



## Water Use Fast Facts in Translation

Recently, COGA published Colorado oil and gas industry water usage facts, “[Water Use Fast Facts](#)”, which can be found at [www.coga.org](http://www.coga.org), under Fast Facts. In summary, the facts estimate water use for oil and gas development at 0.13% of Colorado’s total 2012 water use. That’s 6.5 billion gallons of water for the year at far less than one percent of all water use. These billions of gallons are compared with other users in the state and, despite being “billions” in number, they are the lowest of notable users, such as Irrigation (4497.5 billion gallons/year), Public Supply (315.4 billion gallons/year), and Mining (7.8 billion gallons/year). Also, the one-time use of 5 million gallons for one well are contrasted to water uses we can all relate to, like a Colorado coal-fired plant in one day or 30 Denver-area homes in one year.

The facts speak for themselves. Even so, we wanted to hear what these facts say to Colorado water engineers, professionals who know these numbers inside and out and can translate them. We spoke with Ken Carlson, Civil and Environmental Engineering Professor at Colorado State University and Co-Director of the [Colorado Energy-Water Consortium](#) (CEWC), Kevin Rein, Deputy State Engineer for the Colorado Division of Water Resources, and Ken Knox, Senior Advisor and Environmental Engineer for Noble Energy.

### Do you agree with COGA’s facts?

Ken Carlson said COGA’s numbers are consistent with what’s been published. “We recently published data from an extensive study with Noble Energy that looks at water usage,” said Carlson. The data was compiled into a Fact Sheet jointly prepared by the Colorado Division of Water Resources, the Colorado Water Conservation Board (CWCB), and the Colorado Oil and Gas Conservation Commission (COGCC), “[Water Sources and Demand for the Hydraulic Fracturing of Oil and Gas Wells in Colorado from 2010 through 2015](#)”. COGA’s numbers are also consistent with this study’s facts.

Kevin Rein noted, “The numbers you have come up with, particularly the numbers for statewide water usage and 6.5 billion gallons total 2012 usage are well within the same order of magnitude or are even slightly more than COGCC had estimated.”

Ken Knox also cited the jointly prepared COGCC Fact Sheet as a matching study to COGA’s numbers, adding, “I agree with the numbers on the fact sheet, primarily because they portray the minute fraction of water consumed by the oil and gas industry in comparison with the other dominant uses, such as the irrigation of crops and municipal water demands.”





From his research of [CWCB's 2010 Statewide Water Usage Initiative](#) growth projections for 2008 to 2050, Knox stated, "The percentage of oil and gas water use will continue to be minor, and will continue to moderately increase, but not at the same scale and magnitude as municipal growth."

## **How does oil and gas obtain water purchases?**

"Colorado is rigorous in its administrative application of the water rights system to water use, and equally permissive if uses are consistent with water rights," said Rein. "All water needs to be used according to water rights dictated by the prior appropriation doctrine." This means water cannot be diverted from a stream or reservoir or pumped out of the ground without reconciling that diversion with the prior appropriation system.

## **How is water used by oil and gas, and what is being done to reduce that usage?**

Knox related what anyone in the industry would know: Water is used predominantly for drilling, some minor maintenance activities like dust suppression, and the energy well completion process. The majority is used in the completion phase for hydraulic fracturing.

Knox then identified two ways industry is reducing its overall water use: "One, we are employing new technologies that reduce water demands in the well completion phase. As a result, we have seen water consumption drop 10% in many of our horizontal completions in northeastern Colorado. The second method is an emerging technology to capture, treat, and recycle a portion of flow back and produced water supplies that can then be reused in subsequent completion phases. Our goal is to continue to increase the percentage of water that we can reuse."

Under practical applications and common sense, the oil and gas industry understands water sources are integral, not expendable. "Our incentives, if you will, to keep water usage low is first and foremost because water is extraordinarily valuable to all our neighbors and stakeholders," said Knox, "I cannot overstate the value and importance of our long-term relationships with our communities. Exercising wise stewardship of water resources in a semi-arid environment enhances our relationships and makes our business operations easier."

"Our second incentive is related to the first," Knox continued, "When we stay within our legal parameters and are in compliance with local, state, and federal laws, we don't suffer from adverse regulatory actions."

"The third, and most obvious incentive: When you have reduced water use, you have reduced operating expenses and thereby increase your profitability."

Drilling horizontally rather than vertically is another way water use can be reduced. Recent studies conducted by Carlson and CEWC discovered the average amount of water used per completed horizontal well is about 2.8 million gallons, rather than the common figure of 5 million gallons. Even though vertical wells may use anywhere from 100,000 to 1,000,000 gallons, CEWC studies show greater energy returns on horizontal drilling: 2.9 gallons of water use per million British thermal units (BTU) of energy produced for horizontal wells versus 5.4 gallons per million BTU for vertical wells. Carlson remarked, "It looks like horizontal drilling is a more water-efficient way of drilling."





## What's being done to further water reuse research and development?

“Water reuse is absolutely a trend,” said Carlson, “It’s not practiced to a great degree right now—not to the degree that industry would like. But it’s definitely something that is being considered carefully and moving ahead pretty aggressively. And this will impact the way we look at water in the future.”

“One of the things we are doing at CSU,” Carlson continued, “Is working with various producers to study the impact of recycling water as an overall water balance. In other words, the more water we recycle, the lower the impact on existing sources. We’re looking at water use as, ‘Could the oil and gas industry achieve water neutrality in Colorado?’ ‘Could the oil and gas industry return as much water to beneficial use as it takes to develop its resource?’ We’re studying these questions and others: What type and level of recycling; where would this be applicable; how do we set up a path for industry water neutrality?”

Carlson concluded, “Most people would say, ‘Well, if the industry is water neutral then that’s one issue we can’t blame on them.’”

## Is the oil and gas industry drying up Colorado’s water?

“In response to specific concerns I have heard, I would say that oil and gas is not using up all of Colorado’s water. The numbers speak for themselves,” said Rein. “I run into these kinds of questions from people. It’s important for me to acknowledge their concern and not trivialize it, but I do also need to respond with facts. I can see why people may perceive that oil and gas is drying up Colorado’s water—especially when they see a figure like ‘6.5 billion gallons’. But when you see the industry’s use relative to other users, you see it’s true: This usage is relatively small.” He added, “And if someone believes a fraction of a percent—like 0.13%—is ‘too much’, well, that’s subjective.”

## In conclusion, is it reasonable to say oil and natural gas rank among the most abundant, most affordable, and most water efficient energy resources available today?

“I do agree with this statement,” said Knox, “Especially after looking at published, scientific documents.” Knox specifically cited a 2010 study, “[Water Dependency of Energy Production and Power Generation Systems](#)” conducted by the Virginia Water Resources Research Center of Virginia Polytechnic Institute and State University. The study compares the water use of energy production systems: Primary fuel sources (coal, natural gas, and petroleum oil), biofuels (ethanol and diesel), and synthetic fuels (coal gasification, tar sands, and oil shale). The study states: “Results from this study show that natural gas is the most water efficient energy source while biofuels are the least water efficient.”

“Some of this we know intuitively,” said Knox, “But yes, natural gas is the most efficient in terms of water consumption. It uses 3 gallons per million BTU. Coal uses 41. And, surprisingly, when you talk about renewable energy like biodiesel in the Midwest—that’s 14,000 gallons per million BTU. Solar uses 230 to drive steam into turbines to generate energy.”

Indeed, the facts and numbers can pile up and seem like a confusing jumble of numbers—some of them very big numbers—but when you let them speak for themselves, oil and natural gas extraction is an efficient use of Colorado’s water resources.

