

Climate experts discuss winter and spring forecasts

The winter and spring seasonal forecasts issued on November 17, 2005 by the National Oceanic and Atmospheric Administration Climate Prediction Center (NOAA-CPC) showed the Southwest as having “equal chances” of above-average, near-normal or below-average precipitation (i.e., there’s no forecast). Similarly, the International Research Institute for Climate and Society (IRI) had made no Southwest precipitation forecast for the coming winter and spring. Both the CPC and IRI have more recently forecast an increased likelihood of above-average temperatures in the Southwest.

On November 18, CLIMAS sought the input of experts to contribute their insight to a roundtable discussion on how the region’s snowpack and water supply might fare this winter and spring based on the forecasts at the time. The CPC and IRI have since adjusted their forecasts to project dry conditions for the Southwest region in the coming months, an outlook that reflects comments made by our climate experts. Some definitions and explanations are included within the discussion. Please see the CLIMAS online glossary (<http://www.ispe.arizona.edu/climas/forecasts/glossary.html>) for terms that are not defined here.

Roundtable Participants

Dave Brandon
Hydrologist in Charge, NOAA Colorado Basin River Forecast Center

Holly Hartmann, PhD
Assistant Research Scientist, UA Department of Hydrology and Water Resources; Investigator, CLIMAS

Ed Polasko
Senior Service Hydrologist, NOAA National Weather Service, Albuquerque

Jeff Smith
Senior Hydrologist, NOAA Colorado Basin River Forecast Center

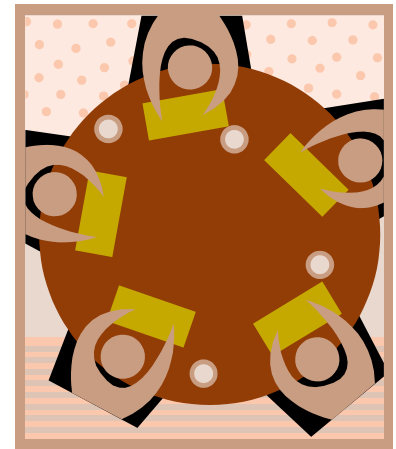
Klaus Wolter, PhD
Meteorologist, Climate Diagnostics Center, Boulder; Research Associate, University of Colorado

Melanie Lenart, PhD
Roundtable Moderator and Research Associate, CLIMAS

Lenart: With the forecasts that just came out for winter precipitation, there’s not much to say for the Southwest, but maybe you have some ideas on what we can expect. Any comments?

Brandon: We put out more of an outlook than a forecast this time of year, since this early there’s a lot of error involved... One of the things we look at is the antecedent streamflow [the total quantity of water that flows through river systems] of the system—what are the flows of the river in the fall compared to what they are usually? We also have a soil moisture model that we continuously run, which is probably the most important factor. There’s not much snowpack this early, but we have 116 SNOTEL [snowpack telemetry] sites over Lake Powell that we look at. We combine those and compare them to last year and other years’ average. Obviously, it’s very early in the season, but we’re about a hair below average right now, and last year at this time we were a little bit above average. When we run these forecasts, the main thing we find is that we can be about 10 to 16 percent more accurate than we would be just using the averages for the last 30 years. A lot of that comes from the moisture model. If you’ve been in a very dry or wet period, the models reflect that well. We also look at ENSO [El Niño Southern Oscillation] signals. We now have an operational procedure in which we look at CPC forecasts for the season and translate those into a shift in precipitation or temperature. We’ve found that in the last 15 La Niñas, 14 were dry in Arizona. There isn’t a strong signal right now...but that’s something we’re starting to look at, is a trend towards a La Niña. Using these variables, we come up with an ensemble streamflow prediction and then run previous years through our model to check it.

Lenart: From what you’re saying, it sounds like you have some bad news for



us in terms of your streamflow outlook this year.

Brandon: Well, bad news is in the eyes of the beholder. There’s a lot of error this early, but Lake Powell streamflow looks like it’s going to be around 80 percent.

Smith: That’s around 6.5–6.7 million acre-feet from April to July. The average is about 7.9 million.

Brandon: That’s the Upper Colorado River and Lake Powell. In 2002, we had 1.1 million acre-feet, so it’s relatively much better. When we ran the model last year at this time, the prediction was a little higher, but we’d had a wet fall and early snow in the San Juan Mountains. That’s coming off a very dry period, and we were still predicting a little below normal.

Wolter: But that was the forecast, what actually happened? Didn’t we get a lot more?

Brandon: We ended up just a bit above normal for the whole basin.

Lenart: The San Juans are an area serving New Mexico from the Colorado River, so how would things look for the rest of the state [i.e., the areas not in the Colorado River watershed]?

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Polasko: Before I get into projections, let's take a step back and look at where we were in June 2004 in two of our major reservoirs: Navajo Reservoir, in the northwest part of the San Juan system, and Elephant Butte, which is our major reservoir on the Rio Grande down near Truth or Consequences. At the end of June 2004, the storage in Elephant Butte was around 228,000 acre-feet and the storage in Navajo was a little over a million. At the end of June 2005, Navajo had 1.5 million acre-feet, so in one year the increase in storage in Navajo was 50 percent. In Elephant Butte, it went up to about 560,000 acre-feet, so that's about two and a half times what we started with. The 2004–05 winter was extremely good for us, especially coming off the extremely dry period of the last four years.

Lenart: Do you think the lucky streak might continue, or are we going back to drier times?

Polasko: Well, I'm still buying lottery tickets, but I'm not putting a lot of money into it...A year ago at this time, the nine or ten SNOTELs I look at in the upper Rio Grande Basin were showing 100 percent of normal snow-water equivalent. In southwest Colorado, we were at about 115 percent of normal. This year, in the Rio Grande Basin, we're barely pushing 29 percent of normal, and in the San Juan headwaters we're not doing a whole lot better at 34 percent of normal. Our outlook in terms of snowpack this year isn't as good as what Dave is looking at in the Upper Colorado.

Lenart: So the outlook is worse for New Mexico than Colorado?

Polasko: It's looking a lot better [for much of Colorado than New Mexico]. We had a decent first two weeks of October in terms of precipitation, but since then we've gone into a much drier regime. Whatever snow had fallen in the

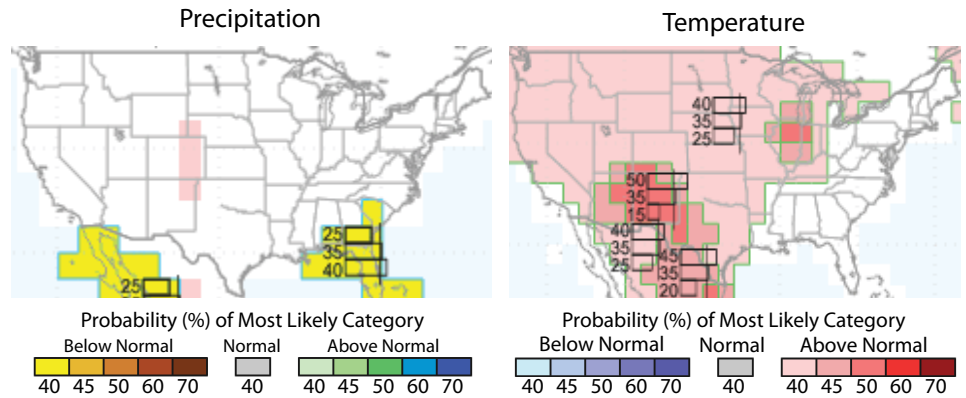


Figure 1. IRI precipitation and temperature forecast for December 2005–February 2006 from http://iri.columbia.edu/climate/forecast/net_asmt/as of November 17. For NOAA-CPC forecasts see page 12–13.

higher elevations wasn't deep enough to stick, so we're starting to lose some of the snow in the 8,000- to 10,000-foot range. We've actually gone downhill a little bit and haven't been able to make up any ground.

Lenart: While we're talking about snow, I know that the CPC forecast for temperature showed that the Southwest has a higher probability of being warm. Holly, how reliable are the temperature forecasts for this area?

Hartmann: By and large, the temperature forecasts are excellent for the Southwest's winter season. The CPC's forecast is calling for increased chances for temperatures like that of the warmest 10 years out of the last 30. When you think about what those 10 years have done to the snowpack, you get an appreciation of the implications for the water supply next spring and summer.

Lenart: Wasn't that an issue in March 2004, when temperatures took some of the snow and sublimated [evaporated instead of melted] it?

Wolter: That was the wind more than anything. I mean, it was warm, but it was also very windy.

Hartmann: And that's something that's not reflected in the CPC's outlook—the focus is on temperature.

Brandon: I think that March 2004 was one of the warmest and driest months on record and nobody's going to forecast that this early. That really was an oddball month, when the wind knocked 20 percent off the snowpack...Temperature really becomes important in that transition time between March and May where you can have large fluctuations. It's not so much the temperature as the intensity and how fast that melts the snowpack.

Lenart: So if the temperature increases and melts the snow quickly, that can cause more streamflow.

Brandon: Right. It causes more runoff rather than letting it soak slowly into the soil.

Lenart: From what I was reading in the CPC prognostic discussion, they were feeling that the El Niño signal and the MJO [Madden-Julian Oscillation] are both neutral, as is the North Atlantic Oscillation. [The MJO is a fluctuation characterized by a 30- to 60-day cycle in tropical Pacific precipitation. This in turn affects global circulation patterns, including the jet stream over North America, which influences precipitation in the Southwest]. Klaus, why do you see a potential La Niña?

Wolter: I'm not saying that I'm expecting a La Niña event; conditions in the

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Pacific are exhibiting symptoms of a La Niña-type situation. The definition of a La Niña is a three-month running average of -0.5 or lower-than-average sea surface temperatures, so it would be three months at least before we could definitely say we had a La Niña, although the atmosphere over the western hemisphere is acting like it's feeling one.

Lenart: I noticed that the CPC has Florida down as dry, and the Southwest and Florida are both dry during La Niña years. Does that dryness have anything to do with the ENSO conditions you're describing?

Wolter: No, I think that prediction came from a variety of tools. There were quite a few that agreed on that. New Mexico has been one of the tougher regions for my forecast. New Mexico so far has been drier than normal but Arizona's dry forecast has verified pretty nicely, as has eastern Colorado's wet forecast. Utah and western Colorado were a toss-up. The dry Arizona signal didn't come from La Niña—it was from the warm tropical Atlantic, especially the Caribbean. The very active hurricane season anchored low pressure over the Caribbean and promoted ridging upstream in Arizona. That had nothing to do with La Niña except in the sense that when you don't have an El Niño, you can have a more active hurricane season. That's a very weak link. The same reasoning applies to eastern Colorado because when we had moisture coming in from the Gulf of Mexico, we had more efficient storms. Why that stopped working in New Mexico, I don't know. The forecast I have for January–March is a very simple dipole, with wetness in Utah and western Colorado and dryness in New Mexico and eastern Colorado. Interestingly, I have a neutral forecast for Arizona, which does reflect the current state of ENSO being almost neutral. If we had a full-blown La Niña, I would definitely go dry there. Right now, it's too close to neutral to call.

Lenart: Ed, you said that things aren't looking too good now for New Mexico's basin outside the Colorado. Did you put a percent normal on the streamflow that you're projecting for this spring?

Polasko: I'm not going to forecast a percent normal streamflow just yet because it's way too early. If you look at last year at this time we'd had a wet fall; December was fairly dry and all of a sudden we were hit with an incredibly wet January and February. Albuquerque had the wettest beginning of the calendar year on record, and our records go back to 1890. We had an incredible turnaround. What concerns us now is the PDO [Pacific Decadal Oscillation] having turned negative. That was for September; we don't have October's data yet, because a negative PDO is pretty highly correlated with dry conditions all across New Mexico. It loses correlation once it gets up into Colorado.

Wolter: The PDO is supposed to reflect longer-term oscillations, so is it really smart to keep track of it on a monthly basis? This year it was quite high late in the spring, and some people think it's nothing but a low-pass filter of ENSO. The fact that we switched from El Niño-like conditions, the last peak of which was last spring, to La Niña-like conditions may have more to do with the current drop in the PDO than anything else.

Brandon: I have a final comment, which is that this is why it's very difficult to take all this information and put it into streamflow numbers. Klaus has good information and a lot of people are looking at it, but it's difficult to turn into numbers.

Lenart: So despite the CPC forecast for equal chances, there's a general feeling here that things might be a little bit drier and we might not get as much streamflow, at least compared to last year if not the average.

Polasko: There's no doubt that New Mexico would be hard pressed to have the same kind of really good water year this spring that we had a year ago. Our concern is that with any kind of much drier regime, will our reservoir storage hold us over in terms of water need? ...In the Upper San Juan Basin, there isn't a great deal of concern right now considering that Navajo Reservoir is at least at 90 percent of capacity and at 114 percent of its 30-year average. So last year's water year did wonders for the San Juan and the northwest part of New Mexico. As you move further into New Mexico, we are much improved from a year ago, but our reservoirs aren't in nearly as good of shape as the northwest ones. Elephant Butte is only at 30 percent of average and 17 percent of capacity. Abiquiu in the Rio Grande system is at about 97 percent of average, but it's still only 20 percent of capacity. El Vado is at 58 percent capacity and at about 110 percent of average. So this is much better than a year ago at this time, but nowhere near where we were in 1999 before the drought of 2000 took hold. We don't get a great many winter storms, so our hopes are that the winter storms we get are potent and bring us a great deal of rain in the lowlands and snow in the higher elevations. Last winter and spring we did quite well and it wasn't anything to do with El Niño or La Niña, even though we ended up with a very weak El Niño towards the end of the season.

Hartmann: In the face of uncertain forecasts, you can't expect to have a forecast all the time this far in advance. It's only really when you get strong signals from ENSO that you have something to look for regarding precipitation. Since it's more of a forecast of opportunity, people who need to make decisions would be well advised to think about conditions that cause them problems and prepare for those rather than relying on a forecast to tell them what to do.

Lenart: Thank you all very much.

