for 1-hr, 10-hr, and 100-hr fuels (downed, dead, woody fuels) using 1m x 1m plots (Fig. 4) and 1000-hr fuels (logs) using 10m x 10m plots. This approach relies on a modification of the FIREMON (Fire Effects and Monitoring Inventory System) methods (Fig. 5), thus fuel load data is comparable to other regional monitoring and research efforts (CFRI, 2017).

Project Information

Contact: Jennifer.L.Taylor@Colorado.edu CIRES website: cires.colorado.edu/outreach/
The GLOBE Observer app: observer.globe.gov

References

Background image: NPS Climate Change Response, 2013. Retrieved from https://www.flickr.com/photos/npsclimatechange/14503287131
Balch, J. K., et al. (2017). "Human-Started Wildfires Expand the Fire Niche Across the United States." *Proceedings of the National Academy of Sciences of the United States of America*, vol. 114, no. 11, pp. 2946-2951. Retrieved from http://www.pnas.org/content/114/11/2946
Insurance Information Institute (2017): Facts + Statistics: Wildfires. Retrieved from https://www.iii.org/fact-statistic/facts-statistics-wildfires
NPS (National Park Service) (2015): Wildland Fire. Retrieved from https://www.nps.gov/romo/learn/wildland-fire.htm
Figure 1: Fourth National Climate Assessment, Vol II. Retrieved from https://nca2018.globalchange.gov/chapter/25/
adapted from : Abatzoglou, J.T. and A.P. Williams, 2016: Impact of anthropogenic climate change on wildfire across western US forests. *Proceedings of the National Academy of Sciences of the United States of America*, 113 (42), 11770-11775. Retrieved from http://dx.doi.org/10.1073/pnas.1607171113
Figure 2: Union of Concerned Scientists, 2013. Retrieved from www.ucsusa.org/westernwildfires
Colorado Fire Restoration Institute (CFRI whitepaper, 2017): Field Data Collection Protocol for Evaluating Fire Mitigation Effectiveness with The Fire and Fuels Software System. Retrieved from https://cfri.colostate.edu/wp-content/uploads/sites/22/2017/10/WRRG_Field_Protocol_DNR_Center25ft.pdf
Figures 5 and 7: Keane, R. E. and Dickenson, L. J. (2007). The Photoload Sampling Technique: Estimating Surface Fuel Loadings From Downward-Looking Photographs of Synthetic Fuelbeds. Retrieved from https://www.fs.fed.us/rm/pubs/rmrs_gtr190.pdf

Project Partners:

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