BAY AREA WATER SUPPLY AND CONSERVATION AGENCY

BOARD OF DIRECTORS MEETING

December 13, 2017

Correspondence and media coverage of interest between November 24, 2017 and December 8, 2017

Media Coverage

Water Use:

Date: December 1, 2017
Source: Brookings
Article: U.S. households are using less water, but what does that mean for metros and infrastructure?

Date: November 28, 2017
Source: Bay Area Council
Article: Press Release: Bay Area Leads Nation in Squeezing Most Economic Value from Water

Water Supply:

Date: December 6, 2017
Source: Mercury News
Article: What could cause California droughts? Melting sea ice

Date: December 5, 2017
Source: San Francisco Chronicle
Article: Arctic ice loss could spell more drought for California, Livermore Lab study finds

Date: December 5, 2017
Source: Sacramento Bee
Article: Cold but no rain in immediate forecast. Is California having a dry winter?

Date: December 4, 2017
Source: SFGate
Article: Some say the Tahoe snow line is moving, now one study backs them up

Date: December 4, 2017
Source: Sacramento Bee
Article: California water districts don't need voter approval on fees

Date: December 1, 2017
Source: Recordnet.com
Article: This has been the driest fall in Stockton in more than a decade

Date: November 29, 2017
Source: U.S. Department of Interior
Article: 2012 – 2016 California Drought: Historical Perspective

Water Supply Management:

Date: December 8, 2017
Source: Bloomberg
Article: Silicon Valley Wants to Solve Our Water Problems

Date: December 6, 2017
Source: Water Deeply
Article: Pioneering Practice Could Help California Reverse Groundwater Depletion

Date: November 29, 2017
Source: Public Policy Institute of California
Article: The Unintended Consequences of Indoor Water Conservation

Date: November 27, 2017
Source: YubaNet.com
Article: Local Management Plans May Not Protect California Groundwater from Climate Change Risk

Date: November 27, 2017
Source: Water Education Foundation
Article: The Drought May Be Over, But California Still Wants Residents to Act Like It's On Forever

Date: November 27, 2017
Source: Environmental Research Web
Article: Surface water could refill Californian groundwater supplies

Date: November 24, 2017
Source: Sierra Sun Times
Article: California Groundwater Recharge Brings Opportunities, Complications

Water Infrastructure:

Date: November 27, 2017
Source: Daily Democrat
Article: Is big infrastructure still possible today?

Date: November 24, 2017
Source: Record.net
Article: Rising reservoirs: Less room for error this winter on San Joaquin River

Water Policy:

Date: December 4, 2017
Source: The Downey Brand
Article: California Supreme Court Confirms Certain Groundwater Pumping Charges are Outside Scope of Prop 218

Date: November 28, 2017
Source: Circle of Blue
Article: Panel Recommends Changes to Two-Decade-Old EPA Water Affordability Guidelines

# # #

U.S. households are using less water, but what does that mean for metros and infrastructure?

Brookings | December 1, 2017 | Joseph Kane

The last few months have seen a growing number of climate concerns – from historically devastating floods to record forest fires – with many regions still assessing the damage. Beyond recovery, planning and paying for more resilient infrastructure also remains an enormous challenge, and no quick and easy solutions seem to be on the way from Washington or elsewhere.

One bit of positive news came out recently, though: as the drought in the Western United States has eased, many households are using less water and putting less strain on the country's scarce water resources. According to a new report from the U.S. Geological Survey (USGS), U.S. household water use is on the decline, approaching levels not seen since the mid-1990s. Steps toward greater water conservation in California and several other states appear to be taking hold, alongside a number of regulatory and technological advances in support of water efficiency, including plumbing fixture upgrades. And with greater efficiency come several benefits: from preserving long-term water supplies to reducing the need to build new infrastructure.

Still, even as households use less water, these drops are not equal nationally, and ongoing challenges remain concerning water efficiency and affordability in many regions.

As our recent report on metropolitan water use highlights, utilities – alongside other local and state leaders – are striving for cleaner, more reliable water service, but they must often do so amidst increasingly unpredictable water demands and mounting infrastructure costs, which results in higher water bills for many households. With more timely and geographically detailed information, however, they can more easily measure and define their water needs – and ultimately design the plans, develop the asset management strategies, and deploy the technologies in support of more efficient and equitable outcomes. The latest USGS report helps clarify what these needs look like at a household level, but now it's up to local leaders to monitor and address them.

For example, recent national trends only reveal part of the story. U.S. households reduced their water use nationally by almost 850 million gallons each day from 2010 to 2015, a 3 percent decline.[1] This reduction came even as the U.S. as a whole saw its population increase by 12 million people (or 4 percent) over the same time span. Put together, this means that residential water use per capita fell from 88 gallons each day in 2010 to 82 gallons each day in 2015 – a far cry from the 98 gallons each day in 2005.

Many of the country's most populated metro areas are leading this charge toward more efficient water use. Households in the 100 largest metro areas reduced their water use by 723 million gallons each day from 2010 to 2015 – meaning they were responsible for 85 percent of the U.S. decline, despite accounting for two-thirds of its population. As shown below, five of the 10 metro areas with the greatest declines were found in California, led by Los Angeles (-193 million gallons each day), Riverside (-106 million), and San Francisco (-63 million), all while seeing significant gains in population. Consequently, residential water use per capita in these metros also tended to be below national averages.

10 metro areas with the greatest declines in residential water use, 2010 to 2015

Metro	Residential Water Use (millions of gallons per day)		Population		Residential Water Use Per Capita 2015 (gallons per day)
	2010 to 2015 Change	2015 Water Use	2010 to 2015 Change	2015 Population	
Los Angeles-Long Beach-Anaheim, CA	-193	1,105	511,231	13,340,068	83
Washington-Arlington-Alexandria, DC-VA-MD-WV	-133	473	461,452	6,097,684	78
Riverside-San Bernardino-Ontario, CA	-106	497	264,308	4,489,159	111
New York-Newark-Jersey City, NY-NJ-PA	-103	1,475	614,895	20,182,305	73
San Francisco-Oakland-Hayward, CA	-63	281	320,741	4,656,132	60
Sacramento--Roseville--Arden-Arcade, CA	-56	239	125,067	2,274,194	105
Detroit-Warren-Dearborn, MI	-53	294	5,793	4,302,043	68
Hartford-West Hartford-East Hartford, CT	-50	41	-1,057	1,211,324	34
New Haven-Milford, CT	-37	28	-3,007	859,470	32
San Jose-Sunnyvale-Santa Clara, CA	-36	116	139,925	1,976,836	59
U.S. Totals	***-850***	***26,577***	***12,440,825***	***325,018,864***	***82***

Source: Brookings analysis of USGS data

Yet, multiple other metro areas actually saw an increase in residential water use. In fact, households in 50 of the 100 largest metro areas used more water each day in 2015 than they did in 2010, revealing clear room for improvement in achieving greater efficiencies. Among the 10 metro areas with the biggest gains, several represent sprawling Sun Belt metros, such as Atlanta (+39 million gallons each day) and Phoenix (+28 million). Not surprisingly, continued population growth and development in many of these markets translated into further rises in residential water use per capita as well.

10 metro areas with the greatest increases in residential water use, 2010 to 2015

Metro	Residential Water Use (millions of gallons per day)		Population		Residential Water Use Per Capita 2015 (gallons per day)
	2010 to 2015 Change	2015 Water Use	2010 to 2015 Change	2015 Population	
Denver-Aurora-Lakewood, CO	81	383	270,848	2,814,330	136
Salt Lake City, UT	50	207	82,393	1,170,266	177
Atlanta-Sandy Springs-Roswell, GA	39	431	424,070	5,710,795	75
New Orleans-Metairie, LA	30	142	73,022	1,262,888	113
Phoenix-Mesa-Scottsdale, AZ	28	690	381,351	4,574,531	151
Spokane-Spokane Valley, WA	27	122	20,071	547,824	223
Orlando-Kissimmee-Sanford, FL	25	236	252,727	2,387,138	99
Miami-Fort Lauderdale-West Palm Beach, FL	20	548	447,696	6,012,331	91
Provo-Orem, UT	20	101	58,989	585,799	173
Las Vegas-Henderson-Paradise, NV	16	267	163,532	2,114,801	126
U.S. Totals	***-850***	***26,577***	***12,440,825***	***325,018,864***	***82***

Source: Brookings analysis of USGS data

For the most part, continued declines in household water use show that the U.S. as a whole is making great strides toward more efficient, cost-effective service, but that is not true across the board. On the one hand, some areas are ahead of the curve, particularly in drought-stricken parts of the West where water conservation has not only become a necessity and way of life, but has also benefited from forward-looking planning focused on environmental stewardship and economic stability. On the other hand, some areas along the Colorado River and elsewhere are grappling with rising water demand and challenges collaborating on region-wide planning approaches, including more responsible groundwater management.

Still, even as households use less water, these drops are not equal nationally, and ongoing challenges remain concerning water efficiency and affordability in many regions.

To achieve greater long-term certainty managing their water resources – in addition to planning and paying for any needed infrastructure investments – utilities and their local and state partners should continue monitoring these trends closely. Doing so requires ongoing attention to the infrastructure itself, including technological upgrades and water supplies, but also a prioritization of water's role in the larger built environment and economic development efforts. Areas with dense, compact development patterns, for instance, tend to use less water, and planning strategies should continue making it easier for all households to gain the affordable water access they need to survive and thrive. The U.S. faces sizable water infrastructure needs, but many areas are already getting a head start on addressing their gaps in this way and should serve as models to consider for future improvements.

# # #

For additional interactive data on how households and other users depend on water in metro areas, non-metro areas, and states nationally, visit the recent Brookings water report webpage.

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IMMEDIATE RELEASE
November 28, 2017

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Bay Area Leads Nation in Squeezing Most Economic Value from Water

San Francisco leads counties, Silicon Valley tops metro areas in generating economic value per gallon

San Francisco—The Bay Area not only is one of the stingiest water users in the country it also squeezes more economic value out of every precious drop than anywhere else in the nation. The analysis builds on the Bay Area Council Economic Institute report *The Impacts of a Reduced Bay Area Water Supply*, and comes as state officials consider cutting water flows to the Bay Area.

San Francisco led U.S. counties with over $1.32 million of gross domestic product (GDP) generated per acre-foot of water consumed, while Silicon Valley led US metropolitan regions with almost $504,000 in GDP per acre-foot of water consumed, the study found. One acre foot equals 325,851 gallons or about the amount of water used by 11 Californians per year.

“Nobody gets more bang per gallon than Bay Area residents and businesses” said Jim Wunderman, President and CEO of the Bay Area Council. “Public policy should encourage population and economic growth in the most water efficient ways possible, including supporting development in areas with a proven track record of economic efficiency with our limited water supplies.”

The findings come as the State Water Resources Control Board discusses a plan to reduce water diversions from the San Joaquin River and its tributaries, including the Tuolumne River. In an average year, approximately 48 percent of Tuolumne River water is diverted for agriculture by the Turlock and Modesto Irrigation Districts, 38 percent remains in the river, and 14 percent is diverted by the San Francisco Public Utilities Commission (SFPUC) to serve 2.6 million people in San Francisco, Silicon Valley, and the East Bay. Residents in the SFPUC service area use an average 54 gallons per day, compared to the California state average of 82 gallons.

About the Bay Area Council

The Bay Area Council is a business-sponsored, public-policy advocacy organization for the nine-county Bay Area. The Council proactively advocates for a strong economy, a vital business environment, and a better quality of life for everyone who lives here. Founded in 1945, the Bay Area Council is widely respected by elected officials, policy makers and other civic leaders as the voice of Bay Area business. Today, approximately 275 of the largest employers in the region support the Bay Area Council and offer their CEO or top executive as a member. Our members employ more than 4.43 million workers and have revenues of $1.94 trillion, worldwide. Learn more at www.bayareacouncil.org.

What could cause California droughts? Melting sea ice
Mercury News | December 6, 2017 | Lisa M. Krieger

Polar bears aren't the only ones in trouble from the Arctic's melting ice.

A new study by Bay Area scientists concludes that Californians could face reduced rainfall — and worse droughts — by the continuing loss of sea ice.

Their computer analyses show a 10 to 15 percent average decrease in California's rainfall in the coming decades. The culprit, scientists now believe, is a link between the melting ice and the buildup of massive high pressure systems that park off the California coast and block Pacific storms.

Precipitation that is rightfully ours will instead veer northwards, falling on Alaska and Canada, according to the team from Lawrence Livermore National Laboratory and UC Berkeley, whose paper is published in the most recent issue of the journal Nature.

"Not every year will be drier. We'll still have the occasional very wet year," said lead scientist Ivana Cvijanovic, an atmospheric expert at Lawrence Livermore. "But, looking year by year, the majority of years will be drier."

The Arctic is warming twice as fast as the rest of the planet — scientists say human-caused emissions of greenhouse gases are to blame — and the ice cover is retreating at a startling pace. Melting is expected to continue throughout the 21st century.

Over the next few decades, the Arctic Ocean is projected to become ice-free during the summer.

This is bad news for polar bears, charismatic creatures whose existence depends on an ice cover. It is also hard for Canada's northern communities, where ice roads have become unreliable and forests are drying out.

But the new study, funded by the U.S. Department of Energy, shows that the ice loss will also have more far-ranging effects — changing weather in more distant, lower-latitude regions like California. The team, which included Lawrence Livermore climate modeler Ben Santer, whose pioneering 2013 paper was the first to find patterns in the climate linked to human-caused global warming, compared two sets of simulations: one in the beginning of this century, and one looking ahead to the mid-century.

California's rainfall will change through a two-step process, involving both the Arctic and the deep tropics, said Cvijanovic.

Normally, ice reflects sunlight. But when it melts, the sun's heat is instead absorbed by water or land. Large-scale warming of the Arctic surface and lower atmosphere affects the way heat travels from the Earth's lower latitudes into the Arctic.

This in turn causes circulation changes in the deep tropics. A very narrow swath of air over the deep tropics, mostly above oceans, increases in humidity. Then the upper atmosphere starts behaving differently, sending waves of air in the North Pacific.

This boosts the buildup of a giant high pressure system — basically a big bunch of air piled up into a ridge, like the famed “Ridiculously Resilient Ridge” of our five-year drought — off our coast.

In normal winters, high and low pressure systems take turns, alternating between ridges and troughs.

But when there’s a ridge, the wet and wintry Pacific storms instead slide north. That phenomenon led to the 2012-2016 California drought.

Low water level revealed two chairs at the Almaden Reservoir in San Jose in January 2014 as the state was in the grips of a historic drought. (Nhat V. Meyer/Bay Area News Group)

If you look out your window, that’s also what is happening now. In the coming days, a remarkably persistent ridge will begin to develop across North America and adjacent oceans, and will likely stay locked in place for at least the next two weeks, according to UCLA meteorologist Daniel Swain.

Previous research by Stanford climate scientist Noah Diffenbaugh also concluded that human-caused climate change is increasing drought risk in California — boosting the odds that our recent crisis will become a fixture of the future.

What’s new is the role of melting ice caps. This hypothesis once seemed to be in conflict with the conventional view; the new study suggests that they’re related.

“This is a really important new piece of the puzzle of how climate change can influence precipitation and drought in California,” said Diffenbaugh. “This new paper identifies the critical role of loss of Arctic sea ice.”

Daniel Swain of UCLA’s Institute of the Environment and Sustainability, who coined the term “Ridiculously Resilient Ridge” in December 2013 on his California Weather Blog, called the study’s link between Arctic sea ice loss and California drought “provocative, but compelling.”

“While the jury’s still out regarding the specific details of where, when, and exactly how this connection may play out, it has become increasingly hard to escape the conclusion that some degree of influence is likely,” he said. The new study “provides a compelling, specific, and detailed example of how this linkage might have significant implications for regional climate.”

Melting ice is not the only factor behind reduced rainfall, added Cvijanovic. There are other influences, such as volcanic eruptions and the direct effect of increased carbon dioxide in the atmosphere.

But the immense loss of Arctic sea-ice cover “is a big shock for the atmosphere,” she said.

“It is not only a problem for remote Arctic communities, but could affect millions of people worldwide,” she said. “Arctic sea ice loss could affect us, right here in California.”

# # #

Arctic ice loss could spell more drought for California, Livermore Lab study finds
San Francisco Chronicle | December 5, 2017 | Kurtis Alexander

Californians may have another reason to keep an eye on melting sea ice in the Arctic — at least if they're concerned about the state's propensity for plunging into damaging droughts.

Alongside the obvious perils for polar bears and other wildlife, as well as the problem of rising ocean levels, the massive ice thaw thousands of miles away is triggering changes in the atmosphere that are likely to shrink rainfall close to home, according to new research by scientists at Lawrence Livermore National Laboratory.

Their study outlines a chain of meteorological events that leads to formation of storm-blocking air masses in the North Pacific. The masses are similar to the so-called Ridiculously Resilient Ridge that kept rain from making landfall during California's five-year drought, forcing widespread water rationing in homes, prompting farmers to fallow fields and causing the Central Valley to sink due to heavy pumping of groundwater.

The Livermore Lab study, being published Tuesday in the journal Nature Communications, doesn't attempt to explain the recent drought, but to help understand future weather patterns. Still, lead author and climate scientist Ivana Cvijanovic said California should expect more arid periods like 2011 to 2016. As such dry spells become more common, the state will average 10 to 15 percent less rain over the long haul, she estimated.

"The recent California drought appears to be a good illustration of what the sea-ice-driven precipitation decline could look like," she said.

The study comes amid efforts to understand the relationship between drought and climate change. While higher temperatures are known to increase drying through evaporation, the link between global warming and rainfall has remained in dispute.

Stanford University Earth system scientist Noah Diffenbaugh and UCLA climate researcher Daniel Swain have suggested that upticks in greenhouse gases have created conditions favorable to high-pressure systems, which generally push the east-moving Pacific storm track northward and result in dry conditions in California.

An earlier study by UC Santa Cruz geologist and climate researcher Lisa Sloan went as far as suggesting that Arctic ice loss was helping spawn the drought-inducing atmospheric ridges by channeling warm water south and sending columns of air upward. Her work, though, came under scrutiny because some said it failed to reconcile the changes in the Arctic with the competing influence of the tropics, long thought to be the main driver of Pacific storms.

The Livermore Lab study maintains that Arctic activity is hastening the tropical influence. According to the research, melting sea ice throws enough energy into the atmosphere that it slows the flow of heat from southern latitudes. This results in greater variability in winds and sea surface temperatures as far away as the equatorial Pacific. Much like El Niño or La Niña influences weather on the West Coast, the altered conditions of the tropics due to ice loss favor the development of high pressure systems in the North Pacific.

"The two hypotheses are not at odds," Cvijanovic explained. "The influence from the Arctic doesn't go first to California; it goes to the tropics."

Cvijanovic and her colleagues acknowledge that they're far from being able to forecast long-term weather patterns for California. However, by incorporating their findings into other models that detail the impacts of climate change, they hope to eventually get a better picture of future precipitation.

"The vast amount of research that is coming out now shows that the Arctic is really inescapable in affecting the planet as a whole, so huge that it can affect so many other locations," she said. "This can help with planning future water supply in California."

# # #

Cold but no rain in immediate forecast. Is California having a dry winter?
Sacramento Bee | December 5, 2017 | Dale Kasler

What happened to the rain?

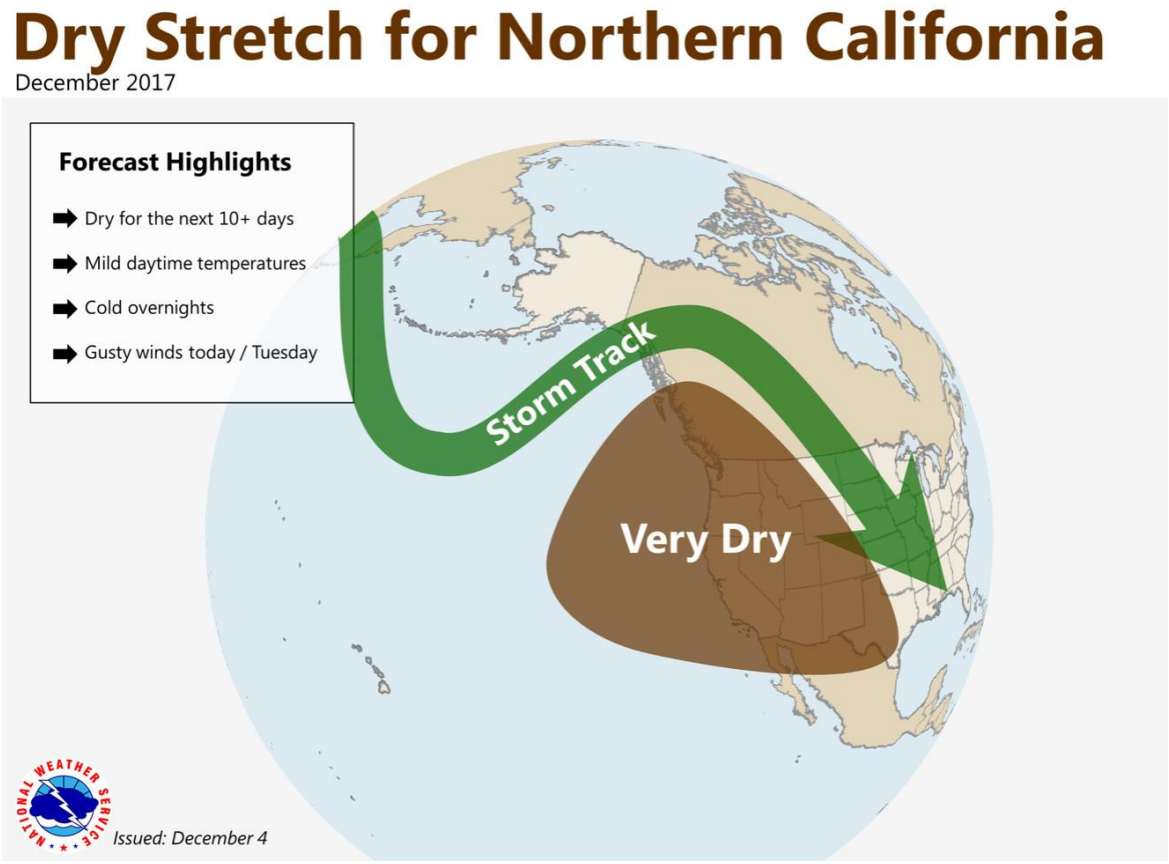
Less than a year after the drought was declared over, precipitation has been relatively scarce in the Sacramento area and Northern California so far this season. This week's cold snap is accompanied by a round of dry weather that's expected to last at least another 10 days.

It's too soon to panic about a prolonged dry spell, however.

The National Weather Service said precipitation this season is actually running slightly ahead of schedule in the northern Sierra Nevada, thanks to a wetter-than-average November. But the weather gauges are emptier the further south you go, and rainfall truly has been in comparatively short supply in practically every California city.

Sacramento's rainfall is just 68 percent of average for the season, according to Department of Water Resources data. Rainfall in Stockton is just 33 percent of average, and the precipitation in Southern California, which is battling a series of wildfires, has been practically nonexistent.

Michelle Mead, the weather service's warning coordination meteorologist in Sacramento, said the weather probably seems a lot drier than usual because most Californians are still recalling last winter's endless rains, which broke the five-year drought and produced the wettest winter in Northern California's recorded history.



“We aren’t doing that terribly bad as far as Northern California is concerned,” Mead said. “In the grand scheme of things, we are doing sort of OK.”

This week’s forecast is all about extreme temperatures, not atmospheric rivers. The weather service said Sacramento Valley temperatures would approach freezing Tuesday night, with Sacramento expecting 34 degrees, and Modesto hitting 35 degrees. Santa Rosa was in line for a low of 29. Farmers were warned about potential damage to crops and livestock.

Although the official “water year” in California begins Oct. 1, the bulk of the precipitation falls between Dec. 1 and the end of February. In the short term, a ridge of high pressure is keeping rain from reaching the West Coast at least through mid-December, although Mead said it’s hard to say what the rest of the season will bring.

While rainfall is important, an abundant snowpack is critical; it can act as a second set of reservoirs and in most years can hold 30 percent to 40 percent of the state’s water supply.

Frank Gehrke, who runs the closely-watched snow survey program at the Department of Water Resources, said snow levels so far appear to be running below last year’s accumulations. But the results are somewhat “scattered” and it’s too soon to make predictions about the rest of the season, he added.

“There’s snow up there; it’s still early in the season,” he said. “Right now we’re sitting, looking at blue skies but it can turn around very quickly.”

Climatologists have become increasingly concerned about the Sierra snowpack’s long-term viability, saying climate change is expected to turn a significant portion of the snow into rain, making it more difficult to capture and store for human use and raising flood risks.

A new study led by the Desert Research Institute, a Reno think tank, said the snow line in the northern Sierra has crept up about 1,200 feet in the past decade. The study was published last month in Water, a scientific journal.

# # #

Some say the Tahoe snow line is moving, now one study backs them up
SFGate | December 4, 2017 | Amy Graff

For years, Sierra residents have murmured about winter rain falling on trails that used to be covered in snow, but there has been no scientific evidence to back up a change in the snowfall pattern.

Now, a new piece of research suggests the snow line, the point of elevation above which rain turns to snow during winter storms, may be changing.

The study published in the journal Water suggests the snow line has risen about 1,200 feet in the northern Sierra Nevada due to rising temperatures since 2007.

The data, compiled by the Desert Research Institute in Reno, has limitations. The study looks at 10 years' worth of data between 2007 and 2017, a relatively short period of record, and in the last decade many of the high snow line years were also drought years. The study's authors extrapolated data for previous decades based on the last 10 years and found big changes in the snow line.

Lead study author Benjamin Hatchett believes the findings should be motivation to dig into this issue more deeply because, if the rising snow line in the past decade is a sign of what's to come, the ramifications on the state's water supply, ecosystems and ski resorts could be dire.

"Our point with this is to say, 'Hey this is what we're seeing, and we should determine whether this is just variability or a trend," says Hatchett, who's a postdoctoral fellow in meteorology at the institute. "If it's a trend, what does this mean for how we store water? What does this mean for our ecosystems and how will ski resorts deal with the change?"

Mike Anderson, the California state climatologist with the Department of Water Resources (DWR), says this issue is "absolutely" on the department's radar and is one of the many metrics showing how the mountains are changing as the climate shifts.

"It's a big deal," Anderson says. "It all plays into this story of climate change and the fact that we're seeing more rain and less snow in the Sierra than in the past."

Some are more skeptical of the study due to its short time span: "That's not what one would call a trend," NASA snow hydrologist Tom Painter told KQED.

Growing up in the Sierra, Hatchett heard longtime backcountry skiers talk about how the lower elevation snowpack around the lake has declined, with drought and rainfall degrading the conditions.

Around Truckee and Lake Tahoe, he frequently heard people saying, "It seems to rain more often nowadays." And he has noticed himself that, when driving over Donner Pass in recent years, chain control often starts higher up the mountain in Kingvale rather than lower down in Baxter and Alta. He designed his research to add some additional science to the anecdotal evidence that the snow line is moving.

Much of his data comes from DWR, which installed special snow level-sensing radar that monitors the rain-snow transition line about 12 years ago, and Hatchett and his team used the equipment's most comprehensive data from locations in Colfax and Oroville looking at the water years between Oct. 1, 2007, and February 28, 2017 to determine the 1,200 elevation rise.

They then applied these results to historical temperature readings to estimate the snow line back to 1951 and found that the snow line likely jumped more significantly in the most recent decade than in any other decade in the past 66 years.

"We were definitely pretty surprised the change in the average snow level jumped up by so much," Hatchett says. "This is a short-term study, but we wanted to point out that nobody had done this."

Atmospheric rivers bringing loads of snow, and also lots of rain

In a warming climate, less precipitation is falling as snow and Hatchett says his study revealed a three-percent decrease on average per year in the fraction of precipitation falling as snow over the past decade.

Some of this rain is the result of an increase in the number of warmer storms driven by atmospheric rivers pulling moisture from the South Pacific and over the Sierra Nevada.

According to researchers at Scripps Institute in San Diego, a total of 45 pummeled the West Coast between Oct. 1, 2016, and March 31, 2017. Of these, three were categorized as extreme, 12 were strong, 20 moderate and 11 weak. This was an unprecedented number of atmospheric rivers and in a typical year the West Coast might see only one or two similar storms.

"Going forward climate models predict atmospheric rivers to be more common," Hatchett says. "Our oceans are warmer, that leads to warmer storms, more rain,

A rising snow line could wreak havoc on the state's water system

Dave Rizzardo, chief of snow surveys and water supply forecasting with DWR, says a rising snow line could have a huge impact on the state's water systems such as dams and reservoirs. These were constructed mainly in the 50s and 60s, based on data from when weather in California was more predictable and consistent.

"This study is highlighting the fact that there's a change," he says. "Meaning we're getting more rain events than snow events in that winter time. When you have built a reservoir and decided this is how it's all going to operate and now that thing has changed, it really changes how you can save, store and move that water."

This is of particular concern in the northern Sierra as the mountain elevations are lower, reaching only up to 9,000 feet, compared to the southern Sierra where the highest peak, Mount Whitney, is over 14,000 feet. When the snow line runs up the mountains in the northern Sierra, you lose a significant area of watershed that's no longer snow.

"If we're losing snow territory, we've completely changed the dynamic in how the runoff is coming off these watersheds," Rizzardo says. "This creates an issue with the water supply, as

you have less snow melting in May to replenish reservoirs. And you have more rain pouring down watersheds in the winter, flooding rivers."

Case in point: Oroville Dam, a dated water system in California that wasn't constructed for extreme weather events, was damaged earlier this year when fierce storms battered the Sierra.

A rising snow line impacts ski resorts

Resorts have been adapting to changing snow lines for years and tailoring their business models as a result.

Sitting right on Lake Tahoe with an elevation of 6,350 feet, the small, family-owned Granlibakken is the lowest-elevation resort in the Tahoe area with hills people have been skiing since the 1920s.

Marketing manager Annora McGarry says that 2016-17 was a banner year as a series of moisture-rich storms slammed the Sierra, but overall the resort has noticed less snow, especially during the five-year drought.

"We've learned that we really can't rely on the snow," McGarry says. "We've worked on expanding our options that we offer to guests in the winter to make the resort appealing."

McGarry says the resort added a ropes course and zip line in recent years to offer guests more fun things to do in both summer and winter. They're also making snow on the sledding hill, so guests can enjoy snow fun even when the snow on the ski runs is light.

NorthStar planned to open Thanksgiving weekend this year, but the storms hitting the Sierra have been relatively warm, bringing a mix of snow and rain, and the resort delayed the start of its skit season to December 1. Over the holiday weekend, the resort still had plenty to offer and in a tweet advertised its many fun attractions including new shops, dining, ice skating, s'mores, pub crawls and more.

A message to skiers read: "Everyone at Northstar California Resort is eager to begin the ski and snowboard season, and with current conditions, our mountain needs additional time to provide the experience that guests expect."

"If it's raining at 7,000 feet all the time, that changes basically everything about the Sierra," Hatchett says.

# # #

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California water districts don't need voter approval on fees
Sacramento Bee | December 4, 2017 | Sudhin Thanawala

The state's water conservation districts don't need the approval of property owners or voters to charge their customers fees to fund programs aimed at protecting groundwater, the California Supreme Court ruled on Monday.

But the justices in a unanimous decision also said the districts cannot charge cities disproportionately more than farmers for conservation efforts.

The decision ensures the water districts have a source of funding to undertake projects to replenish ground water — a key irrigation source for farmers that became even more vital during California's historic drought.

Many groundwater basins throughout California have experienced "overdraft" in recent years, which means more water is being taken out than is being replaced naturally.

The decision may mean the districts will have to reallocate fees "more fairly" between agricultural and non-agricultural groundwater users, said Rick Frank, an environmental law expert at the University of California, Davis School of Law.

Gov. Jerry Brown in 2014 signed legislation that required the first-ever rules for pumping groundwater in California. The law requires agencies in fast-depleting basins to draw up sustainability plans.

Frank said the ruling was significant "because it provided needed and timely guidance" to those agencies, groundwater users and state officials about how to assess groundwater fees to pay for the plans.

The lawsuit pitted the city of Ventura against the United Water Conservation District, which covers all of part of eight groundwater basins over approximately 214,000 acres (87,000 hectares) in central Ventura County.

The city pumps groundwater for residential customers. The district charged the city to fund its conservation efforts under a state law that requires nonagricultural water users pay at least three times more than agricultural users.

Associate Justice Leondra Kruger, writing for six of the seven justices, said groundwater conservation fees do not fall under a state ballot measure — Proposition 218 — that requires the approval of voters or property owners for certain government charges.

But under a separate measure — Proposition 26 — the fees must bear a reasonable relationship to the strain each water user places on the aquifer, she said. The requirement that Ventura pay three times more than farm users for groundwater may not meet that requirement, the court said.

The ruling was a win for Ventura, but the case will require additional litigation to resolve, said Michael Colantuono, an attorney who represented the city.

Mauricio Guardado, general manager of the United Water Conservation District, also claimed victory, saying the district was prepared to defend the fees it charged Ventura.

The ruling will ensure conservation agencies aren't "lazy about how they set their fees," said Tim Bittle, a lawyer representing The Howard Jarvis Taxpayers Association, which pushes to limit taxes and filed a brief in the case.

"They are going to have to actually apply some science to figure out where the water that they are adding to the aquifer goes and who benefits from it and to look at the various types of land use in their districts to determine whose most responsible for the overdrafting in the first place," he said.

# # #

This has been the driest fall in Stockton in more than a decade.
Recordnet.com | December 1, 2017 | Alex Breitler

With that in mind, one might ask, why are our rivers so full?

Low-lying portions of the Calaveras River bike path were underwater this week. Farther south, on the Stanislaus River, the modest flows out of New Melones Lake are expected to periodically quadruple over the next couple of weeks.

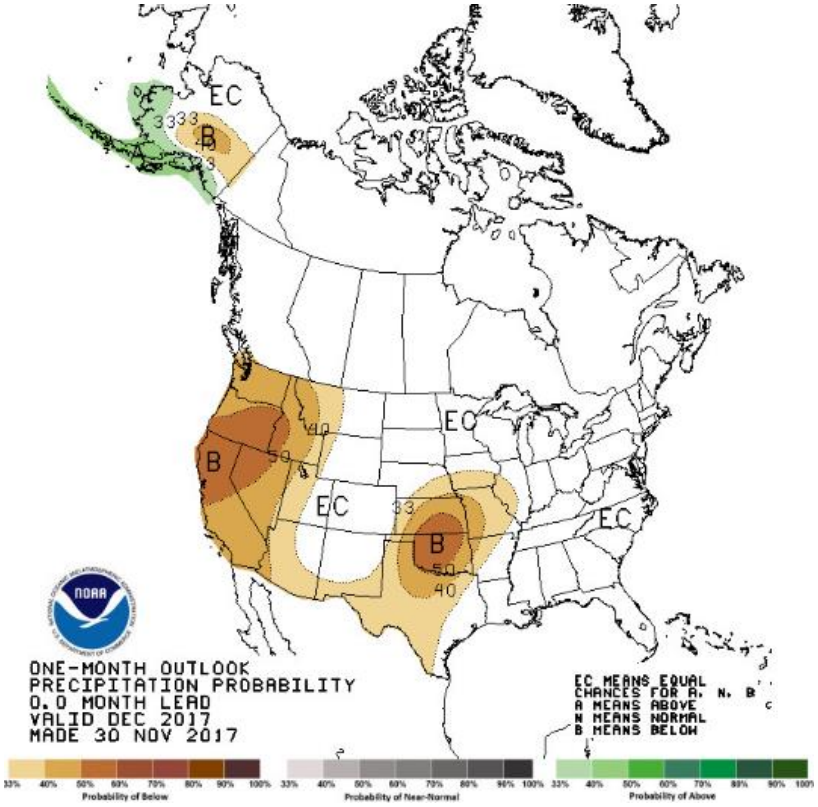
The explanation for all of this is that upstream reservoirs are fuller than normal due to last year's deluges. Despite the dry weather so far, and the likelihood that it will stay dry into mid-December, officials are releasing water from reservoirs to make sure there's room to capture runoff from future storms.

Flows from New Hogan Lake on the Calaveras upstream of Stockton were holding steady about 50 cubic feet per second before climbing to more than 2,600 cfs earlier this week. That's what dunked the bicycle path.

The water level at New Hogan has come down as a result; though at half-full, the reservoir is still 136 percent of normal and is technically holding a little more water than it is supposed to right now.

Flows from New Melones into the Stanislaus River are expected to climb from 600 cfs to as high as 2,500 cfs until Dec. 11, when flows will come back down again, the U.S. Bureau of Reclamation announced this week.

"People recreating in or along the Stanislaus River downstream from New Melones Dam should take safety precautions during the increased flows," the agency said in a news release.



Flows from Lake Camanche into the Mokelumne River have also gone up from about 300 cfs to about 1,300 cfs. That's still considerably less water than the river was carrying last winter and spring, when it was close to 5,000 cfs for many weeks, a situation that caused flooding in adjacent vineyards.

Camanche is 69 percent full and 122 percent of normal. Importantly, there is little room this year to store water above Camanche, with Lake Pardee 99 percent full as of Friday.

In a new forecast this week, the federal Climate Prediction

Center said to expect drier than normal conditions across California over the next two weeks. The longer-term outlook is less certain, especially in Northern California.

The city has received less than an inch of rain all season. But this dry start might not mean much in the end. Just look at 2005, when barely six-tenths of an inch had fallen in Stockton heading into the month of December.

The rains came big-time starting in December, leading to flooding concerns well into April.

# # #

2012-2016 California Drought: Historical Perspective
US Department of Interior | November 29, 2017 | USGS

On January 17, 2014, California State Governor Jerry Brown declared a drought state of emergency. On April 2, 2017, Governor Brown lifted the drought emergency, but declared that California must continue water conservation efforts. With the official conclusion of the most recent drought, which spanned water years 2012 through 2016, it is timely to compare it with other historic California droughts and also to consider some of the lingering impacts.

Water year is defined as starting on October 1 of the preceding year and ending on September 30 of the water year (e.g. Water Year 2017 starts on October 1, 2016, and ends on September 30, 2017). Hydrologically, “water year” is a useful metric because the majority of precipitation in Western states occurs from late fall to early summer. Thus, water years are useful to delineate dry and wet periods.

California's Historic Droughts

Drought is a prolonged and widespread deficit in available water supplies that may cause substantial economic or social impacts, or physical damage or injury to individuals, property, or the environment. These prolonged periods may include one or more years of near normal precipitation, if significant drought impacts continue during this time period. Considering this definition, droughts in California can be classified in four ways:

Meteorological drought is a period of one, or more water years, of below-normal precipitation;

Hydrological drought is a period of one, or more water years, in which there is below-normal availability of surface water and groundwater;

Agricultural drought is a period of one, or more water years, in which water available for agricultural production is curtailed by 25% or more; and

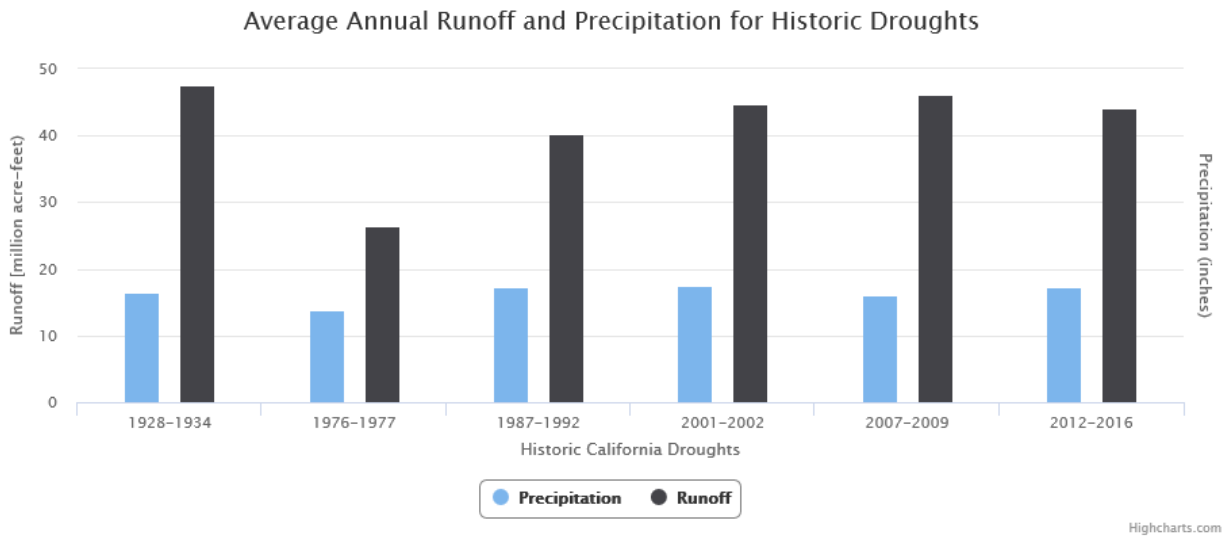
Ecological drought is a period of one, or more water years, during which deficits in natural water availability create multiple stressors across ecosystems.

Since 1895, there have been six prolonged dry periods lasting two years or longer, which qualify as droughts under all of the above drought classifications. They are: water years (WY) 1928-34, WY 1976-77, WY 1987-92, WY 2001-02, WY 2007-09 and WY 2012-16. The impacts from a drought are a function of both duration and severity (or average annual deficits). Shorter timeframe droughts were included either because of their severity, such as the WY 1976-77 drought, or their impacts, such as the reduced hydroelectric power production which contributed to the Western Energy Crisis of 2001-02. The longer the duration of a drought, even under less severe cumulative annual deficits, generally, the worse the impacts.

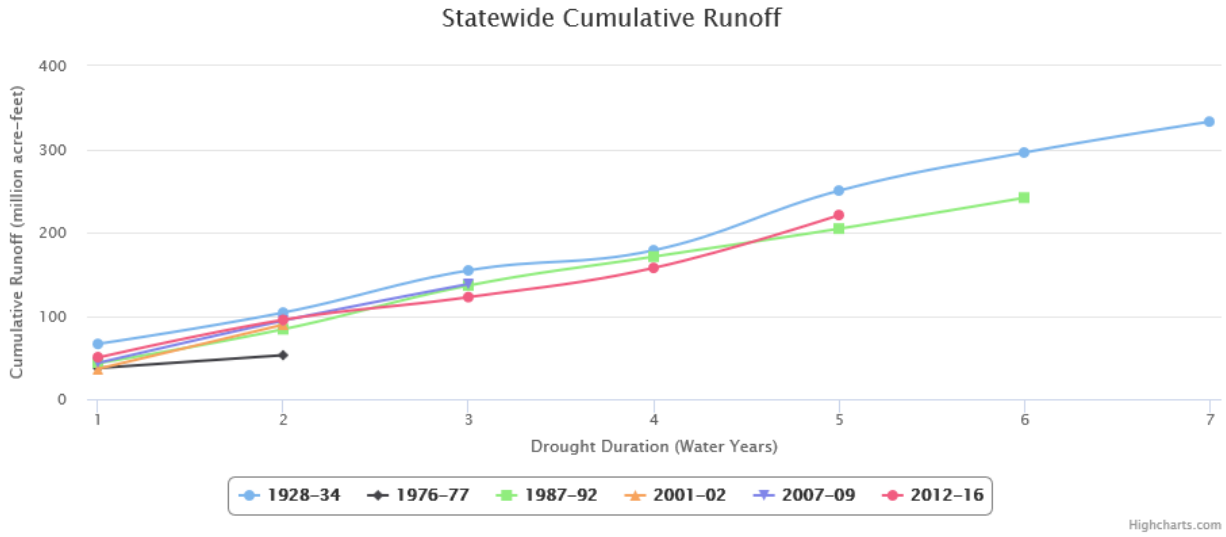
From a runoff perspective under the Sacramento and San Joaquin Valley Water Year Indices, the majority of years in these six periods were classified as “dry” or “critical.” The runoff for these two valleys is an important agricultural drought indicator, given the amount of agricultural production in California’s Central Valley. Historical records of such stressors, as Delta salinity, also indicate that these periods were times of ecological stress.

In addition, WYs 1924 and 1994 were also extremely dry, from both runoff and precipitation perspectives indicating that these are meteorological droughts. Water Year 1924 ranks as 3rd driest out of 117 years, from a runoff perspective, and driest out of 122 years, from a precipitation perspective. In WY 1924, California only received 9.94 inches precipitation resulting in 26.9 million

acre-feet (MAF) runoff statewide. Water Year 1994 ranks as 6th driest out of 117 years, from a runoff perspective, and 9th driest out of 122 years, from a precipitation perspective. In WY 1994, California received 15.13 inches precipitation resulting in 33.7 MAF runoff statewide. By contrast, the statewide mean precipitation is 22.45 inches for the period from 1901 through 2000. The lowest statewide runoff on record is 15.5 MAF in WY 1977; the highest is 201.7 MAF in WY 1983.



Runoff and precipitation conditions for California's six historical droughts. The most severe drought both in terms of precipitation and runoff was the drought of 1976-77. However, because it was just a two-year drought, the water supply impacts were not as severe as those associated with the longer duration droughts because shorter droughts can be partially mitigated by surface and groundwater storage.



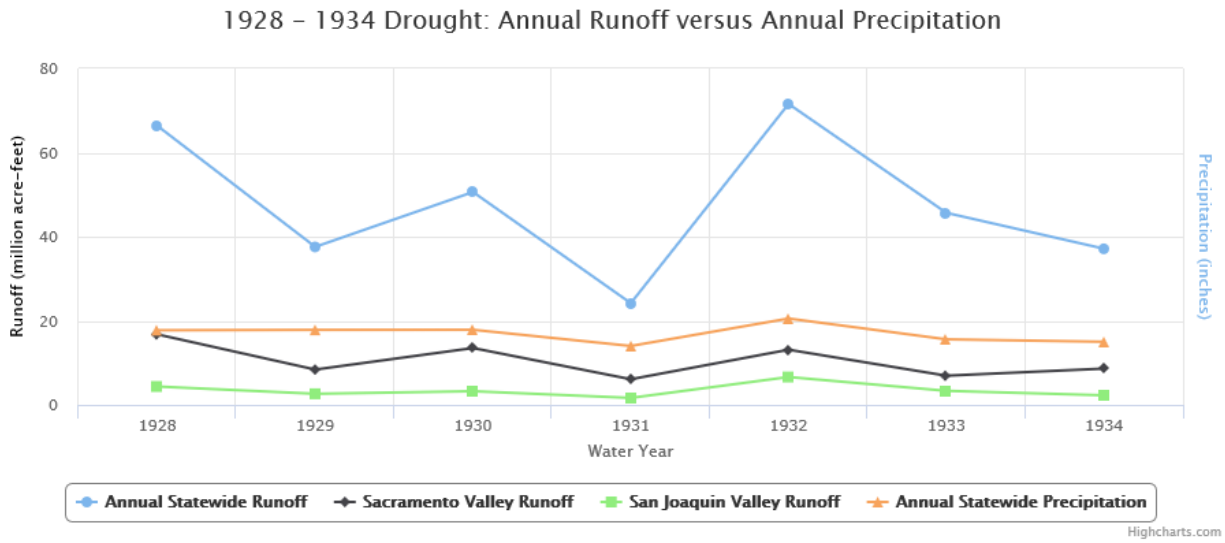
Cumulative runoff for the six historic droughts. The longer the time period of impaired runoff, the more severe the drought impacts.

A Tale of Three Droughts

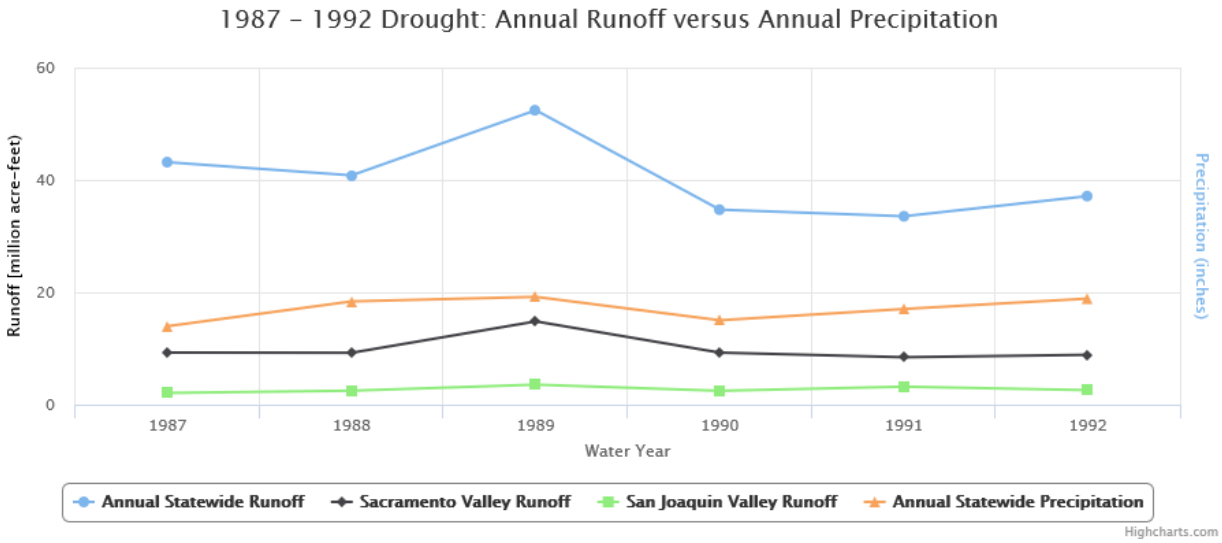
Because of their duration and severity for both lack of rainfall and runoff, the 1928-34 drought, which lasted seven years, and the 1987-92 drought, which lasted six years, are compared to the 2012-16 five-year drought, to assess similarities and differences.

Runoff is an important parameter in assessing drought impact severity. The amount of runoff is dependent upon many factors including the amount, location and type of precipitation (rain or snow); rainfall rates; the amount of base flow (i.e. contribution of groundwater to streamflow); antecedent soil moisture conditions; the amount of empty surface water reservoir storage; the magnitude to which groundwater aquifers are drawn down; watershed geology and topography; the level of urbanization in the watershed; and the amount and type of landscape and cultivated plant cover. A related story discusses the role of snowfall, rainfall, and reservoirs in buffering drought impacts, and indirectly describes the impact of snowfall, rainfall, and reservoirs on runoff.

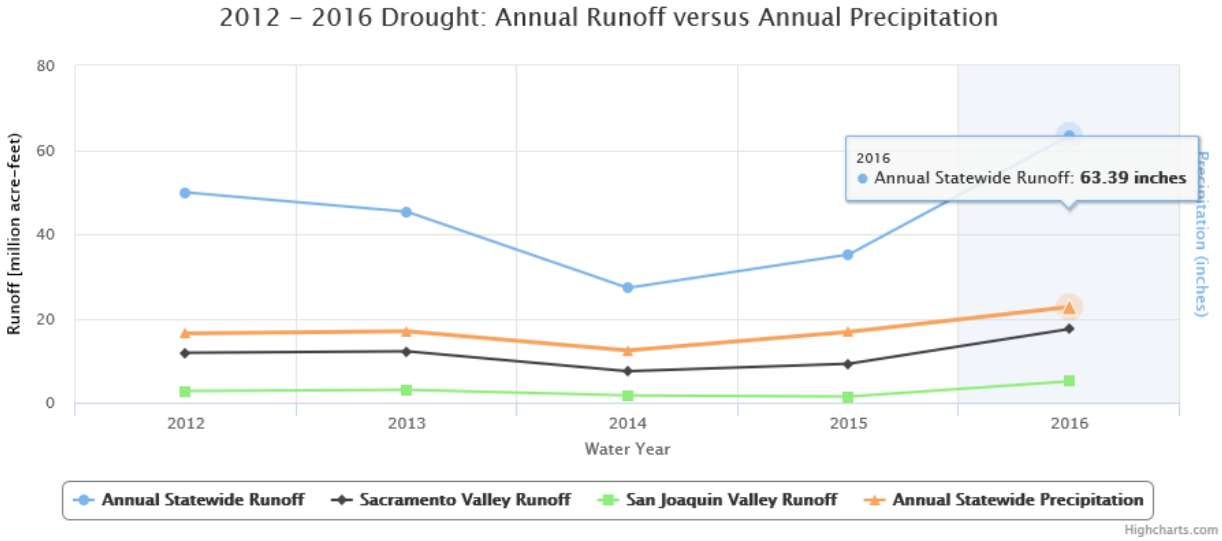
The Statewide Cumulative Runoff graph shows that cumulative statewide runoff in year five of the drought was 204.5 MAF for the WY 1987-92 drought, 221 MAF for the WY 2012-16 drought and 258.3 MAF for the WY 1928-34 drought. This might indicate that the 1987-92 drought was the most severe, but this is not necessarily the case. Following is a closer look at each of the three droughts.



This graph shows a direct relationship between annual precipitation and runoff, i.e. when precipitation decreases or increases so does runoff. In looking at the cumulative runoff graph, this drought appears a little less severe than the 1987-92 and 2012-2016 droughts; however, if such a drought reoccurred today, its seven year duration, as compared to six and five years, respectively, for the other two droughts, might make the impacts of such a drought more severe.



This graph does not show as direct a relationship between annual precipitation and runoff as the 1928-34 drought. The statewide runoff decreased from 43.2 to 40.8 MAF in WYs 1987 to 1988 and from 34.7 to 33.5 MAF in WYs 1990 to 1991 despite increases in statewide precipitation from 13.97 to 18.38 inches and 15.02 to 17.03 inches, respectively, for the same sets of water years. This decrease in runoff could be due to such factors as a mismatch between the location of rainfall and the most productive watersheds for runoff, depleted soil moisture, or empty reservoirs filling.



Similar to the 1987-92 drought, this graph shows that precipitation and runoff are not always directly related on an annual basis. Annual statewide runoff decreased from 49.9 to 45.3 MAF from WY 2012 to 2013, despite an increase in statewide precipitation of 16.44 to 16.95 inches during the same timeframe. Given that both Sacramento Valley and San Joaquin Valley runoff increased during this period, the filling of smaller reservoirs in watersheds outside the Central Valley rather than the larger ones associated with the State and Federal projects, may have caused the statewide decrease in runoff.

# # #

Silicon Valley Wants to Solve Our Water Problems

Despite a lack of VC funds, there's a steady flow of entrepreneurs

Bloomberg | December 8, 2017 | Katie Fehrenbacher

Gary Kremen—the founder of Match.com, former owner of Sex.com, and serial investor—is into water.

The entrepreneur started investing in water tech startups a few years ago. Today he's an elected member of Silicon Valley's water district, an agency that manages water and flood control for 2 million people. Earlier this year, he helped craft a proposal to build a tunnel under the Sacramento-San Joaquin River Delta that could improve drinking water reliability for cities from San Jose to San Diego.

Following several years of investing in energy and solar startups, Kremen became attracted to water problems, he says, because it's an issue that's yet to be solved. "Water is so, so, so, so hard," he says. "We need to focus on the hard things."

A small fraction of venture capital dollars currently goes into tech to manage or clean water. Analysis from research company Cleantech Group finds that total dollars and deal volume for water tech startups in 2016 were down 70 percent and 65 percent, respectively, from a peak in 2013. Many water investments are now coming from family offices, corporate investors, and philanthropy.

But despite the investing challenges, there's still healthy interest from entrepreneurs, who are drawn in by issues such as California's drought, the Flint, Mich., water crisis, climate change, and population growth. The number of tech accelerators focused on water issues jumped from 14 in 2013 to 26 in the first half of 2017, according to Cleantech Group.

At the same time, water-intensive industries looking to conserve resources and comply with regulations are increasingly turning to software to do so.

Robin Gilthorpe, chief executive officer of seven-year-old WaterSmart Software Inc., says he now sees "a good steady flow of capital and entrepreneurs into the water sector." His company, which was Kremen's first investment, uses data to help water utilities improve their operations.

"Three years ago, 'digital water' wasn't a thing. Today there's a lot of talk about it," says Gilthorpe, who entered the field after a career in big data and analytics.

Silicon Valley even has its own water-focused tech accelerator, ImagineH2O. The company began eight years ago and has worked with more than 80 companies, including WaterSmart. Leveraging water data is one of the bigger trends for ImagineH20's companies, says its president, Scott Bryan. "Entrepreneurs are applying what they learned in IT and biotech to the water space," he says.

Some argue that the greatest opportunity to invest in water is in industrial applications, not municipal water use.

The 50,000 or so U.S. water utilities are both highly regulated and conservative when it comes to buying and installing new technology. Gilthorpe of WaterSmart—which does sell to utilities—contends that these utilities are conservative with good reason. “Water is so essential to life; you can’t take risks with it,” he says.

But even the market for managing industrial water has its challenges. In recent years, the oil and gas sectors have pulled back from buying tech that’s used to manage wastewater. That has contributed to a drop in venture capital investment in water tech startups in recent years, say analysts at Cleantech Group.

Some startups have managed to find buyers despite the difficulties. Earlier this year, Monsanto Co.-owned Climate Corp. acquired a startup called HydroBio, which was using data to help farmers manage irrigation. Climate Corp. now offers the software to customers in Europe and plans to expand sales to farmers in the U.S.

“Water will continue to be a challenge in agriculture. Digital tools will help growers make more informed decisions,” says Climate Corp. CEO Mike Stern.

Kremen has had more success than most with his water investments. In addition to putting one of the first checks into WaterSmart, he also backed Aquacue Inc., a leak detection company that was bought by Badger Meter Inc., as well as a water treatment startup called HydroNovation Inc., which was acquired by Taiwanese company KemFlo International Co.

Despite his investing wins, Kremen remains unusually focused on water policy. He plans to run for reelection to his district board seat in 2018.

# # #

Pioneering Practice Could Help California Reverse Groundwater Depletion

On-farm groundwater recharge could greatly help decrease aquifer overdraft, but recent efforts show that some significant obstacles will need to be overcome.

Water Deeply | December 6, 2017 | Michelaina Johnson

A groundwater demonstration project in Lodi, California. Farmer Al Costa's vineyard was flooded with 145 acre-feet of Mokelumne River water to help rejuvenate an overdrafted aquifer.Sustainable Conservation

Groundwater overdraft in the San Joaquin Valley – producer of half the state's agricultural output – has averaged roughly 1.8 million acre-feet annually since the mid-1980s. Even before the start of the most recent drought in 2011, a few San Joaquin farmers recognized the dire need for sustainable water management and started individually pioneering a groundwater recharge practice that has since gained statewide traction.

On-farm groundwater recharge involves intentionally diverting surface or stormwater to agricultural fields for percolation into the aquifer during times of excess. The practice holds tremendous potential for increasing water storage and offsetting groundwater overdraft, but to scale efforts, some serious obstacles will need to be overcome.

Lodi wine-grape grower Al Costa, in partnership with North San Joaquin Water Conservation District and the nonprofit Sustainable Conservation, this year launched a groundwater demonstration project on a 13.7-acre parcel of old-Zinfandel grapes to study the benefits of flooding agricultural fields with surface water to refill the aquifer below. Thus far, 145 acre-feet of Mokelumne River water has inundated the field and percolated into the subsurface, rejuvenating a small fraction of the estimated 100,000 acre-feet of water overdrafted from the aquifer each year. And all this happened with no damage to the grape vines, Costa said.

His project is just one of many projects implemented throughout the San Joaquin Valley that helped capture a share of the past winter's near record rainfall. A recent survey found that about three-quarters of the 81 San Joaquin water districts surveyed were actively recharging this year. The majority of districts were engaging in some type of on-farm recharge, including extra irrigation on active cropland, inundation of fallowed land or substituting surface water instead of groundwater for irrigation (a method known as in-lieu recharge), said Ellen Hanak, director of the Public Policy Institute of California's Water Policy Center, which conducted the survey.

Despite an increasing number of districts and growers adopting this practice, its full potential has yet to be realized, as policymakers create frameworks for this emerging method and researchers quantify its value.

"There is not a lot of on-farm recharge being done today, but it's growing and will continue to grow," said Joe Choperena, Sustainable Conservation's senior project manager.

Understanding an Emerging Method

At first glance, this technique seems to have no drawbacks. On average, it's cheaper than surface water storage, like using reservoirs, and has a huge capacity for replenishing water supplies. Plus, there's plenty of farmland available for recharge.

A 2015 University of California study identified 3.6 million acres of farmland where water can safely percolate deep into the underlying aquifer with low risk of crop damage or groundwater contamination, and a preliminary calculation showed that this farmland could soak in as much as 1.2 million acre-feet of water per day. Groundwater recharge projects could provide about six times more storage capacity than surface water storage for the same price, reported Stanford University's Water in the West in 2014. A 2016 study estimated the price of on-farm recharge at at $36 per acre-foot for a site in the Kings River Basin, which is significantly cheaper than surface water storage and dedicated recharge basins.

With that amount of land and relatively inexpensive recharge potential, why hasn't this practice been more widely adopted?

Expensive Barriers

A map of soil suitability for groundwater recharge from a report. (The Regents of the University of California)

Several obstacles, notably infrastructure and surface water availability, have limited the widespread implementation of on-farm groundwater recharge.

Water agencies in the San Joaquin Valley considered infrastructure issues to be the most significant barrier to recharge this year, according to the recent PPIC survey. On-farm groundwater recharge often requires flood irrigation infrastructure, which many farmers replaced with more efficient systems like drip irrigation during past dry spells to save water.

A report for Sustainable Conservation estimated the cost of installing a flood-irrigation system on a 160-acre farm to be $850,000. While this may sound like a sizable expense for farmers, the organization's marketing and communications director Alex Karolyi pointed out that, when amortized over 20 years, it equates to storing water for future use at a cost of $98 per acre-foot, which is a lot cheaper than the $200–$2,000 per acre-foot that farmers ended up paying for imported surface water during the last drought.

"I think it is safe to say that if infrastructure were in place we could begin to replenish what is typically pumped from groundwater in most years if floodwaters are available," said Anthony (Toby) O'Geen, soil resource specialist at Cooperative Extension at the University of California, Davis, and lead author on the 2015 U.C. study.

The availability of surface water, whether in a river or a canal, is another issue. Some of the regions with the worst groundwater overdraft and best suitability for on-farm recharge, like the Tulare Basin, have no access to surface water, according to U.C. Davis hydrologist Helen Dahlke, whose research pioneers the study of this technique.

Crop tolerance for excess levels of saturation also determines site suitability. Dahlke and her team currently have five experimental sites across the state testing the impacts of on-farm recharge on various crops, including alfalfa, almonds and pistachios. "So far, it has looked pretty good [for] alfalfa," said Dahlke, but the research is ongoing with other crops.

Between 2014 and 2017, her team applied 4–26ft of water to alfalfa fields on two farms in Northern California for an average of six to eight weeks between January and April with no negative impacts on crop yield.

These results show farmers that on-farm groundwater recharge will not damage their crops while also indicating to water districts and environmental organizations like Sustainable Conservation the types of agriculture they should target.

Sustainable Conservation is studying how 11 crops, including grapes, pistachios and walnuts, can handle flooding in spring and early summer when large releases from reservoirs offer water for recharge. During wet and above-normal precipitation years, the most optimal times for on-farm recharge in California are from December to May, when farmers can capitalize on flood pulses or on reservoir releases.

A 2017 study looked at the availability of high magnitude streamflow – flows above the 90th percentile that exceed environmental flow requirements and current surface water allocations under California water rights – in the Sacramento, San Joaquin and Tulare basins. The researchers found "that there is sufficient unmanaged surface water physically available to mitigate long-term groundwater overdraft in the Central Valley."

Financing the Future

But the cost of capturing that excess water can be prohibitive. Even though on-farm recharge's mean price is cheaper than other water storage options, Dahlke cautioned that comparing the cost of on-farm recharge projects with other forms of water storage is limited because the actual price of any given project can vary and is contingent on the state of the infrastructure not only on the farm but also the canal or pipeline delivering the surface water.

The cost of water obtained from managed aquifer recharge projects – of which on-farm recharge is a type – in California could range from $80–$960 per acre-foot per year, wrote Bea Gordon of Stanford's Water in the West. Several factors influence the price, including land cost, lack of available data and changes to the cost of environmental compliance.

"The fact of the matter is, with cost, it's more complicated than just [an] amount," said Hanak of PPIC. "You need to factor in the bigger costs for the value of expanding capacity."

Even with sufficient infrastructure, the on-farm recharge project on Lodi grower Costa's property was hampered by the cost of electricity. The project had $5,000 set aside for paying for electricity to pump water from the Mokelumne River to the site, and the funds were eaten up after running the pump all day for 12 days, said Sustainable Conservation's Choperena.

Even in that small amount of time, though, John Podesta, manager of North San Joaquin Water Conservation District, was amazed at how much water Costa was able to put in the ground on a small section of his vineyard.

"There is so much potential on this property and there [are] a lot of long-terms plans … to make this site a long-term recharge site," he added.

Since the passage of the 2014 Sustainable Groundwater Management Act (SGMA), water districts, growers and the state government have invested more in groundwater recharge to halt overdraft and balance out aquifer levels. Recent water bonds – namely Proposition 1 – and other government funding mechanisms have allocated billions of dollars for improving water storage infrastructure, including groundwater recharge projects, but the competition for the funds is high and permitting of groundwater recharge projects remains complex and time-consuming.

Dahlke said that many of the challenges associated with on-farm recharge will resolve as water agencies comply with SGMA by working to manage groundwater more sustainably and more research sheds lights on the benefits of this emerging technique.

With the Sierra Nevada snowpack projected to substantially decrease by the end of the century because of climate impacts, California's current water infrastructure will need to adapt. The key to future water storage is groundwater, contends U.C. Davis hydrogeologist Graham Fogg.

"We used to have more snow," said Fogg. "We need to find another storage mechanism. Groundwater is a great place for that."

# # #

The Unintended Consequences of Indoor Water Conservation
Public Policy Institute of California | November 29, 2017 | Lori Pottinger

High rates of water conservation helped California manage limited supplies during the 2012–16 drought. But conservation can have a downside. New research shows that indoor water conservation can reduce the quality and quantity of wastewater, making it harder for local agencies to use treated wastewater to augment their water supply.

We talked to two members of the research team about their findings: David Jassby, associate professor of civil and environmental engineering at UCLA; and Kurt Schwabe, professor of environmental economics and policy at UC Riverside and an adjunct fellow at the PPIC Water Policy Center.

Jassby summarized the problem: “In general, as people conserve water inside their homes, the concentration of contaminants in the wastewater goes up—organic matter, nitrogen, detergents, and more. All of these things have to be treated.”

Schwabe noted that in the past, recycled water was mostly used for irrigating nearby cropland and median strips—not drinking. But as treatment processes have improved and demand for water increased, recycled water has become an integral part of the drinking water supply in some areas, where it is used to replenish groundwater basins. In many communities, treated wastewater is discharged into rivers and streams and used by downstream entities that treat the water again.

Salinity is a particular challenge. “Most wastewater treatment plants can treat higher levels of nutrients, but they’re not designed to treat higher levels of salinity,” Schwabe said. “What this means is the water that is discharged into streams or to farms or into aquifers for groundwater recharge will be saltier, which reduces water quality and crop yields.”

Schwabe noted that while utilities can employ technical fixes to address drought-related wastewater quality issues, this doesn’t address the problem of quantity. Indoor conservation results in less treated water flowing into streams or available for reuse.

On average, only about 10% of municipal wastewater is reused in the US. Israel reuses 85–90% of its wastewater—perhaps the highest rate in the world, Schwabe said. California is adopting new rules on “direct potable reuse” of treated wastewater, which would enable cities to add treated wastewater directly into their water supply.

“Farmers in some parts of California are becoming increasingly reliant on treated municipal wastewater from neighboring urban areas. This is an effective strategy for dealing with water scarcity. But it also reveals that conservation—another effective drought strategy—might in some instances work at odds with wastewater reuse.”

Urban areas are also affected. For example, recycled wastewater is a significant portion of stream flow in the Santa Ana River in Southern California. Indoor conservation reduces water supply for communities in downstream reaches of the river.

Does this mean that people abandon conservation? The researchers say no. “Our results are intended to illustrate how different drought mitigation actions are related so agencies can plan, communicate, and coordinate in the most informed and cost-effective manner possible,” said

Schwabe. “Conservation mandates that don’t recognize these linkages can have significant and negative consequences on the effort to reuse wastewater.”

Jassby noted that the place conservation happens is key: “When people are asked to conserve water, they should be encouraged to conserve water outside the home.”

More broadly, having water supply and wastewater treatment agencies cooperate in how they manage their systems can also help, Schwabe said.

# # #

Local Management Plans May Not Protect California Groundwater from Climate Change Risk

YubaNet.com | November 27, 2017 | Union of Concerned Scientists

November 27, 2017 – While hundreds of local agencies across California draft their plans to ensure the sustainability of groundwater basins, water experts say in a white paper released today that these state-mandated plans need to incorporate climate change impacts to be sustainable. The paper is intended to serve as a resource to help agencies do just that. The white paper was published by the Union of Concerned Scientists (UCS) and Stanford University's Water in the West program.

"Many water managers are not trained in the climate science needed to understand how best to estimate the future impacts of climate change on their water resources," said Geeta Persad, Ph.D., post-doctoral scientist at the Carnegie Institution for Science at Stanford and co-author." Yet the law requires them to incorporate climate change into their plans, which is extremely difficult to do on the scale of a groundwater basin, even with more funding and expertise. This white paper aims to help them navigate the process of incorporating climate change projections appropriately," she said.

Researchers analyzed two dozen local plans submitted to the state earlier this year. They found nearly half of these plans did not include a quantitative analysis of climate change, though the state requires them to do so.

The paper is the culmination of research conducted by the Union of Concerned Scientists and scientists, professors and graduate students at Stanford as part of a Stanford Law School Policy Lab.

"The uncertainty of each basin's future, as well as the state's, presents huge challenges for groundwater management in California," said Tara Moran, Ph.D., research associate at Water in the West and co-author. "However, uncertainty cannot be an excuse for inaction. Scientific and technical tools exist to create plans that cope with an uncertain future," she said.

Climate models for California predict a shrinking snowpack in the Sierras and a change in the timing and availability of water. The severity of these impacts depends on how quickly and how deeply emission reduction over the next decade are achieved.

There are 515 groundwater basins in California, 127 of which are over-drafted, which means the amount of water pumped out exceeds safe and sustainable levels of extraction.

The Sustainable Groundwater Management Act (SGMA), passed in 2014, mandates that newly formed agencies manage local basins and ensure sustainability of their underground water supply by 2040.

Yet, the authors found many agencies were not using the appropriate climate data in their plans for their management goals. Failure to incorporate the range of future scenarios into the planning process can have severe consequences. For example, one water agency chose to use a moderate climate change scenario in its plan and only projected impacts out to 2025. However, a high climate change scenario for that same region resulted in a threefold decrease in groundwater supply, which would provoke extreme consequences on that agency's future groundwater recharging efforts.

“A moderate approach may seem prudent, but it is just as likely that future impacts will be much more severe,” said Juliet Christian-Smith, Ph.D., climate scientist and co-author. Christian-Smith was formerly with UCS and is now a senior program officer at the Water Foundation. “Management choices that do not take severe climate change scenarios into account may not be robust enough to protect communities and water users from severe water shortages and other problems,” she said.

The white paper makes a series of recommendations for process improvements that local, state and federal agencies should take to better incorporate climate science in groundwater planning. A key recommendation is that the U.S. Bureau of Reclamation’s Central Valley Project (CVP) and the California Department of Water Resources’ State Water Project (SWP) be consistent in how they use climate science when projecting future water supplies. The CVP and SWP provide significant agricultural and urban water supplies across the state. Local agencies use their projections to inform the groundwater sustainability plans they write.

An additional recommendation is that local groundwater sustainability agencies stress-test their plans against more extreme climate projections and consider both wetter and drier future scenarios rather than relying on historic averages or only moderate scenarios.

“Just as we plan and build infrastructure to be able to withstand a severe earthquake, water managers must plan for groundwater basins to withstand the types of extreme droughts and weather events we are already seeing and will see more of as the climate changes,” said Christian-Smith. “Groundwater sustainability agencies need to make tough choices now to be able to get their communities through the very hard conditions we may face in the future,” she said.

Californians rely on groundwater for about 40 percent of their water supply in average years and much more in dry years.

“Climate science tells us clearly that the future will not look like the past. We need to ensure water managers get and use the climate change information they need and apply climate science correctly when managing our groundwater basins. After all, in the coming decades, the entire state will depend much more on shared underground supplies,” said Adrienne Alvord, Western States director at UCS.

# # #

The Drought May Be Over, But California Still Wants Residents to Act Like It's On Forever

State considers adopting permanent wise water use rules starting in April

Water Education Foundation | November 27, 2018 | Gary Pitzer

Gov. Jerry Brown announces the state's first-ever mandatory water cuts while standing in a bare meadow in the Sierra Nevada in 2015.

For decades, no matter the weather, the message has been preached to Californians: use water wisely, especially outdoors, which accounts for most urban water use.

Enforcement of that message filters to the local level, where water agencies routinely target the notorious "gutter flooder" with gentle reminders and, if necessary, financial penalties.

The situation turned critical during the 2012 to 2016 drought, when reservoirs sank to alarmingly low levels. Gov. Jerry Brown famously delivered a 2015 press conference announcing the state's first-ever mandatory water cuts while standing in a bare meadow in the Sierra Nevada that should have been under five feet of snow.

A year earlier, the State Water Resources Control Board, California's top water cop, issued emergency rules to put the brakes on water use during a time when it was suggested the state might actually run out of water.

On Tuesday (Nov. 21), the board began the process of making those rules permanent, creating a basis of lasting reductions in the urban landscape. A public workshop will be followed by an expected February adoption of the rules.

"This is one small part of a larger framework to make conservation in California a way of life, which in and of itself is part of even a broader vision to manage our water resources sustainably," said Charlotte Ely, senior environmental scientist with the State Water Resources Control Board.

The regulations, aimed to be implemented by April 1, 2018, target the steps people can take in the suburban landscape to lessen their outdoor water use and promote conservation.

While water agencies throughout the state regularly enforce outdoor use restrictions, the State Water Board's proposed regulation "is … necessary, practical," and ensures "statewide consistency and congruity," Ely said.

The regulations target certain "wasteful water practices" – banning runoff from landscaping and the application of water to hardscapes such as driveways and sidewalks , requiring hoses to be equipped with shut-off nozzles for vehicle washing, banning the use of potable water in non-recirculating ornamental fountains and banning the irrigation of turf on public street medians "unless the turf serves a community or neighborhood function."

"This is significant because it's about shifting societal norms in response to shifting environmental conditions and as a society that's something we need to do in the same way that we have done it in other areas, such as our waste stream," said Max Gomberg, climate and conservation manager with the State Water Board. "We used to throw everything in one bin and

it went to the landfill. Now we sort, we recycle and that's been an important societal shift in terms of how we use resources."

While the expected water savings "will be low, a drop in the bucket," Ely said, over the long term, the rules "would have a lasting impact in changing the way we value and manage water here in California."

The State Water Board adopted emergency conservation regulations in the summer of 2014 as California weathered a historic drought. Board members agree that California residents need to take saving water to the next level, even if it means making customers request the glass of water that would normally accompany a visit to a restaurant.

"We need a certain set of tools to press down the gas pedal a little bit on conservation and I'm convinced this is one of those that we can exercise with the drought/flood cycle," Vice Chair Steven Moore said.

Board member Dee Dee D'Adamo said it's important for the state to enable local agencies to continue their water conservation duties unhindered.

"In the event we do go forward I think we need to be thoughtful about unintended consequences," she said. "We need to provide some flexibility and give communities plenty of time to go through this in a thoughtful way and to consider the costs."

Identifying wasteful water use involves some nuance that is contemplated by the regulations.

"We recognize that in some instances irrigating turf may provide functional and recreational benefits," Ely said. "We are not proposing a permitting or approval process for determining whether or not the irrigation of that turf provides a community or neighborhood function."

# # #

Surface water could refill Californian groundwater supplies

California's groundwater "overdraft" could be paid off by redirecting high levels of flow in streams, rivers, reservoirs and other water channels, according to researchers in the US.

Environmental Research Web | November 27, 2017 | Jon Cartwright

"There is enough water physically available to mitigate long-term groundwater overdraft," said Helen Dahlke of the University of California, Davis. "We just have to manage it more efficiently."

In years of high streamflow, the team's analysis shows, over three cubic kilometres of excess surface water is exported from California's Central Valley to the Sacramento–San Joaquin Delta, often when the required flows of the delta and its major rivers are exceeded. That's potentially enough to boost or even replenish groundwater levels, over time.

Over the last 100 years, the volume of groundwater in California's Central Valley has dropped by an estimated 185 cubic km, and continues to drop by 0.6 to 3.5 cubic km each year. Although this overdraft is small compared to the total level of groundwater, which is close to 4000 cubic km, it is significant compared with the groundwater that is of useable quality – typically the top 100–300 m. What's more, extracting deeper groundwater at times of drought is not an option available to all landowners, with deep, high-capacity wells costing hundreds of thousands of dollars.

Together with Tiffany Kocis at UC Davis, Dahlke statistically analysed the flow of rivers in the Central Valley to see whether surface flow could alleviate the problem. Within the valley, the Sacramento River, the San Joaquin River and their tributaries transport huge volumes of water to the Sacramento–San Joaquin Delta. Much of this is vital to sustain the needs of fish and other aquatic species, to ensure minimum water-quality standards and to meet other requirements, but there is often a surplus – especially in winter, California's rainy season.

The researchers analysed the flow records of 93 stream gauges in the Central Valley, and identified the volume of water transported in the top 10% of flows – storm flows – for each. By looking at how often these storm flows occurred, they were able to estimate the total amount of surplus surface water.

Suitable storm flows occurred in 7 out of 10 years in the Sacramento River basin, and in 4.7 out of 10 years in the San Joaquin–Tulare Basin, mostly from storms scattered over a few days between November and April. In those storm years, some 3.2 cubic km of surplus surface water headed towards the delta – water that could potentially be used to replenish groundwater supplies, via a process known as groundwater banking. This is done already, Dahlke says, "but not at the scale that we would like it to happen, since wet years might become more rare. Thus, we need strategies in place to make the most out of the surface water when it is available in abundance."

There are several methods to bank groundwater. One is to substitute surface water for groundwater to reduce groundwater use; another is to supply surface water to those who normally use groundwater; yet another is to actively replenish groundwater by letting water infiltrate the surface, or by injecting it in wells.

But perhaps the most promising method, according to Dahlke, is to flood farmland with surface water in the winter, so that the water is present as shallow groundwater for use later when surface water supplies are running low. "[This would allow] California to adapt to climate change

and to make use of big storm flows when they become available in extreme wet years, as we just had," she said.

# # #

California Groundwater Recharge Brings Opportunities, Complications
Sierra Sun Times | November 24, 2017 | Kevin Hecteman

Nearly everyone agrees groundwater recharge is a great idea, but how should it be done? Where should it be done? Who should do it?

Those were the questions swirling around the Sacramento Convention Center as agricultural, environmental and regulatory professionals explored the subject at a public forum sponsored by the California Department of Food and Agriculture and the State Board of Food and Agriculture.

"We know that we have an overdraft problem throughout California," said Don Cameron, vice president and general manager of Terranova Ranch in Fresno County and a Food and Agriculture board member. "Now, with sustainable groundwater management, we're going to have to address this. We have to have our plans in place by 2020."

The Sustainable Groundwater Management Act, enacted in 2014, mandates local agencies and groundwater users to come up with ways to manage aquifers within their jurisdictions. Plans for local Groundwater Sustainability Agencies were due in June.

California Farm Bureau Federation Associate Counsel Jack Rice, who participated in the forum, said groundwater recharge generally involves three basic types of activities:

Groundwater banking, which moves surface water underground for specific users' later use, such as the Kern Water Bank;
Groundwater replenishment, which uses various approaches to move surface water underground for the general benefit of a groundwater basin;
Practices that slow the flow of water to increase percolation, using tools such as cover crops, swales, stockponds and floodplains.
"It's going to be in (farmers') interest to invest in groundwater recharge or participate in groundwater recharge," Rice said during a panel discussion at the forum. "They do need to be careful about what it means for them as far as impacts to their crops, potential regulatory effects or whether they have complied with various permitting requirements. With that in mind, we know groundwater recharge is one of the only ways to add water to the system."

Could this mean taking a back-to-the-future approach?

"When we used to flood-irrigate much of the San Joaquin Valley," Rice said, "we had adequate groundwater levels."

Conversion to more-precise irrigation methods have had an impact, he said.

"We went to microirrigation, so very little water goes below the root zone," Rice said, adding that installation of drip irrigation often meant removal of the canals and ditches used to distribute water for surface irrigation. "Now that we are looking for ways to divert high winter flows to areas where recharge can occur, this old infrastructure would be really helpful."

CFBF President Paul Wenger, who attended the forum, said farmers with generations of experience can be a valuable resource.

"We've been on the same ground for 106 years," said Wenger, a third-generation farmer near Modesto. "If you want to talk about a vision and what can be sustainable, then you come to farmers and ranchers who have been on this ground, who understand the idiosyncrasies of the microclimates and the situations they're in. They know the soil. They know the water."

Irrigation districts should be in the game as well, Cameron said.

"We have to measure the water we're bringing in so we can account for it, and we need to see if there's any effects that we're not expecting," he said.

At the heart of the forum, held earlier this month, was the question of whether groundwater recharge should be considered a beneficial use of water.

"Groundwater recharge is not considered a beneficial use in California and at the federal level," Cameron said. "We need to change that. What's more beneficial than rebuilding your water supply?"

Rice said broad agreement on the subject is still lacking because of concerns about permitting and potential impacts on other water users.

"Many people are discussing whether it would be possible for groundwater recharge to be considered a beneficial use if conducted in accordance with a groundwater sustainability plan," Rice said. "Though the details of permitting recharge projects are still being sorted out, many realize the importance of finding ways to make groundwater recharge simple and efficient."

Representatives of the state Environmental Protection Agency and State Water Resources Control Board indicated government agencies are working to streamline the permitting process.

Forum organizers said the event was intended to identify benefits, opportunities and barriers to groundwater recharge, and come up with ways to implement recharge projects.

Tim O'Halloran, general manager of the Yolo County Flood Control and Water Conservation District, called the topic "complex."

"You have to approach it from a very long-term perspective," O'Halloran said. "It's not a matter of just opening the gate and letting the water flow. You have to have your water rights, your permits. You have to have your infrastructure set up so you can reach it during the winter."

The Yolo County district has had a temporary permit for high-water diversion from the State Water Resources Control Board for the past two years. That represents an additional water right, O'Halloran said, and is junior to all others.

"We haven't been able to bring in enough water to put it on farm fields; we just get enough to fill up our canal system," he said.

"I've had a lot of discussions with our farming community, our farmers, about what would work for them, and what wouldn't work," O'Halloran added. "There's no-one-size-fits-all for the farmers. Their participation will depend on their specific circumstances."

Cameron said doing nothing is not an option.

"The long-term benefit to this groundwater recharge is sustainability," Cameron said. "We know we're going to have more droughts. We just went through five years of drought followed by record rainfall. We're seeing more extremes in our weather here. To be resilient, and to continue to farm the land we're farming now, we need to rebuild our groundwater."

# # #

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Is big infrastructure still possible today?
Daily Democrat | November 27, 2017 | Matt Rexroad

Can California still successfully take on big projects or is that part of our history already over? As high-profile infrastructure projects ranging from high speed rail to the Delta Tunnels face an uncertain future, that's a critical question that lies before our next Governor.

We were once known for ambitious projects like the California State Water Project which transformed the state and allowed for rapid development in the Central Valley and Southern California.

Today, it's extremely unlikely that a project that size and scope could ever be built. If California can't succeed any longer in taking on huge infrastructure needs, it will have huge implications for the future of the state.

Gov. Brown has taken on no shortage of ambitious infrastructure projects. All of them continue to face numerous setbacks. In addition to the two most high profile and controversial — high speed rail and the Delta Tunnels — the Central Valley Flood Protection Project is a major endeavor with uncertainty in budget or viability. While I have serious concerns about aspects of each of these infrastructure developments, and some are ill-advised to the point where they should not be built, there is no changing that a substantial amount of money and time has already been poured into them.

The bigger question is whether state government can pull them off at all in a fiscally responsible manner.

Much has changed since the Golden Era of infrastructure projects of the 1950s and '60s. During this period, the state's water system was modernized and made us the nation's largest agricultural producer. Highways were built to develop our transportation system and paved the way for economic development that led us to be the sixth largest economy in the world. There is no doubt California would look very different if they had never been built.

However, if attempted now, getting environmental approvals and overcoming political opposition from interests affected by these kinds of projects would be a herculean if not impossible task. This has been one of the biggest hurdles for high speed rail and the Delta Tunnels as lawsuit after lawsuit has been brought against them.

Keeping projects on schedule and on budget also seems out of reach for today's government officials. When the first Bay Bridge was built between Oakland and San Francisco, it was completed early and below budget. Its modern replacement blew past its original cost estimate of $250 million to a final total of $6.5 billion and was years late. Another major and high profile project, the Oroville Dam spillway saw costs nearly double from $275 million to $500 million in less than a year. A similar pattern has emerged with high speed rail and the Delta Tunnels projects which regularly push back schedules and announce increased cost projections and budget overruns.

This is so common now that the public just assumes projects will overshoot their budgets. Every time this happens, confidence in government officials to pull off major projects takes a hit. California is not just famous for its pristine beaches and great weather, but also for its red-tape and bureaucracy. Unfortunately, many of the state laws and policies that built this reputation

also hurt our ability to take on mega projects and are a major contributing factor to spiraling cost overruns and schedule delays.

Overcoming these challenges will squarely fall on California's next governor. The outcome of the state's high-profile megaprojects has incredible stakes for the future of meeting infrastructure needs. If high speed rail or the Delta Tunnels fail, it could very well mark the end of an era of doing big things. If a governor as influential as Brown has failed to overcome the challenges of modern, large infrastructure projects, it's hard to see the next governor having any more success.

As Brown retires to his ranch in Colusa County, Sites Reservoir, the public works project many of us most desire will be just a short distance away and subject to the same state bureaucracy that is currently flailing about. Whether we can chart a course for meeting future generations' needs is an important and unanswered question. Right now, it's not looking very optimistic.

# # #

Rising reservoirs: Less room for error this winter on San Joaquin River
Recordnet.com | November 24, 2017 | Alex Breitler

It was our saving grace: Last winter, a mostly empty New Melones Lake swallowed up torrents of water that otherwise would have had to be dumped into a lower watershed that already was flooding.

Without all of that room at New Melones, the damage along the lower San Joaquin River and in the Delta could have been much worse.

Today, that cushion is mostly gone. New Melones holds four times as much water as it did at this time last year. That's good news if the state shifts back into a dry pattern. But if California gets hit with another string of atmospheric river storms this winter, there won't be enough room to hold it all back.

"We're going to be looking at a 1997-style event," said Chris Neudeck, a Delta levee engineer with the Stockton firm Kjeldsen, Sinnock & Neudeck. He was referring to the region's last major flood, which resulted in two dozen levee failures.

No one knows if last year's intense atmospheric river storms will return. A weak La Niña pattern has formed in the Pacific Ocean, a phenomenon that generally leads to drier conditions in Southern California and wet weather in the Pacific Northwest. In Northern California, it's anyone's guess what will happen.

"We're nervous," said Manteca-area farmer Mary Hildebrand. "We're glad that the season is starting out slower than it did last year, but that doesn't mean it won't get bad in January."

Water levels

A look at some reservoirs above San Joaquin County:

• Camanche (Mokelumne River): 70 percent full, 123 percent of normal

• New Hogan Lake (Calaveras River): 58 percent full, 159 percent of normal

• New Melones Lake (Stanislaus River): 83 percent full, 147 percent of normal

• Don Pedro Lake (Tuolumne River): 79 percent full, 122 percent of normal

• McClure Lake (Merced River): 65 percent full, 147 percent of normal

• Friant Dam (San Joaquin River): 63 percent full, 154 percent of normal

There is at least 3 million more acre-feet of water in California reservoirs this year, and many are above average. Most, however, including New Melones, are not yet full enough that they're required to release extra water to create more room for this winter's storms.

New Hogan Lake east of Stockton is the exception, and it illustrates the difficult balance between maintaining an adequate water supply in reservoirs while avoiding serious flooding.

New Hogan is only about 58 percent full. But that's much higher than it ordinarily would be in late November, before the rains come. So the U.S. Army Corps of Engineers began releasing larger volumes of water from New Hogan down the Calaveras River this week, with plans to lower the reservoir to what engineers consider to be an appropriate level by mid-December.

The problem is that New Hogan is a small reservoir, one which a few big storms quickly could overwhelm. As a result, those who are in charge of securing our water supply must allow more water to be released now, with no guarantee that later storms will replenish it.

That can be frustrating.

“The reservoir was built for flood control, and those of us in the water (supply) industry tend to forget about that,” said Scot Moody, general manager of the Stockton East Water District, which sends Calaveras water to eastside farms and the city of Stockton.

But there is a case to be made downstream of California reservoirs this year by those who don’t want to be flooded out and would like to see dam managers err on the side of caution by releasing water more liberally, before the storms arrive.

“As soon as there is any forecast of a wet rain period, they need to start immediately increasing their releases,” said Hildebrand, who was evacuated briefly with hundreds of others when a San Joaquin River levee nearly failed during last winter’s moderate flood.

But, she acknowledges, with the state’s severe drought still fresh in the minds of Californians, it may be difficult to argue for earlier releases.

Hildebrand supports revisiting the rules that govern dam operations, based on new information about climate change and how it is expected to increase the amount of runoff. The San Joaquin watershed is believed to be especially vulnerable to climate-intensified flooding as snow levels rise in the Sierra Nevada and storms drop more rain instead.

For now, after an exhausting year that included months of emergency levee patrols across the region, she’s hoping for a break.

“Each week that goes by where there’s not a forecast of a whole lot more snow and rain, the more you breathe a little deeper,” she said. “But it can change so quickly these days.

“A normal year would be nice.”

# # #

California Supreme Court Confirms Certain Groundwater Pumping Charges are Outside Scope of Prop 218

The Downey Brand | December 4, 2017 | Staff

On December 4, the California Supreme Court ruled that groundwater pumping charges levied to fund a basin-wide conservation and management program were not property-related fees subject to Proposition 218. The decision, City of San Buenaventura v. United Water Conservation District (Cal. Supreme Court Case No. S226036), will reverberate through water management and public agency circles for years to come.

Monday's decision arose out of a long-running dispute over pumping charges levied by United Water Conservation District as to well pumpers within its territory, including the City of San Buenaventura. The City argued that the District's volumetric pumping charges, which were substantially higher for non-agricultural users and which were directed toward funding the District's groundwater conservation and replenishment programs, were inconsistent with Proposition 218. In the City's view, the fees were property-related charges that failed to comply with the procedural and substantive requirements of California Constitution, Article XIII D. The City further argued that even if these fees were not property-related charges subject to Article XIII D, the District had not demonstrated that such fees, in this case, bore a reasonable relationship to the benefits received by the payors (a requirement of Article XIII C).

The Supreme Court granted review of the case in 2015. In its long-awaited decision, a unanimous Court concluded that the District's groundwater charges were not property-related fees under Proposition 218. As to the question of whether the relationship between charges and benefits was appropriately allocated among the payors, the case was remanded to the lower court for further discussion and analysis.

Pumping Charges Funding Groundwater Management Programs Are Not Property-Based Fees

The Supreme Court reasoned that the critical question before it was whether a charge for the District's conservation and management services qualifies as a "charge for a property related service" pursuant to Proposition 218. Article XIII D of the California Constitution, adopted as part of Proposition 218, provides that no fee or charge may be assessed "as an incident of property ownership" except those property-related fees that satisfy the substantive and procedural requirements of Article XIII D. Reviewing past decisions on this question, the Supreme Court distilled the current state of the law as follows: A fee is charged for a "property-related service," and is thus subject to Article XIII D, if it is imposed on a property owner, in his or her capacity as a property owner, to pay for the costs of providing a service to a parcel or property.

While acknowledging that water is "indispensable to most uses of real property," the Court cautioned that not all fees associated with obtaining water are property-related fees within the meaning of Article XIII D. Here, the challenged fees were associated with groundwater production from particular parcels, based on usage classifications, but funded a basin-wide program of groundwater replenishment and management. The Court noted in particular that the District conserves and replenishes groundwater in a series of interconnected series of underground basins, none of which corresponds with parcel boundaries, for the benefit of all of the public that relies on groundwater supplies.

In light of that, the Court reasoned, the District performed its service not "in its capacity as the owner of the lands" on which its wells are located, but "in its capacity as an extractor of groundwater from stores that are managed for the benefit of the public." (emphasis added). Given that relationship, the pumping charges were not an incident of property ownership under Proposition 218 and were therefore outside the scope of Article XIII D.

Groundwater Charges Levied Must Bear a Reasonable Relationship To Benefits Received by Payors

Certain charges are exempt from the definition of a tax under Article XIII C—these include property-related fees adopted in compliance with Article XIII D and certain payments for government-provided privileges or benefits. In the case of the latter, the charges must be "no more than necessary to cover the reasonable costs of the governmental activity," and are subject to the requirement that "the manner in which those costs are allocated to a payor bear a fair or reasonable relationship to the payor's burdens on, or benefits received from, the governmental activity." (Cal. Const., art. XIII C, § 1, subd. (e).)

While not disputing the reasonableness of the District's aggregate costs for funding its groundwater management programs, the City argued that nonagricultural users like the City bore a disproportionate share of the fiscal burden of supporting the District's activities, in violation of Article XIII C. As to this question, the case was remanded back to the lower court for a determination of whether the manner in which the District had allocated costs bore a fair or reasonable relationship to the payor's burdens on, or benefits received from, the governmental activity. (See Cal. Const., art. XIII C, § 1, subd. (e).)

Sifting Through the Questions, Identifying Solutions, and Planning for the Future

Agencies statewide have anticipated the City of San Buenaventura decision as an answer to long-held uncertainties regarding water agency fee levies. Unfortunately, Monday's decision leaves many of these questions unanswered.

The Court offered no opinion as to whether it would consider groundwater pumping charges imposed by local agencies to fund the costs of groundwater management under SGMA to be analogous to the fees endorsed as non-property related levies here. (See Water Code § 10730.2). As to that pressing concern, the Court merely offered in a footnote that it was "unclear…whether the Legislature intended to express any judgment on the interpretive question before us, as opposed to, for example, signaling its agreement…that groundwater charges are exempt from Article XIII D's voter approval requirement as charges for water service." We expect those questions to be the source of future litigation as agencies work across the state to implement and fund groundwater sustainability plans under SGMA.

Likewise, the Court also expressly refrained from offering an opinion as to whether the District's practice of charging a uniform fee across an area because of the infeasibility of allocating costs on a parcel-by-parcel basis complies with Proposition 218's proportionality requirements. The Court was cautious in stipulating that fees need not be directly tied to the particular cost as to any one individual user, nor did it rule out the possibility that a government agency might have a reasonable basis for charging higher fees to some payors than to others. Of particular note, the Court did not address whether Water Code section 75594's proscribed three-to-one ratio for non-agricultural usage fees versus agricultural usage fees was unconstitutional on its face

(though a concurring opinion suggested that this was the result). These questions, too, will be the source of continued debate.

Our public agency attorneys are watching this issue closely and will offer thoughts and guidance in future alerts as the law on this issue continues to evolve.

# # #

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Panel Recommends Changes to Two-Decade-Old EPA Water Affordability Guidelines
Circle of Blue | November 28, 2017 | Brett Walton

In a highly anticipated report, a panel chartered by Congress to advise public agencies on effective governance recommends that the U.S. Environmental Protection Agency revise how it appraises financial burdens when communities are required to upgrade water and sewer systems.

Observers say that the revisions, if the EPA accepts them, could change the agency's permitting and enforcement of municipalities under the Clean Water Act and Safe Drinking Water Act, the bedrock federal environmental laws that occasionally result in multibillion-dollar modifications of water treatment facilities. That means communities could have more time to complete required projects.

"It's a big deal," Chris Hornback of the National Association of Clean Water Agencies, a trade group, told Circle of Blue, referring to the report's recommendations and the enforcement changes that might come if the EPA revises its water affordability guidelines.

Even Congress recognizes that the rising cost of water and sanitation service in the United States requires new approaches by utilities and regulators. Lawmakers, in the 2016 budget deal, ordered the National Academy of Public Administration, an organization that works to make government more effective, to evaluate the EPA's water affordability guidance and suggest improvements.

NAPA's 233-page report was finalized in October. It contains 21 recommendations that range from better communication between headquarters and regional offices to helping communities develop customer aid programs for poor households. It also includes guidelines for utilities that want to look holistically at clean water investments, a process the EPA calls "integrated planning."

The core of the report, however, is four suggestions for improving the EPA's affordability calculations. The calculations are required for infrastructure projects that bring cities into compliance with federal clean water statutes.

With the help of NAPA's professional staff, five academy fellows wrote the report. The chair, Stan Czerwinski, was the former chief operating officer of the National Governors Association.

Water utility experts from trade groups and academia praised the panel for a thorough and nuanced assessment that was informed by hundreds of interviews with water officials and policy leaders, several roundtable discussions, and industry surveys.

"Their critique of the status quo is spot-on," Manny Teodoro, a public policy professor at Texas A&M, told Circle of Blue.

Outdated Affordability Measurement

The status quo to which Teodoro refers is a 1997 document that guides the agency in its approach to combined sewer overflows, as well as broader planning “frameworks” that were published in 2012 and 2014.

Combined sewers, common in the Midwest and New England, are systems that carry both sewage and stormwater. They are designed to spill waste into rivers and lakes when the system’s flow is too strong, usually during heavy rain. Separating these systems to reduce the pollution load in waterways has been crushingly expensive for some cities, and water and sewer bills have soared.

In evaluating whether a community could pay for a project, the EPA relied on two measures: a “residential indicator” to show household ability to pay, and a “financial indicator” to reflect the utility’s debt load and operating costs.

The residential indicator was based on the city’s median household income (MHI). If the cost of an average sewer bill did not exceed two percent of MHI, then the project was deemed affordable.

The NAPA panel and those with whom it consulted agreed that MHI is inadequate for measuring affordability. It is a blunt tool, one that masks severe financial burdens in the poorest households. In Baltimore, for instance, a quarter of the population earns less than the federal poverty line. As incomes in the United States have diverged, the middle is increasingly unrepresentative of the country as a whole.

Respondents and the panel also agreed that all water costs — drinking water, sewer services, and stormwater — should be included in affordability calculations.

NAPA was not prescriptive in its recommendations. The report acknowledges that, given the wide variation in the nation’s tens of thousands of water and wastewater providers, the EPA will need flexibility in how it writes and enforces permits. But the agency also needs a common starting point for evaluations.

Instead of a replacement metric for MHI, the panel offered five attributes that new guidance should reflect: calculated from public data, clearly defined, easy to understand, reliable, and comparable between utilities.

“These are all sound recommendations that should improve regulatory implementation if EPA and state-level regulators take them seriously,” Teodoro said.

“We look forward to using this information to help communities and utilities fund their infrastructure needs while ensuring services remain affordable,” EPA spokeswoman Tricia Lynn told Circle of Blue. Lynn said that the EPA agrees with many of the recommendations in the report, but would not elaborate on specific recommendations.

Unanswered Questions

Defining or measuring affordability is one task. Acting on it is another. A more lenient definition from the EPA means that communities may approach unaffordable rates more quickly and thus

be granted more time to plug leaky sewers and build mammoth cisterns to hold back rainwater. Instead of 15 years to curb sewage discharges, a city may get 25 years or 30. The system improvements will still be required, just farther down the road, Hornback said.

The question that lingers is still, how to pay for it? Delaying a project for a few years may allow a community to identify a cheaper solution. But it may not. Federal grants for such projects largely dried up in the 1980s, though low-interest loans are still available and certain states such as California and Texas have stepped in with significant state funding. Philadelphia has pioneered a water rate based on household income, and other cities are considering similar measures.

Regulators, advocates, and others worry about two Americas for water quality: wealthier communities that can afford to operate and maintain their systems to the highest standards and subsidize those at the bottom; and poorer areas where drinking water that meets federal standards is available only at a spigot outside town hall. Those concerns cannot be allayed simply by changing the affordability criteria.

Perhaps the most significant question is whether the EPA will act on the report's recommendations. Hornback recalled that the NAPA recommendations are not substantially different from ones made a decade ago by the EPA's internal advisory committee.

"The reliance on median household income only may disguise the impact of income distribution and poverty rate for many utilities," the Environmental Financial Advisory Board wrote in May 2007.

How the EPA acts on the NAPA report remains to be seen, he said.

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