NSF Project Reporting Format

This document has been developed to provide Principal Investigators (PIs), co-PIs, and research organizations with:

- A listing of the questions that will be asked in the new NSF project reporting format;
- Assistance in planning for the submission of the report; and
- A tool to help PIs collaborate with other contributors in answering these questions, if needed.

The project reporting service on Research.gov and the associated help documentation provides more detailed instructions and contextual assistance.

Note: NSF project reports are not cumulative and should always be prepared for the specific project reporting period only.

Accomplishments

https://reporting.research.gov/fedAwardId/1744038
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You have the option of selecting "nothing to report" in this section.

What are the major goals of the project?

As stated in our proposal, the goal of "Fire Prediction Across Scales" was to promote communication between researchers studying fire across a wide spectrum of spatial and temporal scales, drawing on the expertise of fire managers, vegetation experts, the weather forecasting community, and the climate prediction community. Further, we argued that there is a need for more two-way interaction between researchers studying these topics and practitioners working at an operational level. Fire modelers working at a global scale, for example, would benefit from the detailed fire behavior knowledge and decision-making processes in the fire management community. The converse is also true in that fire managers and policy makers responsible for long-term fire management policy would benefit from interaction with scientists at the cutting edge of, for example, weather and climate forecasting at different scales, and long-term changes in climate, vegetation, and fire activity. Accordingly, the conference was organized as a progression through these scales, culminating in a discussion of how impacts at these scales can be better assessed with improved fire prediction.

What was accomplished under these goals (you must provide information for at least one of the 4 categories below)?

Major Activities:

The conference was held from October 23-25, 2017, with scientists, students, government officials, and members of the private sector participating in three days of presentations, panel discussions and an evening poster reception on Columbia University's Morningside campus.In all, 39 oral presentations and 34 posters were presented, with over 120 registered participants attending. Each day concluded with a 5-member discussion panel summarizing the day's topics.

Specific Objectives:

Significant Results:

The meeting started with an operational focus, with a presentation from Matt Butler, a Fire Management Officer for the US Forest Service on the Idaho Panhandle National Forests. Butler reviewed his office's role in fire suppression, prescribed fire management, and his office's information needs. The overarching decision making question was: "Do I let my resources go, or do I order more resources in?". Butler emphasized the need for forecasting products at different scales to predict for example, the potential or outlook for a single long-duration fire, or the overall fire season severity. Butler's presentation was followed by that of Ed Delgado, the

National Program Manager for Predictive Services at the BLM National Interagency Fire Center (NIFC), who described NIFC's information-providing role for individual incidents, seasonal resource allocation across the country, and for long-term strategic planning. Delgado emphasized the need for tying predictive services to business needs, but that their role also came down to "plain 'ol weather forecasting". Karin Riley from the US Forest Service described a framework for uncertainty analysis in assessing predictive tools for single incidents to long-term, decadal planning, describing the challenges in capturing the uncertainty in basic flame physics to future vegetation and climate states. These presentations set the tone for the meeting; our sense was that participants could relate subsequent topics over the next two days, particularly those that were more technical or academic, back to practical, on-the-ground information needs for fire prediction.

At the shortest time scales, recent advances were described in basic experimental fire physics, ranging from laboratory and experimental fires in the field to understand flame-scale convection, radiation, and spread, and the numerical modeling of those processes. The connections between model and experiment were further emphasized during several talks on coupled wildfire/atmosphere models – where fire can influence the weather- and lightning prediction to understand how cutting-edge modeling could translate into operational decision making. Two talks in specifically described the challenges in modeling 'pyrocumulonimbus' plumes from explosive wildfires.

At synoptic scales, the emphasis was on translating the state-of-the-art in numerical weather prediction to fire occurrence and fire behavior prediction using statistical models of the latter. Talks on seasonal prediction emphasized skill over the tropics for both statistical and dynamical models, owing, for example, to the more immediate influence of large-scale sea-surface temperature patterns over local weather in fire prone regions in the tropics compared to the extratropics, but that expected advances in multi-model sub-seasonal and seasonal climate prediction could potentially translate into improved long-lead fire weather prediction.

Presentations at longer timescales capture fire drivers more broadly, including climate, vegetation cover, and human activity, the latter typically being described as the most difficult to model, although recent progress has been made specifically in separating the roles of changing climate, land use, and fire suppression on changes in fire activity. These presentations ranged from the modern 20-year satellite record to paleoclimate timescales over thousands of years, with several describing advances in modeling the role of fire on forest and grassland ecosystems. Representatives from the Fire Modeling Intercomparison Project provided an update on the status of global-scale fire modeling, reinforcing that the wide spread in simulated fire activity during the satellite era was driven by differences in how the human influence on fire is treated in models. Participants described the different challenges in model benchmarking due to data limitations, for example the time-resolution of paleo-proxies, under-detection in satellite data, or differences between fire agencies in how fire is reported. A more detailed synthesis of the paleofire talks is provided in our newsletter article for the June 2018 issue of PAGES magazine, uploaded as a separate file.

In connecting fire prediction to application, there was an emphasis on impact-driven analyses. Several contributions described recent advances in predicting property loss, or economic impacts more generally, starting with physical fire occurrence and behavior modeling, but integrated with values-at-risk in the wildland-urban interface. This approach applied to smoke impacts also, with several presentation linking weather, climate, fire occurrence and smoke modeling to epidemiological models to estimate negative health effects of smoke. A more detailed synthesis of the smoke-related presentations is provided in our newsletter article for the February/March 2018 IGAC Newsletter, uploaded as a separate file.

Key outcomes or other achievements:

What opportunities for training and professional development has the project provided? The conference provided an excellent venue for interaction between early, mid-, and senior career level researchers, and with international participants. Of the 81 presentations made, 13 were given by students and 10 by postdoctoral researchers. Six of the early career researchers acted as rapporteurs over each day, the syntheses of which have been used in writing the PAGES and IGAC newsletter entries, and which will guide the writing of the review paper. In giving the final, invited presentation of the conference, Prof. Dominique Bachelet of Oregon State University noted how encouraging it was to see the advances being made by early career fire researchers.

How have the results been disseminated to communities of interest?

Social media was our main dissemination tool during the meeting, using the #CUFire2017 twitter hashtag. After the conference, we wrote a brief blog post, available through the Columbia University Initiative on Extreme Weather and Climate website: (http://extremeweather.columbia.edu/2017/10/30/2017-conference-on-fire-prediction-across-scales/), and a brief summary for the Columbia Center for Climate and Life, available here: http://climateandlife.columbia.edu/2017/10/26/improving-science-based-tools-for-fire-prediction/

We wrote a paleo-fire focused newsletter article for Past Global Changes (PAGES) magazine and a smoke-focused article for the International Group on Atmospheric Chemistry (IGAC), both of which have been uploaded as separate files. The main output of the conference is an in-progress review paper on fire prediction, essentially structured around the conference themes.

NOTE: You may upload PDF files with images, tables, charts, or other graphics in support of the Accomplishments section. You may upload up to 4 PDF files with a maximum file size of 5 MB each.

Products

You have the option of selecting "nothing to report" in this section. There are no limitations to the number of entries you submit and you can also pull information directly from Thomson Search when using the online tool on Research.gov.

Within the Products section, you can list any products resulting from your project during the specified reporting period, such as:

Review paper in progress

NOTE: You may upload PDF files with images, tables, charts, or other graphics in support of the Products section. You may upload up to 4 PDF files with a maximum file size of 5 MB each.

Participants

There are no limits on the number of participants you list for this section; however, you must list participants who have worked one person month or more for the project reporting period. You have the option of selecting "nothing to report" in this section.   For Research Experience for Undergraduates (REU) sites and supplements, specific questions will be listed in this section. The online service will also ask for additional information on participants such as:

What individuals have worked on the project?

Name	Most Senior Project Role	Nearest Person Month Worked

What other organizations have been involved as partners?

The meeting was initiated and hosted by the Columbia University Initiative on Extreme Weather. Additional support was provided by the Columbia Center for Climate and Life, the Columbia Climate Center, and

PAGES. We received promotional support from the International Association for Wildland Fire, the US Forest Service, the North Atlantic Fire Science Exchange, and the Interdisciplinary Biomass Burning Initiative; the broad range of attendees reflects the help we received from these different organizations in promoting the meeting.

The online service will also ask you for additional information such as:

- Type of Partner Organization
- Name
- Location
- Partner's contribution to the project

Have other collaborators or contacts been involved?   Yes   No

Impacts

You have the option of selecting "nothing to report" in this section.

What is the impact on the development of the principal discipline(s) of the project?

The main impact of the conference was in providing a forum for researchers and practitioners from different disciplines to interact, who would not normally otherwise. We are unaware, for example, of a venue where fire management practitioners have had an opportunity to interact with paleoclimatologists who can provide long-term context for changes in fire activity.

What is the impact on other disciplines? We are confident that our meeting helped to raise awareness outside of the fire research community about the relevance of different fields to fire management. Seasonal fire prediction is a good example. The need for enhanced seasonal fire prediction products was emphasized by fire management practitioners. We were fortunate to have two presentations on the current state of weather and climate prediction at these scales from two leaders in the field, namely Francesca di Giuseppe from the European Centre for Medium Range Weather Forecasts, and Andy Robertson from Columbia University's International Research Institute for Climate and Society and co-chair of the WCRP/WWP Sub-seasonal to Seasonal Prediction Project. Similar to the paleoclimate theme, we are unaware of a venue where these experts would have an opportunity to interact with 'on-the-ground' practitioners.

What is the impact on the development of human resources?

N/A

What is the impact on institutional resources that form infrastructure?

N/A

What is the impact on information resources that form infrastructure?

N/A

What is the impact on technology transfer?

N/A

What is the impact on society beyond science and technology?

The conference was rooted in physical science, but the social aspects of fire were a recurring theme, ranging from the pre-historical use of fire, the impacts of fire suppression on long-term landscape flammability, social factors contributing to catastrophic fire losses, quantifying vulnerability at the wildland-interface, and on predicting the health impacts of smoke. Our meeting served to strengthen ties between those studying the physical and human aspects of fire prediction.

Changes / Problems

If not previously reported in writing to the agency through other mechanisms, provide the following additional information or state, "Nothing to Report", if applicable.

Changes in approach and reason for change:

Nothing to report

Actual or Anticipated problems or delays and actions or plans to resolve them:

There were no major problems during the meeting.

Changes that have a significant impact on expenditures:

Nothing to report.

Significant changes in use or care of human subjects:

Nothing to report.

Significant changes in use or care of biohazards:

Nothing to report.

Special Requirements

This report section is only available when Special Requirements are specifically noted in the solicitation and approved by the Office of Management and Budget.

NOTE: You may upload PDF files in support of the Special Requirements section. You may upload PDF files with a maximum file size of 10 MB each. There is no limit to the number of files uploaded.

Uploads
-Conference program
-Projected and actual travel support
- PAGES article
-IGAC article