2022

GROWING WATER SMART

THE WATER-LAND USE GUIDEBOOK

ARIZONA

Ensuring a Prosperous Future and Healthy Watersheds
Through the Integration of Water Resources and Land Use Planning

BABBITT CENTER
FOR LAND AND WATER POLICY
A Center of the Lincoln Institute of Land Policy

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ACKNOWLEDGEMENTS

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THANK YOU TO OUR FUNDERS

Our work is made possible by the generous support of partners, sponsors, public institutions, private funders, and in-kind contributors who care about the future of Arizona and envision a more resilient future within the Colorado River Basin.

ABOUT GROWING WATER SMART

Growing Water Smart, a program of the Sonoran Institute and Lincoln Institute of Land Policy's Babbitt Center for Land and Water Policy, introduces communities to the full range of communications, public engagement, planning, and policy implementation tools to realize their watershed health and community resiliency goals. The Growing Water Smart workshop empowers local government leaders to adopt land use plans and policies that support water resilience. Interested individuals can learn more at www.growingwatersmart.org.

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ABOUT SONORAN INSTITUTE

The Sonoran Institute's mission is to connect people and communities with the natural resources that nourish and sustain them. We envision a Colorado River Basin where rivers flow, landscapes are healthy, and all communities thrive.

BABBITT CENTER FOR LAND AND WATER POLICY
A Center of the Lincoln Institute of Land Policy

ABOUT THE BABBITT CENTER FOR LAND AND WATER POLICY

The Babbitt Center for Land and Water Policy, a center of the Lincoln Institute of Land Policy, seeks to advance the integration of land and water management to meet the current and future water needs of Colorado River Basin communities, economies, and the environment. The Babbitt Center develops tools and best practices to guide decisions through research, training, and partnerships for sustainable management of land and water resources in the Basin and beyond.

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TABLE OF CONTENTS

TABLES

INTRODUCTION

This guidebook serves as a compendium to the Growing Water Smart training and assistance program. It provides resources related to collaborative and holistic water resource management and land use planning so that communities can shift their focus from supply- to demand-side management, from growth to an emphasis on holistic watershed health, and from siloed governance to an integrated water and land use planning paradigm.

THE LIMITATIONS OF SUPPLY-SIDE WATER RESOURCE MANAGEMENT

By 2050, Arizona's population is predicted to increase by half, putting additional pressure on our state's already limited water resources. In many of Arizona's rural communities, groundwater is the primary—and often only—source of water. Groundwater use in some areas already exceeds what is replenished, resulting in declining water levels, drying wells, conflicts between neighbors, land subsidence, and impacts to springs and streams. Even in communities with access to renewable water sources, water users are experiencing increased variability in water supply each year. For example, Central Arizona agricultural water users have had access to both Colorado River water from the Central Arizona Project canal system and local groundwater, but long-term overuse and drought conditions are impacting the year-to-year availability of Colorado River water, shifting demand onto already-stressed and limited groundwater supplies. In 2022, the Colorado River will experience formal shortage conditions for the first time, with the possibility of further shortages by 2025.

A growing population combined with water supply constraints escalate the costs of operating local utilities and the cost of acquiring new water sources. It may also necessitate enhanced and expanded infrastructure. Water resource managers and water providers have often looked to ***supply-side management*** to meet their growing demand by investing in water acquisition, treatment, storage, and distribution projects. However, increasing water supply, particularly for groundwater-dependent communities with few available alternative sources, comes at a significant cost in terms of money, time, and resources. In addition, cities nearing build-out may not have land available to accommodate the necessary infrastructure.

SHIFTING OUR FOCUS FROM SUPPLY TO DEMAND-SIDE MANAGEMENT

Instead of making costly investments to increase water supply, communities increasingly are reducing demand for water by using existing supplies more efficiently.

Demand-side management generally includes:

- **Water Conservation:** reducing water consumption by encouraging water users to modify their behaviors.
- **Water Efficiency:** using building and site design or technology that uses less water.
- **Water Reuse:** recycling stormwater, greywater, and wastewater to replace or augment the water supply.

One impactful strategy in water demand management is integrating water conservation, efficiency, and reuse into land use planning. Communities throughout the West have found that by increasing development density, utilizing technological efficiencies, and enacting aggressive conservation programs, they have been able to continue to grow without acquiring new water supplies. Water-smart land use planning can reduce the negative financial impacts of increased water demand through efficiency and conservation measures implemented prior to, during, and after building construction.

The demand management approach to water resources is good for the triple bottom line of financial, social, and environmental outcomes. It increases the cost-benefit ratio of capital investments by using the same amount of water and infrastructure to serve more people per dollar spent, benefits the environment by balancing ecosystem and human needs, and ensures a more sustainable future for our communities through a more resilient and long-lasting water supply.

SHIFTING OUR FOCUS TO WATERSHED HEALTH

Every community lives within a watershed—a land area that channels rainfall and snowmelt to creeks, streams, rivers, and underlying groundwater aquifers.[1]

The amount and quality of water in rivers, streams, and groundwater aquifers all depend on activities in the land area upstream from those sources. Watersheds are delicate ecosystems, and a tension exists between preserving the natural environment and developing land for residential, commercial, or industrial uses to house a growing population and promote economic growth. While degradation of land within a watershed comes with societal and environmental costs, careful management yields significant benefits. Holistically managed watersheds can store water supplies; reduce erosion and channel incision; increase infiltration into local floodplains and regional aquifers; reduce water treatment costs; and provide habitat, biodiversity, recreation, and aesthetic values. Healthy watersheds and resilient natural systems can also help communities cope with increasingly extreme weather events such as droughts, high temperatures, and severe wildfires.

Fortunately, many measures can be taken to maintain and improve watershed health, both for existing and future development. Factors such as lot size, density, water conservation measures, vegetation management and habitat protection, and stormwater management all influence the health of the watershed and impact water quality and stream flows.

[1] U.S.G.S., Watersheds and Drainage Basins.

SHIFTING OUR FOCUS TO INTEGRATED WATER RESOURCE MANAGEMENT

The earth's water cycle is a closed loop that circulates water between the oceans, the atmosphere, and the land via precipitation, drainage, and evaporation.

Just as the natural environment treats water as a cycle, it is important that communities view their water supply, including wastewater and stormwater, as interconnected. Integrated Water Resource Management, also known as One Water, is such an approach. By coordinating the development and management of water, land, and related resources, Integrated Water Resource Management maximizes economic and social benefits while minimizing impacts on the environment. A key step in this process is to change institutional structures to strengthen the coordination and collaboration between water supply and wastewater managers, land use planners, economic development managers, and other key officials.

WATER AND LAND USE INTEGRATION OPPORTUNITIES

Arizona communities are charged with accommodating growing populations and supporting economic development and quality of life while managing increasingly variable and scarce water supplies, aging infrastructure, and impacts of land and habitat degradation.

Regionally shared risks of extreme weather and wildfires make the interconnectedness of land and water particularly apparent. Across Arizona, communities have experienced record heat, devastating fires, dry soils, ongoing drought, and damaging floods, alongside the health and economic impacts associated with the COVID-19 pandemic, which in some places were exacerbated by limited access to safe and reliable water. These conditions have highlighted the urgency to act now to build community, economic, and environmental resiliency across regions and watersheds.

At the community level, each planning and regulatory mechanism guiding how and where a community develops provides an opportunity to strengthen the nexus between water and land use. Intervention points are described in **Table 1**. Determining where to intervene will depend on the community's political motivation and capacity, the water demand management initiatives that have been implemented to date, and the water-saving goals. The vision and goals defined in comprehensive and general plans will guide opportunities in other elements of a local government's land use policies and programs.

TABLE 1: OPPORTUNITIES FOR INTEGRATED WATER AND LAND USE

POINT OF INTERVENTION	TOOL	PURPOSE
VISIONING & PLANNING	• Visioning • Information Sharing & Alignment • Public Engagement & Education • Regional Partnerships • Comprehensive & General Plans • Community Water System Plans • Local & Regional Water Quality Plans • Capital Improvement Plans • Hazard Mitigation, Response, & Recovery Plans • One Water Plans	Evaluates local water supplies, current and future demands, and related community and economic values. Establishes goals and objectives for managing the intersection of natural resources and the built environment.
ENSURING WATER SUPPLY FOR DEVELOPMENT	• Arizona Water Supply Rules • Water Budgeting • Water Allocation Policies • Water Demand Offset Programs • Annexation Policies	Links new development to water supply planning. Determines the requirements applied to new development for water resource management, conservation, and efficiency.
LAND USE POLICY AND PROCESS	• Compact Development • Water Efficient Landscapes • Water Smart Buildings • Development Review	Directs how land is developed and the amount of water the developments will require.
WATERSHED HEALTH & ALTERNATIVE SUPPLIES	• Watershed Protection • Green Infrastructure & Low Impact Development • Alternative Water Supplies	Protects the regional water quality and pairs the right water supply with the appropriate use.
EFFICIENT WATER DEMAND PROGRAMS	• Conservation Rate Structuring • Conservation Rebate Programs • Water Metering, Audits, & Leak Detection • Consumer Educational Messaging	Empowers and incentivizes landowners and renters to reduce water consumption. Links community-wide programs to water supply planning.

THE LAND USE–WATER NEXUS RESOURCE GUIDE

This resource guide is intended to help your community identify the most appropriate intervention points related directly to land use that will help you achieve your community's water resource management goals. It is divided into five sections.

Each Section Includes:

- **A Case Statement** justifying each approach.
- **Toolboxes and Tools** describing the specific policy or management actions for achieving water conservation and efficiency outcomes.
- **Approaches** for implementing the tools.
- **Case Studies** demonstrating how other communities have implemented one or more of the tools to integrate their water and land use planning efforts.

SECTION 1:

VISIONING & PLANNING

Summarizes opportunities provided by integrating water and land use during planning processes.

SECTION 2:

ENSURING WATER SUPPLY FOR DEVELOPMENT

Provides a review of the State of Arizona's requirement for new developments to have an adequate and sustainable water supply.

SECTION 3:

LAND USE POLICY & PROCESS

Introduces regulatory principles, policies, and procedures that can make a community's development pattern water smart.

SECTION 4:

WATERSHED HEALTH & ALTERNATIVE SUPPLIES

Describes approaches for protecting water quality and maximizing the many forms of water that can support a resilient community.

SECTION 5:

EFFICIENT WATER DEMAND PROGRAMS

Summarizes additional programs and options for managing existing community water demands.

The following additional resources are available at resilientwest.org/2022/AZ-Appendices

- An electronic version of this Guidebook with **hyperlinks to websites** that correspond to green text throughout this document.
- A legal memorandum on the **local authority** to manage water through land use.
- A summary of **relevant state legislation.**
- A **resource list** of additional reports, tools, and policy examples.
- A summary of relevant **funding and assistance** from our partners, the state, and federal agencies.

SECTION 1

VISIONING & PLANNING

For a sustainable future, communities must create guiding plans that integrate land use planning with water availability forecasting and water resiliency goals.

CASE STATEMENT

Traditionally, water planning and land use planning processes have been conducted in separate departments or agencies. Land use planners have focused on the amount and types of growth that may take place in their communities, while water resource managers have focused on ensuring adequate water availability. Comprehensive planning, water planning, capital improvement planning, and climate resilience planning are all interrelated, however, and integrating them will require holistic thinking and cross-departmental collaboration.

Done successfully, an integrated water resource and land use management approach can ensure the following:

A community's vision for the future considers the interrelated impacts of water and growth.

The community's vision and goals for sustainability and resilience are expressed and aligned across plans for water resource management, community health, capital improvement, and economic development.

Development occurs in a way that protects the watershed, including ecological functions and the quality and quantity of water resources.

TOOLBOX: SETTING THE FOUNDATION FOR STRONG PLANS

Planning provides the roadmap for a community's policies, programs, and regulations. Processes such as visioning, information sharing and data alignment, public education and engagement, and regional partnerships serve as the foundation for creating scientifically sound, publicly understood, and supported community plans.

Photo by J. Emanuel Stuart

Visioning

A visioning process identifies what a community desires for its future and what approaches the community intends to take to realize its vision. Scenario planning can help a community clarify its values and create a clear vision for its future, most frequently through using visualization tools that illustrate alternative future scenarios. In this *normative approach* to long-range planning, models assist in decision-making by assessing the impact of different development patterns on indicators such as water demand, air quality, and vehicle trips.

Exploratory scenario planning applies a slightly different approach and is most effective when used to consider and develop responses to uncertainties. Rather than selecting a preferred scenario and developing a plan to achieve that specific vision, an exploratory approach envisions how a community may need to adapt and manage different outcomes for a variety of scenarios that are driven by forces which are often out of a community's control. Across the West, water and planning departments are using exploratory scenarios to think strategically about how to plan for water, growth, and climate change.

Information Sharing & Alignment

Land use and water departments often use different data sets and analysis methods in their decision-making processes, such as growth rates to inform future land use or water demand projections. Identifying the discrepancies and understanding the implications of different projection methods can help estimate the extent of uncertainty and error in results. Coordinating around these issues, sharing information, and looking for ways to align data sets and methods will promote consistency and mutual understanding across departments and lead to better decision-making.

Public Engagement & Education

Community members can support integrated water and land use. When invited to learn and participate in visioning and goal setting, the public can provide feedback and information on how climate change is impacting groundwater, water bodies, and agricultural outputs. Meanwhile, education or training programs for staff, elected officials, and public stakeholders strengthen understanding and support for strategies that incorporate water-saving measures into land use.

Regional Partnerships

Some goals are attainable within a single jurisdiction while others may require scaling collaboration outside your jurisdiction. Adding partners and coordinating across jurisdictions can expand resources and result in a larger impact. Regional committees and partnerships can provide an opportunity for cross-jurisdictional planning around shared water resources. They offer a way for county, municipal, water district staff, and stakeholders to collaboratively study local and regional issues, define desired future conditions, evaluate potential paths forward, and partner on implementation.

Measuring & Tracking Progress

Measuring and tracking the results of water and land use integration is vital to determining whether a community's vision and goals are being met. Growing Water Smart Metrics: Tracking the Integration of Water and Land Use Planning offers a set of indicators that can be assessed for year-over-year trends to demonstrate achievement of water savings through land use planning. Ten "progress" metrics track considerations as to whether the community's land use plan integrates water efficiency and its water plan integrates land use strategies; conservation-oriented system development charges and pricing structures are being used; indoor and outdoor water efficiency measures are being utilized; and collaboration around development proposals is occurring. Fourteen "impact" metrics measure increasing or decreasing trends in water demand and use and trends in development patterns and land use.

Approaches for Setting Strong Plan Foundations:

- Engage stakeholders early and often to ensure concerns are prioritized and addressed. This increases confidence in the final documents and buy-in during plan implementation.
- Employ *Exploratory Scenario Planning* techniques to thoroughly prepare for a variety of potential future conditions.
- Train your elected officials on your vision documents and how your land use planning decisions align with your strategic vision.
- Partner with regional, state, and federal entities to develop and fund related regional plans and studies.
- Use visioning processes and scenario planning to assess future vulnerabilities and uncertainties affecting water resources.

Photo ©Bill Hatcher/Sonoran Institute, 2022

CASE STUDY

WATER & WASTEWATER INFRASTRUCTURE, SUPPLY & PLANNING STUDY — CITY OF TUCSON & PIMA COUNTY, AZ

Applies to: County | Municipality | AMA | Non-AMA

Acknowledging the scarcity and uncertainty of their water supplies, the City of Tucson and Pima County recognized the need for "a new paradigm" for water and land planning. In 2008 they launched an unprecedented joint effort to work together toward sustainable water planning, set forth in the Water & Wastewater Infrastructure, Supply & Planning Study (WISP).

WISP outlined an approach that allocates water for environmental restoration, balances water supply and demand management, and builds upon the crucial link between urban form and water resources.

At the heart of the new planning paradigm are public engagement and collaboration between the city and county. A new citizen oversight committee identified community values, detailed four principles of sustainability, created a working definition of sustainability, and provided additional recommendations for future action. Interdisciplinary teams of city and county staff developed a series of technical reports covering a range of topics and produced a lengthy set of recommendations. City/county staff organized the recommendations into a set of four interrelated elements: demand management, water supply, comprehensive integrated planning, and respect for the environment. Water sustainability goals for the 2011-2015 planning horizon emerged from these recommendations. The City of Tucson and Pima County adopted this framework through city and county resolutions (No. 21478 and 2010-16, respectively).

Following formal adoption, city/county staff drafted the Action Plan for Water Sustainability. This implementation plan outlined the activities necessary to meet each of the goals under the four elements, set forth a timeline from 2011-2015, identified the relevant existing programs and partners that would be involved, and described the kinds of new partnerships that would need to be established to ultimately meet all adopted goals.

The efforts of the city and county through the WISP and the Action Plan led to measurable success in both policy and planning as well as the construction of projects focused on recharge and environmental restoration. Policy successes include integrating outcomes from the WISP into the Pima County Comprehensive Plan, wheeling agreements which provide renewable water sources to areas currently relying on groundwater, and the creation of a Water Service Area Policy which guides infrastructure planning and future growth in Tucson.

CASE STUDY

REGIONAL WATER PLANNING & DEVELOPMENT — COCONINO PLATEAU WATER ADVISORY COUNCIL & WATERSHED PARTNERSHIP

Applies to: County | Municipality | AMA | Non-AMA

The Coconino Plateau Water Advisory Council and Coconino Plateau Watershed Partnership are affiliate organizations working to ensure an adequate long-term water supply for current and future needs while preserving the health of the environment on the Coconino Plateau (CPWAC, About). Established in 2000 with support of the Arizona Department of Water Resources' Rural Watershed Initiative, the Council identifies, prioritizes, and implements policies, projects, and programs to help meet the water needs of the Coconino Plateau.

The Partnership was formed as a 501(c)(3) in 2013 and is primarily an educational group. The Council and Partnership are composed of numerous state and federal agencies, four cities, the county, four tribes, and several nonprofit conservation and recreation organizations. Together, the Council and the Partnership coordinate efforts of the participants on a regional scale to facilitate and implement sound water resource management and conservation strategies. Coordination in policy planning affords the partners an opportunity to identify regional and shared water-related goals, policies, and practices; share knowledge and resources; and develop strategies on how each partner separately and together might advance the policies through their different jurisdictions and scopes of authority.

Much of the work conducted by the organizations since inception has been focused on studying water supply and development options for the region. With support from federal Rural Water Act funding, the members partnered with the U.S. Bureau of Reclamation on a North Central Arizona Water Feasibility Study; however, the members elected to not pursue the study further after loss of funding assistance when the Act sunsetted in 2016. The organizations refocused their efforts on developing a regional sustainable water management structure, engaging in legislative efforts, and participating in public education and outreach.

One of the key technical and legislative efforts has addressed the Arizona Department of Water Resources' Adequate Water Supply program rules. In their current form, the rules create challenges in demonstrating physical availability of water due to the geologic context of the Coconino Plateau, and therefore generate roadblocks for planning and development in the region. The physical availability rules require a hydrologic study and demonstration that 100 years of groundwater is available at a depth of less than 1,200 feet. Given that the depth of the aquifers providing most of the water supplies on the Coconino Plateau is close to 1,500 feet, Council members have proposed alternatives to the depth criteria, such as instead evaluating the percentage of available saturated thickness after 100 years. The Council and its members supported development of a groundwater model to evaluate alternatives and provide support for the proposed policy change. The rules have not yet been changed, but ADWR is supportive, and a stakeholder process is underway to undertake hydrologic evaluations prior to commencing the rule change process.

The organization has also provided a forum to develop other science and data tools to support decision-making and public engagement. Its recently completed Water-Related Ecosystem Services Analysis, an online decision-support tool to help determine the impacts of a proposed use of water, assist in decision-making for approval of new uses of water, and prioritize water uses. The resource is still new, so it remains to be seen how the members and others will utilize it in their respective jurisdictions and decision-making.

TOOLBOX: PLANNING DOCUMENTS

Most community plans share some nexus with water. The following plans offer the greatest opportunity to acknowledge and address water-related concerns in relation to community development and growth.

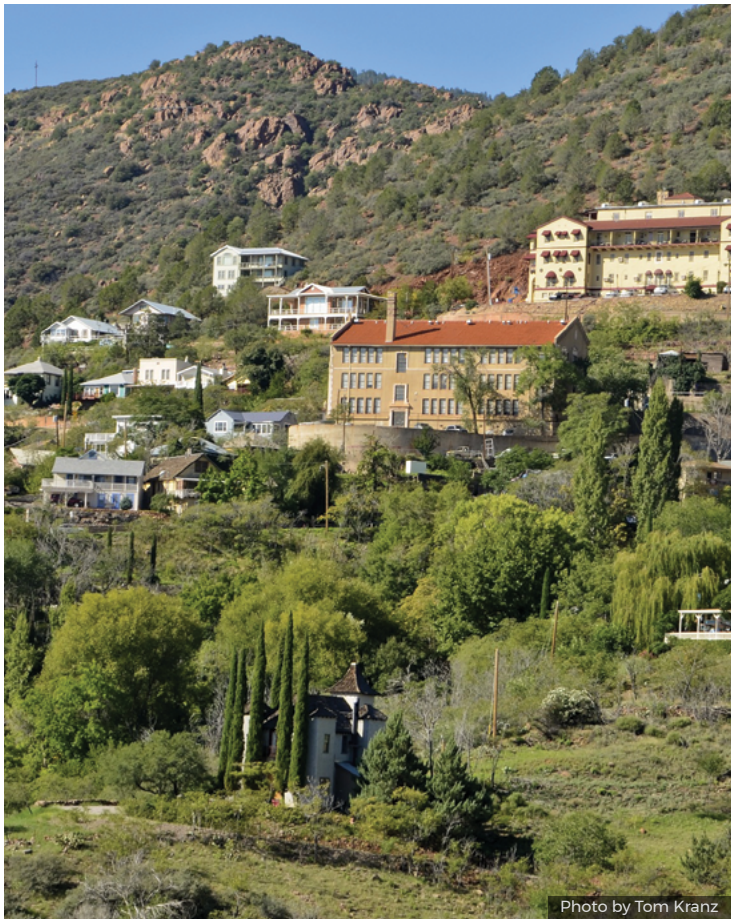


Photo by Tom Kranz

Comprehensive & General Plans

Comprehensive or general plans guide how a community will manage future land use and its implications for a wide variety of functions, including transportation networks, parks and open space, natural resources, housing, economic development, and future infrastructure needs. One of the greatest values of a comprehensive planning process is that it provides rare and valuable opportunities for a community-wide dialogue about the future.

In Arizona, many counties and municipalities are required to include a water element in their comprehensive or general plan (depending on the size of the county or municipality), but there is little guidance on how to link water with land use planning or other elements. Integrating water-related goals across plan elements ensures that the complex interrelationships between water systems, human systems, and ecological processes are considered together.

Comprehensive plans help the community understand:

- Projections for future population and drivers of growth.
- The type and location of development occurring in the community.
- The source, capacity, and conditions of a community's water supply, distribution systems, and water-related infrastructure.
- Adequacy, sustainability, and vulnerability of the water supply.
- Health conditions of the watershed.
- Current programs and projects.
- The tradeoffs that may be involved in achieving the community's goals.

Comprehensive plans can help identify opportunities to integrate water into land use policies to address:

- Water supply and demand.
- Wastewater treatment and reuse.
- Watershed and stream health.
- Floodplain and stormwater management.
- Interagency coordination and collaboration.

Water-related goals and policies may arise in a variety of ways in comprehensive and general plan elements. The most common is through inclusion of a Water Resources element. Water Resources elements are required in plans for counties with populations over 125,000 residents and cities or towns over 50,000 residents.

A Water Resources element must address: (1) the known legally and physically available surface water, groundwater, and effluent supplies; (2) the demand for water that will result from future growth projected in the general plan, added to existing uses; and (3) an analysis of how the demand for water that will result from future growth projected in the general plan will be served by the identified water supplies or a plan to obtain additional necessary water supplies.

The element leaves significant room for exploring various approaches to securing and preserving community water supplies outside of the state's regulatory roles (i.e., administering water rights and allowable uses and permitting wells, among others).

The Water Resources element could, for example:

- Address concerns about sustainability of the aquifer/surface water as part of the discussion of necessary water supplies.
- Evaluate conservation as a planning factor in its demand modeling.
- Identify goals and approaches for coordinating and consulting among departments and with other relevant entities to secure and preserve community water supplies.

Water-related goals and policies may also be relevant in other plan elements, depending on the planning and development concerns and priorities of the local government. Water resources considerations may influence policies developed for parks and recreation, environmental sustainability, or community livability.

Community Water System Plans - Water Supply, Conservation & Drought Preparedness

All water providers in the state (public and private) are required to submit a system water plan[2] to the Arizona Department of Water Resources (ADWR). A system water plan generally consists of a water supply plan, a conservation plan, and a drought preparedness plan. Depending on its size and location, however, not all water systems need to report on all three.

- A ***water supply plan*** inventories supply and infrastructure in an evaluation of a system's ability to meet its customers' needs. ADWR's guidelines recommend that the plan should consider probable and worst-case scenarios for surface water and groundwater supplies.
- A ***drought preparedness plan*** is an evaluation of strategies to reduce water demand in response to drought conditions and should include specific demand-reduction measures.
- A ***water conservation plan*** is designed to increase water efficiency in the system and encourages consumer conservation efforts. The plan should include demand- and supply-management measures, an educational component, and an evaluation component.

Many water providers, particularly in rural parts of the state, are private utilities regulated by the Arizona Corporation Commission. In addition to the plans noted above provided to ADWR, private systems must obtain a Certificate of Convenience and Necessity (CC&N) and regularly report to the Commission information about the system facilities, capital improvements, service area and customers, financing, and service rates and rules. Any increases in rates or charges proposed by the utility must be reviewed and approved by the Commission.

Local & Regional Water Quality Plans

Local and regional entities have several existing water planning authorities related to water quality control planning. Local plans and regulations around water quality are driven by federal Clean Water Act requirements related to reducing pollutant discharge. Stormwater Management Plans provide another opportunity for local entities to link water-related goals and policies across planning efforts and departments.

Local water quality control plans are connected through regional-level planning. Clean Water Act section 208 requires states to do area-wide waste treatment management plans (208 Plans). For each area, a designated representative organization develops and updates an area-wide waste treatment plan. The process must contain (among other things) "the identification of nonpoint sources of pollution, and the proposed control, using best management practices (BMPs), to attain or maintain an approved water use."[3]

Tying regional 208 Plans to local stormwater management plans and comprehensive/general plans (and vice versa), provides an opportunity to integrate goals, policies, and programs for stormwater infrastructure (including green infrastructure and low-impact development stormwater management options), sewer construction, and wastewater treatment facilities across local and regional planning efforts. It could also provide significant justifications for local decisions made on creating, updating, and implementing capital plans.

Capital Improvement Plans

Capital improvement plans (CIPs) forecast and match a community's projected revenues and its capital needs over a multi-year period. Planning departments, parks, public works, and water and wastewater utilities often rely on grants and bonds to invest in green and gray infrastructure improvements or new construction. By creating a long-term investment strategy for the infrastructure improvements identified in a comprehensive plan or water system plan, a CIP ensures that resources match community priorities and further water infrastructure that is resilient to climate change and other future scenarios.

Hazard Mitigation, Response, & Recovery Plans

Hazard mitigation plans identify specific hazards likely to impact a community, including acute shocks such as wildfire or flooding, as well as long-term stressors such as drought. These plans identify pre-disaster risk reduction as well as post-disaster response activities. Planning should include determination of how hazards can impact water infrastructure and plans for reducing vulnerability and risks.

"One Water" Plans

Integrated Water Resource Management, or "One Water" plans promote the holistic management of water in all its forms—drinking water, stormwater, wastewater, and source water. These plans

[2] Ariz. Rev. Stat. § 45-342

[3] Joel M. Gross and Kerri L. Stelcen, Basic Practice Series: Clean Water Act, 117-118 (2d ed. 2012).

offer innovative, cross-departmental solutions to traditional water management practices to maximize the strategic use of all forms of water. One Water approaches can be integrated into planned development or sub-area plans to promote a water-cycle approach to site and building plans.

Approaches for Planning Documents:

- Link water supply and demand to projected land use patterns in both comprehensive plans as well as water supply and wastewater management plans for a more granular understanding of water use by land use type.
- Reference comprehensive and general plan goals and strategies in the establishment or update of associated land use policies.
- Meaningfully address water throughout the community comprehensive or general plan elements, as well as thoroughly in the water resources element.
- Link water supply and demand, conservation, and recharge priorities and policies across related plans—including stormwater management plans and water quality plans—to address common resource concerns through a variety of approaches and authorities.
- Set aside land for water-related infrastructure, such as recharge basins and treatment and recovery wells, in your future land use maps.
- Use capital improvement plans to ensure investments are made in the physical infrastructure needed for water management, such as treatment facilities and water reuse infrastructure, or in projects that manage stormwater through green infrastructure, infill development, hazard risk reduction, and watershed restoration.
- Increase strength of your plans with *consistency requirements*, which require that future plans and zoning codes be consistent with the comprehensive plan.
- Look for confusing or conflicting language, goals, policies, processes, or regulations and take steps to clarify and align them.

CASE STUDY

IMPLEMENTING ONE WATER POLICIES — CITY OF APACHE JUNCTION, AZ

Applies to: County | Municipality | AMA | Non-AMA

The City of Apache Junction, AZ has a vision for managing limited water resources. Their One Water philosophy emphasizes the value of all types of water and strives to make the best use of each.

The City's One Water concept is based on the reality that groundwater is not sufficient to fully supply future development in their area. Therefore, in addition to groundwater supplies, the City focuses on water conservation and making the best use of the renewable water supplies and water use strategies.

One Water concepts are implemented most easily in new developments because retrofitting is not required. In 2021, two large master-planned developments were initiated on Arizona State Land nearby, allowing the City a chance to implement its One Water policies in Planned Area Developments (PAD).

The City's General Plan 2020 outlines the One Water concepts that govern water planning in the City. Creating consistency across the general plan, subdivision code, and most importantly, the zoning code improves implementation of the One Water policies. PADs derive their zoning code from the existing zoning code. If a strategy is addressed in the zoning code, then it is more likely to be in the PAD's derived code.

One Water concepts are being implemented in the following ways:

Water Conservation - Housing densities have been increased to reduce the amount of water needed for outdoor landscaping. Landscaping standards such as limiting turf in front yards are being considered, along with the other water conservation measures recommended by the Arizona Department of Water Resources (ADWR) to reduce water use.

Renewable Water Supplies – To reduce reliance on groundwater, the City is acquiring a portfolio of renewable surface water supplies including Indian leases, CAP water rights, and a Non-Indian Agriculture (NIA) water allocation. Surface water resources are conveyed through the CAP canal, which runs adjacent to the new development. Water treatment will be provided by an existing treatment facility and a second water treatment plant will be constructed to provide additional renewable water supplies.

Reclaimed Water - Wastewater flows from the Development will be treated at the City's existing water reclamation plant, providing reclaimed water for irrigation and aquifer storage to replenish aquifer pumping.

Rainwater Harvesting/ Stormwater Management – Although peak stormwater flows still need to be managed through channels to prevent flooding, stormwater can also be recharged onsite through dry wells, retention basins, and recharge facilities to help replenish the aquifer. This improves sustainability and may contribute to landscape irrigation.

Aquifer Storage and Recovery – Some water supplies are available on an intermittent basis or may need to be stored for later use. NIA water, one-time purchases of CAP water, and potential New Conservation Space water from the Bartlett Dam need to be converted to a 100-year water supply to be included in the City's Designation of Assured Water Supply (DAWS). Although stormwater cannot be recharged for credits or be included in a DAWS water supply allocation, it can be recharged to make the aquifer more sustainable. Reclaimed water is stored in the aquifer to obtain credits for potable water use.

Direct Potable Reuse – The City's water treatment facilities are located near each other. This proximity facilitates sending reclaimed water from the reclamation facility to the treatment plant for potable use in the future.

By minimizing water use through conservation and making effective use of every available water supply, the City will be able to provide a reliable water supply to the Development.

CASE STUDY

PLANNING FOR ADEQUATE WATER SUPPLY – YUMA COUNTY, AZ

Applies to: County | Municipality | AMA | Non-AMA

Yuma County is located in an arid region that receives little annual rainfall yet supports over 200,000 people and a $3 billion agricultural sector. Though the Colorado River supplies much of the county's water, groundwater supplies support development in unincorporated Yuma County. Whatever the source of the supply, ensuring adequate, safe, and reliable water to all current and new development within the county is a top priority.

Between 1973 and 2008, nineteen subdivisions were platted in unincorporated Yuma County despite ADWR determinations of inadequate water supplies. Some of those determinations resulted from insufficient information (hydrologic data and/or legal) and some resulted from insufficient drinking water quality standards. Nearly all were platted as dry lot subdivisions, meaning that the individual homeowners purchasing the lots would be responsible for drilling their own wells and ensuring drinking water quality.

Recognizing the risks to Yuma County residents and communities of development occurring without adequate, safe, and reliable water supplies, the County Board of Supervisors adopted an ordinance in October 2008 to require a 100-year water adequacy determination from ADWR or a written commitment of water services from a city, town, or private water company designated as having an adequate water supply before final plat approval. The ordinance allows Yuma County to directly tie water supply considerations to its development review process to better ensure all county residents have an adequate water supply.

This policy became a key action in Yuma County's 2020 Comprehensive Plan Water Resources Element, adopted in 2012. Following a multi-year planning effort, the updated Comprehensive Plan recognizes the critical need to maintain adequate water resources for current and future development while protecting the important economic and environmental interests in the county. It identifies eight water-related policies and two specific Yuma County actions, including prohibiting the platting of new subdivisions that do not have an adequate water supply.

The adequacy policy has been effective for addressing the specific issue of subdivisions being developed and sold in the county without an adequacy designation. Many new subdivisions are developed to connect to a public water supply system that already has a designation. Subdivisions with private water supply wells must demonstrate adequate supplies with ADWR before being approved and sold.

However, the policy is fairly limited in addressing the other water-related challenges the County has identified. To advance its water-related goals even where the County does not have direct authority (for example, to manage Colorado River entitlements), it has adopted a range of policies and priorities that:

- Guide the County's official actions regarding water resources.
- Inform the County's comments or recommendations on other agencies' water-related policies or projects.
- Guide the County's support of related applications of grants, projects, and policy changes.

Additionally, the County has incorporated water-related considerations into its policies, priorities, and actions in many other elements of its Comprehensive Plan, including Open Space, Recreational Resources, and Circulation.

Taken together, these policies allow the County to tackle water resource challenges through direct action as well as through engagement on related issues, policies, and projects.

SECTION 2

ENSURING WATER SUPPLY FOR DEVELOPMENT

Water supply should be demonstrated as adequate and sustainable before any development is approved.

CASE STATEMENT

Water adequacy rules link supply-side management to demand-side management. Local governments are often able to set their own standards that: (1) establish water supply requirements based on specific parcels or uses; (2) require longer time horizons for demonstrating adequate water supply; or (3) require additional review for approval.

States across the West have adopted statutes intended to ensure that communities have sufficient water supplies for new development, recognizing that:

New development creates new water demand.

Government has a role to play in ensuring sufficient and sustainable water supplies for new and existing property owners.

Growth pressures on water supplies require stronger connection between land use approval and water planning at the state, regional, and local levels.

Collaboration between local governments and water providers is essential to ensuring water supply reliability as well as promoting water conservation and efficiency.

ARIZONA WATER SUPPLY REQUIREMENTS

In 1980, Arizona's Groundwater Management Act (GMA) established the framework for determining the impact of development on water resources. The GMA created five Active Management Areas (AMAs) where groundwater depletions would need to be replaces to create a sustainable system. The AMAs account for about 82% of Arizona's population and major metropolitan areas.[4] At the time the GMA was adopted, the areas outside of the AMAs were not considered to be as concerning for water demand due to their low population density. Over time, as large-scale agricultural industries have expanded, rural subdivisions have increased, and municipalities have grown, pressures on groundwater supplies outside the AMAs have increased.

The Arizona Department of Water Resources (ADWR), authorized by state statutes, manages the Assured and Adequate Water Supply programs to evaluate the availability of water for new development. These programs, explained below, are managed differently within and outside of the AMAs.

Both the Assured and Adequate Water Supply programs evaluate the availability of a 100-year water supply, considering current and committed demand as well as projections for future development and population growth. The Assured and Adequate Water Supply rules apply to subdivisions with six or more plats inside AMAs. Lot splitting into five or fewer lots creates a gap in policy regulation and has contributed to localized water level decline.

Although the state holds the authority to evaluate water availability, local governments have authorities to manage land with respect to water. These authorities and considerations are outlined in the Growing Water Smart Guidebook supplement: Legal Authority to Integrate Water & Land Planning.

Given the scarcity and uncertainty of water supplies, local governments should be wary of permitting development in areas where regulated basic and essential services cannot be provided. In addition, it is increasingly important for local development processes to consider cumulative impacts to the region's environmental and economic systems that sustain local quality of life.

[4] Arizona Department of Water Resources Active Management Areas Fact Sheet (2016).

ASSURED WATER SUPPLY PROGRAM (WITHIN AMAS)

The Assured Water Supply Program, managed by ADWR, is intended to protect and preserve the limited groundwater supplies within Active Management Areas. The ADWR is responsible for the review of criteria for proof of adequate water supply for both individual subdivisions and for water providers. Within an AMA, the Assured Water Supply Program requires a development applicant or water provider to be able to meet ALL of the criteria in Table 2 to receive a determination of assured water supply.

Once a water provider proves an assured water supply for its service area, the provider obtains a *Designation of Assured Water Supply* from the state and becomes a designated provider. A water provider's designation reflects the water supply status of its entire service area.

Subdivision applications within designated service areas do not need be individually reviewed by the state, but the subdivision developer must provide a written commitment to serve from the water provider to the local governing authority. It is the responsibility of the local government to review the service agreement as evidence that the development will receive water service during the development review process.

For individual developments without a designated provider, applicants must receive a *Certificate of Assured Water Supply* from the state.

Because the Assured Water Supply program includes aquifer management plans, both water providers and developers are required to include renewable water sources and comply with water conservation and efficiency goals.

Photo by J. Emanuel Stuart

TABLE 2: CRITERIA FOR ADWR WATER SUPPLY DETERMINATION[5]

CRITERIA	DESCRIPTION
PHYSICAL WATER AVAILABILITY	Sources of water have specific requirements for demonstration of physical availability. A list of those requirements can be found in the Arizona Administrative Code. (See: A.A.C. R12-15-716)
CONTINUOUS WATER AVAILABILITY	Water providers or developers must demonstrate that the water supply is uninterruptible for the 100-year period, or that sufficient backup supplies exist for any anticipated shortages. (See: A.A.C. R12-15-717)
LEGAL WATER AVAILABILITY	An applicant must demonstrate legal rights to all water supplies included in the application. (See: A.A.C. R12-15-718)
WATER QUALITY	Proposed sources of water must satisfy existing state water quality standards and any other quality standards applicable to the proposed use after treatment. (See: A.A.C. R12-15-719)
FINANCIAL CAPABILITY	Water providers or developers must demonstrate financial capability to construct the water delivery system and any storage or treatment facilities. Financial capability for developers is typically considered through the local government's subdivision review process. A demonstration is also required that adequate delivery, storage, and treatment works will be available to the applicant or the applicant's customers for 100 years. (See: A.A.C. R12-15-720)
CONSISTENCY WITH THE MANAGEMENT PLAN (ASSURED WATER SUPPLY ONLY)	Each AMA's management plan prescribes water conservation requirements for municipal water providers. Water demand associated with proposed subdivisions is evaluated in accordance with these conservation requirements. (See: A.A.C. R12-15-721)
CONSISTENCY WITH THE MANAGEMENT GOAL (ASSURED WATER SUPPLY ONLY)	Applicants must demonstrate consistency with the management goals of each AMA. (See: A.A.C. R12-15-722)

[5] Adapted from the ADWR website new.azwater.gov/aaws. Please refer to the Arizona Administrative Code Title 12, Chapter 15 to access the rules listed in Table 2 on Page 22.

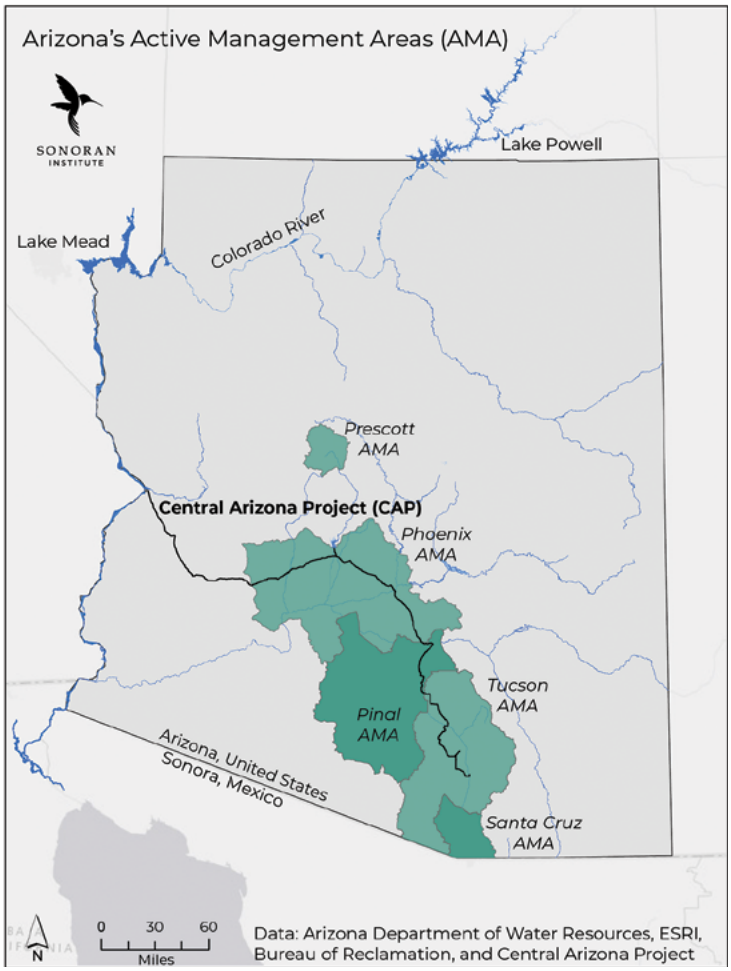
ADEQUATE WATER SUPPLY PROGRAM (OUTSIDE AMAS)

The Adequate Water Supply Program applies to most areas outside the AMAs. The Adequate Water Supply Program issues a *Certificate of Adequate Water Supply* for individual developments and a *Designation of Adequate Water Supply* for water providers. To obtain an adequate water supply determination, the first five criteria in Table Two must be satisfied.

Adequate Water Supply program is less stringent than the Assured Water Supply program in several ways:

1. Since there are no groundwater aquifer management goals outside AMAs, there are no limitations on the use of groundwater. It is generally the primary water source. While groundwater, in most cases, is not allowed to be transported into an AMA from outside of an AMA, it can be transported within the basin itself.
2. While the Adequate Water Supply Program requires that subdivision developers obtain a determination from ADWR regarding water supply availability before marketing lots, it does not deny an application. Subdivisions can be approved even if the water supply is determined to be inadequate, though the finding must be disclosed in a public report, recorded on the plat, and in any promotional or advertising material provided to potential first purchasers. This disclosure process is intended to protect the consumer from unknowingly purchasing land or a home where there is an unsustainable supply of water. However, it places the responsibility on the buyer, and subsequent sales of the property are not required to include information about water availability.

This has enabled some development to occur without a long-term sustainable solution for water supply, causing detrimental impacts to property owners, local government, and the aquifer. Some developers voluntarily choose to acquire a water adequacy determination from ADWR in hopes that an adequate water supply report will provide a real estate marketing advantage. Local governments could support this voluntary initiative by keeping a list on the government website of developments that have an adequate water determination.



TOOLBOX: LOCAL WATER SUPPLY REGULATIONS

Arizona law is clear that local governments can use their land use authority to protect the health, safety, and welfare of their community. This includes regulations that protect community members from "subsidence of the earth's surface, high water table, lack of water" and other hazards.[6] Though much of the water adequacy determination for development approval is handled by the state, designated water providers and land use planners can incorporate other best practices into their land use code and plan review process to manage water supply sustainability.

Photo by Sam Leventhal

For government entities within AMAs, home rule communities, and for designated water providers, the following best management practices can be incorporated into the water utility and/or land use policies:

1. **Articulation of Water Source(s):** For municipal utilities and water providers who have the ability to require development to meet water resource management goals, a definition of and clearly identified allowable and desired water sources is a good practice. For example, a requirement for renewable water supplies such as recycled water.
2. **Development Water Demand Projections:** Subdivision and water service applications should be required to include a projection of the total amount of water (water budget) that a proposed development will likely require at full buildout. Best practices include requiring an applicant to use a specific methodology for determining this projection to reduce burden on developers, avoid underestimates, increase consistency, and add transparency. Coordination between water providers and land use planning departments on the methodology ensures consistent assumptions are used for development approval.
3. **Water Efficiency, Conservation, or Demand Management Requirements**: Requirements or incentives for developments to reduce projected water demand through efficiency and conservation practices as a requirement for water service, development approval, or building permits.

[6] Arizona State Statutes Cities and Towns 9-463.01 (O) 4.

4. **Specific Area Application:** Local government can use specific overlay zones or districts where water resources are particularly scarce or where there are geographic variations that trigger unique additional requirements (e.g., recharge zones, high water tables, subsidence, individual water provider service areas, hydrological zones, etc.).
5. **Defined Review and Approval Processes:** Be specific about what is required for the review, when in the process it occurs, and who conducts the reviews, and what is required for final approval.
6. **Engineering Standards for Water Distribution System:** Include clearly articulated engineering requirements for a water system connection or distribution system in the development regulations or reference to specific manual or engineering guidelines.

The state statutes also grant local governments the authority to adopt additional policy tools to manage the impacts of new development on water resources. These best management practices as well as the additional policy tools are explained below.

Mandatory Adequacy Programs (Outside AMAS)

To address water resource management outside the AMAs, some Arizona cities, towns, and counties have adopted a mandatory adequacy program as allowed by the state's Mandatory Adequacy Program law (A.R.S. section 9-463.01, and A.R.S. section 11-806.01). By adopting a Mandatory Adequacy Ordinance, local governments can deny a subdivision application for lack of water. To be approved, a development must obtain either a determination from ADWR that an adequate water supply exists for the subdivision; or, the subdivider has obtained a written commitment of service from a water provider that is designated as having an adequate water supply.[7]

The determination of an adequate water supply is noted on the final plat. As with the Assured Water Supply Program, under this policy, the Arizona Department of Real Estate requires an adequate water supply determination to approve sale of a property.

A county's board must adopt this ordinance unanimously. Once adopted, it applies to all jurisdictions within it. The state statutes give local government the option of including an exemption for, but does not require, permitting hauled water in situations where water adequacy does not exist. However, this exemption should be very carefully considered and if adopted, very narrowly applied for cases of existing development. Hauled water should not be considered a sustainable water source for new development.

The Mandatory Adequacy Program is a significant tool in the local government toolbox. However, only Yuma County, Cochise County, the Town of Patagonia, and the City of Clarkdale have adopted a mandatory adequacy ordinance. Counties outside the AMA should prioritize this policy as a critical step linking adequate water supply and land use.

[7] Ariz. Rev. Stat. § 9-463.01(J).

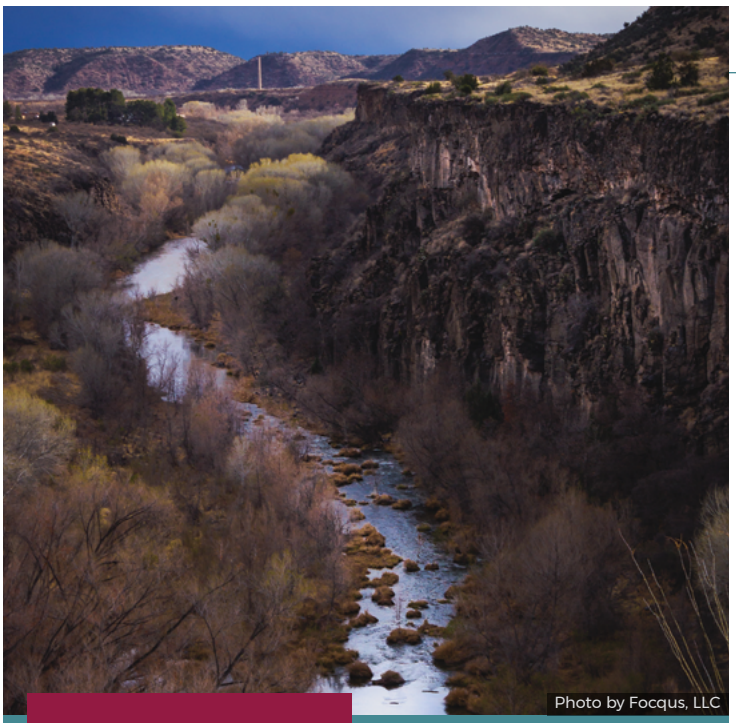


Photo by Focqus, LLC

CASE STUDY

ENSURING SUSTAINABLE AND ADEQUATE WATER SUPPLIES – TOWN OF CLARKDALE, AZ

Applies to: County | Municipality | AMA | Non-AMA

With limited options for new water supplies and large areas of undeveloped lands within its jurisdiction, the Town of Clarkdale has dealt with water supply uncertainty for decades. Adding to the town's water resources planning challenges, the Verde River flows through a corner of the town and is threatened with diminishing flows due to groundwater overuse. The Town of Clarkdale has taken a multi-pronged approach to ensuring adequate and sustainable water supplies for current and future needs, including the significant move in 2006 to acquire the local water company. It conducted a rate study soon after and adopted tiered rates to incentivize conservation, infrastructure investments to reduce system loss, and proactive conservation ordinances and design guidelines.

Acquiring the water company provided the Town with more agency in planning for long-term water sustainability. The rate increase and tiered rate structure was adopted following a five-year public engagement process, which provided opportunities for public education as well as a forum for the Town to listen to concerns and views from residents. The rate structures alone have significantly influenced a drop in gallons of water used per capita per day (GPCD).

The Town implemented complementary water conservation rules, subdivision ordinances, and design/building codes to advance its water sustainability policies. Drought management programs implement water use restrictions during dry periods. Landscaping design ordinances limit new outdoor water uses in new development, and the Town also provides native plant guides and other resources for current residents.

Together, the new rates, rules, and system improvements resulted in a 46% decrease in per capita water use between 2006 and 2014 (WRRC 2014).

Clarkdale also implemented a mandatory adequacy ordinance in its Subdivision Regulations, § 12-1-21 in 2008, one of only two municipalities to do so in the state. The ordinance is supported by the Town's water resources goals, objectives, and policies in its General Plan and the objectives of the Town's Drought and Water Shortage Preparedness Plan. Although the ordinance is limited in applicability—it only applies to subdivisions of land into six or more lots—it has prevented subdivision and development of land within the town without a designation of adequate water supply. It also encourages new developments to connect to the town's water supply system, which is already designated.

Managing Minor Land Subdivisions

The Assured and Adequate Water Supply rules apply only to subdivisions as defined by state statute. The definition of a subdivision, outlined in **Table 3**, is different for municipalities and counties.

State statutes exempt certain types of development from being classified as a subdivision, regardless of whether a development is within or outside of an AMA.

The state allows two types of land division to occur without development oversight, and thereby excluded from the definition of a subdivision: (1) minor land divisions and (2) land with acreage between 36-159 acres. By requiring oversight for major subdivisions only, the state has created a gap in water and land use policy, primarily in counties, which has contributed to sprawl, water level decline, and poorly designed subdivisions.

TABLE 3: ARIZONA STATE DEFINITION OF SUBDIVISIONS

CITIES/TOWNS
4 or more lots OR, if a new street is involved, property which is divided into 2 or more lots OR a platted property which is divided into more than two parts
COUNTY
6 or more lots

Under state law, minor land divisions are exempt from compliance with water adequacy determinations, although a developer can voluntarily apply for an adequate water determination. As a result, these minor subdivisions are nearly always created without review for adequate water supply, infrastructure standards, and impacts on water resources.

Compounding the problem, each of these new lots can be sold and further subdivided up to five times per lot with each subsequent division also evading the water supply and land use review requirements. The only limitation to this land division process is that each lot cannot be smaller than either the state required 5-acre minimum lot size or the dimensional and density requirements of the underlying zone district.

The state grants counties the right (ARS § 11-831) to adopt a minor land division ordinance to require a development permit for lot-splits of five or fewer that will create any lot of 10 acres or less. This local review authority must be exercised within 30 days and is limited to:

- Compliance with the applicable zoning dimensional and density standards.
- Legal access to and between lots as well as proof that each lot has physical access that is traversable by a two-wheel drive passenger motor vehicle.
- Designation of appropriate utility easements.

State law prevents a county from denying a minor land division that meets these requirements.

While these limits make it challenging to manage minor land divisions, zoning can be an effective tool to (1) limit the number of land divisions within a low-density zone and (2) require compliance with minimum development standards. A low-density zone district can mitigate impacts to river systems, aquifers, and recharge zones by identifying areas to avoid locating a building and reducing overall well densities. If a county is hesitant to enact density requirements for larger lots across an entire zone district, a more targeted approach would be to adopt a water resource overlay zone. See the Cochise County Sierra Vista Sub-watershed water conservation overlay case study described in Section 4.

Water Budgeting

A foundational component of water supply planning is the development of a "water budget"—an estimation of water flows into and out of a system. Water budgets can be applied at various scales: to a single home, to a development, to a single water provider, or to a local government with multiple providers.

At development planning stages, calculating a "water budget for buildout" can allow a community to carefully craft a vision within the constraints of its water supplies. Like financial budgeting, every line item of water supply and demand should be accounted for, and the tradeoffs and opportunity costs should be carefully considered when allocating resources. This macro budget provides guidance for evaluating water demand at the development or site scale.

A community that adds water budgets to development review processes and site plans optimizes site performance, conformance with the community's vision, and stewardship of the overall water budget for buildout. With development-scale water budgets, demand offsets or other mitigation programs can be implemented to ensure that new developments occur within available water supplies.

Approaches for Developing a Water Budget Include:

- Examine and tailor calculation methodology. The state provides calculators to estimate water budgets (e.g., for developments in Active Management Areas and the generic Demand Calculator for outside water use), but you may make adjustments to reflect the lifestyles, densities, and other demographic characteristics in your community.
- Align methodologies and data sources across partners. Often different departments or water providers will use disparate data sources or methodologies. Communities that compare and coordinate data and information build a mutual understanding, improve communication, and reduce uncertainty in their projections.
- Connect water billing and actual land use data using GIS. Granularity and accuracy of estimations inform rate structuring and advance efficiency programs. This helps communities better understand how a rezoning proposal could impact water demand. It also helps them understand the water use patterns and trends of land uses and densities.
- Shift units of demand measurement to account for density. Moving from a "per-acre" scale to a "per-unit" or "per-square-foot-of-building-area" scale can help account for increasing density in residential and commercial developments.
- Utilize water budgeting to set maximum amounts for use on outdoor landscaping. A landscaping allocation allows a developer to select plant materials that require watering in amounts at or below the total amount of water budgeted.

CASE STUDY

PROJECTING WATER DEMANDS USING ENTITLEMENTS — CITY OF GOODYEAR, AZ

Applies to: County | Municipality | AMA | Non-AMA

Estimating future water demand is a challenge, and cities and private utilities use many different methods. Relying on population projections alone is not ideal, since these estimates will not capture the range of land uses, industry needs, the type of crops grown, or the type of landscaping in citizens' front yards. To understand these characteristics, cities can link their population projections with the underlying land uses for a more comprehensive analysis.

The more granular the community's data inputs, the more accurate its projections will be. Many communities measuring underlying land use characteristics will look to their zoning codes, which typically allow a range of permitted uses and densities. However, development "entitlements" offer a more precise alternative to zones because they are development plans and permits legally approved by the local regulatory department and include rezoning, variances, and special use permits. Entitlements are unbuilt but committed developments that have a right to water, such as Planned Area Developments and Master Planned Communities. They are key sources of high-resolution data that refine land use zones and enhance water demand projections.

In using entitlements to refine its projections, the City of Goodyear fostered collaboration between the planning department and water resources department. First, the city used billing records co-located with land use and other data to estimate its base demand, then added non-revenue water use. Non-revenue water includes well waste, operational use, flow tests, system losses, and city department use (e.g., fire, street cleaning). This is not insignificant; the City of Goodyear's non-revenue water is approximately 14% of its annual total water production.

Next, Goodyear developed a growth model by integrating multiple data layers in ArcGIS model builder and assigning a tiered "water service commitment level" according to the status of entitlement:

- **Tier 1:** Lands with entitlements.
- **Tier 2:** Lands with preliminary entitlements and state land zoning process initiated.
- **Tier 3:** State land within the planning area without zoning, and other areas without entitlements.
- **Tier 4**: All other land within the planning area, using the general plan to inform assumptions on land use and base demand.

Finally, the city projected water demand by geographic area and entitlement level using the tiered priority system. This approach shows where, when, and how much new water supply is needed, based on commitment level. Using entitlements increased the level of confidence. The process also shows how growth patterns align with the Goodyear general plan vision—all at a higher resolution than a projection based on land use zones alone.

Water Allocation Policies

Water demand offset programs can address water supply shortages by requiring new development to offset their projected water demand either through water conservation in existing development or transfer of water rights. The goal is that all new development, including the expansion of existing homes or businesses, can be "water neutral" in the water supply system. Some communities provide an in-lieu fee alternative. This concept can also apply to offsetting energy, wastewater, air quality, historic preservation, or watershed health impacts.[8]

Photo by Silvan Schuppisse

Approaches for Developing a Water Allocation Policy Include:

- Examine your water data and master plans to set water demand thresholds for each land use type. To delineate the highest water users, set your water demand thresholds high enough that most development projects would be below the first threshold and thus be unaffected by this policy.
- Work with your elected officials and your community to identify the types of new development you want to encourage in your community. Use a tiered-allocation approach to tailor the allocation policy to best support your economic development goals.
- Tie the allocation policy to economic development goals, like revitalization or infill, so a development project may be considered exempt from the allocation policy if they support pre-determined community needs.
- Communicate the allocation policy as a tool for protecting the rights of your current water users and stewarding your community's natural resources.
- For communities in an AMA, ensure that any water supply requirements for over-allocation users align with your obligations to the state.

[8] Alliance for Water Efficiency. Water Offset Policies for Water-Neutral Community Growth. (2015).

Photo by Jason Boomsma

CASE STUDY

WATER ALLOCATION POLICY — CITY OF CHANDLER, AZ

Applies to: County | Municipality | AMA | Non-AMA

Commercial and industrial water demands vary wildly with each user. Variation introduces uncertainty in water use projections and places the resiliency of a community's water supply at risk. An effective way to create greater predictability, whether a community is fast-growing or built out, is to create a water allocation policy. By pairing a community's water resources with its economic development goals, allocation policies mitigate threats from extremely high water users.

In 2015, the City of Chandler adopted a water allocation policy that manages plan approvals for large-volume water users. By creating greater certainty about the city's future water supply, this policy has proven to be an attractive economic development tool. At 80% build-out, the City of Chandler has the water supply to accommodate all projected growth, giving it credibility as a long-term investment. The city is using its remaining unused "quality of life" water supply to incentivize economic development projects that offer the most support to its residents.

The community's process started with an examination of its general plans, master plans, and water budget. To understand how much of its supply was committed, the city projected water consumption using the average water use at a square foot unit rate of existing buildings under each land use type. The remaining unallocated portion of its water supply was re-branded as "quality of life" water to reflect its intended use.

The city developed a tiered framework for allocating water supplies to new development projects:

Tier 1: The base allocation is applied to all Chandler non-residential water users. The city anticipates that the Tier 1 supply allocation will meet the water demand of almost all projects.

Tier 2: New high-volume users that need additional supply beyond the Tier 1 allocation will receive additional water from the city if they support the city's economic goals. The city council defined its "quality of life" priorities as:

- Technology and knowledge-based industries and the expansion of existing business.
- Adaptive reuse of buildings within existing neighborhoods.
- Revitalization in downtown and north central areas, including specific transit needs.

Tier 3: Projects with water demand that exceed the base allocation in Tier 1 but do not support the "quality of life" priorities in Tier 2 are approved only if they provide additional water supply to the city. This may include reimbursing the city for purchasing the water at market rate.

Several other communities in Arizona are using allocation policies, including the Town of Mesa, Town of Gilbert, and City of Surprise.

Water Demand Offset Program

Water allocation rules are policies, laws, and mechanisms that offer local governments a formal means to direct growth by strategically dedicating their water resources in accordance with their community's needs, vision, and overall water supply and demand. Allocation policies link water supply to land use types, economic development, and community revitalization plans. They can be tailored to suit the strategic goals of a community.

Without a water allocation policy, supply agreements are often made on a "first come, first serve" basis, which can unintentionally lead to resource-intensive development without compensatory benefit to the supporting community. Whether they have limited supplies or a projected surplus, cities can benefit from water allocation strategies geared toward sustainability and quality of life.

Using an allocation policy for strategic growth benefits all communities, whether rapidly growing or approaching build-out. Starting early, communities allow their landowners to develop on their own schedule with a sufficient water supply to do so.

Approaches to Managing a Water Demand Offset Program Include:

- Establish a water bank or authority to monitor and administer the program.
- Determine the offset ratio. A ratio of 1:1 will maintain the current water supply-demand balance, and a 2:1 mitigation ratio will reduce the ratio of demand relative to supply. Wastewater reclamation projects are more reliable and are given a 1:1 offset value, and supplies created through demand management are considered temporary and are given a 2:1 ratio.
- If fee-based, ensure the charge reflects the costs of implementing the offset as well as administrative costs. Costs of developing new supplies are borne by the entity needing to offset demand. Fee schedules can be a flat rate or based on percentage.
- Require verification of sufficient water supplies and water budgets. Work completed by developers must include documentation and verification by local program administrators.
- Consider the timing of when the offset fee is paid to allow enough time to procure supplies with those fees by the time the new demand is created by the development.
- Promote infill development by giving priority access for new water supplies to new demands within the existing service area boundary. Consider maximizing development opportunities within the target area before approving development in new regions.

Photo by Maddy Baker

CASE STUDY

WATER SMART SUPPLY — SANTA FE COUNTY, NM

Applies to: County | Municipality | AMA | Non-AMA

Santa Fe County, New Mexico, has been working for nearly forty years to integrate water and land use planning by applying a development suitability lens to reduce natural resource degradation.

The county's efforts began in 1980 with the Santa Fe County General Plan. The growth management approach was to locate new growth in places with adequate services and infrastructure, while trying to minimize growth in areas constrained by limited or low-quality water and natural hazards. In areas dependent upon groundwater, the county was divided into four hydrologic zones where a minimum lot size (base zoning) was set to reduce. Within these zones, the county required a 100-year water supply, with demand calculated based on an estimate of one acre-foot per lot, the groundwater depletions same as permitted by the state. The minimum lot sizes for the four zones included: 160 acres, 80 acres, 40 acres, and 10 acres. The development code was updated to include a requirement for new developments to conduct an analysis of land suitability, available infrastructure, and water resources. Developers could increase density if they completed a geo-hydrological study or entered into an agreement to use less than the allowed one acre-foot of water articulated in a conservation plan.

A 1999 update to the comprehensive plan continued to link new development to locations with suitable water, services, and infrastructure. In 2001, the county's Sustainable Development Growth Plan (see pg. 189) changed direction. After thirty years of trying to protect natural resources by linking lot size and hydrological zones, the county adopted new zoning districts and development standards intended to better protect sensitive land, preserve open space, and ensure high-quality infrastructure and services.

The new approach identified three growth tiers:

- A priority growth area to accommodate new compact development served by surface water or community system and adequate public facilities and services.
- A future development area for infill development likely to occur within the limits of groundwater availability.
- Low-density agricultural land, environmentally sensitive land, and conservation areas.

The code includes a Water Supply, Wastewater and Water Conservation requirement (Chapter 7 Section 7.13.) that defines how developers can satisfy the need for an adequate water supply. The location and scale of the development, the lot size, and proximity to water infrastructure determine whether a development uses a community water system or well. If applicants are connecting to the county utility, the only requirement is a written agreement to provide services. However, if the applicant is not on the county utility, a more stringent set of requirements must be met. For a minor subdivision over five lots that is zoned to permit an individual or shared well, the county requires a valid Office of the State Engineer's

CASE STUDY, *CONT.*

well permit and a hydrological study. Standards for the hydrological study include proof of an adequate water supply for 99 years and well test requirements for pump rates and recovery days linked to the different hydrological formations.

As part of development review, a Water Service Availability Report (see pages 6-12) summarizes how a development meets the requirements for an adequate water supply. The WSAR includes an analysis of the following: existing system capacity of the public water or wastewater supply proposed for use; well field capacity or stream, spring, or other source of raw water supply; historical average and peak use of potable water; the number of hookups and the estimated potable water demand per hookup; and the number of hookups for which contractual commitments have been made or previous development orders have been approved.

Developments must also meet water conservation requirements and file a signed water restrictions agreement and covenants with the plat or site development plan committing to not using more than 0.25 acre-foot per year per lot.

Water conservation requirements include:

- Low-water landscaping/xeriscapes.
- Drip irrigation and mulching.
- Kentucky bluegrass is prohibited; non-native grass is limited to 800 sq. feet and must be watered by water harvested or greywater.
- Water is permitted for new landscaping for up to two years, but thereafter only for viability.
- Between May and November, outdoor watering is prohibited between 11 a.m. and 7 p.m.
- Rain sensors.
- Fugitive water prohibition.
- Rainwater catchment for all new construction to capture a minimum of 85% of the roof area drainage.
- A domestic well-metering program and submetering of landscape water use.
- WaterSense certified or equivalent toilets, urinals, lavatory faucets, and shower heads.
- Energy Star certified or equivalent dishwaters, washing machines.
- Water- and energy-efficient hot water systems.
- For food service, water available only upon request.
- For lodging services, daily linen services only upon request.
- Conservation signage and literature distribution.

SECTION 3

LAND USE POLICY & PROCESS

Policies, programs, and processes that govern where and how development occurs can greatly impact the management of water resources.

CASE STATEMENT

Water demand is both a function of household size, income, and lifestyle habits as well as how we plan, design, and maintain our communities. Research indicates that when it comes to saving water, where and how we build really matters.

To use less water, the best policy is to make water-smart development—using the development patterns, standards, and practices listed below—the most common type of development.

Efficiencies can be found in compact development patterns and in the design of the building, site, and systems, especially landscaping. We know that:

Higher density and compact development consume less water than other development patterns.	Residential land use types consume less water than others.	High-performing, water-efficient plumbing and building standards reduce water consumption
Newer appliances and plumbing fixtures are more efficient than old ones.	Xeric and climate-appropriate plantings and maintenance practices consume less water.	Households that conserve water save money for themselves and the water provider, while preserving water for other people and nature.

TOOLBOX: COMPACT DEVELOPMENT

While most water conservation and efficiency efforts related to land use have primarily focused on outdoor watering and indoor plumbing fixtures, encouraging compact development patterns can bring considerably more benefits. Water usage studies have consistently demonstrated that in urban areas, the largest consumption of water is by large-lot, single-family homes where 70% or more[9] of the water consumed is used for outdoor use during spring and summer. Alternatively, higher density development can result in less water consumption. Research from Colorado and Arizona has demonstrated that even small adjustments can yield large water savings or cities.

Approaches That Promote Compact Development:

- Make rezonings, annexations, and Planned Unit Development applications conditional on meeting water conservation standards.
- Develop future land use plans that establish designated future growth areas where adequate infrastructure exists for accommodating growth at higher and/or more urban densities.
- Change the zoning code to permit smaller lot sizes and higher densities by right in designated districts.
- Reduce or remove development standard barriers to compact development, such as parking requirements, minimum lot sizes, and lot setbacks.
- Consider the density and height thresholds that trigger the need for cooling towers, and mitigate their associated water demand.
- Change zoning code to permit multiple types of residential development (e.g., multiplex, townhomes, apartments, accessory dwelling units) by right in designated growth areas to provide a diversity of housing options.
- Change zoning code to permit compact mixed-use development by right in designated growth areas.
- In exurban and rural areas, change zoning code to permit and incentivize cluster and conservation development by right.
- Manage commercial uses by making water-intensive uses, such as car washes, nurseries, etc., conditional instead of by right. Permit based on standards to meet water conservation and efficiency standards such as water recycling.
- Provide incentives for increased densities using development or utility fee reductions/waivers and density bonuses.
- Use citizen/stakeholder committees, public education, and outreach to help evaluate options, assess feasibility and public opinion, and prioritize actions.

[9] new.azwater.gov/conservation/landscaping

Photo by Nina Henry

CASE STUDY

CREATIVE, FLEXIBLE, AND HARMONIOUS SITE PLANNING & DESIGN — TOWN OF SAHUARITA, AZ

Applies to: County | Municipality | AMA | Non-AMA

Located south of the Tucson metropolitan region and within the growing Sun Corridor, the Town of Sahuarita incorporated in 1994 and has experienced significant growth and change since then. Sahuarita has adopted a variety polices to accommodate anticipated growth and development while promoting high-quality design that recognizes the distinct character of Sahuarita's geography and reflects the key facets of sustainability, including economic health and development, social and community well-being, and environmental preservation. (General Plan).

Much of the new residential development in Sahuarita over the next 10 years is anticipated to be in master-planned communities occurring within three specific plan areas: Rancho Sahuarita, Madera Highlands, and Quail Creek. While guided by the overarching community goals and policies in the General Plan, these specific plan areas also have area-specific development goals, policies, regulations, and design standards. For example, the Quail Creek Specific Plan adopts detailed development regulations that are intended to accommodate rapid growth in a coordinated manner that is tailored to the site and region. As the area transitions from current grazing-related uses, the Specific Plan guides development that preserves open space and natural features including natural drainage ways, riparian vegetation, and wildlife habitat corridors.

The Town has also adopted development policies applicable outside of the specific plan areas that provide flexible options to encourage development that is harmoniously designed with natural features and open space. The Town's Cluster Development Option allows residential units to have smaller lot sizes than otherwise allowed within the zoning area if the plan also includes open space and other desired community features. The ordinance provides for development standards related to setback requirements, grouping arrangements, open space to be included in the plat, and requirements for maintaining the planned common open space and improvements. The open space requirements specifically favor natural open space such as preservation of stream channels. Disturbed areas, such as channelized drainageways or riprap-lined detention/retention basins, cannot be considered cluster open space.

There have been some concerns about the cluster development option allowing development of land that otherwise would not be developed due to site restrictions, flood control, or other factors related to the natural features of the property. On the other hand, the option provides the Town a way to encourage unique, high-quality designs with open space and preservation of natural features, while providing developers additional flexibility to create innovative designs while complying with zoning laws. This remains to be tested, however. With most new development occurring within the Town's Specific Plan areas, the Cluster Development option has not been utilized.

TOOLBOX: WATER-EFFICIENT LANDSCAPES

In Arizona, outdoor watering for urban landscapes accounts for 75 percent[10] or more of water providers' total annual water demand during spring and summer. Some communities can see their peak demand triple in the summer, requiring storage and infrastructure to provide a reliable supply. Communities working to make landscaping water smart from the start can integrate tools to reduce water demand from new construction. There are numerous tools available to local governments that integrate best practices for water conservation and efficiency into their codes and standards.

These include requirements for:

- The types of plants that are best suited for the climate and irrigated by hydrozones.
- A total amount of landscaping permitted based on lot size percentage or square footage.
- The type and amount of turf allowable based on square footage or total landscaped area.
- Low-flow and efficient irrigation system technology, including drip, bubblers, or low-flow sprinklers.
- Rain sensors with a shutoff device to reduce watering during natural rainfall events.
- Evapotranspiration (ET) sensors to adapt irrigation to changing weather and soil conditions.
- A water budget for outdoor water use, ideally tied to tiered rate structuring that sends a price signal to the rate payer.
- Soil enhancements and mulching.
- Scheduled timing of irrigation to limit evapotranspiration.
- Code enforcement and fines for violations of standards.
- Training for landscape professionals on water-saving landscaping, like the Qualified Water Efficient Landscaper (QWEL) training program.
- Model maintenance standards and agreements for Homeowners Associations and others to use in contracting landscape services.

Since mandatory requirements significantly increase water savings, the goal of a community committed to water conversation should be to require that all new developments and retrofits meet water efficiency standards.

Approaches for Promoting Water-Saving Landscapes:

- Assess potential water savings by comparing annual water demands on a new property against an older property or properties with comparable area, plantings, and irrigation methods.
- Develop a landscaping design manual that provides specific guidance to individuals and developers on water-saving tree and plant types and sizes, planting seasons, soil enhancement, mulching, and watering times appropriate for the local climate.[11]
- Promote and/or incentivize the use of individual household rainwater harvesting for outdoor irrigation.

[10] https://new.azwater.gov/conservation/landscaping

[11] Water-Smart Landscaping Principles are widely promoted in educational programs as well as adopted into landscape and water conservation plans. wateruseitwisely.com/100-ways-to-conserve/landscape-care/principles-of-xeriscape-design

- Develop an incentive promoting the removal of water-intensive landscaping by offering landscaping conversion rebates.
- Provide incentives for developers to use water-efficient or xeric landscapes through reduction of tap fees.
- Establish residential, commercial, and public landscaping standards that reduce use of water for irrigation by regulating:
    - Irrigated lot coverage.
    - Plant types.
    - Irrigation system efficiency.
    - Rain sensors and/or evapotranspiration (ET) sensors that adjust watering to changing site conditions.
    - Watering schedules (e.g., before 8 a.m. and after 8 p.m., scheduled by zones and day of the week).
    - Soil amendments.
    - Water loss limits.
- Change property owner behavior through non-regulated options, such as education and rebate programs managed by the water provider:
    - Offer rebate programs for water-efficient plumbing fixtures such as low-flow toilets and showerheads, and front-loading washing machines.
    - Develop rebate programs for turf removal and replacement with low-water-use landscaping.
    - Educate about xeriscaping and water-efficient irrigation systems.
    - Conduct water audits that evaluate systems and educate property managers on opportunities to increase efficiency.
    - Empower staff, HOAs, and maintenance companies with a command of desert plants, soil health, and watering best practices. Like any infrastructure, it requires ongoing maintenance to maintain efficacy.

Photo by Jeremy Stapleton

Photo by Jason Boomsma

CASE STUDY

ADOPTING A WATER CONSERVATION CODE TO REDUCE OUTDOOR WATER USE — CITY OF BUCKEYE, AZ

Applies to: County | Municipality | AMA | Non-AMA

Located within the Phoenix metro area, the City of Buckeye relies almost entirely on groundwater to fulfill its water demand. It is also one of the fastest-growing cities in the nation, increasing in population from 6,000 in 2000 to 96,000 in 2021. This rapid growth highlights the necessity of integrating water and land use planning.

Along with its population rise, Buckeye has experienced a steep increase in outdoor water use. Approximately 70% of Buckeye water demand is outdoors. This is higher than the 50-60% that the City reported seen in comparable cities. In addition to high outdoor water use consumption, a combination of geography, geology, and water treatment infrastructure design makes effluent reuse difficult for Buckeye. Where other cities can use alternative water sources for irrigation of residential and commercial landscaping, city parks, and sports fields, Buckeye must use its valuable potable water.

After conducting an analysis of Buckeye's water use and participating in the 2020 Growing Water Smart workshop, city officials approved a new city water conservation code that seeks to reduce outdoor water use.

Some of the code elements include restricting residential and commercial turf size and placement and banning turf in city rights-of-way, water-smart seasonal turf seeding and irrigation system design, and native plant lists. Areas with 10 or more acres of irrigated land must submit a water conservation plan to the city, which would include: (a) the acreage of turf versus low-water-use landscaped areas, (b) annual water use budget broken down by landscape type, (c) the source of the water, and (d) steps to improve water efficiency and waste reduction.

As Buckeye continues to grow, water used in construction presents an opportunity to use alternative supplies. The city worked with general contractors to create a construction water conservation plan, which is completed in the permitting process to connect with cheaper alternative water sources and introduce conservation techniques in the construction phase. The Plan also collects information which will support Buckeye to make data-driven decisions about their water supplies.

The process of brainstorming, drafting, and gaining feedback on these codes and plans promoted collaboration between the city and prominent stakeholders such as developers, homeowner's associations (HOAs), general contractors, and builders' associations. The stakeholder input process revealed support among HOA leaders for increased city-level regulation at the residential scale. The roll out of the city's codes will provide ample opportunity for resident education around water conservation in Buckeye.

Photo by Tim Roberts Photography

CASE STUDY

SUSTAINABLY AND CONJUNCTIVELY MANAGING WATER RESOURCE – TOWN OF PAYSON, AZ

Applies to: County | Municipality | AMA | Non-AMA

With a goal of community sustainability, the Town of Payson Water Department holistically manages its interconnected groundwater and surface water resources to maintain "safe yield" - maintaining consumption below the amount of water that is naturally and artificially recharged to the aquifer. Outside of Arizona's Active Management Areas, there are no state-level groundwater management goals in place, and Payson's adoption of its own "safe yield" management goal is a unique and proactive approach to local water management in Arizona. The Town has developed a portfolio of strategies to advance its goal, including conservation, aquifer recharge, supply diversification, and investment in infrastructure.

Groundwater has historically been Payson's sole source of drinking water. The Town began using C.C. Cragin reservoir surface water as a municipal source in 2019 following a multi-decade planning and construction process. Infrastructure development and financing mechanisms were incorporated into both public works and land use rules.

The Town has adopted a number of proactive conservation ordinances. Adopted through Resolution No. 2737, the Town's Public Works Water Ordinances cover indoor and outdoor water use, commercial landscaping restrictions, restrictions on wastewater, and resource status levels that initiate restrictions during times of shortage. The Department monitors and reports precipitation trends and groundwater levels to the Town Council each spring, which inform the Water Conservation Level set and applicable water conservation standards for the subsequent year. To manage water demands associated with new development, the Town adopted several standards that apply to water supply and facilities for new subdivisions and other minor land divisions, including standards for plumbing, landscape, water connections, and facilities (Town Ordinances § 154-06-001 et seq.).

Taken together, Payson: (1) established a water budget with the support of a groundwater consultant; (2) established a water management goal (safe yield); (3) manages existing uses via mandatory conservation requirements tied to water supply and demand factors; (4) manages new uses by linking new growth to the Town's water management goal; and (5) protects and augments available supplies through recharge, reuse, and securing new supplies where available. This proactive and holistic approach to water management is unique outside of the state's Active Management Areas and has helped the Town build a diverse, resilient water portfolio to support current and future residents and businesses while maintaining its unique community character and natural resources features.

TOOLBOX: WATER-SMART BUILDINGS

Reducing indoor water use in residences and businesses can be accomplished through water-efficiency standards for indoor plumbing fixtures. Arizona's maximum water efficiency rates for indoor plumbing fixtures are higher than federal standards (Ariz. Rev. Stat. §§ 45-312 and 45- 313). WaterSense-labeled products are not required to be installed by new development, so local jurisdictions can incentivize water-efficient plumbing in local ordinances and in retrofit programs.

Approaches to Promote Plumbing Fixtures and Building Efficiency Standards:

- Refer to standardized codes for guidance and technical best practices, like the green plumbing code and international building and plumbing codes.
- Adopt building code standards that permit the use of water recycling systems.
- Adopt building code standards for submetering of multifamily units.
- Incentivize the replacement of less-efficient toilet and faucet technologies with water-wise ones through rebates or free fixtures.
- Require retrofits for redevelopment or resale. This is particularly effective for communities with a high percentage of housing stock pre-1994. Certificates of compliance can be self-submitted, verified by third party, or verified by staff. Certificates can be issued for retrofits on resale or purchase, reconnection for water service, or on building permits.
- Create incentives for developers to receive lower tap fees for meeting water efficiency standards beyond the building code.
- Link tap fees to water budgets to guarantee that the low demands projected when tap fees are paid will be observed over time.
- Include a requirement in your code to repair indoor leaks (e.g., a leaking pipe, a leaking valve, or a leaking faucet) within a given time.
- Adopt indoor water efficiency standards for non-residential commercial and multi-family development for water-efficient plumbing fixtures, appliances, and equipment in new construction, remodels, and redevelopment.
- Use a water conservation ordinance to target high-water-use sectors, including data centers; breweries and wineries; institutions such as hospitals, schools, and jails; car washes; laundromats; and restaurants and hotel sectors.

TABLE 4: STANDARD WATER USE RATES OF INDOOR PLUMBING FIXTURES

FIXTURE	E.P.A. WATERSENSE PRODUCTS	ARIZONA STATUTES (45-312)	FEDERAL STANDARDS
RESIDENTIAL TOILETS	1.28 gallons / flush	1.6 gallons / flush	1.6 gallons / flush
BATHROOM FAUCETS	1.5 gallons / minute	3.0 gallons / minute	3.0 gallons / minute
SHOWERHEADS	2 gallons / minute	3.0 gallons / minute	2.5 gallons / minute

Photo by Anthony Giammarino

CASE STUDY

GREEN BUILDING DESIGNATION AND INDOOR WATER USE — CITY OF SCOTTSDALE, AZ

Applies to: County | Municipality | AMA | Non-AMA

While legislation is currently under consideration, high-efficiency fixtures are not required in Arizona. Some local jurisdictions, however, have passed their own local ordinances or have implemented rebate programs to incentivize high-efficiency WaterSense products. The City of Scottsdale was a pioneer in this effort, beginning with its 1998 general plan update. Under the guiding principle "Seek Sustainability," Scottsdale created an interdepartmental committee to explore sustainable community initiatives like a green building designation program.

Staff launched the program when an environmental builder and environmental products manufacturer approached the city to recommend such a program as part of a new pilot home project, citing customer support and local buy-in. A green building advisory committee formed, composed of citizens, architects, designers, home builders, state environmental office representatives, utility representatives, and members of academia. The committee modeled its educational and outreach components on the Civano Sustainable Community in Tucson and on green building programs from Austin, Texas; Denver, Colorado; and Kitsap County, Washington. The committee created regionally based standards and established the first citywide green building program in Arizona.

Under the program, City of Scottsdale buildings receive a designation if they meet a threshold of site, water, energy, indoor environmental quality, and material resource standards.

Currently, these include but are not limited to:

- Kitchen faucets with a default maximum flow rate of 1.8 gallons per minute.
- Roof with 50% runoff diverted into landscape areas.
- Smart irrigation controller that regulates irrigation based on weather or soil moisture conditions.
- All primary building entrances protected from direct summer sun (east, west, south) with recessed or covered elements.
- Minimum 5% improvement over the city energy efficiency code.
- Commercial buildings include individually submetered supplies for water features, swimming pools, irrigation, and cooling towers.

Since the voluntary program was established, the City of Scottsdale amended its plumbing code to require that new residential and commercial buildings use the same water efficiency rates as WaterSense products. Updates include:

- High-efficiency toilets, urinals, lavatory faucets, and shower heads. This plumbing code amendment goes beyond the federal standard for low-flow fixtures. It was easy to pass, because the local market had already shifted to HE as the norm, and many builders were already unwittingly meeting this standard.

CASE STUDY, *CONT.*

- Water Heaters. In order to deliver hot water faster and more efficiently, water heaters need to be located near the point of use (i.e., bathrooms, kitchen, laundry room) or be configured with a whole-house manifold system where each plumbing fixture is supplied with a dedicated hot water line directly from the water heater, analogous to an electrical circuit panel. A demand-controlled hot water recirculation loop and pump is required when the most remote plumbing fixture hot water supply line exceeds 21 feet for ¾-inch pipe, 32 feet for 5/8-inch pipe, 43 feet for ½-inch pipe, and 50 feet for 3/8-inch pipe.
- Green Construction Code. Scottsdale adopted the 2015 International Green Construction Code for commercial buildings in specified zoning districts as a condition of zoning bonuses. If a developer wishes to increase building height beyond the maximum allowed limits in downtown and mixed-use/commercial zones, they must follow the green construction code.

Note, there is a distinction between "low-flow" and "high-efficiency." When "low-flow" fixtures (e.g., 1.6 gallons/toilet flush) were federally mandated in the early to mid-1990s, they were very inefficient because manufacturers only made inconsequential changes to meet the standards. The faulty design often required multiple flushes to remove waste. Alternatively, "High-Efficiency" fixtures (1.28 gallons/flush) have been completely re-engineered and tested to meet updated standards.

Today, several other green building programs and water smart certification programs have been established in the state.

Photo by J. Emanuel Stuart

TOOLBOX: DEVELOPMENT REVIEW PROCESSES

The development review process encompasses all the procedures necessary to ensure development applications meet the community's land use regulations. Each community's development review process varies slightly, but engaging water providers in the process can support water resilient outcomes.

Approaches for Integrated Development Review:

- Document the development review process. Identify opportunities to add water resource managers and other sustainability or resilience expertise to the process to identify and resolve water-related challenges or opportunities.
- Promote collaboration and build relationships with counterparts through regular meetings that maintain a shared understanding of the community's strategic vision and priorities.
- Ensure that water-related compliance challenges are addressed, and alternative approaches are considered early by involving water managers at pre-application meetings and preliminary plat review.
- Seek mutual agreement from water resources departments on final approval of land use decisions.
- Ensure that the development is built, operated, and maintained as stated in the proposal by training site inspectors to recognize compliance on water-efficient design.
- Shape development agreements or planned unit developments (PUDs) to include water efficiency standards, alternative water use, or watershed protection efforts.
- Integrate low-impact development design recommendations into the site planning review.
- Use connection charges, such as tap fees, water impact fees, and others as incentives to guide development in areas with supportive infrastructure. Connection charges can reflect water budgets and allocation policies.
- Promote voluntary, incentive-based programs to implement creative plat designs with open space, water-use offsets, and water-smart plumbing, landscaping, and rainwater harvesting systems (in new builds and/or retrofits). Developer incentives can encourage developers to exceed the required water-efficiency standards.
- Develop guidance and user's manuals to help residents and builders understand and comply with building and design codes.

Photo by J. Emanuel Stuart

CASE STUDY

PRELIMINARY INTEGRATED WATER MANAGEMENT PLAN — PIMA COUNTY REGIONAL FLOOD CONTROL DISTRICT, AZ

Applies to: County | Municipality | AMA | Non-AMA

In an effort to support the water element of Pima Prospers, the Pima County Regional Flood Control District (RFCD) revised the development review process to more fully integrate water planning into the rezoning process. The 2015 comprehensive plan update requires rezoning applicants to submit a Preliminary Integrated Water Management Plan (PIWMP), which integrates water supply review at the site analysis and entitlements stage of the planning review process, or a Water Supply Impact Review at the site analysis stage.

The content of the PIWMP varies according to the project's water supply:

- Projects providing renewable and potable supplies at the development review stage must meet a certain threshold of actions from a Water Conservation Measures table, which includes indoor water use, outdoor site design, and infrastructure improvements.
- Projects providing non-renewable supplies will have to provide the above, plus RFCD staff will assess the lack of infrastructural access to renewable supply sources and evaluate impacts to environmentally sensitive areas.

The primary goal of the PIWMP is to determine if sensitive areas, including subsidence areas and groundwater-dependent ecosystems like springs, intermittent and perennial streams, and shallow groundwater areas, are being negatively impacted. If the rezoning presents a threat then RFCD will recommend the application be denied unless the project accepts additional water conservation measures.

The 2015 update shifted the project hydrological impact assessment from the applicant to the county to ensure expertise and consistency in the process. After a site analysis, staff prepares an impact assessment, which includes: a) Availability of renewable and potable water supplies; b) Water use estimates for maximum build out under existing and proposed zoning; c) Current and projected depth of groundwater and groundwater trend data at the site or wells serving the site; d) Proximity of site and wells serving the site to known or potential subsidence areas; e) Proximity of site and wells serving the site to groundwater-dependent ecosystems; and f) Hydrogeologic basin, including depth to bedrock. If necessary, the developer proposes mitigation measures which address water sustainability concerns. A second RFCD department reviews the final mitigation plan at the time of permitting/development.

The standardization of protecting sensitive areas in the planning process through linking the form and location of growth with the sustainable allocation of water is an effective method of integrating water into the land-use planning process.

Photo by Chris Boswell

CASE STUDY

LEADERSHIP OUTSIDE OF AMAS — CITY OF FLAGSTAFF, AZ

Applies to: County | Municipality | AMA | Non-AMA

Communities outside of Active Management Areas have fewer state-level regulations and guidelines to follow, but there are significant benefits to going beyond what is required of them. Without state-level tools and information to guide them, however, it is up to communities outside AMAs to proactively implement their own water resource management plans. The City of Flagstaff is a leader in this effort, creating forward-thinking policies that link land use and water resource planning.

Flagstaff's population is rapidly expanding. With variable and unreliable surface water from snowmelt and about 60% of its water supplies coming from groundwater, the city understands that it needs new development to manage water efficiently and effectively.

Flagstaff Regional Plan 2030, the comprehensive plan for the city and county, describes goals and policies prompting water smart development strategies, green infrastructure, and water infrastructure financing. By 2030, the City aims to manage water supply through conservation, reuse, innovative treatment technologies, and smart development choices.

Best practices in Flagstaff include:

- **Impact analyses:** Every site plan or zoning request must determine if existing water infrastructure is sufficient, whether the plan requires a new well, and how it will impact the city's water budget.
- **Compact and cluster development to preserve open space**: Higher-density, mixed-use infill projects utilize existing infrastructure and steward water supplies, energy, and other resources more than single-family residential.
- **Stormwater management/low-impact development**: All new subdivisions are required to control runoff and recharge on-site. The city provides low-impact development and stormwater manuals.
- **Landscaping code**: Code requires native/xeric plants; the use of hydrozones (organizing plants according to water demand and microclimate); and the use of rainwater, greywater, or reclaimed water (non-potable) for irrigation.
- **Rainwater harvesting**: Flagstaff was the first city in Arizona to pass rainwater harvesting guidelines in 2012. The ordinance adds a rainwater harvesting requirement to existing low-impact development ordinances, making active rainwater harvesting systems mandatory in new residential development unless it demonstrates low outdoor water demand.

SECTION 4

WATERSHED HEALTH & ALTERNATIVE SUPPLIES

The effects of increasing development, climate change, and natural hazards can all degrade the quality of the watershed, impacting both water yield and water quality. Pairing the right water supply to the right use can maximize water supply.

CASE STATEMENT

How we manage all forms of water, from stormwater to wastewater, impacts both the built and natural environment. Approaches that integrate a holistic, "one water" management approach into building, site, subdivision, and infrastructure standards can protect ecosystems and harness the utility of all forms of water.

The way a community develops impacts water quality and the overall health of the watershed. By applying the principles and tools in this section, communities can reduce or reverse the impacts of the following:

Water pollution from urban stormwater runoff.

Sedimentation from soil disturbance, vegetation loss, and erosion from roads and development.

Destruction of riparian areas from climate change and development in the floodplain.

Reduced stream flows caused by drought and groundwater pumping.

Decrease in water infiltration and aquifer recharge due to impervious surfaces and traditional stormwater management.

TOOLBOX: WATERSHED PROTECTION

Landscape-scale changes resulting from both human and natural forces have a significant impact on natural ecosystems and water resource availability. Safeguarding available water resources through watershed protection standards and policies is an important but often overlooked goal in Western communities. Watershed planning and protection has often been considered a function of collaboratives and nonprofits working with local governments to restore ecological processes and functions. The way communities develop and redevelop can either escalate the threat to our watersheds or nurture nature and harvest the returns.

Watershed planning focuses on minimizing negative impacts as new development occurs. Watershed protection goals are included in a wide variety of community plans, such as comprehensive plans, emergency management plans, watershed plans, water resource management plans, and open space plans. Converting these goals into concrete policy in development codes is essential to preventing watershed degradation and enhancing community resiliency.

Approaches for Watershed Protection Standards:

- Map all sensitive areas including wetlands, riparian corridors, infiltration zones, water supply watersheds, groundwater basins, and natural-disaster-prone areas, such as flood, drought, and wildfire areas.
- Adopt plans for wildfire mitigation, watershed management, stormwater management, and floodplain management that designate sensitive areas and goals for mitigation. These plans should reference other plans so that priorities and objectives build on each other and that the environment is viewed holistically.
- Minimize development in sensitive areas through overlay zones that cluster or limit development densities and include design standards.
- Adopt development design and site standards for stream buffers and setbacks to protect water quality and shallow groundwater areas.
- Adopt vegetation protection standards that minimize disturbance to vegetation within the riparian corridor.
- Adopt stormwater management and site design standards that utilize best practices for low-impact design, reducing storm event runoff and increasing water infiltration.
- Adopt site-level soil erosion mitigation standards for new development to reduce sedimentation and runoff, and to protect water quality from land disturbance.
- Protect existing and potential sources of drinking water supplies by adopting surface and/or groundwater districts with standards to minimize contamination of streams and shallow aquifers.
- Organize and encourage regionally collaborative efforts to restore watershed functions through watershed restoration projects and public education.

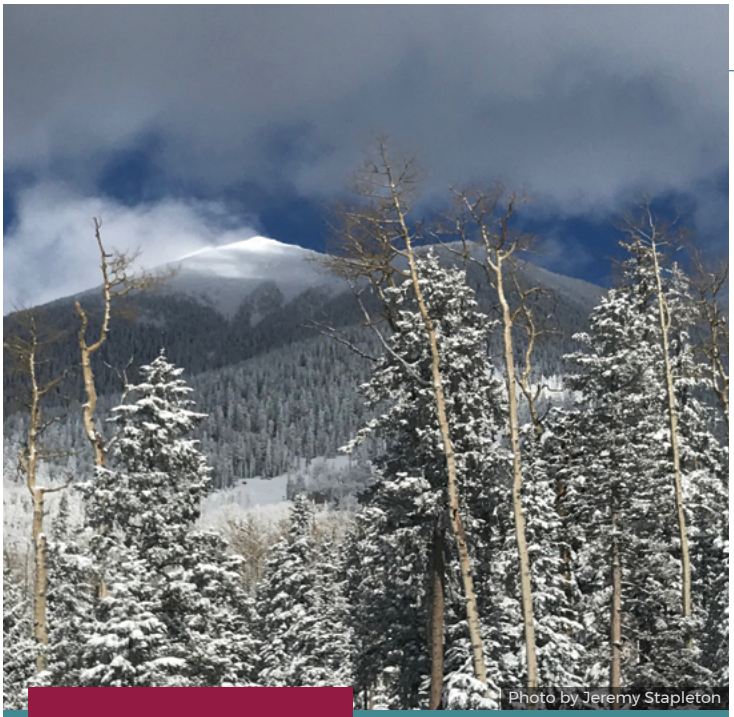


Photo by Jeremy Stapleton

CASE STUDY

WATERSHED PROTECTION PROGRAM — CITY OF FLAGSTAFF AND COCONINO NATIONAL FOREST, AZ

Applies to: County | Municipality | AMA | Non-AMA

Whether a mountain or a desert town, Arizona communities are often surrounded, at least partially, by natural open space. Even if outside your jurisdiction, the health of those natural lands can help or hinder water management.

The City of Flagstaff has been successful in restoring forest lands within and adjacent to the city in order to mitigate fire risk and the associated flood and water quality issues. Much of the land was state or federally managed, yet in 2012 voters supported a $10 million bond to support key watershed restoration work. This is a rare example of federal land restoration being funded by a municipality, and the only known instance where such an effort is funded by municipal bonds. Funds are managed by the Flagstaff Watershed Protection Program.

The City of Flagstaff is groundwater dependent, and their water supply is highly dependent on the precipitation and run off from the San Francisco Peaks. Fires can create major water quality and quantity concerns: a wildfire and subsequent erosion could impair up to 50% of the city's water supply.

Another immediate concern was public safety. Flood risks dramatically increase after forest fires. Streetside signage was placed throughout town to indicate the extent of flooding likely to occur without intervention. This public messaging campaign was key in building community support for this unprecedented bond election.

Photo by Tim Roberts Photography

CASE STUDY

SEEKING SUSTAINABLE YIELD IN THE SIERRA VISTA SUBWATERSHED — COCHISE COUNTY, AZ

Applies to: County | Municipality | AMA | Non-AMA

Over the last two decades, Cochise County has implemented collaborative and forward-thinking approaches to conserving water, protecting riparian habitat, and preserving regional economic viability through integrated water and land use planning. The county, City of Sierra Vista, and Fort Huachuca, working collaboratively, catalyzed innovative zoning and policy structures that pushed the boundaries of water policy in Arizona and resulted in effective water conservation.

In 1998, a joint planning commission between Cochise County and the City of Sierra Vista brainstormed regulations and policies to promote water conservation in the Sierra Vista Subwatershed (SVS), a hydrologic area where groundwater pumping was affecting the flow of the San Pedro River and potentially impacting the riparian habitat of the Congressionally designated San Pedro Riparian National Conservation Area (SPRNCA). The county incrementally enacted these conservation measures, progressing from targeted regulations on golf courses to countywide regulations on waterless urinals, commercial development landscaping, and residential pools. This group evolved into the 21-member Upper San Pedro Partnership, formed to guide policies, funding, research, and monitoring of water impacts in the SVS.

By 2002, several local events indicated a need for more targeted regulations in the SVS. About 70% of the county's total population is in the SVS. In 1999, the United States Geological Survey showed an approximately 15,000 acre-foot overdraft of groundwater resources in the area, which was likely impacting the federally protected San Pedro River. Fort Huachuca, the main economic driver of the region, was then sued under the Endangered Species Act for its role in groundwater overdraft. At the same time, the rate of development in the county was increasing, ultimately peaking in 2008.

The county's role in the coordinated response was its 2002 Water Action Plan for the SVS. County staff cited A.R.S 11-821C3, which allows all counties to plan for development and water resources, as its legal basis for integrating water and land use planning.

An initial strategy from the County was the adoption of key comprehensive plan policies and site development standards countywide and intergovernmental agreements with cities in support of water conservation. The county and the City of Sierra Vista leveraged the Extraterritorial Jurisdiction statute (A.R.S 9-461.11) to propose extending the city's existing water conservation zoning regulations up to 20 miles6 beyond its municipal jurisdiction into unincorporated areas in the SVS.

A follow-up strategy was to amend the comprehensive plan to include the 2006 SVS Water Conservation and Management Policy Plan. In this amendment, the county tied water impacts to its discretionary re-zoning approval process: proposals that increase density above the one unit

per four acres base zoning in rural areas must incorporate water-saving elements into the design until the projected per capita water demand matches the projected base zoning demand. Another key policy of this plan also prohibits density increases if they are proposing to pump groundwater within two miles of the San Pedro Riparian National Conservation Area.

At the same time, the SVS Water Conservation and Management Policy Plan allowed the county to build upon the Extraterritorial Jurisdiction statute to create the SVS Overlay Zone, which established new regulations and included the entirety of the SVS. An overlay zone is an additional "layer" that adds or modifies regulations to the existing zoning of a particular geographic area. Though typically used to guide development in specific areas like central business and historic districts, overlay zones are also effective tools in natural resource protection.

Within the SVS Overlay Zone, new residential and non-residential construction must adhere to site development standards, including:

Residential

- Toilets and other fixtures must be WaterSense-labeled.
- Greywater plumbing stub-out must be available for optional use by the homeowner.
- On-demand hot water must be located at the point of use.
- Commercial, Industrial, Multi-family, and Public Development
- All urinals must be waterless.
- Car washes must recycle a minimum of 75% of the water used.
- All dishwashers and clothes washers, water softeners and drinking water systems must be Energy Star rated or otherwise efficient.
- Multi-family developments over four units must be submetered.
- New artificial water features such as lakes/ ponds are prohibited. Decorative fountains must recirculate and use harvested rainwater.
- Turf and irrigation systems are subject to new restrictions

The SVS Overlay Zone is one of the tools Cochise County has employed to protect its groundwater reserves. The county is also a founding member of the Cochise Conservation and Recharge Network (CCRN). The CCRN identifies and facilitates riparian habitat protection and groundwater recharge projects like retiring agricultural land, constructing effluent recharge and stormwater detention basins, and protecting land from future development in sensitive environments adjacent to the San Pedro River and its tributaries. At the beginning of 2020, CCRN had completed seven projects over 6,344 acres, which cumulatively recharge 3,000 acre-feet per year (AFY) and prevent 3,000 AFY of groundwater pumping. This collectively amounts to approximately 2 billion gallons per year.

Through the SVS Overlay Zone, the CCRN, and other water conservation measures, the county hopes to attain sustainable yield within the watershed. Beyond the "safe yield" goal of the Phoenix, Prescott, and Tucson AMAs, "sustainable yield" lies at the nexus of human and natural ecosystem needs because it seeks to recharge the groundwater table to maintain riparian habitat while also meeting the needs of human residents.

TOOLBOX: GREEN INFRASTRUCTURE AND LOW-IMPACT DEVELOPMENT

Green infrastructure (GI) uses the natural ability of permeable surfaces to absorb stormwater. Low-impact development (LID) is the retention or restoration of natural hydrologic patterns by using landscape and site design to keep as much rainwater as possible from leaving the site. Instead of designing a site or streetscape to funnel stormwater off-site as fast as possible, GI and LID approaches use natural vegetation, porous materials, rain gardens, and detention basins to "slow the flow" and encourage the infiltration of stormwater.

Some of the benefits of green infrastructure include:

- Reducing peak flooding and treating stormwater on-site reduce downstream flood intensity, decrease pollutant loads, and lower the risk of sewer overflow.
- Reducing the need for outdoor irrigation and landscaping, since native plants that rely solely on naturally occurring rainfall can vegetate gardens and basins used for GI.
- Allowing stormwater to infiltrate into vegetation and soils increases groundwater recharge.
- Providing access to green spaces fosters active, healthy lifestyles through increased neighborhood beautification.
- Planting trees and other plant materials also mitigates heat by providing shade, sequestering carbon, and absorbing radiation from the sun.
- Adding natural vegetation along streets aids with traffic calming.

Approaches to Green Infrastructure:

- Work with transportation and civil engineering professionals to update development standards. When possible, use the minimum street width and direct runoff from pavement and buildings to vegetation-lined channels.
- Design all aspects of landscaping—from the selection of plants to soil preparation and installation of irrigation systems—to reduce water demand, retain runoff, decrease flooding, and recharge groundwater.
- Map areas of high flood risk and apply GI approaches to capture water.
- Preserve regional open space by clustering development, thereby maximizing unpaved areas for stormwater retention. Use permeable surfaces for hardscapes.

TABLE 5: COMMON LOW-IMPACT DEVELOPMENT AND GREEN INFRASTRUCTURE TECHNIQUES

APPLICATION	DESCRIPTION
BIORETENTION BASINS, STORMWATER HARVESTING BASINS, AND RAIN GARDENS	Small- to large-scale planting areas containing shrubs, trees, and grasses designed to capture stormwater.
BIOSWALES	Shallow and uncovered channels that induce meandering and are placed within a drainage channel.
CURB OPENINGS AND CURB EXTENSIONS	Drainage inlets that divert stormwater into bioretention basins. Basins can be extended into the shoulder to expand the harvesting capacity with added traffic-calming effects.
DETENTION PONDS	Basins that provide flow control by collecting stormwater runoff.
PERMEABLE PAVEMENT, GRAVEL, OR PAVERS	Methods of paving that allow infiltration and can be used in low- to moderately trafficked areas like sidewalks and parking lots.

Photo by Mead Mier

CASE STUDY

PLANNING & FUNDING GREEN INFRASTRUCTURE — CITY OF TUCSON, AZ

Applies to: County | Municipality | AMA | Non-AMA

Stormwater harvesting programs and policies often focus on green infrastructure (GI), which includes using natural spaces within the built landscape to capture stormwater, to reduce fugitive water (i.e., water runoff from a site), and to mitigate urban flood risk.

The City of Tucson Green Streets Policy, passed in 2013, requires Tucson Department of Transportation to incorporate green infrastructure into the design of public roadways during new construction and for reconstruction projects that include a landscaping element. It also requires that GI costs and benefits be evaluated and incorporated into project budgets. The main goal of this policy was to address flooding issues in Tucson's street network. Secondary benefits included heat island mitigation, improved streetscape aesthetics, and traffic calming.

While construction of the GI features has been successful, maintaining them is another matter. Initially, the transportation department was responsible for GI maintenance, but when the department proved to be too constrained by funding limitations, the city shifted this responsibility to residents and neighborhood groups. It eventually became apparent that neighborhood groups are ill-equipped to handle maintenance projects, and the poorly maintained basins became ineffective at stormwater harvesting, further diminishing street safety and aesthetics.

In 2019, voters approved the City of Tucson Green Stormwater Infrastructure Plan and Green Stormwater Infrastructure (GSI) Fund to support the maintenance of existing GI features as well as the planning and construction of additional stormwater harvesting basins in new areas of the city.

Tucson Water used the recommended maintenance cost rate of $2.84 per square foot of GSI features per year, plus a thorough inventory of the existing 317 GSI features in the city to estimate overall costs. The approved fund added a flat-rate charge which ranges from approximately $1.00/month for low-income families to around $2.00/month for commercial users. The total annual budget for this program is approximately $3 million, covering program administration, feature maintenance, and capital improvements.

Additional benefits of the GSI fund include centralizing responsibility for citywide integrated implementation, helping to avoid duplicated and counter-productive efforts. This initiative of Tucson Water is consistent with several goals of the voter-approved Plan Tucson: City of Tucson General and Sustainability Plan 2013 and Tucson Water's One Water management strategy.

TOOLBOX: ALTERNATIVE WATER SUPPLIES

The use of alternative water supplies can ease peak pressure demands on a water treatment system during warmer months when irrigation demand increases. Alternative water supplies can also help diversify a water portfolio, allowing existing water supplies to be stretched farther.

There are options available to water providers and communities for alternative water supplies:

1. Raw water source
2. Recycled water
3. Greywater
4. Stormwater harvesting
   (see the green infrastructure section)
5. Rainwater harvesting

Raw Surface Water

Communities may require outdoor irrigation, with appropriate water rights, to be supplied by untreated, or "raw" surface water from ponds, lakes, ditches, and rivers. While this water source takes pressure off the treated water system, it should not be considered an unlimited water supply. Non-potable water should not be incentivized as a lower-cost option. All water should be considered a valuable resource and used efficiently. Match conservation and efficiency requirements for raw water to other water sources.

Rainwater Harvesting

Rainwater harvesting is runoff that is collected from roofs into storage systems and thus reduces demand on fresh water supplies and the potable water system. Arizona has been a leader in utilizing rainwater in the West. The State allows for rainwater to be harvested in rain barrels or cistern systems that funnel rooftop runoff to water collection tanks to be used with minimal to no treatment for landscape irrigation, dust control, and/or stock water supply.

Rainwater harvesting can provide water for landscaping and potable use. Though often done on residential properties, local governments can also provide standards for district-scale or commercial rainwater harvesting.

Local jurisdictions and water providers can require or incentivize rainwater harvesting in water conservation ordinances. Rainwater harvesting standards may involve specifications for technical equipment, installation, and maintenance for capturing, storing, and using rainwater at residences or commercial buildings.

Recycled Water

Water recycling is the collection of wastewater for treatment and reapplication for beneficial uses. Recycled water is a reliable supply that is "drought-proof" and locally controlled.

Recycled water treated to non-potable, or non-drinkable, standards is often used for irrigation and some industrial uses. However, there are limits to non-potable reuse applications, and costs must be considered, such as the costs of treatment, for planning and operating a dual infrastructural system, and for developing a means of storage. Therefore, as treatment technology has improved, some communities have opted instead to use an advanced purification process to treat their water further to reach potable, or drinkable, standards.

Potable water reuse systems can be direct or indirect. Direct reuse systems integrate the ultrapure treated water directly into the drinking water system or into

the raw water supplying the system. A growing handful of communities in the United States practice direct reuse. Far more common, though, are indirect reuse systems, in which recycled water is treated to similarly high standards and is then released into another body of water, called an "environmental buffer," for storage. Environmental buffers can be groundwater—reached through either natural infiltration or injection wells—or surface water such as reservoirs, wetlands, or riverbeds. The blended water is eventually retrieved, treated again, and ultimately distributed into the drinking water system.

Greywater Use

Unlike recycled water, greywater is collected from non-sewage water (bathtubs, sinks, laundry) and used on-site, with little treatment, for irrigation. By law, greywater is defined in Arizona as "wastewater that has been collected separately from a sewage flow and that originates from a clothes washer or a bathroom tub, shower or sink but that does not include wastewater from a kitchen sink, dishwater or toilet." Arizona has three tiers based on capacity. The state's laws are very supportive of on-site greywater and prohibit a municipality or county from limiting the use of greywater. For a Tier 1 private residence, the residence may incorporate greywater for irrigation into its site without a permit, as long as it follows the best management practices outlined by ADEQ. Local governments can develop green building incentives or development standards to better promote and incorporate water reuse.

Approaches for Using Alternative Water Supplies:

- Require non-potable water for irrigation but use it efficiently. Water used outdoors does not re-enter the treatment system and thus should not be considered an unlimited supply.
- Set the culture that all water is valuable, and non-potable water should not be incentivized as a lower-cost option, particularly if your community struggles to fund treatment or delivery infrastructure.
- Use and promote reclaimed or recycled water.
- Establish "purple pipe" recycled water delivery systems throughout all new development. Strategically place "purple pipe" in redevelopment projects to promote access to parks and other areas with large non-potable water demand.
- Incorporate on-site water recycling technologies at high-water-use industries in a water conservation ordinance.
- Direct industrial- or institution-scale air conditioning condensate into a water harvesting feature in the landscape design.
- Adopt a greywater ordinance or incentive for residential use.
- Promote rainwater harvesting. Develop rebate incentive programs for cisterns. Develop ordinances that target residential or commercial development.

Photo by Michael Gaida

CASE STUDY

RAINWATER COLLECTION GUIDANCE — COCONINO COUNTY AND THE CITY OF FLAGSTAFF, AZ

Applies to: County | Municipality | AMA | Non-AMA

Managing ongoing droughts and water supply limitations in the arid Colorado Plateau environment is an ongoing challenge for municipal and county governments. Both Coconino County and the City of Flagstaff allow rainwater harvesting and have developed guidance materials, incentives, and requirements to encourage rainwater collection to conserve public water supplies. Rainwater harvesting requirements are incorporated into building and design codes under municipal and county authority to regulate construction of buildings and structures (see Ariz. Rev. Stat. § 9-9-463.01 et seq. and § 9-467 applicable to cities and § 11-861 applicable to counties).

Based on recommendations from a citizen stakeholder group, the City of Flagstaff adopted Rainwater Harvesting requirements in 2012 through Ordinance No. 2012.03. Implementation included amendments to its Stormwater Design Manual, a new Residential Rainwater Harvesting Guide to Water-wise Planning and Design, and a new chapter to the City's Low Impact Development Guidance Manual. The City also provides rebates for rainwater harvesting tank installation and, as available, free rainwater harvesting containers. Purchased in bulk and offered to residents at wholesale prices, the rain barrel program has been popular with residents. The ordinances and programs support several of the City's water-related goals and policies adopted in its regional Comprehensive Plan.

While rainwater harvesting provides a straightforward water supply option, its use for potable, human consumption purposes can pose a serious health risk. Supporting its Comprehensive Plan water conservation goals and policies, Coconino County adopted an ordinance in 2019 and developed a User's Guide to provide specific standards for design, installation, and testing for potable systems. The User's Guide is intended to help residents and builders understand the ordinances and the basics of what is required for potable water harvesting systems in the county. Although many communities are starting to provide resources and guidance for non-potable systems, Coconino County's guide is the first in the state for potable systems. It provides information on properly sizing a system, estimating expected rainwater yields, system components, maintenance, tank and cistern types, installation and maintenance, estimated system costs, and guidelines for testing the system and water quality.

CASE STUDY

POTABLE WATER REUSE — PIMA COUNTY, AZ & TUCSON WATER

Applies to: County | Municipality | AMA | Non-AMA

Reclaimed water, or treated wastewater, is an exciting new frontier for water policy and land use planning. Rapidly improving treatment technology is making reclaimed water more appealing for wider use. The Flagstaff-area private ski resort made headlines for using reclaimed water for snowmaking. Scottsdale has become the first community in Arizona—and third in the nation—to have a permit for direct potable reuse. In Tucson and Marana, reclaimed water is restoring habitat and supporting economic development along the Santa Cruz River.

The Santa Cruz River is an ADWR-permitted, managed recharge facility in Tucson and Marana with surface water flows that depend almost entirely on treated wastewater from Pima County. In 2013, Pima County invested $600 million to upgrade its two treatment plants that release water into the river. With the improved water quality, rare aquatic habitat has been restored, water infiltrates and restores aquifers at a faster rate, and the pleasant river corridor fosters outdoor recreation and economic development opportunities. These long-term improvements have created conditions that favor keeping the water in the river channel.

However, reclaimed water is often used to offset potable demands in urban areas, and water owners were obligated to put their water to the optimal use financially and for the long-term water supply, so until recently, the future of this restored habitat was uncertain. Since ADWR permitted 50% credit for water recharged in MUSFs, off-channel uses were incentivized—that is, until ADWR made an exception in 2019. Via the Arizona Drought Contingency Plan, ADWR in 2019 approved a 95% credit for the water that infiltrates in a limited number of existing MUSFs, including parts of the Santa Cruz River. This new policy gives effluent owners nearly full credit for the water that remains in the river and all but assures water will remain in the river channel. The aesthetic watershed improvements and the certainty of flows support major investments in the river corridor.

One of the first and highly visible projects that resulted from the crediting change was the Santa Cruz River Heritage Project, launched by Tucson Water in June 2019. This project uses existing infrastructure to bring a portion of Tucson Water's share of recycled water to a stretch of the Santa Cruz River near downtown Tucson where it recharges within city limits. The city expanded the pipeline to include a minor filtration process and an outfall into the river corridor. The existing infrastructure kept costs to approximately $850,000.

The primary obstacle was how to maintain the river channel for flood conveyance. The introduced water increases vegetation growth, which then reduces the river channel conveyance capacity during flood events. The river channel is especially constricted by riverside development in downtown Tucson. Tucson Water and Pima County Regional Flood Control District have established collaborative agreements to address the location of the flowing water and channel maintenance in the Heritage Project vicinity.

Under the new ADWR policy, Tucson Water receives 95% credit for this water, considerably incentivizing, though not guaranteeing, the long-term dedication of this reclaimed water to flow in the river channel. This reliable influx of water is actively restoring a historically perennially flowing stretch of river near downtown, reconnecting community members to the river and providing an attraction for growth in an area adjacent to downtown Tucson.

SECTION 5

EFFICIENT WATER DEMAND PROGRAMS

Rate structuring, retrofit programs, and consumer education enable water conservation and efficiency opportunities for existing development.

CASE STATEMENT

Establishing water conservation, efficiency, and reuse in new development enables a community to grow water-smart from the start. Programs that incentivize or assist consumers in reducing water demand serve an important role in retrofitting existing development and promoting a continued focus on wise water use.

Largely within the purview of water providers, incentive programs and rate structures can promote efficient water demand by:

Sending a price signal to incentivize water conservation.	Helping consumers invest in and manage efficient fixtures, appliances, and irrigation.	Monitoring and communicating data about water usage to consumers.

TOOLBOX: CONSERVATION RATE STRUCTURING

Water providers set rates to collect the revenue they need for operations, invest in infrastructure, and protect public health. With a revenue goal identified, providers can develop a rate structure to meet additional objectives, including water conservation and acquisition of supplies. Prioritizing conservation and mitigating water demand can lower water provider expense by sizing water supply acquisition or storage to the lower level of demand.

Water rates are determined by two factors: fixed and variable costs. The fixed costs of water are determined by the costs of water acquisitions and the costs to establish, operate, and maintain the infrastructure to convey the water. A variable cost is based on the amount of water a consumer uses.

Common goals for adopting water conservation rate structures include:

- Reducing daily peak usage.
- Reducing seasonal peak usage.
- Reducing total system demand.

Consumer water conservation does not create financial strain if the offset demand allows new customers to be added to the system while maintaining overall water use. If it is possible that customer conservation may exceed the point where it would present a revenue challenge with the current price of water, consider having a public dialogue to design solutions and rate structures that reflect the community's values and needs. Keep in mind that less demand pressure can result in considerable cost savings over time by reducing strain on water system infrastructure, thus delaying the need for maintenance, retrofitting, or expanding infrastructure.

There are a variety of rate structuring options:

- Drought Demand Pricing: rates are higher during drought periods.
- Excess Use: rates are higher for above-average water use.
- Inclining Block: rate per block increases as water use increases.
- Indoor/Outdoor: with separate meters, rates for indoor use are lower than rates for outdoor use.
- Penalties: customers are charged for exceeding allowable water usage limits.
- Scarcity Pricing: the costs of developing new supplies is added to bills.
- Seasonal Pricing: water rates are higher during the season with the most demand.
- Sliding Scale: the unit price increases based on an average consumption.
- Spatial Pricing: water rates are determined by the actual costs to supply water to specific locations.
- Time-of-Use: water rates are higher during peak days or specific hours of the week.
- Water Budget: block rate is defined for each individual customer based on efficiency projections/expectations for that customer.

Approaches to Conservation Rate Structures:

- Develop a utility water conservation plan to clarify water conservation goals.
- Conduct a rate assessment to determine options for rate structuring.
- Develop a rate structuring plan and conduct community education and outreach to minimize opposition to potential rate increases.
- Adopt a conservation rate structuring strategy.

Photo by Kieran MacAuliffe

CASE STUDY

TIERED RATE STRUCTURES & CONSERVATION FEES – TUCSON WATER

Applies to: County | Municipality | AMA | Non-AMA

Water rates are a key tool for managing demand as well as generating sufficient revenue for operations, maintenance, and capital improvement projects. A key challenge for water providers is finding ways to maintain financial sustainability as customers embrace water conservation.

Tucson Water uses an inclining block rate structure for its residential customers' potable water delivery; as water volume use increases, so does the price per centum cubic feet (CCF). This rate structure incentivizes water users to conserve water and avoid paying higher rates.

Higher income households are less sensitive to rate fluctuations, inclining blocks can occasionally dispro-portionately impact low-income residents or other entities with financial barriers. An unforeseen challenge with Tucson's system was the impact on community gardens.

Initially, community gardens were categorized as a residential customer in Tucson Water's tiered rate system. However, gardening in the summer is quite popular and a community garden with several users will have a significant water demand. Being charged at the highest block rate in the summer presented a significant financial barrier and caused many gardens to close during the summer months.

Single Family Residential Block Rate, Charge per CCF

1–7 CCF	$2.07
8–15 CCF	$3.82
16– 30 CCF	$8.39
Over 30 CCF	$12.93

In response, Tucson Water designed a three-year pilot program to offer community gardens a more affordable rate of $3.36 per CCF, which is somewhere between the lowest and second lowest block rate. Gardens qualify for this program if they have a designated irrigation meter and backflow prevention devices. Tucson Water estimates that this can save gardens up to $2,000 in water bills.

The City of Tucson utility bill also includes a conservation fee, which covers the operating expenses for Tucson Water's conservation initiatives. These activities include research, training and education, conservation audits, rebate programs, rainwater harvesting, and stormwater management programs. Tucson Water started its conservation fee of $0.03 per CCF of potable water sales in fiscal year 2008/09. The fee has increased gradually over time and is currently set to $0.10 per CCF, with exceptions for low-income households.

TOOLBOX: POST-OCCUPANCY INCENTIVES AND EDUCATION PROGRAMS

Both land use planning programs and water providers can engage consumers and provide incentives and education on the benefits of using water efficiently in their homes and businesses. Using technology like advanced water meters and sub-metering helps tailor these post-occupancy interventions.

Conservation Rebate Programs

Incentive programs can be a useful way to reduce current water demands for both residential and commercial properties/water users. They can serve as a complementary way to involve current residents/post-occupancy developments in implementing water-smart building and design features. Providing rebates for homeowners and businesses to remove grass and retrofit water-smart plumbing fixtures is a well-tested tool that can generate meaningful water savings.

Approaches for Conservation Rebate Programs:

- Offer rebates to residents for installation of low-flow plumbing fixtures such as toilets and showerheads, appliances such as high-efficiency washing machines, and "smart" home water monitors to reduce indoor water use.
- Offer rebates to residents and commercial customers for "smart" irrigation controllers, xeric landscaping, and removal of turf grass to reduce outdoor water use.
- Use rebates or grants to incentivize homeowner's associations to remove turf grass and install water-efficient irrigation systems and controllers.
- Establish a rebate program for multi-family residential buildings that have cooling towers to upgrade their conductivity controllers.

Water Metering, Audits, & Leak Detection

Water customers, including commercial, industrial, and residential users, may not be aware that water leaks and inefficient fixtures may be unnecessarily increasing their water use. While water providers may perform their own system-wide water loss audits, they can also support and incentivize customers to do the same.

Water metering is a method of measuring water consumption. Advanced metering technology, called "smart meters," ease the data collection process and increase the specificity of the data. This increased granularity of information creates the opportunity for easily justifiable rate structures, rapid leak detection, and customized demand management programs. Utilities that pair metering and commodity rate structures report a 15% to 30% reduction in water consumption.

Privately purchased metering devices are growing in popularity because they connect the consumer to their water data in real time. In the absence of utility-wide advanced metering, encouraging consumers to purchase their own meters can achieve similar water demand reductions at individual properties.

Furthermore, sub-metering multi-family, commercial, and outdoor uses can provide data granularity to empower refinement and optimization of water policies, rates, and fees. The value of this information may be worth more than the cost of installing an extra meter.

Metering and the corresponding audits and interpretation can identify opportunities to modify water-consumptive behaviors. They can also detect leaks in the system and signal when infrastructural updates are necessary to mitigate water loss.

Approaches for Water Metering, Audits, & Leak Detection:

- Deploy leak detection equipment, such as specialized meters temporarily attached to the main meter, in scenarios where low staff capacity limits on-site visits.
- Offer landscape audits that recommend watering schedules, infrastructure upgrades, and drought-tolerant plants.
- Offer audits at no cost to customers or pair it with an incentive, like a free fixture.
- Encourage participation by providing water audit results of public buildings as examples that demonstrate potential water saving outcomes.
- Use the aggregated analysis of audit results to identify code and policy changes.
- Update your codes to allow individuals to install privately purchased metering devices on the utility meter and provide guidance on how to attach them in a way that avoids disturbance to utility operations.

Photo by Meritt Thomas

Photo by Carlos Muza

CASE STUDY

ADVANCED METERING INFRASTRUCTURE – CITY OF TEMPE, AZ

Applies to: County | Municipality | AMA | Non-AMA

System-wide data collection in real time assists communities with rapidly responding to water emergencies, regulating usage, and helping customers manage their water demand by providing consumer water use trends down to the hour. Advanced Metering Infrastructure (AMI) systems for water are straightforward to install, and costs are decreasing with improving technology.

System-wide data collection in real time assists communities with rapidly responding to water emergencies, regulating usage, and helping customers manage their water demand by providing consumer water use trends down to the hour. Advanced Metering Infrastructure (AMI) systems for water are straightforward to install, and costs are decreasing with improving technology.

The City of Tempe was the first in the Valley to use AMI to track residential customer water use. Digital "collectors and repeaters" installed on light posts across the service area read and transmit customer water use data to the service provider.

Until this big jump to AMI, the City of Tempe had been manually reading each of its 43,000 water meters. The city can now tailor its conservation incentive program to target customers who could benefit most from free consultations and water audits. The automated system increases customer satisfaction by enabling easy access to data and making billing periods consistent.

Tempe residents can monitor their use in real time and see the peaks in their demand at hourly intervals. This data encourages self-moderation and will also show the real time benefits from the improvement measures they take.

Customers can identify leaks by looking for water use that occurs during periods when the property is vacant or during sleeping or working hours. Customers can compare themselves to the neighborhood average or citywide average.

TOOLBOX: CONSUMER EDUCATIONAL MESSAGING

There are many ways for planners and water providers to reach consumers with conservation messaging. Utility bills often include an educational insert or other content to inform the reader about policy changes and to encourage water savings with tips and tricks. Some include warnings and fear-inducing messages designed to curb water use. These messages often miss the mark, since people tend to defend themselves from fear or negative self-images by ignoring this messaging or rationalizing why the new information does not apply to them. Instead, studies show that messaging techniques that promote a sense of control, offer social incentives, provide immediate rewards, and are framed positively are more effective in changing behavior.

Approaches for Compelling Messaging:

- Help your reader feel they have control or influence. Provide tangible acts or decisions they can make to "move the needle" toward a goal.
- People generally want to be either the same or better than their peers. Offer comparisons or share high compliance figures (e.g., "Nine out of ten residents follow these irrigation best practices to save water.").
- Near-term rewards make people feel good. This reward structure can even motivate behavior changes that relate to long-term goals or outcomes that are not immediately visible. The reward can be external or intrinsic.
- People are more likely to believe and act on positive rather than negative information. So, when given an opportunity to describe a trend, note progress toward goals.

Photo by Tim Roberts Photography

CASE STUDY

PUBLIC-PRIVATE PARTNERSHIPS — ARIZONA WATER COMPANY AND CITY OF CASA GRANDE, AZ

Applies to: County | Municipality | AMA | Non-AMA

The City of Casa Grande has partnered with Arizona Water Company (AWC), its largest water provider, to build a water conservation program that will help make the continued growth of Casa Grande possible while ensuring that current and future residents have access to sustainable water resources. The partnership combines current water conservation efforts by Casa Grande and AWC into a single, integrated demand management program to help coordinate and prioritize water when making future planning and development decisions.

Over the last decade, conservation measures have already reduced the city's per capita water consumption by 10%. However, with the city's population and water demand projected to double by 2050, Casa Grande and AWC are working together to reduce per capita water use by an additional 15% by then. Scalable conservation programs will be key to reaching their goals. Once piloted in Casa Grande, the demand management programs will be scaled up and adapted for use in the Arizona Water Company's other service areas throughout the state, potentially reaching 250,000 people across 22 communities.

The partnership is launching two new post-occupancy efficiency program elements.

The SAVE IT! program is a digital public outreach and education campaign designed to reduce residential and commercial demand while also satisfying the public relations requirements in the Pinal AMA's 4th Management Plan. As the face of the integrated demand management program, SAVE IT! educates residents and businesses about the water conservation measures of Casa Grande and AWC through unique branding, online resources, monthly conservation messages, and events.

The Water Wise Outside (WWO) program is designed to reduce outdoor water use in commercial and industrial sectors. A third-party company analyzed historic water use trends on a customer-by-customer basis and a profile with relevant conservation measures is created for each user. Next, WWO will initiate an outreach and collaboration phase to determine the most appropriate conservation actions based on users' circumstances and behavior and citywide demand reduction targets. Examples include replacing portions of irrigated turf with walking paths or native vegetation, developing water-efficient irrigation schedules, investing in artificial turf for recreation facilities and sports complexes, increasing shaded areas, and using non-potable water for irrigation. Finally, water use will be tracked to determine if the conservation actions are implemented and effective. Continued data collection will guide future changes to WWO with the goal of increased efficiency and conservation.

CONCLUSION

The toolboxes outlined in this workbook highlight some of the most effective strategies communities can employ to take a more holistic and sustainable approach to water management. Integrated water and land use actions occur throughout the planning process, from the visioning and planning stage, through development review, and in post-occupancy. All communities have an opportunity to apply an integrated water and land use intervention. Ultimately, by linking land use to water demand, we can wisely manage our limited resources in a way that sustains thriving economies, healthy environments, and vibrant communities in Arizona for future generations.

ADDITIONAL ONLINE RESOURCES

GROWINGWATERSMART.ORG

The Growing Water Smart program offers additional resources to Growing Water Smart participants through our **program website**. The website provides information related to all of our state programs, including Arizona, Colorado, and California. Please visit resilientwest.org/2022/AZ-Appendices to find resources tailored to Arizona, including:

- A summary of relevant **state legislation**.
- A **resource list** of additional reports, tools, and policy examples.
- A summary of relevant **funding and assistance** from our partners, the state, and federal agencies.

THE GROWING WATER SMART PEER-TO-PEER NETWORK

Our **Growing Water Smart Peer-to-Peer Network** is a place for workshop participants to strengthen their professional connections with other local government leaders and affiliates who are integrating water and land use in their communities.

If you or your community recently attended a Growing Water Smart workshops, visit Growing-Water-Smart.mn.co to join the Network.

As a Network Member, you gain an opportunity to:

- **Strengthen professional knowledge and skills** by accessing resources, studies, and news related to integrating water and land use.
- **Build a network of peers** working on similar challenges and advancing community change.
- **Learn about peer projects and share individual experiences** advancing water-smart goals.
- **Explore and identify innovations** in the field.
- **Access technical expertise** to support organizational policy change and action.
- **Be a champion** in the region for water-smart principles.

LOCAL AUTHORITY TO INTEGRATE WATER AND LAND USE PLANNING IN ARIZONA

There is a common misperception in Arizona that counties, cities, and towns have little authority to manage local water resources. However, local jurisdictions already possess a broad set of authorities for addressing water resources, and in fact many communities across Arizona are undertaking a variety of activities to address water resource and supply issues to promote community health, safety, and welfare.

This memorandum, Local Authority to Integrate Water & Land Use Planning in Arizona, describes the general authorities of Arizona counties and municipalities to regulate land use and the extent to which counties and municipalities may incentivize and/or impose and enforce conditions related to water resources on proposed land uses.

Developing any new program, development policy, infrastructure plan, or regulatory action will involve many legal considerations that are often subject-matter and jurisdiction-specific and should be

undertaken with the input and advice of legal counsel. The existing powers and authorities of a local government and key legal limitations will inform the shape and scope that any potential program takes. Some important considerations, described in greater detail in the Supplement, include:

- The *existing powers and authorities* of the local government related to implementing the program, policy, plan, or action. The Legislature has expressly delegated many water-related general powers to counties and municipalities around water supply, water quality, wastewater management, floodplain management, and water/sewer infrastructure. However, the scope of such powers depends upon whether the government body is a county, charter city, general law city, or a town, and any relevant enabling legislation and/or charter provisions that apply.
- Whether there may be a *preemption* concern, such that a state law either conflicts with or otherwise precludes or limits local action on the matter. For example, the Assured and Adequate Water Supply programs delegate authority to ADWR to evaluate water availability for new subdivisions. Local governments are therefore precluded from undertaking that same activity. However, there are other important planning considerations that communities with growing populations and concerns over water supply and demand might wish to consider that are not contemplated within that state program, like water quality, infrastructure needs and costs, public safety, water conservation design criteria, etc. Preemption issues are likely fairly narrow in the context of existing state-level water management programs outside of active management areas; nevertheless, advice should be sought from counsel to consider the appropriate purpose and scope of any proposed action to avoid or minimize potential preemption issues.
- Whether a proposed program or action may place any *unconstitutional conditions* on the landowner. Key considerations are whether a condition or fee has a clear nexus to the government interest and whether the burden placed on the landowner is proportional to the impact of the proposed use. Advice should be sought from counsel to consider the appropriate purpose, scope, and range of options or alternatives offered for any proposed action to avoid or minimize potential unconstitutional conditions issues.
- How the local government might finance the new program or infrastructure plan. Advice should be sought from counsel to consider approaches and means for financing public services and infrastructure, considering an appropriate allocation of costs between new development and existing residents and scale and duration of build-out.

Grow Water Smart

GrowingWaterSmart.org

350+ Community Representatives

Across the Colorado River Basin

Growing Water Smart Workshops are helping leaders build capacity and implement action plans to steward their community's future by ensuring clean, reliable water for people, nature, and industry.

Through our Growing Water Smart workshop series, we have trained over 350 community representatives and impacted the lives of over 3.9 million Coloradans and 2.9 million Arizonans.

With your continued support of Growing Water Smart, more communities can take advantage of our expertise and lessons learned through nearly thirty years of shaping the future of the West.

JOIN US. MAKE THIS WORK HAPPEN.

To sponsor a workshop in a community you care about, contact us.

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