



**CLIMAS**

Climate Assessment for the Southwest Project  
THE UNIVERSITY OF ARIZONA

# Walking the Talk: *RISA Lessons for CCSP*

**Gregg Garfin**

Climate Assessment for the Southwest

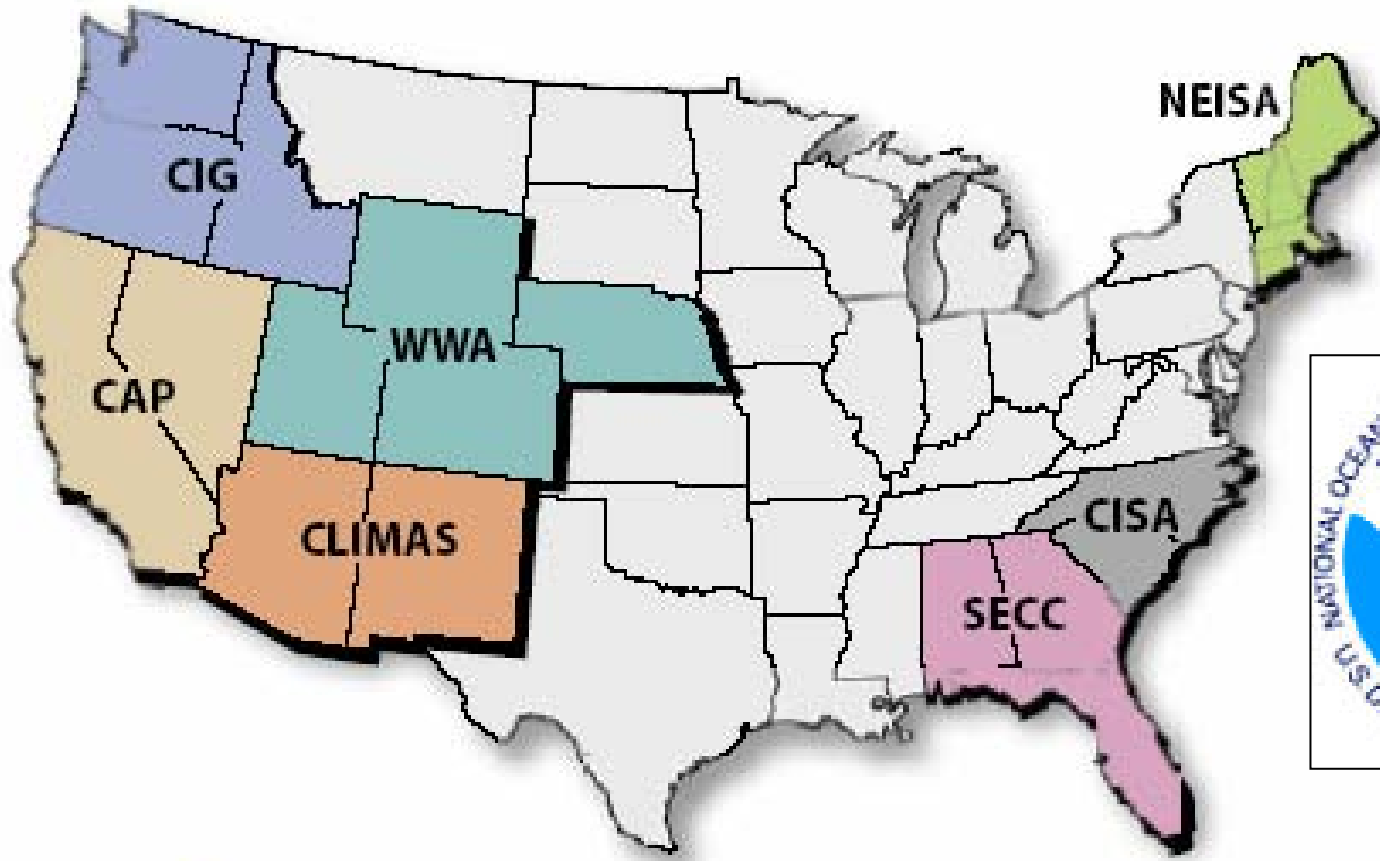
U.S. Climate Change Science Program

Climate Science in Support of Decision Making



CCSP Workshop

14-16 November 2005 Arlington, Virginia



# THE RISA NETWORK

# In Support of Decision Making

- **Climate science in support of decision-making must address the needs for**
  - Cutting-edge process-based science
  - Interactive web-based decision support tools
  - GIS
  - Modeling and predictions
  - Improved and expanded observations networks
- **Discovery-based science does this well**
  - This is the easy stuff

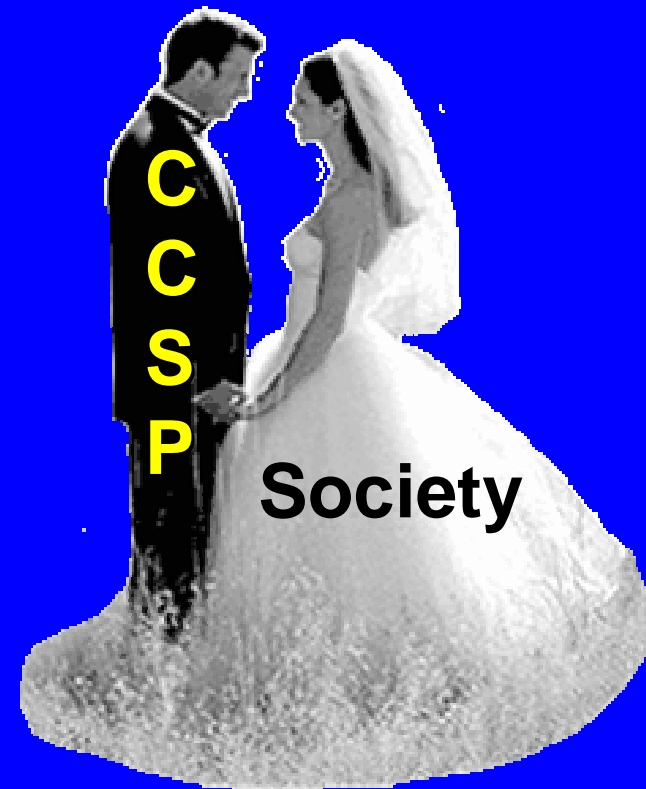
# It's the Relationship!



<http://www.weddingchannel.com/>

# It's the Relationship!

- **From a decisionmaker's viewpoint:**
  - *Trust*
  - *Commitment*
  - *Long-term relationship*



# Getting to Know You: Knowledge Exchange

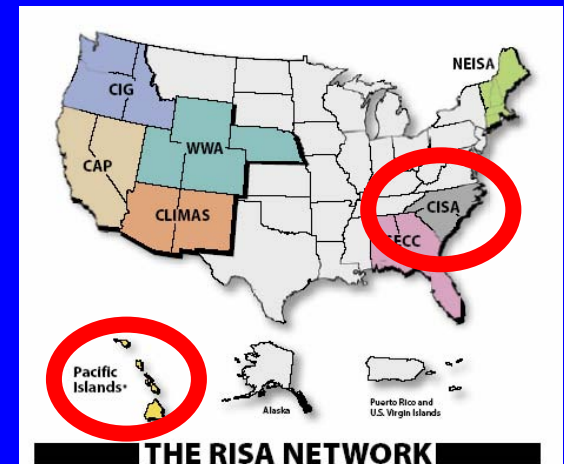
# Needs Assessment

- Timing of decisions
- Scale
- Frequency of delivery
- *Sondeos*
  - What are the variables of interest?
  - Can we model these?
  - Ancillary information?



# Decision Context

- Historical, cultural, socioeconomic factors
- Vulnerability to climate variability and change
- Institutional and legal issues





# Dating: Building Capacity

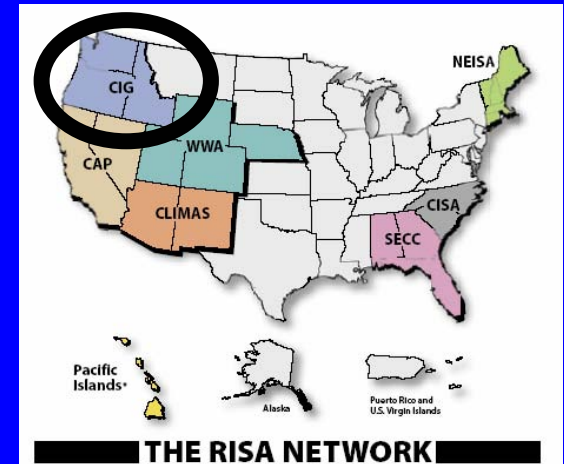
# The Workshop...

## A One-Night Stand?

- Knowledge transfer
- Feedback
- Increased capacities
  - To use decision support
  - To deliver decision support

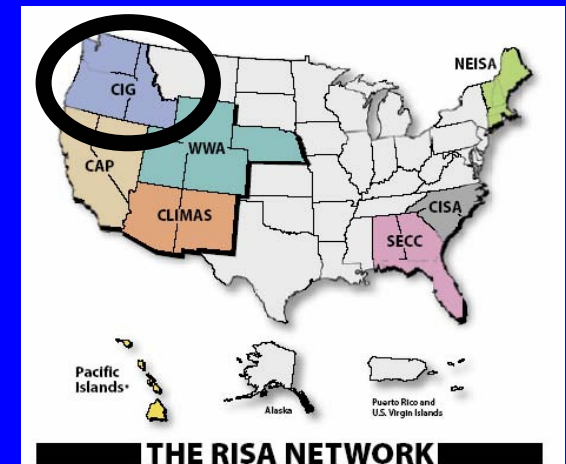
# Sustained Interaction

- CIG annual climate and water resources meetings
  - Focused on improving use of seasonal forecasts, ENSO variability, regimes, trends, climate changes
    - User lack of knowledge
    - Problems with forecasts



# Sustained Interaction

- **DROUGHT:** 2005 workshops on state water outlook + drought planning



# Sustained Interaction: The Payoff

- Beatles = overnight sensation
  - after 5 years of small clubs and beer halls!



Photos: Google Image Search

That's the Way  
*(uh huh, uh huh)*

I Like It

*(uh huh, uh huh):*

Evaluation

# El Niño-Drought Initiative



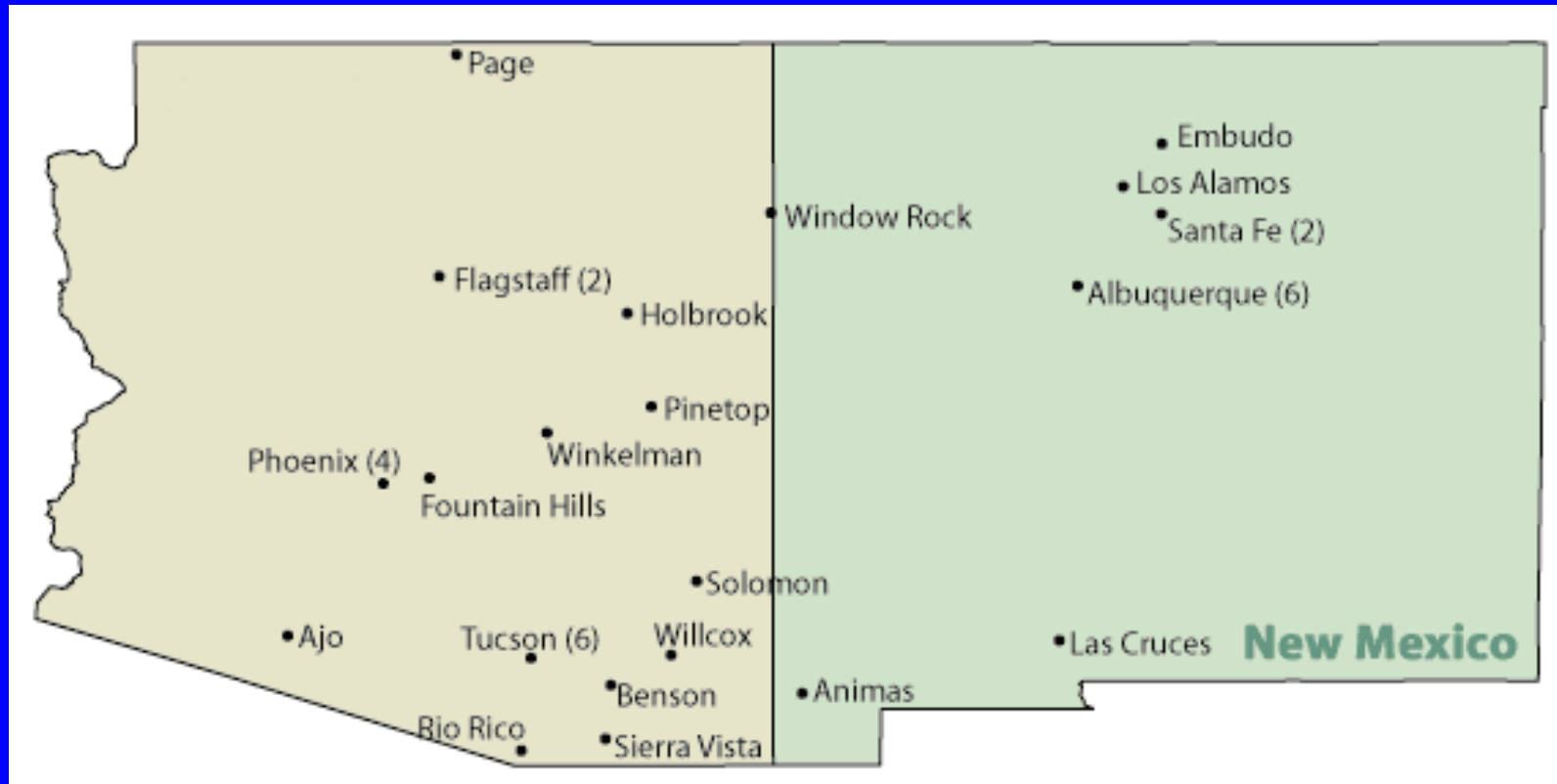
**Users**



**Producers**



# Participants




- Water, Fire, Land and Wildlife Management
- Tourism, Energy, Cooperative Extension, Ranching



# Monthly Climate Information

- Multiagency information
- Multiple pathways
  - Climate summary
  - Surveys
  - Interviews
  - Press briefings
  - Workshops

News from the CLIMAS El Niño-Drought Initiative



August 2002 THE UNIVERSITY OF ARIZONA

## Monsoon brings relief, but not likely to end drought conditions

*By Melanie Lenart & Rebecca Carter*

Everyone knows that the monsoon can spell relief for parched plants and Southwesterners weary of the sun's incessant glare. But just how likely is it that this year's monsoon will break the current drought that grips much of Arizona and New Mexico?

Not very likely, any way you look at it. Using Tucson as an example, rainfall records from 1895-2001 show that drought occurred in 17 of those years; but in only four was the monsoon sufficient to break the drought, according to Andrew Comrie, a University of Arizona climatologist and geography professor involved in the END InSight Initiative.

Comrie stated that the Tucson area would need 9 to 12 inches of precipitation over the three-month monsoon period to break the current drought, compared to an average of 6 to 7 inches during the season. NOAA has given the likelihood of sufficient rain falling to end the drought only a 2 or 3% chance.

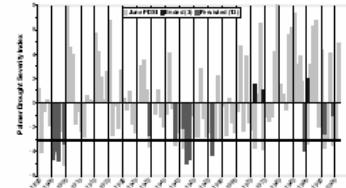
It is far more likely that enough rain will fall to at least ease the current drought situation, if not totally eradicate it. Comrie believes that there is a 15 to 20% chance that enough rain will fall to bring parts of the region out of severe drought (measured at -4 on the Palmer Drought Severity Index) up to -2, or moderate drought conditions. Significant improvements have already been noted in southeastern Arizona and western New Mexico.

Predicting the strength of a monsoon season, however, challenges climatologists because of the many complexities involved. Various researchers have found evidence that summer rainfall correlates to a number of factors, including snowpack and changes over the Pacific Ocean. But climatologists are still working out the details of this intriguing system.

Researchers are also challenged to better forecast which locations will benefit from the monsoon's spotty storms, which can leave some places lush and green from abundant rainfall, while neighboring areas remain dry and brown when the rain misses them. Although some localized areas do seem to recurrently receive higher rainfall amounts, these areas can shift over time. Precisely why this happens is not fully understood, nor can it be forecast with a high degree of certainty.

The term "monsoon" describes the change in wind direction that occurs near the beginning of summer, bringing with it the clouds that played hooky during spring.

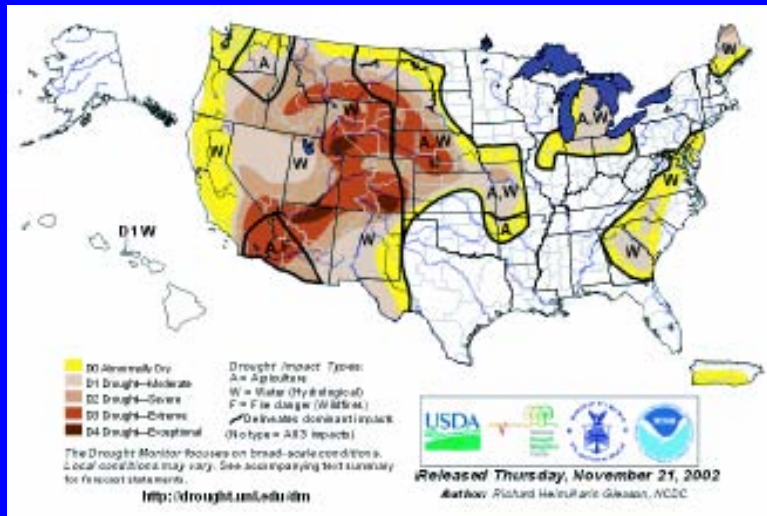
continued on page 2



**Does the monsoon end drought?** Southeastern Arizona experienced 17 years of severe drought from 1895-2001 (indicated by PDSI below -3 for month of June). Monsoon rains ended drought conditions (indicated by PDSI > -0.5 for September) in only four of those years. Source: National Climate Data Center.

# Quantitative Responses (n=34)

## U.S. Drought Monitor

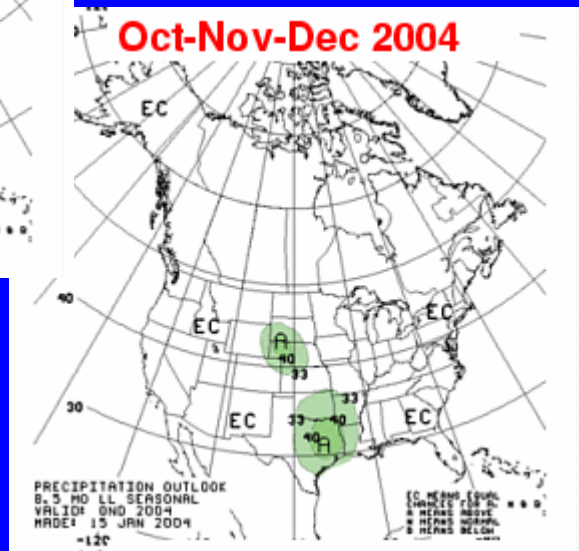
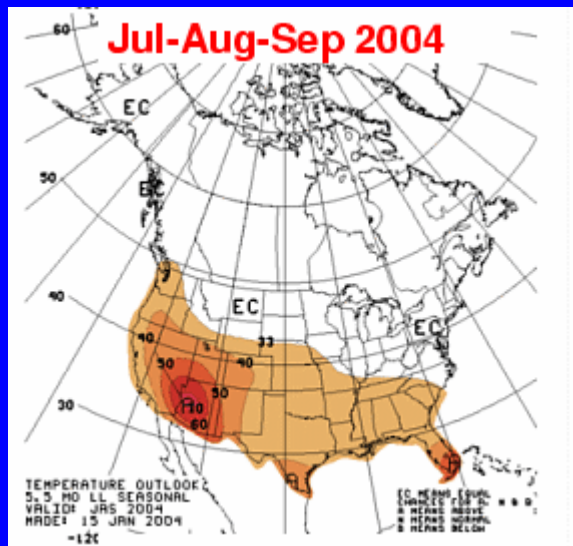


|             |     |
|-------------|-----|
| Useful      | 77% |
| Interesting | 23% |
| Neither     | 0%  |

*Need two maps*

# Qualitative Responses

## NOAA-CPC Seasonal Outlook



*Regional  
Skill +  
Verification*

# Climate Services

- **Translator function**
  - Region-specific interpretation
  - Links to news (impacts)
- **One-stop shopping**
  - User ability to put it all together **themselves**
- **Sustained interaction**
  - Credibility

# Constraints

- Spatial resolution
- Locator information
- Web sites are too complex
- Products lack ancillary information
- Technology issues

# Constraints

- Institutional policy
  - Resistance to change
  - Complexity
    - *Opportunities for long-term investment in capacity building*

# Product: FET

- Detection
- False Alarms
- Historical Context
- Transparency

Climate Forecast Performance: Evaluation Results

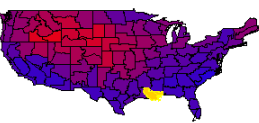
The following maps show how well the CPC climate forecasts have worked for the seasons and lead times you selected: You chose Temperature forecasts issued August - November covering seasons December - April.

To see the data that were used in the evaluations, go to the map that you are interested in and click on the region you are interested in.

### Non Climatology Score Results

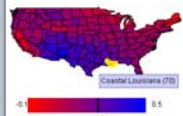
**Ranked Probability Skill Score Results**

This map shows the Ranked Probability Skill Score. This strength of the probability given to each of the three categories actually occurs. For example, forecasts made with high probability if conditions turn out to fall in a distant category (e.g. But forecasts with low probability aren't expected to be correct forecasts where conditions turn out to fall in the neighbor normal instead of cold), are not penalized as much. More the legend show the Ranked Probability Skill Score as a over using chance or climatology as a forecast, where a score would be given a 33% chance of occurring.



0.0 0.733 1.0

Show Data Behind the Map



-0.1 0.209 0.5

Show Data Behind the Map

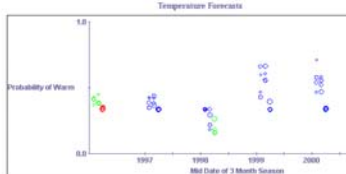
Forecast Evaluation Results: Data Behind the Analyses

The following plots show the data that were used to compute the values in your selected map. The top plot shows only the forecasts that you selected to be evaluated. The bottom plot shows all the forecasts made for the region you selected.

You chose Temperature forecasts issued August - November and covering December - April. You chose region 70 - Coastal Louisiana.

To see maps of a specific forecast and the corresponding observations, just click on a bubble and select the specific period from the drop-down menu.

**Interpreting the "bubble" plots:** Each bubble on the plot represents one forecast, with the smallest circle representing the shortest lead time and the largest circle representing the largest lead time. The x-value of each bubble shows the starting month of the 3-month season. The y-value of each bubble shows the probability that was given for the indicated condition (e.g., W40) by the forecast. Note: a value of 0.333 corresponds with climatology or CL on a forecast map and means there was no forecast made. The color of the bubble indicates the category that the corresponding observation actually fell into: Blue=Above (wet or hot), Green=Near Normal, Red=Below (dry or cold). More details



Temperature Forecasts

Probability of Warm

Mid Date of 3 Month Season

LeadTime: 1months ProbabilAbove: 0.218 ProbabilNormal: 0.317 ProbabilBelow: 0.465 TargetMonth: DJF  
LeadTime: 4months ProbabilAbove: 0.166 ProbabilNormal: 0.299 ProbabilBelow: 0.535 TargetMonth: DJF  
LeadTime: 5months ProbabilAbove: 0.146 ProbabilNormal: 0.279 ProbabilBelow: 0.575 TargetMonth: DJF  
LeadTime: 1months ProbabilAbove: 0.377 ProbabilNormal: 0.211 ProbabilBelow: 0.712 TargetMonth: DJF

Climate Forecast Tutorial: National Weather Service (NWS) Climate Prediction Center (CPC) Seasonal Climate Forecasts

### Climate Outlook Precipitation

March 2001-May 2001

**Example 1: the forecast for March-April-May 2001 for total precipitation.**

The forecast for the **Seattle, Washington** area shows that there is a 5% greater than usual chance of wet conditions (i.e., conditions being something like the wettest 10 years of 1961-1990).

The probability for each of the three possible conditions:

- 38% chance of Wet
- 33% chance of Near Normal
- 28% chance of Dry

**Example 2: the forecast for March-April-May 2001 for total precipitation.**

The forecast for the **Miami, Florida** area shows that there is a 10% greater than usual chance of wet conditions (i.e., conditions being something like the wettest 10 years of 1961-1990).

The probability for each of the three possible conditions:

- 23% chance of Wet
- 33% chance of Near Normal
- 43% chance of Dry

Test Yourself! Take a short quiz and forecasts accurately and reliably. >>>

Climate Outlook Precipitation

March-April-May 2001

Example 1: the forecast for March-April-May 2001 for total precipitation.

The forecast for the **Seattle, Washington** area shows that there is a 5% greater than usual chance of wet conditions (i.e., conditions being something like the wettest 10 years of 1961-1990).

The probability for each of the three possible conditions:

- 38% chance of Wet
- 33% chance of Near Normal
- 28% chance of Dry

Example 2: the forecast for March-April-May 2001 for total precipitation.

The forecast for the **Miami, Florida** area shows that there is a 10% greater than usual chance of wet conditions (i.e., conditions being something like the wettest 10 years of 1961-1990).

The probability for each of the three possible conditions:

- 23% chance of Wet
- 33% chance of Near Normal
- 43% chance of Dry

Putting the Forecasts in Context: The Past as Prologue

The following graph shows recent conditions compared to a 30-year climatology. It also uses examples from the past to represent the many possibilities of what might happen in the future. You can select specific years from the past to be highlighted, so you can see how some conditions may be more likely than others (e.g., during El Niño or La Niña periods).

If you would like to see a probability plot for a specific time period, select the period on the graph.

Which climate variable are you interested in?

- Monthly precipitation
- 3 month seasonal precipitation
- Monthly temperature
- 3 month seasonal temperature

How much of the recent past do you want to see?

- 12 months
- 24 months

How far into the "future" do you want to see?

- 12 months
- 24 months

This plot shows seasonal 3-month precipitation for the last 12 months (black line on the left subplot), compared to the historic 30-year climatology (1961-1990).

Possibilities for the future 12 months are shown in the right subplot, using each 12-month period from the past 40 years (1961-2000).

During some climate regimes, the variation of conditions can be quite different. Select one of the following to highlight what conditions have been in past years under different climate regimes.

None

For comments about forecasts, contact Holly Hartman: [hollyh@hwr.arizona.edu](mailto:hollyh@hwr.arizona.edu)

Forecast Evaluation Results: Maps Behind the Data


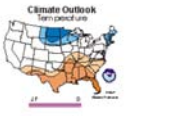
The following maps correspond to the specific forecast you selected from the bubble plot.

You chose the forecast issued in October 1996 covering December-January-February 1997.

The CPC forecast

Forecast issued in October 1996 covering December-January-February 1997

Corresponding Observations. The color corresponds to the condition that actually occurred, according to area averages computed by the Climate Prediction Center using data from the National Weather Service National Climate Data Center



Climate Outlook Precipitation

3 Month Total Precipitation

Probability of Exceedence

FMA Plots

- All Years
- La Niña

Forecast Evaluation Results: Maps Behind the Data

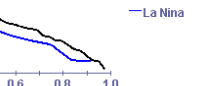
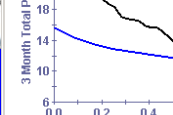
The following maps correspond to the specific forecast you selected from the bubble plot.

You chose the forecast issued in October 1996 covering December-January-February 1997.

The CPC forecast

Forecast issued in October 1996 covering December-January-February 1997

Corresponding Observations. The color corresponds to the condition that actually occurred, according to area averages computed by the Climate Prediction Center using data from the National Weather Service National Climate Data Center



Climate Outlook Precipitation

3 Month Total Precipitation

Probability of Exceedence

FMA Plots

- All Years
- La Niña

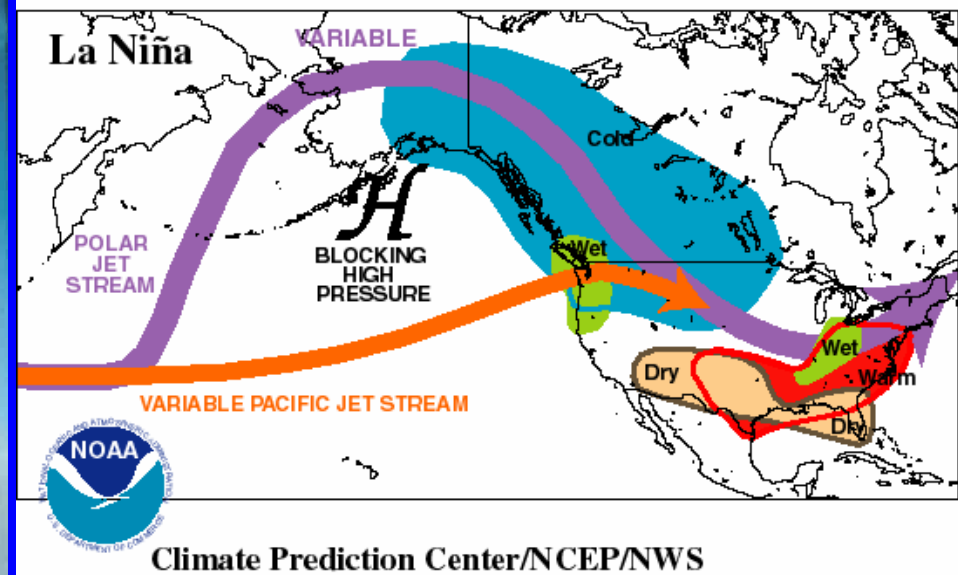
# Effective Outreach

- **Cooperative Extension**
  - Neutral, trusted information brokers
  - Diffusion of innovations
    - Early adopters
    - Language appropriate to the subset of decisionmakers
  - Overcome technology obstacles



# Partnership: Iteration

# The Implications of La Niña and El Niño for Fire Management

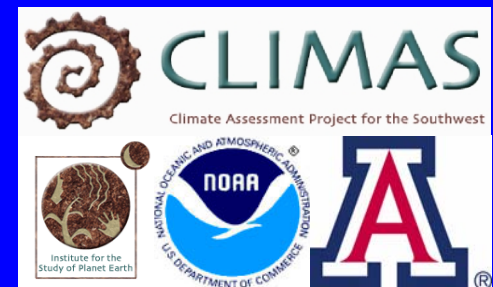


# Capacity Building Iteration

## Fire-Climate Workshops, Tucson, AZ 2000-2002



# Partnerships – Synergies



# Evolution

- 2003-2005 National Seasonal Assessment Workshops
- Multi-RISA + Multi-Agency
- Training + New products

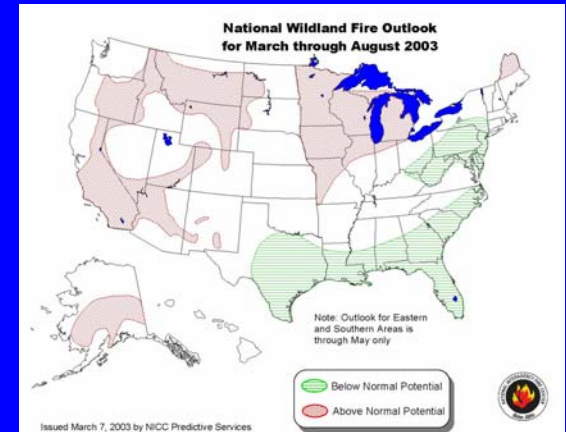
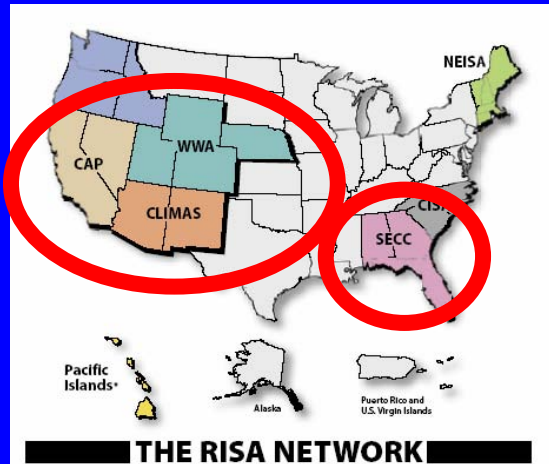
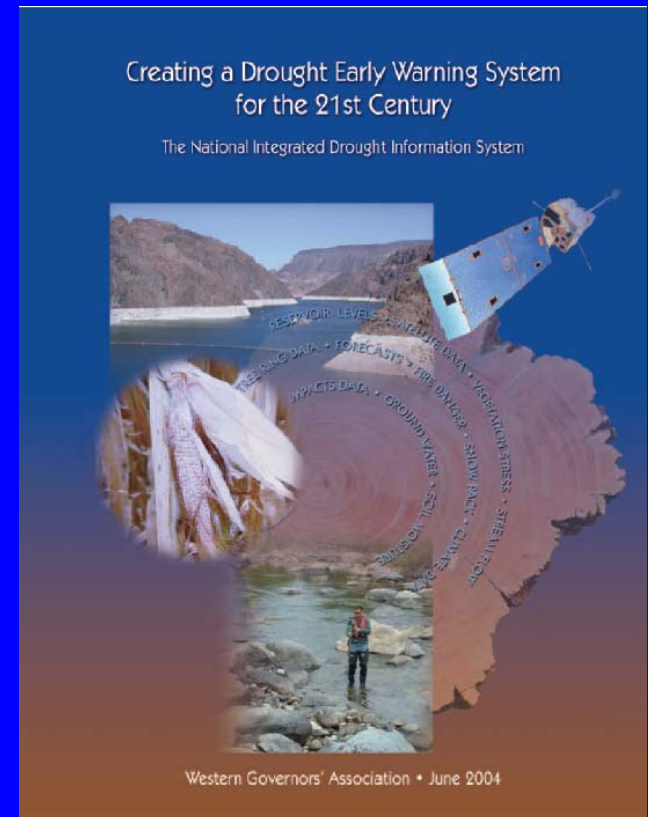


Photo: NY Times



# We Can't Do It Alone

- Need to create rewards for multiagency collaborations



# Take-Home Lessons

- Product *AND* Process
- Two-way knowledge exchange
- Trust, credibility, partnership
- Sustained, iterative interaction
- Capacity building



Thank You  
for  
Your Kind  
Attention



**Regional Integrated Sciences and Assessments**

**Building  
Bridges Between  
Climate Sciences  
and Society**

<http://www.ogp.noaa.gov/mpe/csi/risa/index.htm>