LOS ANGELES WATER FUTURE

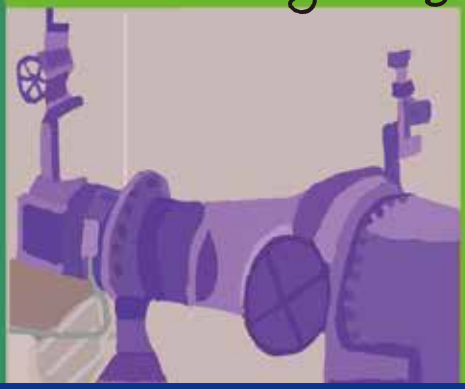
Local Supply Sources

Stormwater Capture

Water Conservation

Groundwater

Water Recycling



Cascade Pass, Inc.

Robyn C. Friend and Judith Love Cohen, Illustrations: David A. Katz

LOS ANGELES WATER FUTURE

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and
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Edited by Lee Rathbone

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Los Angeles Water Future was written by Robyn C. Friend and Judith Love Cohen, and edited by Lee Rathbone. Book designed and illustrated by David Katz.

This book is one of a series that emphasizes the environment and the value of preserving it by depicting what real people are doing to meet the challenges.
This is the eighth book in the series.

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Introduction

It is an ordinary warm, sunny, dry day in Los Angeles. You come in from your walk and you are thirsty. You walk over to the sink, turn on the faucet and there it is: clean, fresh, safe drinking water. You don't need to walk a mile to a lake and carry heavy pails back home. You don't even need to go outside and lower a pail down into a well. You don't need to boil the water or add chemicals to it.

It's so simple that you don't even think about it.

In this book, we will learn about how Los Angeles created the systems that gather, move and treat the water that we all need now, and how, in the future, more water will be provided and conservation and reliability will be improved.

This is the eighth book in Cascade Pass' environmental series. Los Angeles Water Future provides examples of how more water sources can be brought on line and how more conservation can be encouraged.

How does the water get to your home?

Most of the water that Los Angeles uses today comes to us from hundreds of miles away. The Los Angeles Department of Water and Power (LADWP) works with other agencies to make this happen. The Los Angeles *Aqueduct* brings on average about a third of the water. Two other aqueducts, the California Aqueduct, which carries water from northern California, and the Colorado River Aqueduct which carries water into California from other states, bring on average about half of the water. The aqueducts bring the water to water distribution systems that then distribute the water to users. Water that cannot be used immediately is stored in the *reservoirs* like the Los Angeles Reservoir. Water that comes to the city must be treated to make it safe to drink before it goes to your homes and businesses.

Some of the water coming to your home is from local *groundwater*, mostly in the San Fernando Valley. We get groundwater from wells that pump water from underground.

A smaller fraction of the water used in Los Angeles today is *recycled water*. The recycled water is used to *irrigate* parks and golf courses, for environmental purposes like the Japanese Gardens and Wildlife Lake and for some industrial purposes.

Eastern Sierra

LA AQUEDUCT

Treatment

Ozone Filtration
UV

Colorado River

Treated Water
Introduced

Pumping
Station

Regulator
Stations

Storage

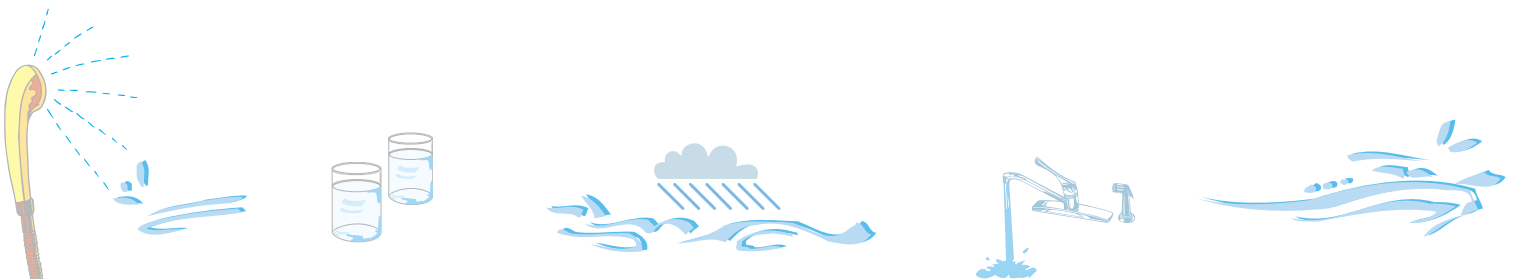
Main Lines

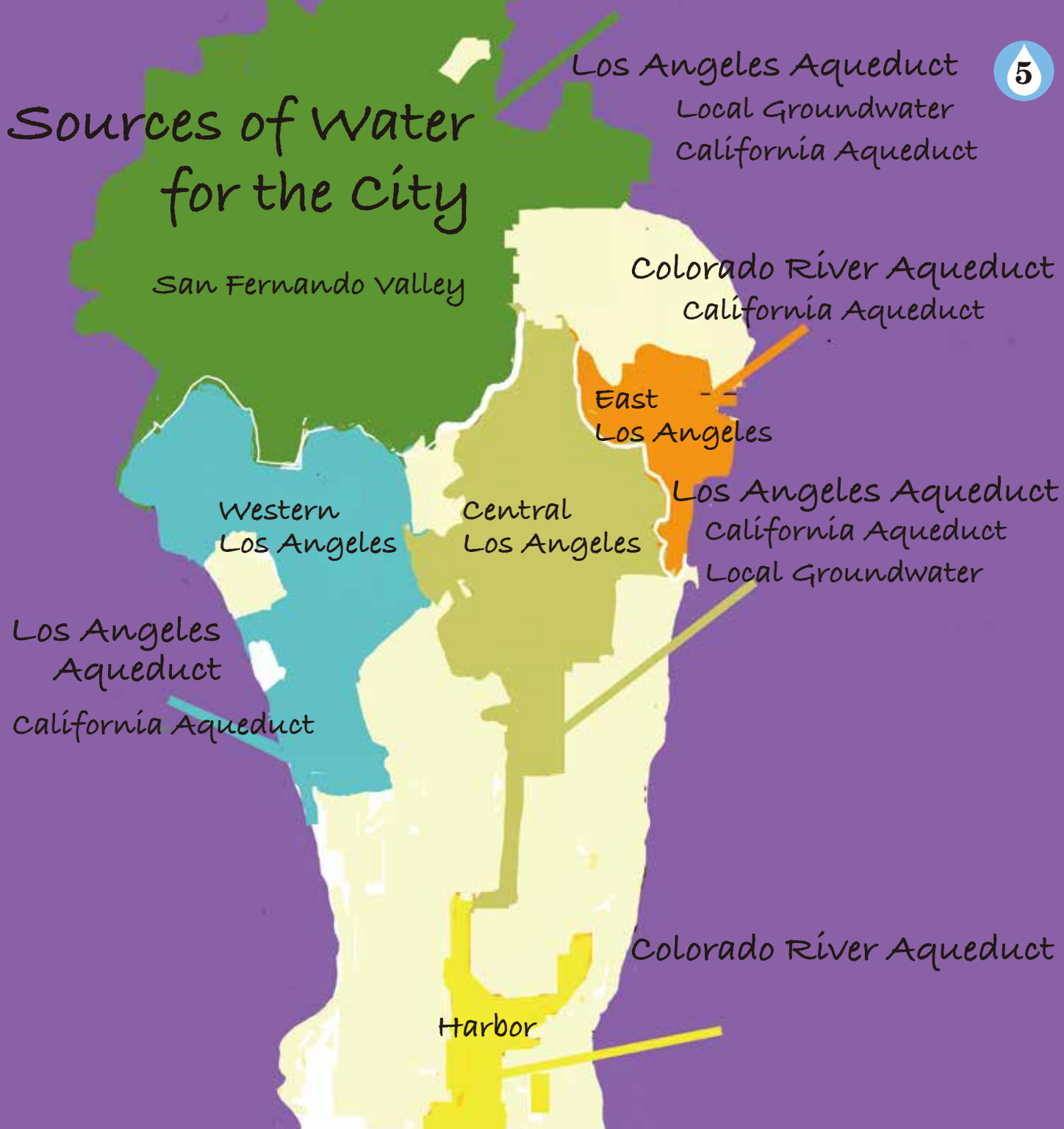
Customers

Water to Your Home

Once the water gets to Los Angeles, how does it get to your home? The LADWP takes the water from the Los Angeles Reservoir and puts it into pipes that get to our homes. Some of the water is stored in smaller reservoirs or tanks on the way to your home. These smaller reservoirs and tanks are located up in the hills, and because they are at high elevations, the force of gravity provides more water pressure to move the water through the pipes.

The LADWP has a distribution system of over 7,200 miles of pipe to deliver water to over 650,000 customers. It serves a population of approximately 4 million people.



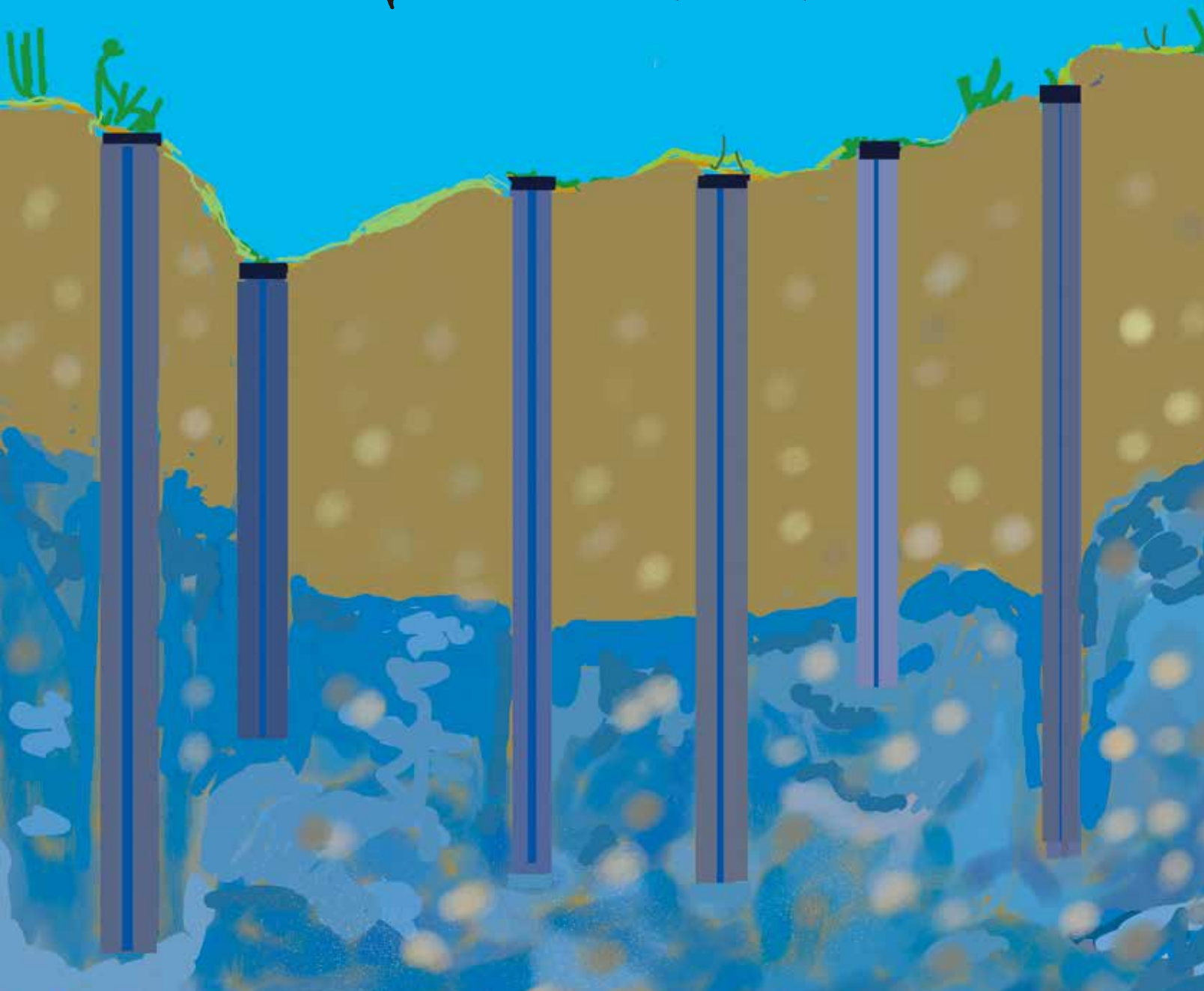

Sources of Water for the City
San Fernando Valley
Los Angeles Aqueduct
Local Groundwater
California Aqueduct
Colorado River Aqueduct
California Aqueduct
East Los Angeles
Los Angeles Aqueduct
California Aqueduct
Local Groundwater
Western Los Angeles
Central Los Angeles
Los Angeles Aqueduct
California Aqueduct
Colorado River Aqueduct
Harbor

How did our water system begin? The City of Los Angeles was born in the 1780's, more than 200 years ago. A group of Spanish settlers looking for a place to farm settled on the west bank of the Los Angeles River, near where Dodger Stadium is today. The river was their first source of water. They built ditches to carry water to irrigate their fields.

As more of the area was settled, the farmers that chose to use the land began to dig wells to pump up the groundwater to the surface. These water supplies were adequate for the residents of the City of Los Angeles for its first one hundred years of existence.

Today the groundwater wells supply about 10% of the water used by the City of Los Angeles. *Contamination* has caused many wells to be shut down. The LADWP is working to clean up this groundwater so we can use much more of it in the future.

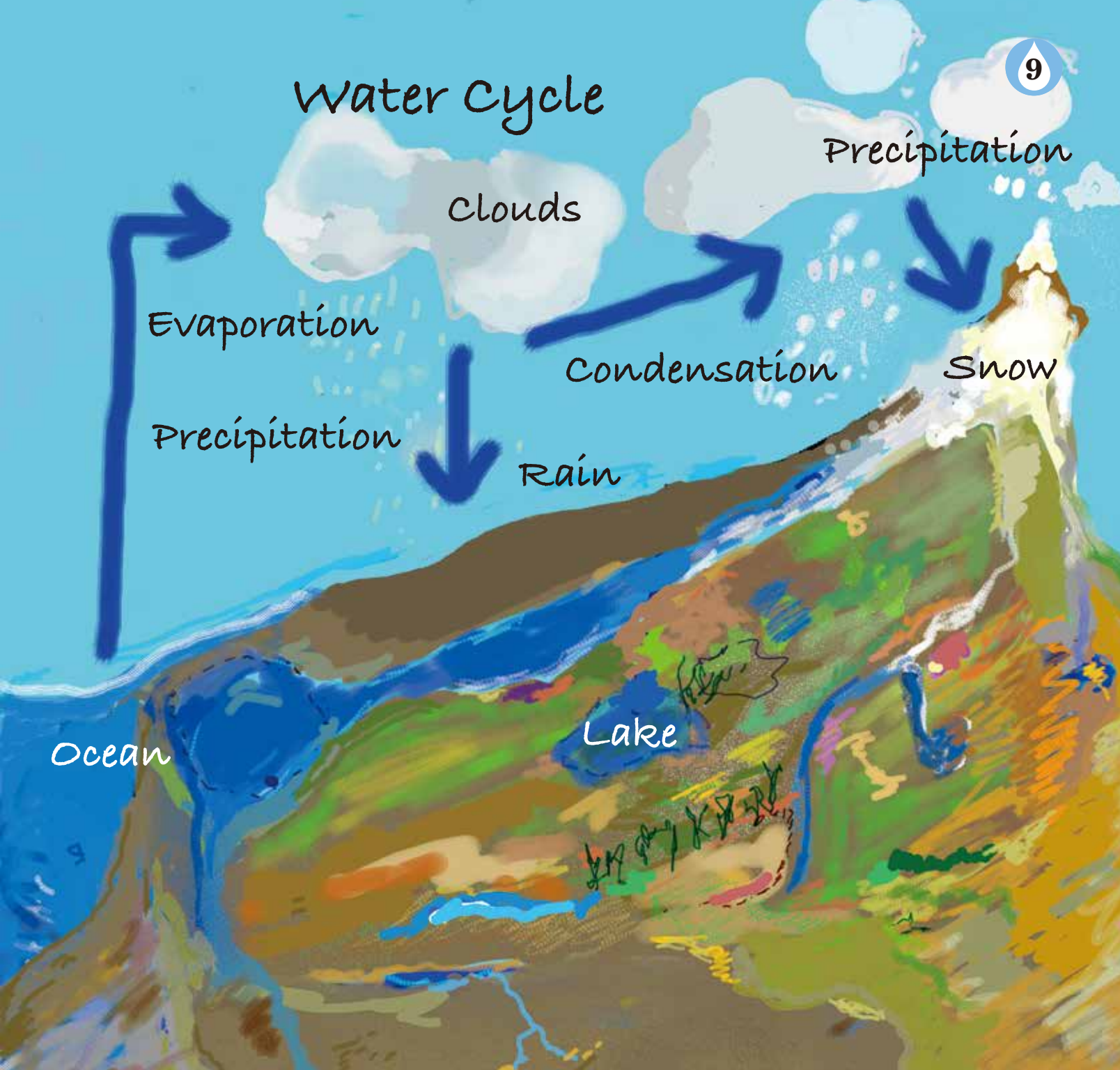
Groundwater Wells



One hundred years ago, the City of Los Angeles was growing and the Los Angeles River and the groundwater were the only water supplies available. There was not enough water for the growing population.

The City's water department had to look for more water and they found it hundreds of miles away in the Owens River. The water begins as snow in the Sierra Nevada Mountains. As the weather changes and the snow begins to melt, the water flows down the mountains and into the Owens River.

The Owens Valley is at a higher elevation than Southern California so the water is brought to Los Angeles without the use of pumps.


Water Cycle
Precipitation
Clouds
Evaporation
Condensation
Snow
Precipitation
Rain
Ocean
Lake

In 1907 the City of Los Angeles began to build an aqueduct to bring the water from the Owens River to the city. William Mulholland was in charge of building the Los Angeles Aqueduct. The Los Angeles Aqueduct was finished in 1913, more than 100 years ago.

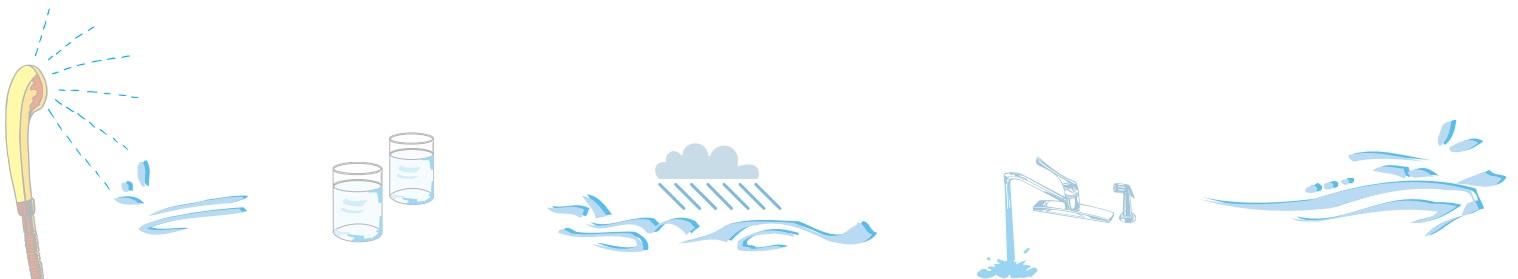
Today the Los Angeles Aqueduct brings a significant amount of water to the City, depending on the snowfall in the Sierra Nevada Mountains.

Beautiful Los Angeles Aqueduct

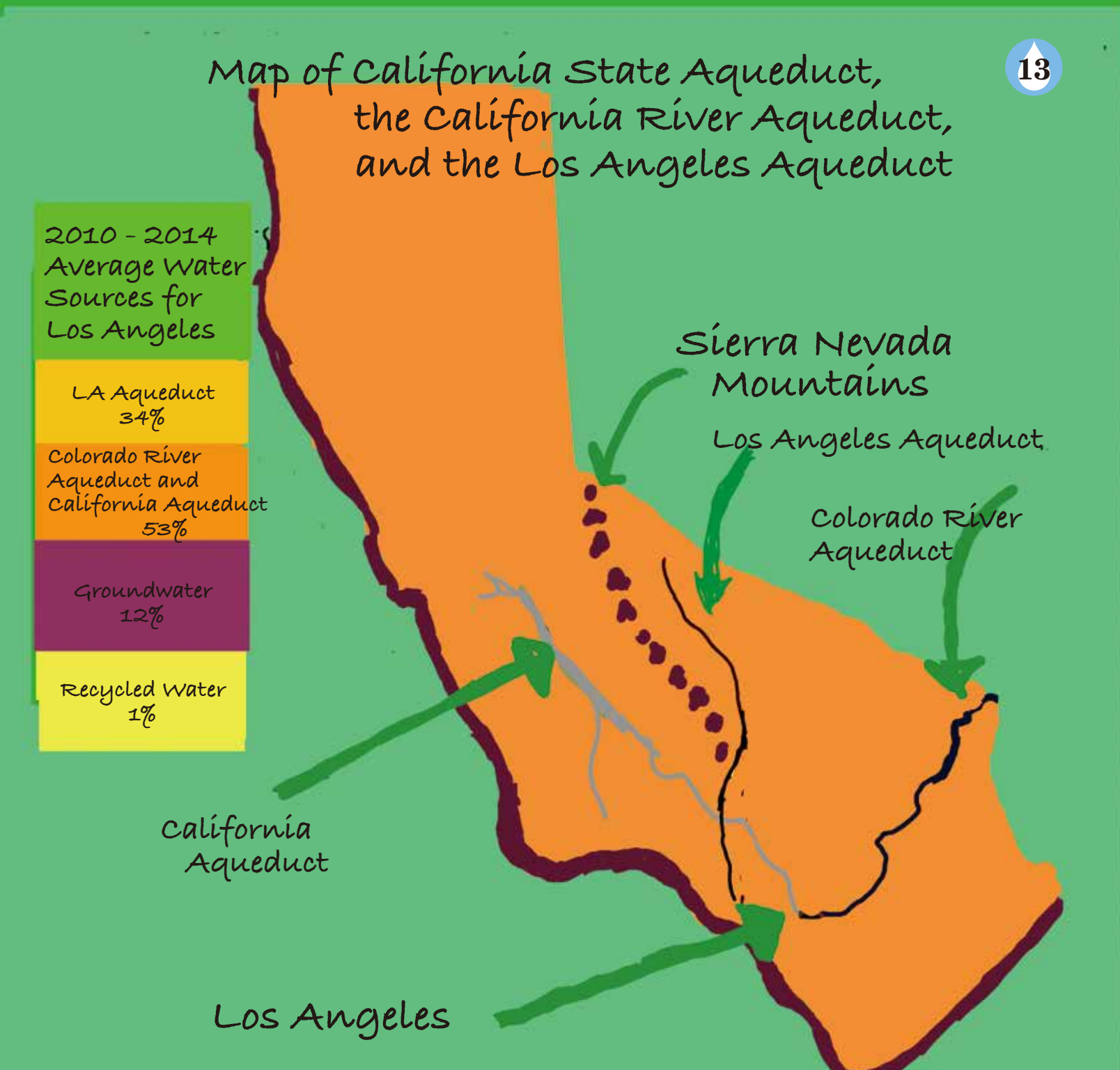
Over A Hundred Years Old

After the Los Angeles Aqueduct was completed, the city continued to grow and by the 1920's additional supplies were needed. Los Angeles, led by William Mulholland, worked with 11 other cities to form the Metropolitan Water District to help bring more water to the City and Southern California through construction of the Colorado River Aqueduct. LADWP staff helped to conduct the first surveys of this aqueduct completed in 1939.

The City continued to grow and more water supply was needed and thus, the formation of the Metropolitan Water District. When the Metropolitan Water District of Southern California built the Colorado River Aqueduct it made more water available for use in Los Angeles. The Department of Water Resources built the California Aqueduct to bring water from the western Sierra Nevada snowmelt to Southern California. This aqueduct was completed in 1973. Together, these aqueducts supply over half the water for Los Angeles.



Map of California State Aqueduct, the California River Aqueduct, and the Los Angeles Aqueduct



A *dam* not only holds water to create sources for drinking water and protects communities from floods, but it can also be used as a power source. Once there is enough water in the reservoir behind the dam, it can flow through the *hydroelectric turbines* to create electric power. Wires then carry the electric power to people's homes and businesses.

Once the water flows through the turbines, it keeps flowing down the river to places where it can be used for other purposes, like *agriculture* and drinking water. Along the way, plants and animals that live in and near the river need to be able to get water, too.

Farmers use the water to irrigate their crops and provide water for their livestock. However there is still some water that flows downstream for other people to use for drinking, cooking, washing, and gardening.

Also, people need to share this water with plants and animals that live in the *estuary*, the place where the river empties into the sea.

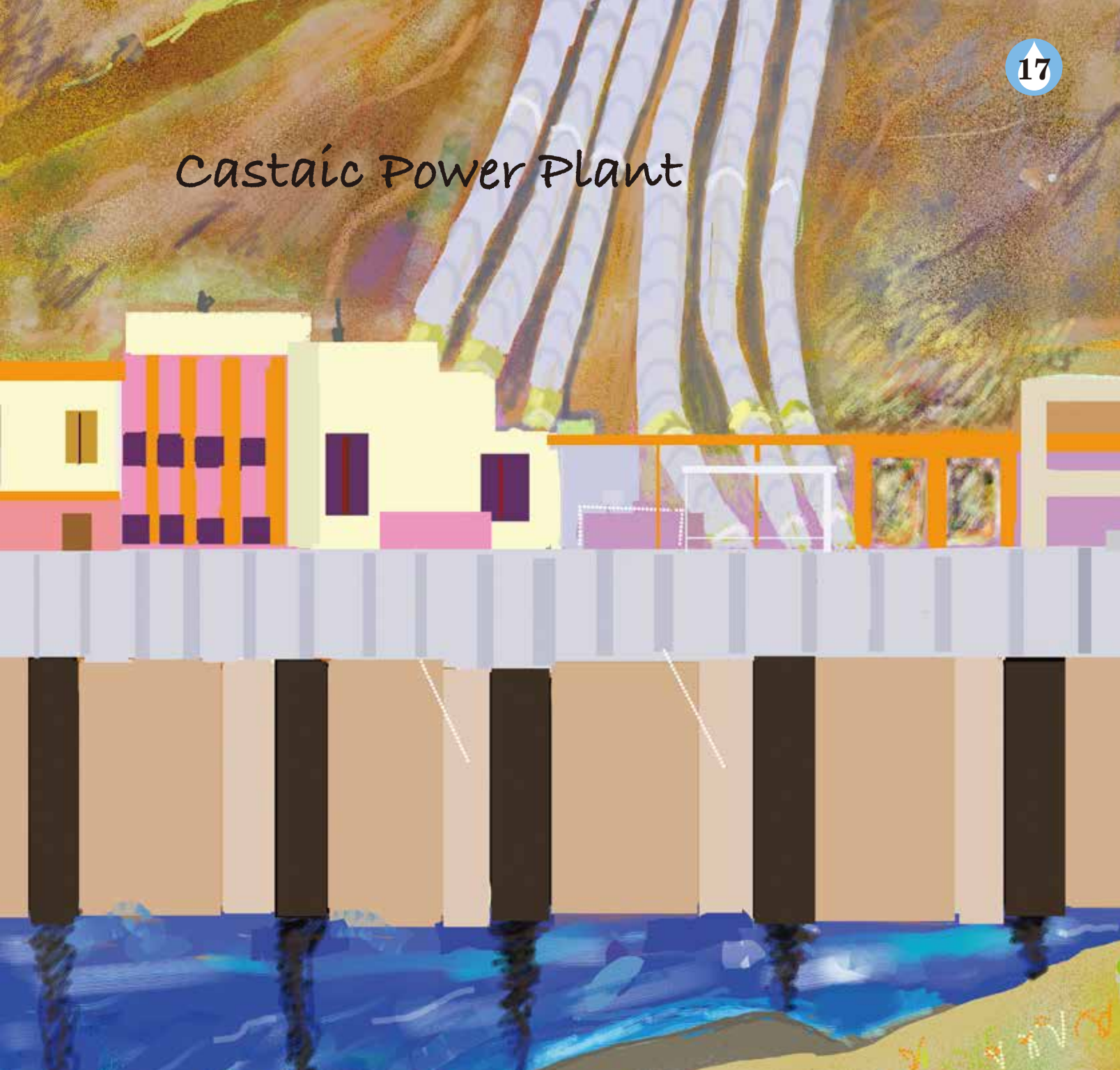
Many estuaries serve as nurseries for young fish and shellfish that other people eventually depend on for food.

Fish in Estuary

There are several reservoirs within each of the aqueduct systems. The dams hold back water but within them are turbines that produce electricity from the rushing water.

The Castaic Power Plant, located in Southern California, at the end of the West Branch of the California Aqueduct, is a pump storage plant.

It provides electricity from water flowing from Pyramid Lake going into Castaic Lake during the days. At night, the water is pumped back up from Castaic Lake into Pyramid Lake. That way, Castaic Power Plant works like a large battery to store electricity that can be used over and over. Castaic Power Plant is owned and operated by the LADWP.


Castaic Power Plant

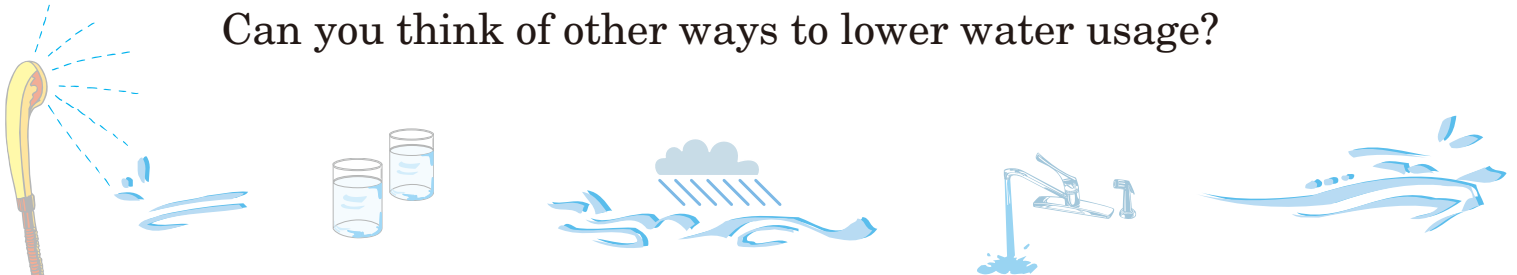
The Future:

Studies are showing that with a growing population and more people living in cities the need for more *potable* water is increasing. At the same time, climate change studies show that weather patterns are changing. In the Eastern Sierra, where Los Angeles receives some of its water supply, storms are expected to be more intense which will result in more rainfall but less snow, and with increased temperature, we will get earlier snow melt as well. This means more water will escape to the ocean and there could be less water available to Los Angeles and other cities from the aqueducts.

Our challenge is to find ways to use the water we have more efficiently and create new local sources of water.

Many cities in Southern California are asking their residents to conserve water by reducing their plant-watering, taking shorter showers, and making sure the dishwasher or washing machine is full before use. Some cities are encouraging residents to catch rainwater on their properties and use it to water their gardens instead of relying only on drinking water supplies.

Can you think of other ways to lower water usage?




Before
Underground Construction
Rocks and Pipes
Placed Underground
Elmer Street
Stormwater Capture
19
After
Above Ground

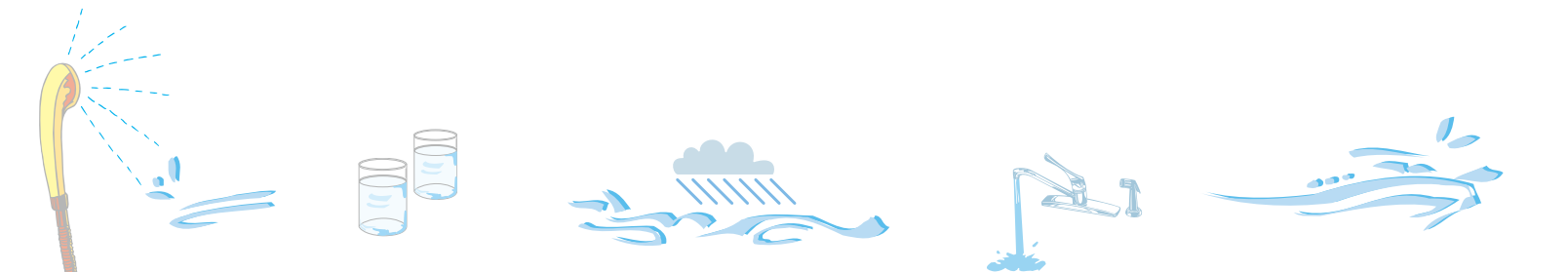
The Future of Water in Los Angeles:

So what is the LADWP planning to help us use water more wisely in the future?

The LADWP has developed a Recycled Water Master Plan, an *Urban* Water Management Plan, and a Stormwater Capture Master Plan. These plans guide the development of projects to make the most use out of water we already have.

Specifically, the plans call for increasing local water supplies by: 1) expanding water recycling, 2) enhancing stormwater capture, 3) increasing groundwater use and 4) increasing water conservation.

The City of Los Angeles plans to reduce its water use by half from the Colorado River Aqueduct and California Aqueduct. Los Angeles receives water from these two aqueducts from the Metropolitan Water District (MWD). Also the City of Los Angeles plans to double the amount of water it receives from the local supplies (groundwater, conservation, stormwater capture and recycling).



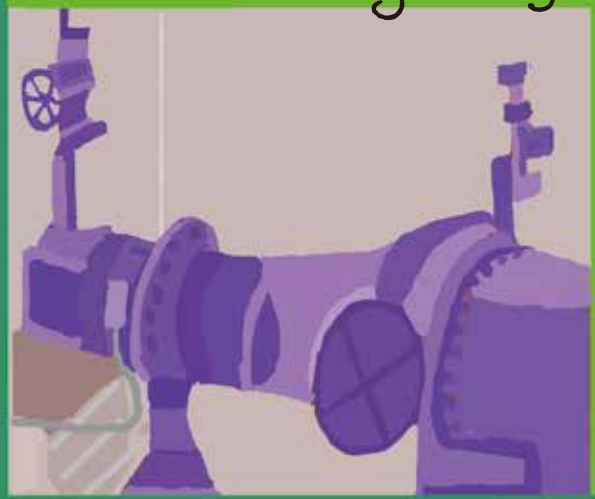
LADWP's Future Water Strategies

Stormwater Capture

Water Conservation

Groundwater

Water Recycling

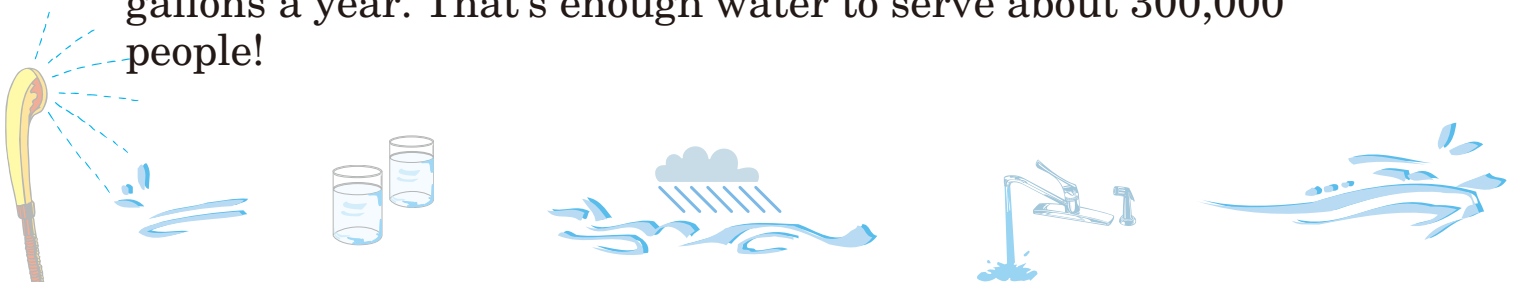


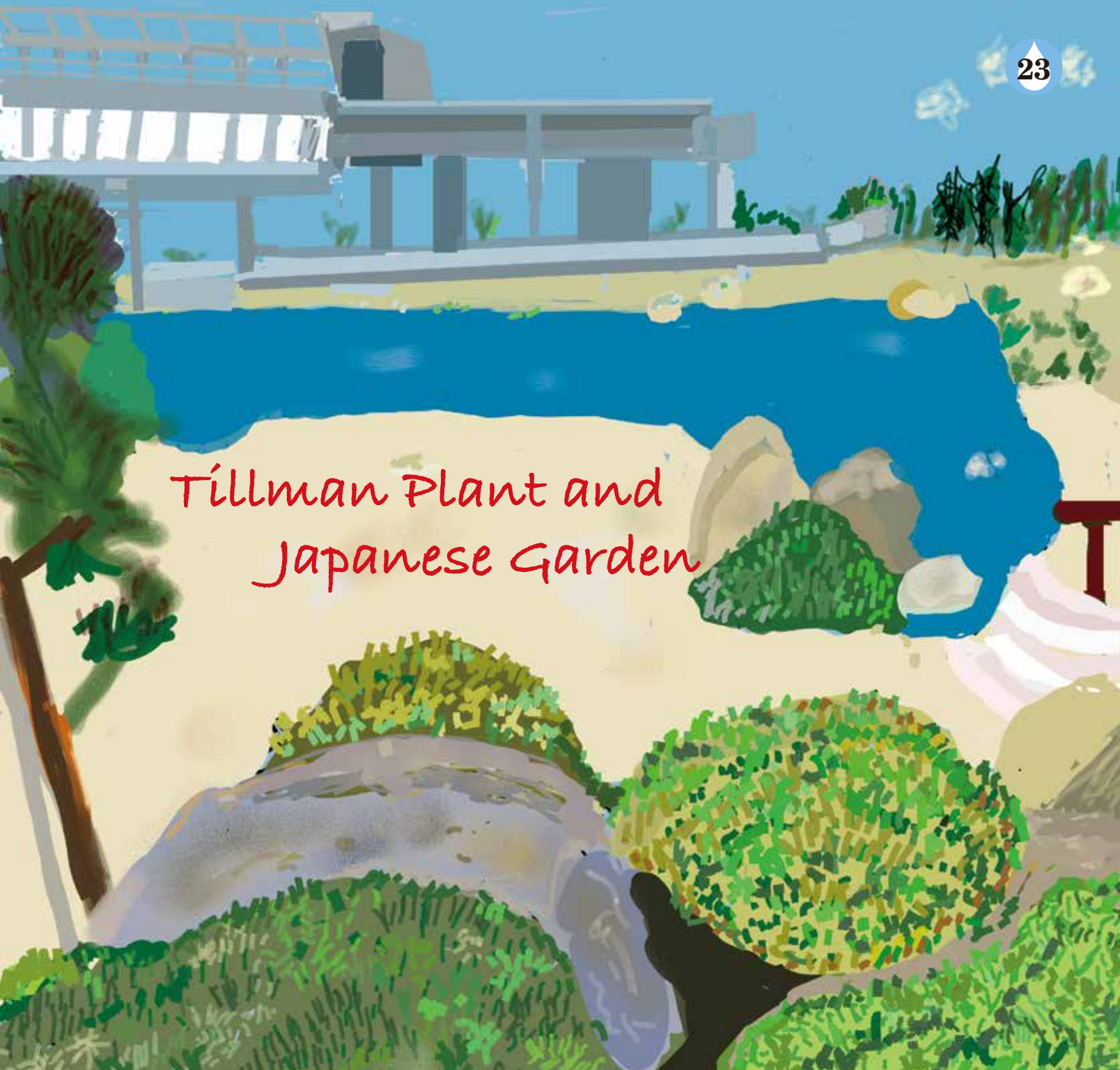
Expanding Water Recycling

What happens to the water we use after it goes down the drain? It goes down the pipes to the sewer system and from there to wastewater treatment plants operated by Los Angeles City Bureau of Sanitation (LASAN). The LADWP and LASAN work together on many projects to irrigate parks, cool down power plants, and provide *habitat* for local wildlife.

One of these projects is the Japanese Gardens located at the Donald C. Tillman Water Reclamation Plant in Van Nuys, in the San Fernando Valley. The recycled water in the Japanese Gardens is used for *irrigation*, and to fill a lake. Nearby, Lake Balboa and the Sepulveda Basin Wildlife Refuge and Recreational Area also use recycled water from the same treatment plant.

The City is pursuing a project to use purified recycled water from a water treatment plant to *replenish* the San Fernando Valley Groundwater Basin. This water can then be pumped out and be used for drinking, bathing, and watering the garden. This project should be able to provide the city with up to 27 million gallons of water every day or 9.8 billion gallons a year. That's enough water to serve about 300,000 people!




Tillman Plant and
Japanese Garden

Enhancing Stormwater Capture

One way to get more water from what we already have is through capturing more rainwater also known as stormwater. Before Los Angeles became a big city, stormwater would soak into the ground and make its way to the aquifers, but once the streets and sidewalks were paved and structures built, the stormwater flows into the City's storm drain system and from there to the ocean. The LADWP has developed a Stormwater Capture Master Plan, which will help the city find projects to capture stormwater for later use. LADWP is also working to enlarge several existing *spreading basins* in order to capture more water during the rainy season. This means that even if there isn't a lot of rain, we could store more of it to use later. The LADWP also currently provides rebates to help residents purchase their own rain barrels that will store water when it rains to use later to water their plants and lawns instead of tap water.

The LADWP Stormwater Capture Master Plan includes three large projects in the San Fernando Valley that would collect rainfall in basins and then slowly feed it into the San Fernando Valley Groundwater Basin, the City's primary underground water source. The plan also includes some smaller projects that would be located throughout the City. These would provide water that could penetrate and soak into the groundwater basins. The LADWP would continue to encourage homeowners, schools and businesses to install large containers or create rain gardens to reuse the stormwater for landscaping.

Stormwater Capture
Tujunga Spreading Grounds

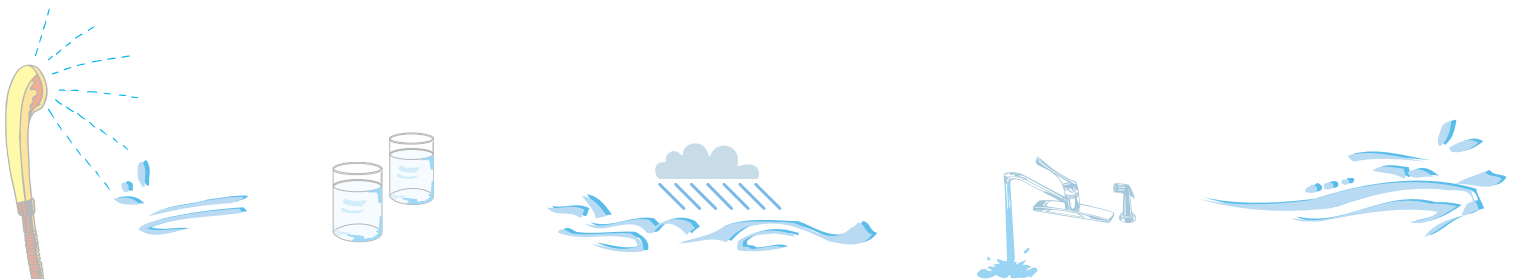
Cleaning up the San Fernando Valley Groundwater Basin

Groundwater is a precious water resource that is found in the soil beneath the ground, sometimes hundreds of feet deep. To get it, we pump it out using groundwater wells.

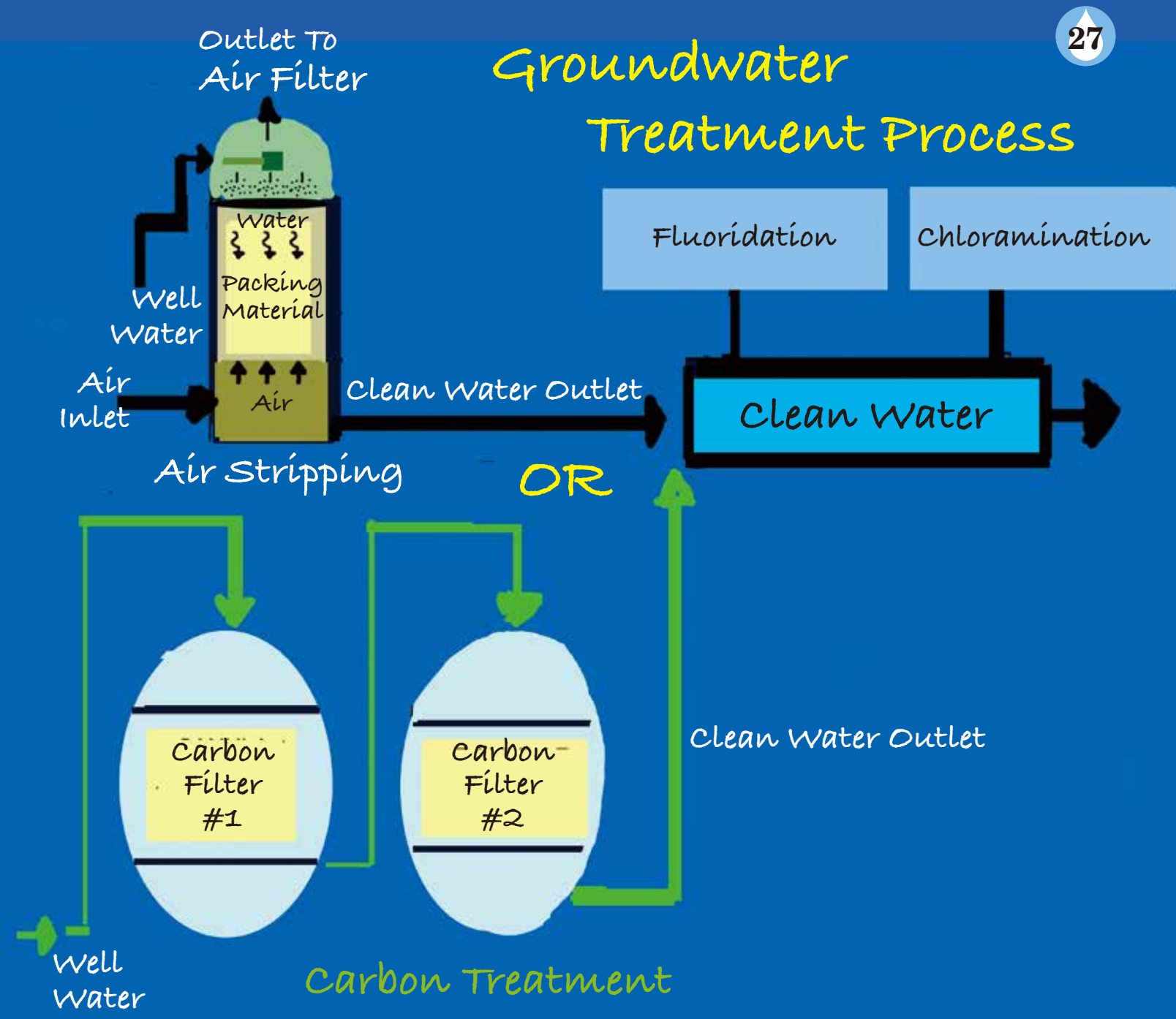
For example, there are over 100 wells that can be used to pump groundwater from the San Fernando Groundwater Basin. Some of these wells are almost 800 feet deep! Much of the groundwater in the San Fernando Basin is contaminated, so LADWP had to shut down many of these wells.

To fix this, LADWP is pursuing a project to remove this contamination so we do not lose more of this resource. LADWP built 25 new wells to test the water in the San Fernando Basin. They are collecting water samples from these wells to figure out the kinds and amounts of pollutants that exist.

This will help LADWP determine the best facilities to build to clean up the basin and restore access to the groundwater treasure beneath our feet.



Groundwater Treatment Process



Increasing Water Conservation (You Can Help!)

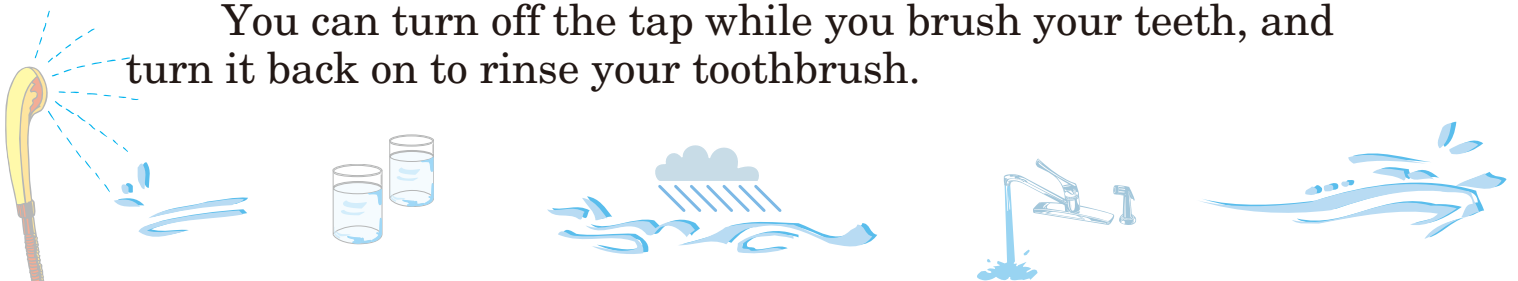
First, we need to reduce the amount of water we use every day. One of the ways we can do this is by using more water-efficient appliances. The LADWP has programs to help consumers do this, by providing *rebates* to reduce the cost to the consumer of replacing appliances. Some of the appliances that are designed and built to use less water are low-flow toilets and high-efficiency clothes washers.

Forty to sixty percent of the water people use in their homes is for their yards and gardens. The LADWP provides rebates for replacing sprinklers that use a lot of water with rotating nozzles that use less water; for replacing water-guzzling lawns with California Friendly plants like Mediterranean plants; and for installing sensors that measure water in the soil and turn on the sprinklers only when needed.

These are big projects that you need help from adults to carry out. But there are lots of little things you can do to help conserve water, and to use less and waste less.

You can take shorter showers, or bathe with less water in the tub.

You can turn off the tap while you brush your teeth, and turn it back on to rinse your toothbrush.



Brush Your Teeth With as Little Water as Possible

Expanding Water Conservation (You Can Help!) (Cont.)

If you wash dishes by hand, you can fill both sides of the sink partially full and use one side to wash the dishes and the other side to rinse the dishes.

If you use a dishwasher, you can make sure that the dishwasher is full before running a load of dishes.

You can make sure that there is a full load of clothes in the clothes washer before running a load.


Fill
Dishwasher
up

Increasing Water Conservation (You Can Help!) (Cont.)

You can conserve water in the garden, too. You can install rain barrels, decrease the times that you water, decrease the number of days a week that you water your garden, and collect water from the shower to water plants. You can create a *rain garden*. This is a garden designed to have low spots that concentrate the rainwater where the plants need it most.

Especially, you can take out your lawn and replace it with California Friendly plants, or a vegetable garden with low water use fruits and vegetables; that way you can have fresh delicious homegrown food, and use less water at the same time!

You can do your part by becoming aware of how you use water, and deciding if there are ways that you could use less water. Can you think of other ways to conserve water?

California Friendly Plants

Glossary

Agriculture: Also called farming, is the cultivation of animals, plants, fungi, and other life forms for food, fiber, biofuel, medicinals and other products.

Aqueduct: Refers to a type of channel that is constructed to carry water over an obstacle, such as a ravine or valley.

Chloramination: A step to fight "bugs" in the water called pathogens by adding chloramine (a disinfectant) to drinking water; keeps water safe to drink.

Contamination: The unwanted pollution of something by another substance, such as sewage or industrial waste.

Dam: A barrier built to hold back water resulting in a reservoir.

Drought: A long period of limited rain and snow.

Estuary: That part of the mouth of a river where the river's current meets the ocean's tides.

Fluoridation: A step to fight cavities by adding small amounts of fluoride to drinking water; makes teeth stronger and reduces tooth decay.

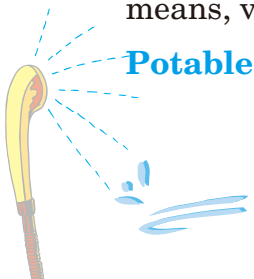
Groundwater: Is the water under the surface of the ground, consisting of surface water that has seeped down. It is the source of water in springs and wells.

Habitat: An ecological or environmental area that is the home of a particular kind of animal or plant.

Hydroelectric turbines: A kind of engine that turns. A hydroelectric turbine takes energy from the movement of water flowing over it and causing it to turn, and converts it to electrical energy.

Irrigation: Providing water for plants especially agriculture, by other than natural means, via a hose, canal, etc.

Potable: Safe to drink.





Rain garden: A garden that is designed to have low spots that concentrate the rainwater where the plants need it most.

Rebate: A monetary incentive for a purchase.

Recycled water: Water that has been treated for reuse.

Replenish: To return a supply of something, such as water, to its former level of supply.

Reservoir: A natural or man-made body of water, such as a lake, or storage pond. It can be created by digging a hole to catch and hold rainwater, or by building a dam to catch and hold water that comes from a river or stream.

Urban: Relating to, or a characteristic of a city or town.

Water cycle: The continuous movement of water on, above, or below the surface of the Earth.

LOS ANGELES WATER FUTURE

LESSON PLAN 1

PURPOSE: The word "cycle" means to make a complete circle.
The water that we drink and wash with makes a complete circle.

MATERIALS: Water cycle diagrams without labels, white paper and crayons.

PROCEDURES: Each child should have a water cycle diagram to start with. Ask them to identify the first step in the cycle that starts with water in a lake or ocean. Have them label the first step and write it on the white paper.

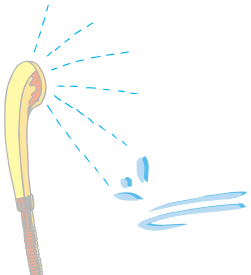
Repeat for the second step when the water evaporates into the air and forms clouds.

Repeat for the third step when the water will come to the ground.

Repeat for the fourth step when the water is brought to the users through pipes or through wells.

Repeat for the fifth step when the some of the water flows out to sewers and goes back to the ocean. Some of the water will be sent to a water treatment plant to be cleaned up so it can be reused.

CONCLUSIONS: Without rain or snow where can we get water? Today, most water is returned to the ocean, but can we recycle more of it?





LESSON PLAN 2

PURPOSE: To understand how the water is used in our homes and how to use less.

MATERIALS: Paper and pencils, pot or bucket, cup.

PROCEDURES: Have the children take paper and pencils home. They should put the pot or bucket under the kitchen faucet and run the water for 30 seconds. They should catch all the water in the pot or bucket. They should then count how many cups of water are in the pot or bucket. They should write the number of cups down. They should also figure out what to do with the water afterwards: water plants, wash dishes, etc. They should have an alternative to throwing the water down the drain.

They should then go into the bathroom and figure out ways to use less water in the various activities there and write them on the paper.

They should go to the kitchen and/or laundry and do the same.

They should go outdoors and do the same.

Have the children share their lists and figure out ways to save water use at home.

CONCLUSIONS: Most of us can find a few ways to save on the water we use at home.

About the Contributors:

Robyn C. Friend, **author**, is a singer, dancer, choreographer, and writer. She earned a Ph.D. in Iranian Linguistics at University of California, Los Angeles, and promptly launched a twenty-year career building spacecraft. She has written for both scholarly and popular publications on a wide variety of subjects, including folkloric dance, world music, linguistics, travel, and the exploration of Mars by balloon.

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David Arthur Katz, **art director**, received his training in art education and holds a master's degree from the University of South Florida. He is a credentialed teacher in the Los Angeles Unified School District. His involvement in the arts has encompassed animation, illustration, playwriting, poetry, and songwriting.

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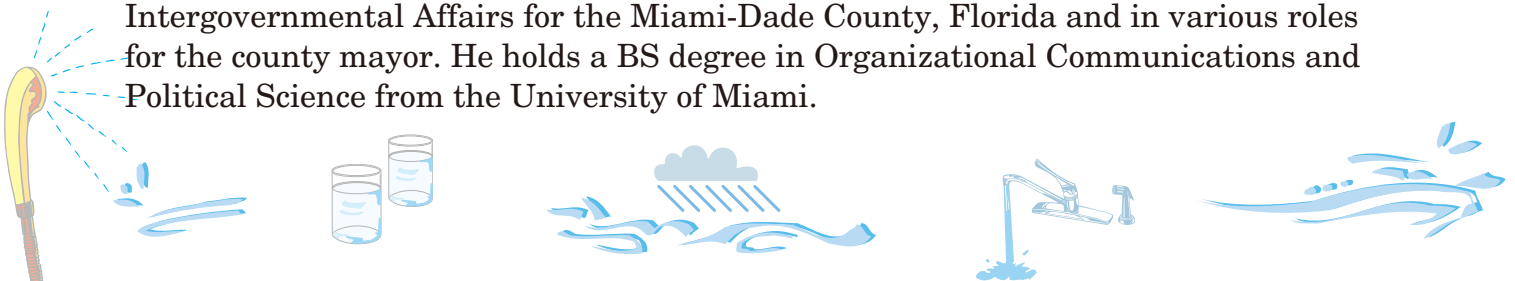
Joseph Ramallo, **contributing editor** as director of Communications has managed the award winning communications and public relations program since 2006 that includes media relations, publications, social media, advertising, education and creative services functions. He also served as a Director of Intergovernmental Affairs for the Miami-Dade County, Florida and in various roles for the county mayor. He holds a BS degree in Organizational Communications and Political Science from the University of Miami.



Walter Zeisl, **contributing editor**, is the Manager of Education Outreach, Programming and Graphic Services. He manages the nationally recognized school education partnership program and award-winning graphic services program. He has served in various LADWP public relations positions for 38 years, more than 28 years in management, including leading the Education Outreach Program. He holds a BA degree in Political Science from UCLA and an MS degree in Public Relations Administration from Syracuse University.

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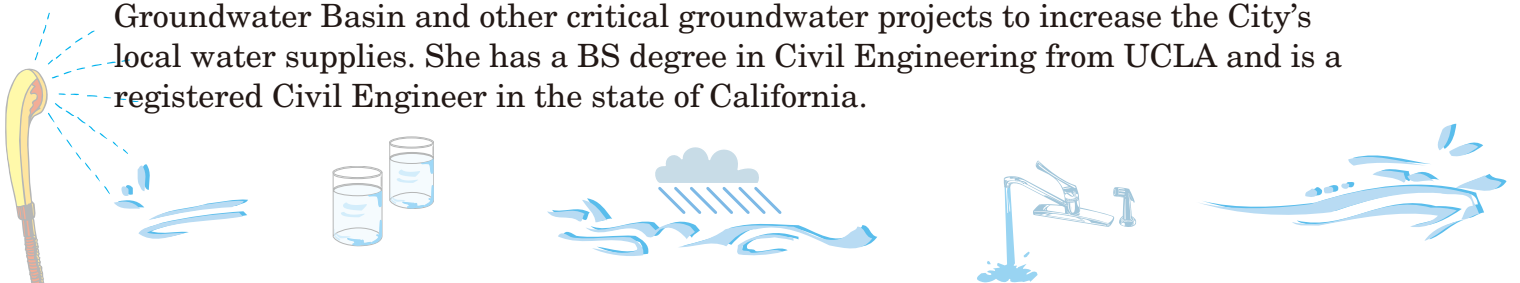
Jevon Lam is the Supervisor of the Water Conservation Policy Group at the LADWP. He is responsible for establishing water conservation policy, including the development of new local regulations and conservation programs. He also manages the long-term planning of LADWP's water conservation programs and oversees LADWP compliance with the Best Management Practices requirements developed by the California Urban Water Conservation Council. Mr. Lam graduated with a BS in Civil and Environmental Engineering from the UCLA and is a registered Civil Engineer in California.

Serge Haddad, P.E. is the Manager of the Water Recycling Policy at the LADWP. For over 10 years with the City, his experience has included structural design, project management, construction, City Council liaison, and water recycling. He currently manages the City's regulatory, legislative, policy, and public engagement aspects of the recycled water program. Mr. Haddad is a graduate from Loyola Marymount U and USC and a registered Civil Engineer in California.

Darline Truong works in the Water Recycling Policy Group, at the LADWP, where she focuses on recycled water K-12 outreach and education. Prior to her employment with LADWP, she worked for the Walt Disney Company as a structural Quality Engineer and the City of Los Angeles – Bureau of Engineering as a Civil Engineering Associate. Ms. Truong received a BS in Civil Engineering from California State Long Beach.

Rafael Villegas is a registered Civil Engineer with the LADWP's Water System. With 16 years of engineering experience in public infrastructure and water utilities, he has a strong background in project delivery that includes design, contract administration, construction management, and project management experience. Currently, Mr. Villegas manages water resource activities in LADWP's Watershed Management Group. He engages in inter-agency coordination, strategic planning, project development and stormwater management policy development that deal with regional recharge issues.

Evelyn Cortez-Davis, P.E. is the Manager of Special Projects and Groundwater Planning at the LADWP. She has over 23 years of water industry experience in the areas of water quality, pipeline design and construction, water conservation, recycled water, water rights, groundwater remediation, and groundwater planning. She currently oversees LADWP's remediation strategy in San Fernando Groundwater Basin and other critical groundwater projects to increase the City's local water supplies. She has a BS degree in Civil Engineering from UCLA and is a registered Civil Engineer in the state of California.



Penny Falcon is the Manager of Water Conservation Policy, Legislation, and Grants at the LADWP. She serves as a Board member of the California Urban Water Conservation Council and is also a member of the State of California's Independent Technical Panel which works with the State Department of Water Resources on drafting new water policy. As a graduate of Purdue University, she has 28 years of environmental experience and is a registered Civil Engineer.

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Acknowledgements

Graphic materials created by **Kana Tatekawa**, graphic designer of Tatekawa and Associates.

Los Angeles Department of Water & Power

BUILDING LA'S WATER FUTURE

The Los Angeles Department of Water and Power and our employees have partnered with schools, teachers, students and parents for more than four decades on numerous award-winning and nationally-recognized programs and activities to enhance learning and help young people prepare for future careers.

We continue to assist schools and our communities now and will do so in the future.

We are excited to have been involved in the development of this book to help young people better understand water issues including, water quality and the importance of local supply sources through conservation, recycling, stormwater capture and groundwater use.

For further information about programs and activities we offer for young people in the city of Los Angeles, go to **www.ladwp.com/education**

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Cascade Pass, Inc.

Los Angeles Water Futur by Judith Love Cohen and Robyn C. Friend tells the story of how Los Angeles created the systems that gather, move and treat the water that we need now and how, in the future, more water will be provided and conservation and reliability will be improved.

This book is one of a series that emphasizes the environment and the value of preserving it by depicting people and organizations who are working to improve the health of our planet. Los Angeles Water Future provides examples of how more water sources can be brought on line and how more conservation can be encouraged.

Robyn C. Friend

Judith Love Cohen