



MARK GRAVES/STAFF

Rolling irrigation pipe stands ready in a Dufur Valley field, farm country along Fifteenmile Creek south of The Dalles. In Oregon, the amount of water landowners are allowed to extract statewide totals nearly 1 trillion gallons annually – enough to fill 150 million tanker trucks. An analysis by The Oregonian/OregonLive has found farmers in a quarter of eastern Oregon, the driest part of the state, are allowed to pump more underground water each year than rains deposit.

DRAINING OREGON

By KELLY HOUSE and MARK GRAVES

The Oregonian/OregonLive



August 26, 2016

Water giveaway threatens economic chaos and hurts wildlife

By KELLY HOUSE and MARK GRAVES

The Oregonian/OregonLive

Oregon is helping farmers drain the state's underground reservoirs to grow cash crops in the desert, throwing sensitive ecosystems out of balance and fueling an agricultural boom that cannot be sustained, The Oregonian/OregonLive has found.

Managers with the Oregon Water Resources Department have handed out rights to pump water while pleading ignorance about how much was actually available. They have approved new pumping for irrigation even as their own scientists warned it could hurt the water table, interviews and state records show.

The amount of water Oregon farmers can legally extract now totals nearly 1 trillion gallons a year – enough to fill 150 million tanker trucks.

More than 5,000 farms in Oregon's \$5.4 billion agricultural industry rely on well water to survive. Nearly a million Oregonians need wells for water they drink.

The unending churn of water comes with consequences.

Overpumping Oregon's underground

reserves, known as aquifers, can dry up household wells and saddle farmers with huge costs to pump from ever-greater depths. It also jeopardizes 652 species of sensitive plants and animals. Victims include federally protected salmon and steelhead, whose recovery has failed to materialize despite a 25-year effort that's cost taxpayers billions.

The Oregonian/OregonLive reviewed hundreds of documents, interviewed dozens of ranchers, farmers and water experts, and analyzed three databases covering thousands of water rights and wells.

Among the findings:

- Farmers in a quarter of eastern Oregon, the driest part of the state, are allowed to pump more underground water each year than rains and snows deposit. It's one rough indicator of the mismatch between supply and demand. The shortfall was 49 billion gallons a year in the Willow Creek Basin of Morrow County. In southeastern Oregon's Harney Valley, it was 11 billion gallons.

- It's virtually impossible for the state to



BETH NAKAMURA/STAFF

“Every time I get a wild idea, I just go out and look at that pump,” said Bill Doherty, a Morrow County farmer whose well had to be shut off. “But you can’t live with that bitterness. You just go on.” When the state moved in to shut off wells near Butter Creek and stem groundwater pumping that had lowered the groundwater table dozens of feet, Bill Doherty and his neighbors fought back. The farmers sued the state three times over its attempt to curb their use of groundwater to irrigate crops, and won twice.

enforce its pumping limits. On all but a fraction of Oregon’s roughly 400,000 wells, owners have no obligation to disclose their actual water consumption. They are on an honor system not to exceed their allowance.

- Lawmakers routinely budget no money at all for studies to expand Oregon’s spotty knowledge of groundwater supplies. At current funding levels, the work won’t finish until 2096.

- Other parts of the country set a higher bar than Oregon for granting pumping rights. Washington state, for example, won’t allow a new well to be tapped if it could cause any harm to a stream that’s already hurting for

water. Oregon, in contrast, will deny permits only in cases where the harm would be considered “substantial.”

Oregon water resources officials defend their decisions, saying all western states face challenges managing water. The regulators note that federal geologists completed the only statewide study of Oregon aquifers decades ago. They say it’s hard to accurately keep tabs on the underground supply without more money for staffing and research.

“We’re obligated to evaluate the applications, we’re obligated to make a decision



timely, and then we have to defend that decision as well,” said Doug Woodcock, deputy director of the Oregon Water Resources Department. “And I think it would be difficult to close down all permit issuance in the state of Oregon until we had all of the information available for everywhere.”

Giving away water with abandon has failed Oregonians repeatedly. In river basin after river basin, officials over the decades took no action until aquifers had dwindled measurably. Regulators put on the brakes and farmers, many of whom had bet on water rights for their livelihoods, lost out.

In the Umatilla Basin during the last 1980s and early 1990s, dozens of farmers lost access to their promised water under state orders. Farm values tanked.

“With one signature, how would you like to have \$400,000 wiped off your net worth?” said Bill Doherty, a Morrow County farmer who sued the state over restrictions that took half his water supply and left him with \$250,000 in debt on an unused well.

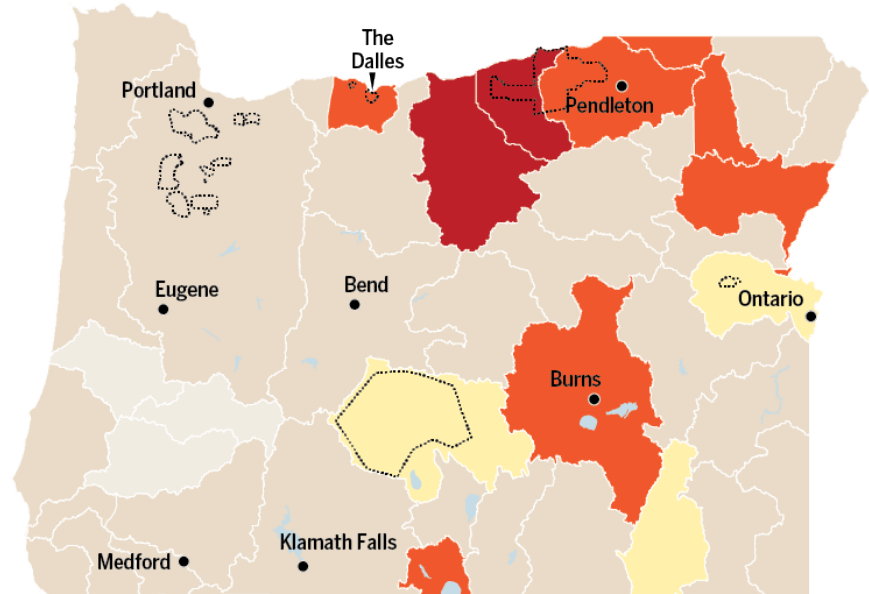
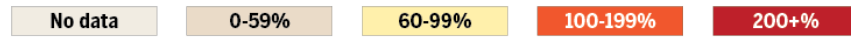
Larry Campbell and his family could see the signs of overpumping years before the state stepped in.

Campbell’s father was a dryland wheat farmer in the Hermiston area all his life. But Campbell’s neighbors in the 1970s started turning to irrigated crops that can be several times more profitable, and he joined in. Two power-

Irrigation rights vs. capacity

In some of Oregon basins, irrigators are allowed to use a greater percentage of the groundwater that winter rain and snow are estimated to replenish, according to an Oregonian/OregonLive analysis.

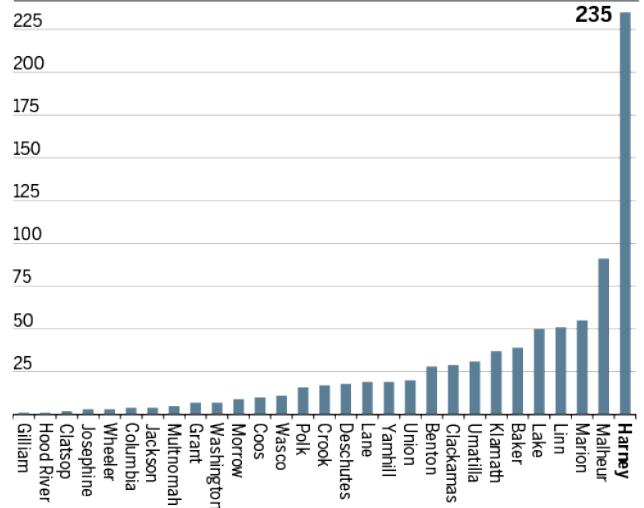
..... Areas labeled “groundwater restricted” by Oregon Water Resources Department



Source: The Oregonian/OregonLive analysis, Oregon Water Resources Department

MARK FRIESEN/STAFF

New Irrigation wells by county since 2010



Source: Oregon Water Resources Department

MARK GRAVES/STAFF

ful new wells soaked 2,000 acres of beans, barley, alfalfa and safflower on the Campbell farm.

It wasn’t long before their wells lost steam. Rather than chasing the water deeper, Camp-



bell, now 77, and his brothers chose to “get outta the fight.” They sold the farm.

The state’s pumping restrictions in the Umatilla were supposed to be evaluated every five years. But regulators rarely have bothered. Oregon’s water agency can offer proof of doing such an evaluation only once in the past two decades. And the water table continues to fall, records show.

“Maybe at some point, all the wells will dry up, and everybody loses and goes back to dryland,” Campbell said. “It’s still good dirt.”

“A pro-development approach”

The Oregonian/OregonLive analysis used a basic measure of the mismatch between supply and demand, comparing permitted use with annual replenishment.

The Oregon Water Resources Department labeled it “an overly simplistic and incomplete view.” Yet the same state agency, with some refinements, relied on similar calculations to justify halting new permits in the Harney Valley last year.

The new findings echo what environmentalists have long warned: that Oregon is giving away water at an unsustainable rate.

“We’re basically writing checks we know we don’t have money in our account to cover,” said Joe Whitworth, president of The Freshwater Trust, a Portland-based conservation group. “Eventually, they’re going to bounce.”

Consider how regulators evaluate applications to pump. A state reviewer fills out a form asking whether water is available to support a prospective well. Forms marked “cannot be determined” routinely get the go-ahead, a review of hundreds of permit applications shows.

“It’s certainly a pro-development approach,” said Ivan Gall, who oversaw the Oregon Water Resources Department’s groundwater program until moving to a different job in the agency this spring.

The water resources agency has hesitated to say no to irrigators in the wake of threats from lawmakers and pressure from industry, according to agency critics and former employees. Conservationists say that rather than being a watchdog, the department is a revolving door with the water users it regulates.

Some irrigators are so confident their permits will be approved, they sink wells first and file the paperwork later. Andy Root, a Harney County rancher who began pumping without state approval, said it has long been common practice in the area. He’s since applied to obtain a water permit years after he began pumping.

Yet farmers and ranchers pay a price for the state’s failure to make hard choices. Oregon’s water agency has clamped down on groundwater use in seven basins since the 1950s, changing course after empowering well owners to begin draining down an aquifer.

The newest trouble spot is in Harney County, site of this year’s armed standoff at the Malheur National Wildlife Refuge. Records show state officials feared years ago that irrigation wells in the Harney Valley might be draining Malheur Lake, a vital stopover for threatened migratory birds. Yet the state kept issuing permits, more than 100 in the past seven years. Now, state officials believe they gave away too much. There’s talk of the state shutting down ranchers’ newly dug wells, a move that would have serious economic ramifications.

Oregon’s failures aren’t unique. Water tables are sinking across the West, from Washington to Arizona. A study last year found humans have overexploited many of the world’s largest aquifers.

Agriculture is the biggest water guzzler by far. In Oregon, it accounts for more than 80 percent of all use.

Our enormous demand will only grow. Global trade in Oregon beef, cherries, cheese and other goods is driving farm development



MARK GRAVES/STAFF

State scientists years ago documented their belief that a well-pumping boom in the Harney Valley could be affecting Malheur Lake, a vital stopover for migratory birds. But their supervisors permitted even more pumping. Now, regulators with the Oregon Water Resources Department have clamped down on well development in the valley while they study its impacts on the water table. They plan to include the lake in a five-year analysis of the valley's groundwater system.

across the high desert. At the same time, climate change is forecast to bring more and more droughts like the bone-dry summer of 2015, drawing streams down to a trickle and curtailing flows of rainwater to deep underground aquifers.

If Oregon is going to solve its problem with overpumping, time is running out.

Permanent consequences

To grasp the damage that overpumping can do, it's important to understand what makes

the underground water supply essential.

Like subterranean sponges, aquifers are stores of water that percolate unseen beneath our feet, filling the spaces between sand, gravel and rocks. Rainfall that doesn't drain into rivers, evaporate or enter plant roots ends up filtering into the soil, where it inches toward an eventual discharge point.

The water reemerges as springs that sustain lush wetlands in the desert and keep rivers flowing after the summer snowmelt has tumbled out to sea. Fish, wildlife and plants thrive in the cool discharge. Taking water from the



subsurface can rob these places and the animals that live there.

“There’s really no such thing as zero-impact groundwater pumping,” said Marshall Gannett, a groundwater scientist with the U.S. Geological Survey.

Because aquifers flow into streams, intensive well drilling can sap water from owners of existing wells, while also depriving farmers who need surface water for irrigation.

A falling water table caused springs underneath the Lost River, in the town of Bonanza, to flow backward. The tiny city of Merrill was forced to truck in water when the aquifer dropped below municipal well pumps in 2010. Intensive groundwater irrigation was to blame in both cases.

In some Oregon streams, springs are such a vital component to surface water that nearly every riffle has its origins underground. Such is the case in the Metolius River, which surges out of the forest floor near the central Oregon town of Sisters at a near-constant 50,000 gallons per minute.

Cool water seeping in from underground can be a lifesaver for salmon when summertime river temperatures climb to lethal levels. But overpumping across Oregon has worsened the odds for fish.

Thousands of spring-fed wetlands that dot the state are at risk, as well. These sensitive environments harbor rare plants and insects, including carnivorous cobra lilies and certain caddisflies found only in Oregon. Allison Aldous, a scientist with The Nature Conservancy, calls these wetlands “amazing warehouses of biodiversity.”

In some Oregon basins, Aldous said, nearly every spring-fed oasis has been tapped to water livestock, often in a way that damages or destroys the wetland.

“There are best management practices, but based on what we see, those aren’t always followed,” Aldous said.

As cattle sip from the springs, farmers tap ever deeper into aquifers that supply them.

Profit in the fields

The lure of profit generates the thirst. Without water pumps, the vast deserts of eastern Oregon could grow little other than dryland wheat. Irrigated crops are far more lucrative.

State regulators more than a century ago began issuing rights to directly siphon Oregon’s rivers without data to show how much the rivers could give. Today, irrigators routinely drain streams before all farmers with water rights can quench their fields. Many have turned to well water as a fresh supply.

Today’s irrigation wells bear little resemblance to ancient versions, those stone-lined holes in the ground with buckets to extract water. New models are products of modern engineering, capable of pumping gallons per second from fathoms below and spreading it across acres of tilled soil.

In a typical farm setup, electric motors force the water into massive wheeled sprinklers known as center pivots. Each pivot’s long arm protrudes from an anchor at the center of a field, orbiting around it in circles up to a half-mile wide. When viewed from an airplane, the resulting green fields create the appearance of a landscape stamped with bingo markers.

Landowners gain the right to pump by applying for a permit. It sets an amount that the holder is entitled to pump on a specific piece of land. Once owners start pumping, they can obtain indefinite rights to the water. Buy the land and you buy the water rights.

Regulators have authorized more than 17,000 irrigation wells across Oregon, about 1,400 of them since 2000. Every drought brings a bump in drilling, despite construction costs that can rise into the hundreds of thousands of dollars. The water is used to grow sweet cherries sold at Portland markets, potatoes fried in fast food restaurants across America and alfalfa that feeds dairy cows around the Pacific Rim.



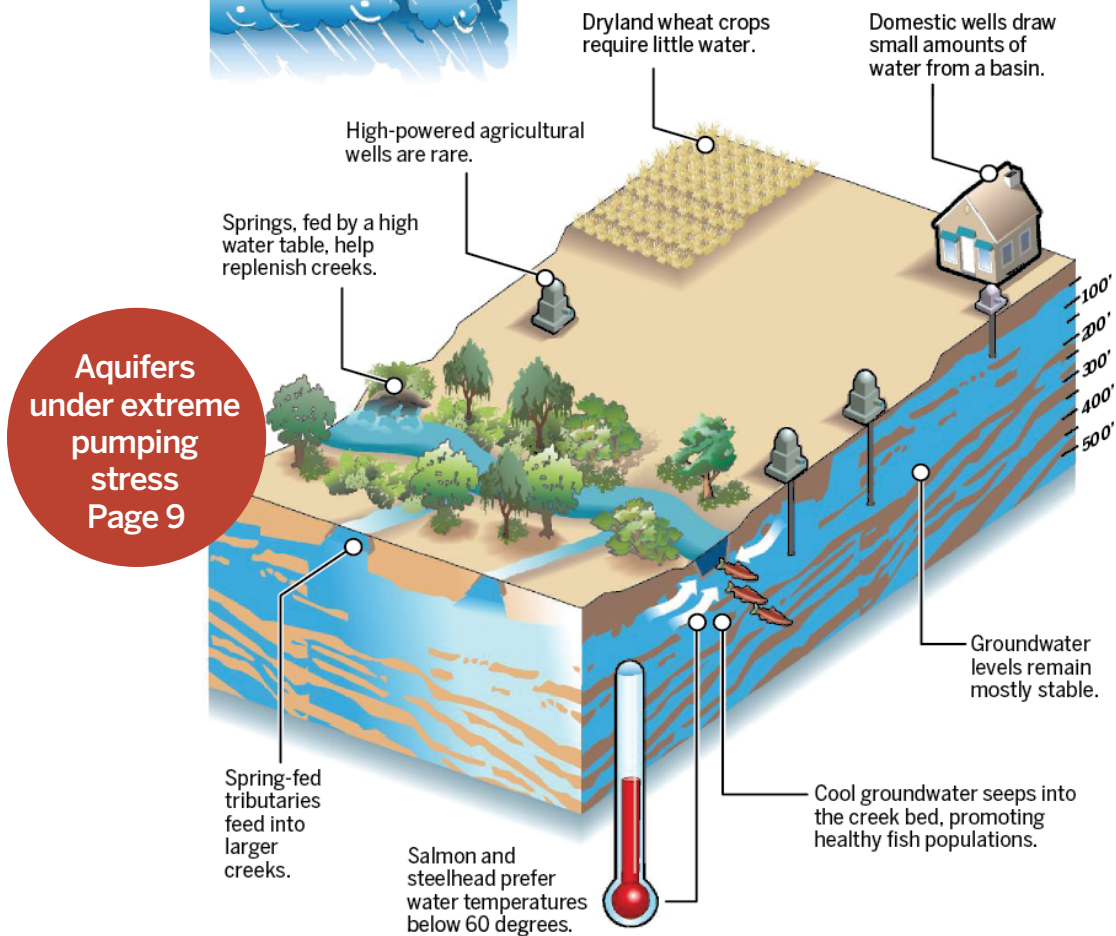
The Perils of Pumping

In one-quarter of eastern Oregon, The Oregonian/OregonLive analysis found, regulators have granted well owners the right to pump more groundwater than aquifers can reliably supply.

Aquifers under moderate pumping stress



Average precipitation in parts of eastern Oregon is fewer than 10 inches per year. Where wells are scarce, that's enough to keep underground aquifers stable from year to year.



Aquifers under extreme pumping stress
Page 9

Sources: U.S. Geological Survey, Oregon Department of Environmental Quality, Oregon Water Resources Department

Obtaining a permit to pump has always been simple. Check off some boxes, pay fees starting at about \$2,000, and you'll generally get a permit by mail within a year. In fact, the Water Resources Department counts among its key performance goals "timely service to customers." The department strives for 80 percent of water users reporting they received "good" or "excellent" service.

After your permit is issued, the water itself

costs you nothing but the price of electricity to pull it to the surface.

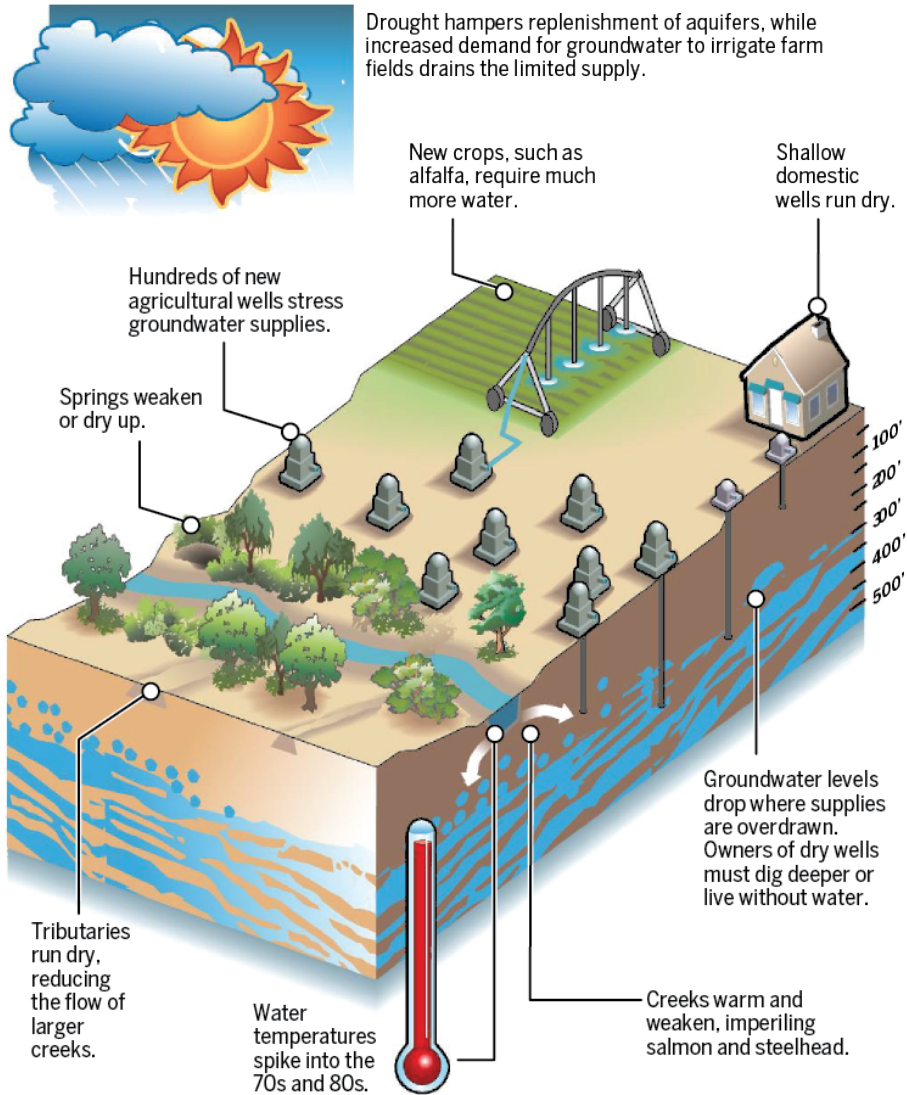
However, the state's understanding of the underground resource hasn't kept pace with the clamor to tap it.

Information void

Oregon lawmakers voiced noble intentions in 1955 when they created the state's first legal



Aquifers under extreme pumping stress



GRAPHIC BY SCOTT BROWN/CONTRIBUTING ARTIST

protections for the underground water supply, aiming to preserve it for posterity.

Legislation pushed by Rep. Charles A. Tom, R-Rufus, declared groundwater a public resource to be allocated on a first come, first served basis. Legislators directed state water managers to move “as rapidly as possible” to measure aquifers beneath all of the state’s 18 drainage basins.

Six decades later, the state has completed

full studies on three.

Not only have such studies been slow in coming, they happened in reaction to crisis. Landowners asked for water rights. Regulators approved them. Only after overuse created conflicts did the state compile data to confirm wells were draining aquifers or robbing rivers.

For vast stretches of Oregon that scientists have not yet studied, the next best thing is a cursory federal survey nearly five decades old.



The 1968 report by the U.S. Geological Survey has not always held up against more thorough studies of individual basins, sometimes drastically under- or overestimating the water supply.

State officials referenced the 1968 estimates last year in explaining why they halted new permits across a large swath of Harney County.

“We used it because there really wasn’t anything else available,” said Gall, the state groundwater manager at the time.

The Oregonian/OregonLive found that the Harney Valley was one of nine key agricultural areas across eastern Oregon where ranchers are allowed to pump more than is available underground.

Permitted withdrawals in the Harney Basin total more than 96 billion gallons a year. The 1968 study shows precipitation adds back only 85 billion gallons a year.

“It’s not like the Harney aquifer is going to be the last one,” said Whitworth, of the Freshwater Trust. “We’re overdrafting everywhere and the state has no ability to track it.”

Other eastern Oregon agricultural communities have begun raising concerns.

In a December request for state money, a John Day Basin group noted the region’s wells are losing water at a “noticeable and alarming” rate. Concerns have also arisen in the Powder Basin, where Baker County Commissioner Mark Bennett sought answers from the state after hearing about Harney’s woes.

Bennett is the administrator for Unity, a city with three wells to supply water for its 71 residents. A growing number of neighbors are looking to dig wells and start cultivating hay.

“The city doesn’t have any money, so how would they pay to deepen their wells if these other folks drilled and sucked all the water down?” Bennett said.

He said state officials told him they would add the Powder Basin to the list of places in need of new groundwater research.

Studies to establish a basin’s profile cost \$3 million to \$5 million and can take about five years. They reveal the aquifer’s shape and size, its capacity and its “recharge rate,” or how much water seeps in each year. They also tell regulators where the water comes from and where it’s headed.

Lacking more precise estimates of how much pumping aquifers can tolerate, regulators track water levels in about 1,000 government and privately owned wells and wait for signs the water table is dropping.

The Oregonian/OregonLive examined 130 wells east of the Cascades for which long-term data exists. Three-fourths showed declines in recent decades, ranging from a few inches to hundreds of feet.

Regulators caution that the result is hard to interpret because observation wells are most plentiful in places with known groundwater problems.

In parts of eastern Oregon, a dozen observation wells might be the only source of information in an area the size of Connecticut. A state push to build more of these wells has inched along, with two dozen constructed since 2012.

“One of the challenges is, nobody really measures water in Oregon,” said Todd Jarvis, director of the Institute for Water and Watersheds at Oregon State University.

Although the state knows how much irrigators are entitled to pump, not everyone who owns a water right uses it fully. Conversely, some may be using much more than they are allowed.

Regulators admit they have no way to know either way, because only in the 1990s did Oregon start requiring owners of large new irrigation wells to report how much they pump.

Five out of six wells across the state are exempt.



MARK GRAVES/STAFF

Harney County landowners are legally entitled to 11 billion gallons more groundwater each year than rains and snows can replace.

Pressure to pump

To some degree, regulators' hands are tied.

Lawmakers control the Water Resources Department budget, and dollars to pay for groundwater research and data have come in at a trickle.

Natural resource concerns frequently get less attention than education, health care and social services – issues more visible, more immediate, and viewed as more important to Oregon voters.

“Until there’s a crisis, people will say there’s no reason to spend the money,” said Rep. Cliff Bentz, R-Ontario, who last year unsuccessfully lobbied for a statewide examination of aquifers

and a financing program to help homeowners deepen wells that had gone dry. The bill never made it out of committee.

Water resources agency officials in the past two years have received \$550,000 to do a job that is expected to cost \$45 million to \$75 million.

John DeVoe, executive director of the conservation group WaterWatch of Oregon, calls it deliberate ignorance on the part of state lawmakers. He said they worry if they fund the science, they’ll be forced to acknowledge the limits of Oregon’s water.

The system is “designed, quite intentionally, to be unable to make sustainable ground-



water management decisions,” DeVoe said.

Enormous public and political pressure to keep the water flowing drives the state’s failure to regulate groundwater more tightly.

When aquifers start drying up, irrigators file lawsuits. Their elected representatives have held budgets hostage and pushed bills to thwart potential crackdowns on water use. Landowners have threatened violence against water managers who stepped in to address declines.

Pressure to keep wells pumping also comes from inside the department.

Agency leaders are sometimes slow to stop doling out well permits, even when their data shows declining water levels and impacts on lakes and streams.

They’ve opted against further restrictions for the Umatilla Basin, despite acknowledging measures they imposed in the 1980s and 1990s have failed to prevent further drops in the water table.

And in the Klamath Basin, regulators continue granting pumping permits to help irrigators cope with shortages of surface water, despite conceding that the water table is already stressed beyond its sustainable limit.

“They have the authority to stop it, and they haven’t exercised that authority,” said Jackie Dingfelder, a former state representative from Portland who lobbied for more restraints on groundwater use. “It is a classic case of the iron triangle, where they’re beholden to their stakeholders and it’s difficult for them to say no.”

People who advocate for restrictions on

water use say they regularly face off against industry lawyers and consultants who once worked for the department. The list of former employees who have since become consultants or attorneys for water users includes a former director, a policy analyst, a senior policy analyst and a mid-level manager.

“Their attitude for a long time has been to view water users as customers, worry about their needs, and say ‘yes’ whenever possible,” said DeVoe, leader of WaterWatch, which has brought numerous lawsuits against the state over water management.

In Harney County, land permitted for groundwater use skyrocketed from 60,000 acres in 2005 to 95,000 acres last year. The state steadily approved new pumping despite warnings from agency scientists nearly 10 years ago that the valley’s water table could be dropping.

Only after multiple complaints from WaterWatch did the state stop giving out more water permits last year. Agency leaders now concede they may have given out access to more water than the system can sustain.

While the state conducts a five-year study to test that hunch, uncertainty looms over ranchers and residents who use well water to drink, bathe and nourish fields of alfalfa. They wonder whether the state’s study will bring bad news or good. They’re not sure they can trust the results.

They worry their wells will go dry while they wait.

— Kelly House and Mark Graves



August 26, 2016

8 takeaways from “Draining Oregon”

Something seemed amiss in Harney County last summer, long before it became the scene of January’s armed standoff at the Malheur National Wildlife Refuge.

After years of liberally granting access to underground water across the high desert of southeastern Oregon, the state abruptly told irrigators it would accept no new applications to pump wells. Regulators launched a 5-year study, saying they feared newly dug wells were sucking up unsustainable quantities of water. Cattle ranching and alfalfa, once bright spots in the struggling rural economy, were thrown into limbo.

How could Oregon so freely approve pumping permits for so long, then suddenly announce concerns so serious that they required immediate action?

The Oregonian/OregonLive found that Harney County fits a disturbing pattern. State regulators frequently lack the basic information they need to make sound decisions about the water that flows under Oregon’s surface. Faced with knowledge gaps, they regularly dole out water anyway. The result, often, is groundwater declines that threaten people and the environment.

Here are some key takeaways from this series:

1 Underground water in Oregon is a big deal. More than 5,000 farms in Oregon’s \$5.4 billion agricultural industry rely on well water to survive. Nearly a million Oregonians need wells for water they drink.

2 Oregon regulators are granting irrigators access to water they don’t know we have. Oregon regulators have given away rights to pump groundwater that would fill 150 million tanker trucks annually. Yet in most of the state, they don’t know with certainty how much water is down there. The best guess in many places is a cursory federal study from five decades ago.

3 Regulators also have no way to know how much we’re using. Most well owners aren’t required to meter and report their water use, putting irrigators on an honor system not to pump more water than allowed.

4 Even when regulators have reason to suspect there isn’t enough water to sustain new well development, they sometimes grant permits anyway. Our review of applications to pump groundwater in two Oregon counties found that regulators routinely approved irrigators’ requests for water, despite



documented concerns from agency staff. In Harney County, state scientists expressed worries more than three dozen times before protests from the Portland-based group Water-Watch of Oregon spurred last summer's moratorium.

5 Oregon's approach to groundwater management has diminished groundwater supplies. Across 26 percent of eastern Oregon, an analysis by The Oregonian/OregonLive found, irrigators are allowed to pump more water than Mother Nature can replace each year.

6 The overpumping of Oregon's groundwater harms people, plants and animals alike. Virtually every drop of underground water is destined, eventually, to resurface somewhere as a natural spring. Pumping can dry up desert wetlands, killing the rare plants that thrive there, and it can deprive fish of the coldwater hiding spots they depend on during hot summer days. For humans, overpumping means well owners siphon water from other users. The resulting clampdowns on irrigation create economic upheaval.

7 Why aren't we doing better? Politics, naturally. Regulators struggle to rein in groundwater use in part because they face enormous public and political pressure to keep the water flowing. Time after time, the Oregon Water Resources Department's attempts to limit groundwater use have prompted lawsuits, open physical threats, or legislative maneuvers designed to thwart regulation. State politicians have repeatedly rejected new money sources for the water resources agency. At the current rate of funding, the state won't complete full studies of all Oregon groundwater basins for at least 80 years.

8 Solutions are out there; we just haven't pursued them. Regulators have contemplated ending the unofficial policy of approving new wells without data to determine their impact, but they haven't done it. Lawmakers could find the \$75 million and additional staffing needed to complete the research regulators say they need to make decisions about new pumping. There are also ways to encourage frugality. Australia created a market in water rights, and some irrigation districts charge a per-gallon fee on water.



Make a difference: Contact your leaders

Have a reaction to “Draining Oregon” that you want to share with someone who can address the problem? Here are some of the key officials you can contact:



Gov. Kate Brown

Call: 503-378-4582

Email form: bit.ly/gov-brown

Mail: 900 Court St. N.E., Suite 160, Salem OR 97301

Richard Whitman

Gov. Brown's natural resources policy director

Call: 503-378-5145

Email: richard.m.whitman@oregon.gov

Mail: 900 Court St. N.E., Suite 160, Salem OR 97301



Rep. Brian Clem, D-Salem

*Chair, House Committee on Rural Communities,
Land Use and Water*

Call: 503-986-1421

Email: rep.brianclem@state.or.us

Mail: 900 Court St. N.E., H-284, Salem OR 97301

Sen. Chris Edwards, D-Eugene

*Chair, Senate Committee On Environment
and Natural Resources*

Call: 503-986-1707

Email: sen.chrisedwards@state.or.us

Mail: 900 Court St. NE, S-411, Salem, OR 97301



Tom Byler

Director of Oregon Water Resources Department

Call: 503-986-0900

Email: director@wrdd.state.or.us

Mail: 725 Summer St. N.E., Suite A, Salem OR 97301



August 26, 2016

Harney County becomes the latest casualty of lax state oversight of water and irrigation

By KELLY HOUSE

The Oregonian/OregonLive

BURNS —

Rancher Harold Knieriem thought his days of worrying about water would end with retirement. No more angst when the skies dry up or a mild winter dollops too little snow on the mountains, leaving his cattle to dine on withered grass.

Then the irrigation pivots started springing up around his small patch of land, drawing water from deep underground and painting bright green circles of alfalfa on the desert floor. The 76-year-old began to fret.

Would all those high-powered pumps draw down his household well? He and his wife, Alice, need the water to drink and to bathe. It would cost them thousands of dollars to drill deeper.

“I have no idea how much time it has left,” he says of the well behind the couple’s modest ranch-style home. “Then all the money you thought you’d retire and do stuff with is gone.”

As drought and economic opportunity prompt growers to look underground for new water to sustain their crops, it’s exposing a fatal flaw in Oregon’s water management. Across



MARK GRAVES/STAFF

Harold Knieriem, 76, worries that Harney Valley’s groundwater irrigation boom will suck the earth dry, leaving nothing for the county’s youth but dry wells and parched fields.

much of the state, the agency charged with rationing Oregon’s water supply lacks solid numbers on the natural reservoirs beneath Earth’s surface.

Knieriem suspects there isn’t enough water



MARK GRAVES/STAFF

The ongoing drought in the West has raised prices enough to make it worthwhile for ranchers to dig a well and grow some alfalfa. They can feed the hay to their own cattle or sell it to others.

down there to sustain what's happening in southeastern Oregon's Harney Valley.

State records show regulators shared Knieriem's suspicions for nine years, but continued allowing irrigators to dig new wells. Now state officials admit the evidence suggests they overshot. They abruptly stopped processing new applications for water last year, setting off alarm bells across the basin.

Ivan Gall, field services administrator for the Oregon Water Resources Department, said agency officials lacked the data to take action sooner and are working hard to catch up.

"We're doing the best that we can with the resources we have," Gall said.

Oregon regulators habitually appropri-

ate groundwater without first making sure the added stress won't drain an aquifer. Even when they have reason to suspect harm will come, they sometimes give out permits anyway. The result is groundwater shortages that, with better science or greater caution, could have been prevented.

The Harney Valley is the latest casualty.

Trouble in the valley

Since the homestead days of the mid-1800s, this high desert valley has been, by necessity, about beef. Harney County has 14 cattle for every human.

"Cattle and hay in this county are life," said



Shane Otley, a local rancher who sits on a committee responding to the water declines. “This is the only resource we have.”

“You take that away, you’re undoing us,” said Harney County Judge Steve Grasty, the county’s elected administrator. “Undoing the economics, undoing the people here.”

Irrigated agriculture remained rare here, even as river siphons enabled farmers to grow watermelons on the Columbia River and onions on the Idaho border. Across much of the Harney Valley, the average year’s rainfall is less than 8 inches. Flowing water is limited to two rivers that by midsummer are little more than glorified creeks. All of it drains to Malheur Lake, a massive wetland oasis that forms the cornerstone of Malheur National Wildlife Refuge.

Cattle in the region grazed mostly on rangeland grasses, which grow naturally in the desert.

But as the West’s worst drought in recent history sent hay and beef prices soaring from \$2.53 per pound of ground beef in 2011 to \$4.24 in 2015, a new economic opportunity opened up for landowners in Harney County.

Alfalfa was in huge demand.

Word got out that money could be made by digging a well, plotting a field and growing alfalfa. You could feed the hay to your own cattle, or sell it in other parts of the world that raise livestock.

Water beneath the surface was abundant and free. Obtaining permission to dig was so easy, many landowners started drilling before seeking the state’s consent. State regulators didn’t seem to mind, said Andy Root, an irrigator who acknowledged drilling a well without state authorization and now risks losing his water, given the state’s stance on new permits.

“The entire valley has done it for many, many years,” Root said.

In a matter of years, ranchers have swapped tens of thousands of acres of rangeland for irrigated forage crops. Newcomers



MARK GRAVES/STAFF

Ivan Gall, with the Oregon Water Resources Department, says his agency is working hard to catch up on a dearth of data that makes groundwater management difficult.

arrived: Washington dairy operators, Lake County hay growers and ranch corporations headquartered in California and Idaho. One lists a Cheyenne, Wyoming, street address described in numerous media reports as a hub for shell companies that nameless owners use to stash cash and avoid taxes.

Land permitted for groundwater irrigation in Harney County rocketed from about 60,000 acres in 2005 to more than 95,000 last year. In the past 15 years, landowners have added more pumping capacity than the entire quarter-century preceding, state records show.

But at the very moment that ranchers were pumping more water from the deep soil than ever before, less was falling from the sky to percolate back down. Snowpack in the basin remained thin and melted early, prompting drought conditions for the past four summers.

Someone needed to decide whether there was enough water for all the new irrigators.

Repeated warnings

Michael Zwart, a veteran hydrogeologist with the Oregon Water Resources Department, voiced alarm at what he saw happening in the Harney Valley.



A glimpse inside well application G-17249

In November 2009, Michael Zwart, a veteran hydrogeologist with the Oregon Water Resources Department, voices concern about a proposal by Tim Clemens to sink a well to irrigate nearly 1,000 acres.

Public interest review [p. 1](#)

PUBLIC INTEREST REVIEW FOR GROUND WATER APPLICATIONS

Water availability "cannot be determined" p. 3

B1. Based upon available data, I have determined that ground water* for the proposed use:

a. is over appropriated, is not over appropriated, or cannot be determined to be over appropriated during any period of the proposed use. * This finding is limited to the ground water portion of the over-appropriation determination as prescribed in OAR 690-310-130;

Asked whether groundwater at this location is or is not over-appropriated, the reviewer chooses "cannot be determined."

Concerns from nearby well owners p. 3

B3. Ground water availability remarks: Region Manager Ivan Gall recommends use of Condition 7N in this basin. These proposed wells are about seven miles north of an area where local well owners have expressed some concern about well interference and ground-water availability. Currently, a water-level recorder has been monitoring water levels at one well and several other wells have been selected for quarterly monitoring. Insufficient data have yet been collected there to conclude that the ground-water resource is over appropriated or that additional appropriations would cause substantial interference with existing users of ground water. However, the short-term record suggests that ground-water levels are declining slightly in that area of the basin. This proposal is rather distant from that area, but the requested rate here, combined with other recent filings in the Harney Basin, raises concern regarding the potential for the ground water resource to be over appropriated when the proposed wells are constructed and water is appropriated.

"These proposed wells are about seven miles north of an area where local well owners have expressed some concern about well interference and ground-water availability." The proposed new well "combined with other recent filings in the Harney Basin, raises concern regarding the potential for the ground water resource to be over appropriated."

The well is approved by the director of the Water Resources Department in March 2010.

Permit issued p. 1

THIS PERMIT IS HEREBY ISSUED TO

Amount of water

PURPOSE OR USE: IRRIGATION OF 970.3 ACRES

MAXIMUM RATE: 12.13 CUBIC FEET PER SECOND (CFS), NOT TO EXCEED 1.78 CFS EACH FROM WELL 1, WELL 2, WELL 3, WELL 4, WELL 5, WELL 6, WELL 7 AND WELL 8

Signed for the director p. 6

Issued *MARCH 29 2010*

E. Timothy Wall

for Phillip C. Ward, Director
Water Resources Department

Take a look at Zwart's [comments on application G-17777](#), another well approved over his concerns.



Nearly every application to draw groundwater in the region crossed his desk. Zwart's role was to document whether the new extraction would harm area streams or lower the water table.

Zwart raised concerns about pumping at least 33 times starting in 2007, records show.

In all but three cases, his superiors waved the well projects ahead anyway.

Most of the approvals came from Tim Wallin, the department's water rights program manager, on behalf of department directors Phil Ward and later Tom Byler.

Byler, the current director, declined to be interviewed for this story through a spokeswoman. Ward did not return a phone call. The agency, in a statement, said it approves permits based not simply on reports from reviewers like Zwart, but also on information the applicant and others may submit later in the process.

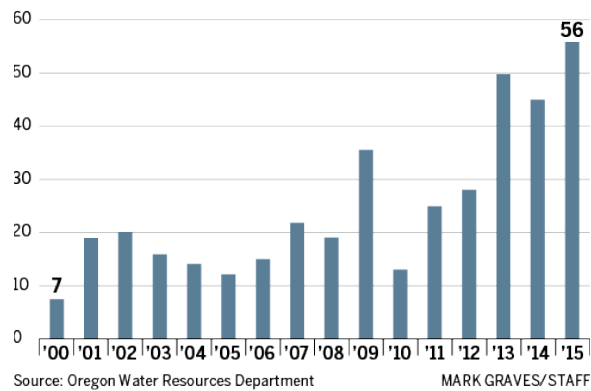
Zwart had been through water shortages before. He was a lead researcher on declines in groundwater in northeastern Oregon's Umatilla Basin a quarter-century earlier.

In August 2007, Zwart was reviewing an application to irrigate 350 acres outside the city of Burns when he noticed a nearby well had lost 20 feet of water in the past two decades. He noted the issue in his review and sent it up the chain of command. Wallin granted the permit.

Rather than turn away applicants, Gall, the department's regional manager for far eastern Oregon at the time, suggested around 2008 that the agency start attaching a notice to permits. The notice said that the agency reserved the right to curb water usage if wells showed continuous or dramatic drops. Regulators have imposed this type of condition on owners of more than 2,000 groundwater permits in Oregon, but they have used it against only two permit holders.

On Jan. 27, 2009, Zwart reviewed an application from a farmer who wanted to irrigate 125 acres of alfalfa east of Burns. He noted nearby

Irrigation wells drilled in Harney County



residents had voiced concern that neighboring wells might be siphoning water from one another. Wallin granted the permit.

Just four months later, Zwart expressed his personal reservations directly when evaluating a request to pump up to 78 million gallons a year.

"I am concerned," he wrote in the May 2009 public-interest review, "that additional development of ground water in the area will result in long-term water level declines and increased potential for interference between wells."

But Zwart had limited evidence to justify his stance because the state has not closely studied Harney County's groundwater. So he hedged, telling his bosses he didn't have enough information to deem the resource over-tapped.

Six months later, Zwart spoke up again. Someone had requested a permit to pump up to 948 million gallons a year to irrigate 1,000 acres. The rancher envisioned eight pivot sprinklers, which typically support circles of alfalfa up to a half-mile wide.

This time, Zwart wrote that well development near the property "raises concern regarding the potential for the groundwater to be over-appropriated when the proposed wells are



MARK GRAVES/STAFF

Rusty Inglis, president of the Harney Farm Bureau, has served as a key liaison between state water officials and farmers in the area, a county where regulators say they may have given irrigators permission to pump more groundwater than the area's aquifers can sustain.

constructed." Wallin issued the permit.

By November 2011, Zwart was highlighting a potentially more dire consequence: Area wells could be robbing water from Malheur Lake.

The important but imperiled waterway is a crucial stopover for migratory birds and a sacred site for the Burns Paiute Tribe. Protected under federal law, the lake encompasses 80,000 acres at times but shrinks to nothing in the worst drought years. Less water to feed the lake from below would further cloud its future.

As groundwater drilling continues, Zwart wrote, "It is likely that there will be some increasing impacts to the level of Malheur Lake."

In the ensuing years, Zwart and his colleagues continued to warn that the Harney Valley's water table was lowering.

Over time, Zwart's superiors stopped issuing permits in two isolated areas to the south and southeast of Burns. But the state continued processing permits to drill everywhere else, even as the Portland conservation group WaterWatch of Oregon formally challenged five permit applications starting in mid-2014.

The giveaway of Harney Valley's groundwater was "a water supply train wreck" in the making, WaterWatch attorney Lisa Brown said.

A year passed before department managers announced, in June 2015, that they might have granted too many permits. The public decla-



ration came nearly eight years after Zwart first raised concerns.

“The development got ahead of the data collection,” Gall, the state groundwater manager, said at the time.

Suddenly, the Harney Valley’s seemingly endless pipeline of new water permits was all but cut off. People who owned wells began to wonder if they’d be allowed to continue using them.

Uncertainty festers

The uncertainty that followed the state’s moratorium on new wells is another blow to a community already jarred by political and economic turmoil.

In the past two years alone, Harney County has weathered a massive wildfire that wiped out nearly 400,000 acres of rangeland, land use restrictions to protect a desert bird called the sage grouse, a prolonged drought and a 41-day armed occupation of the Malheur refuge that upended local life and pitted neighbors across an ideological chasm.

Ranching and alfalfa were helping to revive the local economy, which suffered after the collapse of the timber industry. Now, there are reports of household wells drying up. Farmers who had counted on being able to dig new wells are weighing their options.

“We’ve just been hit right and left,” said Harney County Farm Bureau President Rusty Inglis. Add all those factors up, “and pretty soon it’s tragic.”

Residents and irrigators alike told The Oregonian/OregonLive they’re frustrated that the state didn’t catch the problem sooner.

Senior department managers including Gall, Deputy Director Doug Woodcock, Senior Policy Coordinator Racquel Rancier and spokeswoman Diana Enright defended the agency’s actions.

Gall said circumstances in the Harney Val-

ley made it “easier to get to yes” on well permits, creating a perfect storm for things to go wrong. The valley’s demand for groundwater shot up so suddenly, Gall said, that state officials had little time to ponder the impacts.

State rules call for special scrutiny of wells that are within a mile of a stream, but Harney Valley streams are so sparse that few wells trigger that restriction. The rules allow curbs on drilling that will have a “substantial” impact on any river or lake, regardless of distance, but the main body of water threatened by drilling in the Harney Valley would be Malheur Lake. It is so large that no single well would have a substantial impact.

State rules allow regulators to consider the cumulative impact of many wells on a place like Malheur Lake. But Woodcock said the department typically opts not to.

Managers said that because the state has no estimate of water supplies beneath Harney Valley other than a 1968 federal study, they didn’t know how much pumping the valley could withstand. Because they have kept few observation wells to track water levels, water managers had little ability to watch out for declines.

Denying ranchers’ requests for water would be difficult without good data to back it up, Woodcock said.

If state managers took that step and further research proved them wrong, he said, “What about all those people that we have denied over the years because we were operating on an incomplete data set?”

But Woodcock’s agency also didn’t ask for more money to get the data that would answer questions that its scientists raised about Harney Valley groundwater. Gall said that’s because the department anticipated rejection. The economic recession had gutted state agency budgets, he said, and “there were just no resources available.”

After shutting down the valley to new pumping applications, the state launched a



study of its groundwater. It's scheduled to be finished in 2020.

If the new study finds current pumping is either lowering the water table or draining Malheur Lake, big problems could arise. The lake and surrounding wildlife refuge have long been a source of resentment for some ranchers who believe the federal government shouldn't own water rights or limit cattle grazing there. Ammon Bundy's recent armed standoff at the refuge headquarters emboldened many who share that view.

Harney Valley residents and ranchers can only hope that halting new wells was enough to solve the problem. If not, state regulators could start rolling back the amount of water that

existing irrigators are legally entitled to use.

Landowners owe millions on loans they took out for digging wells, laying pivots and buying farm equipment. Some would have to abandon their business plans. Their land values would drop. Ranches could go under.

The last thing this community needs, locals say, is another issue that pits the environment's needs against ranchers' livelihoods.

For now, Malheur refuge manager Chad Karges won't speculate on what happens if pumping is harming the lake.

"Depending who you talk to right now, some people speculate it's connected and others say it isn't," Karges said. "We're waiting on the study."



MARK GRAVES/STAFF

A sprinkler head sends water spraying onto a farm field in Harney County, where last year state regulators clamped down on issuing groundwater permits.



August 26, 2016

The state pours millions into Fifteenmile Creek but fails to help steelhead for lack of water

By KELLY HOUSE

The Oregonian/OregonLive

FIFTEENMILE CREEK —

Government agencies have spent more than \$2.8 million in taxpayer money on this tiny Columbia River tributary since 2004. Workers have planted shade willows on the banks, lined its rocky bottom with logpile hiding places, and fenced off cattle from the sensitive habitat.

There's just one element missing in the quest to restore Fifteenmile Creek's threatened steelhead.

Water.

Area irrigators own rights to siphon more water from Fifteenmile Creek than mountain snowmelt and high-elevation springs can provide, draining it to a string of puddles each summer.

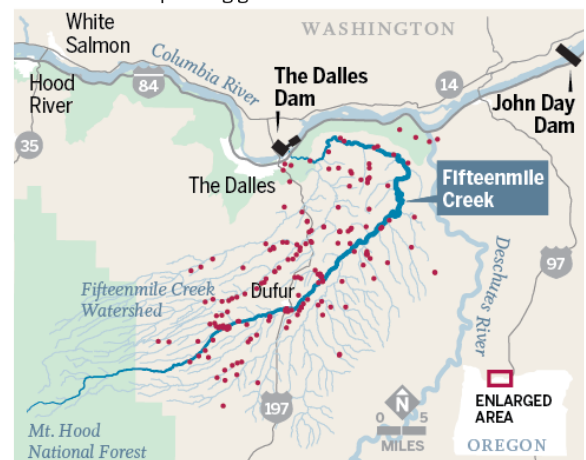
Scientists believe the water shortage has contorted the very life cycle of federally protected steelhead in Fifteenmile, forcing them into unnatural spawning patterns that routinely kill them.

Now, high-powered wells may be draining the basin further, from below.

"We don't have a good handle on it at this

Fifteenmile Creek Watershed

State scientists are studying the Fifteenmile Creek Watershed to see if irrigation wells are robbing water from the stream, which dries to a trickle in summer, blocking threatened steelhead from spawning grounds.



Source: Oregon Water Resources Department

MARK GRAVES/STAFF

time, but certainly there is that feeling that everything is connected," said Shilah Olson, who manages the local watershed council.

Regulators with the Oregon Water Resources Department granted landowners permission to pump the area's underground



APRIL 2016



AUGUST 2016

At its best, in early spring, Fifteenmile Creek roars down 54 miles from the Cascade Mountains before pouring into the Columbia River. But by summer, the creek's flow is drastically altered by loss of snowmelt and irrigation diversions that suck up much of the remaining water.

MARK GRAVES/STAFF

water without first closely studying its relationship with the creek. Then people's well water levels started dropping. The agency put the brakes on new groundwater permits in 2011.

But water resources officials say they need to do more research on whether Fifteenmile has too many wells, or if water levels in certain wells are declining because they were poorly

constructed. Until they find out more, they hesitate to limit existing groundwater rights.

"We take those actions cautiously," said Doug Woodcock, deputy director of the agency. "We want to make sure we got it right."

The problems in the Fifteenmile Watershed are part of a much broader pattern across the state, The Oregonian/OregonLive has found.



U.S. FISH AND WILDLIFE SERVICE

Endangered Hood Canal steelhead are seen at Washington state's Quilcene National Fish Hatchery. Biologists suspect that steelhead in Fifteenmile Creek might act like winter-spawning steelhead, but are actually summer steelhead forced to delay entry to their spawning grounds.

Oregon regulators have given away rights to so much underground water that irrigators in several basins are drawing down aquifers, threatening future economic disruption and posing dangers to plants and wildlife.

It could be years before state scientists can say whether wells are robbing the creek of water. Meanwhile, fish keep dying. Only 424 made it upstream last year in a system that should support an annual run of up to 2,638 spawning adults, according to data compiled by the local soil and water conservation district.

Across the rolling hills south of The Dalles, farmers who rely on groundwater are also watching with trepidation as the state studies the problem.

“This isn’t sustainable, what we’re doing now,” said Tim Dahle, who grows pears and cherries west of Dufur. “We have to improve what we’re doing or we’ll come to resemble California.”

A contorted life cycle

Fed by rain and snowmelt in cooler months, Fifteenmile Creek tumbles down 54 miles from the mountains east of Mount Hood before emptying into the Columbia River just upstream of The Dalles.

By summer, springs originating high in the Cascades are the main source of Fifteenmile’s dwindling flow. Irrigation diversions along the



way further sap the creek.

Scientists used to think steelhead spawning in Fifteenmile and its tributaries were the Columbia River's easternmost run of winter steelhead. It turns out that assumption is probably wrong, and the confusion had everything to do with the creek's disappearing water.

Steelhead spend two or more years in the ocean before returning to the stream of their birth to spawn. Biologists designate the fish summer-run or winter-run based on the season they're biologically programmed to arrive home.

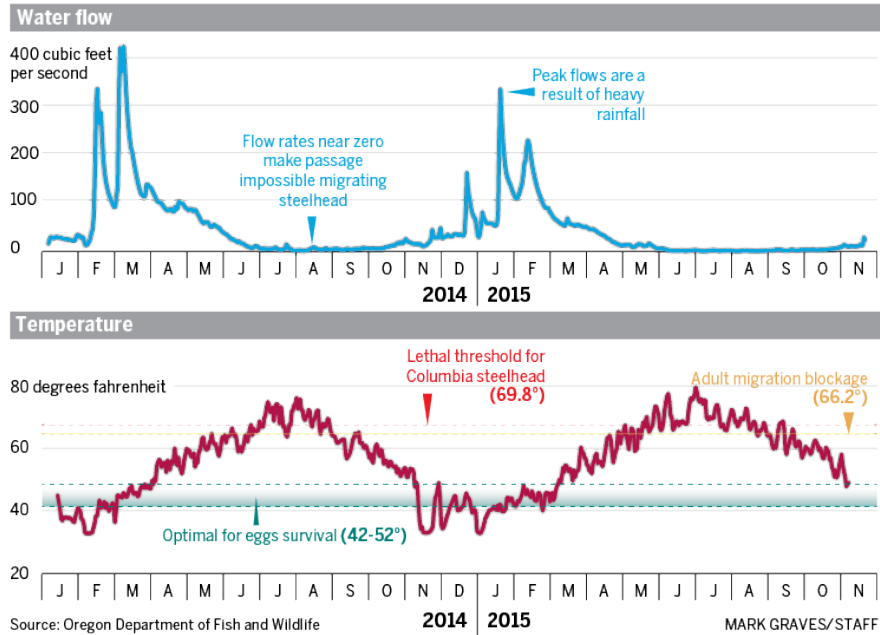
Fifteenmile Creek's steelhead reach their spawning grounds between November and April, seemingly a textbook winter-run. But biologists discovered something strange when they began implanting these migratory fish with electronic tags that track movement.

Many Fifteenmile fish made a tentative trip home much earlier, in July or August when the stream is bone dry and unswimmable in parts. Government scientists now hypothesize that these aren't winter steelhead at all, but summer fish forced by humans to adopt a winter lifestyle.

The tags showed Fifteenmile steelhead essentially killing time during the inhospitable summer months. They overshot the creek, climbed The Dalles Dam fish ladder and continued up the Columbia River to the Deschutes.

Fifteenmile Creek water temperature vs. flow

The data below was collected from two gauge sites near the confluence of Fifteenmile Creek and the Columbia River.



MARK GRAVES/STAFF

Rod French, district fish biologist for the Oregon Department of Fish and Wildlife in Wasco County.

Some even made it past an additional dam, the John Day, before turning back. Some made the round trip more than once before winter rains made the creek passable.

These unforeseen delays in spawning pose numerous hazards to steelhead. Passage downstream

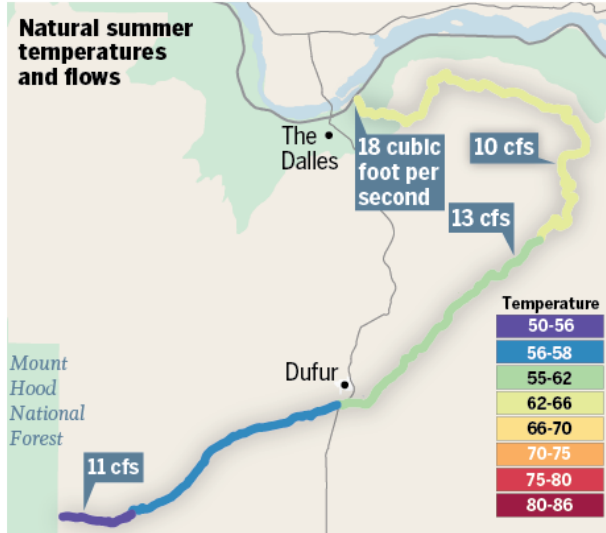
through The Dalles

Dam is impossible for fish in certain months without a swim through grinding turbines. The prolonged stay in the Columbia also exposes

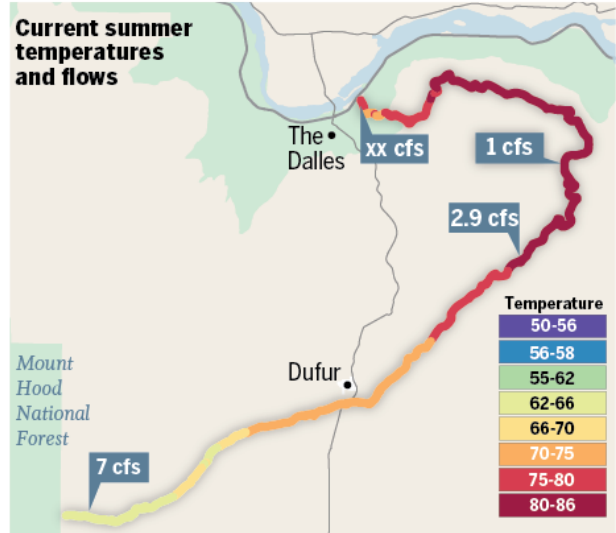


Humans and fish on Fifteenmile Creek

State scientists in summer 2002 gathered temperature and flow data for Fifteenmile Creek. They used computer models to simulate conditions before humans took water for irrigation and removed shade trees. About six times more water used to pour out of Fifteenmile into the Columbia River. The August trickle of 1 cubic foot per second today forms a rocky barrier to steelhead trying to enter and spawn, while the water heats to temperatures that can kill fragile offspring.



Source: Oregon Department of Environmental Quality



MARK GRAVES/STAFF

Fifteenmile steelhead to fishermen’s hooks and predators’ talons for a longer period.

The journey kills about half of all migrating Fifteenmile steelhead, according to research from the Oregon Department of Fish and Wildlife and the Bonneville Power Administration.

Even if adults survive to spawn, their offspring face additional perils in Fifteenmile’s hot, scarce water.

The tiny young fish, called fry, emerge from the gravel by early summer and then spend two years in a stream that regularly goes dry or heats up beyond a steelhead’s preferred sub-60 temperatures. One stretch never dipped below 70 for two straight weeks last year, according to Oregon Department of Fish and Wildlife data. The hottest water hit 83.

“You’re talking about temperatures that are capable of just outright killing fish,” said John McMillan, a science director for Trout Unlimited. “If temperatures are consistently that warm, it doesn’t bode well for the future of fish

in those places.”

Before humans altered the watershed, a 2004 study found, each egg’s chances of surviving long enough to exit the creek would have been closer to 1 in 4.

Last year, fewer than 1 in 50 smolts made it out alive.

Rod French, a district fish biologist for the Oregon Department of Fish and Wildlife, estimates that mass die-offs of juvenile steelhead happen yearly. But because most of the land abutting Fifteenmile is private, they’re rarely documented.

French’s job involves protecting fish in Fifteenmile and nearby streams. It’s made more difficult by the focus on planting greenery instead of addressing the creek’s glaring, human-caused water shortage.

“To be honest, it’s frustrating,” he said. “It’s fairly obvious that fish need water, and it’s the lacking component in this recovery effort.”



MARK GRAVES/STAFF

The Dufur Valley along Fifteenmile Creek south of The Dalles, traditionally has been a dryland wheat region. But in recent years many of the area's wheat farms have converted to cherry orchards with the help of wells dug deep into the underlying basalt rock.

Increased demand, ignored warnings

So scarce is water in the Dufur Valley, whose slopes drain into Fifteenmile Creek, only landowners who hold 155-year-old surface water rights were able to collect their full allotment last summer. Many farmers settle for growing dryland wheat, using rain alone to nurture their fields.

But in recent years, wells have cropped up across the valley as The Dalles' orchard and vineyard economy moved inland, converting dryland wheat fields to thirstier, more lucrative cherries and grapes. Cherries can bring \$10,000 per acre, four times the going price for dryland wheat.

“They’re certainly profitable in a good year, and this is a really great climate for growing them,” said the local watershed council’s Olson.

Acreage of irrigated agriculture in Wasco County nearly doubled between 1997 and 2012, much of it concentrated in the Dufur Valley. The number of wells that officials allowed in the Fifteenmile Creek Basin skyrocketed.

State regulators had many reasons to doubt the Fifteenmile ecosystem could withstand the new withdrawals of water.

Unlike the Willamette Valley’s gravel aquifers, underground water in the Fifteenmile Creek basin is held in Columbia River Basalt, a highly impervious rock formed millions of years ago by lava flows. Local rainfall doesn’t



penetrate easily. The water below seeps its way into rock fissures laterally, across vast distances.

Columbia River Basalt bounces back slowly when wells are sunk into it. Groundwater losses during the 1950s forced areawide restrictions on new wells in The Dalles, where Fifteenmile enters the Columbia. Sixteen miles to the west in Mosier, studies have found wells drawing from the basalt aquifer are sapping Mosier Creek.

“It’s the same thing you see in other areas where people pull from the Columbia Basalts,” said Robert Wood, the Wasco County water-master. “It’s deep water, and it seems like there’s a lot of it. But then we start to see declines.”

Only two long-term observation wells existed, but their data suggested even limited pumping in the valley before the 1990s was taking a toll.

One, by the creek just west of Dufur, was so packed with water in 1979 that it exerted 95 feet of upward pressure. By the late 1990s, half the pressure was gone.

The other, three miles upstream at Ramsey Creek, dropped 30 feet from its 1962 level.

Fifteenmile Creek is visibly connected to what lies beneath, virtually disappearing underground in some stretches, while swelling up with springwater in others.

Such springs can be a lifeline for fish in overheated streams, offering a rare source of cool, flowing water in the height of the irrigation season. Tapping an aquifer joined to the creek would be practically the same as pumping from the creek itself.

Documents show state employees who reviewed applications to use groundwater warned repeatedly that new wells could bring problems.

Nine times reviewers noted that the underground water source a landowner hoped to tap was likely connected to Fifteenmile Creek or

a tributary. In three of those cases, regulators went further, saying that pumping would likely cause harm.

Yet in all of Wasco County, where Fifteenmile is located, water resources officials rejected none of the 70 permit applications the agency reviewed between 1996 and 2011.

Today, irrigators in the Fifteenmile basin and surrounding drainages are entitled to draw 17 billion gallons annually, agency data show. That’s two times more water than precipitation sends back to the water table, according to a 1968 estimate of the area’s groundwater supply by the U.S. Geological Survey.

Only in 2011 did the Oregon Water Resources Department stop granting new groundwater permits along Fifteenmile and its tributaries.

Ivan Gall, the agency’s field services administrator, said officials didn’t have robust enough data to stop approving wells any sooner. Two observation wells did not provide adequate coverage.

“At the location of a new application, you may not have any site-specific information,” he said.

“Knowing about a decline eight miles away may not be that helpful.”

The Oregon Department of Geology and Mineral Industries is two years into a study to map the area’s subsurface. The water agency will use that information to test whether wells are draining the water table and Fifteenmile Creek.

Woodcock wouldn’t comment on what his agency will do if the answer is yes.

“We’ll take a look at the study and see if, in fact, we can confirm there is an impact there before we go and speculate on what it means for adjacent waterholders,” he said.

Conclusive information about the impact of wells on the creek and its steelhead, the agency says, could be years away.



“Band-Aids” for fish

Robert Bissonette, a 60-year-old retired teacher who grew up on Fifteenmile Creek, remembers the days when an angler could bring home a full creel after an hour on the water.

The creek of Bissonette’s childhood was by no means an ecosystem untouched by human activity. But all manner of fish were far more abundant.

“The water was so clear you could see where the fish would be hanging out and where the lam-prey were coming up,” he said. Now, recreational steelhead fishing is banned.

The creek looks prettier with all the money taxpayers have poured into restoring fish habitat, Bissonette said, but until regulators restore the water, “you’re just putting Band-Aids on something that needs a whole systemic rebuilding. And the wells have to be included.”

Every government agency working to save Fifteenmile steelhead has acknowledged irrigation is a major barrier to success. Yet none has forced a clampdown.

The Oregon Department of Environmental Quality, in a 2005 document outlining the creek’s violations of the federal Clean Water Act, said water scarcity was a key culprit.

“Increased instream flow, where depleted, will ultimately be needed” to cool the stream to acceptable temperatures, regulators wrote.

The Oregon Department of Fish and Wildlife and the National Oceanic and Atmospheric Administration each repeated the message in



MARK GRAVES/STAFF

Robert Bissonette remembers when an angler could bring home a full creel of fish in a short time on Fifteenmile Creek.

subsequent documents addressing the obligation to restore Fifteenmile steelhead under state and federal Endangered Species Acts.

After a major die-off of steelhead in the creek’s hot, shallow water in 2009, federal investigators told area irrigators they could be charged criminally if the deaths continued.

Yet agencies with authority under federal environmental laws chose not to order irrigators to make changes that would bolster Fifteenmile’s flow.

State law is of little help.

Senior water users can legally drain streams dry.

Since the 2009 fish die-off, some irrigators who draw directly from the surface of Fifteenmile Creek have agreed to forgo pumping on hot days in exchange for payments from The Freshwater Trust, an environmental group.

The possibility that well owners are simply sumping the water back out from below is “definitely an issue that’s on our radar,” said Caylin Barter, who oversees The Freshwater Trust’s program to revive Fifteenmile. “It’s on everyone’s radar out there.”

A federal status review released in December indicates Fifteenmile’s steelhead are worse off today than they were a decade ago, when they were listed as threatened.

The failed recovery effort left Bissonette, the fisherman, disillusioned and dejected.

Tired of Oregon’s unwillingness to take on irrigators around Fifteenmile Creek, he packed up and moved to Alaska.



August 26, 2016

No money to measure Oregon's water levels

By KELLY HOUSE

The Oregonian/OregonLive

Oregon has given away its underground water supply freely, thanks to a strange political equation.

Farming interests and their allies in the Legislature routinely oppose efforts to curb new construction of irrigation wells, saying state regulators lack hard data to prove water is running out.

Yet serious money never materializes for the studies everyone says are needed, a year-long review by The Oregonian/OregonLive found. The Oregon Water Resources Department says completing work on Oregon's 15 remaining uncharted basins would take \$45 million to \$75 million, plus additional staffing at the agency to get the work done quickly.

"The need for data and information is the one thing every person engaged in this process agrees on," said Mary Anne Nash, a lobbyist for the Oregon Farm Bureau. "Nobody wants to be in a situation where a basin is potentially being shut down while we're gathering more info."

More dramatic reform ideas are out there. Oregon could impose a trading system for

water like Australia's. It could aggressively subsidize high-efficiency irrigation, or it could tax irrigators by the gallon, instead of charging users nothing, regardless of how much they draw.

But experts say we'll never know how much these ideas would help until Oregon knows precisely how much underground water flows beneath our feet.

"You can't effectively manage a resource unless you know how much is there," said Eric Schuck, a Linfield College economics professor who specializes in the economics of irrigation.

History provides little reason for optimism.

Legislative pushback

When aquifers start drying up, regulators face enormous legal and political pressures to keep the water flowing. They have been subjected to lawsuits, budget threats and bills designed to block water restrictions.

Ag interests gave more than \$900,000 to state and federal candidates in Oregon in



2014 alone, according to data from the National Institute on Money in State Politics.

Fred Lissner, a former scientist for the Oregon Water Resources Department, had a front-row seat to water battles in the Legislature during his long career.

A farming boom fed by well water lowered the Umatilla Basin's water table dozens of feet in some areas by the 1980s. Lissner recalled the reaction from Mike Thorne, a Pendleton senator who ran the Ways and Means Committee, when the Water Resources Department proposed cutbacks on pumping.

"He didn't think that was a good idea," Lissner said.

When budget season came along, Thorne held the water department's spending plan in committee long after other agency budgets had been approved. Thorne says he wanted department leaders to consider other options before rushing to regulate.

"I wasn't trying to be punitive," the former Democratic senator said. "I just expected a level of performance that I didn't see."

Subsequent attempts to limit groundwater pumping met similar resistance.

Republican Rep. Chuck Norris, a Hermiston



FILE/2009

In the 1980s, then-Oregon State Sen. Mike Thorne of Pendleton delayed the Water Resources Department budget when it proposed cutbacks on pumping.

real estate agent who chaired the House Committee on Water Policy, introduced legislation in 1995 that some scientists and activists dubbed "the anti-gravity bill." It officially rejected the scientific consensus that rivers and lakes are interconnected with underground water. Never again could the state block a well because it threatened nearby streams.

Gov. John Kitzhaber vetoed the bill.

Separately, Sen. Neil Bryant sought legislation in 1995 to green-light water permits the state had delayed over con-

cerns that new wells would rob the Deschutes River. Bryant, a Bend water lawyer, sponsored the bill after learning that his clients were having trouble getting water.

"They were making it impossible to do any type of new development," Bryant said. "The backlog couldn't continue."

Three years later, state and federal researchers concluded that virtually all groundwater in the Upper Deschutes Basin eventually winds up in the river. It's impossible to obtain a groundwater permit there today without agreeing to return water to the river for every drop of groundwater used.

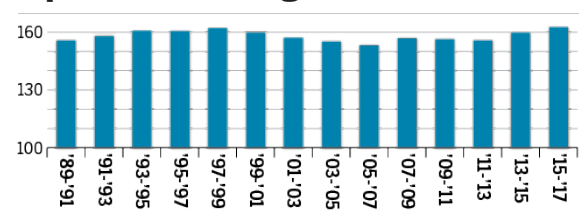
In southern Oregon's Klamath Basin, husband-and-wife Reps. Gail and Doug Whitsett also sponsored bills that would make it harder to limit well usage in the name of protecting surface water.

State and federal officials say pumping in the Klamath has lowered its water table and weakened surface springs.

"We're seeing an overregulation, in my opinion," Gail Whitsett told The Oregonian/OregonLive.

In the Harney Valley, Senate Minority

Oregon water resources department staffing



Source: Oregon Water Resources Department

MARK GRAVES/STAFF



MARK GRAVES/STAFF

Irrigated and harvested fields paint the eastern Oregon landscape along U.S. Route 197 south of The Dalles.

Leader Ted Ferrioli, R-John Day, has criticized the state for turning down new well construction while researchers scramble to study the area's groundwater. Ferrioli says the research money might be better spent helping ranchers deepen their wells.

"People out there are more fearful of the regulatory impact of bureaucrats from Salem than they seem to be concerned about the wells going dry," he said.

Tepid support

Oregon environmental agencies often come up short in the battle for state funding, but the Water Resources Department is a perennial loser. Just 2 percent of the state's general fund

budget last year went to natural resources. The water agency as a whole got less than one-tenth of that sliver.

Among its staff of 163, just 12 people work on wells and aquifers. Those 11 hydrogeologists and one manager last year processed 165 new applications for well permits, while also juggling other paperwork and long-term scientific studies of aquifers. To put that in context, the city of Portland employs seven full-time rangers to patrol its parks.

Resources for managing wells and aquifers remained paltry, despite a 2012 warning from the state Water Resources Commission, a group appointed by the governor to oversee the water resources agency.

The commission that year called for water



managers to do more basin studies, build more monitoring wells, and get more irrigators to measure and report their water use. Commissioners noted that such efforts “are underfunded and have been for years.”

Lawmakers responded strongly to one of the commission’s other 2012 requests: money to plan for future water needs and develop water infrastructure, such as reservoirs. Those efforts received \$51 million in the current two-year budget.

But the Legislature came up with only a pittance to quantify Oregon’s groundwater supply: \$1 million since 2012.

Dennis Doherty, a longtime state water commissioner who retired this spring, said it’s not fair to blame either the water resources agency or irrigators for the depletion of Oregon’s aquifers.

“If the Legislature really cared about understanding groundwater,” Doherty said, “they’d put real money into those studies.”

When agencies were asked to identify areas to save money during the latest recession, water resources officials offered to sacrifice groundwater studies first. Lawmakers obliged. Over three straight budget cycles, from 2005 through 2011, research on aquifers got a grand total of \$100,000.

WaterWatch of Oregon, an advocacy group, tried to create a new source of funding in 2009 by proposing a \$100 annual fee on each holder of the state’s roughly 87,000 water rights.

Farmers and lobbyists testified against the plan. Martha Pagel, the water resources agency’s former director, challenged the fee’s legal underpinnings. The bill died in committee.

Kitzhaber resurrected the concept in 2013,



ASSOCIATED PRESS/2015

Senate Minority Leader Ted Ferrioli, R-John Day, says the state’s research money on groundwater would be better spent helping ranchers deepen their wells.

endorsed by a state committee that spent more than two years studying ways to pay for the water department’s work. Kitzhaber’s natural resources policy director, Richard Whitman, told senators that effective water management during a time of climate change was Oregon’s leading natural resources issue.

“You can see the crisis that’s looming,” Whitman said.

The governor pulled his support a day later, after irrigators complained the fee would threaten their livelihoods.

Whitman vowed to return the next year with “a more well-

formed proposal.”

Three years later, no such proposal has surfaced.

Whitman remains in the same job under Kitzhaber’s successor, Gov. Kate Brown. A spokesman for Brown declined to make Whitman or any other adviser available for an interview.

Stalled solutions

Decades of Oregon water policy have emphasized developing new sources of water to meet demand for the natural resource, rather than controlling its use. Climatologists and many hydrologists say that emphasis needs to change.

The first, most basic step could be to reverse Oregon’s unofficial policy of approving new wells in places where regulators can’t determine their impact. A January 2015 internal memo to Water Resources Department Director Tom Byler recommended just that.

“Staff recommends considering a change in processing practice – defaulting to ‘no’ instead



MIKE GRAVES/STAFF

An irrigation well cap sits in a Dufur Valley field along Fifteenmile Creek south of The Dalles.

of ‘yes’ when data cannot confirm that new groundwater allocations lie within the capacity of the resource,” the memo said.

As of this spring, the policy had not changed.

A separate move, advocated by a wide array of water experts, would be for lawmakers to pay for studying how much each basin has to give. That would give water resources managers better ammunition to reject new wells when necessary.

Water Resources Department leaders say they hope to ask for more money in 2017-19 to expand the agency’s groundwater study team.

“We have had conversations with the folks over in the Legislature with regards to the resources necessary to do the job,” said Doug Woodcock, the agency’s deputy director.

A spokesman for the governor’s office said Brown is committed to securing additional funding. He provided no specifics. But he noted that the governor has called on all state agencies to recommend ways of reducing

their water use, and that the Water Resources Department’s report is due in February.

A \$100 annual fee on all water rights, plus federal matching money and some new hires, would likely be enough to complete all remaining groundwater studies in five years.

The state estimates that Oregonians will consume 420 billion more gallons of water annually by 2050, a 15 percent increase.

The state’s current thinking on how to cope calls for diverting water from Pacific Northwest rivers during rainy winter months, then storing it in reservoirs or pumping it down into aquifers. Some communities have seen success with artificial recharge tactics, even using treated wastewater to do the job. Experts say the strategy holds promise for more widespread use.

“Wherever there’s a wastewater treatment plant, I’d be sticking that treated water underground,” said Todd Jarvis, director of Oregon State University’s Institute for Water and Watersheds.



But critics caution such approaches may backfire. Taking water from rivers in winter could disrupt the lives of fish in unforeseen ways, they say, and pumping wastewater into the water table is a gamble.

Federal agencies have offered grants to help farmers adopt conservation measures. Dufur Valley orchardist Tim Dahle figures he has cut his water use in half by converting from sprinklers to drip irrigation and laying mulch around his trees. If all irrigators in the valley made the same changes, Dahle said, “the problem would go away.”

Currently, farmers lack much financial incentive to follow Dahle’s lead, because water rights entitle owners to water free of charge. Farmers do pay higher electricity bills, the more water they pump. But to make a significant dent in water use, advocates say, someone needs to put a price on the commodity.

In Australia, a 10-year drought prompted drastic measures in the Murray-Darling Basin, the country’s main agricultural region. Government leaders, realizing that irrigators were using far more water than the system could sustain, began rationing water.

Whereas a water right in Oregon entitles a landowner to a certain volume of water, Australian irrigators get a designated share of what the government decides is available each year. Another difference: Half of all water in the Murray-Darling is reserved for the environment.

The system has created a market in water. Anyone who wants more than their share can pay someone willing to relinquish some of theirs. Regulators require a meter on every pump so that every drop is accounted for. Limits are strictly enforced.

“It gives you an incentive to be as careful with that water as possible,” said Schuck, the Linfield economist, who has studied the Australian system.

The program, launched in 2012, is still in its infancy. But it’s being lauded as a model

Potential responses to Oregon’s underground water problem

In many parts of Oregon, state regulators have given away rights to pump more underground water than Mother Nature can sustain. Our canvass of academic experts and a review of policies enacted elsewhere suggest a range of potential responses.

- Rescind Oregon policy of approving wells when there’s no way to determine potential harm.
- Adopt a statute like Colorado’s, saying Oregon will reject new wells unless applicants prove enough water exists.
- Adopt Washington law prohibiting wells that create any harm to streams short on water. Oregon prohibits only “substantial” harm.
- Create \$100 annual fee on each of Oregon’s 87,000 water rights. With federal matching dollars and some state hires, Oregon could pay for \$75 million in groundwater studies in five years.
- Finance groundwater studies with some of \$51 million earmarked for planning water needs and developing infrastructure.
- Spend \$25 million completing state well network to detect falling water tables.
- Require meters on all wells and annual usage reports to regulators.
- Cap total water use and allow users to buy and sell water, like in Australia.
- Charge a per-gallon fee on owners of groundwater rights.
- Expand subsidies for high-efficiency irrigation equipment.

for modern water management, particularly in drought-ridden agricultural regions like the western United States.

In Oregon, irrigators have protested even the idea of universally measuring water use, fearing it will cost too much and lead the state inevitably down the road to some kind of charge on water.



August 26, 2016

How we measured the mismatch between Oregon's supply and demand for water

The Oregonian/OregonLive

The Oregonian/OregonLive set out to gauge whether Oregon well users are entitled to pump more water than the state can sustain.

Specifically: We compared legally permitted pumping volumes with the state's best estimate of what Mother Nature replenishes each year through rain and snow. Out of the 31 basins and sub-basins we analyzed in eastern Oregon, we found nine where permitted demand exceeds capacity.

Our estimates can be considered only one very basic indicator of the mismatch between water rights and water supplies. Accurately depicting the flow of water through underground rocks and soil usually takes multi-year, multi-million-dollar studies. Because few studies have been done statewide, we were forced in most cases to use cursory estimates of groundwater replenishment developed nearly 50 years ago.

We tried to follow a conservative approach

that, in key ways, is more likely to understate the problem than overstate it. For example, our calculations focused strictly on ensuring well users have water. We didn't take into account any impacts on streams that often lose groundwater when a new well is drilled and pumped. Such stream effects can harm both aquatic creatures and the owners of surface water rights.

Some scientists have criticized such approaches as an inadequate measure of sustainability.

Three academic experts who provided feedback on The Oregonian/OregonLive's analysis said it is no substitute for more extensive studies into the size, shape and behavior of aquifers.

But Sasha Richey, a postdoctoral fellow at Washington State University's Hydro Lab, said scientists widely acknowledge that "a sustainable rate of groundwater pumping should remain well below the rate of annual



MARK GRAVES/STAFF

Water trickles down the slope of a mountain fen deep in the Ochoco Mountains, northeast of Bend. The small streams that flow through such wetlands come from groundwater that springs up from underground to create oases in the desert.

replenishment.”

Jay Lund, director of the Center for Watershed Sciences at the University of California, Davis, said the analysis provides a broad sense of the scope of Oregon’s overpumping problem. Although additional data might move the numbers either way for individual basins, he said, it wouldn’t alter the fundamental conclusion that “we need to do better.”

The supply

For the amount of potential new groundwater arriving each year through precipitation, we mainly used a 1968 study by the U.S. Geological Survey. The 15-page report was titled,

“Estimated Existing and Potential Groundwater Storage in Major Drainage Basins in Oregon,” by J.H. Robison.

Robison examined 67 Oregon sub-basins, starting with the amount of water running through each basin’s streams in late summer. Because rain and snowmelt are gone by that time of year, Robison assumed all of the summertime water came from precipitation stored underground. The author then extrapolated from monthly figures to annual volumes.

Robison’s report acknowledged that the method was subject to error. Another problem, academic experts told us, is that precipitation and the volume that reaches deep aquifers may well have declined in the past 50 years.



Nonetheless, the 1968 numbers are all that's available in most cases. The Oregon Water Resources Department used its estimate for the Harney Valley in testimony to legislators last year, when justifying a halt to new groundwater permits.

Experts recommended we use more current estimates of annual water inflow where available. We did so for the Umatilla, Klamath, Willamette and Upper Deschutes basins.

We also modified the 1968 map, merging some basins to match current boundaries and subsequent studies. State regulators took the same approach in analyzing the Harney Valley last year. Our map had 42 basins and sub-basins statewide.

We did not account for irrigation water that might percolate into the ground, a volume that depends on type of irrigation, crops and the soil types. No comprehensive estimate of such "return flows" exists for Oregon basins. A Klamath Basin study called return flows "not a significant source" of replenishment. Data from a U.S. Geological Survey study of the Upper Deschutes Basin indicated 12 percent of the irrigation water sprayed on crops made it deep into the soil.

The demand

To measure how much water users are entitled to pump, we used a state permits database. To avoid double-counting water entitlements, we used mapping software to eliminate duplicate and overlapping permits. We labeled each permit with a basin number and then multiplied the permitted acres by the permit "duty," meaning feet of water the state allows per acre for a specific type of use.

State geologists note that not everyone with a permit uses it. Conversely, the state has no universal way to know when users consume more than allowed. Based on interviews with farmers, the state also has its share of unper-



MARK GRAVES/STAFF

Allison Aldous, a scientist with The Nature Conservancy, measures the flow of a spring in the Ochoco Mountains. The area's small, spring-fed wetlands sustain a diverse and lush micro-environment in an otherwise arid desert region.

mitted irrigation wells, which are not included in our estimates.

We focused on what is knowable: the volume to which everyone is legally entitled.

Finally, in each basin, we compared permitted water use with the annual influx of new water. We defined "over capacity" as 100 percent or more. We found nine basins over capacity, one at 80 to 100 percent of capacity, and two at 60 to 80 percent.

Richey, of the University of Washington, said this definition of capacity is a highly conservative choice. The World Resources Institute recently created estimates of "water stress" on surface and groundwater basins, describing a



system as being under “high stress” if water users consume more than 40 percent of what’s available, and “extremely high stress” if it’s greater than 80 percent.

Other aspects of our analysis also lean toward understating the impact of drilling.

Among them: We had no way of incorporating the effect of pumping on deep aquifers that aren’t well-connected to local surface water systems. These aquifers often contain “fossil” water thousands of years old. They refill slowly and can start declining even before water use exceeds annual replenishment.

Well construction and water tables interact in complex and sometimes unpredictable ways, which may explain why our estimates spotted no problems in some basins the state identifies as trouble spots based on other evidence, such as falling water levels in wells.

The analysis also did not flag places on the Oregon coast that some experts say face shortages.

Finally, we omitted domestic wells from our analysis because many do not require permits. The impact of omitting domestic wells is likely small in most areas of the state, given

that regulators estimate crops and livestock comprise 80 percent of water use.

The impacts

We also looked for signs that pumping might be causing underground water tables to fall.

Oregon officials track a network of monitoring wells statewide. These are not a representative sample of all agricultural areas, tending instead to cluster in places with groundwater issues. Nonetheless, falling wells across multiple basins might hint at the scope of the problem.

From 19,000 monitoring wells, we selected 185 statewide with the most consistent measurements. Specifically: A well had to be tested at least one quarter out of the year in all nine of the half decades since 1970. For each well, we chose the quarter with the most data.

We then calculated median depth of observations in each half decade and measured the average movement, upward or downward. The long-term trend was falling for about 74 percent of wells east of the Cascades and 63 percent of wells west of the Cascades.