National Seasonal Assessment Workshop

Final Report
February 25–28, 2003
Mesa, Arizona

Gregg Garfin, Tom Wordell, Tim Brown, Rich Ochoa, and Barbara Morehouse

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Foreword

It is now early July 2003, and as I look out my office window, I can see plumes of smoke from the Aspen fire, which is consuming thousands of acres of forest in southern Arizona's beloved Coronado National Forest. Although I grieve the loss of this recreational treasure and the resource of the mixed conifer forest atop the Santa Catalina Mountains, I am grateful for the efforts the fire crews working to suppress the blaze. I am also grateful for the heroic efforts of land and resource managers to reduce the risk of catastrophic wildfire through insightful and forward-looking management practices. I am convinced more than ever that their ability to reduce wildfire danger, increase forest health, and to respond wisely, safely, rapidly, and effectively to fires in the Southwest and other regions across the United States can be enhanced and ensured by the foresight and collaborative efforts of our best scientists and fire managers.

The National Seasonal Assessment Workshop, a collaborative effort between the National Interagency Coordination Center (NICC) Predictive Services, the Climate Assessment for the Southwest (CLIMAS), and the program for Climate, Ecosystem, and Fire Applications (CEFA), arose from a discussion between Tom Wordell, Barbara Morehouse, Tim Brown, Tom Swetnam and myself following a climate and fire workshop for the Southwest held in February 2002. Given the destruction of thousands of acres across the United States during the past two years, the devotion of this group of individuals and others to a process of applying the best insights of fire and climate science and proactive management strategies to fire management, and their commitment to improving fire management decision-making and resource allocation is all the more inspiring and all the more necessary. I hope that our efforts to create and to improve the National Seasonal Assessment Workshop will result in regular annual workshops and the adoption of pre-season forecasts that can really improve management strategy and response and reduce the likelihood of future fires turning into devastating infernos.

Gregg Garfin, Assistant Staff Scientist, CLIMAS
July 7, 2003

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We apologize if we have left anyone's name off the list.

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Executive Summary

A change from reactive to proactive fire management can only be accomplished with the aid of forecast tools that can provide a well-informed, science-based, preseason assessment of fire danger. More than a decade's worth of research has demonstrated strong relationships between wildland fire, persistent climate patterns, such as El Niño-Southern Oscillation, and fuel moisture. Moreover, climate forecasts and drought monitoring have improved rapidly based on advances in understanding the long-term circulation of the ocean-atmosphere system. Multi-institutional synergistic thinking with regard to climate and proactive fire management, and a spirit of collaboration between individuals at NICC Predictive Services, CLIMAS (University of Arizona), and CEFA (Desert Research Institute) set into motion the creation of a National Seasonal Assessment Workshop (NSAW) to produce preseason fire danger outlooks for the 2003 fire season.

During the week of February 25–28, 2003, the first annual NSAW brought together climatologists, predictive service units, and fire managers from across the country to produce seasonal fire outlook reports. The NSAW was structured to foster communication between climate forecasters and Geographic Area Coordination Center (GACC) specialists, and to enhance communication and cooperation between the GACCs. The objective of the workshop was to improve information available to fire management decision makers.

Under the guidance of CEFA, climate experts from five agencies merged climate predictions into a consensus forecast for the 2003 fire season. This new climate decision-support tool, along with regional fire and fuels assessments prepared in advance of the workshop, provided the foundation for the seasonal fire danger outlooks. Interactions between fire specialists and climate forecasters set the stage for a period of concentrated effort during breakout sessions to produce the outlooks. The workshop offered a unique opportunity for cooperation among the geographic areas and climate forecasters to share fire danger and climate forecast perspectives, fuels and weather data, and other information.

Carefully structured, intensive work and feedback sessions resulted in:

- Improved communication between climate forecasters and an increased understanding by the forecasters of the forecast needs of the GACCs.
- A high degree of dialogue, coordination, innovation, and sharing of collective knowledge and techniques between the GACCs.
- Feedback to improve climate forecasts.
- Syntheses of climate, weather and fuels information for each geographic area.
- Enthusiastic support for future workshops, the production of collaborative technical notes, and organization of training sessions on forecast and assessment techniques.

The tangible products of the NSAW included the following:

- Geographic area wildland fire outlook reports.
- NICC preseason national wildland fire outlook.
- 2003 consensus climate forecasts for wildland fire management.
- Standardized protocols for producing long-range fire danger outlooks.
- Frameworks for future multiagency cooperation.

Based on feedback from workshop participants the following recommendations will be applied to future workshops:

- Workshop success hinges on maximizing opportunities for interaction between workshop participants, in order to share data and forecast expertise.
- Workshop productivity can be enhanced if public lecture time is decreased and work session time is increased;
    - therefore, consensus climate forecast sessions should be held prior to the workshop and

presented briefly on the first day of the workshop.

- Workshop organizers and participants need to better prepare workshop materials in advance of the meeting; this includes:
    - Providing checklists of data and analyses needed by geographic areas.
    - Priority access to NICC online databases.
    - The creation of rough draft outlooks by the geographic areas prior to future workshops.
- It is necessary to employ a professional technical writer in order to facilitate the rapid turnaround of workshop outlooks and reports.
- Greater commitment of time by climate forecasters and an off-season training in climate forecast methods and uncertainties is key to increasing the use of national climate forecast products.

Carefully structured workshop organization and a collegial environment generated an unexpected level of enthusiasm and cooperation between participants, as well as learning and sharing of expertise. The workshop process provided a model and mechanism for moving the entire Predictive Services organization forward to meet its goals of integrating climate, weather, situation, resource status and fuels information into products that will enhance the ability of wildland fire managers to make proactive short- and long-range decisions for strategy development and resource allocation, and to improve efficiency and firefighter safety.

Introduction

Origins of the National Seasonal Assessment Workshop

The National Seasonal Assessment Workshop came about as the result of a confluence of fire management needs and synergistic thinking with regard to climate and proactive fire management in the United States.

Predictive Service units were established at the National Interagency Coordination Center (NICC) and eleven Geographic Area Coordination Centers (GACCs) were created in response to fire management and resource coordination needs stemming from the very active fire season of 2000. Predictive Services' mission is to integrate climate, weather, situation, resource status and fuels information into products that will enhance the ability of wildland fire managers to make proactive short-and long-range decisions for strategy development and resource allocation. The overarching goal of Predictive Services is to improve efficiency and firefighter safety. NICC utilizes Predictive Services to help coordinate timely and cost-effective movement of firefighting resources between the GACCs

The Climate Assessment for the Southwest (CLIMAS), a NOAA-funded Regional Integrated Sciences and Assessment project, works to improve the understanding of the vulnerability of the Southwest region to climate variations and changes and improve the flow of climate information to interested stakeholder groups in the Southwest.

The research of individuals such as Tom Swetnam and Julio Betancourt in the Southwest United States (e.g., Swetnam and Betancourt 1990; 1998) and Tim Barnett and Jim Brenner in the Southeast United States (e.g., Barnett and Brenner, 1992), demonstrated strong relationships between persistent climate patterns, such as El Niño-Southern Oscillation (ENSO), and acres burned in wildland fires. Moreover, others (e.g., Brown and Betancourt, 1999) demonstrated the utility of such information in achieving fire management objectives. The research of Swetnam and colleagues shows that widespread synchronous fire occurrence in the Southwest is associated with a pattern of a wet winter followed by one to several dry years.

Such a situation was imminent by the beginning of 2000, when enhanced fine fuel growth was set up by wet El Niño conditions in 1997–98, and fuel curing among all size classes was set up by dry La Niña conditions beginning during the summer of 1998. Consequently, in February 2000, CLIMAS hosted a workshop to alert the fire management community of these conditions, to explore the use of historical climate information and climate forecasts for proactive fire management, and to foster dialogue between the climate forecast and fire management communities. The workshop was also sponsored by the University of Arizona's Laboratory of Tree-Ring Research and Institute for the Study of Planet Earth.

The 2000 workshop, "The Implications of La Niña and El Niño for Fire Management," began a process of bringing the issue of long-range climate to the top of the list of proactive fire management concerns. CLIMAS has continued to host a series of annual workshops in order improve communication between the climate forecast and fire management communities, as well as to encourage collaboration between members of the climate and fire research communities in order to address concerns and needs raised by fire managers. The results of surveys conducted by CLIMAS over the course of four workshops indicate that historical climate information and climate forecasts are most useful prior to the fire season in order to aid in resource allocation, repositioning of resources, prescribed fire management, and in order to raise public awareness of fire season danger.

Beginning with the 2001 CLIMAS fire-climate workshops (Garfin and Morehouse, 2001), the program for Climate, Ecosystem and Fire Applications (CEFA) at the Desert Research Institute (Reno, NV) has been a key collaborator in helping the climate forecast community to better address fire management stakeholder needs as a result of focused workshop activities. CEFA has as its mission the following strategic goals, which position it as a bridge between the climate forecast and fire management communities:

- Serve as a liaison between the decision maker (user) and the scientific research community by

assisting in technology transfer and eliciting user feedback.

- Provide climate and weather information directly for fire and ecosystem decision making and strategic planning.

- Assess fire risk, impacts, and hazards.

Moreover, CEFA undertakes innovative applied research to improve the understanding of relationships between climate, weather, fire and natural resources. CEFA activities have helped improve operational fire weather forecasting and smoke prediction using state-of-the-art knowledge of the climate system. In addition, CEFA has established a close working relationship with NICC Predictive Services.

At CEFA's urging, the 2002 CLIMAS Fire in the West workshop included a special focus on producing tangible operational products for the fire management community. In addition to hearing research talks and participating in discussion about future research and operational needs, selected participants at the 2002 Fire in the West workshop created (1) a national consensus climate forecast for the fire season (the format of which was based on the recommendations of fire weather and fire management participants), and (2) a fire season weather, climate, fuels outlook for the Southwest Coordination Center (SWCC).

Climate forecasting is an integral component of seasonal wildland fire outlooks for the following reasons:

1. Fire occurrence is dependent on multi-timescale processes.

2. Persistence in ocean temperatures and circulation allows for increased predictability.

3. In addition, insights gained from research into processes that govern the long-term circulation of the North Pacific Ocean and the interaction between the North American land surface and adjacent oceans, such as the North Atlantic Oscillation, Pacific Decadal Oscillation, and the North American Monsoon, are adding skill to long-range forecasts.

4. Climate forecasts and drought monitoring have continued to improve rapidly, based on the advances in understanding aforementioned parts of the climate system and advances in monitoring long-term conditions, such as the Standardized Precipitation Index (e.g., Schlobohm and Brown, 2001; Guttman, 1998). In addition, research suggests that knowledge of long-term climate-fire relationships, along with information contained in seasonal climate forecasts, provide useful tools for fuels treatment scheduling, and the actual treatment implementation (Brown and Betancourt, 1999).

5. Climate can have an important effect on large fuel moisture in addition to more easily observed and measured effects, such as seasonal abundance and curing of fine fuels.

Beginning in February 2002, a three-way dialogue between NICC Predictive Services (the initiator of the dialogue), CLIMAS, and CEFA set into motion the creation of the NSAW. These three agencies specifically sought to emulate and expand upon the creation of climate-based preseason fire danger outlooks at the 2002 Fire in the West workshop.

Goals and Objectives of the Workshop

The fundamental objective of the NSAW was to improve information available to fire management decision makers. A particular objective of NSAW was to use climate history and climate forecasts to improve information available to decision makers to set priorities for allocation of firefighting resources at local, regional, and national scales, as well as for multi-agency coordination and determination of preparedness levels. This was accomplished through the development of standards and protocols of seasonal outlooks for each of the 11 GACCs.

The NSAW was structured to bring together national climate forecasters, NICC and GACC Predictive Services meteorologists and intelligence personnel, and others in order to:

- Decide upon a set of standards, procedures and protocols for producing multi-timescale fire danger outlooks (Appendix A).

- Put these standards to immediate use by creating comprehensive seasonal fire danger outlooks, that incorporate information about climate and fuels conditions, for each geographic area.

An explicit goal of the NSAW was to establish the aforementioned protocols in a way that facilitates the easy update of seasonal outlooks as needed. In addition, we sought to maximize the distribution of information contained in the outlooks and put into action a mechanism for gathering feedback during the course of the fire season. Furthermore, we structured the workshop to:

- Foster communication between climate forecasters and GACC specialists.
- Foster communication and cooperation between the GACCs.
- Gather feedback from GACC fire specialists and national fire managers.

The NSAW was structured to encourage synergy within the climate forecast community through mutual cooperation to produce a consensus climate forecast. Another objective was to provide opportunities for the climate forecasters to interact personally with fire management professionals. This allowed forecasters to improve their understanding of the needs of the fire management community and, ultimately, to improve the format and content of climate and weather forecast products in order to address management needs.

Finally, the NSAW explicitly addressed a need for improved communication and cooperation between the GACCs, in order to:

- Improve national fire danger outlook "edge-matching" in adjacent regions, through sharing information about regional fuels and climate/weather patterns.
- Enhance the capacity of the GACCs to share methods, techniques, and information useful for producing their own seasonal outlooks.
- Create a mechanism for future cooperation and enhanced information flow, by providing an environment conducive to dialogue and discussion.

The Workshop

Structure

The workshop was structured to minimize the time participants spent passively listening to research presentations and maximize the time spent (1) working on outlook reports, (2) consulting with climatologists and other geographic area personnel, and (3) reporting progress, getting clarification, and providing feedback to the meeting organizers and other geographic area personnel (see Appendix B for meeting agenda).

The first full day of the meeting provided participants with important background talks and information, including national climate forecasts and regional fuels assessments. Prior to the workshop, the organizers prepared a set of standardized protocols and a report format, informed by a pre-workshop period of comments from the GACCs. During the first day, participants gave final feedback on the aforementioned protocols and report format. These discussions clarified the goals and process of composing the outlooks. Participants agreed on a basic layout style, outline and format, document length, mechanism for updates, and forecast coordination between adjacent geographic areas. Climate forecasters spent afternoon and evening hours in discussion as they prepared the national consensus climate forecast for spring and summer 2003. Forecasters compared the results of various forecast models and examined historical probabilities of above- and below-average temperature and precipitation based on analogue configurations of the ocean-atmosphere system. Based on their intimate knowledge of the strengths and weaknesses of the models and historical data, they quickly determined the regions of maximum agreement. By process of debate and reasoning, the forecasters eventually clarified forecast probabilities for problematic regions and assigned no forecast confidence to regions where conflicts between forecast tools could not be resolved.

During the second day of the meeting, participants heard the consensus climate forecast report and had an opportunity to question climate forecasters regarding the regional details of the forecast. Participants then spent the next two days of the workshop work sessions divided up by geographic area. Individual breakout rooms were located along a common hallway at the conference venue. This allowed the privacy necessary to concentrate on work and at the same time the logistical convenience necessary to facilitate communication between the geographic areas. All geographic area workgroups reconvened once each day in order to discuss progress, problems, and the content and distribution of this workshop synthesis volume.

Communication and cooperation

One of the outstanding highlights of the workshop was the degree of coordination, communication, and

cooperation within and between geographic area workgroups. The workshop provided an opportunity for fuels, fire behavior, and fire weather specialists, often dispersed throughout large multi-state geographic areas, to meet face-to-face in order to discuss on-the-ground and forecast conditions throughout the broader geographic area. The two California geographic areas collaborated on a single assessment representing both northern and southern parts of the state; similarly, the eastern and western Great Basin geographic areas worked together to prepare an integrated outlook. Geographic area fire weather program managers were especially heartened to receive firsthand fuels information from the far reaches of their geographic areas. The workshop served to lay the groundwork for sharing information on fuels assessments among the geographic areas.

The geographic areas worked together to build on each other's strengths and share expertise. The workshop participants expressed satisfaction with and enthusiasm for bringing together all 11 geographic areas for one national preseason outlook meeting. The flow of information between geographic areas was particularly impressive with regard to forecasts and assessment methodologies. Participants noted that collective knowledge and expertise from each of the areas, along with a healthy sense of friendly competition, resulted in enhancements to geographic area reports that would not be possible in isolation. Moreover, western geographic areas shared information regarding how their regions have been affected by vast areas of forest mortality due to drought stress and insect infestation. News of forest mortality, especially in areas of southern California characterized by wildland-urban intermix, was of particular interest to climate forecasters from other regions of the nation.

Climate forecasters expressed an appreciation for the consensus forecast process, which allowed them to compare notes and weigh the strengths and weaknesses of individual forecasts. However, the resulting forecast is probably conservative due to the nature of the consensus process; at the same time, confidence in the geographic extent of forecast probability anomalies is probably strengthened by the process. An important outcome is that climate forecasters were sensitized to the forecast and data needs of geographic areas outside the western United States. In particular, forecasters learned of the need to focus forecast and diagnostic efforts on Alaska (the geographic area with the greatest number of wildland acres burned in 2002).

Workshop Products

National Wildland Fire Outlook

National Interagency Fire Center
Predictive Services Group
Issued March 7, 2003

National and Geographic Predictive Service groups, climatologists, fuels specialists, and fire behavior analysts convened for a seasonal assessment workshop in Mesa, Arizona during the week of February 24–28, 2003. Based on the analysis shared and assessments completed, it was determined that nationally, the 2003 fire season will not be as severe as 2002. However, much of the interior West, south/central Alaska, western Great Lakes and northern Maine is expected to experience an above-normal fire season (Figure 1) for the following reasons:

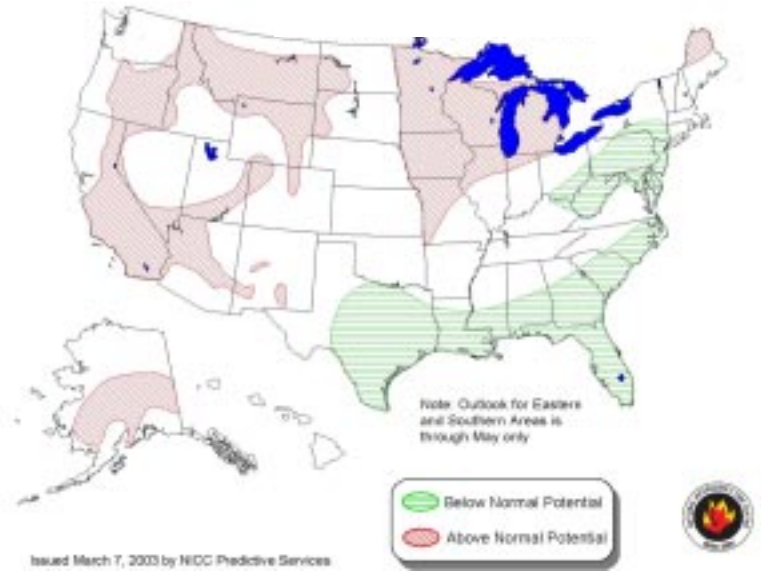

Figure 1. National Wildland Fire Outlook for March–August 2003.

- Long-term drought persists over much of the interior West with mountain snowpack (Figure 2) and winter precipitation remaining below average to date.

- Drought stressed and/or insect damaged vegetation is becoming more prevalent across the western states and will increase the potential for large, destructive wildfires at mid to high elevations.

- Drought conditions are emerging in the Great Lake States (Figure 3) leaving herbaceous fuels standing, uncompressed, and receptive to ignition. An early fire season is anticipated with peat fires in these areas being problematic due to dry conditions.

- Early snow melt is anticipated for Alaska, Pacific Northwest, Great Basin, and northeastern California, which will cause large dead/downed fuel moistures to drop below critical values earlier than normal in the higher elevation areas, resulting in an early and extended fire season.

- The Southern Area is expecting a below normal spring fire season overall; however forecasts call for a very active tropical storm season which could result in an above-average number of hurricanes that impact the area and diminish fire risk through the summer months.

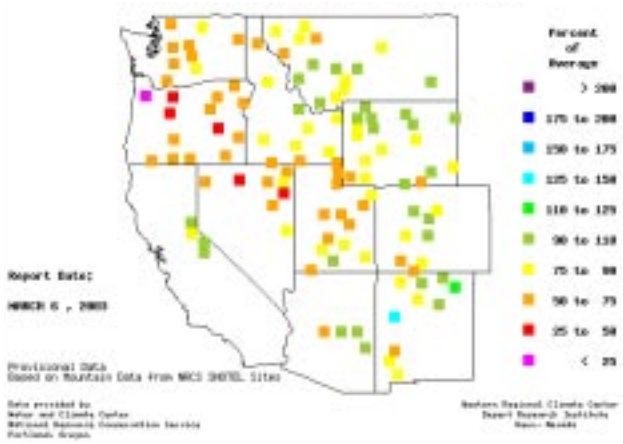

Figure 2. Basin Average Snow Water Content, % of Average

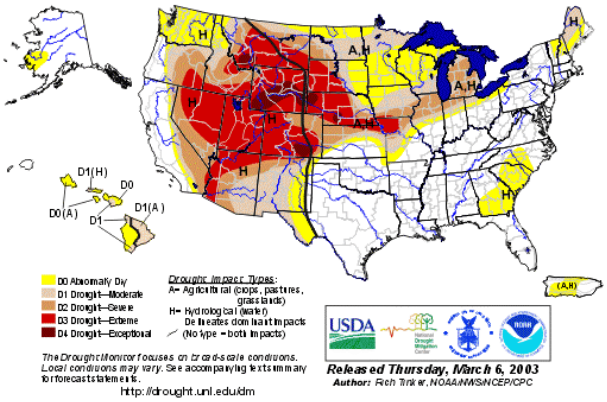

Figure 3. U.S. Drought Monitor, issued March 4, 2003.

- An early spring prescribed fire season is expected across many western states.

Much of the West continues under a 4–5 year drought while much of the East has shown improvement this winter. Snowpack is generally below normal in the West, particularly in the Northwest where Oregon has only received about half their usual snowfall.

El Niño, characterized by warmer than usual waters in the tropical Pacific, is weakening and should end by summer. Overall, it has been warmer and drier in most of the West while the East has been colder and wetter than normal. The western Great Lakes and portions of Alaska have had a relatively dry winter. El Niño is expected to continue the wet pattern in the Southwest this spring. A warmer than normal spring in the West and Alaska will mean an early snowmelt to those areas.

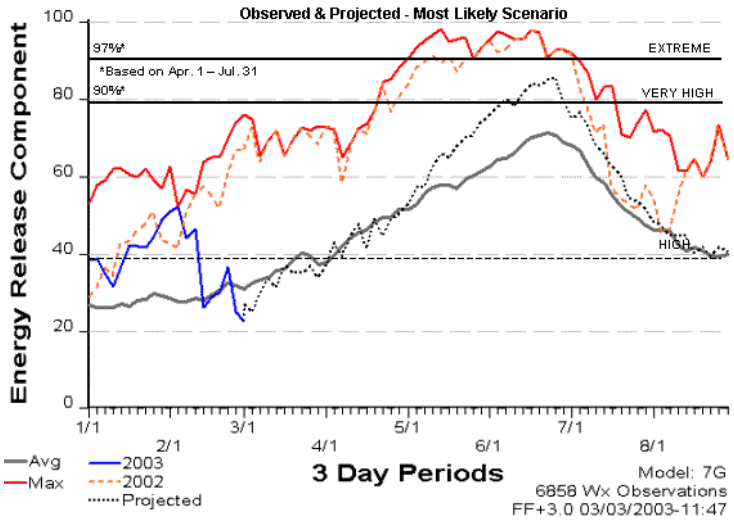

Figure 4. Southwest Area ERC Curve 2003.

Executive Summaries from Individual GACC Outlooks

Alaska: Normal to Above-Normal Potential
Based on the consensus forecast, along with lower than average snowpack, many areas will be snow free about 2–3 weeks earlier than normal. This will lead to an increased probability of early human-caused fire occurrence, particularly along accessible transportation routes, spring hunting areas, and wildland-urban interface areas. Early season human-caused fires commonly occur in interface areas that have more value to be protected than later occurring lightning-caused fires.

Southwest: Normal to Above-Normal Potential
Precipitation events are anticipated in March and April, yielding a normal spring green-up and averting an overly active early season. Fire danger across some areas of the Southwest Area is expected to be above average due to long-term drought, increased likelihood of above-normal temperatures, low amounts of winter snowpack at the mid-elevations, and widespread vegetative dieback due to insect and disease damage. Area average ERC values are expected to peak between the critical 90th and 97th percentiles between late May and early July, which correlates with the peak potential for large fire activity (Figure 4). ERC values are not expected to reach record levels. Expect normal initial attack activity through mid-May, with an increase likely from late May to early July. Annual and perennial fuels will undergo a normal spring green-up and become available to carry surface fire as they cure during the typical dry late spring and early summer period. More grass and brush fires are anticipated this season than in 2002. Resources needed for initial and extended attack, and potential project fires, will be greater than usual from May to the start of the monsoon. At this time, there are no clear indications about the strength or timing of the monsoon.

Northern Rockies: Normal to Above-Normal Potential
The Northern Rockies is entering its fifth consecutive year of drought. Overall, snowpack is currently running between 50-70 percent of normal. Live fuels are showing signs of significant stress. Mountain pine beetle, spruce budworm, and Douglas-fir bark beetle outbreaks are increasing and expected to expand. The area should experience normal spring green-up. A normal season drying pattern in July will set the stage for an active fire season by August. Fire activity during July and August will exhibit characteristics of the extended drought with large fire growth taking place during the latter half of August. "August Singularity" storms can be expected to place a slowing effect on fire activity. A drying trend is expected to re-establish in early September and continue into the fall. Two prescribed burns in the Little Snowy Mountains on the Lewis & Clark National Forest in early January at 5,500 feet reported 75-degree temperatures and 13 percent relative humidity. Spring prescribed burning could be limited due to abnormally dry conditions and stressed vegetation.

Great Basin: Normal to Above-Normal Potential
Ongoing drought conditions since 1999 have created progressively drier fuels each fire season. Below-normal snowpacks each winter followed by drier and warmer springs have led to earlier than normal green-up and curing of fuels across most of the Great Basin. This has resulted in some post-green-up frost kill in oak brush fuels. Tree mortality is becoming evident in the following areas: southwestern Utah and northern Arizona forests and rangeland (up to 20 percent), eastern Utah forests, and northern Idaho forests (2–3 percent). In southern Utah and northern Arizona, drought induced mortality is 20 percent in pinyon-juniper and brush fuels (see image). On the Arizona Strip, up to 30 percent mortality has occurred in ponderosa pine occupying shallow soil sites. These areas currently have a high potential for large fire growth, with dead aerial and horizontal fuels causing problems under any weather scenario. Low to normal spring rainfall will be insufficient to produce the fine fuels necessary to drive fires in the grass/brush fuels, unless accompanied by high winds. In higher elevation timber fuels, a variety of factors will combine to produce above-normal fire potential. Extremely dry large fuels and heavy fuel loadings resulting from increasing timber mortality will increase fire potential at the higher elevations in Utah, western Wyoming, and central Idaho.

Northwest: Normal to Above-Normal Potential
Drought conditions extend across eastern Oregon and the western slopes of the Oregon Cascades. Mountain snowpacks are expected to melt 2–3 weeks earlier than usual, around the middle of May. This will result in an early green-up even at higher elevations allowing an early spring prescribed fire season. Fuel moistures are expected to drop below critical values in early July resulting in an early and extended fire season. A high risk of long duration, large timber fires is likely, even at higher elevations, which normally have a low risk. Two to three episodes of dry lightning can be expected. Eastern Oregon and the Oregon Cascades are likely to experience a very active fire season resulting in a higher than normal demand for resources.

California: Normal to Above-Normal Potential
There are two particular areas of concern regarding fuel conditions in California. One is the drought-affected, large dead fuel moistures of the Eastern Modoc plateau and eastside of northern California. The second concern is the significant brush mortality and drought/bug-killed timber areas of southern California. The Los Padres, Angeles, and Cleveland National Forests have low to moderate levels while the San Bernardino National Forest has moderate to high levels of brush and timber mortality. These are likely to cause extreme fire behavior even under moderate fire weather/fire danger conditions. Indications from the current weather and climate outlook are that the fire season will start in the typical time frames across much of California. However, the drier eastside areas will see a fire season start earlier and be of longer duration than normal. Fire danger is expected to be above average in all parts of the state except the western two-thirds of northern California. Lightning occurrence in Northern California has a very good chance of exceeding that in 2002, as last year was well below the 10-year average amount.

Rocky Mountain: Normal to Above-Normal Potential
Confidence is high that the full onset of the 2003 fire season in the RMA will not be as early as 2002, even if they receive only 75 percent of average spring precipitation. Currently the area has better snowpack than in 2002 and forecasts show that Colorado, southeast Wyoming, southwestern Nebraska, and western Kansas will have average amounts of spring precipitation. Thousand hour fuel moistures and energy release component values are expected to reach critical levels in June. Even with the expected spring precipitation, potential remains high for an above-average 2003 fire season, especially in northern Wyoming, the Black Hills Region, the Northern Front Range, southeast Wyoming, and northwest Colorado. This is due to the vulnerability of the fuels from long-term drought conditions and ERC projections in June, July, and August considering even average precipitation.

Eastern Area: Below-Normal to Normal Potential
The Eastern Area outlook only addresses expected conditions for March through May of 2003. Fairly frequent and significant precipitation events during the winter of 2002–03 provided relief to the long-term drought, which was in place across the Mid-Atlantic states and eastern seaboard at the end of 2002. Meanwhile, precipitation deficits across much of the Great Lakes and northern Big Rivers Compacts have expanded drought conditions into these areas since October 2002. Above normal rainfall over portions of the Great Lakes Compact through the summer and fall of 2002 created an abundance of fine fuels. Below normal winter snow depths across much of the Great Lakes area have left fine grass fuels uncompressed and still standing. These fuels are expected to remain highly receptive to ignition and spread. Fires in peat soils are

expected to be problematic, burn deeper, and require extensive mop-up operations. Fire season initiation could be as much as 2–3 weeks ahead of normal in the Lake State area and northern Maine.

Southern Area: Below-Normal to Normal Potential
The Southern Area outlook only addresses expected conditions for March through May of 2003. Wetter-than-normal weather conditions over the majority of the Southern Area have continued to dampen fire potential through the beginning of March, which is historically one of the most active periods in the Southern Area. Green-up and curing is expected to be later than normal this year. Hundred- and thousand-hour dead fuels are at normal to above-normal moisture levels with the majority of the area at all time maximum values for this time of the year. Overall fire risk during the spring months should remain in the normal to below-normal range. This should allow successful prescribed fire implementation over the next several months. Dr. Gray's (University of Colorado) current forecast calls for a very active tropical storm season, which could result in an above-average number of hurricanes that impact the area and diminish fire risk through the summer months.

The complete preseason fire danger outlooks for each of the 11 geographic areas can be found on the NICC Predictive Services website (http://www.nifc.gov/news/nicc.html [click on one of the geographic areas on the map]). For several of the geographic areas (e.g., Alaska, California, Great Basin, Rocky Mountain), these reports should be considered as preliminary assessments of potential fire danger. These regions are subject to significant variability in late winter/early spring precipitation; hence, conditions could change substantially prior to the onset of the fire season. Seasonal fire danger outlooks will be updated as needed prior to and during the fire season for each of the geographic areas. The aforementioned website should be checked periodically for updates.

National Consensus Climate Forecast

Seasonal forecasts of two-category probabilistic temperature and precipitation anomalies were produced for the contiguous United States and Alaska as significant input into the geographic area wildland fire seasonal outlooks. Forecast consensus was reached by combining several monthly and seasonal forecasts produced at 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), and the NOAA/CIRES Climate Diagnostics Center (CDC). 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 geographic area decision making.

The forecast periods were March–May (MAM) and June–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 based on combining the results of several dynamical climate forecast models and sea surface temperature predictions. The ECPC contribution included current monthly forecasts from global and regional forecast models. The CPC contribution was based on a dynamical model, a statistical model, and long-term trend. The CDC contribution was based on a newly developed statistical model and analysis of precipitation forecasts in the Southwest United States. In addition, historical climate information based on averages of ENSO-related precipitation and temperature for MAM and JJA during rapidly declining El Niño phases were consulted. These objective forecasts were then combined with forecaster judgment, including model forecast skill, temperature versus precipitation correlations, and current opinions regarding the state of ENSO.

The forecasts were produced via a round-table forum during the workshop. The discussions were characterized by collegiality between participants and enhanced communication between forecasters from the major national climate forecast entities in the United States. Forecast discussions 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-average. Given the current state-of-art for climate prediction, probabilities of 65 percent and larger relate to fairly high confidence, whereas 55 percent represents only a slight hedge.

Figure 5 shows the 2003 seasonal U.S. consensus forecasts for MAM temperature, MAM precipitation, JJA

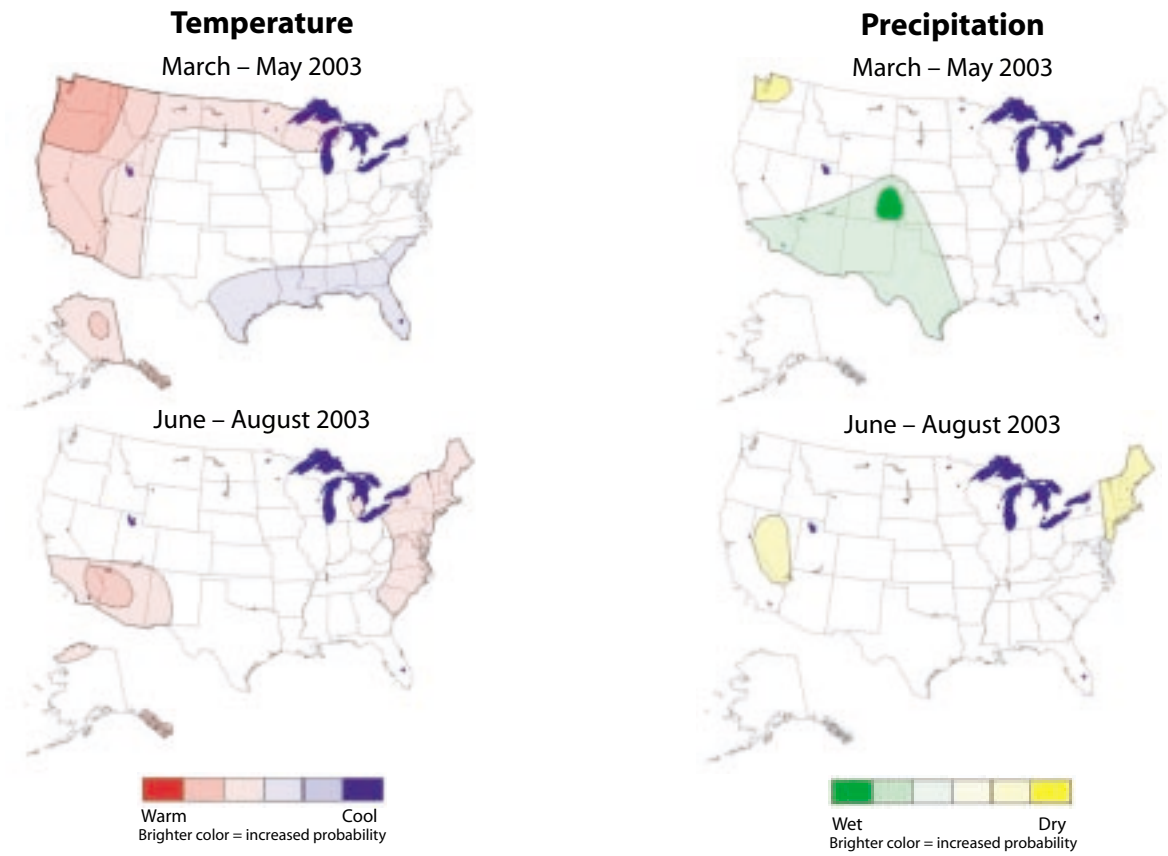

Figure 5. 2003 Seasonal U.S. Consensus Forecast.

temperature, and JJA precipitation, respectively. The primary highlights of these maps are increased likelihoods of above-average temperature for large portions of the West during MAM and JJA, and above-average precipitation for the Southwest during MAM. The seasonal outlook of wildfire potential, which was developed in part from these figures, is available at the NICC web site: http://www.nifc.gov/news/intell_predserv_forms/season_outlook.html.

This is only the second effort to produce a consensus forecast by combining forecasts from different organizations (see Brown et al. 2002). Thus, 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 greater than individual forecasts, depending on the region and the number of inputs that were in agreement. Brown et al. (2003) contains a qualitative assessment of forecast skill for the 2002 consensus probabilistic forecasts.

Recommendations

In addition to brief daily sessions in order to provide feedback during the course of the workshop, participants were given ample time during a working lunch on the final day of the workshop to convey constructive criticism of the workshop process. Critiques focused on two areas: what worked and how to maintain and/or improve it, and what did not work and how to improve it.

What Worked and How to Maintain It

Workshop participants expressed satisfaction with the breakout group organization. Most geographic areas found that the size of their breakout groups was adequate to produce a report representative of their entire geographic area. Some geographic areas, such as southern California, mentioned that future seasonal assessment workshops would be enhanced through greater participation by state fire management agencies. Participants found that individual breakout rooms facilitated concentrated work, while close proximity aided interaction between groups. Moreover, they found that taking time out from individual work sessions in order to gather in large group feedback sessions during the course of the breakout report writing activity was productive and informative. They found that communication with and/or feedback from other geographic areas enhanced the quality and completeness of their reports. Participants came to the consensus that a single national meeting to produce preseason outlooks was preferable to multiple meetings, even if it meant that some regions would attend far in advance of their fire season.

Workshop participants were enthusiastic about producing a technical note on the analytical techniques used by different geographic areas to produce preseason outlooks. All participants valued innovation and the sharing of techniques. When questioned about what they would like to see in a fall assessment and evaluation meeting, participants mentioned the need for climate diagnostics (i.e., analyses of past climate behavior) talks. They expressed the need for explanations of what weather patterns dominated during the fire season, and why the climate and weather of the fire season turned out the way it did. Climate forecast evaluation and review was also a subject desired by workshop participants. Particular topics of interest included the following:

- The North American summer monsoon, the Four Corners high, and how these relate to thunderstorm activity.
- More information and diagnostics regarding lightning occurrence and, if possible, a lightning forecast.
- A climate outlook for the upcoming winter season.

What Did Not Work and How to Improve the Workshop

Workshop participants were clear and concise with regard to improvements for future national seasonal assessment workshops. The major areas of concern expressed by workshop participants included climate forecasts, pre-workshop preparation, and training.

Participants expressed frustration with the structure of climate forecast activity and climate forecaster participation in the workshop. Participants recommended that climate forecasters arrive one day prior to the workshop in order to produce the consensus forecast and give any necessary individual presentations. They remarked that geographic area personnel interested in individual climate forecast presentations could arrange to arrive early in order to attend these presentations. This would also increase their opportunities to question climate forecasters regarding the consensus climate forecast. Participants desired more background from the climatologists with regard to the factors considered in producing individual long-range climate outlooks. Although considerable effort would be required to provide such background, this would provide an excellent opportunity for forecast agencies and/or workshop organizers to provide training on climate forecast methodology and evaluation. All of the aforementioned would allow geographic area fire specialists more time to interact with climate forecasters during collective question-and-answer and individual breakout sessions on the first day of the workshop.

Participants expressed a common sentiment that their work groups would be more productive if a combination of the following measures was taken just prior to the workshop:

- Preparation of a comprehensive checklist of data, images and diagnostics necessary to produce long-range preseason outlooks (responsibility of workshop organizers).

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- Preparation of a website dedicated to the workshop, with links to online climate forecast and diagnostic products.

- Priority access to wildland fire and fire weather data in order to allow more streamlined and efficient data access during the workshop.

- Training in techniques used to analyze data for preseason outlooks.

In addition, some participants recommended better access to the Internet and better technical support for Internet and computer issues.

Although the fuels assessment presentations were valued by most participants, a question arose as to whether it was necessary to devote one-half day to these presentations. Climate forecasters, however, expressed that they learned much from the fuels assessments talks. We think that part of the richness of the workshop was the cross-disciplinary fertilization produced by bringing these very different research and operational communities together to exchange information and points of view.

Conclusions

After several years of workshops designed to foster cooperation between fire managers, geographic area meteorologists, and research climatologists, the first National Seasonal Assessment Workshop provided a successful means for Geographic Area Predictive Services personnel to produce preseason fire danger outlooks for each of the 11 geographic areas of the United States. Moreover, climate forecasters produced a second consensus forecast for the fire season and learned about key forecast, climate diagnostics, and data needs of GACC personnel.

The NSAW marked a turning point in the progression from dialogue and exchange of ideas between climatologists and fire management personnel to an operational process for producing preseason fire danger outlooks. Workshop participants and climate forecasters worked together in a focused and productive manner. The carefully structured workshop process successfully created an atmosphere of collegiality, openness, enthusiasm and an impressive degree of cooperation between workshop participants. Moreover, through pre-workshop communication and feedback, participants rapidly adopted outlook protocols and the method of presenting outlooks in terms of best-case/most likely/worst-case forecast scenarios.

Workshop organizers learned that interaction itself provided the key strength of the workshop process. In post-workshop evaluations, workshop participants placed exceedingly high value on interaction, and the sharing of data and forecast expertise. Participants also showed strong support and enthusiasm for cooperative work in a "work retreat-style" atmosphere away from offices and routine.

A key indicator of the success of the workshop was the enthusiastic support of workshop participants for future workshops, and collaboration on a technical note regarding forecast methods and innovations developed by the geographic areas. Moreover, workshop participants expressed strong support for training on GACC forecast and climate assessment techniques, and the construction, interpretation, and use of the national climate forecasts. The aforementioned activities have the potential to enhance sharing between GACCs, improve forecast skill, build capacity for the use of long-term climate and fuels assessment information, and to bring the entire Predictive Services organization forward on the learning curve.

Through careful observation and structured feedback from workshop participants, workshop organizers learned some important lessons about how to prepare for, structure, and run future seasonal assessment (and validation) workshops. A key factor for future workshops, suggested by workshop participants, is to further increase the time that workshop participants spend in work sessions devoted to constructing fire danger outlooks and in constructive dialogue about techniques and improvements to the outlooks; a suggestion for implementation in future workshops was to decrease time spent listening to technical details of individual national climate outlooks and devote the overlap in time spent with climate forecasters to a more succinct presentation of the consensus forecast. Based on the suggestions of workshop participants, we plan to ask that climate forecasters arrive one day prior to future workshops, in order to prepare the consensus forecast. In this way the first day of the workshop can be devoted to a brief presentation of the consensus forecast and increased opportunities for interested workshop participants to question forecasters about the regional details of the consensus forecast.

Organizers also learned that improved workshop success will depend, in part, on better pre-workshop preparation by both organizers and participants. Workshop organizers need to prepare ancillary materials, such as a checklist of data and diagnostic analyses needed by participants. Priority access to NICC online databases and other web-based data are needed, as is preparation of a website or CD of annotated links to climate assessment and forecast graphics to be used by workshop participants. GACC personnel also need to better prepare necessary data, diagnostic analyses, and rough draft outlooks prior to future workshops.

In terms of human resources, several lessons were learned. Workshop organizers will need to ensure the participation of all parties necessary for producing the outlooks, including non-GACC partners in geographic areas where state fire management personnel play key roles in overall fire management and planning. Work-

shop organizers need to work harder to secure the participation of multiple participants from each geographic area. We found that in the cases where only one GACC participant attended or where the GACC participant did not have an established rapport with his/her non-GACC collaborator, high levels of synthesis were not realized. Workshop organizers also realized the importance of employing the services of a professional technical writer, as was done in the highly successful 2003 Joint Fire Science Program regional workshops, in order to facilitate the rapid turnaround of workshop reports. Finally, workshop organizers need to put further effort into securing a higher level of commitment and more resources from climate forecast entities; a greater level of time and commitment by the climate forecasters is key to improving fire and climate outlooks, increasing understanding of the methods and analyses produced by climate forecasters, and engendering greater trust and understanding between the climate research and fire operations communities.

Issues to be addressed in order to improve the outcomes of future workshops include the following:

1. What are the dangers and virtues of using analog forecast methods?

2. What are implications of preseason forecasts for post-season subsequent rehabilitation efforts and rehabilitation needs?

3. How can outlooks best portray fire danger assessment on both short- and long-term time scales?

4. What (training, validation, message) is necessary for participants to be at a greater level of ease with preseason outlook uncertainty?

In summary, collaboration between workshop organizers from different operational and research backgrounds, and commitment to providing resources by multiple government and university entities allowed for the successful creation and implementation of a workshop to produce preseason fire danger and consensus climate outlooks for the 2003 fire season. The workshop organization and environment generated an unexpected level of enthusiasm and cooperation between participants, as well as learning and sharing of expertise. The workshop process provided a model and mechanism for moving the entire Predictive Services organization forward to meet its goals of integrating climate, weather, situation, resource status and fuels information into products that will enhance the ability of wildland fire managers to make proactive short-and long-range decisions for strategy development and resource allocation, and to improve efficiency and firefighter safety.

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Appendices

Preseason Fire Danger Outlook Protocols

A. Executive Summary

1. A specific forecast statement (i.e., "the bottom line") should be explicitly included in the executive summary and final summary and recommendations.

2. Include a statement about your confidence in the forecast. Mention why you do or do not have confidence, based on your assessment of the various tools used in your forecast.

B. Introduction and Objectives

1. Include guidelines for use of the report and a disclaimer.

C. Current Conditions (including comparison with historical records)

1. Snow (SNOTEL data, SWE).

2. Precipitation anomalies (recent week, month, water year).

3. Temperature anomalies (recent week, month).

4. ENSO & other climate indices impact on weather and atmospheric circulation.

5. Weather and atmospheric circulation.

6. NFDRS, Fire Danger, and other fire potential indicators.

7. Drought indices and maps (PDSI, SPI, KBDI, soil moisture, groundwater, etc.).

8. Vegetation status (NDVI, greenness imagery).

9. Fuel moisture (live, dead, and foliar if known).

10. Fire occurrence data (number, size, duration if known for current year).

11. Fire behavior observations and/or Farsite run comparisons (if appropriate).

D. Climate and Weather Outlooks

1. Long-range climate outlooks (NOAA-CPC, IRI, Scripps, and others).

2. Projected atmospheric circulation.

3. ENSO and other relevant index forecasts.

4. Drought forecasts (including NCDC drought amelioration).

5. Soil moisture forecasts.

6. Fire weather indices.

E. Fire Occurrence and Resource Outlooks

1. Estimates of number of fires (based on historic lightning episode information, acres burned, duration, Scripps/Westerling model, and others).

2. Estimates of expected resource needs.

F. Future Scenarios and Probabilities

1. Fire Family Plus.

2. Priority sub-regions within Geographic Area.

3. Fuel-type considerations.

4. Climate considerations.

5. Season Ending Event Probabilities.

G. Management Implications and Concerns

H. Summary and Recommendations

Agenda

Tuesday, February 25

Morning	*Climate Forecasts (moderated by Gregg Garfin)*
08:00–08:30	Introduction, logistics, and opening remarks – *Gregg Garfin, CLIMAS; Tom Wordell, NICC*
08:30–09:00	Overview of climate forecast issues – *Tim Brown, CEFA/Desert Research Institute*
09:00–09:30	Climate diagnostic discussion and CDC perspective – *Klaus Wolter, NOAA-CIRES Climate Diagnostics Center*
09:30–10:00	Seasonal fire severity forecast – *John Roads, Scripps Institution of Oceanography Experimental Climate Prediction Center*
10:00–10:15	Break
10:15–10:45	The IRI forecasts for North America for 3-month periods through June–July–August 2003 – *Tim Brown, CEFA/Desert Research Institute (for Tony Barnston, International Research Institute for Climate Prediction)*
10:45–11:15	CPC climate outlooks for the U.S. for 3-month periods through March–May 2004 – *Russell Martin, NOAA Climate Prediction Center*
11:15–11:45	Scripps Statistical Fire Forecasts – *Tony Westerling, Scripps Institution of Oceanography Climate Research Division*
Afternoon	
13:00–13:15	An improved Fire Potential Index – *Jacqueline Klaver, USGS EROS Data Center*
13:15–15:30	Fuels Assessments/Outlooks *(moderated by Tom Wordell)* Simultaneous activity: National Consensus Climate Forecast is finalized
15:30–15:45	Break
15:45–17:00	Discussion of Seasonal Assessment Procedures and Protocols *(moderated by Rick Ochoa)*
17:00	Dinner

Wednesday, February 26, 2003

Morning	*Climate Forecast Review*
08:00–08:30	National Consensus Climate Forecast – *Tim Brown*
08:30–10:00	Climate forecast panel discussion
10:00–10:15	Break
10:15–12:00	Breakout sessions by Geographic Area to begin preparing outlooks. Some climate forecasters will be available for consultation
12:00–13:00	Lunch
Afternoon	*Work sessions*
13:00–16:30	Breakout sessions: outlook preparation and report writing
16:30–17:00	Reconvene for group discussion of issues arising from today's work
17:00	Dinner

Thursday, February 27, 2003

Morning	*Work sessions*
08:00–10:00	Breakout sessions: outlook preparation and report writing
10:00–10:15	Break
10:15–12:00	Breakout sessions: outlook preparation and report writing
12:00–13:00	Lunch

Afternoon	*Work sessions*
13:00–13:30	Reconvene for group discussion of issues arising from today's work
13:30–15:00	Breakout sessions: outlook preparation and report writing
15:00–15:15	Break
15:15–17:00	Breakout sessions: outlook preparation and report writing
17:00	Dinner

Friday, February 28, 2003

Morning	*Outlook Presentations (moderated by Tim Brown)*
08:00–08:15	Introduction and logistics – *Gregg Garfin, CLIMAS; Tom Wordell, NICC*
08:15–10:00	Informal presentations (15-minutes for each Geographic Area; hold discussion until 11:15)
10:00–10:15	Break
10:15–11:15	Informal presentations (15-minutes for each Geographic Area; hold discussion until 11:15)
11:15–12:00	Peer-to-peer coordination: open discussion and feedback on GA outlooks
12:00–13:30	Working lunch: discussion and feedback about the workshop and workshop process

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