

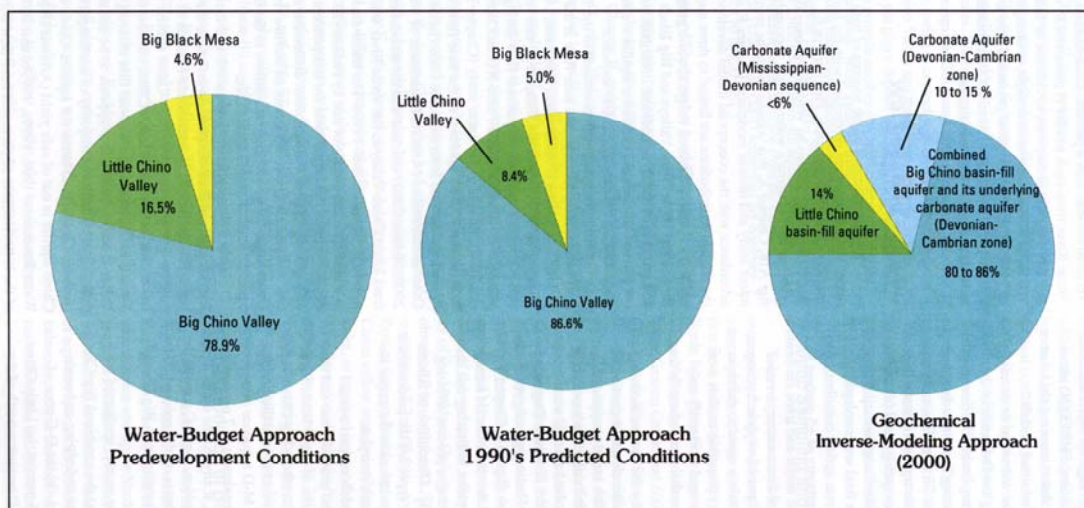
## New study backs up importance of Big Chino to Verde River's flow

By **JOANNA DODDER** – Copyright Daily Courier January 25, 2006  
Courtesy of The Daily Courier, Used with Permission

A new report backs up a previous controversial conclusion that the Big Chino aquifer supplies at least 80 percent of the flow of the upper Verde River.

Laurie Wirt and Win Hjalmarson stirred up Yavapai County leaders in 2000 when their analysis concluded that the Big Chino was an important contributor to the river, which is home to endangered fish and one of the last remaining perennial rivers in Arizona.

The 2000 study arrived in the midst of heated discussions between Prescott-area and Verde Valley leaders about how Prescott's plan to use Big Chino groundwater would affect the flow of the river through the Verde Valley below.



**These pie charts from a new USGS study shows the change over time in the estimated contributions of the three major upper Verde Basin aquifers to the flow of the Verde River. The chart at left shows the percentage contributions to the river's flow before settlers arrived. The center chart shows a compilation of estimates from the 1990s. The right-hand chart shows the estimates in a new USGS study.**

Then-mayor Sam Steiger had just admitted that Prescott had spoken with the developers of the historic Del Rio ranch about providing the city with Big Chino water if Del Rio built the pipeline. Verde officials wanted Prescott officials to wait for more studies, so they would better understand how the hydrology of the upper Verde operates.

A 1980 law gives Prescott the right to pump groundwater from the Big Chino aquifer south to its smaller Little Chino aquifer. The state concluded in the late 1990s that Prescott is pumping more water from the Little Chino than the region is replenishing, and state officials have repeatedly said the Prescott Active Management Area probably will need to import Big Chino water to meet their goal of putting the Little Chino back into balance.

The 2000 study relied on existing scientific information, while the authors of the newly released

U.S. Geological Survey (USGS) study spent years gathering their own information, explained Wirt, a USGS geologist based in Denver who led both studies. Fellow USGS scientists Ed DeWitt and Victoria Langenheim helped with her new study.

"There is all new information in this report," Wirt said. For example, scientists analyzed the water chemistry in the three upper Verde aquifers and compared it to the river's chemistry to estimate the contribution of each aquifer to the river.

While the new study corroborates the previous study, it adds a new level of understanding and confidence, especially about the contribution of a northern carbonate aquifer to the upper river's flow, Wirt said.

The new study estimates that 80-86 percent of the upper Verde River's flow comes from the Big Chino, 14 percent comes from the Little Chino aquifer, and less than 6 percent comes from the unnamed carbonate aquifer in the Drake area just north of the Big Chino.

Those calculations come from on June 2000 measurements, "representing a snapshot in time during low-flow conditions," the new report notes.

Some previous studies have estimated that the carbonate aquifer is a much larger contributor, which would mean that pumping from the Big Chino would have less of an effect on the river's flow.

The Daily Courier contacted several local water officials, including Yavapai County Water Advisory Committee technical advisors and the City of Prescott, that said they have yet to read the 200-plus-page report and didn't want to comment on it yet.

Work on the new study began at about the same time as the less comprehensive 2000 study became public. It also began concurrently with a broader study of the Verde River Basin that is due to become public soon.

The new study's title contains a date of 2004, when the draft was complete, but extensive peer review delayed its final release by about two years, Wirt said.

The Arizona Water Protection Fund Commission, which contributed a \$180,000 grant to Wirt's study, required the creation of a large oversight committee "because of the highly charged nature of politics around the Verde River," Wirt said.

The USGS contributed another approximately \$500,000 in cash and salaries to her study, Wirt estimated.

"I feel fortunate to work for an agency that can allow me to do this," she said, especially in light of budget cuts.

The carbonate aquifer is a compartment of what the Northern Arizona water community commonly calls the R-Aquifer, a much larger Paleozoic regional aquifer beneath the Colorado Plateau.

However, the carbonate aquifer is at the Mogollon Rim's edge in fragmented rock, and it appears it is not hydrologically connected to the R-Aquifer, Wirt said. Much of its water comes from the eastern flank of Big Black Mesa, she said.

"Little if any groundwater recharge to the Big Chino Valley or the upper Verde River is contributed from the area north of Big Black Mesa and the Mogollon Rim," the report states.

## ***Study shows changes with groundwater pumping***

By **JOANNA DODDER** – January 25, 2006  
Courtesy of The Daily Courier

One of the ultimate goals of all the Verde Basin studies is to find out how much groundwater people can pump from specific locations without drying up the Verde River.

To figure this out, they need to understand the size of sub-basin aquifers and how water flows through them.

The Big Chino basin is at least 2,303 feet deep and 28 miles long, but "by geologic standards, that's not a big basin," said Laurie Wirt, the lead author of a new study about the upper Verde sub-basins. The aquifers under Phoenix and Tucson are larger, for example.

Williamson Valley is by far the largest source of tributary recharge to the Big Chino, followed by Walnut Creek.

The Little Chino aquifer is about 658 feet deep and 11 miles long, the new study estimates with the help of magnetic and radiometric images shot from the air.

The draft of Wirt's new report estimated the amount of water that the aquifers could hold, but Wirt said she removed those estimates at the advice of the oversight committee members that included U.S. Geological Survey and Arizona Department of Water Resources officials.

"It's a number that can be misused," explained John Hoffmann, one of the oversight committee members who is acting associate director of the USGS hydrology office in Tucson. "Just because it's there, doesn't mean it's attainable," because of all the soils and rocks inside aquifers that are difficult to estimate.

Aquifer groundwater storage estimates will be part of the future numerical computer models that will have less potential for error, Hoffmann said. This Wirt study and another study the USGS is about to release will help build a numerical model.

Hoffmann noted that the aquifers' storage capacity has nothing to do with how much groundwater pumping will cause the upper Verde River to go dry. If about 17,000 acre-feet is flowing into the Verde River headwaters each year, pumping 17,000 acre-feet annually could dry up the river. That's why it's important to know how much of that 17,000 acre-feet comes from each sub-basin.

It's widely accepted that the Prescott area already has depleted its Little Chino groundwater supplies.

However, the Big Chino Valley looks different than it did before settlers arrived, the Wirt report states.

Before settlers arrived, the river started flowing at the confluence of the Big Chino Wash and Williamson Valley Wash in Big Chino Valley, the report states. Another fork of the river started flowed at Del Rio Springs in the Little Chino Valley.

Wirt's research leads her to believe that the Big Chino Wash, which usually is dry these days, contained perennial stretches of water before 1950. Maps from the 1940s show part of the wash being perennial, and scientists reported collecting native fish from the wash in 1897 and 1950, Wirt said.

The study estimates that the water table in the vicinity of Sullivan Lake, where the Little Chino

and Big Chino sub-basins converge at Paulden, has declined by more than 80 feet since 1947. The river now starts flowing a few miles below Sullivan.

That means that although the Big Chino may contain much more water than the Little Chino, it already clearly is showing the effects of long-term groundwater pumping, Wirt said.

Because of groundwater pumping in the Prescott area, Wirt expected the Little Chino to be an even smaller contributor to the river's flow than the 14 percent she came up with. She believes that change just hasn't shown up yet because of a lag between the groundwater pumping and changes in the river's flow.

Wirt recommends that local water budgets stop double-counting some Little Chino water as also being Big Chino water, since her study shows that most of the Little Chino water now flows directly into the river instead of the Big Chino first.

The study also makes four recommendations for future studies to fill in data gaps.