

# Managing Fire, Understanding Ourselves:

Human Dimensions in Safety and Wildland Fire

13TH INTERNATIONAL WILDLAND FIRE SAFETY SUMMIT &  
4TH HUMAN DIMENSIONS OF WILDLAND FIRE  
BOISE CENTRE • BOISE, IDAHO, USA • APRIL 20-24, 2015

## Wildland Fire Smoke Health Effects Research and Tools to Inform Public Health Policy and Recommendations

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### Introduction

A four hour workshop *Wildland Fire Smoke Health Effects Research and Tools to Inform Public Health Policy and Recommendations* was organized preceding the April 2015 International Wildland Fire conference Boise Idaho to discuss new science on health impacts of smoke and opportunities to further inform and support development of health policy and recommendations. The workshop included presentations from researchers at three US federal agencies (Forest Service (FS), the Environmental Protection Agency (EPA) and the Centers for Disease Control (CDC), and British Columbia CDC). The first part of the workshop discussed new and emerging health research to inform public health policy. The second part of the workshop focused on guidelines and recommendations to reduce the public health impacts of smoke exposure, and the new tools for estimating smoke exposure and forecasting. Attendees and researchers shared insights on scientific evidence needed to improve public health practice and related gaps, and the latest technologies that can deliver useful and health-outcome preventing information. The workshop was overwhelmingly viewed as informative and beneficial to all attendees and participants, which was also reflected in the productive discussion following the workshop. The workshop was moderated by Pete Lahm (US FS) and Ana G. Rappold (US EPA), and organized by Ana G. Rappold and Susan Stone (US EPA).

Current trends in wildfire in the United States and elsewhere support a growing concern about the subsequent air quality impacts on the health and safety of both the public as well as fire personnel. The length of the wildfire season in many areas has increased substantially and the prevalence of larger and longer duration wildfires is also on the rise. The current climate trends and presence of available forest fuels aided by drought conditions leads to extended periods of frequently hazardous levels of air quality for the public downwind of these catastrophic wildfires. In the US, FS, EPA, and the CDC are all recognizing this important shift in public exposure to wildfire created air pollution. The FS has initiated an interagency Wildland Fire Air Quality Response Program which places technical specialists called Air Resource Advisors into incident management teams charged with addressing these large wildfires to provide a bridge between the fire and those affected by wildfire smoke as well as with agencies directly charged with protecting the public from such air pollution impacts. The Program makes use of emergency deployable PM<sub>2.5</sub> monitors as well as fire specific and developing national smoke modeling tools to help forecast these serious smoke impacts. The FS, working in partnership with EPA and CDC, sees this emerging threat as an important issue to build cohesive and consistent messages to protect the public that are based on the best and latest science and knowledge. This workshop and subsequent efforts are aimed at building the tools, cooperation and science needed

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to develop an effective approach, consistent across the country, to addressing serious wildfire smoke exposures facing the public and fire personnel.

Canada has been increasingly faced with addressing similar hazardous air quality impacts from wildfire smoke as the United States. Smoke from wildfires in Canada has impacted rural remote communities resulting in costly and disruptive evacuations to mitigate the impacts to public health as well as transportation. Research and science to predict these impacts, increase understanding of the human health effects of wildfire smoke and value of intervention efforts has been conducted at both provincial and national scales. Environmental Health Services at BC Centre for Disease Control (BC CDC) has recently completed scientific evidence review to help formulate guidelines for public health decision making during smoke events and is actively engaged in studies of health effects and smoke exposure.

### Workshop Summary

The workshop was opened with a presentation by Dr. Wayne E. Cascio of Environmental Public Health Division (US EPA) providing an overview of the occupational, clinical and epidemiologic evidence of smoke related health effects. Dr. Cascio illustrated common biological pathways to adverse health outcomes possibly shared between smoke and other sources of air pollution and identified the areas of further research needs; in population and occupational settings, the need to better understand the toxicology of smoke, and the need to develop and adopt new technologies to improve communications and protect public health during smoke episodes.

Dr. Sarah Henderson (BCCDC, Canada) presented results from the largest study to date of the association between mortality and wildland fire smoke exposure. The study identified a number of respiratory and cardiovascular effects over a decade long period in Western Canada. Dr. Henderson also presented the preliminary results on the evaluation of smoke-related community evacuations in Canada.

Dr. Ana Rappold (US EPA) presented a recent study of simulated forecast-based interventions as a tool to reduce the health and economic burden during smoke episodes. The study illustrated a large health burden associated with these events and the potential benefit an adaptation of current forecasting technologies could bring to the affected communities.

Dr. Joe Domitrovich (US FS), presented challenges of establishing best practices to protect health of Wildland firefighters. His research shows that firefighters experience great variability in exposures to smoke depending on the type and duration of tasks performed and atmospheric conditions. In the study led by Dr. Domitrovich's group, greatest exposures were associated with direct attack, line holding, and burnout activities, especially when an inversion is present. Only a portion of firefighters were exposed to CO levels in excess of NIOSH safety limits across the duration of the shift, however a

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number of periods of short exposures to high concentrations were observed within shifts punctuated with clean air periods which rapidly mitigates these high exposures.

Dr. Ian Gilmour (US EPA) presented background of the proposed research plan recently funded by a JFSP grant. His research is focused on determining the role of composition and particle size on the toxicity of wildfire emissions. Dr. Gilmour presented a state of the art quartz glass tube furnace system designed to entrain or collect smoke from biomass combustion and deliver it in-vivo and in-vitro rodent animals to determine differential toxicity between fuel types.

Dr. Susan O'Neill (USFS) presented recent advances in the development of smoke modeling and estimation of visual range. The use of visual range as a public health communication tool raised interest by many in the group and stimulated a discussion. Visual range is a fairly inexpensive tool for communication of exposure and could be linked to a simple health messaging program. However, visual range also has a number of uncertainties associated with it, including the impact of humidity and haze on visual range, which impacts its utility in various geographical areas differently.

Dr. Catherine Elliott presented a consensus of the review of scientific evidence conducted to establish the Guidance for British Columbia Public Health Decision Makers During Wildfire Smoke Events. Dr. Elliott led an international work group to develop the set of guidelines for smoke events based on the extensive review of scientific evidence with respect to 1) identifying features of wildfire smoke, 2) identifying health effects from smoke, 3) surveillance of smoke and health and 4) level of intervening actions and effectiveness of these actions in protecting public health. The overarching message was the earlier the intervention, the more successful and protective of vulnerable populations it was.

Dr. Paul Garbe (US CDC) discussed challenges in communication during smoke events. CDC provides national leadership in environmental health response and health communications, disseminates health communication messages and has assisted a number of state public health agencies in responding to fire events over the course of years. Dr. Garbe discussed the importance of local response, and experience, as well as keeping flexible messaging and keeping the message "new" across fire seasons.

To conclude the workshop, Susan Lyon Stone (US EPA) discussed revisions to US Wildfire Guide for Public Health Officials and solicited ideas for further revisions. The revised guide will include federal, state and local agencies and will reflect recent advances in scientific evidence and technologies. Important consideration is given in reducing the number of time averaged messages into a single message based on 24 hour averages to be consistent with national air quality standards. An important addition includes expanding the visibility guidelines and establishing consistency with emerging personal air quality sensor messaging. The revision will also include newly deployed NowCast - responsive hourly AQI metric for PM<sub>2.5</sub> as well as links to the "Fires: Current Conditions" webpage - linking information from federal, state and local agencies. Susan Stone was not able to attend the workshop but was instead represented by Ana Rappold.