

coal-bed methane water

## 1. "No one is neutral" in water fight

By Kim McGuire

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Chuck Larson drives cattle to a higher field at the CX Ranch north of Sheridan, Wyoming. Larsen uses CBM water to water his cattle on the ranch. The development CBM in the area is causing mixed reviews. (RJ Sangosti | The Denver Post)

Decker, Mont.

Out on the CX Ranch - a patch of ponderosa-pine prairie straddling the Wyoming-Montana border - water is hard to come by.

So a few years ago, when an energy company approached ranch manager Chuck Larson with the idea of using water from its coal-bed methane gas wells, the burly cowboy didn't hesitate.

Today, on 37 lush, green acres, Larson is growing 3 to 4 tons a year of alfalfa irrigated with water pumped out of an underground coal seam.

"Without the water, that field wouldn't be here," Larson said.

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About 120 miles southeast of Larsen's spread, Ed Swartz is convinced coal-bed methane water isn't saving his ranch, but ruining it.

In October 1999, Wildcat Creek, usually just a trickle, was swamped, flooding the Swartz Ranch with coal-bed methane water.

"The water just kept running for over a year, and I noticed my trees started dying," Swartz said. "It was garbage water."

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As far as Wyoming sheep rancher Pat O'Toole is concerned, the worst thing anyone could do with coal-bed methane water is waste it.

Over the next eight years, up to 450,000 barrels of water a day are projected to be produced in southern Wyoming's Atlantic Rim Basin, where a major coal-bed methane reserve has been discovered.

The federal government wants companies to reinject the water into the ground.

O'Toole wants to gain control of the water and ship it down the nearby Colorado River to thirsty desert towns - a venture that could net a savvy water-rights holder millions of dollars.

"I believe it's too valuable a resource to waste," said O'Toole, who added that he has already floated the idea by Las Vegas' water provider, the Southern Nevada Water Authority.

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In the arid West, where some parts of the land get no more



Butch Jellis (Post / RJ Sangosti)

rain than the Sahara Desert, water from coal seams is being transformed from an energy-company waste to a valuable commodity - and it is worth fighting over.

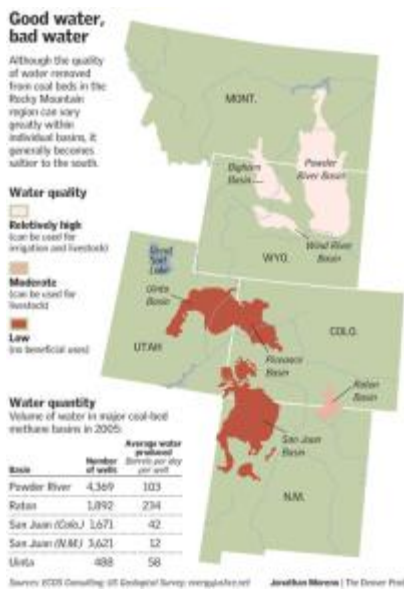
The water and gas have been trapped in coal seams for millions of years, mixing with fresh rainwater seeping in.

In the past decade, as natural-gas prices have soared and new extraction techniques developed, there has been a surge of drilling for that methane gas.

To get the gas, however, energy companies must first get rid of the water - lots of water.

A single gas well in Wyoming's Powder River Basin produced about 4,326 gallons of water a day in 2005, according to U.S. Geological Survey research.

USGS scientists estimated



(Click to enlarge)

that in 2005, more than 1 billion barrels of water were pumped out of coal-bed methane basins in Utah, New Mexico, Colorado, Montana and Wyoming. A barrel is 42 gallons.

That's enough water to serve Denver Water's 1.1 million customers for about five months.

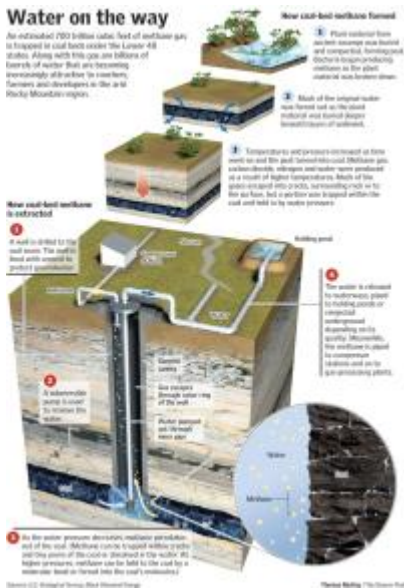
The water is gushing from gas wells at the same time that years of crippling drought have drained the region's water supply.

And the water woes look to get worse.

The Western Governors Association projects another 41 million people will be living in the West by 2030 and will need 60 billion extra gallons of water.

Yet while coal-bed methane water may be seen as an appealing new source, it comes with risks.

The water



(Click to enlarge)

often contains trace metals, such as lead and arsenic, which can taint drinking water even in low concentrations.

But the primary pollutant in coal-bed methane water is sodium, which under certain soil conditions can kill crops, trees and grass.

Some coal-bed methane water is five times as salty as seawater.

Scientists say farmers who irrigate from rivers where coal-bed methane water is discharged are most at risk from damaging salt buildups.

"Salinity is a little like climate change," said Reagan Waskom, director of Colorado State University's Water Research Institute. "It happens very slowly, and it takes awhile to see the impact."

**States left in charge**

Like Swartz, dozens of farmers and ranchers in Wyoming, Montana and Colorado tell tales of damage - at least 20 have sued energy companies and state regulatory agencies over the discharges of salty water.

Colorado currently has no water-quality rules to protect landowners from damage caused by coal-bed methane water.

Other states are retooling their regulations in the wake of mounting lawsuits.

The federal government has complicated the problem by failing to issue any guidelines or discharge limits for companies, leaving states responsible for managing the water.

And so two factions deeply rooted in the property-rights movement in the West are left warring - those who want coal-bed methane water and those who say their land and the environment are threatened by energy companies dumping the waste water.

The fight has spilled across state lines, pitting Wyoming against Montana in a bitter lawsuit over Montana's rules limiting discharges into waterways.

Some energy companies say a ruling upholding Montana's regulations could drive them out of business.

"There's just so much emotion around this issue," said Wyoming Gov. Dave Freudenthal. "People either view this water as their life blood or the end of the world. No one is neutral."

On the CX Ranch, the Larsens drink coal-bed methane water and bathe in it too.

Chuck Larsen doesn't understand why Montana environmental regulators think the water is a "gas byproduct" and not good, old-fashioned H<sub>2</sub>O.

"If that's the case, we're drinking gas byproduct" Larsen said.

At the Wrench Ranch, north of Sheridan, Wyo., and not far from Larsen's spread, Butch Jellis is funneling coal-bed methane water through the tentacle-like arms of an irrigation system onto 100 acres of alfalfa.

Jellis, a cowboy with Buffalo Bill Cody long hair and a bushy goatee, becomes animated talking about the water, which he says has helped increase his crop yield.

"This ranch is my business, and I wouldn't do anything that would hurt my business," he said.

Though no state keeps statistics, the single-largest users of coal-bed methane water appear to be ranchers who use it for livestock or to improve their property for hunting and wildlife, according to Western environmental regulators.

The water is often piped into impoundments, or a landowner might divert it onto their property through a nearby stream.

Both Jellis and Larsen get their water from Denver-based Fidelity Exploration & Production Co., the largest natural-gas producer in Montana.

The difference between coal-bed methane water killing trees and being suitable to drink is the amount of sodium.

In some places, the water is near- drinking quality; in others it is saltier than the sea. The water quality is dictated by the depth of the coal bed, the composition of rocks surrounding the bed, and the amount of time the rock and water interact.

In parts of the Powder River Basin, Fidelity's well water contains relatively few salts and metals, so the company can give it to landowners to irrigate small plots.

At Larsen's ranch, the water is not treated, but gypsum is added to the soil to make sure there's enough calcium to balance out the sodium in coal-bed methane water.

"It's not a silver bullet for every situation," said Joe Icenogle, Fidelity's vice president for regulatory affairs. "But in some places it works."

### **"Garbage grass" takes hold**

The first casualty of the coal-bed methane water spill on Ed Swartz's ranch were the box elders growing along Wildcat Creek.

Then, the Brohm grass that Swartz's father had planted disappeared, and then the alfalfa - the crops Ed's father used to pay off the ranch.

While that vegetation was wilting, alien plant species were taking over the creek bank, which is now dotted with salt-tolerant cattails.

"Mostly it's that 'garbage grass,' I call it," Swartz said. "You reach down and grab it, and it will practically tear your hide off. Think that's palatable to cows?"

The water that flooded the ranch, home to the Swartz family for four generations, came from one of the 150 nearby reservoirs that had been built to hold thousands of gallons of water from Powder River Basin gas wells.

The 22,000-square-mile basin was the scene of the nation's first large-scale coal-bed methane development, which exploded in the mid-1990s.

That was when Casper independent drillers Chuck Peck and Bruce Martens devised a new way to drill wells in shallower coal deposits where there isn't as much pressure locking the gas in place.

Operators were lured to the basin by the fact the gas was relatively inexpensive to produce, with most wells drilled at a fraction of the depth of conventional oil and gas wells - about 300 feet, compared with a standard well of 10,000 feet.

John Wagner, the head of Wyoming's Department of Environmental Quality's water division, said a "gold-rush mentality" prevailed during the times.

"They had figured out how to get the gas out, and everybody and their brother was headed up to the Powder River Basin," Wagner said.

Frustrated by the lack of response from state and federal environmental regulators, in 2002, almost three years after Wildcat Creek flooded, Swartz sued Wyoming regulators and the company that discharged coal-bed methane water into the reservoirs.

The company, Redstone Resource Inc., eventually agreed to pay Swartz for his damage and provide irrigation water under a court settlement.

Today, Wyoming leaders are still arguing about which state agency should handle the bulk of the coal-bed methane water complaints - the state engineer or the Department of Environmental Quality.

Wagner said the department frequently receives calls about flooding, a water-quantity issue that should be addressed by the state engineer.

"We can only tell the guy, 'Look, if you're getting damage, you can sue the coal-bed methane companies for damages,'" Wagner said. "And they don't want to go there."

In April, Gov. Freudenthal rejected new coal-bed methane water rules pushed by the Powder River Basin Resource Council, a property owner group, saying they were a "back door" approach to force the Department of Environmental Quality to regulate how much coal-bed methane water can be discharged.

Freudenthal says the state engineer is responsible for matters that relate to water quantity.

There are more than 3,900 coal-bed methane reservoirs in Wyoming permitted by the state engineer's office, state records show.

Wyoming has only one inspector to check that the structures aren't leaking, and a few other employees who can assist, said Harry LaBonde, deputy state engineer.

"We think it's sufficient," LaBonde said.

### **Dangers still under debate**

Even though Swartz is convinced coal-bed methane water damaged his vegetation, not all scientists are sure the effects are catastrophic.

They agree that water with high levels of sodium can hurt calcium-deficient soils, but they differ on at what level the changes start to occur.

A study conducted last year by the U.S. Department of Agriculture Salinity Lab in Riverside, Calif., indicated crops can be harmed by sodium levels about half as high as those originally thought safe.

That study analyzed soils on a farm in southeastern Montana owned by Roger Muggli.

Muggli is president of Y&T Irrigation Co., which serves about 200 farmers on 9,400 acres in southeastern Montana who grow alfalfa, barley, sugar beets, wheat and corn.

Muggli runs a plant that grinds hay and mixes it with barley, peas and wheat to make cattle feed pellets.

In October, Muggli noticed some of the crops he had irrigated with Tongue River water began to die.

The odd thing, Muggli said, is that alfalfa planted on top of the earthen dikes that had received no irrigation water remained healthy.

"We haven't done anything different in the past 126 years," Muggli said. "What do you mean nothing is going on?"

The state of Wyoming has granted more than 500 permits to energy companies to dump coal-bed methane water - from as many as 5,000 discharge points - into the Powder, Tongue and Yellowstone rivers, which flow through the two states.

Concerned about the impact on those rivers, Montana last year adopted a set of "anti-degradation" rules aimed at preventing water-quality declines.

The tribal government of the Northern Cheyenne, whose reservation is near the Tongue River, has adopted water-quality rules that are equally as stringent.

"Water is precious to us," said Herbert Bearchum, a former tribal council member nicknamed "Happy Herb."

"We heard from the prophecies, though, that people with hair on their faces would try to come and take it from us and disturb our land. Some of us still believe that," Bearchum said.

Wyoming officials insist that operators dumping coal-bed methane water have not harmed rivers that flow into Montana. They also believe that Montana's rules are so strict, they prevent companies from discharging without penalty.

Some scientists, however, believe that coal-bed methane water can harm irrigated crops.

"Montana is sitting at a corner. As is Colorado. As are downstream irrigators," said Jim Bauder, Montana State University soil scientist. "And there's a semi coming that's going to hit them."

Wyoming has sued the Environmental Protection Agency for signing off on Montana's rules. The two states and the tribe are currently in mediation talks with the EPA.

Dave Hogle, the EPA's regional energy adviser, wouldn't discuss the talks.

"I think everybody is gaining an understanding of each other's perspective," he said.

### **Looking to invest**

Twice a year, Pat O'Toole, his family and a small posse of Peruvian shepherders drive his Wyoming flock more than 150 miles between the summer and winter grounds.

In recent years, the view from the trail has come to include dozens of new coal-bed methane wells and the pits that hold the water pumped from the ground.

O'Toole has been angling for control over that water and more expected to be produced from 1,700 new wells planned in the Atlantic Rim Basin over the next eight years.

Under a plan recently approved by the federal Bureau of Land Management, the agency is requiring Anadarko Petroleum Corp. and Double Eagle Petroleum Co., the basin's operators, to reinject water into the ground.

But O'Toole believes reinjecting the water underground is a waste and is proposing a deal that involves shipping the water down the nearby Colorado River to water-desperate Western towns such as Las Vegas.

"It's such a no-brainer," O'Toole said.

Water leases in the West - which range from spot-market purchases to multiyear deals - can fetch as much as \$500 an acre-foot - the amount Santa Fe agreed to pay the Jicarilla Apache for 3,000 acre-feet a year.

Aurora Water buys spot leases from Denver Water for \$347 an acre-foot.

At those prices, Atlantic Rim wells could be pumping as much as \$10 million a year in water by 2021.

Officials with the Southern Nevada Water Authority said the utility has frequent conversations with water speculators, though it is not aggressively pursuing Wyoming water.

"You'd be surprised what we hear - there are icebergs from Alaska someone wants to bring down," said Scott Huntley, an authority spokesman.

Huntley said the Las Vegas water provider is looking at ways to augment its Colorado River supplies and may be open to using coal-bed methane water if the plan can survive an environmental review.

Produced water from energy development, Huntley said, is one of the many sources being analyzed in a major Colorado River study expected to be released this summer.

"We will have a tremendous interest in what that study identifies," Huntley said.

### **Pipelines are possibility**

The coal-bed methane water project that has the most momentum is a plan to build a pipeline to take water in Wyoming to the North Platte River, where it would flow into Nebraska.

The two states have been fighting over shortages in the river since the 1930s.

Last year, the state awarded \$500,000 to the water development commission to conduct a feasibility study.

The Wyoming Pipeline Authority also is querying energy companies to see whether they would be interested in paying for a pipeline for water disposal. Where it would be built or where it would discharge water has yet to be determined, said Brian Jeffries, the authority's director.

"We don't know if a water pipeline will work out," Jeffries said. "But we do think it might be a good idea to explore and see whether it makes economic sense to the producers."

In 2006, a \$50 million pipeline built by Houston-based Anadarko Petroleum Corp. went online and is ferrying more than 60,000 barrels of water a day 48 miles from the basin's northeastern edge to an underground reservoir near Midwest, Wyo.

Members of environmental groups who have complained about coal-bed methane water surface discharges say they support the water being treated and put to municipal use.

"We don't want to see the water go out of the state because we need it here," said Jill Morrison of the Powder River Basin Resource Council. "Every single town in the Powder River Basin - Buffalo, Gillette and Sheridan - is looking for more water."

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### **Regulatory issues**

The widespread coal-bed methane production that began in the 1990s in the Powder River Basin has been followed by a series of regulatory lapses.

A 2002 federal Environmental Protection Agency assessment of a plan for coal-bed methane development on federal land in the Powder River Basin voiced concerns about the impact of produced water on irrigation. It was never officially released because of pressure from Steven Griles, a former Interior Department official, according to EPA memos.

A U.S. Department of Interior inspector general's report found that Griles, a deputy secretary and former energy industry lobbyist, should have recused himself from discussions with the EPA. Griles resigned after the investigation and this year pleaded guilty to obstruction of justice in the investigation of lobbyist Jack Abramoff.

The EPA - which is in charge of protecting the nation's water quality - said in 2000 that it would issue guidelines for companies handling coal-bed methane water. The agency finished its report in 2003, but industry guidelines have never been released.

The EPA is currently analyzing whether effluent guidelines are needed for produced water, but officials say they don't expect a decision until at least 2009.

The Government Accountability Office, in a 2005 report to Congress, found that the Bureau of Land Management neglected inspections because employees were busy writing new drilling permits.

gift or curse | second in a three-day series

## 2. Uncharted waters for Wellington

No precedent for rights to abundant coal-bed methane runoff.

[By Kim McGuire](#)

[Denver Post Staff Writer](#)

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Brad Pomeroy is President of Wellington Operating Company. The company is headquartered in Centennial but has oil fields in Wellington. He is pictured in front of one of his oil pumping units. PHOTO BY HELEN H. RICHARDSON (the Post / Helen H. Richardson)

Related Articles

Wellington - The Wellington oil field was long past its prime when Brad Pomeroy took control in 1992.

By then, the north Larimer County field was producing more water than oil, and disposing of the water was a costly enterprise.

So when Richard Seaworth, a local farmer, was looking to develop part of his property as a residential neighborhood, Pomeroy saw an opportunity.

"Richard needed water. I had water," Pomeroy said. "But if I would have known then what I know now, we probably wouldn't be having this conversation today."

Getting the legal blessing to use water produced from the Wellington oil field for development has been an arduous task.

No state agency had ever granted a



An oilfield north of Wellington may be a new source of water for homes and municipalities in the area. Environmental consultant David Stewart (front) has put a plant together to clean the water to in-stream quality, left. At right, is the water quality as it enters the process. At rear is Stewart's associate, Randy Evans. (the Post / Helen H. Richardson)

discharge permit for that kind of water, nor has a water right ever been granted.

Pomeroy is still fighting to get that right. "There's a reason cavalry scouts don't have a long life span," he said.

Water from oil and gas wells has been a nuisance for the energy industry as long as it has been drilling in the West.

It has become an even bigger headache now that companies are drilling in water-drenched coal seams for methane gas.

To get the gas, an operator must first pump out the groundwater to reduce the pressure holding the methane in place.

That water - sometimes loaded with salts and trace metals - is capable of withering crops and damaging soil.

In southern Wyoming's Powder River Basin, new wells are producing 4,326 gallons of water a day, according to U.S. Geological Service data.

The Wyoming Oil and Gas Conservation Commission predicts that between 2006 and 2029, coal-bed methane drillers will produce more than 11.6 billion barrels of water - enough water to fill Dillon Reservoir six times.

Coal-bed methane wells also are being drilled in southern Colorado's Raton Basin, northern New Mexico's San Juan Basin and central Utah's Uinta



Basin. Inside the Wellington Waterworks, consultants Randy Evans, left, and David Stewart, center, work with project partner Richard Seaworth in the heart of the processing system. (the Post | Brian Brainerd)

Some of those basins - like the Raton - produce large quantities of relatively fresh water, while others, such as the San Juan, are loaded with salts and metals.

Water quality frequently dictates how operators dispose of coal-bed methane water. If the water contains high levels of sodium and metals, it's often reinjected into the ground.

In the San Juan Basin, 99 percent of the water is reinjected, while in the Raton Basin, about one-third is reinjected.

Still, most operators in the West "drill and spill" - routing water to a nearby creek or river for disposal.

A few companies are now treating the water to remove the salt. Each disposal option carries a cost.

## Industry



Joe Icenogle, of Fidelity, looks at a methane well near Sheridan, Wyoming. Fidelity is using a waste water treatment service from a company named EMIIT to treat the run off water from their wells. DENVER POST PHOTO BY RJ SANGOSTI (the Post / RJ Sangosti)

executives say the price tag to build a deep-injection well is up to \$1 million.

Jerry Jacob, environmental manager for Dallas-based Pioneer Natural Resources Co., owner of more than 1,900 wells in Colorado's Raton Basin, said it costs a penny to treat every gallon of water to river standards but not to drinking-water quality.

The company is producing about 1 million gallons of water a year from its wells, most of which are in Las Animas County.

If Pioneer treated its water so it could be used for irrigation - as some in Wyoming and Montana are doing - Jacob estimates the company would spend more than \$35,000 a day on water treatment.

Given that the potential annual gain from an alfalfa crop

### The big players

Some of the dominant oil and gas operators in major coal-bed methane basins in the Rocky Mountain region.



(click to enlarge)

would be about \$420,000, treating the water would quickly become a money-losing prospect, he said.

"That's more expensive than California water," Jacob said.

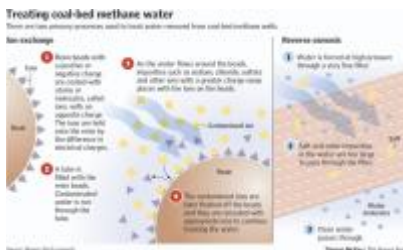
Still, more companies are considering treating the water as Western states move to place more controls on the disposal of coal-bed methane water.

The industry is coping with the changing regulatory climate by finding new ways to use the water, much like Pomeroy has done in the Wellington field.

"They say oil and water don't mix, but we're finding ways for them to play in the same sandbox," Pomeroy said.

### Water, water, everywhere

Since Pomeroy took over the Wellington oil field almost 15 years ago,



(click to enlarge)

he has had to dispose of more than 20 million barrels of water.

To do that, he has utilized a deep-injection well that shoots water back into the underground aquifer from which it was pumped.

Pomeroy estimates he pays \$1 per barrel to reinject the water, a hefty price to glean the 100 million barrels of oil he says are left in the field.

"My goal as an operator is to produce more oil," Pomeroy said. "If I become better at assessing the financial risk the wastewater presents, I become a better operator."

So far, drillers haven't found a way to make money off the produced water, and there's little economic incentive for them to do anything other than dump it in a creek or river.

The water quality in the Powder River Basin is a mixed bag that has led to conflicting views about the water by landowners.

On the east side of the basin near Gillette, where the water is relatively fresh, operators often discharge the water into local drainages without treating it.

The practice, however, is coming under more scrutiny in Western states, and operators are now developing areas that contain poorer water.

That's the case in the Big George coal seam, a gas-rich geologic formation in north-central Wyoming.

In addition to having water about three times saltier than the eastern side of the basin, the Big George area overlies steeper terrain, making it more difficult to build reservoirs to hold the water, operators say.

Dumping the water into a nearby river has led to conflicts with landowners in every state where the practice is allowed.

Already, more than 20 landowners in Wyoming have sued operators for damages associated with the disposal of coal-bed methane water.

Bernie Barlow, who owns a ranch about 20 miles east of Buffalo, says she feared for years that one of the many impoundments above her property would overflow and send coal-bed methane water down Dead Horse Creek, which runs through her property.

In 2003, a reservoir managed by Yates Petroleum Corp. did spill over, causing the creek to overflow and her cattle to get foot rot, Barlow said.

"Does it make any sense that here it is - the worst drought on record - and I'm praying there's not a cloudburst because there's a dozen reservoirs upstream of me and just a little bit can cause them to overflow?" she said.

A Yates spokesman said heavy rains did cause the reservoirs near the Barlow ranch to spill but noted that some landowners were happy to have the water.

Some companies have established good working relationships with landowners.

One company picking up accolades is Houston-based Anadarko Petroleum Corp.

Anadarko's \$50 million pipeline project went on line late last year and is ferrying more than 60,000 barrels of coal-bed water a day to be disposed of at a played-out oil field near Midwest, Wyo.

Environmental groups say more companies should invest in pipeline projects to ensure that coal-bed methane water is safely disposed of.

## **Mutually beneficial**

Richard Seaworth reckons his property in northern Larimer County is a good place to build a neighborhood - there's less smog than in Fort Collins and less wind than in Cheyenne.

But to build a development on his 160 acres, Seaworth needed water.

He didn't have to look far.

Just down the road from his ranch sat the Wellington oil field, a 6-mile-long stretch of muddy earth that's been producing oil - and water - since 1923.

While drillers have dumped water into creeks and ranchers and farmers have been taking it, to be able to use coal-bed methane water for urban development will require new regulations and legal rulings on who controls the water.

"Water rights are property rights, and we have to protect those rights," Seaworth said.

Seaworth said he probably wouldn't have thought about using water from an old oil field 20 years ago, but now water is harder to come by.

The idea of using water produced from energy development recently surfaced in Congress, where Western lawmakers - including Rep. Mark Udall, D-Eldorado Springs, and New Mexico Democratic Sen. Jeff Bingaman, chairman of the Senate Energy Committee - introduced a bill in April to fund the development of treatment technologies.

When the federal "More Water, More Energy, Less Waste Act" was introduced, project sponsors cited the Wellington project as the best example of what they were hoping to accomplish.

"Energy and water are two of our most important resources, so it makes sense to pursue both," Udall said.

In 2005, New Mexico energy companies backed state legislation seeking ways to dispose of coal-bed methane water to help cities and landowners.

New Mexico's largest natural-gas and electricity provider, PNM, even considered using coal-bed methane water to help cool one of its coal-fired power plants near Farmington.

The utility currently uses more than 22,000 acre-feet of water a year to cool the plant, which is the seventh-largest coal-fired power plant in the West.

"There was no technology that was able to do the job," said Jeff Buell, a PNM spokesman. "There is technology available that can help purify the water, but nothing that could handle the volume of the water we need to run our plant."

### **Better than irrigation water**

Water produced from mature oil fields is often laden with high levels of salts, metals and other pollutants, and the Wellington field was no different.

So in order to sell the water to Seaworth, Pomeroy had to first treat it.

Pomeroy hired Fort Collins-based Stewart Environmental Consultants to devise a treatment technology that would filter and clean the oily residue clinging to the water.

It took the firm about four years to get the \$1.5 million facility up and running. Today, it treats 65 gallons per minute.

Dave Stewart, the firm's president, said there were some operational hiccups but that the technology is effectively cleaning the water.

"The water quality is better than the water in the irrigation ditch," said Stewart, who hopes to receive a patent for the technology.

The number of energy-related water-treatment companies, such as Stewart's, is growing in the West as more states consider tightening water-quality rules.

Colorado is developing new rules aimed at protecting landowners from coal-bed methane water, while Wyoming is refining its regulations.

The federal Environmental Protection Agency is studying new guidelines for well-water discharges, which it plans to issue in 2009.

In Wyoming, Sheridan-based EMIT Technologies Inc. was the first company to get a statewide treatment permit. Since then, Yates Petroleum Corp. has gotten one, and drillers say other operators are selling their wares.

"We're getting a lot of door-knocking," said Joe Icenogle, vice president of regulatory affairs for Denver-based Fidelity Exploration & Production Co.

"What they tend to say is, 'We've got this great technology, but what we really need is for your company to put up a lot of capital to try it out,'" he said.

There are two major treatment options for coal-bed methane water: reverse osmosis and ion exchange.

EMIT employs ion exchange, a World War II-era technology that uses resins to snag and filter out the salts.

The "ballpark figure" for treating water is 12 to 48 cents a gallon, according to Doug Beagle, EMIT's president.

For a well in the Powder River Basin - which produced about 103 barrels of water a day in 2005, according to the U.S. Geological Survey - that would come to anywhere from \$500 to more than \$2,000 a day.

In the Raton Basin - where in 2005 an average well produced 233 barrels a day - the treatment cost would be from \$1,100 to \$4,700 a day.

Water-treatment-company officials don't deny that treatment adds to overall operating costs but say treating the water could help divert expensive lawsuits from landowners.

"Certainly, opportunities exist for capturing the value of the water," Beagle said. "If you can, you can potentially reduce the amount of contention associated with production."

## **Investing in deposits**

Operators were lured to the Powder River Basin in the mid-1990s by the prospect of vast coal-bed methane deposits that were cheaper and easier to drill than conventional gas wells.

By 2000, the state oil and gas commission estimates, there were more than 200 operators.

"Honestly, some of them were operators that weren't interested in working with landowners," said Don Likwartz, the commission's director.

Today, many of those drillers are gone.

Likwartz said about 75 companies remain in the basin. But five operators - Devon Energy Corp., Anadarko, the Williams Cos., Fidelity and Yates - lease more than 70 percent of the basin.

In the San Juan Basin, BP owns the most coal-bed methane wells - more than 3,500 - and recently announced it plans to invest \$2.4 billion in the basin over the next 13 years.

In Colorado's Raton Basin, the primary coal-bed methane company is Pioneer Resources.

The company gained most of its wells through its acquisition three years ago of Evergreen Resources Inc., a Trinidad-based company.

In late July, Pioneer purchased 30,000 acres in the basin from Petrogulf Corp. for \$205 million. The property is estimated to hold 124 billion cubic feet of coal-bed methane reserves.

The basin represents Pioneer's only Rocky Mountain holding and is a major company asset, Pioneer officials say.

As in the Raton Basin, there is one primary operator in Montana - Fidelity Resources, the largest provider of natural gas in the state.

Company officials say they want to expand their assets on the Wyoming side of the Powder River Basin but acknowledge that one of the challenging factors is water management.

"Produced water is going to be challenging more and more every day in terms of how you manage it," Fidelity's Icenogle said.

### **Speaking the language**

Colorado's regulatory system, Pomeroy said, was structured so that it made permitting the Wellington project a nightmare.

Pomeroy said he was told they must get a water-discharge permit from the Colorado Oil and Gas Conservation Commission, the agency that oversees energy development in the state.

No one had ever wanted to use the water before, so it took almost a year for the commission to grant the permit - a first of its kind for the agency.

"The problem is, the energy guys don't speak water and the water guys don't speak energy," Stewart said.

The Wellington project showed that utilizing the water - at least on a commercial basis - will require unraveling decades of dense and unyielding Western water law.

In Colorado, the coal-bed methane water is legally considered "byproduct waste," and no one to date has been able to get a legal water right to take it at the well, rather than capturing it from a stream.

Pomeroy and Seaworth are waiting for a water-court judge to declare them legal owners of the water being produced out of the Wellington field.

If that right is granted, it will be the first time in Colorado a decree has been given for water produced from energy development.

Pomeroy plans to sell the water to Seaworth.

"It is a fact of life in Colorado that we're going to have to have new sources of water to accommodate growth," Pomeroy said. "And how are we going to do that without drying up more farmland?"

coal-bed methane water | third in a three-day series

### 3. Battle looms over water quality

By Kim McGuire

Denver Post Staff Writer

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(L-R) Domenic Valentine, 11, (CQ) cattle dog, Taz, and brother Gianni (CQ), 7, help feed cattle on the Valentine Ranch April 21, 2007. The young ranch hands, sons of Ron Valentine, are 5th generation members of the Valentine family to help work the ranch. "We've gotta leave give something back to the next generation," says Ken Valentine. ( | Nathan W. Armes)

Related Articles

Aguilar

Ken Valentine's popularity took a nose dive last year when he began speaking out about water from coal-bed methane wells being dumped into the Apishapa River.

The Las Animas County rancher believed the water was tainting the Apishapa with salt and managed to persuade fellow farm-club members to write to the state health department.

The club later rescinded that letter, saying Valentine, a former club director, had misled them and that the energy industry - primarily Irving, Texas-based Pioneer Natural Resources Co. - was helping local farms and ranches, not hurting them.

"The biggest problem with the Valentines is that they just don't want Pioneer on their land," said Tom Verquer,



An undated photo depicting coal miners in Aguilar, Co. Photo Courtesy of the Valentine Family ( | Nathan W. Armes)  
the club's current president.

The farm-club spat is one sign of the growing tension among landowners in the Raton Basin over coal-bed methane development.

Just like the Powder River basin in Wyoming, the Raton is home to ranchers who, for almost a decade, have been receiving coal-bed methane water for their livestock and to replenish streams used by the deer and elk valued by hunters.

The region, still staggering from drought and now the aftermath of last winter's blizzards, is in dire need of more water, Las Animas County officials say.

But some landowners, such as Valentine, are increasingly wary about coal-bed methane water - which can damage soil if the salt levels in the water are high enough.

Unlike Montana and Wyoming, Colorado has no water-quality rules placing pollution limits on coal-bed methane water, which must be pumped out of the ground in order for operators to extract the valuable gas.

There are 800 outfall pipes discharging coal-bed methane water into southern Colorado streams and rivers, according to state records.

"It's our job to protect water quality, and there is definitely impacts to water quality from CBM discharges," said Steve Gunderson, director of the state health department's water-quality division.

"The system we have now just isn't protective enough," Gunderson said.

The place that may be most in need of protection is southern Colorado's Raton Basin, where coal-bed methane production is expected to increase in the next 20 years, according to the state oil and gas commission.

More than 2,900 wells dot the rocky terrain in Las Animas and Huerfano counties, 70 percent of them owned by Pioneer.

The company - which has operations in South Africa, Tunisia and Canada - established its dominance in the basin by buying Trinidad-based Evergreen Resources Inc. in 2004.

In December 2005, Ken Valentine and



Ken Valentine, 56, stands on land owned by his family but just across the dirt road is land owned by CBM where pumps extract coal bed methane from abandoned coal mines. Valentine says that the water the family uses to irrigate the 65 acre field is polluted due to the dumping of waste water generated by the extraction of coal bed methane gas. The ranch's irrigation diversion point, off the Apishapa River, is located approximately 400 yards from the CBM discharge point. ( | Nathan W. Armes)  
his brother, Dan, were checking fence lines when they found a pipe releasing coal-bed methane water into a spring that runs through the family ranch.

The brothers were alarmed since they'd heard about the damages suffered by some farmers in Montana and Wyoming who irrigated crops from rivers where coal-bed methane water was discharged.

"We were one of the few people that had water on our property during the 2002 drought," Dan said. "We kept our cows when everyone else in the county was selling off. It's because of these springs."

During the drought, Las Animas County officials filed with a district water court for a water right on the coal-bed methane water produced in the basin.

Seeing the



A coal bed methane pumping station located near the Valentine Ranch in Aguilar, Co. ( | Nathan W. Armes)  
water just welling up, county officials said they figured it was only a matter of time before Front Range cities came after it.

"But, boy, we opened a can of worms. Everyone said, 'We can't do it,' and I still don't understand why not," said County Commissioner Ken Torres.

The state's legal view is that coal-bed methane water is "byproduct waste" - and cannot be claimed under a water right for irrigation or municipal supplies.

That legal definition also places regulatory responsibility for the water under the state Oil and Gas Conservation Commission.

The agencies that regulate water - the state engineer and the state Department of Public Health and Environment - have a much smaller stake.



Ken Valentine, 56, stands at the ranch's irrigation diversion point off the Apishapa River in Aguilar, Co. The CBM discharge point is approximately 400 yards from the Valentine's diversion point. ( | Nathan W. Armes)

How Colorado manages coal-bed methane water may soon change as a state health department task force eyes new water-quality rules and the state engineer's office faces complying with a recent water-court ruling.

In the court case, two farm families near Bayfield, in southwestern Colorado, argued that the state engineer's office should have issued permits for coal-bed methane wells, as it does for water wells.

Operators should also have to prove they are not harming nearby water sources when they withdraw coal-bed methane water, the farmers argued.

In July, a judge agreed, ruling that the state engineer should require companies to get a water permit when they drill for methane gas.

"Water is a big deal to us, and if those springs go dry, it will change our lives," said Jim Fitzgerald, one of the plaintiffs.

### **County, methane share history**

Coal and the methane gas made from ancient plants and animals are intertwined with Las Animas County's past - its heydays and its worst days.

In 1917, the Hastings Mine exploded, killing 121 miners in the worst mining disaster in Colorado history.

The cause of the explosion was the deadly buildup of gases that weren't vented off before a rail car entered the mine.

"Explosions were quite common then," said June Valentine, Ken's mother and a local historian who has studied the Las Animas County mines.

Energy companies have now found a way to harness that deadly gas and bring money and jobs to Trinidad - a town that never completely recovered economically after the large mines were shut down in the 1980s.

Times were so hard then that city leaders placed mannequins in the vacant store fronts to make Trinidad look less deserted, locals say.

Trinidad's rebound began in the early 1990s when Colorado Interstate Gas built a pipeline extension along the Purgatoire River.

Producers had always known the gas was there but had no way to get it to market.

In the mid-1990s, Evergreen Resources became the first company in the basin to produce coal-bed methane gas on a commercial basis.

In 2004, Pioneer purchased Evergreen, making the company the largest producer in the Raton Basin. In 2006, the company drilled 288 wells there.

The company's aim is to produce gas, but much of Pioneer's time is dedicated to managing the water, company officials say.

Pioneer executives say up to 230,000 barrels of water are produced each day in the Raton Basin by coal-bed methane wells.

About a third of Pioneer's water is discharged into waterways, a third is placed in pits and a third is injected underground, according to the company.

It costs about \$1 million to build an injection well - Pioneer has eight dedicated to disposal of coal-bed methane water.

While some of the water in Raton Basin contains high levels of salt, it is better quality than the water being produced in the Powder River Basin, U.S. Geological Survey research shows.

"It's important to realize each coal-bed methane basin is different," said Jerry Jacob, Pioneer's environmental manager. "When people talk about coal-bed methane and coal-bed natural gas, it's different as night and day."

"This basin is nothing like the Powder River Basin - the water quality is different; water quality is much more variable, the way the coals are drilled and produced, it's all completely different," Jacob said.

One thing the basins do have in common is landowners who don't want coal-bed methane water discharged on their property.

Ken Valentine didn't, but by the time he discovered Pioneer's discharge point, it was too late.

### **Risk avoidance**

The Spanish Peaks overwhelm the view on the twisting gravel road that leads to the Valentine Ranch, a 1,000-acre spread.

Settled in 1907 by John Valentin, an Italian immigrant, the ranch is operated by Valentin's grandsons, Ken and Dan, a local schoolteacher.

The brothers run about 65 Angus cows and grow alfalfa irrigated by Frio Springs, which feeds the Apishapa River.

A few days after Christmas 2005, Ken and Dan found Pioneer's outfall placed about 400 yards above the family's diversion dam.

Ken was worried.

The Valentine brothers say they called Pioneer's emergency number and asked the company to test their water. When the company didn't respond, they say, they persuaded Colorado State University to analyze their water samples.

The CSU tests did find elevated levels of sodium in the water - about six times the amount some scientists say is suitable for irrigation on clay soils.

Salt is a killer in the agricultural community - stunting plant growth when it accumulates in the root zone, forcing the plant to work harder to extract water from the soil.

Levels of salt are influenced by what kinds of rocks surround the water and whether fresh water can infiltrate the underground formation.

Knowing the risk, the Valentines decided to stop irrigating 65 acres of hay meadows in January 2006. Since then, rain is the only water that's fallen on the fields.

Ken figures they've lost more than 80 tons of hay since they stopped irrigating.

Pioneer officials say they've taken several measures to make sure the basin's water quality isn't hurt by high sodium levels.

Poor-quality water is reinjected into wells more than 6,000 feet underground, they say.

Outfall pipes also are strategically placed far from the main stems of the area's two primary rivers, Pioneer officials say. In June, the company moved the outfall pipe near the Valentine ranch.

CSU scientists say it's not clear whether coal-bed methane discharges are damaging soil in the Raton Basin.

So far, they've documented only one Huerfano County landowner who suffered damage to a corn crop after irrigating with water from a stream directly receiving coal-bed methane water.

Troy Bauder, a CSU soil scientist, said that the area's water chemistry is dominated by sodium bicarbonate, and there is a natural deficiency of calcium.

Without calcium - which acts as a glue in the soil - the buildup of sodium can cause the soil to break down.

While he hasn't seen widespread soil damage, Bauder said the Valentines may have been prudent in stopping irrigation.

"I can't say that's a bad decision based on what I've seen," Bauder said.

### **Making a strong case**

Ken Valentine made a strong impression on environmental regulators when he appeared last year before the state Water Quality Control Commission, Gunderson said.

Armed with water-quality data taken from Frio Springs, Valentine urged regulators to adopt new rules aimed at protecting the waterways from salty coal-bed methane water.

It appears they will.

After Valentine's testimony, the state health department formed a task force to recommend whether Colorado should adopt salinity rules - rules that could limit some coal-bed methane water discharges.

In July, the task force released a draft policy paper outlining how the state could revise its permits. It doesn't, however, propose a limit on sodium.

"It's going to make industry howl, but we know it's a step in the right direction," Gunderson said.

Officials with Petroglyph Energy Inc. say that they fear new rules will impede their ability to discharge water and that, as a result, they are considering treating the water.

"If we're going to stay in business, it's something we've got to do," said Tom Melland, Petroglyph's operational manager.

Environmental regulators have granted 13 discharge permits in the Raton Basin in the past two years, covering more than 800 outfalls in dozens of the area's streams.

Gunderson said the division also will likely change its current permitting process to make sure landowners are aware where the outfalls are being placed.

"One key way to think about the evolution of the coal-bed methane production in the Raton Basin is that it's not as established as the San Juan Basin," Gunderson said.

"In the Raton, there aren't the kind of infrastructure in place - such as pipelines - that makes water management easy," he said. "It's quite a thorny problem."

So far, the state health department has issued only one reprimand to a company discharging coal-bed methane water. That complaint was filed in 1999 against Evergreen, which flushed the water into a dry arroyo without the department's permission.

While companies sometimes directly discharge coal-bed methane water into local streams, the water is often routed through an evaporation pit. There, the water is held until it's released into a nearby stream, or pumped into a water truck and carried to either an injection well or waterway for disposal.

Like the deep-injection wells, those pits are regulated by the Colorado Oil and Gas Conservation Commission. Agency officials estimate there are more than 13,000 permitted pits in the state.

In Colorado, the key to more widely using coal-bed methane water is getting a court-approved right on it.

That's why Ken Torres and his fellow Las Animas County commissioners decided to stake their claim to the thousands of gallons of coal-bed methane water flowing out of the ground.

They knew the water wouldn't be a long-term supply but wanted the water for livestock, dust control and fire suppression.

"Quite frankly, we're living with an open door for urban areas to come in and seek this water," Torres said. "That's why we haven't pulled the application. We want to stay at the front of the line."

**Weighing "beneficial use"**

Up in northern Larimer County, a small, independent oil company with a mature oil field could become the first water user to get approval to put water produced from energy development to "beneficial use" - the legal doctrine that Colorado water law is built upon, water attorneys say.

Wellington Oil Co. is treating water in hopes of someday selling it to a farmer who wants to build a real estate development. The company's water-right application is pending before a Greeley judge, but it has already gotten a discharge permit from the oil and gas commission - the first the agency has ever granted.

Colorado continues to define the water as "byproduct waste," under jurisdiction of the state oil and gas commission, not the state engineer.

In 2001, the Wyoming state engineer said coal-bed methane water could be put to beneficial use, which has opened the door to alternative disposal methods.

A Durango-based water judge ruled in July that withdrawing coal-bed methane water was a beneficial use in Colorado too.

"When you're making millions of dollars in profits by selling that gas, it's hard to argue that it's not beneficial use," said Sarah Klahn, a Denver attorney who represented two Bayfield farm families in the case.

The state engineer's office is appealing that decision, but if the ruling stands, it could make gas companies come up with plans to manage the water.

Such a mandate could force companies to spend more than \$100,000 to obtain all the necessary permits and legal rights, BP America Production Co. claimed in court filings.

"Produced water is a byproduct - let's say that again - a byproduct of energy development," BP spokesman Dan Larson said.

### **Farmers keeping close tabs**

One group closely following the state health department's march toward water-quality rules is the Raton Basin's farmers and ranchers.

Many landowners in the basin have brokered agreements with energy companies to receive the water and are now using it for their livestock.

The farm club's Verquer said many ranchers wouldn't have survived the 2002 drought had it not been for coal-bed methane water.

"Without Pioneer legally putting water into these streams, they would have no water source at all," said Verquer, who ranches near Hoehne.

Pioneer officials say there are more landowners who want the water than they have water to give.

The Valentines are not among them.

While they've lost more than 80 tons of hay, the brothers say they don't regret their decision to stop irrigating.

They point to the experiences of Montana and Wyoming landowners who have suffered damage from salty coal-bed methane water.

"The cost of repairing the land is too high," Valentine said. "There's no guarantee the gas companies would respond. They haven't yet. So we're at risk if we don't put it on, and we're at risk if we do put it on."

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Colorado rancher, Dan Valentine, 59, stands with his cattle dog, Taz, in an alfalfa field Sat., April 21, 2007. Water used to irrigate the field has been polluted by the dumping of waste water created by the extraction process of methane gas from abandoned coal mines in the area. ( | Nathan W. Armes)