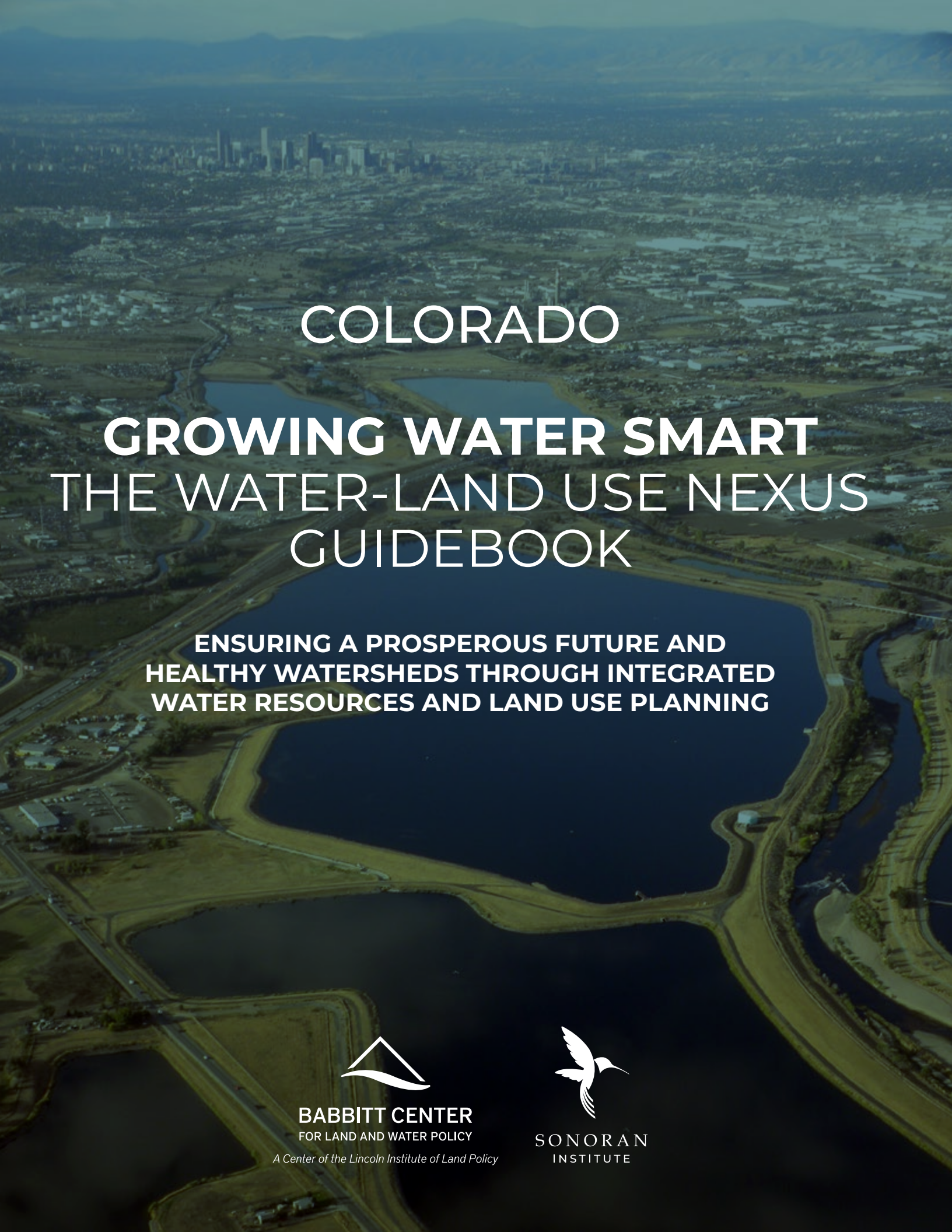

COLORADO

GROWING WATER SMART
THE WATER-LAND USE NEXUS GUIDEBOOK

ENSURING A PROSPEROUS FUTURE AND HEALTHY WATERSHEDS THROUGH INTEGRATED WATER RESOURCES AND LAND USE PLANNING

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

SONORAN
INSTITUTE

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THANK YOU TO OUR FUNDERS

Our supporters understand that we are all connected within the Colorado River basin. They know that we must come together to find solutions to the problems we all face. Because of this, they are supporting programs like this that make a positive change. Like you, they care about the future of Colorado, and envision a more resilient future throughout the North American West. Our shared vision is made possible from generous support from joint-partners, sponsors, public institutions, private funders, and in-kind contributors.

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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. Through Growing Water Smart, Colorado communities learn how they can integrate land use and water planning.

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 resilient communities living in harmony with the natural world, where flowing rivers and healthy landscapes enable all people and nature to thrive. Our work transcends borders, bringing together diverse communities to promote civil dialogue about complex conservation issues that know no boundaries. All aspects of our work are guided by inclusivity and collaboration to create positive environmental change in the western United States and northwestern Mexico.

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 communities, economies, and the environment. The Babbitt Center develops tools and best practices to guide decisions through research, training, and partnerships for management of land and water resources. We recognize that water is the lifeblood of the American West and land use decisions are made every day that shape our water future. Coordination of these land and water use decisions is critical for ensuring resilient and sustainable communities.

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INTRODUCTION

Traditionally, responsibility for water resource management and land use planning has been siloed in different departments or entities. However, the manner in which new development occurs can have a major impact on municipal water demand as well as the health of the watershed in which it resides. This introductory section makes the case for bringing water resource management and land use planning in line with one another, and in doing so, shifting our focus from supply to demand side management, from unfettered economic growth to holistic watershed health, and from siloed implementation to an integrated water management paradigm.

SHIFTING OUR FOCUS FROM SUPPLY TO DEMAND SIDE MANAGEMENT

By 2050, Colorado's population is predicted to almost double in size putting pressure on our State's already limited water resources. A growing population can escalate the costs of operating local utilities, the need for enhanced and expanded infrastructure, and, if the water supply is constrained, the cost of acquiring new sources. In the past, water resource managers and water providers have turned to ***supply side management*** to meet growing demand by investing in water acquisition, treatment, and storage and distribution projects. However, these options come with a significant price tag and can be more time and resource intensive.

An alternative to these costly investments is more efficient use of existing supplies. Increasingly, communities are turning to ***demand side management***—an approach that seeks to reduce the demand for water. A demand side approach generally includes:

- **Water Conservation:** Encouraging water users to reduce how much water they use by modifying behaviors
- **Water Efficiency:** Encouraging or requiring the use of technology, building or site designs that uses less water.
- **Water Reuse:** Treating or converting grey and black water to replace or augment water supply.

One of the more promising strategies in water demand management is integrating land use planning with water conservation and efficiency. In 2015, Colorado's Water Plan emphasized the importance of this approach by establishing the goal that "by 2025, 75% of Coloradans will live in communities that have integrated water-saving measures into land use planning." Communities throughout the West have found that by increasing development density, utilizing technological efficiencies, and promoting aggressive conservation programs, they have been able to continue to grow without acquiring new 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 construction. This approach increases the cost-to-benefit ratio of capital investments by using the same amount of water and infrastructure to serve more people per dollar spent. This approach benefits the environment and ensures a more sustainable future and it's good for the triple bottom line.

SHIFTING OUR FOCUS TO WATERSHED HEALTH

Every community lives within a watershed—a land area that channels rainfall and snowmelt to creeks, streams, and rivers. Many of Colorado's communities were founded along rivers or rely on them for recreational activities. However, a tension exists between preserving a pristine natural environment and developing land for residential, commercial, or industrial uses to house residents and promote economic growth. It is possible to plan thoughtfully for future development in order to achieve multiple objectives. Where development is allowed, many factors such as lot size, density, water conservation measures, and stormwater management all greatly influence the health of the watershed and impact water quality and stream flows.

Section 4 on Healthy and Resilient Watersheds describes how approaches such as source water protection, pollution and sedimentation controls, riparian buffers or setbacks, preserving native vegetation, stormwater management, and low impact development can improve watershed health.

SHIFTING OUR FOCUS TO INTEGRATED WATER RESOURCE MANAGEMENT

The water cycle circulates water between the earth's oceans, atmosphere, and land via precipitation, drainage, and evaporation. This closed loop manages the 2.5% of fresh water on earth. The natural environment treats water as a cycle, and it is equally important that managers of the built environment view water supply, wastewater, and stormwater as an interconnected loop. Integrated Water Resource Management, also known as One Water, is an approach that promotes coordinated development and management of water, land, and related resources to maximize economic and social benefits while minimizing impacts on the environment. Changing institutional structures by strengthening coordination and collaboration between water supply and wastewater managers, land use planners, economic development managers, and other key officials is an important step in this process. More resources on Integrated Water Resource Management are found in the **Resources Appendix.**

WATER AND LAND USE INTEGRATION OPPORTUNITES

The planning and regulatory mechanisms that guide how and where a community develops each provide an opportunity to strengthen the nexus between water and land use. Determining where to intervene will depend upon a community's political readiness and capacity, what water demand management initiatives have been initiated to date, and the level of aggressiveness desired in achieving water saving goals. The intervention opportunities include:

POINT OF INTERVENTION	TOOL	PURPOSE
Planning & Policy Making	Water Conservation Plans Comprehensive Plans Capital Improvement Plans	Establishes goals and objectives for managing the intersection of natural resources and the built environment.
Pre-Development	Water Adequacy Requirements Conservation Tap Fees	Links new development to water supply planning.
Development Review	Zoning and Subdivision Regulations Annexation Policies Planned Development Policies Development Agreements	Determines what water resource management, conservation and efficiency requirements are applied to development.
Building & Construction	Building, Plumbing and Landscaping Codes	
Post-Occupancy	Water Conservation Rate Structuring Conservation & Efficiency Incentives Outdoor Watering Restrictions Water Budgets & Auditing	Empowers and incentivizes homeowners and renters to reduce water consumption.

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.

SECTION 1 **Planning & Policy Making**
Summarizes the opportunities provided by integrating water and land use during planning processes.

SECTION 2 **Adequate & Sustainable Water Supply**
Provides a review of the State of Colorado's requirement for new developments to have an adequate and sustainable water supply.

SECTION 3 **Water Smart Land Use Policy**
Introduces planning principles that can make a community's development pattern water smart.

SECTION 4 **Healthy & Resilient Watersheds**
Provides guidance on how to protect your water supply to support community resilience and ecological systems.

SECTION 5 **Conservation Rate Structuring**
Summarizes how a utility can manage water demanded of households through market-based incentives and pricing mechanisms.

Each section includes:

1. **A rationale** for why a particular approach should be considered.
2. **A case statement** that provides justification for each approach and what water saving impacts can be expected.
3. **A toolbox** of the particular policy or management actions a community can take to achieve water conservation and efficiency outcomes for this approach.

The **Growing Water Smart Resource Appendix** is available at the end of the guidebook. It includes a summary of relevant Colorado State laws and a resource list of where to find more information, including community case studies and policy examples.

SECTION 1:

PLANNING & POLICY MAKING

The sustainability of a community is dependent upon the availability of water; consideration of future water needs is imperative to decision making.

CASE STATEMENT

The State of Colorado provides limited guidance for drafting policy to link land use and water in required plans. However comprehensive planning, water planning, and capital improvement planning are all interrelated. Integration of these planning processes will require breaking down the traditional planning and operational silos of different departments and agencies. Land use planners have focused on how much and what type of growth may take place in their communities while water resource managers have focused on ensuring adequate water availability. An integrated water resource and land use management approach can ensure:

- A community's vision for the future considers water and growth together.
- A water resource management plan and a capital improvement plan consistent with the vision for future land use and the community's sustainability and resilience goals.
- Development occurs in a way that protects the watershed including ecological functions and the quality and quantity of water supplies.

TOOLBOX: PLANNING

1. COMPREHENSIVE PLANNING

Comprehensive plans, also known as master plans 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 a rare opportunity for a communit-wide dialogue about the future.

By state statute, every municipality or county in Colorado is required to create a comprehensive or master plan. In Colorado, the State's comprehensive planning requirements for **municipalities** (CO Rev Stat § 31-20-206) and **counties** (CO Rev Stat § 30-28-106) allow for, but do not require a water element.[1] However, House Bill 1095 now requires that if a comprehensive plan addresses water supply, then it must also address water conservation.[2]

Implementation of the new House Bill 1095 creates a powerful new tool for local governments in achieving water savings. Local governments can require adherence to the master goals as a condition of approval directly, particularly in situations where the land use code is inconsistent with the plan or the code lacks specific direction for achieving plan intent. It should be noted that this complements the state's adequate water supply rules which grant local governments the ability to negotiate the inclusion of water demand management when approving to a development's water supply.

How this new rule might be applied will depend upon a community's master plans and existing regulations. In general, the options available for conditions are similar what might be included in a water efficient land use code. A local government could require an applicant to meet a requirement such as:

- **A Water Use Maximum.** A development could be required to adhere to a specified water budget for indoor and/or outdoor water use for each household or a commercial development. This requirement would be included in the HOA covenants or demonstrated when acquiring a building permit.
- **HOA Covenants.** Subdivisions covenants and design guidelines can include best practices for water efficient construction such as indoor/outdoor metering, water budgets, xeric standards, efficient irrigation standards, watering restrictions.
- **Water Sources.** Subdivision approval can be tied to water sources such as requiring use of nonpotable or recycled water sources.

[1] California, Arizona, and New Mexico provide more guidance on integrating water into land use.

[2] House Bill 1095, passed and signed in 2020. **leg.colorado.gov/bills/hb20-1095**

Integrating all water related goals into one plan or plan element ensures the complex interrelationships between water systems, human systems, and ecological processes are considered together. Comprehensive plans also offer an excellent educational opportunity in helping the community understand the:

- Projections for future population and drivers of growth
- The type of development occurring in the community and where
- 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, and
- The tradeoffs required to best achieve the community's goals.

A comprehensive plan can help a community identify opportunities to integrate water into traditionally land use focused comprehensive plans by including goals for:

- Water supply and demand management
- Wastewater treatment and disposal
- Watershed processes and health
- Floodplain and stormwater management, and
- Interagency coordination and collaboration.

2. SCENARIO PLANNING AND VISIONING

Some communities incorporate a robust visioning process into their comprehensive plans or water resource management plans. A visioning process identifies how a community can intervene to most positively influence the development of their community in response to change. Some of these visioning exercises take the form of clarifying community values and choosing from among a series of desirable futures. This normative approach to long range planning aims to create a clear vision for the future, most frequently through using visualization tools that illustrate alternative scenarios. These models can assist in decision making by assessing the impact of different development patterns on indicators such as water demand, air quality, and vehicle trips.

Exploratory approaches to considering the future uses a slightly different technique. The Exploratory Scenario Planning approach is most effective when used to consider and strategize responses to uncertainties. Rather than selecting a preferred scenario and developing a plan to achieve that particular future, this approach explores how a community may need to adapt and manage different outcomes for a variety of scenarios. The use of exploratory scenarios is being applied across the West in water departments wanting to think strategically about water, growth, and climate change.

3. WATER CONSERVATION PLANS

The Colorado Water Conservation Act of 1991 requires water utilities with a water demand of greater than 2,000-acre feet annually to develop a water conservation/efficieny plan (CO Rev Stat § 37-60-126). These plans require a summary of the water provider's water supply and demand budget and a plan for water conservation and efficiency. In 2015, the State of Colorado added a requirement to this statute to evaluate best practices in water demand management that can be implemented through land use. .

4. CAPITAL IMPROVEMENT PLANS

Planning departments, parks, public works, and water and wastewater utilities often rely on grants and bonds to invest in green and grey infrastructure improvements or new construction. Capital Improvement Plans (CIPs), which forecast and match projected revenues and capital needs over a multi-year period, provide the greatest opportunity to create a long-term investment strategy for the infrastructure improvements identified in a comprehensive plan or water resource management plan. A CIP ensures resources are allocated to community priorities.

STRATEGIES FOR PLANNING & POLICY MAKING

- Link water supply and demand to projected land use patterns, not just growth projections in both comprehensive plans as well as water plans.
- Use visioning processes and scenario planning to assess vulnerabilities and uncertainties affecting water resources as the future unfolds.
- Create an independent water element in the comprehensive plan or add a water conservation plan as a supplement.
- Use the CIP to ensure investments are made in water management physical infrastructure or projects including stormwater management, green infrastructure, growth area infrastructure, disaster mitigation, and watershed restoration.

CASE STUDY

WATER SMART COLLABORATION - FORT COLLINS, CO

The City of Fort Collins is expected to double in size over the next 20–30 years. The City manages its own utility with three additional water suppliers providing service within the Growth Management Area, resulting in inconsistent fees, policies, and conservation programs. One developer in a third-party's service area has already petitioned to be served by the City of Fort Collins, seeking lower costs for water.

A key challenge for Fort Collins, and the region, is aligning practices, scaling efficiency, and acting together to ensure an affordable, sustainable water supply to meet future demand.

The City of Fort Collins and the North Front Range Metropolitan Planning Organization (NFRMPO) both participated in the Growing Water Smart program in 2017 and submitted a joint application for Growing Water Smart technical assistance funding. They utilized a facilitator to lead two full-day workshops to identity the greatest opportunities for cooperation on water resource management across agencies and service areas. This process brought together, the City of Fort Collins' Planning Dept., Fort Collins Utilities , Fort Collins-Loveland Water District, East Larimer County Water District, and the NFRMPO. A representative from Greeley also observed the process.

The workshop started with understanding current conditions and trends. Each organization completed a self-assessment prior to the workshop with information including water supply and demand balance, drought contingency plans, service connection requirements, water costs, and water efficiency plan strategies. This information was used to identify alignment opportunities. The discussion focused on supply vulnerabilities, inconsistencies in methodology, organizational business models, and water demanded by new development.

At the time, the City was in the process of updating its comprehensive plan using scenario planning to assess different development pattern options. Water demand was one of the sustainability indicators assessed under the different scenarios.

The scenarios explored three different futures and their associated water reduction percentages based on the development patterns. For example, the "no change/as is" scenario would result in a reduction in household water use of 2% overall by 2040 while a denser development pattern would result in a 14% water demand reduction overall. Each water provider was asked to assess how each scenario would impact their organization, and a collective assessment followed. This exercise helped align growth areas with planned and existing infrastructure.

Another outcome was identifying opportunities for collaborating on post-occupancy water conservation programs, since each organization has a different level of capacity for working with its customers. The region is continuing its efforts to enhance collaboration by formalizing its process as a regional working group.

CASE STUDY

WATER SMART PLANNING - WESTMINSTER, CO

The City of Westminster has a long history of linking water and land use policy. In 2004, the citywide Comprehensive Land Use Plan was updated to improve the alignment between land development and water resources including:

- Revised tap fee structure to reflect water usage.
- Revised landscape requirements for low-water using materials and creation of an inspection position to ensure landscape plan compliance.
- Linking water and parcels of land through geographic information systems (GIS).
- Increased reporting to City Council on water supply and demand projections.

In 2013 Westminster adopted a new comprehensive plan which was amended in 2015. This plan intensified redevelopment and designated growth focus areas and included the Department of Public Works and Utilities in the development process to ensure infrastructure is sufficient for new development. A 2018 code update removed a disincentive that was not achieving desired development goals. The revised standards dictate that any land use change may not negatively impact infrastructure including: drainage, water and sewer infrastructure, and water supply.

A new set of interconnected plans, Westminster Forward, is currently underway with an expected completion in 2020. Westminster Forward includes a comprehensive plan, a sustainability plan, a water supply plan; parks, recreation, and library plan, a transportation & mobility plan, and a development code update. Combined, these elements will cover water quality, quantity, supply and demand, and climate change vulnerability.

Westminster is a Growing Water Smart community and received a technical assistance grant to do a code audit to identify and revise any conflicting policies that hamper the attainment of their water and land use goals.

SECTION 2:

ADEQUATE AND SUSTAINABLE WATER SUPPLY STANDARDS

Reviews the State of Colorado's requirement for new developments to have an adequate and sustainable water supply and how to develop municipal and county water supply standards.

CASE STATEMENT

Water adequacy rules link supply side management to demand side management. States across the West have adopted state statutes intended to protect communities from the threat of not having adequate water supplies for new development recognizing that:

- New development creates new water demand.
- Government has a role to play in ensuring sustainable and adequate water supplies for new and existing property owners.
- Growth pressure on water supplies requires stronger connection between land use approval and water planning at the state, regional, and local level.
- Collaboration between local governments and water providers is essential to ensuring water reliability.

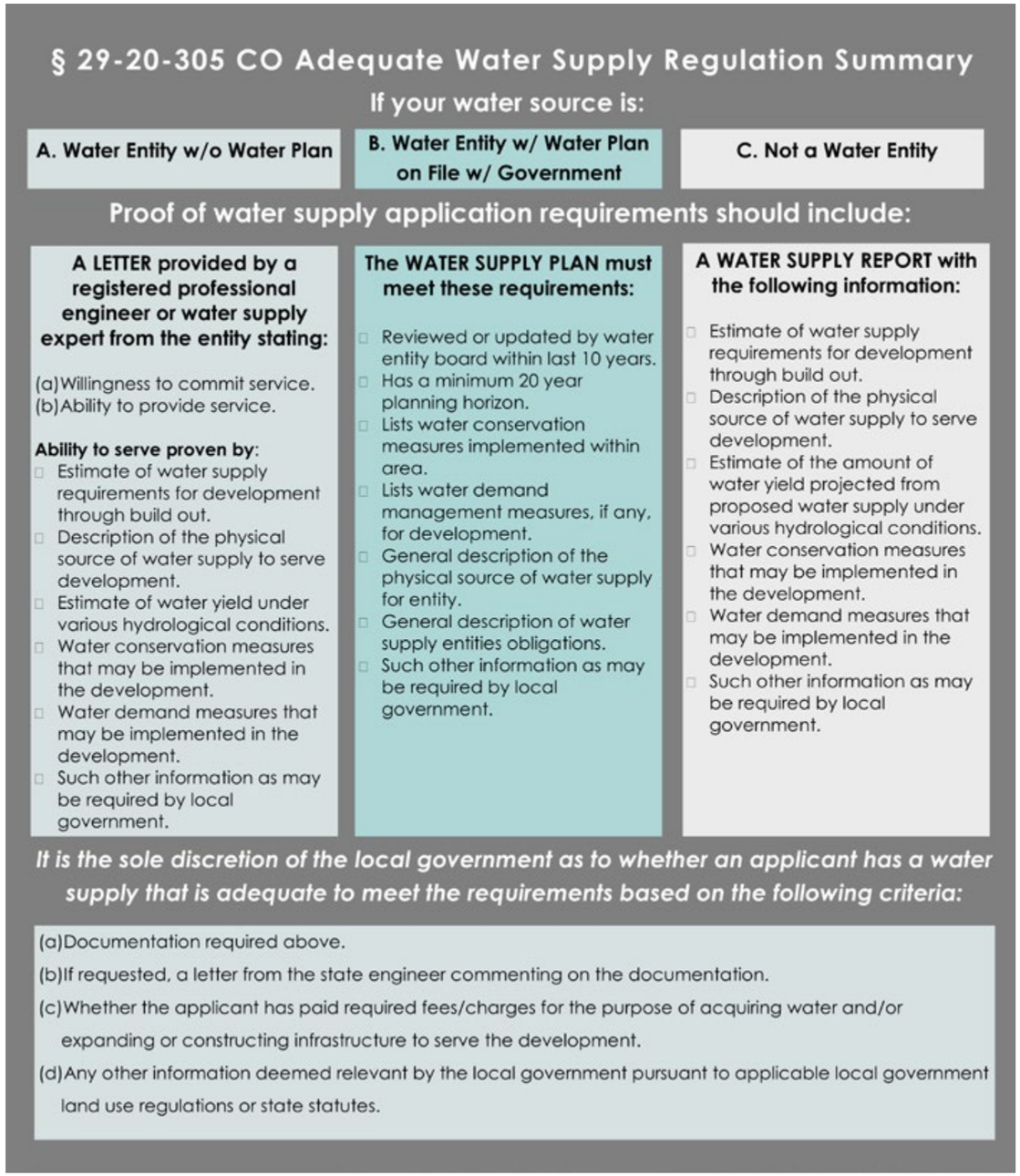
TOOLBOX: WATER ADEQUACY

The State of Colorado water adequacy statute **(CO Rev Stat § 29-20-3)** was revised in 2017 and requires that all local governments must determine that a proposed development will have an adequate and sustainable water supply for build out of a development proposal. The State defines adequate and sustainable as: "sufficient for build-out of the proposed development in terms of quality, quantity, dependability, and availability to provide a supply of water for the type of development proposed, and may include reasonable conservation measures and water demand management measures to account for hydrologic variability."

The statute also provides guidance on what information should be used in the determination process. The rules exempt the statutory cluster subdivisions pursuant to **Part 4 of Article 28 of Title 30**, of the Colorado Revised Statutes.

While the statute requires local government to prove water supply, there is wide variation across the state in how this requirement is integrated into the development code. Best practices linking water supply to new development all contain similar elements. The following components should be included in an adequate water supply requirement:

1. **Definition of both Adequate and Sustainable Supply:** The update to the Colorado statute now includes a clearer definition of an adequate and sustainable water supply as quality, quantity, dependability, and availability. Communities are updating their regulations to both include these definitions as well as any relevant additional description of these indicators.
2. **Articulation of Water Source(s):** Definition of and clearly identified allowable water sources whether from a water provider, individual wells, shared wells, or cisterns.
3. **Water Rights Inventory:** Legal demonstration of future water source(s) by either the acquisition or dedication of surface water rights or approval for future wells. Most communities require the water demand projections at pre-development and the securing of the actual water rights at final plat.
4. **Demonstrations of Water Availability:** For each source(s) as defined by requirements for water quantity (e.g. pump rates or water supply plan), the expected availability of the water supply (e.g. availability under drought and normal conditions), the water supply plan timeframe (e.g. minimum of 20 years), etc.
5. **Development Water Demand Projections:** A projection of the amount of water (water budget) that a proposed development will likely require at full buildout for proposed development. Many communities are now including a specific methodology for determining this projection based on issues in the past with developments underestimating water demand.
6. **Water Efficiency, Conservation or Demand Management Practices**: While not widely used across Colorado, the state statute gives authority to the local government to include pre-development requirements or incentives for developments to reduce projected water demand through efficiency and conservation practices.



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7. **Uniform or Specific Area Application:** Effective development regulations apply to all new development or define specific zones where water resources are particularly scarce or there are variations that trigger specific requirements (e.g. recharge zones, different water provider service areas, specific hydrological zones, etc.)
8. **Maps:** Maps of geographic locations or zones where different adequacy requirements or review processes apply.
9. **Defined Review Processes**: Specificity on what is required for the review and when in the process as well as who conducts the reviews. For individual wells, review by the Colorado Division of Water Resources (DWR) should occur to verify the permit as well as comment on water supply adequacy prior to final plat.
10. **Engineering Standards for Water Distribution System**: Except for individual wells, the engineering requirements for a water system connection or distribution system clearly articulated in development regulations or reference to specific guidelines.
11. **Requirement, where necessary, for augmentation:** Augmentation requirements differ across the State, but generally is either a requirement for an augmentation plan or purchase of a certificate from an approved supplier.

The State of Colorado Department of Public Health & Environment as well as Division of Water Resources each play an important role in the water supply review process. Development code regulations generally mention them as a review agency or that design must be in compliance with the department's regulations.

DEPARTMENT OF PUBLIC HEALTH & ENVIRONMENT	DIVISION OF WATER RESOURCES
Responsible for:	
Permitting of water provider potable water systems.	Design standards for construction of wells by contractors.
Facility design standards for construction of water supply treatment and distribution system through the Engineering Section.	Permitting of wells for public, community, and individual residential and commercial wells.
Water quality compliance of public and community water systems at the Division of Water Quality.	Review and approval of augmentation plans.
At this time, individual wells are not required to be tested by the State. They do encourage property owners to conduct testing. Some counties have begun to require a water quality test for new wells as part of the submittal requirement.	

Municipal and county regulatory standards will emphasize different information. Municipalities most frequently provide water from a municipal utility while counties rely on a water district(s) and/or individual wells. For a municipality, its water adequacy standards may be quite simple including only the need for a letter to serve, connection standards, potentially a water rights transfer standard in order to meet new demand, and a prohibition against individual wells within the service boundary.

County water supply standards are substantially more complicated and should be tailored to the specific hydrology of the area. They may:

- set requirements or standards for different water sources;
- at a minimum, require the standards for application review as outlined in the state statute;
- reference maps and requirements for different hydrological zones; and
- clarify design standards for private, community, and public water supply and/or distribution systems.

For both municipalities and counties, when the service provider is not a government utility or there are numerous water providers, it can complicate having a clear picture of the region's water supply and demand budget. Enhanced cooperation between water providers and the local government becomes critical to ensure the water supply standards are applied consistently.

CASE STUDY

WATER SMART SUPPLY - SANTA FE COUNTY, NM

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 locations with adequate services and infrastructure while trying to limit 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 groundwater depletions. Within these zones, a 100-year water supply was required with demand calculated based on an estimate of 1-acre foot per lot, the 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 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.
- And 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, then a more stringent set of requirements must be met. For a minor subdivision over 5 lots that is zoned to permit an individual or shared well, the County requires a valid Office of the State Engineer's 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 (WSAR) summarizes how a development meets the requirements for an adequate water supply. The WSAR includes an analysis of: 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 hook-ups and the estimated potable water demand per hook-up; and the number of hook-ups 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 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 grey water
- 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 11am and 7pm
- 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 sub-metering of landscape water use
- WaterSense certified or equivalent plumbing toilets, urinals, lavatory faucets, and showerheads
- EnergyStar certified or equivalent dishwaters, washing machines
- Water and energy efficiency 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:

WATER SMART LAND USE POLICY

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

CASE STATEMENT

Water demand is a function of household size, income, residence, and lifestyle habits. But water demand is also a function of how we plan, design, and maintain our communities. Research indicates that when it comes to saving water, where and how we build really matters. Efficiencies can be found in density of development patterns, building, site and systems design, and especially landscaping. We know that:

- Certain building types and development patterns consume or conserve more water than others.
- Certain land use types consume more water than others.
- Certain types of landscaping plants and trees either consume or conserve more water than others.
- Newer appliances and plumbing fixtures are more water efficient than old ones.
- Households that conserve water save money for themselves and the water provider and water for other people and nature.

To use less water, the best approach is to make water smart development the easiest and most incentivized type of development to build. Three key tools are available for communities to do so:

1. Promote higher density and compact development, especially where existing infrastructure already exists.
2. Promote high performing, water efficient plumbing and building standards.
3. Promote water saving and climate appropriate landscaping standards and maintenance practices.

TOOLBOX: COMPACT DEVELOPMENT

While the majority of water conservation and efficiency efforts related to land use have primarily focused on outdoor watering and indoor plumbing fixtures, there are considerable benefits to encouraging more compact development patterns. Water usage studies have consistently demonstrated that in urban areas, the largest consumption of water is by large lot single family homes where 50% or more of the water consumed is used for outdoor use during spring and summer. In addition to gains from landscaping efficiency and conservation, the density of a development can lead to less water consumption due to reduced landscape irrigation water demand per dwelling unit. Research from **Colorado** and **Arizona** has demonstrated that developments between 3-8 units per acre have the greatest gains for water conservation.

Promoting water efficient land use patterns provides many additional benefits than simply saving water. It can also support the more efficient use of existing infrastructure, protect natural resources, promote walkability, control flooding, and enhance community vibrancy.

STRATEGIES FOR PROMOTING COMPACT DEVELOPMENT

- Prioritize infrastructure investments that support existing communities, especially underserved communities, before new development. At pre-development review, make rezoning, annexations, and Planned Unit Development (PUD) applications conditional on meeting water conservation standards.
- Develop future land use plans that establish designated future growth areas, both infill and greenfields, 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, lot setbacks. As for height limitations, evidence shows water demand begins to climb at the point a cooling tower is needed for the building. Craft your code for your climate and context.
- 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.
- Change zoning code to permit compact mixed-use development by right in designated growth areas.
- Change zoning code to permit multiple types of residential development (multiplex, townhomes, apartments, ADUS) by right in designated growth areas to diversify single family homes.

CASE STUDY

WATER DEMAND OFFSET PROGRAM - CITY OF SANTA FE, NEW MEXICO

The City of Santa Fe, New Mexico began a Water Conservation Program in 1997 that has contributed to a per capita water use reduction of more than 50% since 1995 bringing demand down to 56 gallons per capita per day (GPCD).

A 2002 drought caused the City's demand to exceed supply. The City took aggressive action initiating a rate structure increase, a rebate program, and a water demand offset program. Their water demand offset program gained national recognition demonstrating its effectiveness as a way to meet future demand. The program set requirements for all new development to offset water demand either through conservation in existing development or transfer of water rights to the City. The requirements are:

- For residential development requiring under 10 acre feet/yr and commercial development requiring under 5 acre feet/yr, the water demand offset could be met through conservation;
- For new development requiring greater than this demand, water rights would be required to offset new demand.

To help developers offset demand, the City developed a toilet retrofits program. The program connected willing homeowners who desired a retrofit to developers who could either buy credits from a qualified broker or do it themselves.

This program was so successful that the City nearly maximized its conservation potential. In response, the City updated its water demand offset program. The program includes the creation of a water bank to hold conservation credits for future development and a Water Conservation Credit Program. This program includes:

- The addition of rebates for more types of water use efficient appliances or retrofits of older ones and for outdoor watering equipment;
- A water budget program where a water user enters into an agreement to use less water and the City monitors the usage and pays the customer for the reduction in use; and
- A "free stuff" program including low-flow faucet and shower heads.

The water demand offset program applies to commercial projects that require 5 acre-feet per year (AFY) or more, residential projects that require 10 AFY or more, and mixed use projects that require 7.5 AFY or more.

TOOLBOX: WATER EFFICIENT LANDSCAPING

According to **Colorado State University**, "as a percentage of total water use in the urban Front Range, outdoor water use accounts for about 40 percent of all urban water use." 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 into their development code for water conservation and efficiency. These include requirements for:

- The types of plants that are best suited for the climate and irrigated by hyrdozones;
- 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 like drip, bubblers, or low flow sprinklers;
- Rain sensors with a shut off 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; and
- Model Maintenance Standards and Agreements for HOA's 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 make all new developments and retrofits meet water efficiency standards.

STRATEGIES FOR PROMOTING WATER-SAVING LANDSCAPES

POLICY AND REGULATORY STRATEGIES

- Conduct an assessment of saving potential 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 local climate.

CASE STUDY

WATER FEES AND WATER WISE LANDSCAPING - CASTLE ROCK, COLORADO

The Town of Castle Rock, Colorado is a fast-growing region with the current population of 60,000 people anticipated to grow to 140,000 by 2050. The town relies heavily on groundwater and aquifer levels have been steadily declining. It was clear a sustainable solution was required to support the water needs of a growing population.

In response, Castle Rock developed a voluntary incentive-based fee program in 2015 to encourage new developments to be water efficient. They implemented system development fees that pay for the infrastructure of the water system in both residential or commercial developments, and for actual water obtained and developed by the utility for future water supply. The fee structure is intended to reward lower gallon per minute (GPM) water use with a reduced fee.

For developments with a water-efficiency plan that meets a set of minimum standards the Town offers prorated water resources fees. The standards include indoor and outdoor water efficiency, resident education, third-party verification, and monitoring and enforcement. Specifically, the requirements are that:

1. The developer is responsible for seeing the landscape plan through to completion. All front and rear yards must be designed and installed by the builder.
2. Turf areas cannot exceed 19% to 32% of the lot size, depending on actual square footage of the lot. Kentucky bluegrass is prohibited. Allowable turf species must be approved by the town and must be able to survive on 19 inches of supplemental irrigation per year.
3. 100 percent xeric landscapes are allowed but must provide a minimum coverage of 75% by plant materials at 5-year maturity in front yards and side yards when adjacent to streets. Rear yards must have a minimum of 40% plant coverage at 5-year maturity. The remainder of yard coverage can be composed of mulches, aggregate surfacing, artificial turfs, and hardscapes.
4. Residential irrigation design must follow the Town of Castle Rock's Landscape and Irrigation Performance Standards and Criteria Manual. Automatic irrigation controllers that are weather based or soil-moisture based are required.
5. The Town is taking active steps to reduce their dependence on groundwater, diversify their water portfolio, and encourage innovative water conservation measures in new developments. You can learn about how Castle Rock is managing water on the Town's **website**.

- Promote and/or incentivize the use of individual household rainwater harvesting for outdoor irrigation.
- Develop an incentive for the removal of water-intensive landscaping by offering landscaping conversion rebates or direct install programs.
- Provide incentives for developers to use water efficient or xeric landscapes through reduction of tap fees.
- Change your subdivision code to include residential, commercial, and public landscaping standards (see toolbox above.)
- Maximize the use of graywater and recycled water for appropriate applications including outdoor irrigation, toilet flushing, and commercial and industrial processes.

NON-REGULATORY STRATEGIES

- Education campaigns targeted to property owner behavior change.
- Rebate programs for water efficient plumbing fixtures such as low-flow toilets, showerheads, and front-loading washing machines.
- Rebate programs for turf removal and replacement with low-water use landscaping;
- Education about xeriscaping and water efficient irrigation systems.
- Water audits that educate property managers and evaluate water efficiency of systems.
- Low impact development (LID) practices, including green infrastructure projects that capture stormwater through rain gardens and biofiltration.

TOOLBOX: WATER SMART PLUMBING FIXTURES AND BUILDING EFFICIENCY

Reducing indoor water use in residences and businesses can be accomplished through water-efficiency standards for indoor plumbing fixtures. As a result of a new state rule adopted in 2016, all new construction will now meet many of the WaterSense requirements. As a result, most water savings typically gained by water efficient fixtures and appliances in the future will likely come from retrofits.

STRATEGIES FOR PLUMBING FIXTURES AND BUILDING EFFICIENCY STANDARDS

- Use the green plumbing code as a guide or adopt the green plumbing code requiring high-efficiency faucets, showerheads and toilets in the plumbing code.
- 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 older, less efficient toilet and faucet technologies with waterwise units through rebates or free fixtures.
- 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.

SECTION 4:

HEALTHY & RESILIENT WATERSHEDS

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.

CASE STATEMENT

In addition to managing water use it is important to safeguard a community's water supply. The quality and quantity of a community's water is inextricably linked to the health of the watershed. Human and naturally occurring factors can degrade ground and surface water quality and quantity including:

- Pollution from urban and agricultural runoff and natural disasters;
- Sedimentation due to soil disturbances, vegetation loss, and erosion from roads and new development;
- Destruction of riparian areas due to development and changes in climate;
- Increased stormwater due to increase in impervious surfaces from development;
- Decrease or lack of water infiltration resulting from impervious surfaces and more rapid runoff; and
- Inconsistency in water supply caused by periodic droughts.

TOOLBOX: WATERSHED PROTECTION

Landscape scale changes that result from both human and natural forces have a significant impact on natural ecosystems and water resource availability and quality. Natural resources that are valued assets for flood protection, water quality improvement, groundwater recharge, habitat, recreation, and overall long-term water resource sustainability should be preserved and restored. One approach that western communities can take to safeguard water resources is considering and incorporating watershed protection into land use standards for new development and redevelopment.

Watershed protection goals are generally included in a wide variety of community plans such as comprehensive plans, hazard mitigation 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.

STRATEGIES 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.
- Limit development in sensitive areas by clustering homes within a smaller geographic zone, incentivizing infill development in less sensitive areas, and providing low impact design standards/guidelines.
- Create zoning districts with lower densities and/or cluster development to protect surface and groundwater sensitive areas.
- Adopt development standards for stream buffers and setbacks to protect water quality.
- 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 run-off and protect water quality from land disturbance.
- Adopt surface and/or groundwater districts with standards to minimize contamination of streams and shallow aquifers that will protect existing and potential sources of drinking water supplies.
- Participate in collaborative efforts to restore watershed functions through watershed restoration projects.

Communities should identify the top multi-benefit and integrated strategies and projects, then implement these projects over less integrated proposals (unless crucial urgency demands otherwise). Plans, programs, projects, and policies should be monitored and evaluated to determine if the expected results are achieved, and to improve future practices.

CASE STUDY

HEALTHY RIVER SYSTEMS - PITKIN COUNTY ROARING FORK RIVER MANAGEMENT PLAN

In 2016, the City of Aspen and Pitkin County began a joint project to create a River Management Plan for the upper Roaring Fork River. The plan goal was to enhance the health of the Roaring Fork river and its tributaries.

The plan process compiled years of studies and data using computer models that let water managers simulate how different factors might affect stream flows. These studies showed that since the early 2000s, the ecological health of the Roaring Fork River has been declining as a result of water flow modifications, pollution, and development negatively impacting the river's ecological health. The upper Roaring Fork near Aspen was identified as most at risk due to water diversions. During the summers, the upper Roaring Fork often does not meet the minimum flow set by the State of Colorado of 32 cubic feet per second.

The plan was released in the summer of 2018. While the plan outlines management actions for the region to move forward, the most significant outcome was a continued commitment by stakeholders to collaborate on achieving long term goals for enhancing the health of the Roaring Fork.

TOOLBOX: GREEN INFRASTRUCTURE AND LOW IMPACT DEVELOPMENT

Green Infrastructure is an approach to natural resource management that emphasizes nature-based solutions. Within Green Infrastructure, a subset of practices and methods known as Low Impact Development (LID), includes approaches that can reduce pollutant loadings by managing runoff as close to its source(s) as possible. These include retaining and restoring natural hydrologic patterns by using landscape and site design to keep as much rainwater as possible from leaving the site or directing it to say, a district park, instead of designing a site to funnel stormwater off site as fast as possible. LID uses natural vegetation, detention basins, and porous materials to “slow the flow” and encourage the infiltration and harvesting of stormwater.

Some of the many benefits of green infrastructure include:

- Reducing peak flooding and treating stormwater on-site reduces pollutant loads and risk of sewer overflow.
- Reducing the need for outdoor irrigation and landscaping; native plants can revegetate channels and basins, relying solely on naturally occurring rainfall.
- Planting trees and other plant materials mitigates heat by providing shade, sequestering carbon, and absorbing radiation from the sun. Trees and plants also absorb pollutants, thus improving soil and stream health, as well as air quality.
- Allowing stormwater to infiltrate into vegetation and soils improves groundwater recharge.
- Providing access to green spaces fosters active, healthy lifestyles.

COMMON LOW IMPACT DEVELOPMENT AND GREEN INFRASTRUCTURE TECHNIQUES

APPLICATION	DESCRIPTION
Bioretention basins, stormwater harvesting basins and rain gardens	Small to large scale planting areas within the hardscape containing shrubs, trees and grasses.
Bioswales	Shallow and uncovered channels that induce meandering, and are placed inline within a drainage channel.
Curb extensions and chicanes	Traffic calming measures which widen the sidewalk and/or narrow the street for a short distance.
Curb openings	Drainage inlets that divert stormwater into bioretention basins.
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 .

STRATEGIES FOR GREEN INFRASTRUCTURE

- Work with transportation and civil engineering professionals to update development standards and map streets, bike paths, and other areas of the community that have the highest flood potential.
- When possible, use the minimum street width possible, and direct runoff from pavement and buildings to vegetation-lined channels.
- Use green infrastructure methods for traffic calming, beautification, and place making.
- Consider placing green infrastructure along areas with high speed vehicles or with bicycle and pedestrian traffic.
- Incorporate water holding areas into the landscape, such as creek beds, recessed athletic fields, ponds, cisterns, and other features.
- Design all aspects of landscaping—from the selection of plants to soil preparation and installation of irrigation systems—so as to reduce water demand, retain runoff, decrease flooding, and recharge groundwater.
- Preserve regional open space by clustering development, maximizing unpaved areas for stormwater retention.
- Use permeable surfaces for hardscapes whenever possible.
- 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.
- Limit development in sensitive areas by clustering homes within a smaller geographic zone, incentivizing infill development in less sensitive areas, and providing low impact design standards or guidelines.
- Create zoning districts with lower densities and/or cluster development to protect surface and groundwater sensitive areas.
- Adopt development standards for stream buffers and setbacks to protect water quality.

SECTION 5:

WATER CONSERVATION RATE STRUCTURING

Utility pricing, or rate structuring, can incentivize consumers to use less water and maximize conservation benefits.

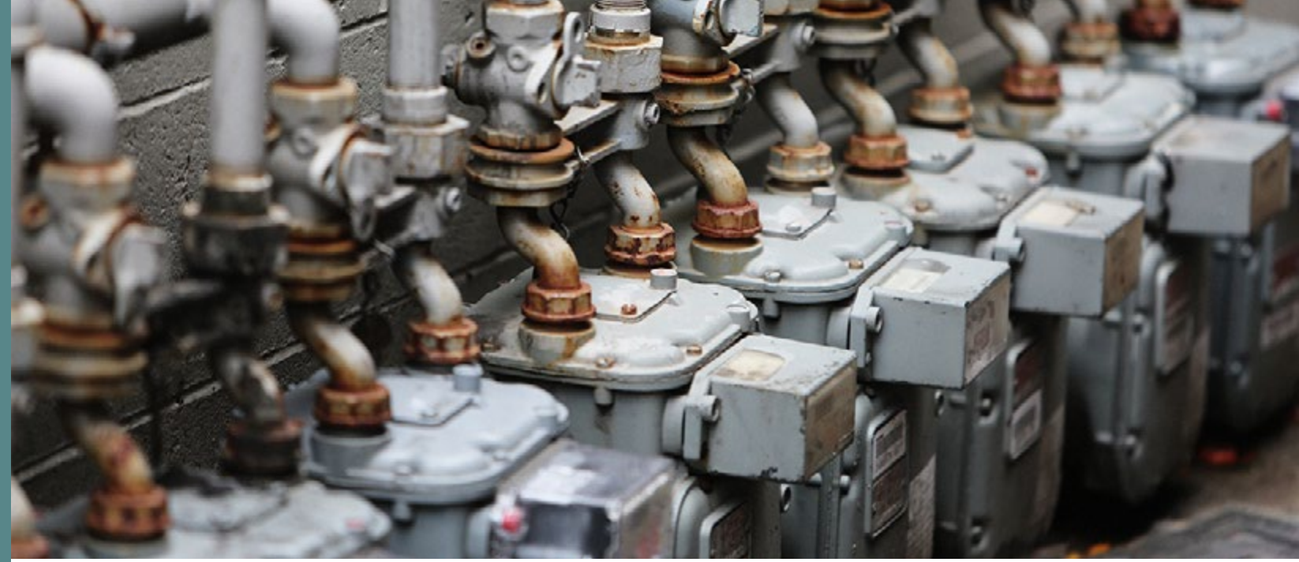
CASE STATEMENT

Water demand for a property can vary greatly due to size and type of property, season, weather, demographics (e.g., income and education level), and conservation habits. For individual households and businesses sensitive to the price of water, rate structuring is one of the more effective ways to modify human behavior.

Even though rate setting must be carefully performed for each agency, the core principle of incentivizing water conservation by charging higher prices as a customer uses more water can still be applied. Many water providers use declining block or uniform water rate structures that do not encourage conservation. Well-executed rate structuring can result in significant water use reductions and can expedite desired shifts in water use behavior, while also ensuring the water agency remains solvent. Common goals for adopting water conservation rate structures include:

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

While rate structuring can be extremely beneficial, it must be done with equity at the forefront. Lower income communities are more sensitive to rate fluctuations. When well-executed, rate structuring can produce significant water savings and expedite shifts in water use behavior.



TOOLBOX: CONSERVATION RATE STRUCTURING

Water utilities set rates to collect the revenue they need to operate the water utility, invest in its infrastructure, and protect public health. With a revenue goal identified, utilities can develop a rate structure to meet additional objectives including water conservation and acquisition of supplies, but prioritizing conservation can ensure costs are mitigated by right-sizing any acquisition or storage to meet a mitigated demand.

Water rates are determined by two factors. First, the fixed costs of water determined by the costs of acquisitions of water and the costs to establish and maintain the infrastructure to convey the water. Second, a variable cost based on the amount of water consumed by a consumer. 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, or sub-metering, rates for indoor use are lower rates than outdoor use.
- **Penalties:** Customers are charged for exceeding allowable limits of water.
- **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.

STRATEGIES FOR 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.

CASE STUDY

CONSERVATION RATE STRUCTURING - DENVER, COLORADO

Effective 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. In April 2016, Denver Water implemented a new rate structure. The previous rates covered service costs, but was no longer generating adequate revenue for operations and maintenance due to an average reduction in consumption of 20 percent over 10 years.

The 2016 rate structure includes three tiers based on water use. Indoor water use—for bathing, cooking and flushing toilets—is considered essential for human life and is charged at the lowest rate. Efficient outdoor water use is charged in the second tier (middle rate), followed by inefficient outdoor water use in the third tier (highest rate). In addition to variable charges based on water use, the rate structure includes a monthly fixed charge based on the size of an individual's water meter and additional fees for customers in suburban areas.

The public's reaction to the rate structure was not positive. Customers found themselves shocked by summer water bills 25 to 35 percent higher than previous years. Denver Water was criticized for not being transparent over the increase despite having included notices in bills three months prior to the changes. The sheer number of phone calls from baffled residents to Denver Water customer service indicated that the communication strategy needed to be approached differently. In 2018, Denver Water elected to increase the fixed monthly charge and decrease the monthly rate per 1,000 gallons of water used.

The revenue generated by the new rate structure is being used to make updates to the city's aging water infrastructure. Denver Water has a five-year plan to put $1.25 billion into 143 capital improvements. Some of these capital improvement projects include new storage tanks at Hillcrest Facility that serves growing demands in southeast Denver, building a new water treatment plant and pipelines for northern Denver, and replacing 60,000 feet of old water main pipes per year.

CONCLUSION

The toolboxes outlined in this workbook highlight some of the most effective strategies communities can employ to manage local water demand. Ultimately, by linking land use (and landscaping) to water demand, we can wisely manage our limited resources in a way that sustains thriving economies, healthy environments, and vibrant communities in Colorado for future generations.

Tracking the results of water and land use integration are an important component to determining whether community goals are being met. **Growing Water Smart Metrics: Tracking the Integration of Water and Land Use Planning** offers a set of baseline data that can be assessed for year-over-year trends to empower adaptation. Ten "progress" metrics track things such as the development of long-range plans, implementation of water conservation and efficiency programs, adoption of landscaping and building codes, implementation of adequate water supply rules, and regionalization efforts. Fourteen metrics are then recommended to measure the "impact" of your community's strategies by assessing trends in land use, development patterns, and water demand.

Appendix B describes the growing number of resources that can aid communities and water providers in the goal of better integrating water and land use.

APPENDIX A: Summary of Relevant Legislation

COLORADO WATER ADEQUACY

Signed into law in May 2008 and revised in 2017, the Colorado Water Adequacy Rule gives local government agencies the authority to approve new development based on a determination of sufficient water supply to ensure the pace of development does not exceed water supplies.

Initially the adequacy determination was required at final plat, but has since been changed to permit the local government to determine when a determination ought to be submitted. Verification of water adequacy is determined by the Colorado water engineer, a registered professional engineer, or a water supply expert. The approval agency is determined based on the source of future water. The determination is guided by the submission of a report including:

- An estimate of the amount of water supply needed for buildout.
- A description of the source of the water supply.
- An estimate of the yield from the source under various hydrological conditions.
- Water demand management measures to be used.
- Any additional information the local government may require.

The rule is not applicable under the Colorado Cluster Development Statute which exempts the development of houses in rural areas from county subdivision regulations encouraging clustering of housing.

law.justia.com/codes/colorado/2017/title-29/land-use-control-and-conservation/article-20/part-3

WATER ELEMENTS IN MASTER PLANS

In 2020, the State of Colorado adopted HB 20-1095 making a change to the state statutes guiding master plan development. In the past, the regulations for master plans simply directed local government to examine water supply for all providers in their jurisdiction to ensure water supplies are able to accommodate new growth. The amendment directs local governments to also consider water conservation strategies as part of the overall water supply planning process as well as authorizes the Department of Local Affairs to offer water conservation support to local governments.

leg.colorado.gov/sites/default/files/2020a_1095_signed.pdf

INDOOR WATERSENSE FIXTURE REQUIREMENT

Initiated in September 2016, SB 14-103 requires all manufacturers who sell new plumbing fixtures to distributors, wholesalers, retailers, developers, and homebuilders in Colorado to sell only those labeled WaterSense. The EPA's WaterSense program is similar to the Energy Star label but is designed to reduce water usage through low-efficiency plumbing fixtures including:

- Lavatory faucets
- Shower heads
- Flushing urinals
- Tank-type toilets

Excluded from this policy are value type and composting toilets, residential kitchen faucets, public lavatory faucets, metered fixtures, and non-flushing urinals.

openstates.org/co/bills/2014A/SB14-103

WATER HARVESTING RULES

As of August 2016, HB 16-1005 permitted rain barrels to be installed at single-family households and multi-family households with four (4) or fewer units. A maximum of two (2) rain barrels can be used at each household and the combined storage of the 2 rain barrels cannot exceed 110 gallons. Rain barrels can only be used to capture rainwater from rooftop downspouts and the captured rainwater must be used on the same property from which the rainwater was captured, for outdoor purposes only, including to water outdoor lawns, plants and/or gardens. Rain barrel water cannot be used for drinking or other indoor water uses.

Under special circumstances explained in SB 09-080, rural residents that qualify for "exempt" wells may collect rainwater with a Rooftop Precipitation Collection System Permit from the Colorado Division of Water Resources. Though these collection system permits do not limit the size of the rain barrel, the water must be collected from the roof of the primary residence and the rainwater may only be used for the uses allowed under the resident's exempt well permit.

A unique provision of HB 09-1129 is that it allows developers to participate in pilot projects that harvest rainwater and put it to beneficial, though non-essential, use in the subdivision. These projects may only operate according to an engineered plan, submitted to the state engineer for approval and eventually, to the water court. Individual landowners are not eligible for these pilot projects.

extension.colostate.edu/topic-areas/natural-resources/rainwater-collection-colorado-6-707

CITIZEN'S GUIDE TO COLORADO WATER LAW

For more information on these and other water-related laws, please see the Colorado Foundation for Water Education's Citizen's Guide to Colorado Water Law.

issuu.com/cfwe/docs/weco_cgwlaw_5thed_final

APPENDIX B: Growing Water Smart Resources

GENERAL: THE IMPORTANCE OF INTEGRATING WATER AND LAND USE

- A comprehensive review of the land use and water nexus is available in the **Colorado's Water Plan - Land Use and Water:** Story Map of Land use Planning and Water Management in Colorado. cwcb.maps.arcgis.com/apps/MapSeries/index.html?appid=8c8f4b394db6407e873d5f8ee43cb0e2
- Western Resource Advocates' **New House New Paradigm** provides a good explanation of the benefits integrating water and land use (2009). westernresourceadvocates.org/publications/new-house-new-paradigm
- Andrew Spurgin, Principal Planner for the City of Westminster, puts forth a succinct rationale for the Western Planner entitled **Integrating Water and Land Use Planning in Colorado** (2020). westernplanner.org/2020articles/2020/5/7/integrating-water-and-land-use-planning-in-colorado

INTEGRATED WATER RESOURCE MANAGEMENT

- The **One Water initiative** of the US Water Alliance is working to integrate water resource management in a holistic and coordinated manner. The webpage serves as a hub for the One Water Council, leadership insights, webinars, and more. uswateralliance.org/one-water
- **Integrated Water Resource Management** (IWRM) is about the management of water in all its forms – drinking water, stormwater, wastewater and source water. American Rivers has a compilation of resources on this topic: americanrivers.org/conservation-resources/integrated-water-management
- The American Planning Association has a **KnowledgeBase Collection** of resources on Integrated Water Resource Management. planning.org/knowledgebase/watermanagement
- **Planners and Water PAS 588** is an American Planning Association report that focuses on the One Water rationale for managing water supply, wastewater, and stormwater as one resource (2017). planning.org/publications/report/9131532

SECTION 1: PLANNING & POLICY MAKING

COMPREHENSIVE PLANNING

- A manual from the Babbitt Center for Land and Water Policy describes how to include water in Colorado's local planning documents. **Incorporating Water into Comprehensive Planning: A Manual for Land Use Planners in the Colorado River Basin** (2019). lincolninst.edu/publications/other/incorporating-water-comprehensive-planning
- The American Planning Association has several guides for comprehensive planning:
  - **Sustaining Places: Best Practices for Comprehensive Plans** (2015). planning.org/publications/report/9026901
  - **Policy Guide on Water** (2016). planning.org/policy/guides/adopted/water
- Colorado APA, CWCB, and DOLA have jointly developed a series of **deep dive webinars,** Breaking Down Silos, that cover case studies for integrating water and land use. They can be found here: colorado.gov/pacific/cowaterplan/integrating-water-land-use-planning

WATER CONSERVATION/EFFICIENCY PLANNING

- The CWCB provides a resource for water providers to develop a **water efficiency plan**. cwcb.colorado.gov/municipal-water-efficiency-plan-guidance-document
- In 2019, CWCB expanded its Water Efficiency Plan Guidance to include: **Best Management Practices for Implementing Water Conservation and Demand Management Through Land Use Planning Efforts** (Getches-Wilkinson Center for Natural Resources, Energy, and the Environment at the University of Colorado Law School and Babbitt Center for Land and Water Policy) lincolninst.edu/incorporating-land-use-planning-water-efficiency-plans

EXPLORATORY SCENARIO PLANNING AND VISIONING

- The Lincoln Institute of Land Policy and Sonoran Institute have been working to help integrate exploratory scenarios into land and water planning. Resources include:
  - **Videos and facilitator training videos** on exploratory scenario planning can be found on resilientwest.org. resilientwest.org/exploratory-scenario-planning-2
  - Joe Marlow, et al., **Integrating Exploratory Scenario Planning into a Municipal General Plan Update** (2015). lincolninst.edu/sites/default/files/pubfiles/marlow-wp15jm1.pdf
  - Wihbey, **John. Embracing Uncertainty: Exploratory Scenario Planning (XSP) in Southwest Colorado** (2016) lincolninst.edu/publications/articles/embracing-uncertainty
  - Stapleton, Jeremy. **How to Use Exploratory Scenario Planning (XSP).** (2020) incolninst.edu/publications/policy-focus-reports/how-use-exploratory-scenario-planning-xsp

SECTION 2: ADEQUATE & SUSTAINABLE WATER SUPPLY

DEMONSTRATING AN ADEQUATE WATER SUPPLY

- For a comprehensive review of Western States' water adequacy requirements and recommendations read **Integrated Land and Water Planning in Colorado** (2016) waterpolicy.info/wp-content/uploads/2016/09/Integrated-Land-and-Water-Planning-in-Colorado.pdf
- Douglas County, CO created a **water supply overlay district** to protect the different water sources within the county, especially groundwater. The water supply policy for new development requires a 100-year supply of water, a static analysis to evaluate the volume of water that is appropriable for the proposed development, a dynamic analysis to evaluate the sustainability over 100 years of the water supply considering the location in the water basin, and determination of adequacy depending upon water provider.
  - Explanation of the Water Supply Standard: douglas.co.us/documents/water-supply-standards-packet.pdf
  - Water Supply Overlay Ordinance: douglas.co.us/wp-content/uploads/2014/11/6707e834595d1ca2706dac85dfd6500f.pdf

PROJECTING WATER DEMAND FOR LAND USE

- The Pacific Institute released **A Community Guide to Calculating Future Water Demand** (2016). It outlines some of the methodological concerns with water demand forecasting and provides a checklist for reviewing water demand projections (pages 3-6) for accuracy. It includes a summary of the methodologies used in water demand forecasts (pages 9-11) followed by the best practices that should be integrated into water demand forecasting. pacinst.org/publication/community-guide-evaluating-urban-water-demand-forecasts
- A Sacramento Valley, California workbook describes the methodologies available for **projecting water demand by dwelling unit or per acre** (2007). norcalwater.org/res/docs/NCWA-guidebook-final.pdf
- The **Water Efficiency Rating System** (WERS) is a tool developed and used by the City of Santa Fe and Green Builders Coalition but is now available for universal use. WERS is a third-party verified tool that is used by developers to predict water use for new and existing properties. It allows for developers to identify water efficiency goals and determine what design modifications will allow them to reach that water demand goal. wers.us

TAP FEES

- Western Resource Advocates **A Guide to Designing Conservation Oriented Water System Development Charges** (2018). westernresourceadvocates.org/wp-content/uploads/2018/07/WRA_Guide-to-Conservation-Oriented-SDCs_web.pdf

SECTION 3: WATER-SMART LAND USE POLICY

- Western Resource Advocates partnered with Pace University's Land Use Law Center to develop a comprehensive guidebook for local planners that describes the many opportunities for developing water-smart land use policy, **Integrating Water Efficiency Into Land Use Planning in the Interior West** (2018). westernresourceadvocates.org/publications/integrating-water-efficiency-into-land-use-planning
- Colorado Water Wise Technical Guide. **Guidebook of Best Practices for Municipal Water Conservation in Colorado** (2010) coloradowaterwise.org/Resources/Documents/BP%20Project/CWW%20Best%20Practices%20Guide%20-%20FINAL.pdf
- The Northwest Colorado Council of Governments Water Quality and Quantity Committee recently published the **Water Savings Resource Guide and Model Provisions for the Colorado Headwaters Region** (2020) nwccog.org/water-savings-guidance

EFFICIENT DEVELOPMENT PATTERNS

- This **Smart Growth America** guide illustrates the most effective zoning and ordinance strategies for more efficient development patterns. epa.gov/sites/production/files/2014-01/documents/2009_essential_fixes_0.pdf
- In the **Keystone Center Water and Growth Dialogue** (2015), Clarion Associates conducted a comparison of the different development typologies across the West to identify water savings from land use patterns and density. clarionassociates.com/wp-content/uploads/2016/08/Keystone-Colorado-Water-Dialogue.pdf
- Community Builders' **Place Value** report (2016) provides the rationale for thinking about downtowns and neighborhoods that promote walkability, include mixed uses, a variety of housing types, and places supporting social interaction as ways to build a thriving economy and save water. communitybuilders.org/insights/place-value

WATER SMART LANDSCAPING AND PLUMBING CODES

- Denver Water's **Water Wise Landscape Handbook** (2017). denverwater.org/sites/default/files/2017-05/Water_Wise_Landscape_Handbook.pdf
- The Colorado Department of Local Affairs' **Water-Efficient Landscape Design Model Ordinance** (2004). drive.google.com/file/d/0B2oqdPZKJqK7S3lRLWRaOGhsYm8/view?,authuser=0 and **Best Practices Manual** (companion to the Model Ordinance) drive.google.com/file/d/0B2oqdPZKJqK7ei1Zb1dNTVZsQU0/view?,authuser=0

WATER-NEUTRAL DEVELOPMENT

- A **model ordinance for water neutral development** from Net Blue. allianceforwaterefficiency.org/resources/topic/net-blue-supporting-water-neutral-growth
- City of Santa Fe **water demand offset ordinance** summary. Their toilet retrofit requirement was a nationally recognized success. santafenm.gov/archive_center/document/2124

SECTION 4: HEALTHY & RESILIENT WATERSHEDS

- These resources provide an **overview of water resource management** for both surface water and groundwater:
  - Colorado Foundation for Water Education's **Citizen's Guide to Where your Water Comes From** (2005). colorado.gov/pacific/sites/default/files/Citizen%27s%20Guide%20to%20Where%20Your%20Water%20Comes%20From.pdf
  - Colorado Foundation for Water Education's **Citizen's Guide to Denver Basin Groundwater** (2007). issuu.com/cfwe/docs/cg-groundwater

WATERSHED PROTECTION

- **Protecting Water Resources with Smart Growth** (2004) is for communities, local governments, state and regional planners, and other audiences already familiar with smart growth who are seeking more ideas for protecting water resources. The document compiles 75 policies designed to protect water resources and implement smart growth strategies. epa.gov/smartgrowth/protecting-water-resources-smart-growth
- The CWCB has a substantial **floodplain management resource** available at cwcb.colorado.gov/floodplain-stormwater-criteria-manual
- The **Colorado Water Plan** (2015) includes an entire chapter on watershed health and collaborative watershed management. The chapter can be reviewed here: colorado.gov/pacific/cowaterplan/watershed-health
- Managing the upper watershed often requires collaborative approaches with public land agencies and private landowners. This resource created by the CWCB and Colorado State Forest Service reviews the **key principles of managing forest lands for watershed health.** csfs.colostate.edu/forest-management/#1465417421331-ebba1e6f-66a0
- The U.S. Environmental Protection Agency has an example ordinance for establishing **Groundwater Quality Overlay Districts** (2015). epa.gov/sites/production/files/2015-12/documents/model_groundwater_ordinance.pdf
- The Colorado Department of Local Affairs (DOLA) Division of Local Government released **Planning for Hazards: Land Use Solutions for Colorado** (updated in 2020), a guide and website designed to help Colorado counties and municipalities prepare for natural disasters such as flooding and drought and reduce risks through the integration of resilience and hazard mitigation into land use plans, programs, and policies. planningforhazards.com
- The **CWCB drought planning resources** can help communities manage their response to drought. cwcb.colorado.gov/drought-assistance
- The Northwest Counties Council of Government's Water Quality & Quantity Committee completed a **water quality protection model water quality standards resource guide** in 2018. nwccog.org/wp-content/uploads/2018/06/2018.06.20.-NWCCOG-Model-Water-Quality-Prot.-Stnds-FINAL-with-appendices.pdf

SECTION 5: WATER CONSERVATION RATE STRUCTURING & POST-OCCUPANCY STRATEGIES

WATER CONSERVATION RATE STRUCTURING

- **Building Better Water Rates for an Uncertain World** provides the background and concepts needed to develop, evaluate, and implement an effective rate structure. financingsustainablewater.org/tools/building-better-water-rates-uncertain-world
- A comprehensive study of water rate structuring best practices, **Designing Water Rate Structures for Conservation and Stability**, was conducted for Texas communities by the University of North Carolina and the Sierra Club in 2014. efc.web.unc.edu/2014/02/26/water-rate-structures-for-conservation-and-revenue-stability

CONSERVATION PROGRAMS, INCENTIVES, AND PUBLIC EDUCATION

- **American Water Works Association** has a webpage dedicated to communication strategies for utilities, including sharing their own messaging platform. awwa.org/Policy-Advocacy/Communications-Outreach/Public-Communications-Toolkit
- This Water Research Foundation webinar highlights **turf replacement programs** from Metropolitan Water District, San Diego County Water Authority, and Southern Nevada Water Authority. mavensnotebook.com/2015/09/30/a-look-at-three-successful-turf-replacement-programs
- Both of these sites provide a great Colorado-wide review of what communities are doing with regards to more sustainable and efficient water management: waterrebates.com/colorado and coloradowaterwise.org/page-645756
- Denver Water has won national attention for its water education programs to raise awareness about water conservation. Read the backstory of the **Use Only What You Need** campaign. denverwater.org/about-us/history/use-only-what-you-need
- The City of Santa Fe, NM "lead by example" **Water Conservation Program** that has resulted in a greater than 50% reduction of per capita water consumption since tracking began in 1995.

The success of the conservation awareness program and an aggressive rebate program are demonstrated by water demand. Santa Fe is at 56 gpcd. santafenm.gov/sustainable_santa_fe_plan and santafenm.gov/water_conservation

- Santa Fe's more recent effort is the **"It's Not Coming Back"** campaign. savewatersantafe.com/seasonal-drought-campaign-2015
- A research agency conducted a poll of US water users and identified which values and messages resonated the most in water messaging in **Water conservation is the next big thing. Have consumers gotten the memo?** (2016). sheltongrp.com/posts/water-conservation-is-the-next-big-thing-have-consumers-gotten-the-memo
- The **Water—Use It Wisely campaign** provides opportunities to integrate conservation education into your website. wateruseitwisely.com/jump-in
- Water Education Colorado provides a **Citizen's Guide series** that covers all aspects of water resource management, law, and best practices. watereducationcolorado.org/publications-and-radio/citizen-guides

CONCLUSION: MEASURING RESULTS

- **Growing Water Smart Metrics: Tracking the Integration of Water and Land Use Planning** (2020) is Sonoran Institute's guide to 10 progress and 14 impact metrics to help measure the integration of water and land use. resilientwest.org/2020/growing-water-smart-metrics-guide
- The City of Boulder, CO has Resource Central conduct annual audits of their water conservation impact. The **2019 Annual Report** is the most current version, and explains using metrics and infographics to show results. www-static.bouldercolorado.gov/docs/2019_City_of_Boulder_Annual_Report-1-202002141354.pdf?_ga=2.169762017.1372263212.1595613640-1608649521.1593012213

NOTES

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Through our Growing Water Smart workshop series, we've trained over 135 community representatives and impacted the lives of over 3,200,000 Coloradans in the last five years. We have expanded our program to also serve Arizona and California communities.

By continuing to support Growing Water Smart, more communities will get to take advantage of our expertise and to share in lessons we have learned over nearly thirty years of shaping the future of the West.

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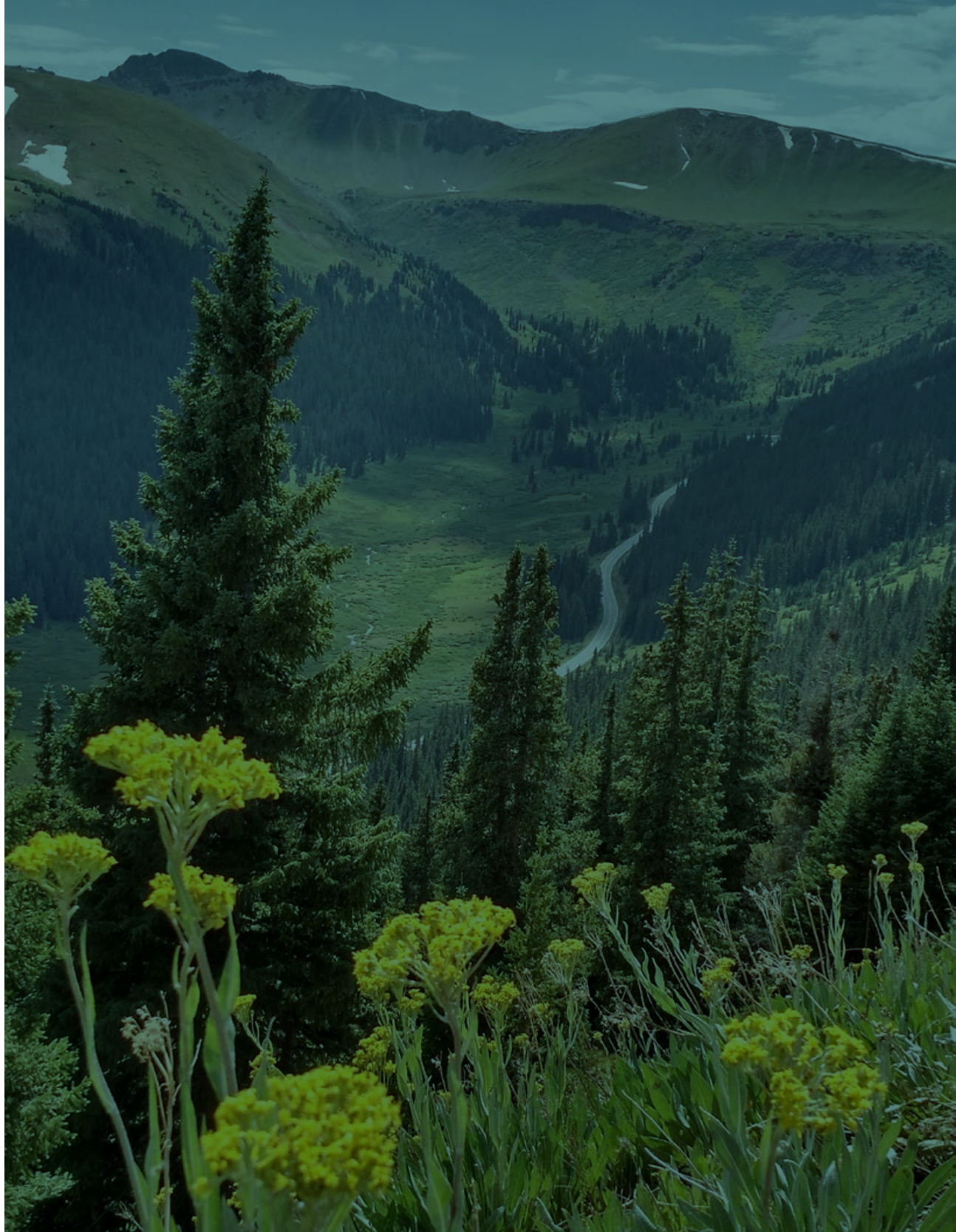

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