- Review of the WMO Guide on Agricultural Meteorological Practices

The 3-day workshop was followed by a 2-day meeting of the WMO Commission for Agricultural Meteorology Expert Team on Agrometeorology for Sustainable Development (ET 1.3).

1.2 Expected Outcomes of the Workshop

The target audience of the workshop included meteorologists, fire scientists, practitioners and managers of wildland fire prevention and mitigation, environmental monitoring organizations and the earth observation community. Workshop participants (82) representing 32 countries are listed in Appendix 2.

Senior experts in several fields were invited to prepare state-of-the-art presentations to address the above objectives (Appendix 4). The programme (Appendix 3) was designed in such a way as to engage all the participants in discussions on each of these presentations and to develop appropriate strategies to enhance operational fire weather systems and their application in fire management.

Recommendations from the Workshop were considered at the ensuing meeting of the Commission for Agricultural Meteorology of WMO for transferring appropriate implementation strategies and related services. As well, the workshop contributed to the 10-year work plan of the Group on Earth Observations (GEO) towards development of the Global Earth Observation System of Systems (GEOSS).

1.3 Overview of Report

Following this introduction the report consists of five sections. Section two includes an introduction and overview of fire danger rating science and practice. Section three describes operational and prototype fire danger rating systems from around the world. Fire danger rating system enhancements in six topic areas are addressed in section four, while operational fire weather guidelines are addressed in section five. The report generally follows the workshop agenda provided in Appendix 3.

2. History and Legacy of Fire Danger Rating in Wildland Fire Management

Martin Alexander of the Canadian Forest Service gave a keynote address on the *History and Legacy of Fire Danger Rating in Wildland Fire Management.* (Presentation 2).

Nearly every country in the world with fire-prone vegetation utilizes some form of a fire danger rating system. Fire danger is regarded as a general term used to express an assessment of fixed and variable factors of the fire environment (i.e., fuels, weather and topography), including lightning and human-caused ignition risk that determine the (i) ignition probability, (ii) spread rate, (iii) control difficulty and (iv) impact(s) of wildland fires. Fire danger rating is in turn the process of systematically evaluating and integrating the individual and combined factors influencing fire danger in the form of fire danger indexes. A fire danger index is a quantitative indicator of one or more facets of fire danger expressed in a relative sense or as an absolute measure. The use of a fire danger rating system enables operational decisions to be based on quantified indices rather than relying strictly on experience and judgment and is therefore less subjective. Nowadays fire danger ratings are used in a whole host of fire management applications ranging from prevention planning to initial attack dispatching to prescribed fire planning and execution.

Fire danger rating research and operational use of fire danger rating systems has a very rich history which is well chronicled in many agency publications, textbooks and journals (e.g., Journal of Forestry, Fire Control Notes, Forestry Chronicle, Australian Forestry, International Journal of Wildland Fire). Although a comprehensive synthesis doesn't presently exist, this is something that perhaps the World Meteorological Organization should consider commissioning. Harry T. Gisborne, the first full-time fire researcher for the U.S. Forest Service, is generally credited with developing the first fire danger rating system in about 1928. Work in Canada by the government's forest service, lead by James G. Wright who was later joined by Herbert W. Beall, followed shortly thereafter. Australian bushfire research pioneers Alan McArthur and Harry Luke began to make their mark starting in the mid 50s. One of the distinct trends in the evolution and development of fire danger rating systems has been the desire for increasing applicability and commonality. Early on the focus was at the local level and this gradually expanded to unique regional versions (e.g., in 1954 there were nine distinct systems being used in the U.S.). Recognition of the need for a nation-wide system began in the late 50s and was realized in the U.S. and Canada in the early 1970s. Presently, there appears to be a desire for a single global level system.

In developing a fire danger rating system, the first issue is to formulate objectives defining what the fire danger rating system should be designed to do. Once that is determined, decisions can be made on the six basic issues of developing an operating system: (i) what to measure; (ii) when to measure; (iii) where to measure; (iv) how to measure; (v) how to integrate measurements; and finally (vi) how to apply the danger ratings. In this regard, Taylor and Alexander (2006. Int. J. Wildland Fire 15: 121-135) have identified four key scientific, technological and human elements that need to be considered in developing any fire danger rating system based on experiences with the Canadian Forest Fire Danger Rating System. These include:

1. Development of a modular system of fire danger indicators, or models of fire occurrence and behaviour in important fire environments through a sustained program of scientific research and based on relationships between fire weather, fuels, topography, and ignition sources.
2. Reliable technical infrastructures to gather, process, disseminate, and archive fire weather data and forecasts and fire danger predictions within operational agencies.
3. Guidelines, decision aids, and training for fire managers in the application of fire danger indicators appropriate to the needs and capabilities of operational agencies based on research and operational experience.
4. Fostering communication, sharing resources, and setting common standards for information resources and training through cooperation between fire management agencies and research agencies.

Report on the International Workshop on Advances in Operational Weather Systems for Fire Danger Rating

Northern Forestry Centre

Edmonton, Canada

14 - 16 July 2008

Edited by

M. Brady, J. Kwan, E. Naydenov

GOFC-GOLD Report No. 36

GOFC-GOLD Project Office

Edmonton, Canada

March 2009