

Report on 90-day Weather Projection for the Northern Half of New Mexico

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Introduction:

This 90-day weather forecast is for the northern half of New Mexico. The forecast area is bounded by the state borders on the north, west, and east, and Interstate 40 on the south.

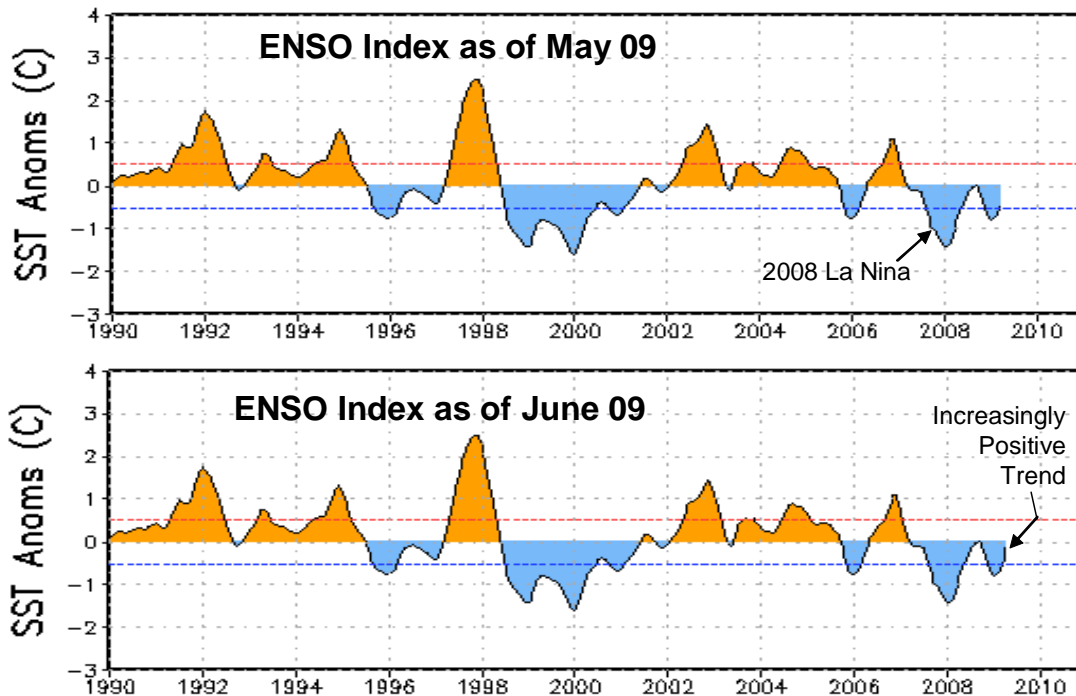
The report contains a summary weather outlook for June through August (directly below), a review of the current El Nino Southern Oscillation (ENSO) condition, which is rapidly changing, and an overview of current weather trends along with outlook maps for the next 90 days. Also included are discussions about the burgeoning monsoon condition and some interesting facts about the five classic markers of summer, the first of which will happen at the end of this week.

Summary, Ninety-day weather outlook for forecast area:

- Atmospheric measures now indicate that the existing La Nina-like condition is rapidly giving way to neutrality and will probably develop into an El Nino-like one.
- Long-range computer models agree that these El Nino-like conditions, which will develop in early summer and persist through the winter, will probably allow for normal precipitation patterns in the forecast area.
- Precipitation throughout the forecast area during the past four weeks was about average. Temperatures have been significantly above normal in the same period.

Review of Current El Nino Southern Oscillation Situation and Discussion:

The Historic Oceanic Nino Index, which is the official metric from which a La Nina or El



Nino is declared, is at $-0.1C$, significantly more positive than late May. Most of the climatic models agree that based on the rate of change the condition may soon morph into the positive region and perhaps develop into an event that resembles an El Nino.

This trend is shown in the graphics above (from National Climatic Prediction Center). The top one shows the historic index in May; the bottom one shows it as of yesterday. It depicts a very steep positive movement.

The recent negative ENSO index event, which began early last winter, never qualified as an official La Nina. For one to be declared, the 3-month moving average index must be greater than $-0.5C$ for five consecutive averaging periods. In this latest ENSO cooling episode we had just two consecutive averaging months that meet that condition, but it was enough, apparently, to have caused a few very dry months in the forecast area in late winter and early spring.

The National Climatic Prediction Center's Climate Forecast Model is indicating a reasonably high probability for an El Nino-like condition, although it is yet unclear whether an official El Nino will result. However, this portends normal levels of precipitation for the monsoon season and into the fall, and perhaps higher than normal precipitation in some areas.

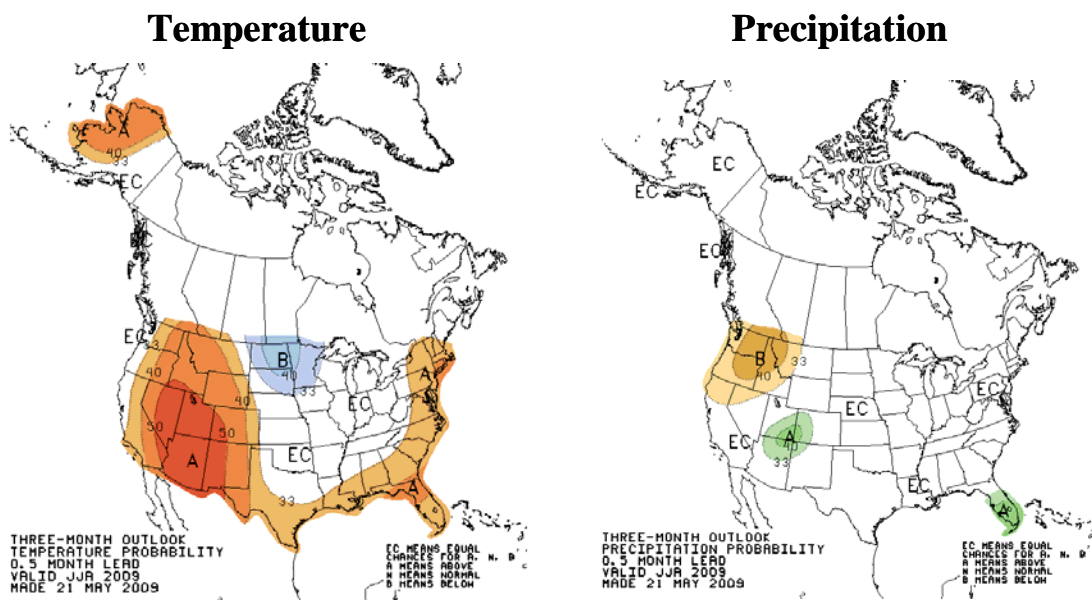
Last 30 days.

Generally, with a few geographic areas excepted, precipitation in the forecast area has been about normal. Simultaneously, temperatures have been several degrees (F) above normal. River runoffs are on the wane.

Next 90 days.

The projection for the next 90 days is not much different from the one last month. The

Outlook for Jun Through Aug 09



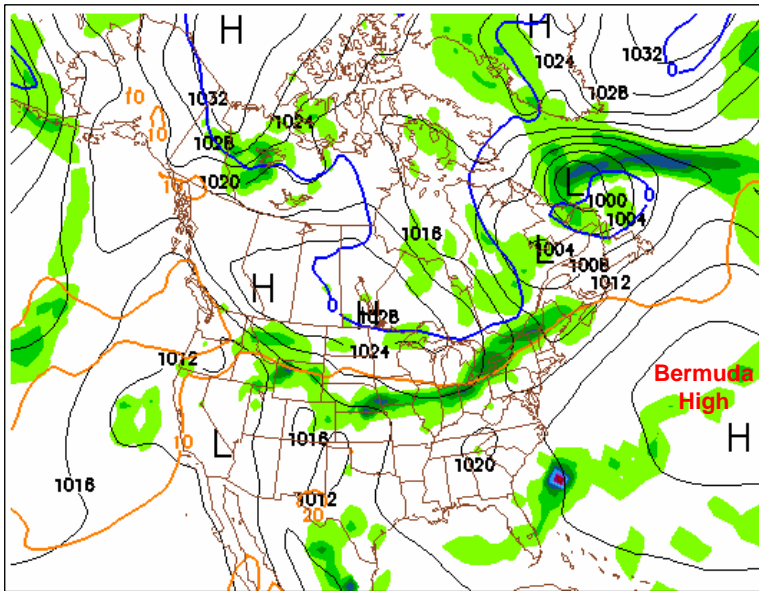
maps show the predictions (from the National Climate Prediction Center).

Above normal temperatures are expected, probably due to the overall global warming. But precipitation is expected to be around normal, which is consistent with the expected positive trend in the ENSO index. Based on historical trends, the precipitation might be expected to edge above normal as the El Nino-like condition develops.

Recent Weather Trends

As expected, we are moving from our winter-time climatic condition to the summer-time one. As explained in previous reports, in the summer the large Bermuda high pressure center in the Atlantic with its clock-wise rotation picks up moisture in the Gulf and delivers it to the southwest US. The map below depicts surface pressure conditions for last Friday, the 5th. As can be seen, the Bermuda high is developing, but it is not deep enough into the upper atmosphere to significantly move moisture into the area. However, if it continues to develop and high pressure ridges don't prevail over the forecast area, we will soon have a good monsoon flow.

Recent Surface Pressure Map



The recent rains in the forecast area were caused by conditions that are similar to those from the summer monsoon, except that the moisture was dragged into the area by a series of cyclones (i.e., storms) originating in the sub-tropics of the Pacific. Moving eastward and with counter-clockwise rotation these storms picked up moisture from the Gulf of California and western Pacific and delivered it to the southwest US. For a

few days the meteorological conditions appeared to be identical to a mid-summer monsoon—high dew points, southerly flow of moisture, and afternoon thunderstorms. However, that condition ceased when those storms moved out of the area.

Summer Markers:

Climatologists carefully track the change of seasons and have developed a set of “markers” to hail these changes, especially for the winter and summer.

There are five markers for both winter and summer and each group of five occurs at or around the solstices, the date of the official start of the winter and summer seasons.

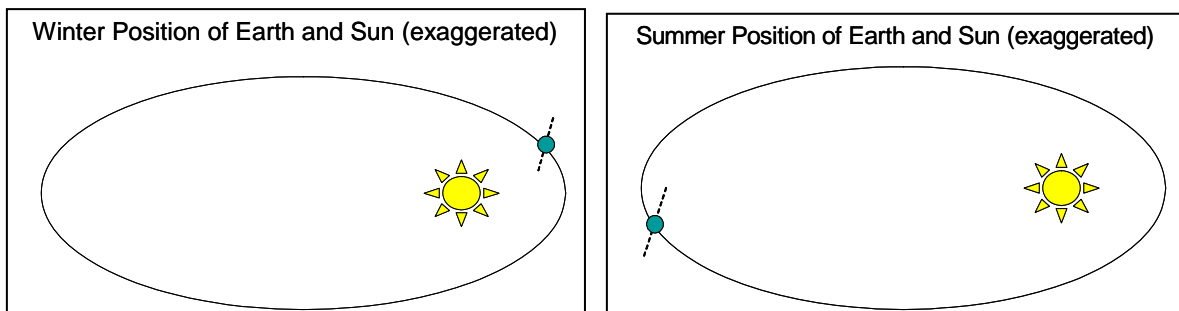
Listed below are the summer markers and their dates:

- 1) The earliest sunrise, 13 June

- 2) The longest day, 21 June (solstice, summer begins)
- 3) The latest sunset, 1 July
- 4) The aphelion, 4 July
- 5) The average hottest day (among all days of the year), 12 July

Most people believe that all of these events should occur at the same time—on June 21st. But that is not true. The detailed explanation is complex, but it simply boils down to geometry and a need to simplify time-keeping on earth, as well as differential heating patterns in the earth's land areas.

The earth orbits around the sun on an elliptical path, not a circular one as many people assume. One complete path around the sun constitutes a year. Meanwhile the earth is rotating like a top, and one complete rotation constitutes a day. After approximately 365 rotations, one solar orbit has been completed. See the figures below.



Since the earth is actually closer to the sun in the winter, one might ask why it is cold. The reason is that the earth's axis of rotation is tilted relative to the sun. In the winter the tilt is such that the northern hemisphere is angled away from the sun and in the summer the same hemisphere is angled toward the sun.

Angled toward the sun in summer, the northern hemisphere captures more energy than it does in the winter. The days are also longer. So that part of the globe warms. From the perspective of a North American earth dweller, the summer sun appears much higher in the sky relative to the southern horizon than in winter.

As can be imagined, the farther one goes toward the poles, the more significant is the apparent summer-to-winter change of solar position. At the equator, there is very little apparent seasonal change, whereas at the poles, there is a very dramatic change, so much so that above the arctic circle (N 66.6deg) the sun never rises in the winter and never sets in the summer.

Summer solstice, the 2nd summer marker, is the point where the earth's northern hemisphere is most significantly tilted toward the sun. The earth dweller sees it as the point where the sun's noon-time position is at its northern-most position during the year. It is also the point where there is more daylight time than any other day.

The 5th marker, the long-term average hottest day of the year, is created by a combination of increased heating of the earth and the land mass conditions. In NM, with mostly land area, the earth absorbs the sun's heat fairly rapidly. The maximum potential solar heating occurs at solstice (2nd marker), but it takes a little longer for the mass of the earth to absorb the heat and reach its highest surface temperature, which occurs on about 12 July.

(On the coastal areas with nearby water, the 3rd marker happens much later in the summer.)

The aphelion, the 4th marker, varies its position over the eons and currently occurs on July 4th.

The 1st and 3rd markers are controlled by simple geometry, the elliptical orbit, and our time-keeping. If the orbit were perfectly circular, these markers would occur at solstice. But the elliptical orbit causes the earth to move faster around the sun when it is closest (in winter) and slower around the sun when it is farthest (summer). It is similar to what happens to a spinning ice skater as she pulls in her arms—the speed of spin increases. Thus, when the earth is nearer to the sun, the days are actually compressed; the opposite happens in summer. To keep precise time as an earth dweller, each day of the year would have a unique set of time definitions, which is too complicated for all but timekeeping fanatics.

Long ago scientists agreed to simply divide the year as though the orbit were circular and live with some variance in some time parameters. A consequence—one that only climate geeks are normally aware of—is that the 1st and 3rd markers of summer and winter do not coincide with the solstice.

Please take a moment to toast each summer marker occasion. Well, I suppose only climate weenies can be expected to do such things.

Next Report: Mid to late July or early Aug, 2009.