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SERIES: SPECIAL REPORT: RUNNING DRY

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WARNING SIGNS IGNORED

100-YEAR WATER RULE CREATED BY PANEL MISTAKENLY VIEWED AS '100-YEAR SUPPLY'

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ROCKY MOUNTAIN NEWS

Eighteen years ago, Boulder water lawyer David Harrison and a small band of water engineers and attorneys breathed a sigh of relief.

Toiling in obscure meeting rooms at the Colorado State Capitol in 1984, Harrison and his colleagues thought they had done the state a service by clarifying fuzzy laws governing underground water supplies.

In writing what would become known as the 100-year rule, they had found a way, they thought, to protect fragile, ancient aquifers.

The rule says quite simply that water from underground sources for a particular property - sources that aren't replenished by spring runoff or rainfall - can be drawn out of the ground at a rate of just 1 percent a year.

The rule was meant to help manage the underground water, not establish how much actually exists or how long it will last.

But the "100-year rule" quickly morphed into a "100-year supply," especially in Douglas County, where most water comes from deep below the earth's surface. People tapping the Denver Basin aquifers thought they had water guaranteed to last a century.

Looking back, Harrison says, the earnest group of lawmakers, water engineers and attorneys may have created a defacto ticket for runaway growth.

"Why 100 years? I don't know why (we chose) that number," Harrison said. "Now I look at places like Douglas County and say 'Boy, that sure opened the gates, didn't it?'"

Since then, most elected officials and developers have held on tightly to that ticket, even as warnings emerged about the depletion of the county's groundwater.

Even today, some real estate agents, developers and elected officials still tout the county's 100-year supply.

But the reality is much different. Thousands of wells needed to support blockbuster growth are draining the aquifers faster than many experts expected. That has set up Douglas County and parts of Arapahoe County for a potential water crisis that will take more than \$1 billion to avert, according to a closely guarded study by a group of 11 south metro water districts who belong to the 18-member Douglas County Water Resource Authority.

And that assumes there is enough time to fix the problems before trouble hits.

Some homeowners in western parts of the county already have had to redrill or drill new wells because of falling water levels.

Of even greater concern, some experts say, water problems caused by draining aquifers could begin to reach eastward into heavily populated parts of the county in 10 to 20 years, if not sooner.

State Engineer Hal Simpson said officials know now that the rule does not guarantee 100 years of water. The rule was conceived using the knowledge available at the time.

"Now, of course, people are saying maybe it should have been longer, but hindsight is always better," Simpson said.

A few communities took the limits of the aquifers seriously.

Highlands Ranch, one of the first major developments in Douglas County, began buying surface water rights in the 1980s and has cut its dependence on groundwater to as little as 30 percent in wet years.

The Parker water district, after 18 years of bureaucratic wrangling, is finally close to building a nearby reservoir that it expects would support current growth projections - but no more.

But these early believers in surface water were few and far between.

For those community leaders who now acknowledge the urgency of finding new water sources, the learning curve has been slow.

Enchantment with booming development, a scarcity of science on the aquifers and a false sense of security born of the 100-year rule were so strong that few paid any heed as warning bells sounded:

* A 1989 report to the Douglas County commissioners by the county's water advisory board raised serious questions about whether the county could continue to rely on groundwater. The study recommended requiring that all new developments in population centers use surface water. The reaction: the board members were labeled by developers as "a bunch of anti-development kooks," recalled former board member Steve Board, who later became mayor of Castle Rock.

* A 1992 report by the town of Castle Rock said continued reliance on groundwater would be the most expensive way to provide water to the city. The report said long-term dependence on groundwater should be "minimized." Today, the town still gets its water from the aquifers, though it did impose a 200-year rule in place of the 100-year rule in 1998 to slow the drain on the aquifers.

* In the early 1990s, wells on the western edge of the county began going dry. But not until 1998 did the county draw boundaries around those western areas and impose some limits and requirements on development there. The limits primarily apply to large community or subdivision wells.

* In 1995, Gov. Roy Romer made a dramatic but unsuccessful call for Douglas County to put signs in front of new home projects warning buyers that water pumped from the aquifers was unreliable over the long term.

* By 1996, the Romer administration had become so concerned about the longevity of underground water banks that officials instructed the state engineer's office to place warning labels on municipal well permits. The label says water supplies may last less than 100 years "due to anticipated water level declines."

But the reports and warnings did little to slow the mining of underground water. Douglas County, after all, was on a growth curve that couldn't be stopped, and everyone was thirsty.

From 1990 to 2003, the population grew from a little more than 60,000 to 219,000 today.

Despite concerns about water, the county's love affair with new rooftops continued.

"Nobody wanted to rock the boat while the boat was going full throttle," said Board, who plans to run for county commissioner next year.

Paper water

Even today, the danger signals have barely made a dent into the mindset of many community leaders.

"We have a 100-year supply, maybe a 500-year supply," Douglas County Commissioner Jim Sullivan told the News as recently as August. He has since acknowledged concerns with long-term reliance on groundwater.

Sullivan has been a county commissioner for 12 years and is chairman of the Douglas County Water Resource Authority. The other two county commissioners, Mike Maxwell and Melanie Worley, generally defer to Sullivan as the water expert among them.

Steve Ormiston, vice president of Shea Homes, the developer that controls the Highlands Ranch water district, insists that it's not misleading to say there's a 100-year supply of water in the ground.

"The state law says that you can't extract at a rate greater than 1 percent a year - so 100 years is accurate," Ormiston said.

A spokesman for two other major developers in the county, Village Homes and SunMarke, declined to discuss water supplies in Douglas County.

What those who point to the "100-year supply" may not understand or fail to point out is that water experts refer to this century of supply as "paper water."

Wells are allowed to extract whatever is estimated to be there at 1 percent a year, but no one is certain exactly how much is there, whether it can be pumped at a reasonable cost or how long it will last. Also not taken into account is how a well's pressure or production can decline if other wells are drilled nearby.

"We don't want to give people the perception that there's a guaranteed supply," said state engineer Simpson. "It may be there, but it may be very difficult to get."

Unpredictable aquifers

During the seven years since the state engineer instituted the well permit disclaimers, the aquifer has been acting in unpredictable ways.

Some wells that once produced 300 to 500 gallons of water per minute now produce just 50 gallons a minute.

Parker, Castle Rock, Highlands Ranch and dozens of small districts have continued to sink wells deep into the main aquifer, intent on capturing the clear, clean water that needs little more than some chlorine before it can be piped to thousands of new homes.

Since the state engineer's warnings began in 1996, 1,300 high-capacity wells have been drilled, according to the Colorado Division of Water Resources. Even Highlands Ranch's water district, served mostly by surface water, drilled five wells last year and planned nine more this year, according to its filing with the state. It has 50 wells.

Simpson said other counties have seen the potential for draining the aquifers and taken steps to slow groundwater use. But the state has no authority to force counties to impose stricter standards than the current 100-year benchmark. That's a call the legislature would have to make.

El Paso County, for instance, moved in 1986 to limit the rate at which its aquifers could be drawn down. The county adopted, in essence, a 300-year-rule, which means any large well can draw only one-third of 1 percent each year from the water supply estimated to exist under the property.

In 1997, Adams County did the same. Castle Rock is the only south metro area community to change the 100-year rule, adopting its 200-year rule in 1998.

Former Colorado Springs Mayor Bob Isaac said his city, which relies on surface water rights that it has owned for decades, supported El Paso's move to a 300-year rule.

"It was a defensive measure," Isaac said. "We didn't want massive new development on our border served by an unreliable water supply because, guess what, when they ran out they would be looking at us for new supplies."

Douglas County has limited development in the western part of the county, creating a defacto 200- to 300-year rule for those rural wells, said Commissioner Sullivan.

So why has Douglas County clung so long to the 100-year rule for most of the county?

In the 1970s, when much of the county's scenic ranch land was being platted for development, little was known about aquifers, the extent of the water supplies or how these vast underground systems would behave once large quantities of water were drawn out. The state produced a computer model of how much water existed in various areas in the mid-1980s, and that has remained the reference point for calculating the estimated supply for a particular area.

But today, it's clear that the scientific understanding of the unique Denver Basin is still evolving and water levels are dropping faster than anticipated.

Water experts say they need more and better data to accurately forecast exactly how fast the water levels will continue to drop.

"Fifty years ago, Parker and Castle Rock and most of the county were just a lot of farms," said Nick Robinson, who chairs the board of the largest metropolitan district in Highlands Ranch.

"And when you have developers buying raw land - unless the infrastructure is already there - they're going to do the cheapest thing."

"Has there been a lack of planning? I don't know. But there's definitely been a lack of forethought."

Labeled as kooks

By the late 1980s, concerns about underground water began surfacing.

A report by the Douglas County Water Advisory Board in 1989 issued dire warnings on continued pumping of wells to mine water.

"Douglas County's reliance on and depletion of this finite, essentially non-renewable resource should be of concern to all residents of the county," said the report by the board of 17 residents appointed by the county commissioners in 1987.

The report outlined a cycle of declining water levels leading to the need for more wells, thus escalating the declines even further. The bottom line: water will become increasingly expensive, the report said.

"Such costs over the long term will continue to escalate and may become excessive if alternative sources of supply are not provided. County residents will bear these increasing costs," the report warned.

The report recommended that the county commissioners make draconian changes in how they looked at water and development. All new development in cities and other populated areas should be served by surface water, not groundwater, the committee concluded. Countywide conservation standards should be imposed on subdivisions that rely on wells, the board recommended.

How did officials react?

"To be honest with you, there was this perception (by developers) that the people on the water advisory board were a bunch of anti-development kooks. We all got branded that way. All of us," said Boand, chairman of the board in 1989. "I don't think there was a single anti-development person on that board. They were a bunch of realists and scientists and attorneys and agricultural people."

Jennifer Drybread, former county planning official who worked with the board, said some of the recommendations, such as encouraging conservation, were added to the county's master plan.

But the county didn't go along with the extreme measures, such as requiring surface water for new development, she said.

"There was a response by others that there was a much larger water supply - 'Don't be alarmist. The problems can't be as bad as you are predicting,'" Drybread said. "That was more perhaps the general tendency by the county commissioners at the time and others."

Sullivan called the report "doom and gloom."

It did lead to a survey of water districts, many created by the developers for new subdivisions.

Sullivan said the survey led him and others to conclude that the report had overblown the problem and made some faulty assumptions.

"I put a lot more stock in that," he said.

Sullivan said the survey led to the formation of the Douglas County Water Resource Authority made up of cities and major water districts. Thirteen years later, a group of 11 of those districts is close to a plan to address the county's water future.

For that, he thanks the board and its 1989 report.

"That was the thing that got people off their fannies," he said.

An echo in Castle Rock

Three years after the 1989 study, another report issued by the town of Castle Rock raised questions about the wisdom of relying on groundwater.

The study concluded that groundwater would become the most expensive way to provide water to the town in the long run as it was forced to drill more and more wells to compensate for dropping water levels. It cited wells in northern Douglas County where water levels were dropping 40 feet a year.

The town used the report to rethink some of its water planning, said Board.

It reaffirmed an aggressive stance toward purchasing renewable surface water supplies, he said. Now, about 4 to 5 percent of its water is surface water, largely from West Plum Creek. The town began last year adding a surcharge to build a fund for buying more surface water.

The 1992 study also was the impetus for a decision in 1998 to require new developments to meet a 200-year, not a 100-year rule for underground water, Board said.

"", there was an acknowledgment that renewable water was needed, a recognition that there were differences in the aquifers and finally a recognition that we knew less than we thought we knew," Board said.

In 1995, then-Gov. Romer issued his infamous public call to put a warning sign on all Douglas County homes about the reliability of groundwater. County commissioners reacted by angrily demanding a meeting with then-Gov. Roy Romer, recalled Larry Kallenberger, Romer's state director of local affairs at the time.

At a private meeting in Romer's office at the state Capitol, then-County Commissioners C. Michael Cooke and Sullivan took exception to Romer's comments and assured him there was more than 100 years of water available for the county, Kallenberger and Sullivan said.

Romer repeated his request for a voluntary warning for new homes, while the commissioners accused him of scaring homeowners into thinking "they no longer will be able to raise their families in these homes," Kallenberger said.

Sullivan said Romer bristled at the commissioners criticism, but they tried to show the governor that they were making progress on securing other water sources.

Romer stood his ground.

"His response was, 'Well, somebody should have been thinking about that in the approval stages,'" Kallenberger said.

"What are you going to do, go and argue with the governor?" Sullivan said.

Cooke, who is now head of the state Department of Revenue, declined to comment on water issues or the meeting with Romer.

Jim Lochhead, director of the Department of Natural Resources under Romer, said he met regularly with Douglas County commissioners in the mid-1990s about water and other issues.

"I think their view was that we had a significant amount of time to deal with it," Lochhead said. "I think our view was that while we have the luxury of time, why not get ahead of the curve instead of waiting until there is a crisis?"

In 1996, the Romer administration got more aggressive with its water concerns. The state engineer's office ordered the warning label on all municipal and subdivision wells.

The office also began advising that "alternative renewable water resources should be acquired" in all of its comments on new groundwater-based subdivisions. The office routinely comments on new subdivisions and their water plans.

The need for water

Douglas County theoretically accepted in 1992 that it would need renewable water supplies.

That was the year the Douglas County Water Resource Authority began working on a water plan.

By the mid-1990s, the authority was still in the early stages of studying a plan to connect the county's urban areas with pipelines and acquire surface water rights. The initial cost estimate was \$223 million. It later would rise to \$600 million.

Today, the sub-group of 11 districts within the same authority estimates the cost at more than \$1 billion, according to a draft of the still unreleased report. The authority has purchased no renewable water supplies and approved no pipelines or storage systems for the county.

The study group has been keeping the draft report under wraps since August, in part because it is concerned that the plan to share water with Denver and build a new pipeline system and several recycled water plants will cause a political firestorm, said metro area water officials. Officials now expect the plan to be released in early January.

The study concluded that doing business as usual - continuing to drill more wells - would cost an estimated \$2.3 billion, according to water engineer Pat Mulhern, one of the study's authors. But Mulhern said the water districts can't afford to do nothing because they need renewable water.

Officials continue to say publicly that the county is addressing its water issues through its study, which includes a plan for sharing water with Denver in dry years while drawing water from the city and injecting it into the aquifer in wet years.

As recently as March 2002, Commissioner Sullivan told concerned residents that the long-range water plan that is the focus of the study was in place. He told them he ``never felt better about it. . . . The plan is in place and moving along nicely to (provide) renewable water to the majority of the people of Douglas County," according to meeting minutes.

But 20 months later, the water plan still isn't finalized and key players aren't signed on.

Well, wells and more wells

As warnings sounded and studies were undertaken, city and county governments approved subdivision after subdivision relying on underground supplies.

In Parker and Castle Rock, planning departments and, ultimately, city councils decide whether to allow new development. By law, the county has no control over projects those cities approve or annex.

In unincorporated parts of the county, developers generally create special districts to provide water and other services their home buyers will need. Those districts are usually staffed and controlled by the developer until there are enough homeowners to serve on those boards.

The districts usually hire water consultants to assess water needs and oversee well-drilling.

The county commissioners have final say over whether a new development goes forward outside the cities and what requirements it must meet.

Sullivan insists the county has responsibly addressed the water issues related to those developments.

The commissioners kept approving development because much of the county was already zoned for growth before he took office, Sullivan said. People bought property expecting to develop it.

"When I became a commissioner 15 years ago, the county was zoned for 500,000 people," said Sullivan, a former developer himself. "Our biggest hurdle has been how to slow it down where people still have property rights. That's been our dilemma."

He said the commission has since scaled back planned development by some 30,000 housing units.

He noted that cities such as Parker and Castle Rock continue to expand.

"I question a couple of the cities for what their expansion plans are," he said. "I've got to be honest. I don't think there's enough water to supply that."

However, he said both cities are making progress in securing renewable water supplies.

Other water officials are deeply skeptical about the way Douglas County has managed its water supplies and growth over the years.

"It's what happens when you have government by special district rather than government by community," said Eric Kuhn, manager of the Colorado River District in Glenwood Springs. "In Douglas County, they had developers coming and building special water districts to serve their own needs. They were not thinking about development down the road."

Setting boundaries

In 1998, after years of homeowner complaints about dry wells in western parts of the county, the Douglas County commissioners responded.

They established special zones that prohibit development in some areas unless renewable water is available.

Since then, the county hasn't approved any subdivisions for the area, known as Margin A, Sullivan said.

But they made one exception to the water rule. In March, the commissioners agreed to allow the use of nonrenewable water for 162 new homes in the Headwaters, a two-golf course community proposed for the county's water-strapped western edge.

In that case, commissioners overruled the planning commission, saying the Headwaters' developer, Jackson Properties, could use wells for its homes and water from a nearby stream on the two golf courses.

The hearings drew hundreds of residents who feared open space and groundwater supplies would be harmed by the development. Final approval of the project is pending.

Sullivan defended the commission's action, saying it simply allowed the project to form its own water district to drill deep wells or buy water from other sources.

"A lot of people didn't understand that," he said.

The commissioners took another step to address water issues as part of a major overhaul of the county's planning system in 2001.

They decided to encourage all new developments to hook into existing water districts.

If a developer can get a water district to agree to provide water, the county commission automatically signs off, even if the district doesn't have a guaranteed long-term source of water, said deputy planning director Betty Allen.

For example, the Roxborough Park metro district, where homes abut the Pike National Forest, has no guaranteed water supply after 2022 because its contract with the city of Aurora ends then. But that hasn't stopped Douglas County from approving new subdivisions for the district, albeit with reservations by the planning commission.

In March 2001, two planning commissioners cited water concerns in voting against a housing subdivision and golf course in Roxborough.

Planning Commissioner Steve Wilson told the other commissioners he ``did not think it wise to increase the number of dwelling units in the Roxborough area when there is no proof there will be water after the year 2022," according to minutes of the meeting. The project was approved 5-4.

The next year when the development came up for another review, Planning Commissioner Jill Repella told the other commissioners she hoped the district had a signed agreement for water before the first home closing, according to minutes of the June 24, 2002, meeting.

"If not, she hopes the developer would give some type of moral commitment to give a clear disclosure to the new homeowners as to the extent of the water supply," the minutes said.

Alan Fishman, who is a principal with the company developing the Chatfield Farms subdivision in Roxborough Park, said the developer informs potential buyers of the water situation and the relatively high property taxes.

"Some people don't buy because of it," said Fishman, who lives in Chatfield Farms.

Fishman and Larry Moore, manager of Roxborough Park, are confident Aurora will not cut off water before the district finds a new source.

The county commissioners have approved two new subdivisions for Roxborough Park since 1999 for hundreds of homes.

Allen said once a water district agrees to serve a subdivision, the county has no legal responsibility for the adequacy of the district's water supplies. She points out that Roxborough Park is setting aside money for new water sources.

"Who are we to second-guess the water districts?" asked Allen, a 21-year veteran of the county planning department.

A long-ago foreshadowing

Some saw this dilemma coming a long time ago.

In the bowels of the state engineer's office in Denver rests a letter written 35 years ago.

D.D. Colvin, secretary of Louviers Mutual Service Co. which supplied water to the west Douglas County town, wrote the Water Conservation Board on Feb. 7,

1968, about his concerns over dropping water levels in the town's well. He noted that the problems coincided with the recent drilling of several industrial wells.

At the end of the letter, Colvin made a plea.

"The Louviers Mutual Service Company officially protests the introduction of any new wells in the area unless there is some effort made to analyze the water level problem with the ever present possibility of additional cost for deeper water extraction."

A copy was sent to the Douglas County commissioners.

INFOBOX

What the officials say

* Peter Binney, Aurora's utilities director

"Douglas County is running out of cheap water. The water is still there, it's just that the economics of the water that is available to them is going to change dramatically."

* Steve Boand, hydrologist and former Castle Rock mayor

"The average citizen thinks the life of the aquifer is 100 years from the first day they start pumping. We know that is not right under a whole bunch of different scenarios."

* Douglas County Commissioner Jim Sullivan On water problems developing in 20 years:

"I haven't heard that from any of our water people. I don't know but what that might be some sort of scare tactic." He said this summer that well levels are not falling 20 to 30 feet a year, as water district officials say. "That has happened in only some places. Stop pumping it for six months, and it will come back." This fall, Sullivan said he was shocked to learn of drops of 30 feet a year in wells in Parker and Castle Pines North.

* Jim Lochhead, director of the state Department of Natural Resources under former Gov. Roy Romer

"I think their view (Douglas County commissioners in the mid-1990s) was that we had a significant amount of time to deal with it. I think our view was that while we have the luxury of time, why not get ahead of the curve instead of waiting until there is a crisis?"

* Ray Waterman, Castle Rock City Councilman On why he opposes limiting growth to reduce pressure on water supplies:

"Growth has its problems, but the town I'm from in New Mexico went from 12,000 people to 6,000 people, and, believe me, that's worse.

* Hal Simpson, state engineer Will wells give out in Douglas County?

"It's not a question of if. The question is when."

* Frank Jaeger, head of the Parker Water and Sanitation District

"Saying 'maybe someday we can get you some water' is not a good plan."

* John Hendrick, head of the Centennial Water and Sanitation District that serves Highlands Ranch

"Would an outsider say we were looking through rose-colored glasses? Yes."

* Mike Maxwell, Douglas County commissioner:

"One of the things we've got to do is preserve water for citizens who are already here. We've got to get a better source of water."

* State Sen. Ken Gordon, D-Denver

"Our water policy is like somebody jumping out of a 90-story building thinking they'll figure something out before they hit the ground."

Water warning signs

* 1968 The Louviers Mutual Water Service Co. sends a Feb. 7 letter to the state Water Conservation Board and Douglas County commissioners reporting that the water level in its well in the western part of the county is dropping, probably because new wells were drilled nearby. The water company asks the state not to approve any new wells in the area until the problem is studied. State officials today say they don't know how the state responded. Wells, mostly for commercial and industrial uses, have been drilled since.

* 1981 Douglas County Planning Commission approves an Interim Master Plan with this goal: "In recognition of the limited groundwater resources within the county, conservation practices and restrictions on the use of water will be required of all development." The county commissioners recognize the plan, county documents indicate.

* 1985 State law reaffirms property owners' legal rights to 100 years' worth of water under their land and says they may withdraw only 1 percent a year, based on a formula created by the state engineer's office.

* 1989 A report by the Douglas County Water Advisory Board calls dependence on groundwater a major concern for all residents and recommends, among other things, requiring all new developments in population centers to use surface water

and not groundwater. The county includes some measures, such as encouraging water conservation, but rejects the requirement for surface water.

* Early 1990s Most of the homes just south of Chatfield in three subdivisions have their wells go dry and are forced to truck water to cisterns. About 100 homes eventually hook up to the Denver Water system.

* April 1992 Castle Rock issues a water management plan that says the town would need to construct 160 wells to meet demand for buildout of 82,000 people. It warns that dropping water levels will increase production costs, making groundwater the most expensive way to provide water. The plan calls for minimal long-term dependence on groundwater. Castle Rock still relies mostly on groundwater today.

* 1995 Gov. Roy Romer publicly calls for signs on new home projects in Douglas County warning about the reliability of groundwater. At a private meeting in the summer of 1995 in Romer's office, county commissioners Jim Sullivan and Michael Cooke tell the governor his "science is bad" and there is enough water under the county for more than 100 years," Sullivan says.

* January 1996 State Engineer Hal Simpson orders a warning put on all new municipal and subdivision well permits that draw on the aquifers, noting that they are nonrenewable and might not last 100 years. He also instructs the office to issue a similar warning when asked by counties to comment on new subdivisions.

* 1996 State legislation to require home builders to disclose to buyers if homes rely on nonrenewable underground water passes the House and is killed in a Senate committee.

* 1997 A similar bill requiring notification is killed in a House committee.

* June 1998 A study by water consultant John C. Halepaska & Associates warns Douglas County of water problems on the western side of the county and says pumping in Castle Rock and Parker is helping drain wells in the west. County imposes water limitations on development on the western edge.

* 2001 County reworks its master plan, giving automatic approval to developments that tap into existing water districts rather than forming new ones.

The language of water

* Acre-foot An acre of water a foot deep, which is about 326,000 gallons, enough for one or two families for a year.

* **Aquifer** A body of underground water that is part of a river system. Under the South Platte River, for instance, the Ogallala aquifer spreads out in eastern Colorado and western Nebraska. Other aquifers, such as those under Douglas County and much of the metro area, consist of ancient water trapped deep underground.

* **Aquifer recharge** A process in which water is injected into an aquifer to store it for reuse later.

* **Artesian pressure** Water trapped underground will often rise above the top of an aquifer if it is tapped by a well. The force driving the water upward is called artesian pressure.

* **Denver Basin** A system of four aquifers covering 6,700 square miles from south of Colorado Springs to Greeley and from the foothills eastward to near Limon.

* **Groundwater** Water found underground. It may come from a deep aquifer such as those in the Denver Basin, or it may be water that has spread underground from a surface river system.

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