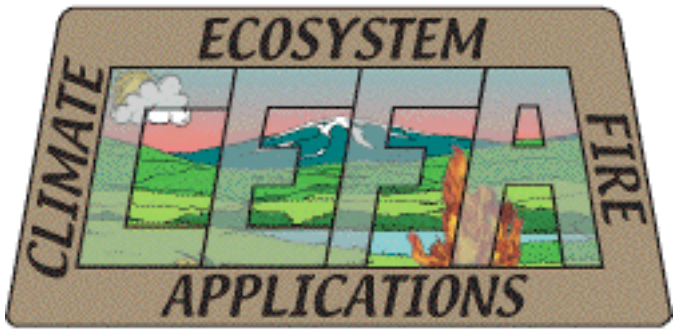
Program for Climate, Ecosystem and Fire Applications



2003 Seasonal Consensus Climate Forecast for Wildland Fire Management

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Division of Atmospheric Sciences

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2003 Seasonal Consensus Climate Forecasts for Wildland Fire Management

by

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with contributions from
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Introduction

On February 25, 2003, climate experts from the International Research Institute for Climate Prediction (IRI), the Scripps Institution of Oceanography Experimental Climate Prediction Center (ECPC), the NOAA/NCEP/NWS Climate Prediction Center (CPC), the NOAA/CIRES Climate Diagnostics Center (CDC), and the Desert Research Institute Program for Climate, Ecosystem and Fire Applications (CEFA) met to produce a national seasonal climate forecast for wildland fire management. The primary purpose of the consensus forecast was three-fold; 1) to produce seasonal climate forecasts for use in developing a national seasonal wildfire outlook; 2) to determine whether or not additional probabilistic information could be provided for areas where individual forecasts showed little confidence; and 3) to directly integrate climate forecast information into specific stakeholder decision-making.

The forecast development was facilitated as part of a national seasonal assessment workshop for wildfire and climate held on February 25-28, 2003 in Mesa, Arizona and organized by the University of Arizona, National Interagency Coordination Center, and the Desert Research Institute. Several agencies cooperated to facilitate the workshop including the National Interagency Coordination Center (NICC; representing agencies of the Department of Interior and the USDA Forest Service), the University of Arizona Climate Assessment for the Southwest (CLIMAS; a NOAA funded Regional Integrated Sciences and Assessments project), and the program for Climate, Ecosystem and Fire Applications (CEFA) of the Desert Research Institute. The USDA Forest Service, the NOAA Office of Global Programs, and the University of Arizona Institute for the Study of Planet Earth provided funding for the workshop. The climate forecast portion of the workshop followed closely the format described in Brown (2002).

Forecast Description

Seasonal forecasts of two-category probabilistic temperature and precipitation departures from average were produced for the contiguous United States and Alaska as significant input into the wildland fire seasonal outlook. Forecast consensus was reached by combining several monthly and seasonal forecasts produced at IRI, ECPC, CPC and CDC noted above. The forecast periods were March-April-May (MAM) and June-July-August (JJA) 2003. A combination of dynamical and statistical models from the respective organizations, and forecaster judgment were incorporated in producing the forecasts. Specifically, the IRI contribution was their most current seasonal forecasts based on the CCM3.2 (developed at the National Center for Atmospheric Research), ECHAM4.5 (developed at the Max Plank Institute), NCEP-MRF9 (developed at the National Centers for Environmental Prediction), COLA2.x (developed at the University of Maryland), and NSIPP (developed at the National Aeronautics and Space Administration) models and sea surface temperature predictions (Mason et al. 1999). The ECPC contribution included current monthly forecasts from two versions of the Global Spectral model as well as the Regional Spectral Model (Roads et al. 2001, 2003; Kanamitsu et al. 2002). The CPC contribution was the current seasonal long-lead outlooks based on a dynamical model, a statistical model, and long-term trend (http://www.cpc.ncep.noaa.gov/products/predictions/90day). The CDC contribution was based on a newly developed statistical model and analysis for precipitation forecasts in the southwest U.S. (http://www.cdc.noaa.gov/~kew/SWcasts/index.html). In addition, it was based on ENSO composites for MAM and JJA during rapidly declining El Niño phases. These objective forecasts were then combined with forecaster judgment including model forecast skill, temperature versus precipitation correlations, and current ENSO opinions.

The forecasts were produced via a round-table forum during the workshop. Forecast discussion lead to determining regions of warm/cool and dry/wet, and assigning a consensus probability. Since the forecasts were comprised of only two categories, the probabilities simply represent the chance of above or below normal. For example, if the forecasters determined a 10% chance of the above normal category occurring, then the probability of the above normal category became 50% + 10%, or 60%. Increasing percent values above 50 indicates a relative increase in forecast confidence. Given the current state of art for climate forecasting, 55% would be considered low confidence (only a slight hedge), and 70% high confidence. A forecast probability of 50% means no forecast confidence for either category.

Seasonal Forecasts

Figures 1 – 4 show the 2003 seasonal U.S. consensus forecasts for MAM temperature, MAM precipitation, JJA temperature and JJA precipitation, respectively. The primary highlights of these maps are above normal temperature for large portions of the West during MAM and JJA, and above normal precipitation for the Southwest during MAM. Much of Alaska is indicated as above average temperature for MAM, but little confidence was given to a precipitation forecast for either season. The seasonal outlook of wildfire potential, which was developed in part from these figures, is available at http://www.nifc.gov/news/intell_predserv_forms/season_outlook.html. Though the climate

forecasts were developed in the context of fire management planning, the product may also be useful for other issues such as resource management planning.

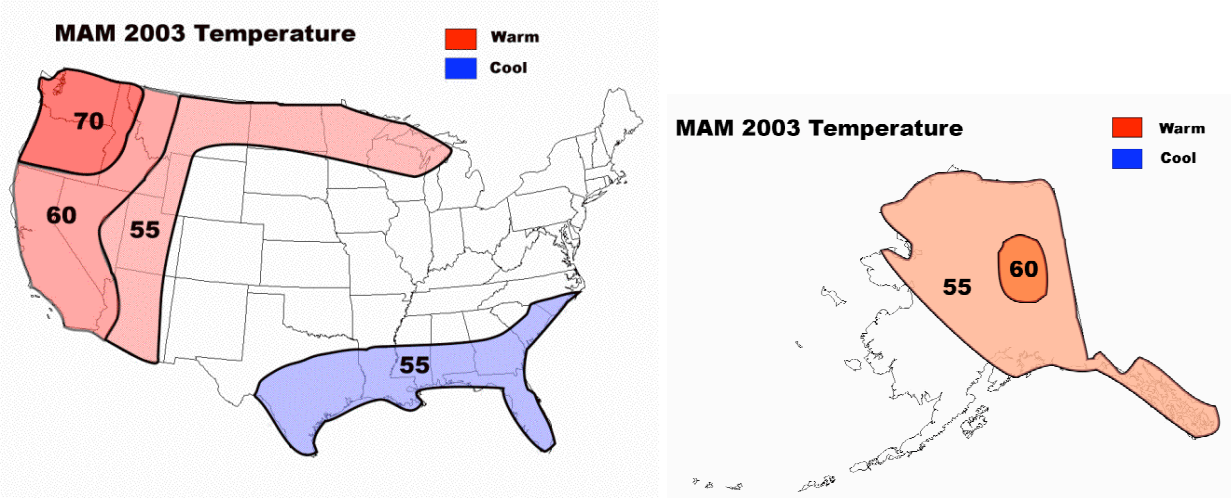

Figure 1. March-April-May 2003 temperature forecast. Red shaded areas indicate above normal temperature, blue shaded areas indicate below normal precipitation and white areas indicate a no confidence forecast region. Forecast probabilities are indicated by the percent value; areas without a value imply a 50% probability.

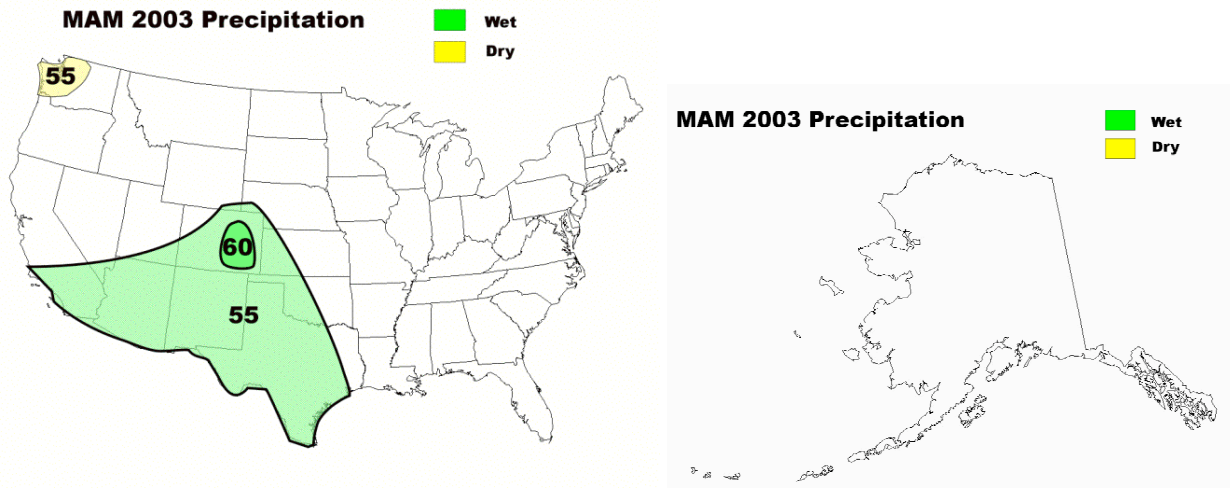

Figure 2. March-April-May 2003 season precipitation forecast. Green shaded areas indicate above normal precipitation, yellow shaded areas indicate below normal precipitation and white areas indicate a no confidence forecast region. Forecast probabilities are indicated by the percent value; areas without a value imply a 50% probability.

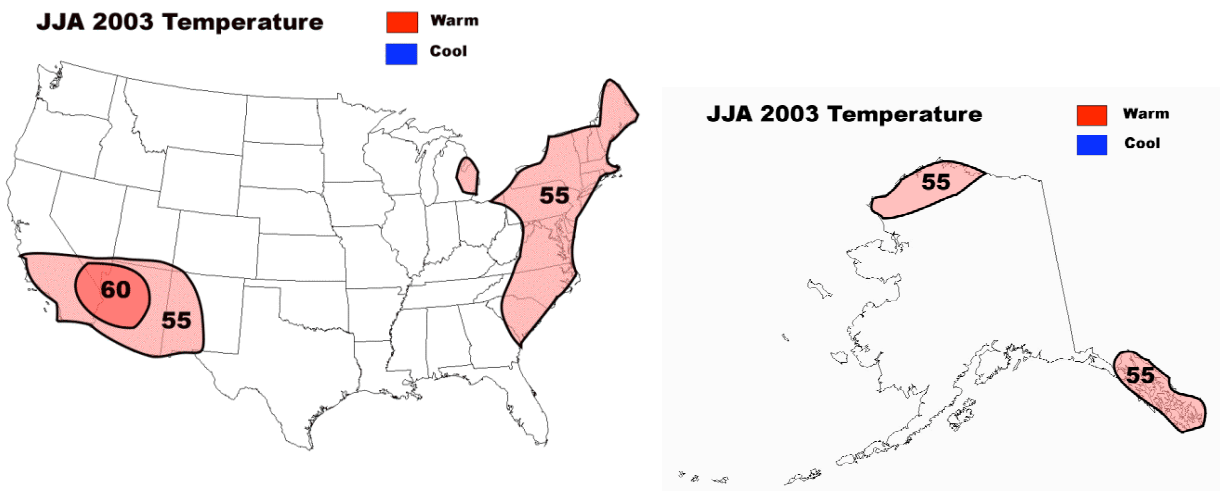

Figure 3. June-July-August 2003 season temperature forecast. Green shaded areas indicate above normal precipitation, yellow shaded areas indicate below normal precipitation and white areas indicate a no confidence forecast region. Forecast probabilities are indicated by the percent value; areas without a value imply a 50% probability.

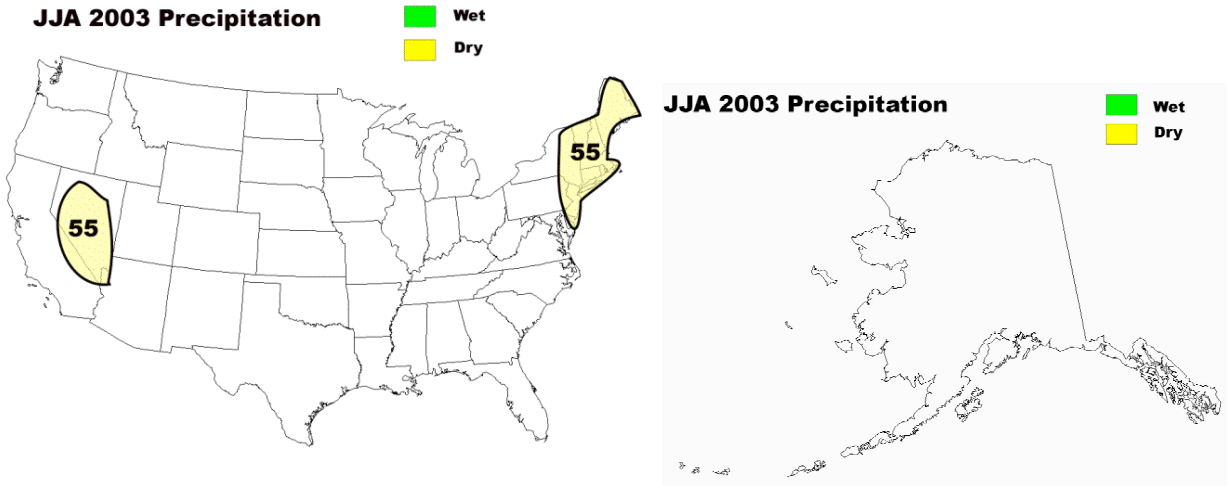

Figure 4. June-July-August 2003 season precipitation forecast. Green shaded areas indicate above normal precipitation, yellow shaded areas indicate below normal precipitation and white areas indicate a no confidence forecast region. Forecast probabilities are indicated by the percent value; areas without a value imply a 50% probability.

Forecast Confidence

Since this is the second effort to produce a consensus forecast by combining forecasts from different organizations (see Brown 2002), quantitative skill results cannot be offered at this time. However, the skill has been established for most of the inputs, and it is likely that the consensus forecast skill would be equal to or slightly larger than individual forecasts, depending on the region and the number of "ensemble" members that were in agreement. Skill results

related to some of the individual forecasts can be found in Barnston et al. (2001), Roads et al. (2001) and Hartmann et al. (2002).

It is of interest to examine last year's forecasts at least qualitatively in relation to observed departures from average. Figures 5 and 6 below show maps of the 2002 probabilistic forecasts and associated departures of temperature and precipitation produced at CPC. The MAM temperature forecast was generally good in the Southwest, but did not validate in the Great Basin and northern Rockies. The MAM precipitation forecast was quite good for portions of the West and Southeast, but did not validate in Colorado and Wyoming. The JJA temperature forecast was good for portions of the West, Southwest and East regions, but did not validate in the Southeast and the northern Rockies. Though the JJA precipitation forecast was quite conservative overall, it was generally good in the Southwest and northern Rockies, but did not validate in portions of the Northwest, central Rockies and western Plains. For all forecast seasons, there were regions with substantial observed anomalies for which no forecast was made, highlighting an overall desire and need to improve forecast skill and confidence for all regions.

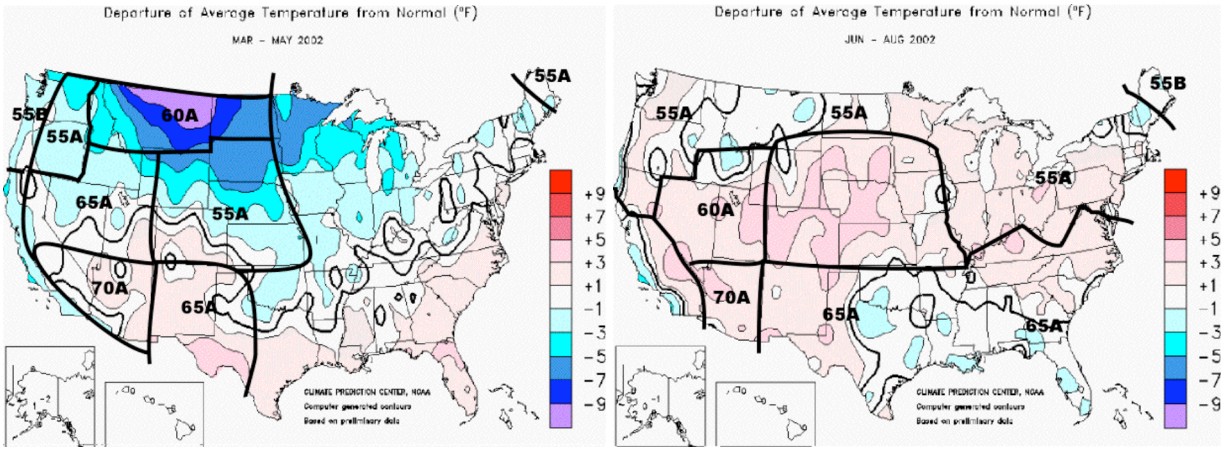

Figure 5. March-April-May (left) and June-July-August (right) 2002 observed temperature departure from average and 2002 season two-category consensus forecast probabilities given as above and below (letters 'A' and 'B', respectively); areas without a value imply a 50% probability. Temperature maps provided by the NOAA/NCEP/NWS Climate Prediction Center.

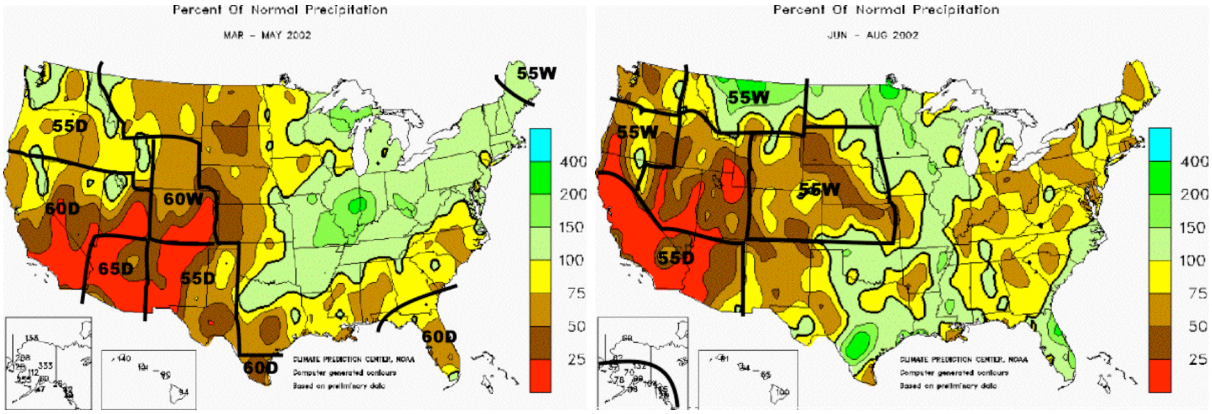

Figure 6. March-April-May (left) and June-July-August (right) 2002 observed precipitation percent of normal and 2002 season two-category consensus forecast probabilities given as dry and wet (letters 'D' and 'W', respectively); areas without a value imply a 50% probability. Temperature maps provided by the NOAA/NCEP/NWS Climate Prediction Center.

Forecast Team

The forecast team members included the following:

- Tony Barnston, International Research Institute for Climate Prediction
- Dr. John Roads, Scripps Institution of Oceanography Experimental Climate Prediction Center
- Russell Martin, NOAA/NCEP/NWS Climate Prediction Center
- Dr. Klaus Wolter, NOAA/CIRES Climate Diagnostics Center
- Dr. Timothy Brown, DRI/CEFA (facilitator)

Acknowledgements

Dr. Gregg Garfin (CLIMAS) and Tom Wordell (NICC) were instrumental in developing the logistics, organization and content of the workshop. A workshop report is forthcoming from CLIMAS. Reviews of this report from Beth Hall and Paul Schlobohm are greatly appreciated.

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