UTILIZATION OF CLIMATE INFORMATION IN PRESCRIBED FIRE

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1. BACKGROUND

Climate and its impacts on fuels and fire behavior has become an increasingly important component of fire management in the last decade. The links between anomalous wildfire years and conditions such as drought, El Niño, or Santa Ana wind events are well-documented in the literature (Swetnam and Betancourt 1990; Westerling et al. 2003; Westerling and Swetnam 2003). Additionally, fire management uses forecasts of these types of climate conditions to plan, budget appropriately, and locate contingency resources where necessary in anticipation of the annual western wildfire season (Brown 2003).

Climate is of course regional. In the eastern U.S., Santa Ana winds do not occur, and the impact of El Niño is confined mostly to Florida and the southern tier of states. Drought can be an important impact on fire in the East, but for most much of the season it is shorter-term weather driven fire events that have the greatest management implications.

One aspect of climate impacts on fire management decision-making that has been previously overlooked is how climate impacts prescribed fire use. Management-ignited fire is used to treat over two million acres of public lands each year, and there is increasing pressure for that figure to rise as fire managers attempt to reduce hazardous fuels levels and restore potential natural conditions in forests and rangelands. Since the condition, composition, and volume of fuels on the landscape is controlled indirectly by climate regimes, and windows of opportunity to use prescribed fire are also subject to fluctuations in weather associated with climate cycles, it is important to assess whether prescribed fire managers are utilizing climate information in planning and executing prescribed fires. Using climate information appropriately can help prescribed fire managers better understand the current conditions of their fuels, the fire behavior that will be associate with burning those fuels, and allow them to take full advantage of burn windows (e.g., Brown and Betancourt 1999).

This study assessed whether or not prescribed fire managers are currently utilizing climate information to help them plan and execute prescribed fires. It also looked at what some of the primary obstacles are to utilizing prescribed fire to its fullest potential in different regions of the United States, and how objectives in prescribed fire use differ between agencies. Finally, it draws some conclusions about the potential problems associated with failing to use climate information for long-term fire effects.

2. METHODS

We created a survey to assess how federal agency prescribed fire managers utilize climate information. Thirty-one questions were asked about what types of weather and climate indices fire managers use for prescribed fire purposes, how long the review process is for prescribed fire plans, if fire managers are measuring on-site fuel moistures, what some of the primary obstacles are to completing prescribed burns, and what the primary cause of escaped fires has been for their unit. The survey was approved by the University of Nevada-Reno Human Subjects Board.

Initially, the survey was administered to prescribed fire managers in northern California (including the southern Sierra Nevada) and Nevada as part of a focused case study (Kolden 2005). This survey was expanded to include 192 prescribed fire managers throughout the United States of which 32 represented the eastern and southern areas. All five of the primary federal land management agencies that utilize prescribed fire were included (BIA, BLM, FWS, NPS, and USFS), as well as numerous state agency personnel. Additionally, each of the 11 Geographic Areas designated by the National Interagency Coordination Center were represented. The results presented here constitute primary initial findings from this survey.

3. RESULTS AND DISCUSSION

Two survey questions were used to assess whether or not respondents were using climate information in their prescribed fire programs. First, we asked what the top influences are on how respondents set their targets for burning each year. For combined national results, funding was the top influence for 41% of the respondents, while issues such as resource availability or timber sale activity influenced 23% of the respondents. In terms of the role of climate only 2% of the respondents felt that climate information or seasonal climate forecasts were the top influence on their target planning, and only 17% of respondents felt that climate information or seasonal climate forecasts were one of the top three influences for setting annual targets (Fig. 1).

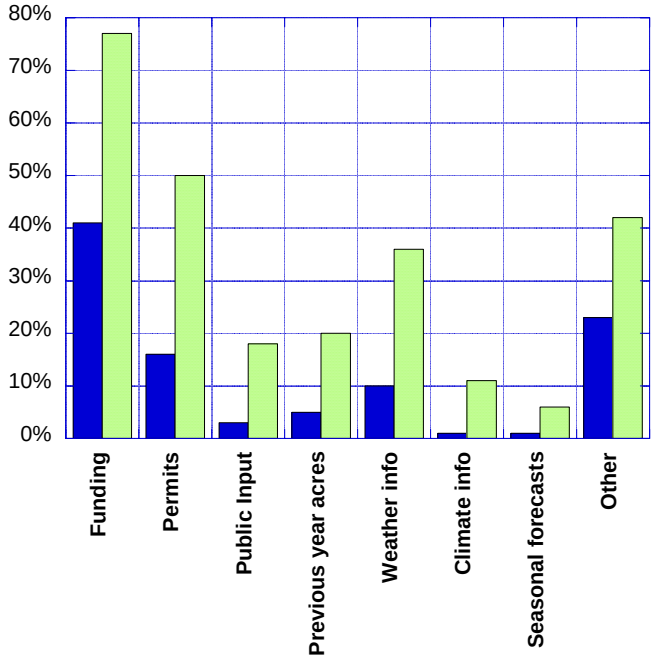

Figure 1. The top influence (solid blue) and top three influences (light green) on how respondents set their annual acreage targets by percent of respondents.

The second question that assessed whether or not prescribed fire managers utilize climate information asked respondents if they do or do not use a series of data sources, tools, and indices that track weather and climate and impacts on fuel conditions. These included Remote Automated Weather Stations (RAWS), seasonal climate forecasts, National Weather Service forecasts, Keetch-Byrum Drouth Index (KBDI), Palmer Drought Indices, the US Drought Monitor, FireFamilyPlus, etc. While most respondents indicated that they use RAWS data (93%) and the National Weather Service forecasts (93%), other tools that better indicate climate anomalies are not used as widely. KBDI (33%) and the Palmer indices (27%) are used by less

than a third of respondents to assess conditions for prescribed fire, while 51% use historical weather data, and less than half utilize the FireFamilyPlus software program (44%). Low use rates for these and other indices indicate that prescribed fire managers are primarily taking into account weather influences on prescribed fire use, and not climate influences.

The low use rate of climate information may stem from the constraints felt by many respondents on when they can utilize prescribed fire. Many noted that they are unable to utilize optimal burning windows due to air quality regulations, conflicts with Threatened and Endangered (T&E) Species requirements, a shortage of qualified personnel and resources, and the perceived wildfire threat in other parts of the country affecting local willingness to put fire on the landscape. Distinct differences between eastern and western managers were evident in terms of their constraints, and smoke management was a local constraint felt by all agency respondents in specific airsheds such as southern California's San Joaquin Valley, the Missoula area in western Montana, the Carolina plains, and near the National Parks with the highest tourism rates.

The influence of the National Fire Plan and follow-up directives such as the Healthy Forests Initiative were easily detected when respondents were asked what their two primary objectives for prescribed burns are. Hazardous Fuels Reduction was the top answer, with 93% of respondents indicating that this is one of their top two objectives. Additionally, 45% of respondents chose Ecosystem Restoration as one of their top two objectives, while 27% said they burned for Habitat Improvement (Fig. 2).

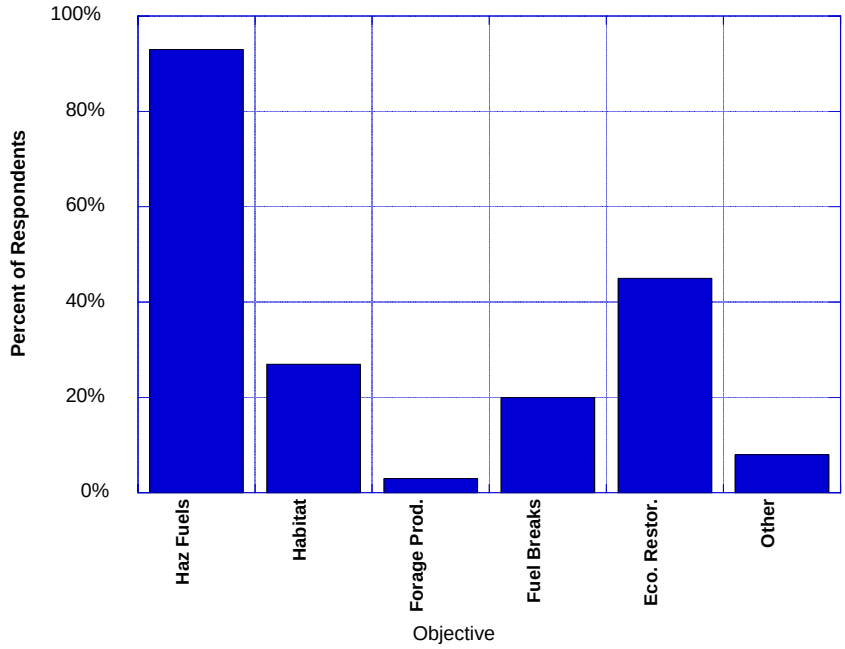

Figure 2. Percent of respondents indicating their top two primary objectives for prescribed fire use.

The respondents from the Eastern Area and Southern Area regions differed from western fire managers in several distinct ways. Many of these respondents noted that the majority of fire management tools are built for western fire managers and are not useful for eastern ecosystems. Additionally, one of the primary obstacles to eastern fire managers completing prescribed fire is the loss of personnel and funding to the western wildfire season during months when prescribed fire use might actually be optimal in the eastern US. Prescribed fire managers in the East are completing an average of 93% of their acres using broadcast or underburning, compared to only

59% in the West. Eastern managers have far fewer RAWS units available, and only 78% of respondents use RAWS, while 100% use NWS forecasts. KBDI is widely used by eastern managers (81%), while the Palmer Indices are not (13%). Problems with fuel models and lack of data in the East may be one reason why only 22% of eastern respondents use FireFamilyPlus software. While eastern managers also have an emphasis on hazardous fuels for prescribed fire objectives (94%), there is a greater emphasis on ecosystem restoration among the eastern managers, as 72% had this as one of their top two objectives. Overall, eastern managers complete far more acres of prescribed fire each year with seemingly fewer tools.

4. CONCLUSIONS

The push to return ecosystems forged under changing climatic conditions to historic natural conditions must account for a likely new 21st century climate. The only way for prescribed fire managers to accomplish this is by utilizing climate information (with consideration of temporal and spatial cross-scale impacts) in the planning and execution of prescribed fire, but our results indicate that prescribed fire managers are not using climate information in their prescribed fire programs. This is partially due to objectives centered around hazardous fuels reduction, and partially due to the numerous regulatory and political obstacles that prevent prescribed fire managers from utilizing optimal burning windows (though this is partially climate related). These reasons highlight climate and fire management as a multi-stress problem, and yields the questions of why and when is climate important and what are effective entry points and pathways for climate information in the spectrum of field-level decision making to national policy. A reevaluation of the infrastructure under which prescribed fire currently operates is necessary if ecosystem health objectives are to be reached.

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Speaker bio: Dr. Brown conducts research in applied climatology and meteorology, with emphasis on the application of data analysis, statistical methods and scientific visualization to atmospheric sciences data. His primary research topics include analysis of wildland fire-climate and fire-weather relationships and applications product development for wildland fire management planning and decision-making. Dr. Brown established and is director of the Desert Research Institute Program for Climate, Ecosystem and Fire Applications (CEFA). He is graduate faculty in the Atmospheric Sciences Program at the University of Nevada, Reno.