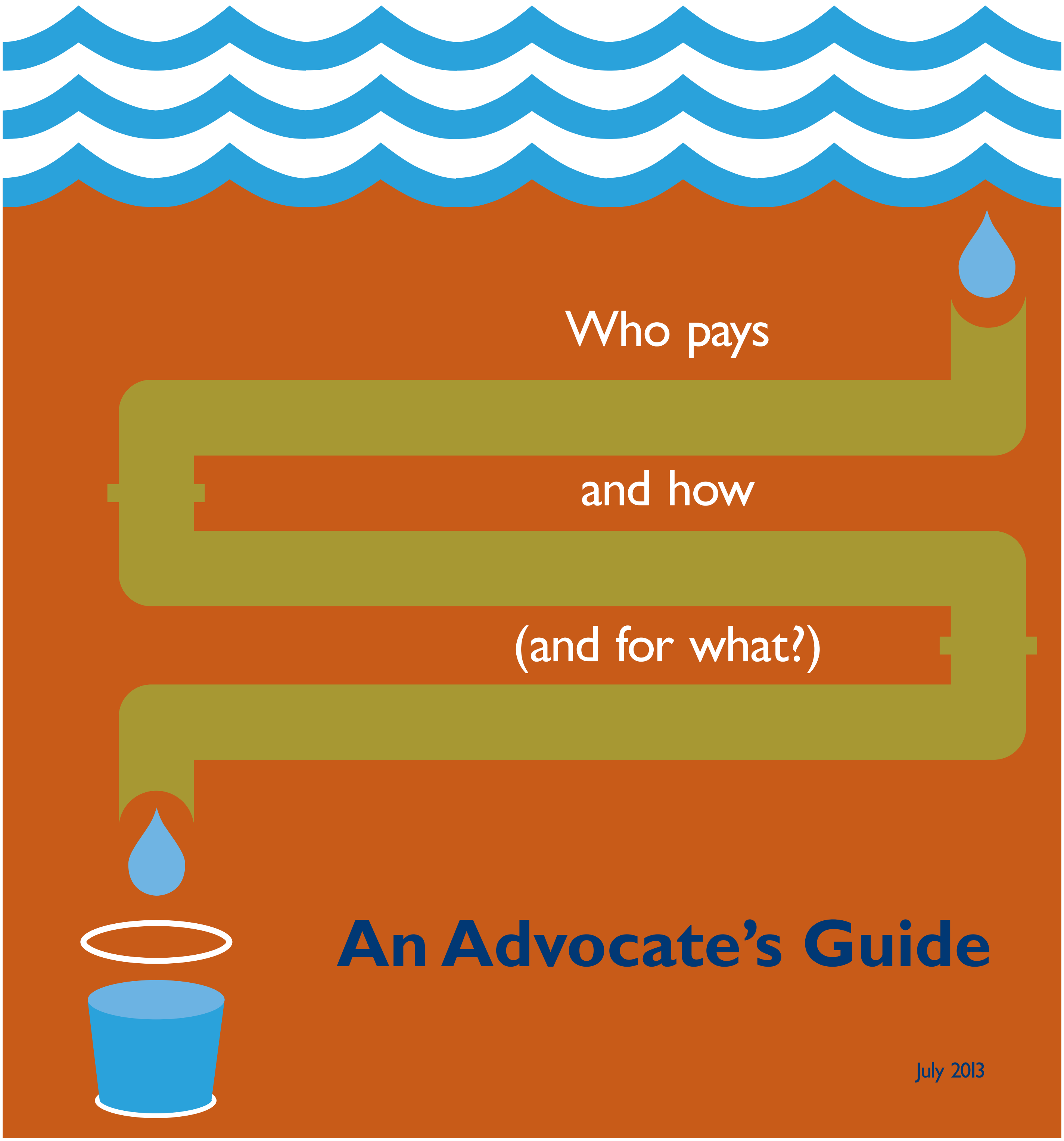
American Rivers
Rivers Connect Us®

DRINKING WATER INFRASTRUCTURE:



Who pays
and how
(and for what?)

An Advocate's Guide

July 2013

American Rivers
Rivers Connect Us®

About American Rivers

American Rivers is the leading organization working to protect and restore the nation's rivers and streams. Rivers connect us to each other, nature, and future generations. Since 1973, American Rivers has fought to preserve these connections, helping protect and restore more than 150,000 miles of rivers through advocacy efforts, on–the–ground projects, and the annual release of America's Most Endangered Rivers™.

Headquartered in Washington, DC, American Rivers has offices across the country and more than 100,000 supporters, members, and volunteers nationwide.

For more information about American Rivers, visit our website at **www.AmericanRivers.org**

Find this report and more resources online at: **www.AmericanRivers.org/AdvocateGuide**

Acknowledgments

American Rivers would like to thank Sharlene Leurig of Ceres, Stacy Tellinghuisen of Western Resources Advocates, and Jennifer Walker of the Sierra Club, Lone Star Chapter for their advice and insight. Thank you also to Jeffrey Hughes, University of North Carolina for his helpful review. This guide was made possible through the generous support of the Walton Family Foundation.

Report Design: Patricia Robinson Design

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How Can This Guide Be Used?

There is an increasingly urgent need for renewed investment in our communities' water infrastructure. This need is driven by the unfortunate reality that for many decades, funding to maintain water systems has fallen short of the cost of providing safe drinking water, sewage treatment and flood control. The result is decaying or outdated infrastructure that cannot keep pace with changing demand for water and wastewater treatment, growing population and extreme weather swinging from severe drought to increasingly heavy rainfall events.

While consumers, advocates, and water utility leaders may recognize a need to invest in our critical water systems, the question is what sort of infrastructure we should build to meet the needs of present and future generations. The infrastructure of yore—mega projects to convey, store and treat water—is often too inflexible and too expensive to deliver reliable and cost-effective services in this era of extreme weather, climate change, and fiscal austerity. Throughout our work to improve our nation's water supply and clean water systems, American Rivers has made the case that responding to these challenges requires a transition to more resilient, cost-effective approaches to water management. In the realm of drinking water supply, this largely means optimizing existing infrastructure, in part by making water efficiency the backbone of water supply planning.

As advocates, we recognize the need to understand better the types of infrastructure that provide sustainable water management. Becoming effective advocates also requires that we understand the financial tools available to water utilities, and the financial obstacles to implementing sustainable water infrastructure. We need to engage in policy and practical conversations about the role that financing plays in the decisions water managers make, and to identify the financial needs that must be satisfied to transition to sustainable water management. While the ultimate goal is to integrate water management across the water cycle—from drinking water to wastewater—the financial tools and constraints for water providers differs significantly depending on what part of the water cycle they are managing. To keep things simple, this guide is designed to educate and empower advocates focused on shaping the infrastructure and resource management decisions of drinking water providers.

This guide is intended to acquaint advocates with the financing practices and imperatives that define drinking water management today. It can be used to prepare for engagement with drinking water utilities, the city councils that set water rates and the State Revolving Fund administrators that help to finance water infrastructure. And it can be used by advocates of all different stripes—environmental, community affordability and taxpayer advocates—to strategize collaboration with each other and with water utilities.

This guide should help advocates understand not only how to be more effective opponents of destructive and bloated infrastructure projects, but also how to be more effective proponents of sustainable drinking water systems. This means advocating for water supply planning that is rooted in conservation and efficiency and optimizing existing infrastructure, all to secure water supplies for communities while keeping our rivers, lakes and streams healthy.

If we seek to move our water systems toward flexible, low-impact solutions that maintain sustainable water supplies for communities and ecosystems, we must understand the financing behind such solutions. Advocates have a significant role to play on the financial side of keeping our rivers healthy and flowing, and our communities and economies thriving, into the future.

How Do Water Systems Pay for Infrastructure?

In the United States, most water customers are served by systems that are owned and operated by local governments. Since more than 80% of the municipal water used in this country is provided by public water systems, this guide is focused on the way these public water systems are financed.

There are two mechanisms that finance more than 90% of the water infrastructure constructed in the United States today: municipal bonds and State Revolving Funds. Which of these mechanisms a water system uses to finance construction of its infrastructure often depends on how many customers it serves and the priorities of Revolving Fund programs in each state.

To finance Capital Improvement Programs (CIP), small systems (those serving a population of 10,000 or less) generally depend on grants and loans from United States Department of Agriculture programs and **State Revolving Funds** ("SRF") programs administered by the U.S. Environmental Protection Agency. There are two SRF programs: the Clean Water SRF, dedicated to stormwater and wastewater systems, and the Safe Drinking Water SRF, dedicated to drinking water systems. These funds are pools of money, allocated by Congress and directed to states by the Environmental Protection Agency. State fund managers then distribute funds to water utilities through an application process. How these loans and grants are distributed depends on the state, but often loans are **subsidized** to lower the cost of borrowing for these systems. Loans may be structured to have deferred principal payments, and may even be 0% loans that accrue no interest and may even include a portion of principal forgiveness (in effect, a grant). Mid-size systems (serving an area with population between 10,000 and 100,000) also rely heavily on SRFs, though they also may be able to raise money by means similar to large systems.

Large systems (those serving a population greater than 100,000) serve the vast majority of the country's population. These systems are able to go to the financial markets directly to raise capital, though they sometimes may also use SRF loans to reduce their borrowing costs. By far, the most commonly used method to finance water infrastructure is the sale of **municipal bonds**—long-term, often tax-exempt **debt** issued by local governments or the public water systems they operate. Most frequently, the bonds issued to finance water infrastructure are issued directly by the water system.[1]

A bond is a mechanism through which water systems borrow money. Instead of borrowing from a single lender, like a bank, a bond sale allows a water system to borrow money from many investors. Like a loan, the bond agreement defines the **interest** rate the borrower pays and when the **principal** borrowed is to be repaid.

1 For example, bonds to finance drinking water infrastructure in Los Angeles would be issued by the Los Angeles Department of Water and Power, not the City of Los Angeles.

The amount of time between the bond sale and the full repayment of principal is called the **maturity**. Bonds are often sold in a **series** to support a specific project or a **Capital Improvement Program** (CIP). The bonds sold in a series may have many different dates of **maturity**, from one year to forty years. The interest rate often varies among the bonds in the series, but is almost always paid in semi-annual payments called **coupon payments.** Within limits set by law, this interest may be tax exempt, making municipal bonds attractive for investors at lower interest rates.

Most frequently, the repayment of these bonds is secured by **revenue** from the water system's customer base, in simple terms, rates paid by customers through their water bills. Occasionally, water systems may pledge additional or alternative revenues from voter-sanctioned **sales taxes** or property taxes. When a bond is secured by both revenue and tax it is called "double-barreled." Very rarely are water systems financed through the sale of **General Obligations** bonds, which pledge the full taxation authority of the local government for repayment.

Municipal bond issuers are required to submit an Official Statement (OS)— essentially a bond prospectus describing the use of bond proceeds and repayment obligations—with the Municipal Securities Rulemaking Board (MSRB). MSRB makes these financial documents freely available on its website, Electronic Municipal Market Access (EMMA) available at http://www.emma.msrb.org/. Because the OS describes the water system's capital improvement program, existing assets, demand projections and legal risks, among many other factors, this is an extremely useful document for advocates looking for information on the utility's plans, pricing structures and risk profile. On the EMMA website you can search for water systems by name by clicking on the "Search Securities" tab.

Financing costs vary considerably with the type of financing used and the creditworthiness of the water system. Ultimately the cost of financing, in the form of interest payments and other transaction costs, is passed through to ratepayers or taxpayers, depending on what the water system has pledged to secure repayment. This is why water systems are highly motivated to protect their credit rating, if they are large enough to have rated debt. As a general rule, the higher the **credit rating**, the lower the cost of borrowing.

	STANDARD & POOR'S	FITCH	MOODY'S
Investment Grade	AAA	AAA	Aaa
	AA	AA	Aa
	A	A	A
	BBB	BBB	—
Speculative Grade	BB	BB	Baa
	B	B	Ba
	CCC	CCC	B
	CC	CC	Caa
	C	C	Ca
	D	D	C

Even when the financing rate is low, the total financing cost can be significant. It is not uncommon, even in a low interest rate environment, for the interest paid over time to nearly double the total cost of a project. For this reason, it is important to know which costs a water system is including in a project cost estimate: if a pipeline is described as being a $1 billion project, does that figure reflect only the construction cost of building the pipeline, or does it also reflect the costs of financing the project? The total price tag of construction plus financing is sometimes called the **"all-in cost."**

A QUESTION WORTH ASKING: What will be the all-in cost of the project?

Cash also plays an important role in water system financing.

All systems use cash accumulated from customer payments to pay for **operations and maintenance** ("O&M"). O&M includes the purchase of energy and chemicals, basic repair of existing infrastructure, and labor costs. O&M must be paid with cash on hand and can never be financed with bond or SRF proceeds. In planning for capital projects, utilities may not fully consider long-term O&M costs creating a budget shortfall. Additionally, O&M budgets routinely suffer when cash resources are stretched or required to meet other demands.

Cash is also used to fund **reserves**, which serve a range of purposes. Reserves may be held in a general account for use in response to any unexpected contingency, such as a water main failure that requires an immediate response. They may also be broken up into a variety of specially designated funds for targeted purposes. A **depreciation** or **replacement fund** is one such special type of reserve designed to fund the continual replacement of the system. It is worth noting that most systems fail to adequately set aside enough money aside for this purpose. Failure to fund depreciation is the primary culprit of water loss from leaky pipes, which is routinely in the double digit percentages of water treated and moved by a water provider. In some places, water loss through decrepit infrastructure can be as high as 60%!

***Depreciation** is the reduction in value of an asset based on its age and its useful life. Every type of physical asset has its own rate of depreciation. The depreciation rates of pipes and treatment plants, for example, are set by the Governmental Accounting Standards Board (GASB) and used by all water systems when reporting the value of their assets. How much an asset has depreciated is an indication of the need for capital expenditures to replace it.*

Reserve funds can be designated for drawdown when revenues decline during periods of wet weather (when water systems typically see a downturn in sales), or in the case of economic downturn or slowed housing growth. Many water systems ate deeply into their reserve funds in the most recent recession (systems without sufficient reserves had to raise rates, defer investments or suffer credit downgrades). Reserves can also be drawn down when a drought has persisted long enough to require emergency conservation measures that drive down water sales (it's worth noting that the early stages of a dry period may actually be a financial boon as customers supplement insufficient rainfall with purchased water for outdoor irrigation purposes).

Reserves are one of the most important financial variables to investors and credit rating agencies because they indicate the cushion a system has to weather changes in sales or to fund unexpected expenditures. But reserves can also be extremely difficult to maintain, as city councils often prefer to defer rate increases by tapping into a reserve fund (which locally may be a depreciation fund, or rate stabilization fund, or drought stabilization fund, etc.). Of course what this means is that when sales or expenditures really start to deviate from normal, the financial situation becomes all the more dire because there are not enough funds in reserve to manage the crisis. This can mean sudden and extraordinary escalations for ratepayers.

A water system's financing decisions make a big difference to **ratepayers**. Cash financing requires systems to have money today to pay for system improvements, whereas debt financing borrows against the accounts of future ratepayers as far as 30-40 years down the road. While debt financing increases the all-in costs of projects, it can minimize the near-term cost to today's customers. This makes debt financing attractive to water system managers and city councils since it minimizes the near-term rate increases required to pay for a project. But when a system overloads on debt financing, the outcome can be a disproportionate burden on future generations of ratepayers, a problem of **intergenerational equity**. Some systems, like Seattle Public Utilities, explicitly consider the relative financing burden among present and future generations of ratepayers—but this practice is by no means common.

The revenue raised by water systems comes from their customers' rates—the amount they pay for water services each billing cycle. Systems also can raise revenue from **connection** or **tap fees**, one-time assessments on new accounts being hooked up to the water system. In some areas these fees are designed so that new customers paid the costs associated with growth—new distribution lines, additional treatment capacity and even additional supply. During times of significant growth, connection fees can account for a high percentage of water systems' total revenues. In these times, it can be especially tempting for water system managers to minimize rate adjustments to the larger customer base by allowing the connection fees to make up for the difference between operating revenues and operating costs. But when growth slows, the result can be financially perilous. Some utilities prudently avoid using connection fee revenue to cover operating expenses—others are bit less rigid and can end up depending on these revenues for operating expenses. In Las Vegas, annual revenue from connection fees for the Southern Nevada Water Authority dropped within a few short years from $188 million to $3 million, leaving reserves to make up for the shortfall in operating budget.

While connection fees are a logical way to have growth pay for itself, if the **projected growth** fails to materialize, present-day ratepayers have to make up the slack. This has forced water rates upward in metropolitan Atlanta, Colorado Springs and many other areas where growth slowed after infrastructure was already built and financed.

*The Carlsbad Seawater Desalination Plant in San Diego is an **example of a PPP** in which the investor has an equity stake in the water infrastructure. The project was financed by a combination of public and private debt secured by the California Pollution Control Financing Authority. The private developer, Poseidon Resources, and its private capital source, have returns secured by a long-term Water Purchase Agreement with San Diego County Water Authority.*

QUESTIONS WORTH ASKING: Who pays for system growth?
What rates will present customers bear if projected growth does not materialize?

In addition to these sources, there are various vehicles to bring private capital into water infrastructure development. Public-private partnerships are a common approach for water utilities seeking outside investment in infrastructure upgrades and operations.

Public-private partnerships ("PPPs") can take many different forms. Private investors may take an **ownership or equity** position in an asset like a desalination plant, and use private equity or bonds to pay for a portion of the construction cost. For a private investor to take an ownership stake in a water infrastructure asset, there must be a pledged revenue stream or a marketable asset awarded to the investor to generate return. The investor may secure the return from a long-term Water Purchase Agreement with a public entity, or may be given the right to market water produced by the asset.

It is important to note that PPPs do not always involve the investor taking an ownership stake. Private investors may help to finance construction of a project in exchange for the right to market water made available by that project for a certain period of time. Or the private investor may help to finance the optimization of a water system, and generate return by splitting the savings in operating costs resulting from that optimization (say in the form of reduced energy or chemical costs). While PPPs have the potential to expand the sources of capital available to water systems, at present they are only a tiny sliver of money flowing into water infrastructure.

***Veolia Water** is a global infrastructure firm that owns and operates water systems across the globe, including in Europe and Asia. In the United States, Veolia Water North America primarily operates as a consulting and engineering company serving public water systems. For example, Veolia partnered with the Pittsburgh Water and Sewer Authority to optimize energy consumption and debt structuring to find $2 million in cost savings. Veolia's financial return comes from the savings generated in the partnership.*

What Risks Come Along With Financing Water Infrastructure?

Water systems repay their creditors primarily with the money paid by water service customers. While sales, property and other tax revenue may play a role in some places, for the most part, water providers shape their financing plans around the volume of water they expect to deliver.

As a result, both the availability of water to sell and the amount of water demanded by their customers contribute to financing risks. For both supply- and demand-side risk, the underlying principle is the same: once you finance a system expansion or improvement, you have to pay for it, no matter how much water you deliver.

Supply risk is the risk that a financed water supply asset will fail to provide the service for which it was designed. A water supply may fall short of expectations for many different reasons, including:

- ***Over-abstraction[2] of the resource***

  A fifth of the water used in the United States is groundwater,[3] a resource that is being rapidly depleted in many regions. Groundwater is often the cheapest supply option. But because it is shared among many users and its use is virtually unregulated in most areas, groundwater may be an unreliable supply source.

- ***Over-allocated resources***

  West of the Mississippi, surface water is allocated among users according to the priority of their historical use (earliest users have highest priority). Many watersheds governed under this system, known as ***prior appropriation***, are over-allocated, meaning that there is not enough physical water in the system to satisfy all the legal claims held by human users. The ability of users to claim their rights depend on the priority of their claim. This means that different users may be disproportionately affected by physical water shortages.

  East of the Mississippi, surface water is governed under the ***riparian doctrine***, which affords any property owner adjacent the water body to its use. In this sort of system, downstream users are generally at higher risk of falling short of supply.

2 Abstraction is the removal of water from its source.

3 J.F. Kenny et al., *USGS Circular 1344: Estimated use of water in the United States in 2005*, U.S. Geological Survey 2009, at 43 *available at* http://pubs.usgs.gov/circ/1344/pdf/c1344.pdf.

Hydrological/Climate change

Water systems define the reliable annual yield of water supplies based on historic observations of rainfall or snowpack. Our ability to judge the future yield of water resources based on historic observations is compromised by climate change, which may cause the timing and volume of precipitation to significantly diverge from historic norms. In coastal areas, climate change may also imperil groundwater resources as rising sea levels introduce seawater into freshwater aquifers.

In many areas of the country, prolonged droughts have called into question the actual water supply yield of water storage reservoirs. Reduced storage in the large reservoirs along the Colorado River in the Southwest United States is one example. Likewise, in northeast Georgia, the severe drought of 2006-2009 tested a new water supply reservoir built less than a decade earlier by the Upper Oconee Basin Water Authority. In the wake of the drought, one of the local governments that is a member of the water authority sued the authority itself, arguing that the reservoir's yield is far less than originally calculated, and that the yield should be re-calculated based on conditions during the drought.[4]

Water for endangered species

The Endangered Species Act can be used to limit out of stream water diversions in order to protect wildlife dependent on the same water resource. San Antonio is among the places where major water supply sources were significantly curtailed for the protection of endangered species.

A lawsuit filed in 1991 by the Lone Star Chapter of the Sierra Club against U.S. Fish and Wildlife Service led to the formation of the Edwards Aquifer Authority, charged with maintaining the aquifer at levels capable of supporting endangered species including the Texas Blind Salamander.[5] Before the EAA's formation, San Antonio Water System had relied exclusively on groundwater pumped from the Edwards Aquifer. To comply with EAA regulation, San Antonio launched a decade-long conservation campaign that reduced water use in the city by 100 million gallons a year even while the city doubled in population.

Water systems will always face some sort of supply risk. The important questions are, how does the system educate customers about its risks and how effective is the system in mitigating its risk?

4 Melancon, Merrit. "Water Battle May be Close to Resolution." *Athens Banner-Herald*. March 11, 2011. http://onlineathens.com/stories/031111/new_797769107.shtml.

5 Eckhart, Gregg. "Endangered Species of the Edwards Aquifer." *The Edwards Aquifer Website.* Retrieved May 10, 2013. http://www.edwardsaquifer.net/species.html.

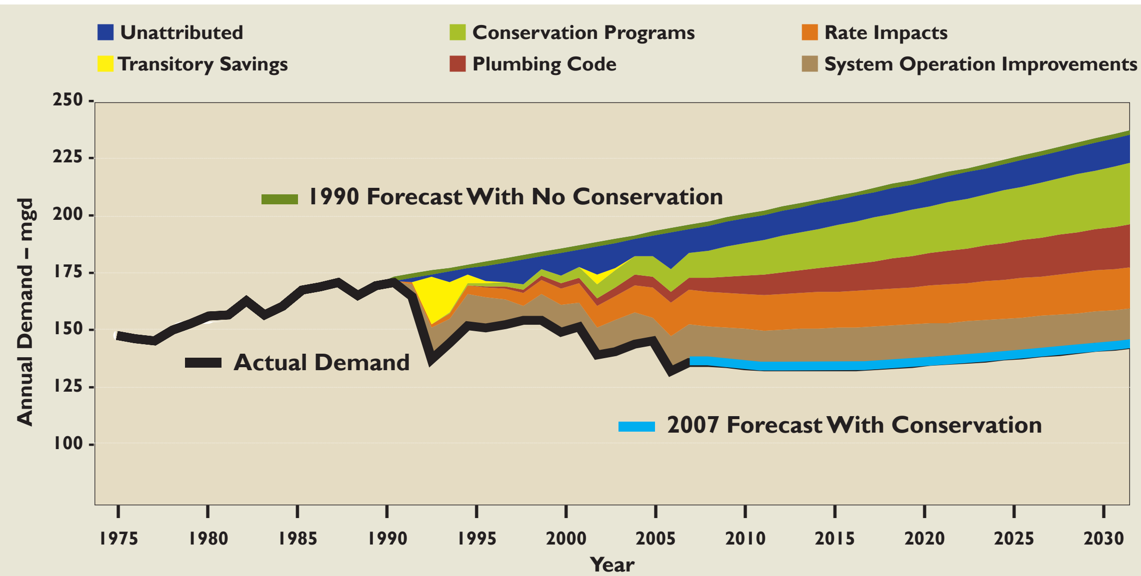
QUESTIONS WORTH ASKING: How diversified and/or flexible are the water system's supplies? If the system relies on an aquifer, is the volumetric condition of the aquifer known? Has the utility modeled precipitation and hydrology in its catchment area under a variety of future climate scenarios? If the system has plans to increase supply, do those plans involve only expanding traditional infrastructure (e.g. storage reservoirs), or will the plans optimize existing infrastructure and water efficiency to provide flexibility and a cushion against changes in climate and hydrology?

Demand risk is the economic consequence of water demand failing to meet projected estimates. Demand may fall short of projections for any number of reasons including:

- Economic growth or population gains falling short of projections,
- Passive efficiencies, reductions in per capita usage due to adoption of high-efficiency appliances and fixtures or behavior changes that were not driven by the water provider, or
- **Active efficiencies**, reductions in per capita usage due to adoption of high-efficiency appliances and fixture or behavior changes that were influenced by the water provider through policies and programs such as appliance and fixture rebates, water pricing structures, or outdoor watering limits.

The prevailing assumption that population growth inherently brings with it growth in water demand has proven to be inaccurate in many areas of the country—the cumulative effect of passive and active efficiencies can result in water demand growing more slowly than population, remaining static, or even declining as population grows.

Figure 1: Seattle Public Utilities' Demand Forecasts With and Without Conservation



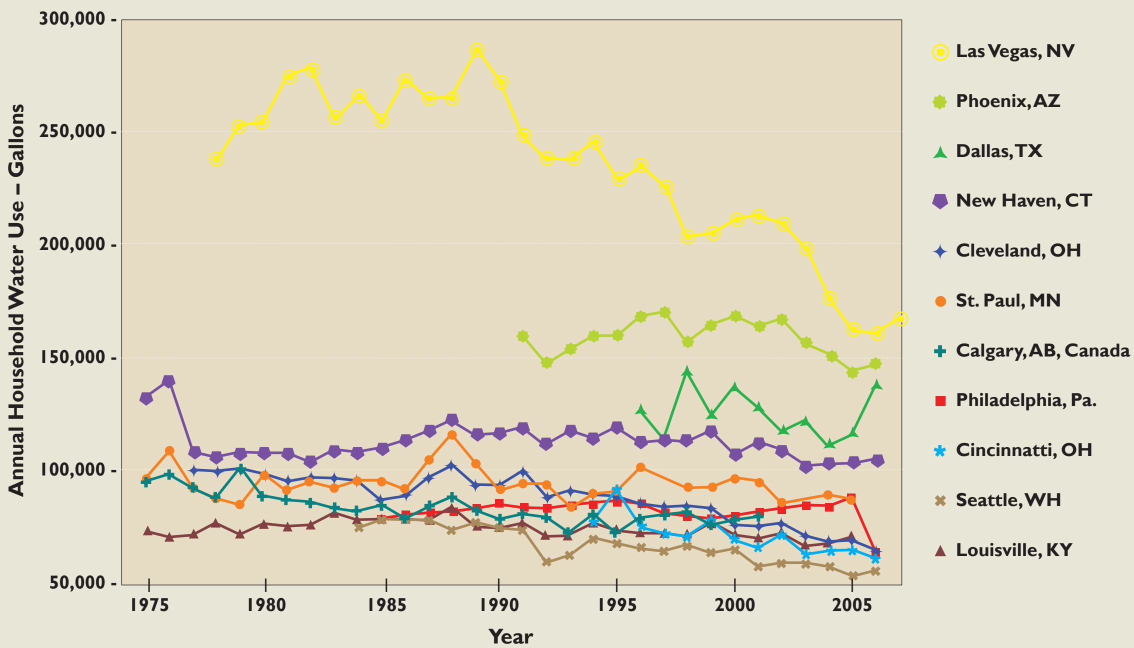
Source: The Johnson Foundation at Wingspread, "Charting New Waters: Financing Sustainable Water Infrastructure," *Convening Meeting by American Rivers, Ceres, and The Johnson Foundation at Wingspread,* January 2012, http://www.johnsonfdn.org/sites/default/files/reports_publications/WaterInfrastructure.pdf.

Although it might not be evident amidst all of the headlines about regional water conflicts, per capita water use has declined significantly in the United States over the last twenty years[6], and many water systems have experienced an even steeper decline since 2005. Despite this widespread demand decline,

6 *See generally* Thomas D. Rockaway et al., *Residential water use trends in North America*, 103:2 J. AWAA 76 (2011).

many systems continue to forecast future demand assuming that per capita use will remain fixed. Under these planning assumptions, a system may finance construction of additional storage capacity, treatment facilities, or water delivery systems in excess of their actual need. Whether their customers need these improvements or not, they will end up paying for them. For this reason, investment in large, inflexible supply projects can create an unsustainable debt load that then limits investment in other aspects of the water system that must be maintained and improved.

Figure 2: North American Water Use Per Household – 1975-2007



Source: P. Comes, T. Rockaway, J. Rivard, and B. Kornstein, "North American Water Usage Trends Since 1992," *Water Research Foundation*, 2010. Reprinted with permission.

The relationship between water **price** and demand further complicates demand forecasts for water providers. Demand for water is price-dependent, although customers' sensitivity to price depends on many factors, including income and customer class (i.e. industrial vs. residential). Customers are more sensitive to price increases for outdoor use than indoor use, since outdoor use is highly discretionary compared to essential indoor uses. As the cost of water rises, water systems will surely see increased price response among their customers. Yet relatively few utilities consider demand response to pricing in their demand forecasts, and many systems do not estimate the sensitivity of customers to price when setting rates or estimating revenues. Failure to anticipate the sensitivity of customers to price changes is an increasingly risky endeavor, as over the past decade water prices have been more rapidly escalating than any other fundamental service.

Price elasticity is a measure of customers' sensitivity to changes in price. When it comes to water, elasticity is calculated as the percentage change in water demand divided by the percentage change in water price.

$$\textbf{Elasticity} = \frac{\%\ \text{change in demand}}{\%\ \text{change in price}}$$

Elasticity can be less than or greater than 1, and may be positive or negative. For water, elasticity is typically negative, meaning that as the price increases, the demand decreases. Water demand is generally *inelastic*, meaning that it is greater than –1.0, so the percentage change in demand will be less than the percentage change in price.

There is no definitive value for the price elasticity of demand for water. It depends on customers' income, the availability of regular rainfall to supplement using purchased water for outdoor uses, and the economic value generated by their water usage (for industrial customers), among other factors. A sample of studies on price elasticity of demand for water shows that for most water systems, elasticity of residential customers falls within -.05 to -.50, meaning that for every 10% increase in price, demand will fall by between .5 and 5 percent.[7] It is important to understand that price elasticity of demand is not linear, but changes along with price. So as water becomes more expensive, the elasticity of customers' demand may increase.[8] Price elasticity also depends on what the water is used for: outdoor water use is more price elastic than indoor water use since it is more discretionary.[9]

QUESTIONS WORTH ASKING: How has the water system seen demand change in the last five years? What trend in per capita demand does it assume? Does the system consider the effect of plumbing codes and the spread of high-efficiency appliances and fixtures across its customer base when undertaking its demand projections? Does the demand projected reflect price effects?

7 Margaret Hunter, Kelly Donmoyer, Jim Chelius, and Gary Naumick, "Declining Residential Water Use Presents Challenges, Opportunities," *Opflow*, May 2011, American Water Works Association. http://www.austintexas.gov/sites/default/files/files/Water/JointSubcommittee/article_decliningresidentialwaterusepresentschallengesopportunities.pdf.

8 *See for example* Shanthi Nataraj, "Do Residential Water Consumers React to Price Increases? Evidence from a Natural Experiment in Santa Cruz," Giannini Foundation of Agricultural Economics, University of California http://giannini.ucop.edu/media/are-update/files/articles/v10n3_3.pdf.

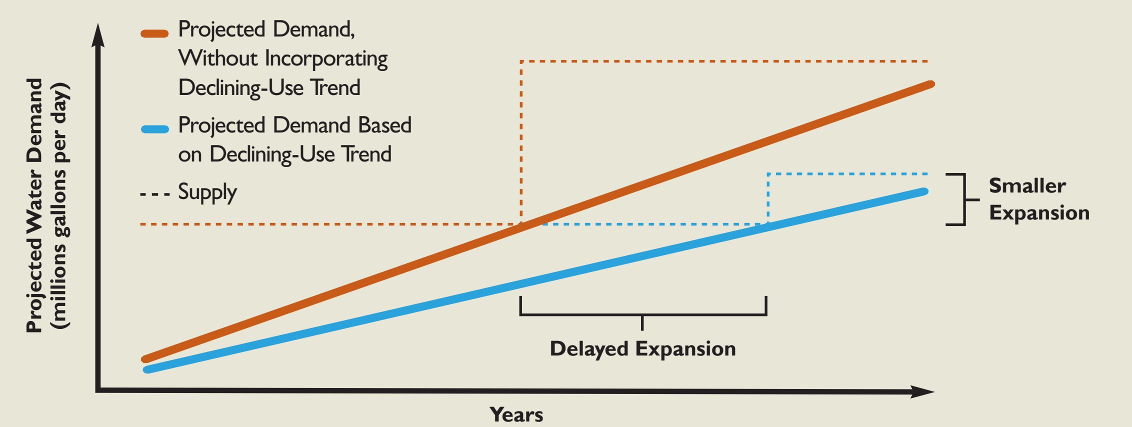
9 Tatiana Borisova, Burcin Unel, and Colin Rawls, "Conservation Pricing for Residential Water Supply," *University of Florida IFAS Extension*, FE756 http://edis.ifas.ufl.edu/pdffiles/FE/FE75600.pdf.

Why Don't Water Systems Put Water Conservation and Efficiency First?

At this point it is a well-worn adage that conservation is the cheapest source of supply. While conservation and efficiency programs are not free, they are less costly than traditional supply projects. Over the long-run, reduced per capita water use saves customers money **by lowering the fixed costs** of the system: smaller delivery mains, treatment plants, and storage facilities all impose lower costs on the customer than building for increasing **peak capacity**.

Peak capacity is an important concept to understand, as it drives infrastructure and supply costs. A water system's peak capacity is based on the highest annual demand the system encounters, often in the summer months when customers increase water use for outdoor irrigation. Peak capacity may also be described as peak demand. Water conservation programs can reduce peak demand, forestalling the need for expensive capacity expansion projects including treatment and storage.

Figure 3: Projected Water Demand & Expansion



Source: Hunter, et al, "Declining Residential Water Use Presents Challenges, Opportunities," Opflow, *American Water Works Association*, May 2011, http://www.austintexas.gov/sites/default/files/files/Water/JointSubcommittee/article_decliningresidentialwaterusepresentschallengesopportunities.pdf.

So if water conservation and efficiency have the proven potential to reduce capital expenditures, why don't more water utilities put conservation first?

The answer really comes down to a conflict between benefits in the short-term and the long-term benefits.

In the short-term, which on a water systems' scale may be 10 - 15 years, costs are largely fixed—they have an existing amount of debt they must service, facilities of a fixed size that must be maintained, and a labor force that must be supported no matter how much water their customers use. In contrast to these **highly fixed costs**, their **revenue is highly variable**, and for the most part dependent on the amount of water their customers use. A typical water system may have 80% of its costs fixed, however 80% of its revenue may be variable and based on volumetric sales.[10] While selling less water reduces short-term costs marginally, it can eat deeply into revenues.

Because of these high fixed costs, water systems may have to make up for reductions in sales revenue by increasing rates. This fixed cost reality is why **it is essential that advocates are clear about the cost savings potential of conservation.** Rarely is it true that conservation will save customers money in the near-term because the fixed costs of the water system must be paid. Typically the **cost savings potential of conservation is a long-term benefit** of reduced infrastructure and supply expenditures.

In this environment, it is no wonder that conservation falls to the bottom of the priority list for many water systems. Putting conservation first requires a transformation in the way water systems—and their customers—view their mission: not as the distributor of a product, but as a service provider.

This identity shift will need to be accompanied by a transformation in the water system business model, including the way services are priced—a topic addressed further in the next section.

Alongside this fundamental business problem, cultural challenges to integrating conservation and efficiency more deeply into water systems persist. One of these challenges is that many water system managers do not feel confident in the reliability of supply gained from conservation. **Reliability** is a key decision driver within water systems—water managers assess their performance based on their ability to meet customers' demands. Many water managers are more familiar with the traditional engineering and hydrological approaches to quantifying the reliable yield of hard supply projects than conservation. Of course because most calculations of reliable yield for hard supply projects fail to consider climate change, drought surpassing historical extremes and growing demand on limited resources, the reliability of these projects are frequently overstated. This is why advocates need to emphasize the role of water conservation in providing secure water supplies that are more resilient to changing climate and demographic conditions.

The reliability of supply gained from conservation and efficiency —otherwise known as the water savings potential—depends on the origin of those conservation gains. Water supply gained from indoor appliance replacements does not depend on a persistent change in user behavior—once a toilet is replaced, it will use a set amount per flush for as long as it is in place. The potential water savings from toilet replacement is different than the reliability of water saved from the installation of an irrigation control system or the reliability of turf grass removal. Assessing the most cost-effective and reliable sources of water from conservation is a crucial first step in understanding how conservation fits within a system's long-term supply strategy. Utilities can compare the cost of different water efficiency or conservation approaches and their respective yields through undertaking a **conservation potential assessment**, a type of cost-benefit analysis.

Conservation or Efficiency

While these words are often used interchangeably, they actually represent different concepts. Conservation is the reduction in water use through restrictions in behavior. Efficiency is the reduction in water use through the optimization of technologies or behaviors to yield the same benefit previously enjoyed by the user.

QUESTIONS WORTH ASKING: **Has the water system commissioned or performed a Water Conservation Potential Assessment? What proportion of revenues comes from outdoor use? Has the water provider developed an analysis of the potential for water efficiency and conservation measures to provide the forecasted supply? What is the savings potential? What is the cost?**

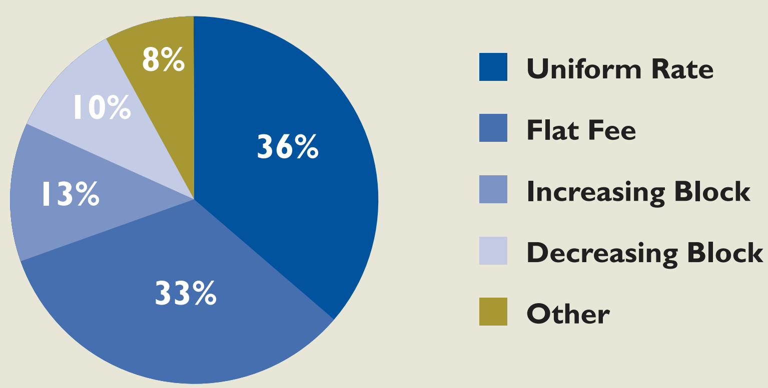
10 *See* Jeff Hughes, *Pricing and Revenues: A Challenging Relationship*, U. of N. Carolina Envtl. Finance, Aug. 23rd, 2012, http://efc.web.unc.edu/2012/08/23/pricing-and-revenues-a-challenging-relationship/.

How Should Water Providers Structure Their Rates?

While it is true that most water systems structure their rates to generate the majority of their revenue based on the volume of water used by their customers, water rate structures vary widely.

For many years it was not uncommon for water providers to assess a flat rate for each connection with a certain meter size or to forgo meters altogether. With the exception of very small systems, those days are largely gone. Yet while most water customers' monthly bills reflect the amount of water they use, the way each unit of water is priced varies widely. In many areas, water systems price each unit of water **uniformly**—say $0.001 for each gallon of water delivered. In recent years as droughts have become more common and the cost of water supplies have increased in regions of the country, more water providers have been transitioning to increasing or **inclining block rate** structures under which the price per unit of water delivered increases as the amount of water used increases. Even within an inclining block rate structure, there can be significant variation in the number of volumetric tiers and the difference in unit price between those tiers. In areas with abundant water resources, water providers may even price water in a decreasing or **declining block rate** structure under which the unit cost of water declines per unit of water delivered—this pricing tool is sometimes used to attract water-intensive industry.

Figure 4: National Breakdown of Residential Rate Structures



Source: Environmental Protection Agency "2006 Community Water System Survey".

The fundamental difference between these different types of rate structures is how they price the volumetric component of a bill. This only tells part of the pricing story. In addition to a **volumetric** charge, almost all water systems also assess a fixed charge for each billing cycle—meaning no matter how much water each customer uses, they pay a fixed fee for their water connection. The fixed component of a bill may be modest, say $10 or less, or it may also be quite high compared to the volumetric component of the bill, or even the majority of the bill that a customer receives.

The relative **ratio of fixed to volumetric charges** is a matter of great concern to both the customer and the water provider. For the water system, the higher the fixed charge, the greater the known revenue they can plan for in the coming year. But for the customer, the higher the fixed charge as a proportion of the total bill, the less they're able to manage water costs by reducing water use.

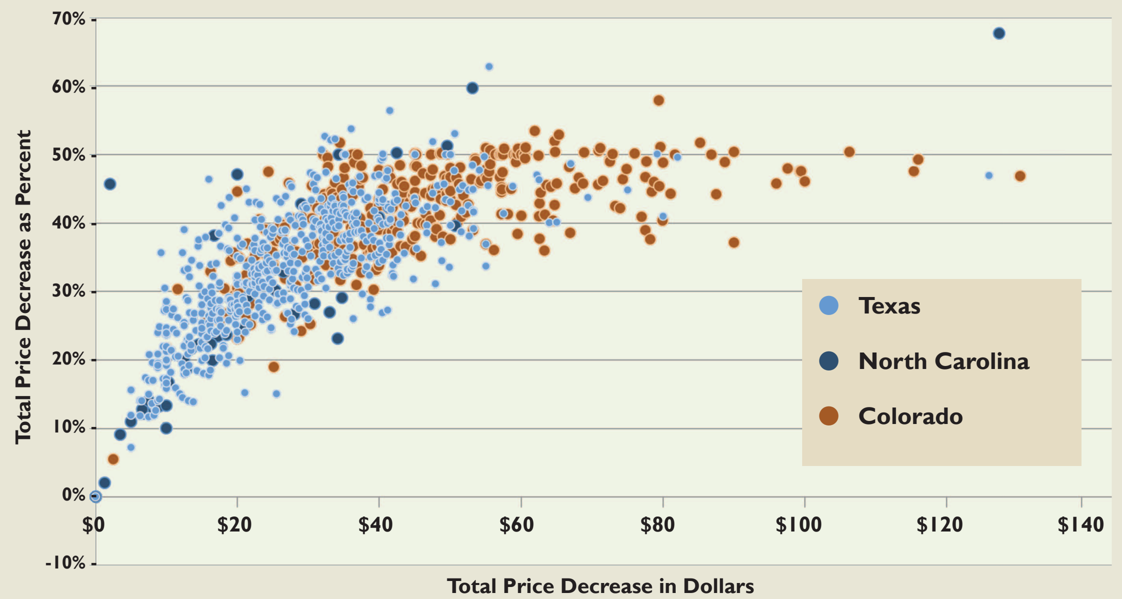
The higher the fixed proportion of a bill, the less risk the system faces in having customers use less water. Yet of course, the higher the fixed proportion of the bill, the lower the pricing signal to reduce water use. Clearly there is a delicate balance required between shoring up the reliability of revenues and using pricing as an effective driver of behavior.

So what are some **metrics** that advocates can use to assess a water system's pricing structure?

One metric for assessing the strength of a water system's conservation pricing signal is the reduction a household would see in its bill by decreasing its monthly use from one consumption point to another, say **10,000 gallons to 5,000 gallons** of water. A reduction of water use of this size could be achieved by limiting outdoor irrigation or replacing indoor appliances and plumbing fixtures for a larger family. The decrease in a monthly bill can be assessed both in terms of the total dollar reduction and in terms of the percent reduction in the household bill achieved by reducing water loss to this level. Water systems in the upper right hand corner of the graph in Figure 5 (page 19) provide a very strong signal in both terms for households to reduce water consumption, whereas water systems in the lower left hand corner of the graph provide little financial incentive for customers to reduce their usage.

QUESTIONS WORTH ASKING: What difference in monthly bill would a household see if it reduced its use from 10,000 gallons to 5,000 gallons? What effect would this have on water provider revenues? On the utility's ability to sustain a reserve or invest in infrastructure replacement? For combined drinking water and wastewater systems, what would be the impact on wastewater provider revenues since wastewater services are usually billed on water meter usage?

Figure 5: Colorado, North Carolina & Texas Reductions in 2012 Water & Sewer Bill for Decrease in Consumption from 10,000-5,000 Gal/Month



Source: Courtesy of Jeffrey Hughes, University of North Carolina Environmental Finance Center.

It is important to keep in mind that a pricing structure that delivers a strong financial incentive to customers to reduce their usage may also create financial risk for a water system if their customers respond to this pricing signal. There are many examples of water systems that have sustained credit downgrades because their customers have reduced water usage considerably in response to water conservation programs and pricing, necessitating rate increases that were not implemented by city councils. Contra Costa Water District in California[11] is one such example, as is Fort Worth's water system.[12]

Advocates can find credit rating opinions for water systems by registering for a free account on any of the rating agency websites.

This does not mean that conservation is toxic to water system financials, but it does mean that **conservation must be anticipated in the transformation of water systems' rate structures** to allow them to maintain revenue sufficiency as conservation changes water sales. Advocates arguing in support of water conservation need to lend their voices in support of rate transformation and the implementation of financial policies that smooth the revenue effects of conservation while still spurring further efficiency and conservation. When a water system anticipates the effects of conservation and efficiency in its financial planning, it also becomes better prepared to use water efficiency as the backbone of its water supply planning overall, with benefits for ratepayers and for water resources generally.

So what tools do water systems have to maintain their financial health while sending a strong signal to conserve?

The most comprehensive guide to water utility rate structures and financial policies in support of conservation is the California Urban Water Conservation Council's (CUWCC) set of Best Management Practices.[13] Advocates should acquaint themselves with these Practices, which go into far more depth than is possible in this guide. Another useful resource is a recent white paper released by Pacific Institute that focuses on the challenges posed by a "new normal" of increasing water costs and decreasing water

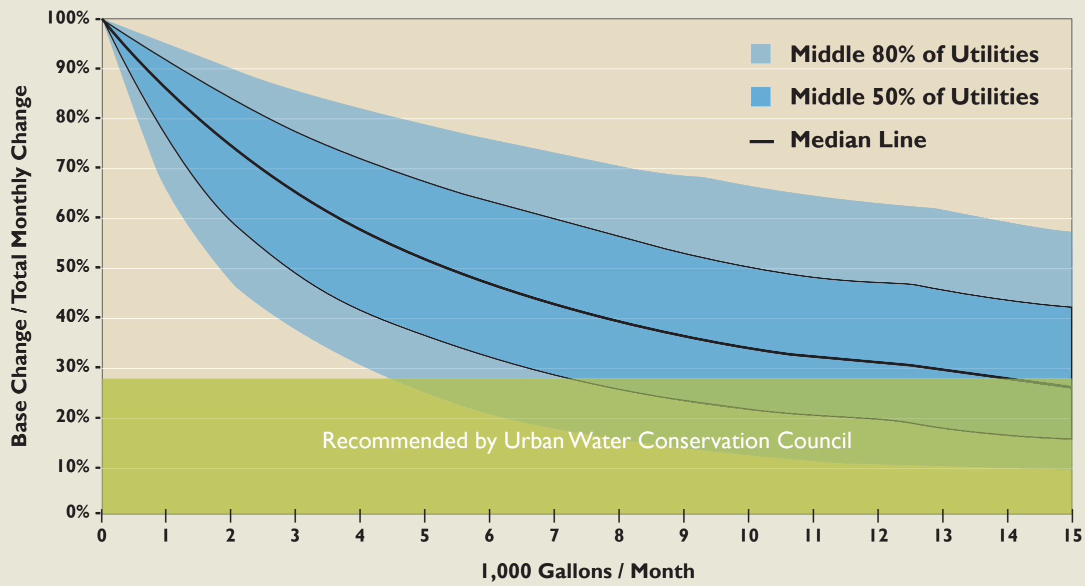
11 Fitch Research, "Fitch Rates Contra Costa Water District (CA) & Water Authority Revs 'AA+'," *Fitch Ratings*, June 19, 2012, http://www.fitchratings.com/creditdesk/press_releases/detail.cfm?pr_id=752983.

12 Fitch Research, "Fitch Downgrades Fort Worth, Texas' Water and Sewer Revs to 'AA'; Outlook Stable" *Fitch Ratings*, April 10, 2013. http://www.fitchratings.com/creditdesk/press_releases/detail.cfm?pr_id=788107.

13 California Urban Water Conservation Council. "Memorandum of Understanding Regarding Urban Water Conservation in California," September 16, 2009. http://www.cuwcc.org/WorkArea/showcontent.aspx?id=12976.

demand. The paper addresses some of the key challenges that water service providers will face in their efforts to establish rate structures that support fiscal solvency, including the advantages and disadvantages of different rate structures and their relationship to water use trends.[14]

Figure 6: Portion of Monthly Bill that is Fixed (Base Change) Across 84 CA Utilities in 2011



Data analyzed by the Environmental Finance Center at the University of North Carolina. Data Source: AWWA and RFC CA Rates Survey, 2011.

One indicator of the balance between conservation pricing signal and revenue stability is the **fixed charge** component of a bill. The CUWCC recommends that water systems hold the revenue from fixed charges at 30% or lower of the total revenue from customer bills.[15] The figure above shows this guideline if it were applied to individual customer bills.

The fixed charge is one tool that helps water systems recover a portion of the high-fixed cost of water service. There are other financial tools, such as combining very conservative sales projections with **revenue stabilization funds**.[16] The fund can be raised over time through the monthly payments collected by customers either through a discrete line item on the customer bill or from general revenues.

Stabilization funds can be difficult to create and maintain because customers and city councils often do not understand why the water system is accumulating revenues in excess of present costs. When there is political resistance to rate increases, the existence of surplus funds like those contained in a stabilization fund may seem like an attractive alternative source of cash for operations. Unfortunately tapping into a fund to delay rate adjustments that are not driven by downturns in revenue undermines the water system's ability to weather future droughts or demand shifts.

For stabilization funds to work, the water system's management and board should define the policies that determine when the fund will be used to supplement lower than normal revenue. If the reduced revenue is the result of a temporary change—say a multi-year recession—the fund could help to minimize rate increases that would otherwise be necessary to make up for lost revenue. If the reduced revenue is the result of a permanent change—say, a permanent reduction in customer water use

14 Pacific Institute (Kristin Donelly and Dr. Juliet Christian-Smith), "An Overview of the 'New Normal' and Water Rate Basics", available at http://www.pacinst.org/wp-content/uploads/2013/06/pacinst-new-normal-and-water-rate-basics.pdf.

15 http://www.cuwcc.org/BMP-11-Rates.aspx.

16 This can sometimes be called a rate stabilization fund.

brought by appliance retrofits —the fund would minimize rate increases in the short-term but would not necessarily prevent future rate increases to compensate for the reduced revenues. Of course, over the long-term a water system's fixed costs may also be reduced by having to meet lower peak or average capacity as a result of these permanent changes, and so rate increases would be lower in comparison to the cost of meeting those higher system capacities.

Some systems have a type of revenue stabilization fund called a **drought stabilization fund** that is only assessed in times of drought. The fund could be seeded over time with revenues received from customers in good years, and called upon in times of drought when water systems put into place mandatory watering restrictions that eat into sales. A different approach to this is a **drought surcharge** applied to water sales during times of extreme drought. Depending on how they are designed, the drought surcharge can do multiple things: if applied based on volumetric use, it can communicate a stronger pricing signal to help move customers toward conservation; if applied to customers regardless of volumetric use, it simply helps to recover revenue lost from water use restrictions. The political palatability of drought stabilization funds or drought surcharges probably depends on the place, and whether voters are more accepting of mandatory use restrictions or price signals in response to droughts.

A QUESTION WORTH ASKING: What tools does the water system have in place to stabilize revenues if customers significantly reduce their water use?

In the coming decades we are likely to see major changes to the water utility pricing structure. For example, water providers might charge customers a monthly rate year-round that is based on their peak summer demand, which drives infrastructure and supply costs. In this pricing paradigm, customers with high outdoor summertime use would pay a higher proportion of water system's costs year-round in both their fixed and volumetric rates, reflecting the real costs they put on the system. There are many other examples of water pricing models yet to be tested by water providers.[17]

The adoption of pricing structures better suited to sustainable water systems will be a political endeavor. It will depend on education and outreach to water customers, mayors and city councils and require political organizing. The more transparency and openness that a water system can bring to the process—by including community stakeholders in substantive discussions about rates—the more that new rate structures can have broad-based support for implementation. (The San Antonio Water System's various citizen committees provide positive examples of this kind of open public process.) Water advocates can and should play an active role in supporting the transition to twenty-first century water utility pricing.

17 A great resource for advanced water utility pricing models is the University of North Carolina—Chapel Hill Environmental Finance Center blog, available at http://efc.web.unc.edu/.

How Do Water Systems Pay for Conservation?

Most water systems fund conservation and efficiency programs with cash on hand, meaning the revenues they receive from customers today. In some places, like San Antonio, conservation programs are funded with revenue from the customers who use the most water—those customers who are in the "top-tier" of water users and who choose to pay higher unit rates for water rather than reduce their usage in response to the pricing signal of inclining block rate structures. For cities like San Antonio, this has been a highly effective way of funding appliance and plumbing fixture replacement programs.

The San Antonio Water System pays for all of its indoor appliance retrofits with revenue earned from their highest tier of water users. Acknowledging that some customers are highly price insensitive, and will water lawns no matter what the cost, SAWS decided to put that revenue stream to work to fund toilet rebates and other appliance replacement programs to reduce indoor water use among its other customers.

In Santa Fe, all new residential developments must pay for the water required to deliver water services to the residence over time. Developers can either purchase water rights on the open market or may earn water from the city by paying into a Conserved Water Bank, which is used by the city to fund indoor appliance replacement programs. For example, a developer may earn enough water to build one new home by depositing into the Conserved Water Bank enough money to buy 10 low flow toilets.

Cash-based programs can go a long way toward funding appliance and plumbing fixture replacement campaigns. But the amount of cash a system has on hand during any given year is limited and in heavy competition with other priority needs. In most states, water systems are only able to use cash to fund conservation programs because they are prohibited from using the money they raise through bond sales for the benefit of private entities. This prohibition is sometimes called a "**gift clause**."

While this seems like a minor inconvenience, it actually is one of the most persistent obstacles to large-scale conservation programs. A water system may be able to secure hundreds of thousands of gallons of water in the span of a few years by replacing wasteful indoor plumbing and appliances. But without the ability to use bond funds for this purpose, the water system must dedicate a huge proportion of its cash accounts to this program or substantially increase its customers' rates to raise additional cash in the near-term.

Think of it this way: a water system planning a major upgrade to its centralized infrastructure—its treatment plants, conveyance systems and storage facilities—has the option of bond financing the construction of these assets. Bond financing brings with it the advantage of spreading the construction and financing costs over very long periods—as much as 30 to 40 years. On the other hand, most water systems that are planning significant water conservation and efficiency campaigns can only use their cash on hand to pay for these programs.

Some water systems have found ways to unlock the potential for bond financing in conservation and efficiency programs. In 1989, the voters of Washington State passed a ballot proposition exempting public water systems from the state's gift clause. The ballot language adopted by 64% of voters was: "Shall the State constitution permit local governments to finance, from the revenues of water sales, private efforts to conserve water?"[18] Oregon voters have passed a similar proposition. As a result, public water systems in both states have been able to achieve a significant penetration of high-efficiency plumbing fixtures and appliances and forestall unnecessary capacity expansions for decades.

Conservation advocates could play an important role in other states to allow the bond financing of water conservation programs. In addition, conservation advocates can help to deliver the message at the state level of the need to dedicate state funds allocated for public water systems to conservation programs, to make up for the limited amount of cash funds available to water systems.

Even without such changes to water systems' legal abilities to pay for conservation programs, advocates can help push systems to broaden their thinking and deeply examine the potential benefits of exploring conservation and efficiency meaningfully in their water supply planning. Performing studies such as a Water Conservation Potential Assessment can help the water system's leadership understand the financial implications and opportunities associated with different conservation and efficiency measures, opening the door to implementing these measures in a financially sustainable way.

QUESTIONS WORTH ASKING: How does the water system pay for water conservation and efficiency programs? Does the water system use bonds to pay for these programs? Are there opportunities to enable the use of bonds to pay for demand management programs?

18 http://ballotpedia.org/wiki/index.php/Washington_Public_Funding_of_Private_Conservation_Efforts,_Amendment_86_(1989).

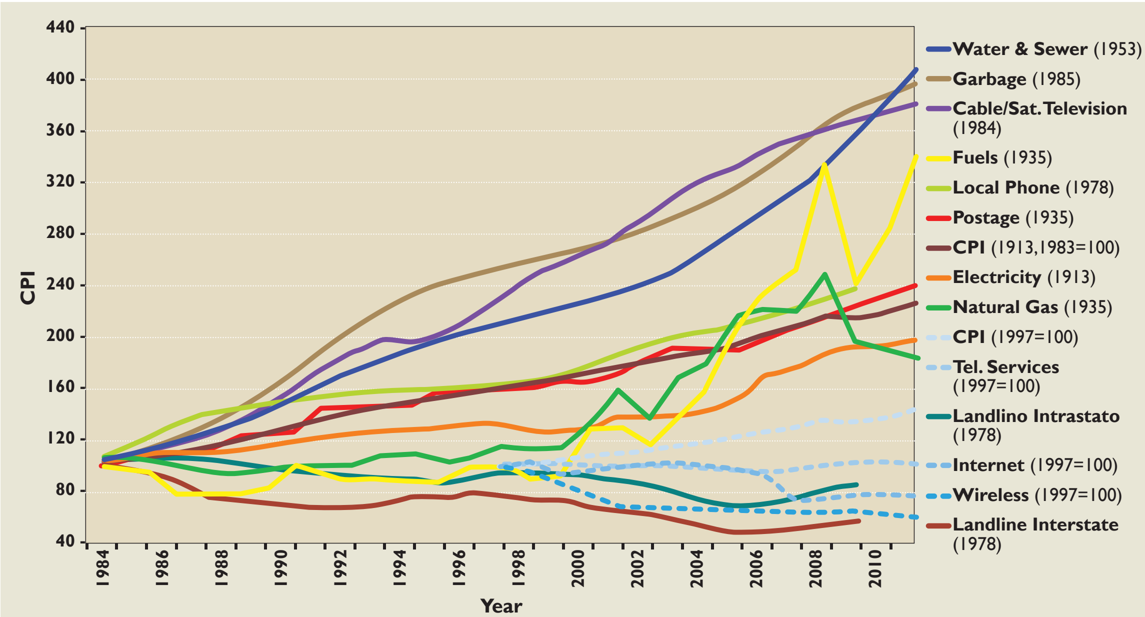
How Do We Balance Conservation and Affordability?

Pricing water services to encourage conservation and efficiency can be a powerful tool. Yet political leaders and community members may fear that conservation pricing will be one more burden on low-income households already struggling to meet rising water costs.

The better informed advocates are of the tools available to protect affordable water services for low-income households, the less likely this fear will become an obstacle to conservation and efficiency programs.

It is true that the cost of water services is already increasing at a rate that presents long-term affordability challenges. As Figure 7 shows, the cost of water services is rising faster than Consumer Price Index (CPI) and at a much faster rate than any other basic service. The escalation of water rates is largely the result of decades' worth of deferred rate adjustments that were necessary to continually improve and maintain water systems.

Figure 7: Trends in Consumer Price Index (CPI) for Utilities



Source: Janice A. Beecher, Ph.D., "Trends in Consumer Prices (CPI) for Utilities Through 2011," *Institute of Public Utilities Regulatory Research and Education*, Michigan State University, March 2012, http://ipu.msu.edu/research/pdfs/IPU-Consumer-Price-Index-for-Utilities-2011-2012.pdf.

In fact, this is why water conservation is so important for today's water users and for future generations—**the more we lock ourselves into high-cost infrastructure projects designed to meet increasing peak demand, the less ability we will have to control the cost of water services.**

Water systems can safeguard affordability for low-income customers by setting policies aimed at providing essential water services at affordable prices. This level of service is sometimes known as lifeline rates, and while the volume of water delivered may vary between different communities, one rule of thumb is 1,200 gallons per person per month.[19] In most cases, this is enough water to adequately meet all indoor needs. In some communities, water systems may choose to set lifeline rates for some degree of outdoor irrigation. Water systems could choose to maintain this rate for all households, regardless of income, or for qualifying low-income customers, however in many areas, state laws prevent income-based rates of any kind.[20]

The amount a household should be expected to pay for basic services will differ considerably across communities. In some communities, capping lifeline service levels to a maximum of 2% of Area Median Income (AMI) may be sufficient to protect affordability. In communities with a much higher percentage of households significantly below the poverty line, even 2% of AMI may be considered too burdensome and another benchmark may be required. For example, as income disparity widens a more appropriate measure may be the household bill as a percentage of $20,000 annual income and the percentage of households living on less than $20,000 a year.[21]

The 2% AMI target was originally proposed by the Environmental Protection Agency as a measure of the financial capability across an entire service area in the context of relief from regulatory pressure and was never meant to be a definitive indicator of low income struggles in a particular area. In other words, an area where the average water bill divided by the AMI is below 2% does not mean that there are not families, sometimes many of them, that have legitimate financial difficulties paying their bill. This same measurement is widely used by credit rating agencies and investors to assess affordability of water services, as an indicator of political resistance to rate increases or economic inability to pay among a system's ratepayers. The problem with using percentage of AMI as a measurement of the affordability of an *average* household bill rather than affordability of an essential level of water service (like 1,200 gallons per person per month) is that in communities with very high average use, the affordability metric may then promote excessive water use. For this reason, affordability targets are most appropriately set based on an essential level of water use rather than the historic or existing average level of household water use.

However the water system sets its affordability metrics, the goal should be twofold: preserve affordability of essential water services for low-income customers and keep essential water services affordable to all customers over the long-term.

QUESTIONS WORTH ASKING: Does the water system have a lifeline rate? How does the system set goals to maintain the affordability of services for its low-income customers? How will the system's existing Capital Improvement Program increase rates across all customer classes over time? How does the system set goals to maintain long-term affordability of its services for average customers?

19 This is equivalent to 40 gallons per capita per day (40 gpcd) which is effectively the lowest system-wide average water usage in the United States. For example, San Francisco Public Utility Commission estimates per capita water use in its service territory as 50.7 gpcd. This system-wide average reflects mostly indoor water use for essential purposes.

20 For more on water rate designs for affordability, see "Socioeconomic Impacts of Water Conservation" edited by Janice A. Beecher, Thomas W. Chesnutt, David M. Pekelney, AWWA Research Foundation, 2001.

21 *See* http://efc.web.unc.edu/2013/05/29/water-services-are-cheap-right-maybe-not-for-everyone/ for an alternative approach to affordability.

How Do We Build Support for Conservation and Efficiency?

Conservation and efficiency can be a hard sell for customers who view their water as a commodity or consumer good. When water systems make up for reduced customer use by increasing rates, the perception of many customers is that they are being charged more for less. Educating stakeholders about the value of their water services and the long-term costs of trying to meet peak demand will take time and effort by water providers and advocates. It will require a broader understanding of water systems' role as service providers, and even as emerging stewards of natural resources, rather than merely as distributors of a product.

Who are the important people to educate? **City council** members, county commissioners and **mayors** often face the most political pressure when a water system decides to change rates or implement conservation and efficiency policies. They should be a primary audience for advocates.

The more stakeholder voices in support of conservation and efficiency, the more likely political leaders will show leadership by implementing conservation and efficiency programs, policies and pricing. Advocates should consider building alliances that represent a broad constituency base, including environmental advocates, affordability advocates and taxpayer advocates, all of whom have an interest in ensuring the long-term affordability of water services and the minimization of wasteful spending.

There are some great examples of collaboration among environmental advocates and advocates for low-income communities and taxpayers. In Utah, Citizens for Dixie, a taxpayer advocacy group, has been successful at delivering the economic message of the unnecessary cost of water diversion projects.

QUESTIONS WORTH ASKING: Which community voices are missing from the political debate over conservation and efficiency? Who will deliver the message most effectively?

Advocates already play an important role in shaping opposition to wasteful water projects. To enable the transition to soft-path solutions to water needs, advocates will need to expand their commitment to supporting conservation policies, financial practices and rate structures. We hope that this guide provides a common platform for understanding the financial practices needed to effectively implement conservation. We also hope it will foster the enhanced collaboration needed to guide the transition to sustainable water management.

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