On, Thursday December 19, 2024, at 12:00 pm (EST) the Department of Fire Protection Engineering at the University of Maryland will host its 11th annual competition to predict the burning behavior (heat release rate, HRR) of Christmas trees. This is a friendly competition designed to bring together members of the fire safety science community that hopefully provides an opportunity to explore and develop collaborations in the future. The event also serves to share a positive fire safety message, mainly: "If you have a natural Christmas Tree this season, please keep it well-watered."

We would like to invite you to join us this year by submitting predictions to this year's competition. Last year, we received more than 200 predictions from 25 different countries (and 11 US states). This was our largest group ever and I am very happy to see this event continue to grow. Once again, I look forward to receiving messages and predictions from old friends and colleagues and to seeing new groups join us from around the world.

This year's event is special. In collaboration with the National Institute of Standards and Technology (NIST), our competition burns will consist of repeated experiments on extremely large (5.8 m tall) Douglas-Fir trees burned in the National Fire Research Laboratory (NFRL). Measurement data, video recordings, and a full test report will be released the day of the competition. A community watch party/livestream will be hosted at 12:00 pm (EST) on December 19: https://umd.zoom.us/j/7239055335; details regarding how to watch the event will be provided to all participants who submit a prediction.

The 2023 competition had a repeat winner: The University of British Columbia. In second place was the University of Edinburgh. Teams of *at least 3* individuals from the same University or Research Institution are needed for a chance to win best team prediction. The first and second place teams of this competition earn our coveted golden and silver pinecones (2023 competition winners are shown in Fig. 1).

Come take a break with us for a moment when we can come together as a community just for fun (and to share an important fire safety message). Good luck!

Please let me know if you have any questions,
Isaac
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University of British Columbia
First place (golden pinecone)

University of Edinburgh
Second place (silver pinecone)

Figure 1. Winners of the 2023 Christmas Tree Fire HRR Prediction Competition

Submitting Predictions

This year's competition will take place on Thursday, December 19, 2024, at 12:00 pm (EST). All HRR predictions received prior to this date will be scored for the competition.

Visit https://pages.nist.gov/christmas_tree_fire_safety/ to use a custom-made app that allows you to 'build' (and submit) your own fire by adjusting three parameters:

Peak Heat Release Rate (Peak HRR [kW])
Relative time to Peak HRR
Total Heat Released [MJ]

In this app, after you click 'Submit by Email', an email will be generated that contains the three parameters defining your HRR curve. In this email, please remember to add your name, email and lab affiliation if you wish to receive credit (and final competition results) and CLICK SEND so that we receive your submission.

If you are having trouble automatically generating an email using the 'Submit by Email' button, please: (1) Click the 'Copy Entry' button to copy your submission entry text, (2) Paste that into the main text field of a new email, (3) Provide your contact information [do NOT edit parameter values], (4) Make the email subject "HRR Competition", and (5) Send that email to treehrr@nist.gov.

A video guide to using this app to create HRR curves and submit predictions is available online: https://youtu.be/NPPijDHtP3k

Competition information

This year's competition will be organized and scored to contextualize model predictions vs. experimental uncertainty. In short, this means that tests will be repeated, and your predictions will be scored with respect to the average and min/max range of experimentally measured burning behavior (and with considerations for measurement uncertainty).

This year's scoring categories include:

- Peak HRR (kW)
- Time to Peak HRR (s)
- Total energy release (MJ)
- Duration (s) for which calculated HRR exceeds 20% of measured Peak HRR

This year's competition trees are Douglas-Firs; tree dimensions, weights, and moisture content (average from multiple locations immediately before testing) are provided in Table 1. Figure 2 provides representative images of the first Competition Tree. Both trees were kept, unwatered, for several weeks in laboratory storage. Uncertainty in listed dimensions is estimated as ± 1.5 cm.

Table 1. Tree Sample Information

	Tree 1	Tree 2
Height	5.79 m	5.83 m
Width	2.71 m	3.05 m
Pre-test Weight	60.20 ± 0.32 kg	56.00 ± 0.31 kg
Moisture Content	11.0 ± 0.6%	13.0 ± 0.7%

Figure 2. Competition Douglas-Fir Tree #1 (left) before and (right) after burning.

Ignition: A ring-shaped natural gas burner (approximately 2/3 the diameter of the outer tree branches, with four spark igniters; HRR = 165 kW ± 5 kW) was placed just below the lowest branches of each tree. Ignition (time, t = 0 s) is defined as the time at which burner flames are first ignited; burner flames were maintained for approximately 10 s before the natural gas supply was shut off.

Data: Christmas tree heat release rate will be measured at the National Fire Research Lab (NFRL) at the National Institute of Standards and technology. Details of the Calorimetry Measurement System used for these large fires (including relevant uncertainty information) are provided in NIST Technical Note 2077. Calorimetry measurements in a rapidly growing fire are especially challenging. The NIST 20 MW calorimetry system has a system time response on the order of 10 s. Calorimetry HRR profiles are therefore corrected for time response by re-scaling the measured mass loss rate profiles while imposing the requirement that the measured total heat released matches the calorimetry value. Further details of this correction will be provided in a NIST Technical Note to be released the day of the competition.

Previous NIST studies on the burning behavior of large tree fires (2.5m and 5 m tall trees) are available online (and may offer useful reference for this year's competition):

1. https://nvlpubs.nist.gov/nistpubs/TechnicalNotes/NIST.TN.2131.pdf
2. https://www.sciencedirect.com/science/article/pii/S0010218009001655

Additional information

Rules, scoring guidelines, and some reference materials can be found online at:
https://fpe.umd.edu/burn-competition

As seen in Fig. 3, on average, larger teams (i.e., more participants per team) did as well or better than smaller teams. If there's ever a member of your team who's hesitant to submit a prediction, share this plot and tell them not to worry.

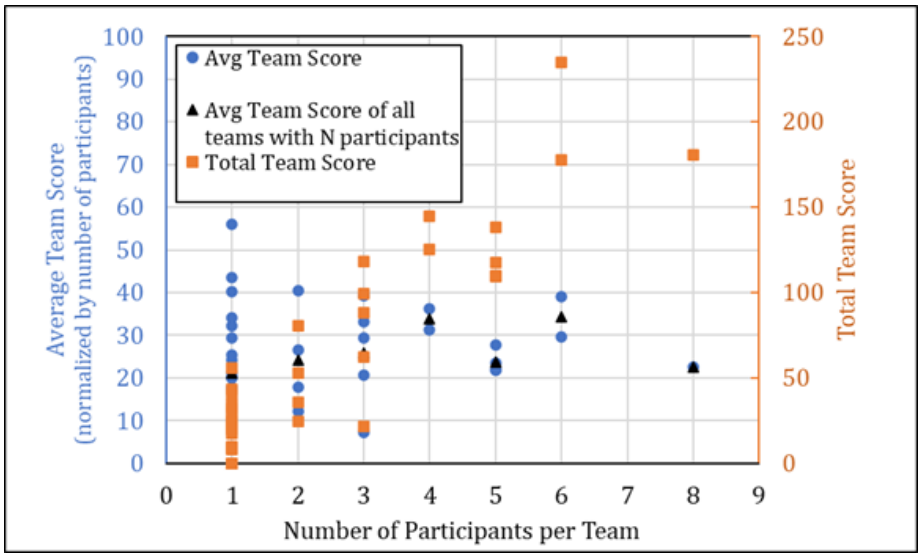

Figure 3. Team score vs. number of participants per team (2021 results)