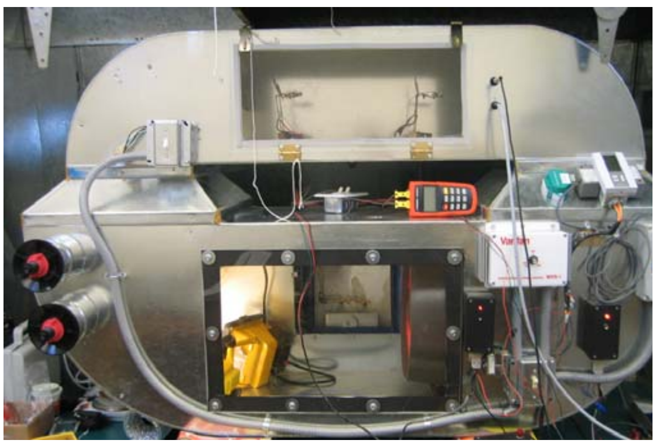
The Tracer Ignition Minimization (TIM) Tool

Project # 10-374

Background:

Wildfires are a growing concern to military land managers throughout the country. Climate change, encroachment and other land use pressures, and invasive species that encourage fire all contribute to an increasingly fire-prone military training environment. But military land managers have some ability to mitigate the fire threat by constraining fire-prone training activities to lower fire danger periods. This can be done at a gross level through the National Fire Danger Rating System (NFDRS), but a more precise accounting of fire likelihood that takes into account the specifics of military training and the complexities of military ignited fires is often desired to avoid over or under prediction.



The climate controlled wind tunnel used to test ignition probability.

Objective:

One of the largest causes of military training ignited wildfires is the small arms tracer round. We set out to better establish the conditions under which ignitions from tracer rounds are likely, so as to more accurately assess the fire risk posed by them. In doing so, we expected to find times when traditional fire danger rating systems would rate ignition and fire risk as high but the tracer ignition probability might be low. With a better estimate of fire ignition probability, fire and range managers can make more informed decisions about training restrictions and firefighter staffing levels increasing range operations efficiencies.

Summary of Approach:

With funding from Legacy, we studied tracer ignitions in *Megathyrsus maximus* (guinea grass), a wide spread pyrophytic invasive grass in Hawaii, but the approach could be used in any relatively homogenous vegetation type in any geographic region. We used observations of fire ignitions in the laboratory to build a computer algorithm to predict the probability that a military tracer round coming to rest in guinea grass fuels will start a fire. To do this, we built a climate controlled wind tunnel that regulates wind speed, temperature, and relative humidity. Fuels were conditioned in the wind tunnel overnight and were then subjected to an ignition device that mimics the effect of a tracer round coming to rest in guinea grass in terms of both temperature and duration.

Benefit:

The resulting model is highly statistically significant and if implemented with an ignition threshold of 10% under the current fire danger rating system at Schofield Barracks, HI would have allowed an additional 9,563 hours of training with tracers over the past 10 years, or an average of about 2.6 hours per day. Over 70% of this savings was at night. Smaller savings with a similar split between daytime and nighttime training were observed at Makua Military Reservation, HI.

Accomplishments:

This approach shows some promise in military applications. It is far more precise in predicting ignition probability than the NFDRS because it is related to the specific heat profile characteristics of the tracer round. It is also specific to the fuels into which the tracer round is fired, which may or may not be the case when using the NFDRS. These improvements may allow land managers to reduce staffing levels and fire ignitions on training ranges without unnecessarily constraining military trainers.

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