

DROUGHT: PREPARING FOR AN UNCERTAIN FUTURE

Background Information



ASU Arizona State
University


Museum of Science.



Northeastern

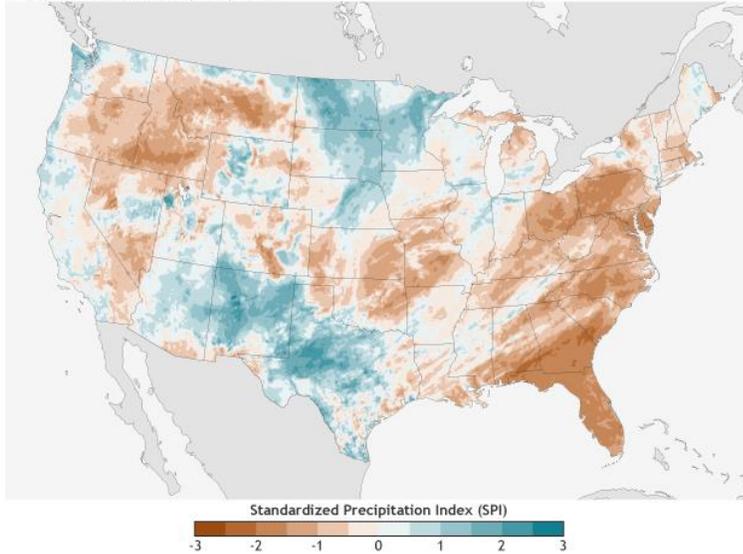
 **ECAST**
EXPERT AND CITIZEN ASSESSMENT
OF SCIENCE AND TECHNOLOGY

Section 1: Vulnerabilities to Drought

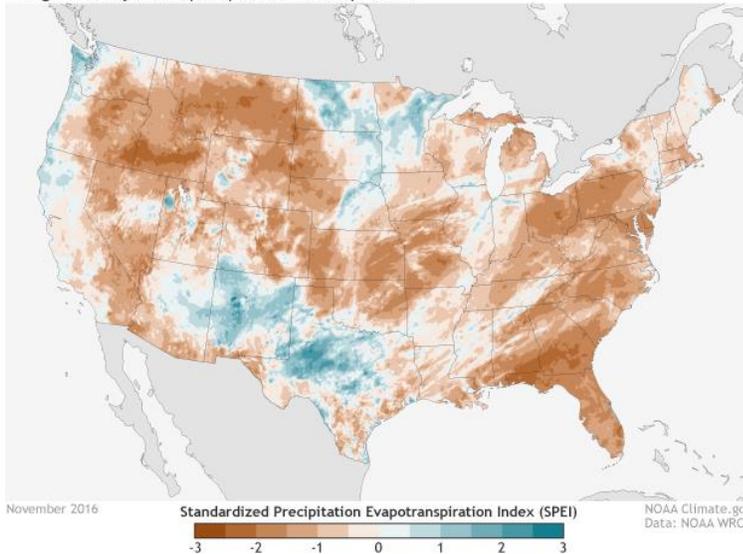
Drought Overview

Droughts occur across the U.S. and scientists predict droughts will become more severe in the future.

Drought severity due to precipitation



Drought severity due to precipitation and temperature



These two maps show different ways scientists monitor drought. The upper image is based on a lack of rainfall. The lower image is based on a lack of rainfall and water loss due to wind and warm temperatures. In both, red colors mean drier than normal conditions and blue colors mean wetter than normal. Source: <https://www.climate.gov/news-features/blogs/beyond-data/western-drought-it-aint-over-tilwell-it-aint-over>

Droughts impact people, ecosystems, and the economy in numerous ways. They increase the risk of wildfires, can lead to water shortages, and hurt farmers and ranchers' livelihoods. Resilience planners across the country are thinking about how to deal with the impacts of droughts in the future.

What is drought?

Scientists who study drought recognize that drought is complicated. Drought can mean a time without rainfall, it can mean dry soils (of concern for farmers and ranchers who rely on rain), or more long-term patterns like low river flows or low lake and reservoir levels¹. Drought is most often associated with a lack of rainfall, but heat and wind contribute to drought as well². Heat and wind increase the amount of water lost from lakes, rivers, soils, and plants. The two images on the left from show two ways scientists measure drought and the importance of temperature and wind. The upper image shows drought across the U.S. due to a lack of rainfall in November 2016. The lower image shows drought due to lack of rainfall and water loss due to warm temperatures.

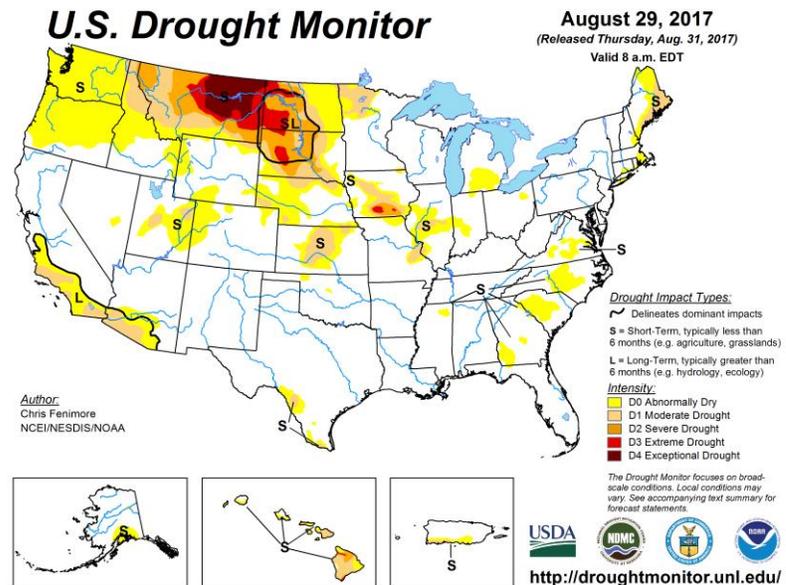
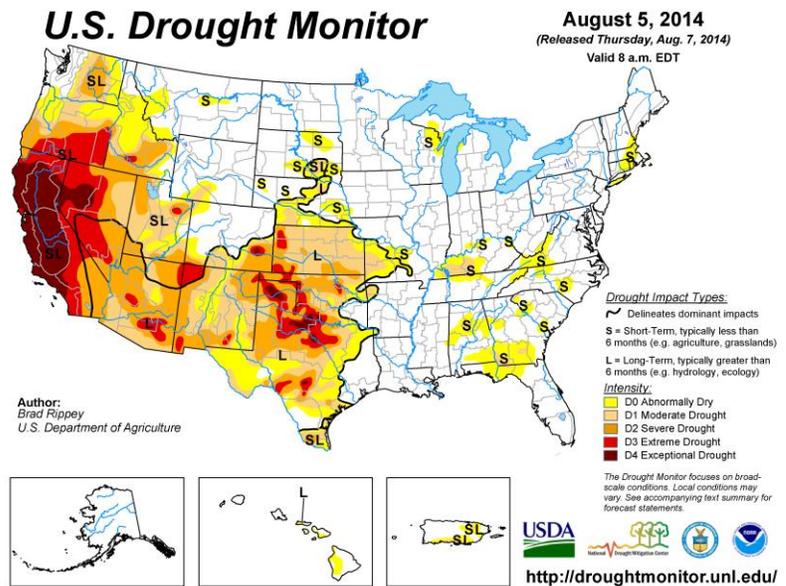
¹ <https://www.climate.gov/news-features/blogs/beyond-data/western-drought-it-aint-over-tilwell-it-aint-over>

² <https://toolkit.climate.gov/topics/water-resources/drought>

Drought is made more complicated by human management of water. Humans divert rivers to cities and farms, build dams to create reservoirs and store water, and create laws and rules about who can use specific sources of water. The Colorado River, whose watershed encompasses 7 states across the West, is a good example. A series of reservoirs, pumps, canals, and legal agreements move water far beyond its natural course, supplying water to millions of people and millions of acres of farmland.

Because of human management, not all droughts lead to water shortages. A water shortage occurs when there is not enough water to satisfy all demands for water. During water shortages, decision makers and water managers face difficult questions about who gets water. Many parts of the U.S. encounter droughts, but only the worst droughts lead to water shortages.

Droughts occur across all parts of the country. While it's almost expected that some parts of the West and Southwest occasionally suffer from drought conditions, recent droughts impacted New England and communities across the South³. At the end of August 2017, the [U.S. Drought Monitor](http://droughtmonitor.unl.edu/) showed about 26% of the country was experiencing drought, with parts of Montana, North Dakota, and South Dakota experiencing moderate to severe drought.



The U.S. Drought Monitor shows what parts of the country are experiencing drought. The upper map, from August 2014, shows the severity and extent of droughts across the West. The lower map is more recent and shows exceptionally dry conditions affecting Montana and the Dakotas in August 2017. Source: <http://droughtmonitor.unl.edu/>

³ <https://www.climate.gov/news-features/featured-images/drought-building-places-other-california>

Scientists predict droughts will become more intense over the coming decades across all the U.S. but particularly in the Southwest. River flows in the Southwest and California are also predicted to decline. Over the last two decades, the Southwest and Southeast saw a decline in the amount of rainfall compared to averages from 1902-1960⁴. Why are droughts predicted to become worse? Changes in global and regional climate alter patterns of rainfall and temperature. As temperatures increase and rainfall patterns change, some parts of the U.S. will be left drier than in the past several decades. Temperatures influence drought in other ways. Higher temperatures affect if precipitation falls as rain or snow. In many parts of the U.S., snow is important to water supplies because it 'stores' water and releases it slowly into rivers as it melts. If more precipitation falls as rain or if snow melts earlier in spring, communities dependent on snowpack might not be able to capture this water in reservoirs for use during the rest of the year.

Not all communities experience droughts in the same ways. Communities that rely on rainfall for agriculture or raising livestock are particularly at risk to the impacts of drought. Communities get their drinking water from a variety of places, including rivers, reservoirs, and groundwater. While one community may have access to a river and groundwater, others may be dependent on a single source. The ability to store water for the future also varies across the U.S. Water pollution can make droughts worse as polluted water requires expensive treatment to be made safe to drink.

Communities across the country are considering the potential impact of drought and how to prepare for and respond to these events. The following section outlines the social, economic, and environmental impacts drought has on cities, rural areas, and people. This will introduce you the problems officials face when considering resilience plans.

Social impacts

Droughts impact people directly and indirectly. All people need a clean source of water to survive. Severe droughts can lead to water shortages that jeopardize people's lives. More indirectly, people who depend on rainfall, such as farmers and ranchers, face threats to their livelihoods due to drought. Periods of drought cause declining groundwater levels. People dependent on groundwater face dry wells and must pay to drill deeper wells or expensive water deliveries⁵. As drought takes a toll on the livelihoods and well-being of people, they are more likely to face stress, depression, and even suicide⁶.

People and businesses move because of the impacts of drought because water is not available or it is too costly to access, as is the case when falling groundwater levels require deeper wells. Migration can cause social problems as people uproot and community connections are lost. In some places, those moving due to drought may not receive a warm welcome. Northwest

⁴ <http://nca2014.globalchange.gov/report/our-changing-climate/precipitation-change#graphic-16688>

⁵ Grossi, 2017. <http://www.hcn.org/articles/the-california-drought-isnt-over-it-just-went-underground>

⁶ Vins, 2015. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4627029/>

Arizona, for example, saw an influx of farmers from California during a recent drought, which stoked worries about water availability⁷.

Drought can increase the risk of disease⁸. Lakes and rivers can increase in temperature when they are shallower, which can lead to the growth of disease-causing bacteria. Groundwater can also become polluted by bacteria during drought, which puts those who use private wells at risk. Drought forces animals to seek new sources of water in areas where humans live. This increases the risk of animal and insect-transmitted diseases. Drought can also lead to dusty conditions. Dust contributes to respiratory problems, particularly in people with asthma or other respiratory ailments. In some parts of the country, dust can also lead to respiratory infections, such as valley fever, which is caused by fungi that live in soils.

Drought can hurt crop yields both due to a lack of water and by increasing the risk of pest infestation. Lower crop yields lead to decreased availability of food and higher food prices, which directly threatens human well-being. Drought can also lead to social and legal conflict as people and communities attempt to secure dwindling water supplies. Georgia, Florida, and Alabama have been battling in court over for water use rights along the Chattahoochee River for decades⁹, with one dispute eventually leading to a U.S. Supreme Court Case¹⁰. Likewise, the states of New Mexico and Texas have been in a legal standoff for decades over water use and groundwater pumping near the Rio Grande, which supplies water to cities and farms in both states and in Mexico¹¹.

Economic impacts

Droughts impact many parts of the economy. People that rely on rainfall are particularly at risk. This includes farmers and ranchers. Drought can decrease yields from farmland and threaten pastureland that livestock depend on. To cope with the impacts of drought, farmers and ranchers must take expensive measures to protect their crops and livestock. For ranchers, this means bringing in water and fodder for their animals. For farmers, dealing with drought might mean pumping groundwater, planting different crops, or leaving fields fallow.

Pumping groundwater to offset the impacts of drought can be expensive and is often only a short-term solution to drought. Through 2011 and 2012, low snowpack in southern Colorado and northern New Mexico led to low river flows in the Rio Grande¹². Reservoir storage hovered around 5% due to prolonged drought, meaning that little stored water was available for agricultural irrigation. For farmers in the Mesilla Valley north of Las Cruces, NM, low reservoir

⁷Associated Press, 2016. <http://www.sandiegouniontribune.com/sdut-california-nut-farms-move-to-arizona-raises-water-2016apr03-story.html>

⁸ CDC, 2017. <https://www.cdc.gov/nceh/drought/default.htm>

⁹ <https://www.npr.org/2016/10/30/499985890/florida-and-georgia-argue-in-court-over-water-rights>

¹⁰https://www.washingtonpost.com/politics/courts_law/supreme-court-justices-wade-into-florida-georgia-water-fight/2018/01/08/89b61f18-f4aa-11e7-a9e3-ab18ce41436a_story.html?utm_term=.29101444fc9c

¹¹ Haederle, 2013. <http://articles.latimes.com/2013/jan/25/nation/la-na-texas-water-20130126>

¹² <https://www.climate.gov/news-features/features/costs-drought-rio-grande>,
<https://www.climate.gov/news-features/features/drought-rio-grande>

levels meant they had to pump groundwater to flood their fields of onions, alfalfa, chilies (famous to the region), and groves of pecan trees. Groundwater pumping is more expensive than using surface water irrigation, which hurt Mesilla Valley farmers' bottom lines. Low river flows also meant less groundwater recharge. This compounded farmer's problems as groundwater levels fell. Falling groundwater levels reduced pumping efficiency and necessitated expensive new wells for some farmers.

Drought impacts on farmers and ranchers affect the rest of the economy. Recent droughts in Texas and Oklahoma in 2011 led to \$5.2 billion dollars in lost crops and livestock, including cattle, corn, and cotton¹³. These losses rippled through the economy as crop prices increased throughout the world. Droughts across the Southeast US in 2016 hurt corn and peanut production for farmers in Alabama and Georgia¹⁴.

Drought also impacts infrastructure. As communities pump groundwater to cope with drought, land can sink, a process that scientists call subsidence. Severe groundwater pumping can cause land to sink several feet over a few decades, as was the case in California's San Joaquin Valley. From 1965 to 2013, the land surface sunk about 7 feet due to years of groundwater pumping¹⁵. Sinking land damages roads, powerlines, railways, and canals, which necessitates expensive repair and can cause disruption to key services.

Severe droughts could lead to water shortages in cities and towns. Shortages can lead to cuts in water deliveries to some users. Manufacturers and other major water users might have to suspend production or shutter their doors, hurting employment and economic activity. Other sectors of the economy might also be effected. Construction of new homes may slow as people worry about the area's water supply. Golf courses, which are often important to local tourism, could see water deliveries cut. Investment in new businesses may also decline due to worry about water supply.



Land in the San Joaquin Valley has sunk about 7 feet due to groundwater pumping. Image from [USGS](https://ca.water.usgs.gov/land_subsidence/).

Environmental impacts

Dry conditions affect ecosystems, plants, and animals, which in turn can affect people and their livelihoods. Droughts lead to lower river and lake levels. This can lead to warmer water temperatures—shallow water warms more quickly— and can impact water quality. Blooms of

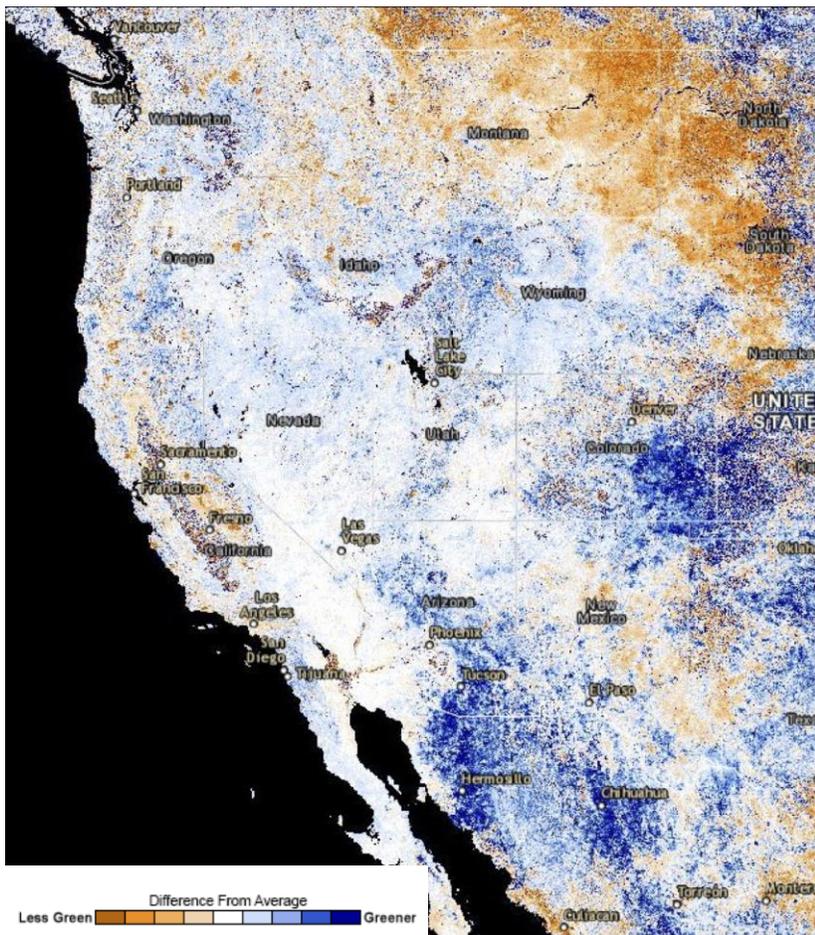
¹³ <http://today.agrilife.org/2011/08/17/texas-agricultural-drought-losses-reach-record-5-2-billion/>

¹⁴ http://www.sercc.com/SERCC_drought_report_Oct_2016.pdf

¹⁵ https://ca.water.usgs.gov/land_subsidence/

toxic cyanobacteria and algae are more likely in warmer water, which threatens both ecosystem health and water supplies critical to humans¹⁶.

On land, dry conditions can stress plant and animal communities. Most basically, drought can lead to less healthy plants. Scientists use satellites to track the 'greenness' of land and measure the impacts of droughts. Less green means plants in that area are likely experiencing the impacts of drought. The map on the next page shows areas that experienced more 'greenness' compared to average across the American West in early August 2017. A large consequence of less healthy forests is an increased risk of wildfire. Drought makes forests more susceptible to catastrophic wildfires by stressing trees and increasing the risk of infestation by pests¹⁷.



This map shows areas of the American West impacted by drought during the first two weeks of August 2017. Blue areas are those that are greener than average. Red areas are less green suggesting that plants are less healthy in those areas. Map from the University of Arizona's Droughtview Program: <https://droughtview.arizona.edu/>

Prolonged drought can cause the types of plants going in an area to change. Nonnative plants often overtake ecosystems changed by drought. In Western North America, nonnative grasses contribute to increased risk of wildfires, which in turn leads to more burned areas where nonnative grasses can continue to grow. This 'feedback loop' has led to drastically altered range lands¹⁸. Plant changes can impact the types of animals present, affect key environmental processes like erosion control, and impact human uses of lands for activities like grazing.

In response to a lack of surface water due to drought, some communities rely on groundwater to meet their needs. Pumping groundwater faster than it is replenished leads to declining groundwater levels. Declining groundwater levels can in turn impact the

¹⁶ <https://www.epa.gov/nutrientpollution/climate-change-and-harmful-algal-blooms>

¹⁷ Breshears, 2005. <https://dx.doi.org/10.1073/pnas.0505734102>

¹⁸ <https://www.fs.usda.gov/ccrc/topics/drought>

amount of water in nearby streams, rivers, and springs. This can lead to changes to plant and tree communities along rivers and can impact the movement and health of fish.

Section 3: Potential Resilience Strategies for Drought

Cities will need to plan for drought and its impacts in the coming decades. Tradeoffs of various resilience strategies and uncertainty about the extent of future droughts complicate these planning efforts. The following section outlines three possible strategies that can help communities prepare for drought. This section will give you an overview of these strategies and the social, economic, and environmental impacts of each. This information will prepare you to make your own resilience plan for the city that you and your fellow participants will be considering, based on the discussion you will have with your table on the day of the event about the range of possible resilience strategies and their tradeoffs.

CONSERVE & PROTECT – Reduce water use and clean existing polluted water sources

One way communities can prepare for drought is to use existing water sources more efficiently. Conserving water can help communities prepare for drought in two ways. If communities use less water, then the impacts of drought will be less drastic. Saving water can ensure that there is more water available during droughts in the future but only if a community can store saved water for the future. If water saved by a community is used to support new homes, businesses, or agriculture, then that water will not be available for use in the future.

Outdoor water use represents a large portion of total water use across the country. Replacing lawns and lush plants with drought-tolerant plants and mulch or gravel can reduce outdoor water demands at homes, offices, and stores. However, replacing lush landscaping with drought-tolerant landscaping can raise outdoor temperatures, particularly during the hottest part of the day. Other measures to reduce outdoor water use include installing automatic irrigation systems and general conservation measures like washing cars and patios less.

To save water indoors, communities can fix leaks and replace faucets, toilets, and showers with more efficient fixtures. Over the past few decades, water-efficiency requirements for faucets and fixtures have reduced water use across the country as new fixtures were installed in new and old homes. But many homes still have old fixtures that use a lot of water. Older homes are also more likely to have leaks. Replacing fixtures and fixing leaks can range from relatively simple repairs to more extensive construction depending on the extent of leaks.

Houses aren't the only source of leaks in a community's water system. Water lines, canals, and other pieces of the water distribution system can also leak. Replacing old water mains and lining or covering canals ensure that more of the city's water supply actually reaches users. However, these leak repairs require extensive construction and can take a long time to complete. Many water mains lie beneath streets, meaning replacing them requires disruptions to traffic.

Irrigated agriculture uses a lot of water. In California, for example, agricultural irrigation accounts for about three quarters of all freshwater use¹⁹. Installing water-efficient irrigation systems, such as drip irrigation systems, can reduce the amount of water farmers need for their crops. These systems are expensive to install and maintain and are not suitable for all types of crops. Farmers can also utilize temperature, wind, and soil moisture data to adjust the amount of water they use on their crops, which can lead to better yields and more water efficient practices²⁰.

CONSERVE & PROTECT

CONSERVE & PROTECT involves saving water and cleaning up existing water sources. Efforts to save water include new water efficiency standards for buildings, changing water prices, drought tolerant landscaping, and water-saving irrigation technology.



ECONOMIC ★★★
Ground and surface water clean up can be very expensive depending on the level of contamination. Changing fixtures in old buildings can require costly construction but is very inexpensive to install in new buildings. Changes to water pricing increase costs for businesses that use a lot of water, such as farms and factories.

ENVIRONMENTAL ★★★★★
In general, saving water has environmental benefits only if that saved water is used for environmental purposes, like maintaining flows in a river. Cleaning surface waters can improve the environment by reducing contamination that harms plants, animals, and ecosystems.

SOCIAL ★★★
Increasing the price of water can impact the price of some goods and can impact residents' utility bills. Construction for new landscaping or replacing fixtures can be disruptive to residents and businesses. If saved water can be stored, conservation can increase the amount of water available to the community for the future.

Water pricing can also be used to conserve water. Increasing water prices can encourage residents, businesses, and industries who use a lot of water to adopt water-efficient practices or technologies. Changing water prices comes with some tradeoffs. Depending on how much prices are increased and for what users, increasing water prices can strain residents' and business' budgets and could impact the prices of some goods.

Many communities have ground or surface water that goes unused because of contamination. Industrial activity, runoff from streets, and other activities can cause harmful chemicals to pollute surface and groundwater, making it unusable without treatment. Cleaning polluted water allows communities to utilize water resources in their own backyard.

Read through this box to learn more about the Conserve & Protect strategy. You will use this information during your discussions at the forum.

Treatment plants rely on filters and other processes to remove pollutants, though the type of treatment varies depending on the pollutant. For groundwater pollution, these treatment

¹⁹ https://ca.water.usgs.gov/water_use/2010-california-water-use.html

²⁰ <https://toolkit.climate.gov/case-studies/precise-soil-climate-and-weather-data-help-dairy-optimize-water-use>

plants pump water from the ground, treat it, and then pump it back into the ground nearby. Pumping cleaned water back into the ground helps control the spread of contaminants. Treatment plants are expensive to build, maintain, and operate. They require extensive construction to build and a lot of electricity to run.

NEW SUPPLIES & STORAGE – Develop new sources of water and invest in ways to store water for the future

While the Conserve & Protect strategy focuses on preserving existing water sources, the New Supplies & Storage strategy emphasizes investment in new sources of water and ways to store water for the future. Most communities get their water from rivers or groundwater. The availability of new sources of water depends greatly on local climate, geography, and infrastructure.

Most water on the earth is salt water in oceans. Desalination, the process of removing salts from water, can take sea water and turn it into water suitable for drinking. Desalination plants require large amounts of electricity to operate but return a reliable source of water that is not affected by drought. San Diego, CA recently built a large desalination plant and a power plant to run it. The desalination plant uses as much energy as 30,000 homes²¹. Desalination creates very salty wastewater that is usually returned to the ocean. The full impact of this salty mixture on marine

NEW SUPPLIES & STORAGE

NEW SUPPLIES & STORAGE involves solutions to increase the amount of water available to a community. New supplies include desalination, new groundwater wells, reclaimed wastewater, or captured stormwater. Strategies for storage include expanding reservoirs and storage in underground aquifers.



ECONOMIC ★★★★★

Expanding the city's water supply ensures that businesses and people can continue to function into the future. However most of these strategies are expensive and require a lot of new infrastructure. Desalination, for example requires a lot of energy and pipes or canals to move water to where it is needed.

ENVIRONMENTAL ★★

Desalination creates very salty water that can harm marine ecosystems. Desalination is also very energy intensive. Pumping groundwater can lower water levels in streams and wetlands, which can damage those ecosystems and affect water quality. Conversely, recharging aquifers helps to maintain water levels. Stormwater capture using plants and basins improves water quality.

SOCIAL ★★★★★

In general, increasing water supply reduces the risk of water shortages, which can quickly threaten the health and well-being of a community. Pumping groundwater, however, can lower water levels and endanger the water supply of people who depend on individual private wells.

Read through this box to learn more about the New Supplies & Storage strategy. You will use this information during your discussions at the forum.

²¹ <http://www.mercurynews.com/2014/05/29/nations-largest-ocean-desalination-plant-goes-up-near-san-diego-future-of-the-california-coast/>

environments is uncertain but some scientists have found that very salty water damages plant and animal communities nearby desalination plant.

There are several ways for communities dependent on groundwater to increase the amount of groundwater available to them. If there are nearby aquifers that have not been used, a community can build new wells there and use canals or pipes to move that water where it is needed. This is usually thought of as a short-term solution or an emergency supply to be used only when needed because pumping more groundwater than is replenished is unsustainable in the long term.

To combat falling groundwater levels, communities can invest in various ways to recharge local aquifers. This can include pumping reclaimed wastewater or excess surface water underground or using 'passive' aquifer recharge basins that slowly allow water to soak back into the aquifer. Stormwater from rain can also be stored in places like parks or landscaping basins on residential or commercial properties to control runoff and allow for groundwater recharge. Actively pumping water into the aquifer can be expensive and requires substantial infrastructure and energy. Passive recharge on the other hand requires the construction of basins and communities must account for potential pollution from stormwater runoff.

Communities can store water in reservoirs, which is already a common practice across the country. Creating new reservoirs, or increasing the capacity of existing ones, requires building new dams or increasing the height of existing dams. Such construction is expensive and will flood some areas, including any communities along the stream or existing reservoir.

Cities can recycle treated wastewater, which is often referred to as reclaimed water, to increase the amount of water available for use. This could include using reclaimed water for outdoor uses, such as watering parks, golf courses, or farms, for industrial uses, such as using it to cool a power plant, or using it to replenish aquifers. Reclaimed water can be further treated to make it safe to drink. One problem with using reclaimed water is the location of wastewater treatment plants. They are usually at a lower elevation than drinking water treatment plants and many big water users. This is because cities have built their water systems to take advantage of gravity to move wastewater downhill. Using reclaimed wastewater requires pumps, pipes, and other distribution infrastructure to get reclaimed water where it is needed. Such infrastructure is costly to build and operate and requires disruptive construction in some places. Currently, most treated wastewater is released to streams and rivers. Using reclaimed wastewater for other purposes can affect the amount of water in rivers and streams, which in turn can impact those ecosystems and communities downstream.

PREPARE THE PUBLIC – Take actions that minimize the human impacts of drought

The Prepare the Public strategy addresses some of the human impacts of drought. This includes ensuring that more people have a reliable source of water, protecting people whose finances might be impacted by drought, limiting the impacts of drought-related events like wildfires, and general emergency preparedness measures.

Many people across the U.S. rely on private groundwater wells for their water supply rather than a municipal water system. Because municipal water supplies often rely on multiple sources of water, people who rely on municipal water systems are more protected against

shortages compared to people who rely on private wells. Communities can expand their municipal water systems to provide water to those with private wells. Expanding municipal water systems involves building new pumps and water mains. Beyond the construction costs and disruptions, expanding municipal water supplies also increases the demand for water on municipal water systems and increases maintenance costs for the community.

Droughts increase the risk of wildfires. To protect residents from wildfires, communities can invest in forest and grassland management. This includes clearing underbrush and dead trees, conducting controlled burns, and clearing buffers around roads, powerlines, and buildings. Communities can also invest in restoration of areas burned by serious wildfires to prevent

PREPARE THE PUBLIC

PREPARE THE PUBLIC involves safeguarding people from the impacts of droughts, including water shortages and wildfires. Solutions include grass and forest management to control wildfires, increasing access to municipal water supply systems, and drought insurance.



ECONOMIC ★★★
Grass and forest management for wildfires, expanding municipal water systems, and drought insurance and relocation efforts are expensive, however, these strategies also reduce potential harm to businesses and commerce.

ENVIRONMENTAL ★★★
Forest management for wildfires improves environmental quality by reducing the risk of catastrophic wildfires. Other Protect People strategies have little to no environmental impact.

SOCIAL ★★★★★
Preparation for wildfires reduces losses of life and property. Expanding municipal water systems ensures that those dependent on groundwater have access to a more diverse water supply. Insurance and relocation funds provide a safety net for those whose livelihoods are threatened by drought.

Read through this box to learn more about the Prepare the Public strategy. You will use this information during your discussions at the forum.

erosion and potential landslides. Wildland management to prevent catastrophic wildfires and restoration efforts increase ecosystem health. By preventing and mitigating the impacts of serious fires, these efforts also protect ecosystem processes like rainwater retention that are critical to the rivers and aquifers that supply communities with water.

For farmers, ranchers, and those dependent on personal wells, drought can pose a substantial financial hardship. The federal government has programs available to help farmers and ranchers in times of drought, but these programs can be augmented with local community support to better prepare farmers and ranchers and aid those who are affected by droughts in

other ways. These programs provide financial assistance to farmers or ranchers who lose crops or livestock due to drought or to residents who may have to import water, dig deeper wells, or even move due to the impacts of drought.

Communities can help prepare the public for the impacts of drought by investing in general emergency preparedness measures. This can include purchasing trucks that can deliver potable water to those whose wells run dry, opening shelters during extreme drought, or providing meals to those most impacted by drought. Communities can take steps prior to a drought to prepare the public such as encouraging residents to keep bottled water on hand. Investments in emergency preparedness have the added benefit of being useful for many emergencies, such as floods or wildfires. However, these measures do little to build long-term resilience to the impacts drought and instead focus on keeping people safe during times of emergency.

Now that you know how drought affects communities and you're familiar strategies to reduce those impacts, think about which impacts you're concerned about and the strategies you prefer. At your upcoming forum event, you will use this knowledge, along with your values and ideas, to collaborate with peers on creating a resilience plan for drought.