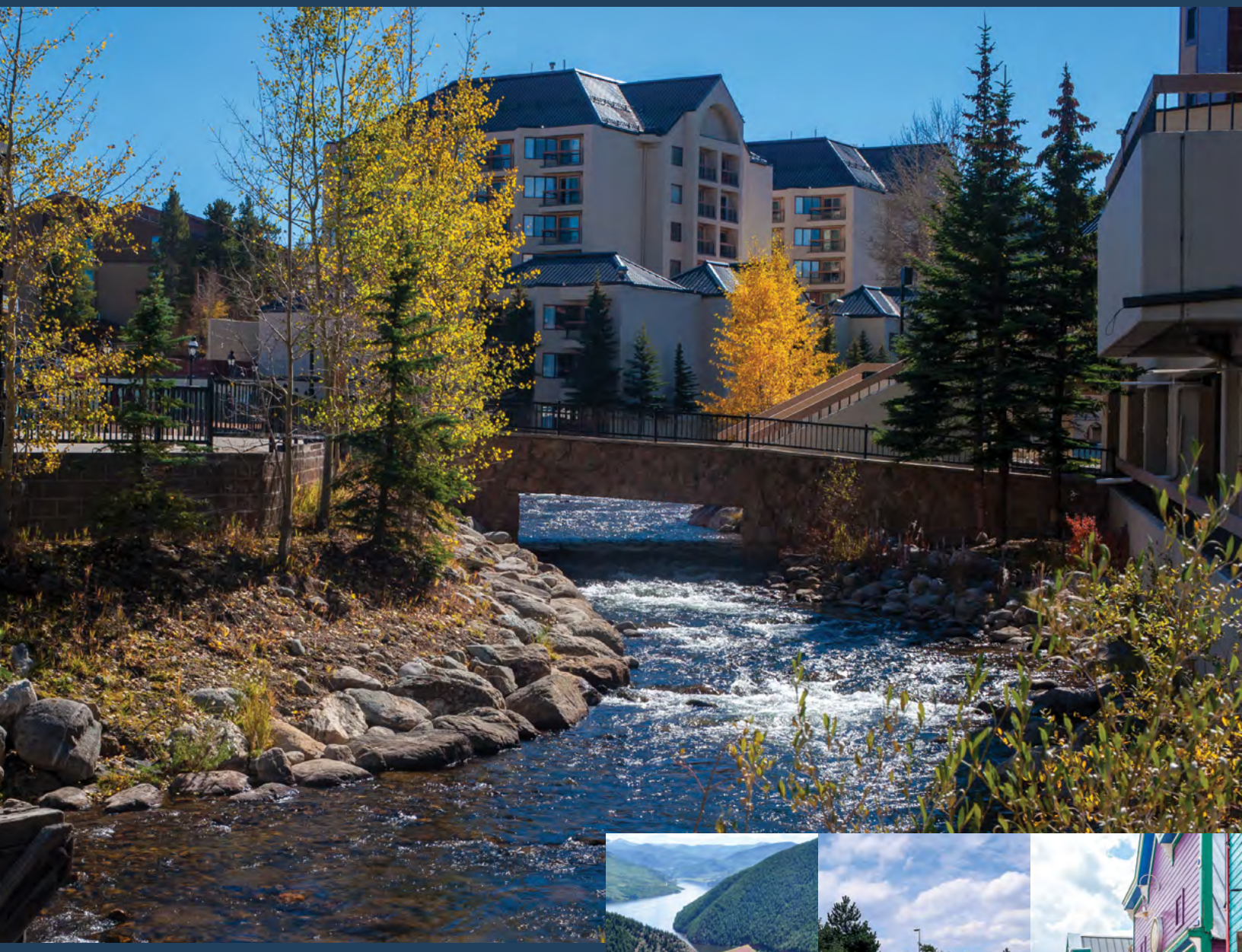
Water Savings Resource Guide and Model Provisions for the Colorado Headwaters Region



Northwest Colorado Council of Governments

WATER QUALITY / QUANTITY COMMITTEE

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Acknowledgements

The purpose of the Water Quality/Quantity Committee (QQ) of the Northwest Colorado Council of Governments (NWCCOG) is to enhance the Colorado headwaters region's water quality while encouraging the responsible use of water resources for the good of Colorado and the environment. Members of QQ include headwaters municipalities, counties, and water and sanitation districts located in Grand, Summit, Eagle, Pitkin and Gunnison counties as well as the Colorado River Water Conservation District and the Upper Gunnison River Water Conservancy District.

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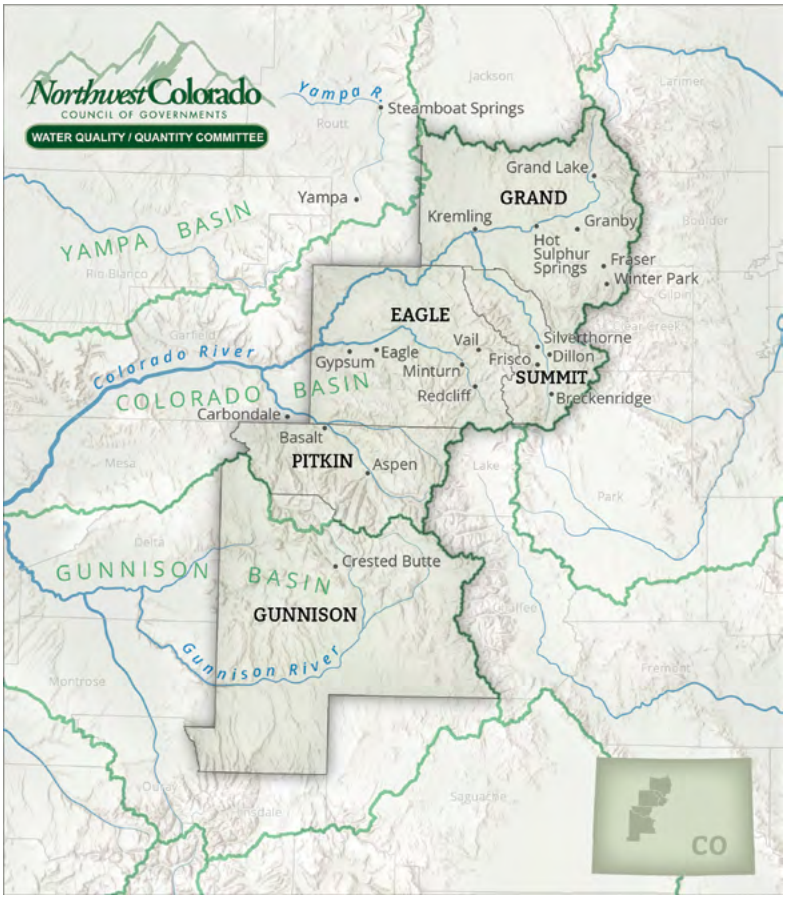

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Contents

Introduction

Why Water Conservation and Efficiency Matter

Across the West, and particularly in the Colorado River Basin, how water is managed has become a key issue as a growing population and extended drought have put pressure on already limited water resources. States are working at the legislative level to identify policies that can support growing populations and economies with scarce and diminishing water supplies. In 2015, the State of Colorado adopted its first statewide water plan with the goal of reducing the projected 2050 water-supply gap from as much as 560,000 acre-feet by 2030. A core messages in *Colorado's Water Plan* is that, during this time in which demand for water is projected to outstrip supply, linking land-use planning to water-resource planning is imperative. The Northwest Colorado Council of Governments (NWCCOG) Water Quality/Quantity Committee (QQ) played a key role in advocating for this land-use section in Colorado's Water Plan. The state has responded with significant investment in programming to support local governments with integrating water efficiency and conservation into local community planning.

As headwaters communities of the Colorado River and as advocates for more water-efficient land-use practices statewide, the communities encompassed by Pitkin, Eagle, Summit, Grand, Gunnison and Routt counties recognize that they need to be at the forefront of water conservation and efficiency efforts and set an example for the rest of Colorado. In order to successfully respond to these water challenges, QQ has developed this resource, ***Water Savings Resource Guide and Model Standards for the Colorado Headwaters Region***, which builds upon the Model Water Quality Protection Standards released in 2018. The *Water Savings Resource Guide and Model Standards* resource explores the regulatory tools available to enhance resilient and sustainable water-resource management. It is intended to serve as a reference, along with QQ technical support, when updating community plans and development regulations.

The QQ Policy and Code Assessment

To inform the content and development of this resource guide, a high-level review of community comprehensive plans, water plans and development codes was conducted to identify the presence of policy elements across the 28 QQ communities in order to:

- Establish a comparative baseline for QQ member headwaters communities' current policies.
- Better understand what policies are currently being implemented to achieve water conservation and efficiency in these communities.
- Identify QQ peer case studies.
- Inform development of Model Code Provisions language.
- Provide member communities with feedback to inform future planning.

Consultants conducted a review of community planning documents for their inclusion and comprehensiveness of water supply and demand information as well as water resource-related goals and strategies. Documents reviewed include water-related plans, comprehensive or master plans, and community sustainability/resiliency plans. Additionally, a review of development regulations was conducted to determine how land-use regulations currently address water conservation and efficiency. Regulations reviewed include water-supply standards, zoning, landscape ordinances, watershed protection, water-conservation standards and linkages to building and plumbing codes.

To collect data from each community, a self-assessment was distributed to team leaders tasked with gathering information from their water districts, utilities and planning departments. The total response rate was about 50 percent for the 28 communities. For communities that did not complete a survey, the consultant team gathered information that was available online. Information related to water providers – including water supply and demand balance, rate structures and water conservation programs – was not reviewed unless it was provided in the survey.

All the counties included in the review – Eagle, Gunnison, Summit, Routt, Grand and Pitkin – also represent river systems – the Eagle, Gunnison, Blue, Yampa, Colorado and Roaring Fork rivers, respectively. Regional collaboration is a hallmark of and is evident within all of these counties. In terms of managing water resources, all of these counties are inextricably linked together by their watersheds. How each individual community in the region grows and develops inevitably impacts the other communities as well as the entire river ecosystem's water quality and quantity. The policy and code assessment summaries are, therefore, organized regionally to reflect the interconnected nature of water and promote thinking at a watershed scale. For each community, the summary offers a starting point for a dialogue about strengths, gaps and opportunities as well as to inform which chapters in this guide are most relevant.

The results of the policy and code review can be found in Chapter 5.

Opportunities for the Headwaters Communities

Based on the policy and code assessment – and to support QQ communities willing to become leaders in water conservation and efficiency – QQ has identified the following opportunities to guide planning and development regulations for greater water savings.

1. **Local governments need to think about water supply and demand, even if they are not municipal service providers**. Throughout the development of this resource guide, counties asked a valid question: "If we are not water providers, what is our role in water?" All local governments, including those without utilities, have a significant role to play in linking land use to water. Although water providers and other local governments have different responsibilities, working together with the tools they have supports sustainable water-resource management.
2. **Collaboration is essential**. Linking water and land use requires working across the historically separate disciplines of water provider and land-use manager. In order to integrate water and land use, these entities must work together to understand future supply and demand then craft demand-side management strategies that promote a more efficient use of scarce resources. Water providers only have authority to promote water conservation and efficiency *after* a development is established and occupied. All opportunities to influence Water Smart development lie with the land-use authority, regardless of whether or not that entity is a service provider.
   Member communities of the QQ have long worked together as leaders in the effort to protect water quality and quantity in the Colorado River and its tributaries. Only more recently has coordination on regional land-use policies linking water conservation and efficiency with land use become a priority. There are some early adopters that have begun to make the connections between land-use policies, water supply and water conservation, as demonstrated by Summit County's Blue River Regional Water Efficiency Plan and the Roaring Fork Valley's River Management Plan. Additionally, communities served by the Eagle River Water and Sanitation District have been working together to identify regulatory

solutions and best practices for ensuring there is a sustainable water supply. These types of efforts are likely to become the norm in the headwaters region, given the interconnectedness of communities within watersheds and the basin.

3. **Local community plans should include a vision for how to manage water resources.** Community comprehensive plans or master plans offer a huge opportunity for all communities to clearly state each community's agreed-upon vision for how water should be managed. While generally concerned about water in the West, most community members lack a basic understanding of their own water supply-and-demand situation. A comprehensive plan can serve as an effective educational tool in helping build public support for future policy changes that, as most working in land use know, can be extremely challenging to get adopted. The comprehensive planning process provides an opportunity for community members to discuss water-resource threats, opportunities and recommendations, thereby fostering support for necessary actions. Overall, few comprehensive plans in Colorado effectively link land-use management and water, and the policy assessment revealed this to be the case for QQ community plans. As QQ communities update their community plans, they should consider including a comprehensive section on water resources as outlined in Chapter 1.
4. **Communities should consider Water Smart development patterns during comprehensive planning**. Research has proven that higher densities are up to 30 percent more water-efficient than lower density large-lot single-family developments. These benefits are primarily a result of smaller lots and, therefore, less outdoor watering, benefits that accrue regardless of whether or not a community has a landscaping ordinance. While many of the headwaters communities have high-density zoning districts in their codes, it is unclear if the overall development pattern is or is not supporting their water conservation and efficiency goals. All of the headwaters communities would benefit from a greater understanding of the link between their land-use patterns and water demand. To conduct an analysis like this requires some time, but it would provide a more thorough understanding a community's water demand. A number of these analytical methodologies, mostly being applied by higher capacity metropolitan areas, are summarized in Appendix D.

   Assessments that link water demand and land-use patterns are extremely useful when a community is preparing a new land-use master plan that designates future land-use districts and densities. While no headwaters communities are incorporating this type of analysis, Westminster and Fort Collins offer examples of Colorado communities using this type of assessment as part of their comprehensive planning processes. Westminster has long linked its zoning for future development to ensure that it matches existing water supply, and Fort Collins recently utilized scenario planning to identify the most water-efficient future land-use patterns.
5. **Development approval standards for adequate water supply should follow state statute.**[1] The State of Colorado requires local governments to develop a regulatory policy for the review of proposed development to ensure adequate water supply. In examining headwaters communities' development regulations, QQ learned that municipalities are much more likely to have clear standards for water supply than counties that are served by external water providers (e.g. districts) or by wells. The QQ recommends that all local governments not served by their own utility review Chapter 2 and consider strengthening their water-supply standards. Within QQ, Gunnison County has the strongest county-level regulations while the City of Aspen provides an explicit municipal example. It should be noted that state statute also offers a local jurisdiction the ability to require water conservation plans as part of the development approval process. However, few Colorado communities utilize this regulatory option. In Colorado, Sterling Ranch in Douglas County provides the best-known example of this type of pre-development water conservation plan as part of the approval process. Eagle County and the Eagle River Water and Sanitation District has also recently utilized this tool in approval of Planned Unit Developments.
6. **Development regulations should use zone overlay districts for areas with limited water and/or recharge areas**. While water efficiency and conservation are the focus of this resource guide, it is important to remember that the same land-use tools used to protect water quality can also be applied to protect water supplies, most notably overlay zones, density-based zoning and setbacks. Within the headwaters region, Pitkin County and the Town of Breckenridge offer examples for other communities.

1 In 2008, the State of Colorado adopted legislation, HB-08-1141, that required local governments to review new developments for adequate and sustainable water supply. See Chapter 2 for more information on Colorado's water adequacy rule and incorporation of standards for water supply into development regulations.

Using a baseline assessment and maps, Pitkin County has linked critical groundwater recharge areas to a its water-supply review process, requiring a higher standard of review within these designated areas.[2] In 2000, Breckenridge adopted the Cucumber Gulch Overlay Protection District, requiring specific development standards and setbacks within the Cucumber Gulch drainage to protect water quality and wetlands. Crested Butte protects the its water source, Coal Creek, through a water protection district overlay that requires all development to conduct a thorough assessment and to demonstrate that the project will not negatively impact water resources.

7. **All communities should adopt or strengthen outdoor watering regulations**. Across Colorado, outdoor watering accounts for about half of all urban water use. Outdoor watering regulations offer communities one of the greatest opportunities to increase efficiency, to minimize water waste and, for irrigation water not served by reuse or greywater, to reduce consumptive use of potable water supplies. Many of the headwaters communities have begun to address efficiency and conservation in outdoor watering regulations.[3] In 2017, the City of Aspen adopted the region's most comprehensive landscape ordinance in an effort to significantly reduce outdoor water demand. Aspen, Frisco, Dillon and Carbondale all offer examples of development codes that integrate additional water-use restrictions under drought conditions. Given the significant percentage of water use attributable to outdoor watering, QQ recommends all municipalities and counties assess the potential water savings that could be realized by strengthening outdoor watering regulations.
8. **Resort-based communities should explore opportunities for commercial water efficiency.** Across the country, several types of commercial uses typify high-volume water users. These include public institutions, hotels, restaurants, golf courses, laundromats and car washes. In the headwaters region, resort-based communities are likely to have an above-average demand within the commercial sector because of their tourism-based economies. Larger metropolitan cities, such as San Francisco, Calif., and Santa Fe, N.M., offer excellent case studies in how to integrate indoor water efficiency into water conservation ordinances to reduce water demand across the commercial sector. Recommendations by QQ for resort regions, particularly municipalities, emphasize exploring opportunities to improve water efficiency for new development and redevelopment of existing structures.

How to Use This Resource Guide

Policymaking is not static. Instead, community plans, ordinances and development codes are created, revised and updated in response to changing conditions, new information, and available capacity and resources. For this reason, it is helpful to conceptualize strategies for how we manage our communities' scarce water resources along a continuum *(from the minimum to a maximum level of intervention)* rather than as a checklist *(either a policy or regulation is present or not present)*.

This resource guide is intended to support communities with refining how to integrate water conservation and efficiency into future updates to comprehensive plans and land-use development codes. It offers important considerations about policy decisions, best management practices and Model Code Provisions language to inform water policymaking.

Throughout this guide, common planning terms are used to indicate how policies and regulations can support achieving water savings. While included in the relevant chapters, these terms are defined below for clarity.

1. A ***policy*** is a written statement of intent, generally expressed as goals or principles, that guides decisions.
2. A ***comprehensive plan***, or master plan, is a policy document that sets forth a government's vision for the future, describes desired goals and outcomes, and defines specific actions.
3. An ***ordinance*** is a law or regulation adopted by a government. In land use, zoning and subdivision regulations are the best known. Yet local governments can adopt other ordinances to protect the general health, safety and welfare, including flood protection, historic preservation, design review, landscape

2 Case study presented in Chapter 2.
3 Case studies presented in Chapter 3.

design, water conservation and efficiency, impact fees, stormwater protection, wildfire protection and more.

4. The ***development code*** integrates all the different land-use regulations into a single regulatory document.
5. A ***standard*** is a criterion in a code section that establishes a level of quality or quantity that must be complied with or satisfied in order for a development to meet requirements for approval.

Chapter Contents

The contents of this resource guide cover five different subject areas that QQ has identified as key areas of opportunity. This guide is intended to be used as an ongoing resource to continually improve community integration of best practices for water savings. Each section is drafted as a stand-alone unit that can inform a community's learning and strategy development within that specific subject area.

Chapter 1: Water Smart Comprehensive Plans. A comprehensive plan plays a key role in laying out a community's vision for the future, a vision that needs to include resilient and healthy water systems. This chapter offers suggestions for content that should be included in a water plan element.

Chapter 2: Water Adequacy and Water Supply Standards. The State of Colorado requires that local governments ensure new development has an adequate and reliable water supply. This chapter examines the development review requirements for an adequate water supply and provides additional considerations for how to effectively draft a comprehensive development code that links new development to water-supply needs.

Chapter 3: Outdoor Water Demand. Outdoor watering restrictions and landscaping ordinances likely offer headwaters communities significant opportunities for reducing the water demand of new development and for reducing peak water demand during summer months. This chapter reviews the best practices for how a land-use code can integrate water efficiency and savings into landscaping and outdoor-watering standards.

Chapter 4: Indoor Water Demand. Water demand has been declining across the country largely due to significant technological advances in water-efficient plumbing and appliances. In 2014, the State of Colorado adopted a rule that only permits the sale of WaterSense fixtures.[4] However, this rule does not apply to all indoor fixtures and appliances nor does it prevent non-WaterSense fixtures or inefficient appliances from being installed. Additionally, given the large tourism sector in the headwaters region, water savings for commercial uses in the headwaters region offer an additional opportunity. This chapter outlines code recommendations to help ensure indoor water use integrates the most current best practices for both residential and commercial indoor water efficiency.

Chapter 5: Headwaters Policy and Development Code Review by County Region. This chapter includes the results of the policy and code assessment conducted during the fall of 2018 for each QQ community. The summary serves as a starting point for a community discussion and helps identify what chapters in this resource guide are the most applicable.

Appendices

A. Resources
B. Glossary of Key Terms
C. Methodologies for Population, Water Demand and Land-use Projections
D. Summary of State of Colorado Legislation Linking Water and Land Use
E. Summary of QQ Region Comprehensive Plan Goals and Strategies

4 Title 6 Consumer and Commercial Affairs/Energy and Water Conservation. Article 7.5 Water Efficiency CRS 6-7.5-101-103

Implementation Guidance on Model Water-saving Code Provisions

Model Code Provisions are provided at the end of each chapter for water supply standards, outdoor watering, and indoor watering. These Model Code Provisions provide communities with:

1. A point of comparison for conducting a review of their own development regulations for water-saving best practices.
2. Model language to utilize during an update to a community's plan or code.

These codes will need to be tailored to each local community and should be developed with local expertise and reviewed by a legal team prior to adoption. The best practices provide guidance for how to tailor the code provision to best match community context and water-saving goals. Within each model code, italics and < > indicate where a community needs to tailor the model code to meet its unique needs. The following are considerations in tailoring the model code provisions for a specific community:

- Additional materials generally accompany the development application to implement these provisions. The types of plans and other materials that might be required are described in the chapters and in the model codes themselves. Generally, more prescriptive standards require a plan, such as a landscape plan or water supply report prepared by a certified professional, while other standards may only require a description by the applicant in the submittal packet of how the standards will be met.
- While applying the same standards to all development ensures consistency, it is not always feasible, nor will it always yield significant water savings. Application of the standards should be consistent with state statutes, support community water conservation goals, match identified water-saving opportunities, and/or apply to the intensity of the proposed development. For example, landscaping requirements may apply only to commercial development, or different-sized developments may necessitate different requirements to prove water adequacy. Each chapter provides examples of how to tailor the water-saving standards to accomplish a jurisdiction's desired outcomes.
- Development measures can be mandatory or voluntary. When it comes to water savings, mandatory standards provide measurable results while voluntary standards do not. For outdoor and indoor water standards, options are provided for how to tailor the standards. Best practices make the requirements mandatory but provide an option for a waiver and include alternate best management practices or integration of water-efficient technology.
- Development application fees or other methods to require the developer to cover costs are essential for additional staff or outside experts to review applications and plans as part of the development review process. Local governments should use this option to ensure high quality customer service and performance.
- As QQ members, communities have access to QQ staff for support and guidance in drafting water-saving codes.

Chapter 1

The Comprehensive Plan

Chapter 1 Contents

Benefits of Integrating Water into a Comprehensive Plan

A comprehensive plan (or master plan) articulates a community's vision for the future and, as such, offers an important opportunity to connect land use and water. As an official policy advisory document, comprehensive plans play a key role in guiding planning boards, elected officials, property owners, developers and business owners as they make decisions about future land development that can have a significant impact on water resources. When integrated into local regulations, the comprehensive plan also ensures development is consistent with the community vision outlined in the comprehensive plan.[1] Development of a comprehensive plans also offers local government one of its best opportunities to (1) engage community members in substantive dialogue about how to steward water resources and (2) build public support for desired policy changes and community investments.

When drafting a comprehensive plan, there are two structural options for incorporating water into the plan:

1. By creating a standalone water plan.
2. By integrating water throughout the comprehensive plan.

Neither option is better than the other, and the approach most often depends upon how urgently a community needs to address water-related issues and whether or not a comprehensive plan update is pending. For cases in which a critical need to address water issues exists but the comprehensive plan is still current and unlikely to be updated within a year, a standalone water plan can be completed as an addendum to the existing comprehensive plan.[2] For cases in which the comprehensive plan is being updated in its entirety, the decision to create a standalone plan or integrate water issues throughout the comp plan depends upon the degree to which a community wants to call out and focus on integrated water-resource management.

Regardless of the chosen structure, the water-related topics in a community's plan should address all of the following connections between water-resource management and land-use planning.

The State of Colorado does not currently require the inclusion of a water element for either municipal or county master plans. Instead, it is an optional element.[3]

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1 Comprehensive plans are usually non-legally binding and considered official advisory documents. However, Colorado statutes allow for comp plan adoption into the development code: "*The master plan of a county or region shall be an advisory document to guide land development decisions; however, the plan or any part thereof may be made binding by inclusion in the county's or region's adopted subdivision, zoning, platting, planned unit development, or other similar land development regulations after satisfying notice, due process, and hearing requirements for legislative or quasi-judicial processes as appropriate.*" *CRS* § 31-23-206(1) and § 30-28-106(3)(a).

Communities wanting to make a master plan binding must include language within their development code that requires consistency with the comprehensive plan vision, goals and future land-use plan. Clear statements should be included in relevant code sections. For example, the general provisions can include language about the role of the plan, such as: "*These Regulations are intended to be consistent with the Master Plan. Should any provisions of these regulations be determined inconsistent with the Master Plan, the Master Plan shall prevail. The planning commission and elected body shall have the authority to determine the extent of any such inconsistency. A decision may be appealed in accordance with the appeal procedures in this code.*" Within the zoning and subdivision code, a statement should clearly state compliance with the master plan, for example: "*The Planning Commission and elected body shall use the Master Plan as a guideline in the evaluation of a development proposal for consistency. Development proposals shall be consistent with the Master Plan.*" Colorado case law on this matter can be reviewed in *Board of County Commissioners v. Condor, 927 P.2d 1339 (1996)*.

2 To view an example of a standalone water plan, see Butte County, Calif., and El Paso County. The City/County of Broomfield Comprehensive Plan provides an example of an integrated plan.

3 C.R.S. § 30-28-106(3)(a)(IV) and §31-23-206(1)(d). The master plan guidance provided for municipalities and counties states that, while not required, if a community selects to include a water-supply element, the process to develop the element should include coordination across all the entities that provide water for development to ensure there is a sufficient water supply and necessary infrastructure to meet future needs.

The review of QQ member comprehensive plans indicates that headwaters communities have yet to fully integrate best practices for including water in their community plans. The goal of the review was to identify:

- The comprehensiveness of plans in presenting an overview of current and projected water supply and demand as well as water and wastewater infrastructure trends.
- How water is represented as a theme in goals, including as a community amenity, natural resource or infrastructure component.
- The inclusion of water as a natural resource management issue, including addressing issues of climate change, watershed and habitat protection, natural hazards and open space.
- The inclusion of linkages between land-use development regulations and water conservation and efficiency.

Of the 25 plans reviewed, 75 percent mention water in the plan goals and strategies. The emphasis within QQ communities tends to be on the protection of water as a natural resource and the development of water-system infrastructure and less on specific connections for how land use can enhance water efficiency and conservation. Additionally, the comprehensive plans generally lack detail on current and projected community trends important to linking water and land use.

Comprehensive plan development, more than any other community planning process, offers the best opportunity to educate the public about water and growth trends. Comprehensive plans link population growth, water supply and water demand trends to where and how future development occurs. No other water-related planning process can make this connection. This chapter outlines considerations for strengthening the link between land-use and water in comprehensive planning in the headwaters region.

Integrating Water into the Comprehensive Plan		
Plan Components	**Definition and Description**	**Opportunities to Connect to Water**
Vision	A statement of the desired future of the community and the ideals the community aspires to achieve.	• Integrate principles of sustainability and resiliency into the community's vision.
Community Profile	An overview of the community's trends and future demographics.	• Ensure the water supply projections and population projects are aligned, regardless of number of water providers. • Inventory and evaluate water infrastructure for conveyance, treatment and resiliency. • Assess watershed health. • Identify challenges and opportunities with managing water supply, water demand, watersheds and aquatic ecosystems.
Goals, Objectives and Strategies	A statement of desired community conditions, targets for achieving goals, and courses of action or tasks to achieve each objective.	• Identify water-resource related goals and desired policy actions, including regulatory recommendations.
Future Land-use Plan	A map and/or plan which identifies the types of land uses that are desired for different districts in the future.	• Identify specific geographic areas where future development should be mitigated to protect critical water resources. • Foster more efficient land-use development patterns through compact form. • Ensure future growth is designated in areas where water is available, sustainable and resilient.
Implementation Plan	A work plan that prioritizes future actions and investments.	• Ensure implementation of priority water-related projects, policies and programs by creating a detailed action plan.

Creating a Comprehensive Plan Water Element

The comprehensive plan provides an important opportunity to host a community dialogue about current community conditions, trends that indicate what is likely to happen in the future, and what residents want the community to be like in the future. The list presented below provides subjects that can be explored during the development of a comprehensive plan. A community should identify priority questions very early in the process so that data gathering will include the full range of issues considered important.

Water-related Research Questions for Comprehensive Plans	
Theme	**Questions to Explore**
What are our current water supply and demand conditions and what are trends for the future?	• How much water does our community currently have available, where does it come from, and how is it treated and distributed? • How much water will be needed in the future and how will it be provided? • What are the current and projected costs of providing water to our community? • What is our projected water supply and demand balance?
How resilient is our watershed?	• Do we have any issues in our watershed? • What areas are critical to water-source protection, including water sources and recharge zones? • What aquatic or riparian habitats are essential to protect biodiversity and ecosystem health? How much water do they need to remain healthy?
How are water resources and development connected?	• What are the different patterns and trends in the different sectors and land-use types in our community? What types are most water efficient/inefficient? • Where are water sources limited or becoming an issue in ways that limit future growth potential, including the presence or threat of declining streams, groundwater drawdowns, water quality, well depths and well density? • What areas can accommodate future growth without negatively impacting water resources in terms of water quality, water quantity and costs of services? • Where should development be limited to protect water quality? • How much growth are we predicting for the future, and how much water will this future land use pattern require? • How can future water demand be reduced in new development? • How can site-level planning tools contribute to overall water-resource management, including low-impact design (LID), rainwater harvesting, landscaping plans, stormwater management, erosion control, etc.
How are agriculture and water resources related?	• What irrigated agricultural lands should be prioritized for protection because they play a key role in the water cycle and ecosystem? • How can we use the tools available to us to support how agricultural water is managed (water banks, alternative transfer methods, 1041 powers, etc.)
Is access to water resources equitable in our community?	• How are vulnerable populations impacted by costs of water? • Are vulnerable populations more likely to be exposed to public health or safety dangers?

Summarize Current Conditions and Trends

The comprehensive plan plays an essential role in integrating typically disparate information from multiple sources into a holistic assessment of a community's water resources. To prepare the summary of current conditions requires an assessment of what data is currently available, identification of priorities for new analyses, and determination of what information is critical to the planning process.

For water supply and demand information, most communities in the headwaters region need to look no further than existing water supply plans, sustainability plans, water efficiency plans, climate action plans, watershed studies and infrastructure plans to find information on current conditions, trends and recommendations.

Project Future Population and Water Demand

Connecting water-demand trends to land use requires agreement on population projections in order to produce a community-wide water-demand projection. There are many different methodologies for calculating population forecasts, and depending upon the context, some are more appropriate than others. It is not uncommon for water providers to each use their own methodology and datasets to calculate future demand. Aligning these datasets can take time and necessitate collaboration among water providers. This also requires capacity in data analysis. Working with consultants requires clarity regarding the assumptions and methodology applied during this phase.

Connect Projected Demand to Land Use

With clarity about how much water will be required in the future, the next step is to connect water supply to where growth should occur. At a minimum, a plan should explain the spatial distribution of adequate water infrastructure and supplies and link that capacity to future growth. More advanced analysis may use growth trends to project how different types of development (residential, commercial, industrial) and the pattern of development (compact or dispersed) could affect water supplies. Appendix C provides a more thorough exploration of methodologies for water and land-use projections.

Draft Goals and Strategies

Goals articulate desired future conditions while strategies articulate how to achieve desired outcomes. The list of potential strategies is endless. A frequently asked question is, "Which strategies will result in the biggest water-saving bang for the buck?" The short answer is. "It depends." A goal of net-neutral growth over the next decade, for example, would drive a different set of strategies than a goal of maintaining the current water conservation reduction trend. Clarity and agreement on specific targeted outcomes will make selecting the right strategies easier.

Develop a Water Smart Future Land-use Plan

Integrating water should not only try to align future supply and demand but also consider what mix or percentage of the development pattern will be more compact and support the community being built water smart from the start. Over the past decade, research from across the Intermountain West has proven that more compact development patterns are as much as 30 percent more water efficient, principally because smaller lots correlate to less outdoor watering. While research supporting the water-saving benefits are more recent, the many other benefits of compact development have been touted for some time:

- Reduced costs for infrastructure resulting from a reduced need for constructing new infrastructure.
- Reduced pollution from stormwater runoff and increased water infiltration due to the reduced area of impervious surfaces.
- Increased health benefits from decreased vehicle trips and increased walking and biking.

These benefits are achieved primarily by integrating the following strategies into the comprehensive plan:

1. Designated priority growth areas for future development.
2. Designated infill areas.
3. Designated areas for cluster or conservation development.
4. Designated areas for mixed-use and diverse housing types.

The comprehensive plan also drives the content for development code revisions. The future land use plan (FLUP) identifies future zoning districts, purposes, densities, uses and any unique development standards. Water resource overlay zones, districts with limited water supply and designated growth areas are all identified during this phase.

The greater the detail with which the comprehensive plan addresses desired changes to the regulatory framework – whether zoning, subdivision ordinances or development standards – the easier it will be to execute policy changes in the future. Western Resource Advocates' guide, Integrating Water Efficiency Into Land Use Planning in the Interior West, includes invaluable information in *Chapter 5: The Comprehensive Plan* on how to better incorporate water concerns into a comprehensive plan.

Case Studies

Case Studies from Colorado Communities

The **City of Westminster** has long linked land use and water in their comprehensive plan. Their water supply plan explicitly connects to the land-use plan in the comprehensive plan as the basis for the utility department's water-supply projections. Because of Westminster's leadership in the state, many case studies, cited in the footnotes, document their successful approach.

In 2018, the **City of Fort Collins** worked with Clarion and Associates, a community-planning consulting firm, to use decision support software and scenario planning to inform the development of their comprehensive plan, City Plan. The scenario analysis was used to assess how different future development patterns would impact prioritized sustainability indicators, one of which is water demand. The consultant, the utilities department and the planning department worked together to develop three different land-use futures with different densities and their associated water savings. The results demonstrated that, depending upon the development pattern selected, water savings by 2040 ranged from 2 to 14 percent with the most compact development pattern resulting in the greatest water savings. (*See graphic on next page.*)

El Paso County completed a stand-alone Water Master Plan in 2018. The plan includes a countywide strategy for collaboration among all the water providers to meet future water supply needs and to more sustainably use water. Goals within the chapter include collaboration, water supply resiliency, water conservation and efficiency programs, water source protection, and Water Smart land use. This is an award-winning example from Colorado of a standalone comprehensive plan element for water.

The City of Pagosa Springs and the surrounding area in **Archuleta County** has been a popular second home and tourist destination since the 1990s, and at one point Archuleta County was one of the fastest growing places in the state. As regional partners came together to discuss water, they realized there was significant disagreement about how much the area was likely to grow in the future. The tourism economy is currently growing, but construction has not yet recovered from the 2006 recession. A working group was formed to develop a population projection that would be adopted by consensus by all the partnering boards, including the water district, a large property owners association, the fire district, the Town of Pagosa Springs and Archuleta County. To accomplish this, the group:

- Compared the different sources and growth projections used by different entities.
- Learned about population projection methodologies.
- Developed assumptions about the drivers and limits of growth.
- Employed a consultant to create population projections with high, medium and low ranges.
- Created a report with recommendations for next steps.

A consultant developed a population projection that would help the community understand what, if any, impact second homes and short-term rentals might have on future water demand. The consultant determined the best approach to understanding the linkage between water, house production and population was to utilize wastewater production data since water demand in the project area incurs significant fluctuations in the summer due to an increase in visitors and outdoor watering. This analysis revealed that population growth and housing production are linked, but that there is a delay between housing production and increased demand on the water system. The analysis also revealed that the most reliable growth rate for the planning areas was likely the past 18 years' growth trends, not the longer historical trend from the 1970s. The community agreed to adopt an adaptive management approach utilizing high, medium and low projections for planning rather than a single projection.

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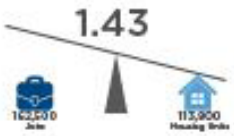
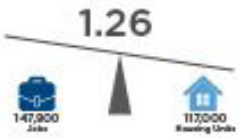
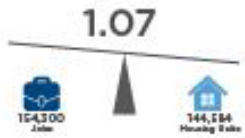
How do the scenarios compare?

The metrics below illustrate how well each scenario would meet our future needs for housing, jobs, and transportation. The metrics also show how much the proposed transportation improvements could cost and how much progress we could make toward achieving community goals for climate action and access to amenities and services.

	SCENARIO 1	SCENARIO 2	SCENARIO 3
Diversity of Housing Types Scenario 1 maintains the historic trend with a large majority of the residential land continuing a low density development pattern. Scenario 2 and 3 reflect the recent construction trends with Scenario 3 shifting towards higher density multifamily development.			
Average Density in Mixed-Use Areas The scenarios assume that the greatest amount of infill and redevelopment will occur in the four mixed-use districts. Average densities assumed to occur in mixed-use districts increases from Scenario 1 to Scenario 3, to help support the community's desire for more robust transit system.			
Character of Mixed-Use Development Scenario 1 largely maintains the suburban character of existing centers and corridors while scenarios 2 and 3 show redevelop with a more urban character, supporting a greater mix of uses and less surface for parking lots.			
New Job and New Housing Unit Capacity While Scenarios 1 and 2 both add significant new job capacity, they provide significantly less new housing capacity than Scenario 3. As a result of this housing focus, Scenario 3 translates to a job-to-housing ratio that is much lower than the current ratio.			
Jobs/Housing Balance Fort Collins currently has a job-to-housing unit ratio of 1.27, meaning the number of jobs available in the city is larger than the number of housing units. At buildout, the city's job-to-housing unit ratio would vary significantly by scenario.			
Household Water Consumption Since the largest source of water consumption in single-family housing is irrigation, any scenario that promotes increased density and a higher overall proportion of multifamily housing will reduce the community's irrigation and overall water consumption.			

City of Fort Collins

Comprehensive Plan Examples

Outline for Water Resources

Integrating water into a comprehensive plan, regardless of the structure, should include the topics listed below.*

A. Current Conditions

1. The Water System
   - Description of Water Sources and Supplies
   - Ownership of Water Distribution Systems
   - Water Systems Capacity
   - Water Infrastructure and Financing
2. Current Water Demand
   - Water Use Measurement
   - Non-revenue Water
   - Water Conservation Programs
   - Water Reuse
3. Water Quality
4. Stormwater Management
5. Watershed Health and Management

B. Resiliency Considerations for the Future

1. Population Growth and Development Expectations
2. Projected Water Demand
   - Future Water Demand Scenarios
3. Water Supply Sustainability
   - Climate Trends and Drought Planning
   - Transferable/Acquirable Water Rights and Groundwater Management
   - Recharge/Recovery/Storage Program(s)
   - Conservation and Efficiency Programs
   - Water Equity

C. Sustainable Water Resources: Goals, Objectives, Strategies

1. Summary of Challenges and Opportunities
2. Vision for Sustainable Management of Water Resources
3. Goals and Objectives
4. Action Plan
5. Short- and Long-term Priorities

*** The Lincoln Institute For Land Policy is developing a resource guide, Incorporating Water Into Comprehensive Plans in Colorado Communities. This outline was developed from an early draft of that resource. A revised resource will be available in mid2020. Additionally, in 2019 El Paso County won a Colorado APA Planning Award for their excellent work in developing a water resources master plan. This document serves as a good example for other communities.**

Comprehensive Plan Examples

Water Element Content

Vision Statement for Water Resources

Our water resources are resilient and sustainably managed to support the ecological, social and economic goals of our community.

Goals

1. Effectively manage water resources to ensure a resilient and sustainable water supply that supports people and ecosystems.
2. Promote water conservation and efficiency across all sectors.
3. Protect and enhance water quality.
4. Effectively manage stormwater to protect public safety and enhance ecological functions.
5. Restore watershed health and habitat by protecting rivers, streams and riparian resources.
6. Maintain well-functioning and cost-efficient water and wastewater systems.
7. Address water equity issues of affordability, infrastructure investments and climate resilience.
8. Protect agricultural water rights and uses where they significantly contribute to hydrological and ecological functions.
9. Ensure water efficiency and conservation are incorporated into future development.
10. Adopt an integrated water-resource management approach and collaborate across sectors, jurisdictions and agencies on implementation.

Strategies

Possible implementation strategies are too numerous to list here; however, strategies typically fall into these categories:

- Data and evidence.
- Funding.
- Projects.
- Best Management Practices.
- Policy.
- Education.
- Collaboration.
- Regionalism.

Both *Appendix A: Resources* and *Appendix D: Summary of State of Colorado Legislation Linking Water and Land Use* offer many ideas for specific strategic action items.

Plan strategies, unlike goals, will be tactical and specific. For example, develop a drought management plan that will protect the health of the river and tributaries in the event of an extreme drought.

Plan strategies should also thoughtfully integrate water resource management into zone districts. For example:

- Identify service areas where new development can connect to existing and proposed infrastructure.
- Identify areas along declining streams with limits for future augmentation.
- Identify areas of growth where wells are being supported by agricultural recharge.
- Quantify potential water demand, total number of wells and augmentation availability based on average water use. Use this information to allocate growth spatially to inform appropriate zoning densities.

Chapter 2
Water Supply Standards

Chapter 2 Contents

Best Practices Summary:
Adequate Water Supply Standards

1. **Identify Permitted Water Source(s)**
   - An individual well.
   - Shared well.
   - Cistern.
   - Water provider.
   - Water demand offset program.
   - Reclaimed water.

2. **Provide Proof of Water Rights**
   - If a well, a letter from the Colorado Division of Water Resources (DWR) verifying a well permit.
   - If a water provider, a letter from a water provider with information on the provider's supply portfolio and capacity to serve.
   - If a water dedication or water rights, proof from an attorney verifying sufficient water rights and appropriate water use.
   - An augmentation plan or certificate, where required.

3. **Provide Calculation Methodology for New Development Water Demand**

   An estimate for the total water demand by the development at build out is generally determined by one of the following methodologies and determined by the community capacity and available datasets.

   - Indoor demand based on a gallons per day per unit or historical use, and demand for outdoor irrigation based upon the number of square feet of irrigated land, plant types, quantity of plants, soil characteristics and estimates of plant evapotranspiration and irrigation efficiency.
   - Total household demand shall be based on existing service provider standards.
   - Total household demand shall be based on gallons per day unit or equivalency unit.
   - Total unit demand based on historical use data provided by a water provider.

   Establish a maximum water allowance (water budget) that is enforced through monitoring of annual water use verified through metering and billing.
   Adjust water budget, if necessary, for a change in development use or for expansion of square footage.

4. **Specify Water Supply Adequacy Standards**
    - Include a definition of adequate and sustainable water supply (generally as defined by the state)
    - Include the process for how, when and what a developer should submit as proof of adequate and sustainable water supply.
        - For a water provider with a water supply plan on record with a local government, a commitment *letter to serve*, as long as the water plan has been updated within past 10 years, has a minimum 20-year planning horizon and includes a description of both the provider's physical water sources and water supply obligations.
        - For a water provider without a water supply plan, a commitment *letter to serve* with proof of ability to provide adequate water supply, including the physical source of water to serve a development's water demand through buildout and proof of a firm yield.
        - On a well, a *water supply report* that includes water yield under various hydrological conditions. A well pumping and yield test is the most common method for estimating the quantity and sustainability of wells. Given the state statute applies to subdivisions of two units or more, some communities have established graduated requirements with increasing rigor as the size of the subdivision increases.
5. **Specify Water System, Distribution and Connection Standards**
    - Design standards for water systems that define the engineering, ownership and operational requirements for different system types, including public, community and private water supply systems as well as shared wells.

6. **Define Potable Water Quality Standards**
    - The state statute gives authority to local governments to ensure that wells and smaller water systems excluded from oversight by CDPHE meet the requirements for water "quality, quantity, dependability and availability." This is done by requiring a water quality test during pump tests with samples submitted to CDPHE, the county's public health department or a certified lab by final plat.

7. **Use Water Supply Overlay Zones**
    - Water overlay zones account for variations in hydrological conditions or water service providers to specific zone districts with appropriate standards.

8. **Include Conservation and Efficiency Standards**
    - The state statute provides authority to local governments to negotiate water savings and conservation with development applications. A community may opt to adopt a water conservation ordinance with inclusion of requirements for efficiency in new development or opt to negotiate on a case-by-case basis with developments that meet certain criteria.

Linking New Development to Water Supply

Comprehensive Water Supply Standards and Why They Matter

As pressure on our communities' water supplies increases due to prolonged drought, changes in precipitation patterns and population growth, there is a need for more sophisticated approaches to connect water supply planning to the demand created by new development. Few planners, planning and zoning commissioners, or elected officials in the West have not been asked at a public hearing, "*Where is the water going to come from?*" or "*How will this new development impact my water?*"

In zoning and subdivision regulations, a water supply standard offers local government its best opportunity to clearly link the water demand generated by new development with a sustainable supply. During the development review process, the following questions should be addressed:

- How much water is required for the new development?
- Where the water is going to come from?
- Is the water supply adequate and sustainable?
- At what stage in the process should the developer have to provide proof?
- Is the water potable?
- How will the water be delivered?

State planning statutes for water adequacy, also referred to as "show me the water" rules, guide local government requirements for development review and are intended to protect the homeowners from investing in a property without a sustainable water supply. The State of Colorado water adequacy statute (C.R.S. § 29-20-301 *et seq.*) provides specific guidance to both municipal and county governments on how to conduct the development review process and make a determination for whether a proposed development has an adequate water supply for buildout. Colorado's statute defines adequate supply based on four characteristics and includes guidance on what information should be used during the determination process:

> *"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" [C.R.S. § 29-20-302(1)].*

While municipalities and counties must prove adequate water supply, there are some nuances in the state statutes that require a more rigorous review for counties.[1]

State of Colorado Requirement for Applying Water Adequacy Review		
	Counties	**Municipalities**
Size of Development for Adequacy Determination	2 or more lots	50 or more lots
State Engineer Review	Required[2]	Not Required, Optional
Determination Timing	Flexible within development review	Flexible

As a best practice, all local governments should review all development for water adequacy, including proof of the quality, quantity, dependability and availability of water to serve the development. Additionally, proof of water adequacy is simply one element within a community's water supply standards. For example, determining a water demand calculation for new development or addressing types of water sources or delivery system requirements may also be important but are not required by the state statute.

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1 Application requirements for water adequacy are not the same for counties versus municipalities. For counties, the obligations for proving water is in C.R.S. § 30-28-133-136. A subdivision is any parcel of land divided into two or more parcels [C.R.S. § 30-28-101(10)]. For statutory towns and municipalities, the water adequacy rule is limited to "an application regarding a specific project that includes new water use in an amount more than that used by 50 single-family equivalents or fewer as determined by the local government" C.R.S. §29-20-103. Counties have a higher standard of proof for water adequacy. These statutes, as well as others relevant to water- and land- use related statutes can be found in Appendix D.

2 §30-28-136(1)(h)(I)

A water supply standard should provide clear and specific expectations to a developer based on the community's own understanding of its water resources and should, at a minimum, address the following elements:

1. Identification of permitted water sources.
2. Proof of water rights.
3. Quantification of water demand budget.
4. Determination of water supply adequacy.
5. Standards for water delivery system construction and connections.
6. Water service fees.
7. Drinking water quality standards.

Optionally, a community may also want to include:

8. A requirement for geographically specific standards in the zoning code through use of an overlay zone that adds additional requirements based on water provider, hydrologic or geologic variations.
9. Water conservation and efficiency requirements to reduce overall water demand of new development.

This chapter outlines the key considerations for updating standards for water supply in development regulations, best practices and case studies and offers Model Code Provisions for water adequacy and water supply standards in Chapter 5.

The Roles of Local Government and Water Providers in Development Review

In Colorado, the responsibility of vetting new development for adequate water supplies is placed on local governments. Managing water resources requires a holistic approach to planning that evaluates the costs of infrastructure, planning for droughts and ensuring land uses and densities match the region's water supply. Information sharing and alignment of policies across multiple jurisdictions and entities is critical. Local governments are well-positioned to take a leadership role in building a collaborative understanding of regional, county and watershed supply and demand trends. Regardless of whether a local government is a water supplier, this broader perspective supports making better decisions regarding the availability of and impacts to water supplies for new development.

Not all water providers have a clear picture of their water supply and demand balance or the difference between their total water supply available and total water demand of users. The State of Colorado does not require water suppliers to develop water supply plans. The State of Colorado does have a requirement for water providers to develop water efficiency plans (WEPs), which identify strategies to enhance water savings but only once an entity crosses a threshold for 2,000 total acre-feet provided.[3] Often, if a water provider has not crossed that threshold, it may not have good data about water use in the community.[4] Accurately tracking water use requires a substantial amount of capacity, and many smaller communities or water providers simply lack this capacity. Many water suppliers and utilities voluntarily undertake WEPs, even if not required, with planning support provided by funding through the Colorado Water Conservation Board (CWCB). The WEPs and water supply plans can provide important information to a planning department about current water-resource management challenges and opportunities. Planning departments, local officials and water providers should work together to develop a shared understanding of their current conditions, trends and information gaps.

3 WEPs are managed by the CWCB within the Colorado Department of Natural Resources. A WEP is required when the water supplier supplies over 2,000-acre feet/year. Importantly, WEPs now require water providers to collaborate with local government to include land-use water efficiency strategies. In 2018, the CWCB developed new guidance for water providers on the land-use and water nexus.

4 In the headwaters region, many communities have WEPs.

Differences between Municipal and County Water Supply Standards

Given statutory requirements, there are differences between municipal and county codes with regard to proof of adequate water supply. A municipality with a single water provider, whether a public utility or a district, will likely have a much less complicated process for proof of water adequacy than a county that uses multiple water sources, particularly domestic wells. While each community will be different, the following elements should be evaluated for inclusion in the development review process.

Different Municipal and County Water Supply Standards	
Municipalities	**Counties**
☐ Definition of adequate water supply. ☐ A clear process that defines how to prove adequate water supply, proof of utility capacity and willingness to serve, if different providers. ☐ Applicability for additional review over 50-unit development per state statute or a locally determined standard. ☐ Water demand calculation methodology for development (indoor and outdoor). ☐ Dedication of water rights process, if required. ☐ Fee program schedule (tap fees, impact fees, administrative fees, water efficiency incentives). ☐ Utility connection standards. ☐ Prohibition on individual wells in service area. ☐ Process for out-of-service area request for connection. ☐ Water utility authority.	☐ Definition of adequate water supply. ☐ Applicability for additional review over 2- unit development per state statute. ☐ Clear process that defines how to prove adequate water supply for different sources, including review process by State Engineer's Office. ☐ Water demand calculation methodology for development (indoor and outdoor). ☐ Standards and requirements for water supply plan, where applicable. ☐ Dedication of water rights process, if required. ☐ Water distribution system construction and connection standards. ☐ Prohibition of any disallowed sources of water, if applicable. ☐ Connection requirement to public system, where applicable. ☐ Potable water quality standards. ☐ Proof of augmentation, where applicable.
Additional Options	**Additional Options**
☐ If multiple water providers with different requirements, an overlay zone clarifying standards for different services areas. ☐ Water budget agreement and monitoring plan for compliance. ☐ Requirement for development to meet water efficiency and conservation standards. ☐ Fines for water budget exceedance violations.	☐ Water budget agreement and monitoring plan for compliance. ☐ If multiple water providers with different requirements, an overlay zone clarifying standards for different services areas. ☐ If multiple hydrological zones, an overlay zone clarifying any differences in standards. ☐ Requirement for new development to meet water efficiency and conservation standards.

What is a Water Demand Offset Program? Net Neutral Water Supply Standards

As communities face limits on new water supply sources, they are turning to conservation and efficiency as the least expensive source of "new" water for development. A Water Demand Offset (WDO) program requires new development to offset the impact of its projected water demand on an existing water supply by:

- Minimizing water demand through *onsite* water-efficient design.
- Conducting *offsite* actions to reduce existing water demand elsewhere in the supplier's service area.

The offset should be equivalent to at least 100 percent of the new development's water demand with many programs requiring a 2-1 (200 percent) offset. Communities utilizing these types of programs have been increasing since the early 2000s, and the evidence proves that they support growth without increasing system-wide water consumption over significant periods of time.

While WDO programs vary in implementation, they all utilize a combination of these requirements for the developer to:

- Be responsible for directly conducting installation of water efficiency enhancements either onsite or offsite.
- Purchase WDO credits from the water supplier, which will then contract with another entity to conduct water efficiency enhancements offsite.
- Pay a fee into a fund that will be used by the water supplier to fund new water conservation or supply projects.

Offsite actions include the same range of water-saving measures as are available onsite and target retrofitting existing development. In California and New Mexico, the offsite action most often required is retrofit of water-using fixtures, typically toilet retrofits. Retrofit of older toilets provides a significant return on investment with significant water savings realized through a simple transaction for the homeowner. Since retrofitting older developments is where significant gains are made, it is important to have a good understanding of the total number of older structures available prior to initiating a program. Many of these programs also offer an

Water Demand Offset Program Components		
Onsite Strategies	**Offsite Strategies**	**Program Management**
• Ultra-highly efficient fixtures. • Dual-flush toilets. • Front-loading washing machine or on-demand hot water systems. • Outdoor submetering. • Xeriscaping and drip irrigation • Self-adjusting irrigation controllers in all landscaped areas. • Use of recycled water in common areas, parks and other community outdoor facilities. • Rainwater cisterns. • Graywater systems. • Stormwater capture.	• All onsite strategies but applied to existing developments. • Agricultural conservation. • Recycled water. • In-lieu-of fee for acquisition of new supplies. • Conservation education programs	• Fees to fund program. • Rules requiring savings are in perpetuity. • Monitoring.

incentive to the developer to increase efficiency in the new development, which will reduce the water-demand offset requirement.

The Alliance for Water Efficiency developed Water Offset Policies for Water Neutral Community Growth, which provides an in-depth review of case studies from around the country. They also created a model ordinance and worksheets that are available upon request. The two communities below offer examples of programs that have been operating for longer periods of time and thus have decades of experience in operating these programs, including understanding the impacts and lessons learned. Both have experienced population growth for over a decade with no net impact to the water supply.

- City of Santa Fe, N.M., *Water Demand Offset Ordinance* and *Utility Water Budget* page.
- Soquel Creek Water District, Santa Cruz County, Calif., *Water Demand Offset Program*.

Cisterns and Hauled Water as a Potable Water Supply in a County

Many county codes fail to specifically call out hauled water as a water source. Cisterns can supplement water storage in cases where well production is insufficient or where no potable water is feasible. However, bulk water sales are not considered a guaranteed water right from a water provider.

Counties that regulate cisterns, either through the development code or policy, lean toward hauled water only as a last resort when no other water sources are available. They may also provide standards for cistern construction and storage aimed at preventing issues with water quality and public health. The QQ advises against hauled water and recommends very careful consideration of the implications of permitting development where no viable water source is available on site.

Colorado Counties with Cistern and Hauled Water Requirements and Standards

Community	Regulatory Description	Link to Development Regulations
La Plata County	Available as a water source option only in cases where a well is impractical. Includes decision criteria for impracticality of a well. If a cistern is permissible, include a statement on plat note and in covenants about water source. Requires that, if a water system is developed within 400 feet of development, it must connect within 18 months.	Development Regulations Section III.E. Water Quality and Quantity Standards
Weld County	Applies to structures prior to 1993 that have not yet received a building permit and lack another approved source of water. Adopted to set standards to protect public health. Prohibits use of a cistern until obtaining a Cistern Usage Permit. Outlines process, including inspection and cistern standards, to obtain permit. Permit terminates when another water source becomes available.	Development Regulations Article III. Cistern Water
Fremont County	Required at submittal to obtain building permit when evidence of proof of water supply from either a well or water provider is required. Cisterns as a water source limited to parcels *greater than 35 acres* **and** *platted prior to June 1, 1972,* where an individual well has proven to be impossible.	Building Department Cistern Policy

Best Practices for Water-Supply Standards

This section lays out the best practices for most of the elements above to help a local government determine how to improve their water-supply standards.

Identify the Water Source(s)

A development code should be specific and include all the types of water supply sources deemed appropriate by the local authority. These may include water for a development from:

- An individual well.
- Shared well.
- Cistern.
- Water provider.
- Water demand offset program.
- Reclaimed water.

If multiple sources exist, clarity should be given regarding whether there are limits to where certain sources are permissible such as: no wells in a municipality, requirement to connect within certain number of feet of a water provider line, requirement to connect to community or public systems in specific zones, or limits on hauled water. Additional information is provided for evaluating water sources for hauled water and water-demand offset programs on pages 24-25.

Provide Proof of Water Rights

Per state statute, a development code should specify how the water right for each water source should be verified, including the following as proof for different water sources:

Water Right Verification by Water Source	
Groundwater Well(s)	A letter from the Colorado Division of Water Resources (DWR) verifying a permit for a groundwater well(s).
Water Provider	A letter from a water provider with information on the provider's supply portfolio and capacity to serve.
Water Rights Transfer	If a water dedication is required or water rights being provided, proof from an attorney verifying water rights and appropriate use.
Augmentation Plan	An augmentation plan or certificate, where required.

Augmentation and Water Adequacy Requirements

In Colorado, augmentation is required in areas where there is a shortage of water due to unsustainable use of groundwater or surface-water over-appropriation. Augmentation is not proof of an adequate and sustainable water supply. Instead an augmentation plan is designed to address the potential harm done to streams and downstream water rights from groundwater pumping or over-appropriation. A *Plan for Augmentation* is a Water Court-approved plan designed to protect senior water rights while allowing junior water rights to divert water out of priority. Augmentation requires that the amount of water consumed be placed back into the impacted stream by time, location, amount and quality. Where augmentation is required, a developer needs to either purchase an augmentation certificate or develop an augmentation plan. Understanding the hydrology and spatial distribution of development within an augmentation zone is an important step in managing water resources sustainably and planning for future development.

Water Rights Dedications or Payment-in-lieu for New Development

In communities that use surface water, either for irrigation or potable supply, some require developers to "bring water with them" through the dedication of water rights equivalent to the demand that the new development will require. This requirement shifts some of the burden of ensuring an adequate supply to the development community. Many communities require developers to acquire their own water rights rather than a fee in lieu. This approach is beneficial to water utilities who need to augment their water supply portfolio to meet new demand but lack staff dedicated to acquiring water rights. In cases where water costs are increasing or unpredictable, delaying acquisition of water rights for a development can result in a community's in-lieu-of fee being inadequate. However, if a community is also trying to protect agricultural water rights, a water utility or water provider may be more skilled at negotiating water acquisitions that result in mutually beneficial urban and agricultural outcomes. A community's development regulations should provide clarity on the process for water rights transfers. Within the headwaters region, substantive examples can be found in different codes, including:

- Carbondale, Article 10 Water Rights Dedication.
- Steamboat Springs, Chapter 25, Article II, Sec 25-77 Water Rights Dedication Policy.

Provide Calculation Methodology for New Development Water Demand

A *water budget* is a term with many meanings in water-resource management.[5] In the context of development review, a water budget is a calculation of the water quantity required to serve a development. Methodologies to determine the amount of water required for a development vary and generally depend upon local context, including utility capacity, number of water providers and water sources. The calculation methodology can be based on a general standard, actual historical-use data standards for building type, or even specific design standard calculations that account for fixtures, appliances and irrigation. In some instances, the methodology may require both an indoor and outdoor water-demand calculation. The outdoor methodology may be a fixed standard or a calculation that accounts for vegetation types, climate, soil characteristics and acreage to be irrigated.[6] Codes should specify the desired calculation methodology to ensure consistency in the development review process and to provide the most accurate estimation possible for a required water supply.

It should be noted that municipalities, water districts and counties have the authority to set a *maximum daily or annual use* standard for a new development as a means to promoting water conservation and efficiency and managing a limited water supply. In communities capable of tracking water consumption through metering, the water budget agreed to during the development approval process may be enforced. Water users found in violation of an agreed-upon water budget based on review of utility bills may be fined or required to renegotiate with the water provider. Jurisdictions also have the authority to review redevelopment during the building permit approval process to determine if a project's water budget is consistent with the water budget approved during initial development approval.

Examples of Water Demand Calculation Methodology

Methodology Used	Community	How Calculation is Applied in Code
Plumbing Standard	Gunnison County	• *Average Daily Demand* (ADD) based on 350 gallons per day per residence. • Estimated *Maximum Daily Demand* (MDD) based on 3 times average daily demand. • Estimated *Peak Hour Demand* (PHD) based on 6 times average daily demand. • ADD for commercial and industrial demand is based on industry standards.

5 For all definitions and applications of the term water budget, see Appendix B: Definitions

6 U.S. Department of Energy, "Calculating Outdoor Water Demand Guidelines"

U.S. Environmental Protection Agency and Colorado Department of Public Health and Environment Standard for Residential Demand	La Plata County	• 350 gallons per day (gpd) per dwelling unit. • Or based on a calculation of indoor and outdoor water demand separately. 195gpd per unit or 75 gpd per capita minimum or indoor use and an outdoor minimum daily quantity of 210 gpd per unit. • Or based on a site-specific demand study with quantification of indoor water demand and number of square feet of land surface to be irrigated, plant types, quantity of plants, and estimates of plant evapotranspiration and irrigation efficiency.
	Colorado Department of Local Affairs Model Code Provisions	• Average daily demand of 350 gpd per dwelling unit or 75 gpd per capita, whichever is greater. • Manufactured home parks – 450 gpd per home. • Campgrounds and recreational vehicle parks – base on 50 gpd for common connection and 100 gpd for individual connections.
Historical Use	Santa Fe, N.M.	Based on Water Use Study that identified average use for residential and commercial building types by acre-feet per square foot. For example: • Single Family Dwelling unity < 6,000 square foot lot 0.15 acre-feet/year. • Full-service restaurant 0.02 acre-feet/year/seat. • Hotel 0.13 acre-feet/year/room.
Standard Developed by County	Douglas County	Residential uses: • 1 acre-foot/year in large-lot zone districts. • 0.75 acre-foot/year in smaller-lot zone districts. Irrigated areas: • 2.5 acre-feet/year/acre. Commercial and Industrial uses: • 0.75 acre-feet/year/6,695 square feet of building area for commercial, office or industrial.
	Boulder County	• The average daily demand of the entire service area and the proposed development will be based upon 300 gpd per residential unit or 75 gpd per capita, whichever is greater. • The average daily demand for commercial and industrial uses will be reviewed based on the anticipated demand of the proposed development. Appropriate multipliers may be utilized in calculating this amount. • Each residential lot shall have adequate water to sustain required landscaping. Irrigation water • The irrigation water demand shall be based on information submitted by the soil conservation service. Such material shall consider the type of vegetation to be maintained, the soil characteristics, the historic yield of the property and available water rights. • All areas shall be evaluated for water demand. • The development agreement shall include any requirements for water.
DWR Individual Well Standard	Colorado Division of Water Resources	Each ordinary household use: • 0.3 acre-foot per year (*about 268 gpd*). • Use for each 1,000 square feet of lawn irrigation: 0.05 acre-foot per year *(about 45 gpd).*

The best practice for a community will be based on capacity. Communities like Santa Fe County and the City of Santa Fe rely on an analysis of historical demand to establish water allowances for developments and hold households accountable for exceeding these water allowances. Santa Fe County even makes the water demand allowance per household different based on water sources and zoning, and for individual wells, the county permits less than what is allowed as a maximum by the State of New Mexico in order to reduce groundwater withdrawals.

Specify Water Supply Adequacy Standards

This section should, at a minimum, meet the state statute requirement for proof of adequate water, including the community's definition and articulation of the process for how, when and what a developer should submit as proof of adequate and sustainable water supply. Which process a developer needs to follow is dependent upon the water providers and water source.

Proof of Adequate and Sustainable Water Supply for Different Water Sources as Defined by State Statute	
Water Entity with a Water Plan	A water supply plan on record with a local government can serve as proof of ability to serve as long as the water plan has been updated within past 10 years, has a minimum 20-year planning horizon, and includes a description of both the provider's physical water sources and water supply obligations.
Water Entity Without a Water Plan	A commitment letter to serve with proof of ability to provide adequate water supply as defined by the state as proof of ability to serve, including the physical source of water to serve a development's water demand through buildout and proof of a firm yield.[7]
No Water Entity and a Well	A water supply report that includes water yield under various hydrological conditions.

The complexity of this specific section depends greatly upon the water sources available to a jurisdiction, specifically, whether the water source is a government-owned utility, water district(s) or individual well(s).

- **For communities utilizing municipal or water district supplies**. Code language should include required documentation by the state rule supported by a clear methodology for how to calculate the proposed development's water demand so that the water provider can accurately compare its supply portfolio or the water rights provided against the development.
- **For communities utilizing wells**. Since the specific methodology is not provided by the state, the code should include the preferred methodology for developers to use to demonstrate adequate water supply. The specific methodology is usually included in a section describing the water supply report requirement for well-supplied developments. Since water supply reports can be quite technical, planning departments may find it useful to create a summary sheet for development review. Jefferson County utilizes a Well Water Supply Report, a two-page summary that provides a good example. In some Colorado communities where water resources are very limited, planning departments have added staff hydrologists, as they have with infrastructure engineers, to assist in the development review process. While this may be an option for some, headwaters jurisdictions will most likely rely on the DWR who can review water supply reports to make a determination on water adequacy during development review.[8]

Proof of Adequate Water Supply for Communities with Individual Wells

Within the QQ, some counties have water districts that provide water supply to developments for defined service areas. For portions of the county outside service areas, most development relies on individual wells and septic systems. The DWR is the agency responsible for well permits and review of development proposals.

7 Firm yield refers to the maximum quantity of water that can be guaranteed with some specified degree of confidence during a critical period, usually a historical drought period.

8 For communities already using DWR as an external review agency, information is provided in the development review letter on whether a proposal includes sufficient information.

As defined in Guide to Colorado Well Permits, Water Rights, and Water Administration, most residential development occurs on exempt wells, of which there are two types:

- *Household use only*. This type of well does not permit outdoor watering. Enforcement is dependent upon voluntary compliance unless a county requires well metering.
- *Domestic and livestock wells*. This type of well is issued on tracts of land of 35 acres or more where the proposed well will be the only well on the tract. These well permits allow the well to service to up to three single-family dwellings, irrigate 1 acre or less of lawn and garden, and provide water for the individual's domestic animals and livestock. To serve the allowed three households typically requires a shared-well distribution system and shared-well agreement. This type of well is most common where large lots are subdivided under the state's subdivision exemption for tracts 35 acres or greater. For communities where these larger parcels are being subdivided again into smaller lots, note that, in 2011, the state changed its policies and now requires that these wells may need to be re-permitted as household-use only wells as a condition of approval.[9]

A Well Pumping and Yield Test is the most common method for estimating the quantity and sustainability of wells.[10] An aquifer test is conducted in the field to determine:

- The *drawdown* of water level over time to determine how much water is in the aquifer and the aquifer's recharge rate.
- The *water yield* to determine how much water the well can produce over a period of time, the size of the pump needed and if additional on-site water storage is necessary.
- The *average yield* is the reported yield of the well immediately after it is built. Yield is always highest right after the well has been developed.

Well-pumping test methodologies can vary and should be developed based on local hydrology, climatic variability and other requirements, and the standard should be developed with the support of professionals.

The best practice is to apply a proof-of-water standard to all development on wells. However, the applicability of a standard for more stringent proof of adequate supply can be based on:

- The size of a development (*e.g. more than four units*) based on the water demand budget (*e.g. demand is greater than 0.10 acre-foot per year).*
- Recent existing data or studies (*well pump test conducted within 1 year on adjacent properties*).
- Location of development *(within a zone where water supplies are limited).* When a development crosses the defined threshold, it triggers the need for additional information and rigor in a developer's application.

These variations in both applicability and review requirements should be clearly stated in the code. The development of a water-supply report should be conducted by a professional hydrologist, geologist or water engineer. Counties should submit information in the water supply report to DWR at or following preliminary plat and prior to final plat to best inform decision-making.

Specify Water System, Distribution and Connection Standards

Design standards for water systems should define the engineering, ownership and operational requirements for the different system types including for public, community and private water supply systems as well as shared wells. In some cases, these specifications are in external engineering design manuals and only referenced briefly in the code. In other cases, the codes might explicitly state requirements. The code should state compliance requirements with CDPHE as well as any additional design standards, such as construction to meet specifications for connection to specific water providers.

9 The DWR issued policy memo 2011-11 to provide guidance on the subdivision of 35-acre tracts with exempt wells into smaller tracts.

10 California Department of Water Resources

Examples of Well Water Adequacy Requirements: Well Pumping and Aquifer Tests	
Gunnison County	Applicable to developments on central well(s). • Well Test. A single-well constant-rate pumping test conducted using an electric submersible or top drive turbine pump for a minimum of 24 hours. • Recovery Monitoring. Shall be monitored for 24 hours after the cessation of pumping to identify the rate and volume of recovery. • Monitoring Devices. Water levels shall be monitored using an electric water-level probe or pressure transducer. • Frequency of Measurement. Should be commensurate with the rate at which water levels are changing inside the well. As a rule, once every 2 minutes during the start of the test and decreasing in frequency as the water level stabilizes.
Routt County	Evidence is submitted showing adequate water quality and quantity can be made available for the development. Such evidence may include test results of wells within 500 feet of the lots in the development, laboratory analyses of water quality, and geologic and hydrologic analysis. Evidence should also show that the water source will be safe, adequate and reliable.
La Plata County	Applicable to developments of four lots or fewer. • Well Test. A single-well constant-rate pumping test conducted for 8 hours with water level recovery data for 4 hours of the test duration. • Well must maintain a minimum pumping rate of 2.5 gpm for test duration. Pumping rates should not vary by more than 10 percent. • For flows of 30 gpm or less, volumetric measurement using 5-gallon minimum-sized calibrated bucket and a stopwatch is acceptable. For flows over 30 gpm, a calibrated flow meter, orifice bucket, orifice plate and manometer, or for high-capacity wells, ultrasonic meters should be used. Cut-throat and Parshall flumes are also acceptable. • Recovery Test. Recovery test shall be conducted for 4 hours. If static water levels recover to within 10 percent of initial static water level, the test can be terminated. Applicable to developments of more than four lots. • A comprehensive hydrogeologic report to identify aquifer characteristics, including aquifer hydraulic conductivity, transmissivity and storage coefficient.
Santa Fe County, N.M.	• Hydrological report may rely on previously developed geohydrologic reports with appropriate pumping test on wells within 1 mile in lieu of new test well as long as the report adequately characterizes the aquifer beneath the proposed development. • Where a test well is required, no more than 1 test well per 10 lots shall be required where cluster or shared wells are to be used and share the same geologic formation. • The total available drawdown shall be reduced by a factor of 20 percent as a margin of safety to account for seasonal fluctuations, drought, reduction of well efficiency over time, and peak production requirements.
Jefferson County	• At least one viable aquifer test shall be conducted where individual wells are proposed. Production well shall be pumped for a minimum of 8 hours. • The yield of the well shall be determined as a stabilized production rate where withdrawal rate and the drawdown do not change by more than 10 percent during the last hour of the test. • Water levels in the production wells shall be monitored for at least 24 hours after pumping stops or until 90 percent recovery has occurred. • The test for water-supply adequacy shall be valid for up to 3 years unless the county determines conditions in the hydrology or land use have not changed since the test was completed.
Boulder County	• Well should be continuously pumped or bailed at a minimum rate of 3 gallons per domestic unit for a minimum of 5 hours. After 5 hours of pumping or bailing at such a rate, recorder data should show that the well is producing at a minimum rate of 3 gpm per domestic unit and that the quality of water recovered from the well after 5 hours meets public health standards for potability.

Examples of Water System, Distribution, and Connection Standards	
Shared Well System	**La Plata County Sec. 82-186 III. D. Shared Well Systems** For wells serving two or more residential units, a water design and operations plan prepared and certified by a professional engineer or professional geologist who is experienced in the design of domestic water-supply systems shall be submitted for approval to the county. Requirements for the submittal are more fully detailed in subsections IV-VIII. Shared-well systems must have sufficient storage capacity to store a quantity of water sufficient to supply two days of average total daily demand of the water system. Placing an electric power meter and water meter on the common well facility to measure power output is suggested. Water demands must be calculated using the water-demand criteria in subsection II.
Water Systems	**Routt County Public Water System Requirement 4.5.2 Water Supply** D. Where a public water system is proposed all the following requirements shall be met: 1) The availability of water sources, including quality, quantity and dependability, shall be explained in a written report and certified by a registered professional engineer or geologist and an attorney, if necessary, to substantiate water rights. 2) Representative samples of the source water must be analyzed by a reputable laboratory to confirm satisfactory chemical quality. 3) Water supply, treatment and distribution facilities must be provided in conformance with the requirements of the CDPHE, the local health authority and the board through their designated representatives. 4) The minimum size of a water main shall be 6 inches in diameter unless otherwise stated by state regulations or the Uniform Fire Code (if applicable). 5) An organization shall be formed to own and operate this system. Administration shall be by an incorporated town, homeowners association or approved special district whose service plan has been submitted and approved by the county.

Define Potable Water Quality Standards

The Colorado Primary Drinking Water Regulations set the minimum standard for a potable water supply based on the federal drinking water standards under the Safe Drinking Water Act (SDWA). However, the SDWA does not apply to private wells nor to smaller water systems. The state's water adequacy statute gives authority to local governments to ensure that those wells and smaller systems excluded from oversight by CDPHE meet the requirements for water "quality, quantity, dependability and availability."

The CDPHE requires public water systems to pass a water-quality test at permitting as well as to submit regular water quality tests. Individual wells are not tested by the CDPHE unless local government regulations require testing of smaller systems and private wells. This is done by requiring a water quality test during pump tests with samples submitted to CDPHE, the county's public health department or a certified lab by final plat.

Example of Water Quality Requirements Based on CDPHE Standards			
Turbidity	Silver	Radium 226	Dissolved Solids
Arsenic	Selenium	Color	Iron
Barium	Endrin	Total Hardness of CaCO3	Manganese
Cadmium	Lindane	Magnesium	Copper
Fluoride	Methoxychlor	Sodium	Zinc
Lead	Toxaphene	Chloride	Molybdenum
Mercury	2, 4-D	Sulfate	Ammonia as N
Nitrate	2,4,5-TP	Specific Conductance	Phosphate as P
	Gross Alpha		Boron

Link Zoning to Water Supply Standards

Zoning is an important tool to support sustainable water management. The density and location of development can impact both surface water and groundwater. Zoning can regulate development density to match the available water supply and protect important water resources. With different water providers, zones can be used to align with different capacities and requirements. The zoning overlay should include:

- *Purpose Statement*: Details what water resources are to be protected.
- *Description*: Describes the boundaries of the zone.
- *Applicability*: Describes the types of development applications that must meet the requirements in the zone.
- *Standards or Requirements*: Details additional development standards.
- *Permitted Uses and Activities*: Describes permitted uses.
- *Variances and Rezoning*: Describes administrative processes in cases where zone standards are inappropriate to specific applications.

Case studies for how to connect land-use zoning and water-supply standards are provided below.

Include Water Conservation and Efficiency Standards

At a minimum, jurisdictions should include a development review standard for water efficiency and conservation. For example, the City of Broomfield includes in both its development review standards as well as planned unit development standards the following: *The proposal should optimize conservation of energy, water, and other resources.* While this does not provide guidance for how to meet the standard, it does demonstrate a jurisdiction's intent to manage water resources and offers an opportunity to discuss water savings.

A jurisdiction may also include water resources as part of its 1041 regulations. Water would fall under the state's defined areas of interest of natural resources and activities of interest including: site selection and construction of major new domestic water and sewage treatment systems, major extension of existing domestic water and sewage treatment systems, efficient utilization of municipal and industrial water projects, and site selection and development of new communities. Both Grand County and Eagle County include water supply in their 1041 regulations. Grand County's 1041 regulations state, "*The water supply for the project will use recycling and water reuse to the greatest extent possible,"* while Eagle County's regulations state, *"The project shall emphasize the most efficient use of water, including recycling, reuse, and conservation of water."* Note that, while a water provider can offer graywater, recycled, or non-potable water as part of its water portfolio, on-site graywater or recycled systems are regulated by the state and require a jurisdiction to adopt specific code language. In Chapter 3 Reducing outdoor Water Demand, Permit Alternative Water Sources, page 63, provides more information about reclaimed, recycled and reused water.

A less common practice in Colorado permitted by the state is requiring new subdivisions, particularly major subdivisions, to create water conservation plans as part of the adequate water-supply review requirements prior to development approval. The best-known example in Colorado of a negotiated water conservation requirement is Sterling Ranch, a 3,500-acre master planned community in Douglas County. During the approval process, a water conservation and efficiency plan was negotiated that has resulted in the subdivision being a model for what is possible in Colorado with water demand now at 62 gallons per capita per day.

Eagle County, in collaboration with the Eagle River Water and Sanitation District (ERWSD), has been working to improve water budget estimates for new developments. The ERWSD discovered that, for some developments, water consumption after buildout was greater than what had been proposed. As the ERWSD explores water budgeting, the county and water district agreed to include additional requirements in the development agreements for planned unit developments (PUDs), the primary type of development in the service areas. In the approval for Fox Hollow PUD, the agreement includes the total water demand estimate for the subdivision by indoor and outdoor, consequences for exceeding the total water allowance, and both indoor and outdoor water efficiency and conservation measures.

Santa Fe County, N.M., took a different tact. Rather than negotiate each development separately, in 2006 they adopted an ordinance that requires water restrictive covenants to run with the land for all new subdivisions as part of development approval, setting a maximum water demand for different lot sizes. The code additionally contains water conservation and efficiency standards required by the county for all new development. Both the water budget and conservation standards are required to be included in a new subdivision's covenants.

Subdivision Covenant Example: Santa Fe County, N.M.

Article 13: Water Use Limitations; County Development Code; Conservation Plan; Special Provisions for Enforcement

13.1 **Water Use Limitations on Domestic Water Use:** County Development Code. Domestic water use is restricted to 0.40 acre-feet per year (130,331 gallons per year) per lot as required by the County Development Code. Water use on the condominium tracts is restricted to 14.33 acre-feet in the aggregate, which amount equals 0.40 acre-feet per year (130,331 gallons per year) for condominium units and 0.73 acre-feet per year for other accessory and landscaping uses and the recreational facilities in the condominium tracts. No individual domestic wells under NMSA 1978 § 72-12-1 maybe drilled on any single-family residential lot or on the condominium tracts. the following additional provisions apply to lots and units under the County Development Code:

13.1.1 Water-saving fixtures shall be installed in all new construction. Water-saving fixtures shall include, but not be limited to, low-flush toilets, low-flow fixtures, and insulation of hot water pipes. Toilets shall use no more than 1.6 gallons per flush; shower head flows shall not exceed 2.5 gpm; and faucet flow shall not exceed 2.5 gpm.

13.1.2 Evaporative coolers must circulate bleed-off water.

13.1.3 Dishwashers shall use no more than 13 gallons in a regular cycle and shall have a cycle adjustment which allows reduced water to be used for reduced loads.

13.1.4 Washing machines shall use no more than 43 gallons in the regular cycle and shall have cycle or water-level adjustments which reduce amounts of water to be used for reduced loads.

13.1.5 Low water-use landscaping techniques applying the principles of xeriscaping shall be utilized. Drip irrigation is encouraged whenever possible. Low water-use grasses, shrubs and trees may be watered as needed during the first and second years of their growth to become established. Thereafter, such vegetation shall receive only minimal water as needed by each species. Lawns of nonnative grasses shall not exceed 800 square feet per lot or unit and shall only be watered with rainwater collected by means confined to the property or with recycled household graywater. Graywater systems shall meet the requirements of the New Mexico Construction Industries Division and the Uniform Plumbing County Development Code and other applicable regulatory requirements.

13.1.6 All water service connections shall be metered with a Santa Fe County-approved meter. Meter readings shall be recorded annually within two weeks of January 1st. Meter readings shall be provided to the County Land Use administrator upon request.

13.1.7 Except as part of the recreational facilities, swimming pools, of a permanent or temporary nature are not permitted, on the lots or condominium tracts. Temporary wading pools of a diameter not to exceed 8 feet and a depth not to exceed 1 foot and covered spas are acceptable at each dwelling unit.

13.2 **Water Harvesting**. Ordinance 2003-6 adopted by Santa Fe County requires water harvesting by use of various methods of rainwater catchment including cisterns, rain barrels, and directing drainage to landscaped area via swales, tree wells, raised planters or other permaculture techniques. Each lot owner will be required to collect roof drainage from a minimum of 85 percent of roof area to be reused for landscape irrigation. Homes consisting of 2,500 square feet or greater of heated area must install underground, partially buried, or insulated cisterns, and all landscaping shall be connected to a drip irrigation system. Homes under 2,500 square feet of heated area must submit a rainwater catchment plan with their development permit application.

13.3 **Special Enforcement** of Article 13 by Santa Fe County; Severability.

13.3.1 The covenants of this Article 13 shall run with and bind the land, shall inure to the benefit of and be enforceable by the County Land Use administrator, any owner or the association in any proceeding at law or in equity against any person or persons violating or attempting to violate any covenant or restriction or to restrain any such violation. Any failure by the County Land Use administrator, any owner or the association to enforce any covenant or restriction herein contained shall in no event be deemed a waiver of the right to do so thereafter. If the County Land Use administrator, an owner or the association prevails in any action against any person or persons to enforce any provision hereof, they shall be entitled to recover from such person or persons his costs and reasonable attorney's fees.

13.3.2 The invalidity or unenforceability of any covenant, restriction, term or other provision

of Article 13, as determined by a court of competent jurisdiction, shall not impair or adversely affect the validity or enforceability of any other covenant, restriction, term or provision hereof: which shall be and remain valid and enforceable to the fullest extent permitted by law. The provisions of this Article 13 shall be governed by and interpreted under the laws of the State of New Mexico and are binding upon each owner, and the owner's successors and assigns.

13.4 County or Regional System. If a water system is constructed and available to serve the subdivision, lot owners and unit owners may be required to connect their improvements to the Santa Fe County or other regional water system.

Case Studies

County Water Adequacy Standards

Douglas County offers an exceptional case study demonstrating how a community can regulate development to protect groundwater supplies. Most of the county is reliant on the Denver aquifer, a non-renewable (non-tributary) source with great variability in hydrology across the county. While hydrology is different than the headwaters region, applicable to the region is the use by Douglas County of a water-supply standard that utilizes a zoning overlay with four districts that align with and address the variations between different hydrological zones. Each zone requires a different combination of water sources intended to protect groundwater by diversifying the water supply and the County's reliance on non-renewable sources. Each zone has its own standards that address the types of development permitted, requirements for well pump tests and well yields, a proven renewable water right, a standardized water budget methodology, and a requirement for a land dedication to protect groundwater under open space zones. Where water is available from a water provider, the development proposal must include a water supply plan and report.

Jefferson County's water-supply standards are applicable to two water sources: a public water system and individual wells. For developments utilizing wells, the county requirements are:

- Proof of legal water based on documentation that includes Water Court decrees and/or well permits.
- A water-supply report proving quality, quantity, dependability and quality prepared by a professional geologist or registered engineer qualified in water resource engineering. The report content requirements are clearly identified.
- A water-supply information summary.
- An aquifer test with specific requirements outlined for cases where water requirements are greater than identified standards per acre.
- A final water availability analysis conducted by the planning and zoning department that will review for sub-basin hydrology, climate and existing land development.

Potentially useful for the headwaters region is the county requirement of a two-page Water Supply Information Summary form to be completed and submitted for development proposals using well-water systems. This application form includes a checklist of the water-quality bacteriological and chemical analysis results, well test data, water-demand estimates, water right verification, and when required, aquifer test results. Additionally, Jefferson County has a *Mountain Groundwater Overlay District (Section 42)* that adds additional requirements including a 4-hour yield test in a geographic area of the county where the fractured-bedrock geology creates more uncertainty with well water.

In Santa Fe County, N.M., development occurs on a public system as well as with individual wells. The County utilizes three types of growth tiers to direct growth into designated growth areas where appropriate infrastructure and renewable water resources exists and to direct growth away from environmentally sensitive lands through low-density development. Their county's water-supply standards for developments on individual wells and having greater than five units require a well permit and a hydrological study with different pump-test rates and recovery time periods for different hydrological formations to prove adequate water for 99 years. For developments using a service provider, applicants must submit a Water Service Availability Report with information on system capacity and ability to serve. All new developments, regardless of water source, must install meters. Additionally, all development must

also meet water-conservation requirements, filing either subdivision covenants or including plat notes that commit to not use more than the agreed-upon amount of water per lot per year. Santa Fe County has achieved one of the lowest county per-capita water-demand rates in the West.

La Plata County, as of May 2019, is in the process of updating their code. Beginning in 2017, a Water Advisory Committee worked on recommendations for policy updates. The committee's recommendations to improve their water-supply standards include adding or strengthening:

- A requirement for an 8-hour pumping test for new wells or for the change-of-use of an existing well.
- A requirement for proof of water supply adequacy under various hydrologic conditions.
- A requirement for water-quality standards, including a requirement for a water-quality test for individual wells at drilling and upon the sale of a property.
- Water system development standards that include backfill, restraints, pipes, etc.
- Requirements for acquisition and transfer of renewable water rights.
- Promotion of growth connected to a water system.
- Adoption of 1041 powers that address agricultural dry-ups.

The memorandum outlining recommendations is a good example of the process to review water adequacy standards in a county.

Pitkin County contracted hydrology consultants to conduct field work and hydrologic systems analysis for five sub-areas in the county: the Upper Crystal River, the Central Crystal River, the Lower Crystal River, West Sopris Creek, and Thompson and Coal creeks. The study found that each area had different hydrological conditions and that the differences in the systems, if not properly managed, could cause a decline in water resources. An important consideration for these areas was reliance on groundwater recharge from irrigation systems and practices. The study found that if water rights and allocations of the irrigation ditches changed in one of the aquifers, groundwater would decline. The consultants worked with Pitkin County to develop an evaluation process to inform land-use decisions and longer-term groundwater management for the county. The county has integrated area maps into the development code for the Capitol and Snowmass Creek, Crystal River, and West Sopris Creek study areas and requires additional review criteria for proof of adequate water supply, including a hydrogeologic analysis or pumping data for these areas.

El Paso County has an extremely comprehensive water-supply standard that addresses the complexity of its surface-water and groundwater supplies. It offers extensive detail for the content of:

- The water-supply report.
- Demand calculation methodologies for surface-water and groundwater sources.
- A 300-year supply requirement.
- Articulation of what information is needed during each phase of the development review process.
- The basis for determining sufficient supply.

The standards apply to all developments, although subdivisions with four or fewer lots may submit a simpler water-resource summary in lieu of a full water-supply report. While the detail in this code appears excessive for headwaters communities, this water-supply standard offers a good example of how to provide detail and clarity in a code requirement, particularly for the report content, and how to be explicit about the decision-making processes.

Model Code Provisions

Adequate Water Supply

General Provisions

A. Purpose

Water sustains <*jurisdiction*> social, economic, recreational, and ecological values and requires the sustainable and efficient management of scarce water resources. To ensure that future land use development has a sustainable water supply, proposed development must demonstrate a water supply that is legally and physically sufficient in terms of quality, quantity, and dependability at build out, and is in compliance with Colorado law.

<For county, C.R.S §29-20-301 et seq. and C.R.S. §30-28-133(3)(c)(d)>
<For municipalities, C.R.S. §29-20-301 et seq. and CRS §29-20-103>

B. Applicability

The requirements of this section shall apply to:

1. All development projects which result in the creation of new lots and for which water is required and a necessary element of the development.
2. Site plans and conditional use or special use permit applications where water supply is required for consumptive or irrigation purposes.
3. Redevelopment which requires a change-of-use permit for land use <*and/or a well permit*>.
4. Development that requires a building permit where the project is increasing the square footage by <a *percentage, such as greater than 50%*> triggering a review for consistency with the original water supply allowance granted.

C. Exceptions

<such as development that will not use water, agricultural uses not requiring subdivision approval, a plat vacation>

Definitions

Aquifer - A body of rock or sediment that is sufficiently porous and permeable to store, transmit, and yield significant quantities of groundwater to wells and springs.

Firm-yield -To deliver the same amount of water every year regardless of water supply conditions.

Groundwater— Water that occurs beneath the land surface and fills the pore spaces of the alluvium, soil, or rock formation in which it is situated. It excludes soil moisture, which refers to water held by capillary action in the upper unsaturated zones of soil or rock.

Tributary ground water - Water in an aquifer that is hydraulically connected to surface water where withdrawals have an impact on the surface water flows of the stream.

Water Allowance Calculation – The calculation methodology used to determine water demand for a development at build out. *<Select applicable methodology. For more information on water estimate methodologies see Chapter 2, page 27. For information on methodologies for outdoor water demand calculations see Chapter 3, page 62.>*

- *Indoor demand is shall be based on <gpcd standard> and demand for outdoor irrigation shall be based upon the number of square feet of irrigated land, plant types, quantity of plants, soil characteristics and estimates of plant evapotranspiration and irrigation efficiency.*

- *Demand shall be based on existing service provider standards.*
- *Demand shall be based on <gpcd standard> per unit.*
- *Demand shall be based on historical use data provided by water provider.*

Water Demand Management – Strategies to reduce or conserve water by influencing water demand.

Water Supply Adequacy — The legal and physical water available each year to meet demand of a proposed development that is adequate in terms of quantity, quality, and dependability.

Water Quality — A description of the chemical, physical, and biological characteristics of water with regards to its suitability for potable use.

Water Supply Quantity — Total quantity of water required to serve a development for average daily, annual, and peak demand.

Water Supply Dependability — Percentage of the time water supplies meet demands.

Water System – A system for the provision of water for human consumption through pipes or other constructed conveyances.

Community Water System — A public water system for the provision of water for human consumption through pipes or other constructed conveyances that serves at least 15 service connections used by yearlong residents or that regularly serves at least 25 year-long residents.

Private Water System – A water system that is not a public water supply system, that has fewer than 15 service connections and does not regularly serve an average of twenty-five (25) individuals daily at least sixty (60) days each year.

Public Water System— A system for the provision of water for human consumption through pipes or other constructed conveyances that has 15 or more service connections or regularly serves at least 25 individuals daily at least 60 days out of the year.

Water Supply Submittal Requirements

A. Application Requirements

Applicant shall submit the following documentation to demonstrate whether the proposed water supply is adequate in terms of quantity, quality, and dependability.

1. A description of the development including acreage of each land use, total square footage of non-residential use, total number of dwelling units per phase, and total number of dwelling units in development at buildout.
2. Estimate of water demand for the development through build-out using the methodology approved by the <jurisdiction>.
3. Description of the legal entity that will own and operate the water system.
4. Description of the water system or well capacity to serve the proposed development.
5. Proof of adequate water supply to meet the subdivision water demand.
6. Proof of legal water rights either as an attorney letter verifying legal right and/or a well permit obtained from the CDWR to serve the proposed development.
7. Proof of an augmentation plan where one will be required for the source of supply.
8. Water quality analysis results to demonstrate compliance with Colorado Drinking Water Standards.
9. Description of water demand management strategies, if required by the *<jurisdiction>.*
10. For public, community, or private water systems, approved system design completed by a professional engineer licensed in Colorado and meeting requirements of CDPHE.
11. For new water system, proof of adequate financial and operational capacity to maintain and operate the system

12. For shared wells, approved well system design completed by professional engineer licensed in Colorado and a copy of a shared well agreement.

B. Adequate Water Supply Documentation

The source of water supply shall determine documentation required to demonstrate proof of adequate water supply.

1. **Letter to Serve**. For water supply provided by a government water utility, a water and sanitation district, or any other water system to a proposed development, a letter indicating its willingness and capacity to serve shall be submitted as proof of adequate water supply. The applicant shall submit a letter to commitment to serve from the water provider confirming:
    a. A description of the legal and physical source of water supply to serve the development;
    b. Historical average flow of potable water and historic peak flow of potable water;
    c. The existing system capacity including total number of hook-ups, total number of commitments, uncommitted firm supply available for future development, and the ability to meet annual and peak demands of the proposed development;
    d. Proof of a firm yield under normal, single dry, and 20-year drought conditions;
    e. Current water conservation programs and any water demand requirements the water provider requires the development to implement;
    f. Confirmation of compliance with Colorado Drinking Water Standards.
2. **Water Resources Report**. For water supply not provided by a government water utility, a water and sanitation district, or any other water system to a proposed development, a Water Resources Report is required to determine whether the water supply proposed to serve a project is adequate in terms of quantity, quality, and dependability. The Water Resource Report shall contain an analysis of the following information:
    a. A description of the legal and physical source of water supply to serve the development;
    b. If groundwater, a description of the aquifer including but not limited to geologic maps, cross sections, boundaries, intakes and discharge areas, depth to water, water level contours, and estimated thickness of saturation of the aquifer.
    c. Summary of the results of the hydrologic assessment demonstrating the adequacy of the well for a water supply;
    d. Determination of the reliability of the water source confirming the ability to meet annual and peak demands of the proposed development under normal, single dry, and 20-year drought conditions.
    e. Any proposed water demand management strategies to increase water efficiency and reduce water demand.
    f. Evidence of compliance with Colorado Drinking Water Standards.

3. **Hydrological Assessments and Well Tests.** Development served by wells shall perform a hydrologic assessment based on the following requirements.

    a. The hydrologic assessment shall be predicated upon historical well data or actual well test results determined by the size of the proposed development. *<Option 1 is to make the requirements for a well test applicable to all subdivisions. Option 2 is to scale applicability based on size of development. Option 3 is to connect hydrologic variation to zoning. See Ch.2, page 30 for more information on tailoring requirements for wells. Options provided below>*
        i. Current and historical production rate of the existing well and wells within ½ mile shall be used for a subdivision of 2 lots which have an existing well within the proposed development.
        ii. A constant rate pumping test of an existing well shall be conducted for a subdivision of 3-4 lots which have an existing well within the proposed development.
        iii. Any well tests completed within the past year for an existing subdivision within 1/2 mile of the proposed development shall be used for subdivisions of 3-4 lots without an existing well within the proposed development.
        iv. Where there is no existing subdivision within ½ mile that has conducted a well test within the past year, a constant rate pumping test of a test well shall be used for subdivisions of 3-4 lots which do not have an existing well within the proposed development.
        v. A constant rate pumping test of a test well shall be conducted for a subdivision with more than 4 lots but less than <25>,

vi. *A comprehensive well water supply report shall be completed including 1 test well for every <10> lots for a subdivision with <25> or more lots.*

b. Well pumping test, conducted by a professional contractor certified by the State of Colorado, shall be summarized in a report prepared by the contractor and conducted according to the following requirements. *<Read more about well test standards Ch. 2, page 30. Appropriate test standards should be developed with hydrological expertise and based on geological context>*
   i. The total number of tests wells required shall be based on size of development.
   ii. A pump test shall be conducted for <*8*> hours.
   iii. Monitoring of existing wells within 600 feet of development boundary, with permission, shall be conducted.
   iv. Well test pumping and flow rates shall be measured at regular intervals for the duration of the test.
   v. Test wells shall be monitored to determine the rate and volume of recover. The drawdown shall not exceed 10% within last hour of the test prior to stopping of pumping with 90% recovery within *<24>* hours after cessation of pumping.
   vi. Wells shall yield a minimum <*13*> gallons per minute. Well yields less than <*13*> gallons per minute shall be required to develop storage.
   vii. Well pump test information shall be summarized in a report prepared by the contractor.
c. Where the hydrologic conditions are comparable, the hydrologic assessment may rely upon previously developed geo-hydrologic assessments with appropriate pumping tests within 1 mile of the proposed development in lieu of drilling a new test well.

C. Timing of Water Supply Submittal Requirements

No final land use application shall be approved without a finding that the proposed water supply meets water supply standards. Review of submitted materials will occur during the following phases.

1. At Sketch Plan, the water supply information shall include the description of the development and estimated water budget for the project at buildout, a description of how the development proposes to meet the water supply standards, and whether additional water supplies will be required for the development.

2. At Preliminary Plan, the application shall include all the data needed for the *<jurisdiction> <and if necessary, the Colorado Division of Water Resources>* to determine whether the water supply is sufficient in terms of quality, quantity, and dependability for the proposed development.
3. At Final Plat, the data submitted will remedy any issues or conditions identified in the Preliminary Plan review and prior to approval of final plat.

D. Enforcement

The <jurisdiction> shall have the right to enforce compliance with the requirements for an adequate water supply by withholding plat approvals or building permits pending compliance. The *<jurisdiction>* also maintains the right to verify that the water allowance approved by the *<jurisdiction>* and actual water use following construction is in compliance. If not in compliance, the *<jurisdiction>* retains the right to negotiate additional fees and/or a water conservation plan to bring the development into compliance.

Water Supply Standards

A. Adequate Water Supply. All development shall demonstrate water supply for the development that is adequate in terms of quantity, quality, and dependability at buildout, consistent with water supply application requirements and adequate water supply documentation.

B. Water Allowance. The water use of the development shall not exceed the total estimated water demand in the approved application. This limitation shall be included in development covenants, where applicable, or on the plat.

C. Compliance with Colorado Drinking Water Standards. Drinking water provided to development shall meet CDPHE drinking water standards**.**

D. **Connection to an Existing System**: Where an existing water system has sufficient legal and physical capacity to serve the development, the developer shall install water lines and other system requirements necessary to make service available to the property line of each lot in the following circumstances:

1. Development is located within <*select appropriate distance of 400 feet – 0.5 mile*> of an existing water supply line. Distance shall be measured from the property line of the proposed project.
2. Development is located within a designated growth management area where it is consistent with <*municipal, water provider, and county*> plans to connect to an existing system.
3. If development is within an area planned for future water service, but existing services are currently unavailable or infeasible, if and when a public water system becomes available, the development may be required to connect within <*designated time period such as 1 year*>. This requirement to connect shall be recorded on the final plat or part of a development agreement.

E. **Existing System Not Accessible:** Where an existing water system is unavailable or an existing provider demonstrates in writing that service cannot be provided, the following water supply options are available: <*select appropriate system types for jurisdiction*>

1. Central Water System (public, community, or private).
2. Shared Well
3. Individual Well
4. Hauled Water or Cistern with the following limitations:

   <*See Chapter 2, p. , for examples of challenges with hauled water and guidance on limiting hauled water usage for development*>

Water Conservation <*select all appropriate water saving standards*>

A. The water supply for development shall, to the greatest extent possible, emphasize water conservation, water efficiency, and use of reclaimed water.

B. All new residential development shall utilize water harvested by rainwater barrels for outdoor watering of landscapes as permitted by the State of Colorado.

C. The <*jurisdiction*> reserves the right to require the developer to enter into a water conservation agreement to reduce water demand and impact to water supply.

Dedication of Water Rights.

<*A local government can require dedication of water rights and the legal standards and dedication process can be clearly articulated. Options are described in Chapter 2, p.25.*>

Water System Design

A. **Connection To Existing Water System.** Development shall comply with construction standards of the system to which the development is connecting or to the standards of the nearest public entity that supplies water to facilitate a potential future connection.

B. **Public, Community, or Private Water System**. A public, community, or private water system shall be designed by a professional engineer licensed in Colorado and be designed to meet all applicable CDPHE and federal regulations. Engineering plans shall be submitted for review by <*jurisdiction*>.

C. **Shared Well System.** A shared well system serving two or more residents shall be designed by a professional engineer licensed in Colorado to serve the maximum annual water requirement for the proposed development including storage capacity for the average total daily demand for <*3 days*>. The final plat shall specify the shared well, permit number if available, and a prohibition on drilling additional well(s) while connected to the shared well system.

Chapter 3
Reducing Outdoor Water Demand

Chapter 3 Contents

Best Practices Summary: Water-efficient Outdoor Watering

1. **Add Soil Amendments**

- Test soil to determine amendments based on plant types.
- Remove rocks, debris, clumps.
- Enhance soil with compost based on a documented metric: number of inches, cubic inches per square foot or percent of volume.
- Till soil to 6-inch depth.

2. **Specify Plant Material**

- Provide specific plant lists with water-use categories.
- Limit turf to a certain percent of total development or square footage.
- Specify site plant composition by water-use categories (hydrozoning).
- Promote native plant species and natural areas.
- Integrate Firewise plant material where appropriate.

3. **Include Firewise and Water-efficient Landscapes**

- Low-growing, naturally occurring and non-resinous plants.
- Regularly maintained landscapes including mowing grasses, cutting back of shrubs when dormant to limit fuel, and irrigation system maintenance.
- Incorporation of open areas and buffers incorporating permeable hardscaping such as rock pathways or pebble mulch around groups of plants.
- Use of hydrozones with highest water use adjacent to structures.
- Efficient automatic irrigations systems that can be used in case of fire.
- Water budgets matched with defensible space practices.

4. **Require Mandatory Irrigation Scheduling**

- Day-of-week restriction with recommendation for limiting turf watering to 1-2 days per week.
- Time-of-day watering restriction to between 6:00 p.m. and 9:00 a.m.
- Time limit for zone watering (cycle and soak) to reduce over-watering and water waste, especially on turf.
- Voluntary restrictions on watering during rain events.
- Mandatory seasonal or year-round compliance.

5. **Require Efficient Irrigation System**

1. Water-use management plan or water budget.
2. Hydrozones that group similar water demands by irrigation zone.
3. Irrigation system design.
    - Smart irrigation system controllers.
    - Irrigation shutoff valve.
    - Master valves and flow sensors.
    - Rain sensors.
    - Soil moisture sensors.
4. Efficient emitters.
    - Overhead (spray) irrigation.
        - Allowable only where sufficient width exists to prevent waste.
        - Pop-up height consistent with mature height of plants being watered – minimum of 6 inches.
        - Pop-up spray heads equipped with internal check valves, internal pressure regulations, and matched precipitation rate spray and rotary nozzle.
        - Rotors equipped with internal check valves and pressure regulations are more efficient than spray heads.
        - Head-to-head coverage.
    - Drip systems.
        - Point source drip or subsurface drip irrigation for all trees, shrubs, perennials and annuals.
        - Internal check valves at each drip emitter and for subsurface drip systems.
        - Subsurface drip irrigation may be used for turf or grass areas.
        - Bubblers may be substituted for drip emitters.
5. Promote alternative water supplies.
6. Separate irrigation meters.

6. **Require Landscape Water-use Estimates and Maximum Allowable Water Budget**
7. **Prohibit Water Waste**
8. **Require Water Harvesting and Rain Gardens**
9. **Permit Alternative Water Sources**
10. **Require Restrictive Covenants**
11. **Utilize Water Connection Charge Incentives**

Making Outdoor Water Use More Efficient

Creating Outdoor Water-use Regulations: Why it Matters

Nationwide, outdoor watering for urban uses accounts for about 30 percent of average household water use. In more arid Colorado, where demand for water peaks during the summer months due to increased irrigation, residential outdoor water use is 40-50 percent of water consumption. Unlike indoor water use, where nearly all the water is returned to the water cycle as wastewater, outdoor watering is considered a fully consumptive use. Water used outdoors is lost to evaporation and transpiration by plants, combined referred to as evapotranspiration. While some water infiltrates and recharges groundwater, this is a minimal amount and highlights the importance of increasing efficiency in landscaping and irrigation practices, which significantly reduce outdoor water demand and help to manage water sustainably.

Efficient outdoor watering also has significant crossover impacts. For water providers, peak demand is what determines the upper maximum threshold of water infrastructure capacity for both potable water and wastewater treatment systems. The greater the community's peak demand, the more capacity a system requires for storage, conveyance infrastructure and treatment. Reducing peak demand can extend existing infrastructure capacity, preventing the need for costly investments in upgrades or expansion. Reducing outdoor water demand has significant impact on water supply sustainability. During extended drought periods across Colorado (2002-08, 2011-18), extreme pressure was placed on headwaters water supplies and river ecosystems. While the winter snowpack of 2018-19 refilled regional reservoirs, the 2017-18 dry year, as well as previous dry years, highlights the need for more resiliency to address climate change and growing populations.

Many of the headwaters communities already have policies and regulations to protect reservoir storage, groundwater levels and stream flows. However, there is a great deal of variation across the region in the adoption and application of best practices. The City of Aspen's recent adoption of new water-efficient landscaping standards demonstrates the region's strongest regulatory approach to water conservation. Other communities across the region – including Breckenridge, Eagle, Eagle County and others – have all adopted some components of outdoor watering efficiency practices.

This chapter is intended to offer headwaters communities a tool to review their existing codes and identify additional practices to increase outdoor watering efficiency. The chapter provides a review of the best practices, considerations on how to select strategies, and Model Code Provisions for both an outdoor water conservation ordinance and a water-efficient landscapes section.

Methods to Reduce Outdoor Watering Demand in Regulations

There are three proven methods to reduce the demand of outdoor watering in development regulations:

1. Decrease water waste by improving site-specific water efficiency through irrigation system design, best practices and technology.
2. Reduce the amount of water needed for irrigation by enhancing soil conditions, appropriate plant types and landscape design.
3. Use water budgets to establish the maximum amount of water permitted for outdoor water use.

These strategies are grounded in the seven core principles of xeriscape: planning and design, soil improvements, efficient irrigation, zoning of plants, mulches, turf alternatives, and appropriate maintenance.[1] Studies have demonstrated that efficiency in outdoor watering can result in reductions of 18 to 50 percent, depending upon the local climate.

Selecting the appropriate regulatory structure depends upon a community's specific goals for water savings and their capacity for regulatory oversight and enforcement. Regulatory structures to address outdoor watering in development codes include:

1 Read more about xeriscaping, which was developed by Denver Water in 1981 to promote more water-efficient landscaping. The Alliance for Water Efficiency website includes two longitudinal studies assessing water savings from the use of water-efficient landscape design.

- A general water conservation ordinance identifying efficiency requirements.
- Emergency watering restrictions, usually linked to a drought management plan.
- Planned Unit Development (PUD) standards.
- Golf course standards.
- Landscape standards.

Most of the best practices outlined below can be incorporated into any of these types of code structures. Each best practice is supported by the following bar indicating appropriateness of inclusion of a best practice in the land use code.

Water Conservation Ordinance	Landscape Standards	PUD Development Standards	Golf Course Standards

Outdoor Water Conservation Ordinance Versus Landscape Standards

A ***water conservation ordinance*** offers communities an option to address a wide variety of water-saving standards for both indoor and outdoor water use. The standards for a water conservation ordinance can be very similar to a landscape code with requirements for site preparation, plant types and irrigation efficiency. A landscape code, in contrast, includes more prescriptive design requirements, detailed landscape and irrigation plans, installation certification, and regulatory oversight. A water conservation ordinance is generally a better tool for communities where local government and water providers have less administrative capacity yet still want to promote water conservation and efficiency. The elements of a water conservation ordinance can include:

Efficiency Standards to Include in a Water Conservation Ordinance	
• Indoor plumbing and fixture requirements. • Commercial indoor water efficiency requirements. • Outdoor watering restrictions. • Promotion of drought-tolerant plants. • Promotion of efficient irrigation technologies. • Quantity of total landscaping area or plant types.	• Water waste prohibitions. • Water harvesting requirements. • Water budget requirements. • Landscape plan requirements. • Emergency watering restrictions. • Monitoring and enforcement.

Some headwaters communities have utilized this tool; although, none fully uses it to maximize potential water savings. Most headwaters governmental entities limit the water conservation ordinance to standards for outdoor watering restrictions, water waste and emergency restrictions.

For an example of a comprehensive water conservation ordinance, see the Water Conservation Regulations for City of Petaluma, Calif.

Landscaping standards have been included in regulatory design standards for decades. The standards have traditionally been focused on the aesthetic values and benefits of well-designed landscapes with a focus on rights of way, commercial and multi-family properties, street trees, parking lot screening, and residential subdivision design. Increasingly, landscaping standards include water efficiency as a primary goal.

Water-efficient landscaping standards may include the following components:

- Promotion of drought-tolerant plants.
- Size and quantity of total landscaping area and planted materials.
- Landscape design plan.
- Water budgets.
- Water-harvesting specifications.
- Promotion of efficient irrigation technologies.
- Irrigation system design plan.
- Pre- and post-installation authentication requirements.
- Monitoring and enforcement.

A landscaping ordinance can be structured to be either a short code section with an explicit design manual or a longer, detailed code section. The City of Aspen's Water Efficient Landscaping Standards are contained in the Utilities section of the code, is quite brief, and narrowly articulates the purpose, applicability and procedures for meeting the landscaping requirements. The detailed policies, guidelines and criteria for development are contained in an external manual. Alternatively, Colorado Springs includes detailed and prescriptive standards

in their development regulations as well as a manual. Each community decides which process to follow. The primary benefit of an external guidelines manual is that it simplifies the process for updates. It is far simpler to replace a PDF manual than to update a community code section.

For an example of a comprehensive landscape code, see the City of Flagstaff, Ariz.

Setting Community Goals and Defining a Purpose

Selecting the appropriate regulatory tool requires a clear understanding of what the regulation is intended to achieve. The community should be able to answer:

1. What are the desired results of reducing outdoor watering by addressing landscaping? What are our goals?
2. Do we have a specific water reduction target in mind?
3. What is the existing capacity (a) in our community to administer outdoor water-saving strategies and (b) in the landscaping consulting sector to implement outdoor water savings?
4. How will we monitor and enforce our regulations?

Purpose

The purpose and intent of any of the code sections for water-efficient landscaping should be explicit. Common goals include:

• Protect and promote the values and benefits of native landscapes and habitats. • Reduce peak-season water demand. • Reduce stormwater runoff and impervious surfaces through the integration of low-impact design (LID) principles. • Reduce wildfire risks in high risk zones through "Firewise" site design	• Ensure investments in future water and other resources as sustainably as possible. • Reduce the overall per-capita use of water. • Eliminate outdoor water waste. • Promote the conservation of water supplies. • Promote the conservation of energy resources. • Reduce noxious or invasive plants.

Across the headwaters region, few communities identify outdoor water conservation and efficiency as a goal within landscape ordinances. The Town of Eagle's irrigation conservation ordinance, for example, explicitly states the purpose of the code is to protect the Town's municipal water supply system and protect the health and quality of nearby Brush Creek.

Example of a Landscape Code Purpose Statement: Flagstaff, Ariz.

The purpose of this [section of the Code] is to foster the creation of sustainable landscapes appropriate to the unique natural characteristics of Flagstaff. Located on the Colorado Plateau, Flagstaff has frequent dry summers, cold winters, high elevation and a short growing season. This combination of characteristics creates special challenges for landscaping. In addition, Flagstaff has limited water resources and, consistent with the Flagstaff General Plan's goal of responsible environmental stewardship, high expectations for water use and management have been established.

The intent of this [section of the Code], therefore, is to provide landscaping standards to:

1. Establish and preserve sustainable landscaping that protects and promotes the unique natural character of Flagstaff.

2. Ensure an appropriate balance between the value of responsible water use and the value of well-designed landscape areas.

3. Improve community aesthetics.

4. Protect native trees and plants, low-maintenance naturalized plants and other natural resources.

5. Improve the quality of the environment by enhancing air quality and reducing the spread of invasive plant species.

6. Provide an applicant with maximum flexibility while conserving the city water supply and protecting the public interest in planting viable landscaping.

Applicability

Examples of Applicability Standards	
Eagle County, Colo.	• Standards exclude existing structures and landscapes except for commercial, industrial or multifamily structures that increase the footprint by 25 percent or more. • Single-family or duplex residences that increase the footprint by 25 percent or more must submit a landscape plan that indicates adherence to water-conservation principles. Removal of existing landscaping or turf not required. Planning director can require sprinkler upgrades if estimated water savings are significant. • A landscape plan is required for residential development. • A certified landscaper is only required if the residence is 5,000 square feet or larger. A certified landscape architect is required for multi-family, commercial and industrial development.
City of Westminster, Colo.	Landscaping will be required according to the landscape regulations in instances as follows: • In new development. • In redevelopment, except in cases where modification does not increase non-conformance with these regulations nor increase hardscape area of greater than 500 square feet. • In existing developments where there is an official development plan or amended official development plan or official development plan waiver that addresses landscaping and landscaping is proposed to be modified from what was approved. • In existing non-single-family detached developments where there is no official development plan or amended official development plan or official development plan waiver that addresses landscaping and landscape area or materials are proposed to be modified. • In existing single-family detached residential development where there is no approved official development plan or amended official development plan or official development plan that addresses landscaping and landscape area or related requirements are proposed to be modified to less than the standards herein for a new single-family detached lot.
Aspen, Colo.	Standards shall apply to the following projects that use City of Aspen potable water: • Landscaping, grading, installing or disturbing hardscapes; additions to structures, etc., that have a disturbance area greater than 1,000 square feet and greater than 25 percent of the entire site. • All new construction with internal work only that demolishes greater than 50 percent of the existing structure (based on the entire square footage of rooms where floors, ceilings or walls are exposed over the square footage of the structure).

Outdoor water standards can be tailored to specific types of development, including residential (single and multifamily), commercial and public uses. This can be triggered by new development, a remodel or a redevelopment. Determining development type and the water efficiency standards applied, should be driven by the potential savings to be generated. For example, if community development trends include new subdivisions or planned communities, then making new development water-smart from the start can reduce the need for water conservation education programs to change behavior. If a community has a high percentage of older development or is near buildout, water-saving standards can target remodels and redevelopment. Many communities take an “all of the above” approach.

Outdoor Water Savings Best Practices

The following best practices can be incorporated into different outdoor watering code sections.

Enhance Soil Quality

Water Conservation Ordinance	Landscape Standards	PUD Development Standards	Golf Course Standards

Soil quality plays an important role in supporting healthy landscapes through the release of nitrogen from organic matter without the addition of fertilizers. It also plays a role in supporting water savings as the aeration of soils results in deeper roots, improved drainage and better infiltration of precipitation. To develop specific soil quality standards, consult with local specialists on what is most appropriate for your community's soil characteristics.[2] soil quality standards, consult with local specialists on what is most appropriate for your community's soil characteristics.[3]

Soil Amendment Best Practices
• Test soil to determine amendments based on plant types. • Remove rocks, debris, clumps. • Enhance soil with compost based on a documented metric: number of inches, cubic inches per square foot or percent of volume. • Till soil to 6-inch depth.

Soil Amendment Code Examples	
City of Aspen Landscape Ordinance 4.1: Soil Criteria	• Sandy loam to a depth of at least 6 inches containing at least 5 percent organic matter by volume. Trees shall be planted in sandy loam containing 1-3 percent organic matter by volume to a depth of 36 inches. An appeal procedure is offered to the soil amendment standards based on a soil analysis test by a professional soil scientist or laboratory. • Soil amendment organic matter shall consist of either Class I or Class II compost. • Soil preparation standards include minimum till depth of 6 inches with additional criteria for soil content and soil inspections. • Mulch standards include 1 cubic yard/80 square feet to depth of 4 inches.

Promote Xeric, Drought-tolerant and Native Landscapes

Water Conservation Ordinance	Landscape Standards

Plant materials can be classified by how much water they need to be healthy, ranging from very low to high. Codes can specify desired plant materials and prohibited plant types as well as permitted site landscape coverage requirements. Headwaters communities have already begun to incorporate plant requirements for native, drought tolerance and low water into their codes.

2 Colorado Extension offers a primer on determining soil amendments.
3 Colorado Extension offers a primer on determining soil amendments.

Plant Material Best Practices
• Provide specific plant lists with water-use categories • Limit turf to a percent of total development or square footage • Specify site plant composition by water-use categories • Promote native plant species and natural areas • Integrate firewise plant material where appropriate

Plant Lists

Approved plant lists can provide clarity to developers and community members on what species meet water saving goals and code requirements. Some communities opt to mandate plant types by providing a list of water efficient plants.

Plant Lists for Mountain Region of Colorado
• Colorado State University (CSU) Low-water Native Plants for Colorado Gardens: Mountains 7,500' and Above. • CSU Colorado Native Plant website. • GreenCo Crop Coefficient Plant List. This list includes plants for the mountain region above 8,500 feet and the West Slope region between 6,500 and 8,500 feet, rated by very low, low, medium and high-water use. • CSU Extension list of low water native grasses suitable for Eagle County, CO. This list is applicable for other Headwater communities.

What Difference Does the Term Make?

Xeric plants have evolved with drought and continue to flower, set seed and generally thrive in arid conditions.

Drought-tolerant and *drought-resistant*, in contrast to a truly xeric species, are adapted to drought conditions through survival mechanisms such as defoliating or going dormant. Drought-tolerant plants are those that can survive a short-term drought while drought-resistant refers to the adaptation response.

Native plants, often defined as species present in America preceding European settlement, evolved based on regional climates (e.g. desert, alpine ranges, etc.). Not all native plants are necessarily xeric as demonstrated by some native species being threatened by climate change.

Plant water-use classifications references the water requirement of a plant – very low, low, medium and high. *Low water-use plants* are one class.

Waterwise describes water- and plant-management practices that emphasize using lower water-use plants and grouping plants by water needs by hyrdozones to encourage more efficient water use.

Site Coverage

Standards can also specify the amount of landscape coverage for different plant types. To promote water savings, the standard should clarify the total site coverage and plant combinations rather than focus on the minimum amount of landscaping required. For example, standards can require that very low to low water-use plants be used for 80 percent of the total landscaping and high water-use plants be limited by location and percent of total landscaping.

Turf

Out Of all plant material choices, turf is one of the most water intensive. Communities can achieve water savings by managing both turf species and amount of turf. The Rockies require cool season grasses adapted to

higher altitudes and long winters; however, cool season grasses require more water than warm season grasses. Different cool season grasses have different evapotranspiration (ET) rates making some grass species slightly more water efficient than others.[4] The headwaters region could increase water efficiency of turf by adopted one or both of these best practices:

- Identifying the more desirable turf species and limiting percent of bluegrass.
- Limiting the total amount of turf permitted.[5]

Relative Maximum Evapotranspiration Rates of Turfgrass[6]		
Water-use Ranking	*Evapotranspiration Rate*	*Grass Species* *(**Bold** indicates cool season grasses)*
Very Low	<6	**American buffalo grass**
Low	6-7	Hybrid Bermuda grass Centipede grass Dactylong Bermuda grass Zoysia grass
Moderate	7- 8.5	**Hard fescue** **Chewing fescue** **Creeping red fescue** Bahia grass Seashore paspalum St. Augustine
High	8.5- 10	**Perennial ryegrass** Kikuyu grass
Very High	>10	**Tall fescue** Creeping bent grass **Annual bluegrass** **Kentucky bluegrass** **Rough bluegrass** **Annual ryegrass**

4 Turfgrass Water Requirements and Factors Affecting Water Usage. Bingru Huang. This research has found that water transpiration from the grass leaves accounts for over 90 percent of water used by the plant while only 1-3 percent is used in the plant process.

5 Communities with smaller lot sizes can limit turf as a percent of total landscape while communities with larger lots sizes should limit turf as maximum square feet permitted.

6 Modified from Turfgrass Water Requirements and Factors Affecting Water Usage. Bingru Huang.

Plant Material Code Examples	
City of Aspen	Does not limit plant type except for invasives and noxious species. Instead suggests GreenCO Plant List which provides water-use categories to achieve water allocation budget.
Town of Breckenridge	All plants should be adapted to a high-altitude environment or an elevation appropriate for the site. Landscape Guidelines Plant List. Xeriscaping with native species is encouraged but not required.
Town of Frisco	The maximum amount of lawn/sod area shall not exceed 10 percent of the undeveloped area of the site. All new plant materials shall use species found on the Plant Materials List (p. 172). These species have been selected either because they are a native species to this climate or have demonstrated ability to survive in an alpine environment with minimal water and no threat of competition.
Town of Carbondale	The Green Building Code (Ordinance 8) provides points for a reduction in turf with either the area being 25 percent of the total landscaped area, or 2,000 square feet, whichever is smaller. Provides additional points for use of low water-use plants.

Integrate Firewise Principles into Design in Fire-prone Zones

Water Conservation Ordinance	Landscape Standards

In fire-prone communities, consistency between defensible space principles and xeric principles can be complementary to achieve water savings and fire protection goals.

Firewise practices identify three primary zones around a structure that can be landscaped to defend against wildlife, referred to as defensible space. Within each zone are recommendations for how to manage plant material. Complementary landscaping principles include:

- Low growing, naturally occurring, and non-resinous plants.
- Regularly maintained landscapes including mowing grasses, cutting back of shrubs when dormant to limit fuel, and irrigation system maintenance.
- Incorporation of open areas and buffers incorporating permeable hardscaping such as rock pathways or pebble mulch around groups of plants.
- Use of hydrozones with highest water use adjacent to structures.
- Efficient automatic irrigations systems that can be used in case of fire.
- Water budgets matched with defensible space practices.

If a community has a wildfire manager, a mandatory review of the landscape plan or site consultation prior to the landscape design can also support wildfire mitigation. A community Wildland Urban Interface (WUI) code can be cross-referenced for compliance or firewise language can be integrated into code language explicitly.

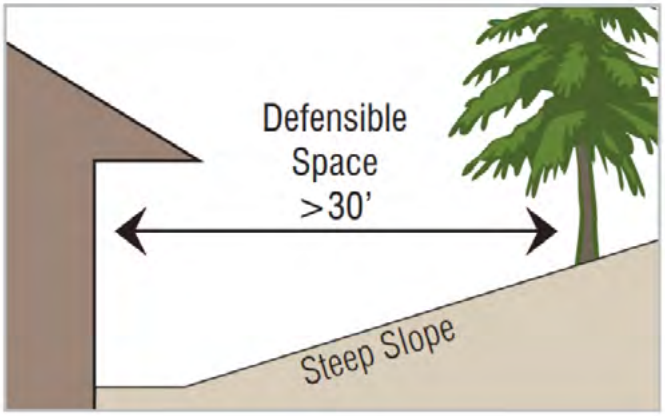
The State of California requires all communities to adopt water-efficient landscape regulations. The Town of Mammoth Lakes, Calif., adopted Water-Efficient Landscapes Recommendations and Requirements which goes above the state water efficiency standards also integrating defensible space. The town is at a high-altitude mountain community with an increasingly arid environment. The purpose statement makes an explicit statement on achieving both fire and water wise landscapes. The Town provides three levels of landscape review.

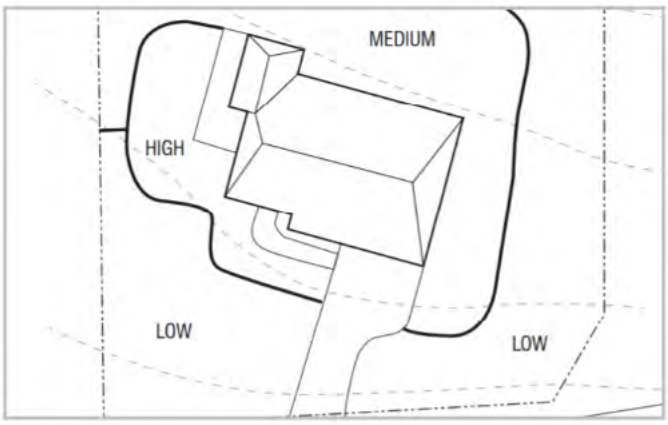
Levels of Landscape Review		
Option 1	**Option 2**	**Option 3**
No turf or lawn. No invasive plants or high fire-hazard plants. More than half of the landscape area consists of low water-use plants and remaining area is medium water-use. Low-volume drip or soaker irrigation.	**If limited lawn or turf is proposed:** A water budget that is 85% or less of the maximum allowed. Turf or lawn area is less than 20% of the total landscape area or less than 1,250 square feet, whichever is lesser. No turf or lawn on slopes greater than 25%. No invasive plants or high fire-hazard plants.	**If the estimated water budget is less than or equal to maximum allowed.** Turf or lawn area is more than 20% of the total landscape area or more than 1,250 square feet. Water features are used.

To meet the requirements, the plant list includes both water-use and fire ratings.

Grasses					
Latin Name	Common Name	Variety	Origin	Fire	Water Use
Achnatherum hymenoides	Indian Rice Grass		Native	low	low
Achnatherum spp	Needlegrass		Native	low	low
Boutelova gracilis	Blue Grama	'Blonde Ambition'		low	low
Calamagrostis	Feather Reed Grass	'Karl Forester'		high	medium
Hesperostipa comata	Needle and Thread Grass		Native		low
Leymus cinereus*	Great Basin Wild Rye		Native	low	low
Panicum virgatum	Switchgrass	'Prairie Sky'		low	low
Schizachyrium scorparium*	Little Blue Stem				low

The landscape design standards include defensible space design recommendations for maintaining the highest water uses and low growing plants closest to the structure.





As the Town is demonstrating, Firewise does not mean water-inefficient.

Firewise Landscape Example	
Town of Breckenridge	The landscape code includes a requirement for wildfire mitigation. The code divides area the around a structure into three zones intended to reduce the likelihood of fire spreading. Some of the specific requirements include: • The incorporation of firebreaks and buffers. • Within the zone adjacent to a structure, wide spacing between plant material to prevent fire spreading. • Pruning of existing plants. • Grass and groundcover 6 inches and less, unless irrigated bed, native grasses or wildflowers which shall be cut back to 6 inches in the fall. • Trees with 10 feet between crowns.
Town of Mammoth, Calif.	Landscape design that is fire-safe, compatible aesthetically with the natural setting, and makes the most of every drop of water is the goal of the Water Efficient Landscape Ordinance.
Vail Fire-resistant Landscaping Guide	
CSU Fire-Resistant Landscaping and FireWise Plant Materials	
California Water Service Be Waterwise and Firewise	

Schedule Outdoor Watering

Water Conservation Ordinance **Landscape Standards** **PUD Development Standards**

Controlling the *timing* of outdoor watering by day of week and time of day can be an effective strategy to reduce water demand. Many headwater communities already utilize this strategy; although, the implementation varies from community to community. In some communities, it is implemented only during drought emergency water restrictions, while others impose a mandatory seasonal restriction. Most headwater communities include irrigation scheduling as a recommendation to be followed voluntarily.

Scheduling Best Practices
• Day of week restriction with recommendation for limiting turf watering to 1-2 days per week • Time-of-day watering restriction to between 6:00 p.m. and 9:00 a.m. • Time limit for zone watering (cycle and soak) to reduce overwatering and water waste, especially on turf. • Voluntary restriction on watering during rain events. • Mandatory seasonal or year-round compliance.

Research conducted in Colorado's Front Range on watering restrictions indicated that voluntary standards, even when implemented under emergency drought conditions, have little impact.[7] Conversely, mandatory restrictions in the same study reduced outdoor watering demand by 30 percent.

Research also indicates that people tend to overwater with day-of-week watering restrictions, overestimating the amount of water their landscapes need, in particular for turf lawns, which do best under a soak and cycle watering regime.[8] To address this issue, a time and frequency standard, informed by local climate conditions, can be established to define the length of time an area should be irrigated – for example, limiting sprinklers to 15

7 Use and Effectiveness of Municipal Water Restrictions During Drought In Colorado. Journal of The American Water Resources Association. https://sciencepolicy.colorado.edu/admin/publication_files/resource-296-water_restrictions_jawra.pdf

8 CSU recommends watering of turf 1 day per week rotating: https://extension.colostate.edu/topic-areas/yard-garden/watering-established-lawns-7-199/

minutes per area within the same hour. Research has also shown people irrigate during rain events, which can also lead to overwatering. For these reasons, outdoor watering scheduling is best combined with other methods of water savings.

Water Scheduling Examples	
Town of Crested Butte	Limits watering by street address to even and odd days of the month. Also limits watering to between the hours of 5 p.m. and 5 a.m. Penalties range from a warning to a $300 fine.
Town of Eagle	Ordinance 21 includes four water restriction phases. Stage 1 restrictions are in effect year-round. Restrictions include: • No water irrigation permitted before April 15 or after Oct. • Water irrigation is only permitted before 10 a.m. or after 5 p.m. • Even and odd day watering by street address. • Exemptions from restrictions are permitted to establish landscaping.

Require Efficient Irrigation Systems

Water Conservation Ordinance	Landscape Standards	PUD Development Standards	Golf Course Standards

The goal of efficient irrigation system design is to ensure that the right amount of water is delivered to the right place at the right time. To do this, an irrigation system will account for the following factors:

- Plant type and spatial distribution.
- Soil type, slope and soil amendments.
- ET and precipitation.

Irrigation System Best Practices

1. Water-use management plan or water budget.
2. Hydrozones that group similar water demands by irrigation zone.
3. Irrigation system design.
    - Smart irrigation system controllers.
    - Irrigation shutoff valve.
    - Master valves and flow sensors.
    - Rain sensors.
    - Soil moisture sensors.
4. Efficient emitters.
    - Overhead (spray) irrigation.
        - Allowable only where sufficient width exists to prevent waste.
        - Pop-up height consistent with mature height of plants being watered – minimum of 6 inches.
        - Pop-up spray heads equipped with internal check valves, internal pressure regulations, and matched precipitation rate spray and rotary nozzle.
        - Rotors equipped with internal check valves and pressure regulations are more efficient than spray heads.
        - Head-to-head coverage.
    - Drip systems.
        - Point source drip or subsurface drip irrigation for all trees, shrubs, perennials and annuals.
        - Internal check valves at each drip emitter and for subsurface drip systems.
        - Subsurface drip irrigation may be used for turf or grass areas.
        - Bubblers may be substituted for drip emitters.
5. Non-potable water source.
6. Separate irrigation meters.

Irrigation efficiency is achieved by incorporating best management and design practices into the application of the three primary irrigation methods – drip, microspray and overhead. Low-pressure methods like drip and micro-spray are more efficient than overhead spray systems. Drip is considered the most efficient method, achieving up to a 90 percent efficiency rating with little ET, followed by microspray with efficiency ratings of 70-90 percent, then overhead irrigation with efficiency ratings of 50-75 percent. The State of Colorado recently required that all sprinkler bodies sold in the state be WaterSense certified, which can reduce water use by 20 percent or more when irrigation system pressure exceeds 60 psi.[9]

9 The State of Colorado legal requirement for WaterSense sprinkler heads.

Irrigation System Examples	
City of Castle Rock	1. Smart irrigation controllers (as defined by the Irrigation Association) are required and shall be installed according to manufacturer recommendations. They shall apply the appropriate amount of water to maintain healthy growing conditions. 2. Due to common power outages, battery back-up or non-volatile memory is required on all controllers. 3. Central control systems are recommended for larger irrigated areas – 10,000 square feet or larger.
Eagle County	Requires a water-efficient irrigation plan based on site conditions. For subdivision and PUD applications, the detailed plan is due at final plat while single family residences and duplexes must submit a plan at building permit stage. Requirements include limitation on pop-up spray heads for turf with drip, micro-jet and other low-flow systems for all other planted areas. An exception is provided for fire-prone areas that permits above-ground spray heads within 15 feet of a structure. Non-potable water systems are suggested where feasible, and use of smart controllers, gray water, time of day scheduling, rain sensors and hyrdozones are recommended.
Town of Silverthorne	All landscaping plans are required to have automatic irrigation systems. Landscaping plans must include the layout and design of the irrigation system. *A 5-percent reduction in landscape area requirements is provided for meeting xeriscape principles, including drip systems, rain sensors and/or smart controllers.*
Town of Aspen	Irrigation system specifications include manual and master shutoff valves, dedicated water meters and submeters for all non-residential landscapes over 5,000 square feet. WaterSense smart controllers and flow meters are recommended. Sensors for all systems and check valves for sprinkler heads.

Technological advances in control systems, such as smart controllers and moisture sensors as well as in-sprinkler head design, all contribute to reducing water waste and overwatering. Each individual irrigation system component can contribute to increasing irrigation efficiency.

Irrigation System Options	Water-saving Potential
Water budgets	Medium
Smart controllers	Medium
Rain sensors on controllers	Low-Medium
Matched precipitation rate sprinklers (overhead)	Medium
Low-pressure irrigation systems (drip)	High
Anti-drain check valves	Low Medium

Require Water Estimates and Establish Water Budgets

Water Conservation Ordinance | **Landscape Ordinance** | **PUD Criteria** | **Golf Course Standards**

Two important tools for managing irrigation efficiency include water estimates and water budgets:

Water Estimate: An estimate for the total water use for a landscape design is often submitted as either part of the water supply standard or part of a landscape plan. This estimate is used to ensure adequate water is available for the development.

Water Allowance: An outdoor water irrigation allowance, also often referred to a water budget, is a site-specific method of calculating the maximum allowable amount of water to be used on a landscape. A water irrigation allowance is measured by the total number of inches per year, gallons per square

foot or percentage reduction of water use based on ET. Water budgets quantify the time period for the maximum amount of water, such as per week, month, season or year.

Water allowances provide flexibility for landscape contractors to design sustainable landscapes to meet the approved water budget rather than following a more prescriptive set of standards, such as limitations on plant types and landscape area. Water allowances also provide water managers a clear metric for tracking water conservation, which can be enforced through water irrigation audits or customer billing.

If a community adopts a water allowance approach, the code should include the maximum water allowed as well as a specific methodology for calculating the water budget. A water budget calculation sheet is generally submitted as part of the landscape plan.

Water Estimate Examples	
Silverthorne	Irrigation plans require a monthly water-use calculation detail in gallons for all commercial and large residential developments.
Water Allowance Examples	
City of Aspen Landscape Criteria: 4.3.1 Water Budget	A maximum applied water budget of 7.5 gallons/season/square foot of irrigated landscape (12 inches per season) with LID incentives available to increase the water budget up to 8.5 gallons/season/square foot. Incentives include: Non-irrigated native vegetation areas, ecological restoration areas, bioretention areas, non-irrigated permeable areas and stormwater conveyance structures. Use of rain barrels is incentivized to reduce overall water demand in the water budget calculation by 125 gallons per barrel per season. Water Budget Calculation Irrigation Water Budget = [(ETo x Plant Factor) - Re] x Irrigated Area / Irrigation Efficiency x 0.623 ETo = Reference Evapotranspiration in inches/season (May-Sept.) Re = Effective Precipitation in inches/season Irrigated Areas = Hydrozone area in square feet Water budget calculation sheet

Definitions:
Water-efficient Irrigation System Components[1]

Anti-drain check valve: prevents water loss from sprinklers or emitters at low spots in the irrigation system.

Controller: regulates irrigation cycle to activate the control valves at times and days selected.

Drip emitter: low pressure device that emits water drops at rates of 0.5-2 gph. Includes drippers, bubblers, soakers (in-line emitters) and micro-sprayers.

- **Bubbler:** head that emits flows short distances at 0.25-2 gph
- **Drip or soaker line:** tubing that emits water along its length.

Hydrozone: portion of a landscape plan where plants have the same irrigation requirements. Plants are grouped by very low, low, medium and high zones.

Irrigation uniformity (DU): a measure of how evenly water is applied to a landscape. The higher the percentage of DU, the more efficient the irrigation system. DU is determined during an irrigation audit.

Micro-sprayer: low-pressure device that sprays water a short distance at flows of 0.5-5 gph with an efficiency rating between drip and overhead systems.

Pressure regulator: controls water pressure within set limits.

Rain sensor: detects recent rainfall and signals the controller if irrigation cycles may be omitted.

Soil moisture sensor: detects moisture levels in root zone at strategic irrigation zone and signals the controller if irrigation cycles may be omitted.

Sprinkler head: emits streams of water through the air to plants.

Water meter: measures the volume of water entering the system.

Weather-based smart controller: responds appropriately to changes in weather by receiving localized weather information via cellular modem, paging signal, wi-fi signal or on-site weather sensors for air temperature and/or sunshine.

1 Source: EPA The Watersmart Guidebook: Landscape Water-Use Efficiency p. 15

Water Budget Calculation Methodologies[1]

Determining a Water Allocation for Total Landscape
A *water allocation*, calculated in gallons/square foot/year or acre-feet/year, is used by Aspen, Eagle River Water and Sanitation District, Colorado Springs and many others to determine the amount of water a development will require as well as to establish a maximum amount of water a development may use for irrigation. Water allocation amounts vary from 15 gallons/square foot/year in Colorado Springs to 7.5 gallons/square foot/season in Aspen. The common calculation is:

Total Irrigation Water Allotment (gallons/year) = Landscaped Area (square feet) x Allotment (gallon/square foot/year)

Determining a Landscape Area Requirement
A different calculation is used to determine the amount of irrigation needed to maintain a healthy landscape. The most frequently utilized methodology includes a calculation that employs an estimated local *reference evapotranspiration* (ETo) in inches per month to establish climate-based maximum and conservation levels of landscape water requirements or allocations. ETo is an estimation of the evapotranspiration from a *reference surface*, a hypothetical crop that resembles a well-watered turf of uniform height, actively growing and completely shading the ground.[2] A *plant factor* (PF) is used to adjust the ETo to account for the variability in water requirements among landscape plant species. Plant species have different water-use demands and thus plant factors. Ranges for plant factors include:

- High PF: plants need 60-100 percent of the water needed for grass lawn (PF of 0.6 - 1.0)
- Moderate PF: plants need 30-60 percent of the water needed for grass lawn (PF of 0.3 - 0.6)
- Low PF: plants need 10-30 percent of the water needed for grass lawn (PF of 0.1 - 0.3)
- Very Low PF: plants need 10 percent or less of the water needed for grass lawn (PF of less than 0.1)

The most commonly used equation is the Simplified Landscape Irrigation Demand Estimation (SLIDE):

Gallons of Water = ETo × PF × Landscape Area × 0.62

ETo is inches of water for the time period of interest (day, week, month, year)
PF from an accepted reference source
Landscape Area is square feet of planted area
0.62 is a unit conversion factor to yield a result in gallons

Aspen, which has a high alpine climate with an average annual precipitation of 27 inches per year, identifies the hyrdozones and plant factors in its Aspen Landscape Water Allocation Worksheet as:

Hydrozones Efficiency		
Water Use Category	**Plant Factor**	**Code**
Cool Season Turf	0.90	VH
High	0.80	H
Medium	0.65	M
Low	0.40	L
Very Low	0.25	VL

Adjusting for Irrigation Efficiency
The next step to adjust the water requirement for the efficiency of the irrigation system (IE). A properly designed irrigation system can be assigned an irrigation efficiency of 0.75 to 0.80 and drip irrigation a factor of 0.9. The calculation adjustment is the sum from the Landscape Area Requirement divided by IE. Aspen uses an irrigation efficiency rating of 90 percent for drip and 75 percent for overhead irrigation. Denver, by comparison, uses IEs of 90 percent for drip, 70 percent for rotor, and 65 percent for spray.

Aspen's Irrigation Water Budget and Water Budget Spreadsheet
Developed for the City by Element Consulting, the Hydrozone Water Budget Spreadsheet requires a contractor to enter information into a spreadsheet to generate a water budget to be submitted with a landscape plan. The formula accounts for the square footage of each hydrozone and allows a contractor to allocate plant material based on the total water allocation of 7.5 inches/square foot/season.

Irrigation Water Budget = [(ETo x Plant Factor) - Re] x Irrigated Area / Irrigation Efficiency x 0.623

ETo = Reference Evapotranspiration in inches/season (May - Sept.)
Re = Effective Precipitation in inches/season (May - Sept.)
Irrigated Area = Hydrozone Area in Square Feet

This methodology is applicable to all of the headwaters communities, but modifications for climate variation requires changes to the ETo and Re and possibly plant factors. The U.S. Climate website provides climate data for Colorado, including the effective precipitation necessary for calculations. Selecting the appropriate methodology should be done in consultation with a landscape architect, water specialist, Natural Resources Conservation Service (NRCS) or a CSU Extension agent to align with your climate, water-saving goals, capacity for application review.

1 Page 33 Calculating Water Budget https://www.gcsaa.org/uploadedfiles/Environment/Get-Started/BMPs/Green-Industry-Best-Management-Practices-for-the-Conservation-and-Protection-of-Water-Resources-in-Colorado.pdf
2 https://coagmet.colostate.edu/extended_etr_about.php

Prohibit Water Waste and Fugitive Water

Water waste is a common water conservation standard within headwaters communities' regulations. Emerging best practices in reducing water waste include a balance between education and violation enforcement. Castle Rock has a Water Use Management Plan that outlines their strategies for managing water waste, including training seasonal water monitors and enforcement.[10] The city is refining the program to provide education with early warnings rather than rely solely on fines as a disincentive. The City of Santa Fe utilizes a water conservation hotline for community members to report water waste. This hotline was established during an extremely dry summer. The city included outreach methods like public service announcements (PSAs) to educate the community on the importance of reducing water waste. The City of San Diego's water waste education campaign, *San Diegans Waste No Water. All Ways. Always*, includes not only irrigation runoff or leaks, but also violations of any of its water conservation standards, as water waste. The city has a hotline and developed an app for community members to report water waste, Waste No Water and has increased the fines for violations.

Require Water Harvesting and Rain Gardens

Colorado increasingly is adopting best practices for stormwater management including low impact development (LID). The NWCCOG created the Model Water Quality Protection Standards to support local government adopting best practices. Landscape codes and water conservation ordinances can reiterate existing LID practices or promotion design best practices such as rain gardens, bioswales, detention ponds and rain barrels. In California, Arizona and New Mexico, rainwater harvesting is often a requirement for residential development. These states have also aggressively promoted integration of bioretention and retention in landscaping codes.[11]

Water Harvesting Examples	
City of Aspen	Rain barrels are offered as an incentive in the use of the water allocation budget. The total gallons collected by rain barrels is subtracted from the landscape's total water estimate therefore increasing the amount of supplemental water available for additional landscaping.
Town of Carbondale	In all districts, rain gardens are required within parking areas at the ends of parking rows, adjacent to lot lines and to define access drives.
City of Santa Fe	Plant types specified for bio-retention ponds: Stormwater detention and retention ponds shall be planted with appropriate trees, shrubs and grasses with a minimum of one tree and three shrubs per 500 square feet or required ponding area. Plants located in the bottom third of the detention pond or retention pond must be adaptable to periods of submersion and may require replacement during periodic maintenance to remove silt.

Permit Alternative Water Sources

Many headwaters communities allow outdoor irrigation, with appropriate water rights, supplied by non-potable water sources from ponds, lakes, ditches and rivers. Another alternative is reclaimed, or recycled water, wastewater collected from indoor use and reused primarily for irrigation purposes. Although often confused with each other, recycled water and graywater are distinguished by the sources of the wastewater and their distribution system. Graywater is collected from non-sewage water (bathtubs, sinks, laundry) and used on-site with little treatment for irrigation. Recycled water can be sourced from any wastewater and is heavily treated before it is reused. Recycled water has historically been implemented through a utility provider who has a separate water distribution system, often referred to as "purple pipes." In 2016, Colorado adopted a new statute to permit use of graywater and recycled water on-site.

Under the oversight of the Colorado Department of Public Health and Environment (CDPHE), local governments, under the *local graywater control program*, may adopt a local ordinance to regulate the use of reclaimed water

10 Page 15, City of Castle Rock Water Use Management Plan

11 Central Coast Low Impact Development Institute. Plant material selection for LID.

Castle Rock Graywater Systems (4.05.010)

A. Requirement. Graywater systems shall comply with the minimum requirements of Colorado State Regulation 86 as well as any and all other applicable state and local requirements.

B. Castle Rock Water's service boundary, including town limits and areas served through extraterritorial agreements, shall constitute the legal boundary for graywater system jurisdiction for graywater use categories A, B, C and D as defined in Colorado State Regulation 86.

C. Castle Rock Water is the local agency responsible for oversight and implementation of all graywater regulatory activities in the town limits of Castle Rock as required by Colorado State Regulation 86.

D. Castle Rock Water's graywater control program meeting the requirements of Colorado State Regulation 86 is as follows:

1. Castle Rock Water shall determine any graywater system fee structure, maintain a record of the locations where graywater systems are installed, and review and approve design criteria for any system consistent with Colorado State Regulation 86. Graywater systems are only allowed in new homes where plumbing systems have been designed for the graywater system.

2. Upon issuance of a certificate of occupancy and the sale of a new home, the legal responsibility, including operation and maintenance of approved graywater recycling systems, transfers similar to other residential household appliances to the homeowner. The transfer of property ownership must include the transfer of records and operating manuals related to the graywater system and is accomplished by paper or electronic records transferring with a graywater system.

3. Appropriate graywater space allocation is required for graywater systems and system location must be identified on permit drawings. These drawings should indicate all plumbing connections to ensure compliance with local code requirements. Graywater system specifications are to be included with permit drawings. In the process of inspecting for the certificate of occupancy, if an inspection is adequately conducted and the inspector is knowledgeable of the NSF 350 Standards, Colorado State Regulation 86 and the applicable plumbing code, the final inspection is used to verify that a graywater system meets regulatory requirements.

and graywater systems for use on-site.[12] The local regulation must establish implementation practices that comply with the state's regulation. The rule provides two options for water re-use: (1) for graywater from the bathroom and laundry to be captured, minimally treated and then reused for outdoor irrigation; and (2) for recycled water systems which incorporate sewage for reuse for irrigation and flushing of toilets. As of 2019, only a few Colorado communities have adopted graywater regulations under the new state rules: Denver, Pitkin County and the Town of Castle Rock.[13] The complexity of the state rules has been a barrier, slowing implementation of the plumbing alternative.[14]

Require Restrictive Covenants

Community associations in Colorado are not allowed to prevent homeowners from incorporating xeriscaping and drought-tolerant plants in their landscaping.[15] This restriction should be reinforced in the water conservation ordinance and landscaping guidelines. The Colorado Homeowners Association Law website provides a good resource for developers drafting restrictive covenants.[16] New Mexico's Santa Fe County water-conservation ordinance requires that all developments file restrictive covenants or plats adhering to the water conservation standards and water budget upon development approval. These must be signed and filed with the county clerk.

Require Irrigation Water Meters

In the era of big data, water meters play a key role in communities with public water systems to manage and evaluate water use.[17] In Colorado, individual meters are required by state law for units served by a water provider. Local governments and water providers may require additional standards such as submetering for more than one unit per tap as well as indoor and outdoor meters. Smart meters and/or separate irrigation meters support water managers tracking water use and providing data-driven feedback to customers about water use. The use of these tools in headwaters communities is not yet widely adopted as a requirement for new development.

Water Connection Charge Incentives

Communities may also incentivize water conservation and efficiency through service and tap fees.[18] The City of Westminster's landscape code requires a separate irrigation meter on all non-single-family projects. Rather than charging by meter size, charges for an irrigation connection are based on a tiered fee schedule for three different types of landscapes ranging from high water use to low water use. Fees are collected when a connection is made to the system.

The City of Fountain adopted a rate conservation ordinance in 2013 to complement the landscape ordinance.[19] The city's landscape ordinance itself includes few best practices except for a recommendation that "native vegetation, or low water-usage vegetation on water-conserving design concepts shall be used whenever possible." Instead, conservation is incentivized through reductions in the water acquisition fee if builders voluntarily reduce the amount of landscaping for new construction. Water acquisition fees, based on lot size, are reduced by 50 percent for lots with 50 percent or less turf area, and by about 70 percent for lots with 30 percent or less turf area. Since the establishment of this incentive in 2013, voluntary participation has increased each year with 2016 and 2017 at 57 percent and 78 percent participation, respectively.

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12 CDPHE Rule 86, adopted in 2015, establishes the allowed users and allowed uses of graywater within the state of Colorado; establishes the minimum state-wide standards for the location, design, construction, operation, installation and modification of graywater treatment works; and establishes the minimum ordinance or resolution requirements for a city, city and county, or county that chooses to authorize graywater use within its jurisdiction.

13 Regulation information available on government websites: Denver, Town of Castle Rock, and Pitkin County.

14 Water Education Colorado news article.

15 C.R.S. § 37-60-126.

16 Are your covenants X(eric) rated?

17 7 Ways Smart Meters Save Water. Water Online.

18 A Guide to Designing Conservation Oriented Water System Development Charges. Western Resource Advocates has created a comprehensive set of case studies on linking water connection charges and water conservation.

19 Water Connection Charges. A Tool for Encouraging Water Efficient Development. Western Resource Advocates. This resource features both Westminster and Fountain a case studies.

Santa Fe County Water Conservation

7.13.11.1. General Requirements.

1. All plats and non-residential development shall file signed water restrictions and covenants included in this section with the plat or site development plan. All applications subject to water restrictions and conservation requirements shall file a declaration with the county clerk memorializing the restrictions of this section. These restrictions shall run with the land, and any violations shall be enforceable by the county pursuant to Section 14.3.

2. Total water use shall not exceed that specified in the development order, plat note or the Sustainable Land Development Code (SLDC).

3. Except for water harvested using rainwater catchment systems and graywater, the annual water use for domestic purposes for new residential dwellings constructed on any lot created after the effective date of this ordinance shall not exceed 0.25 acre-foot per year or such lower amount as may be established in the development order approving the land division.

13.3 Special Enforcement of Article 13 by Santa Fe County – Severability.

13.3.1 The covenants of this Article 13 shall run with and bind the land, shall inure to the benefit of and be enforceable by the county land use administrator, any owner or the association in any proceeding at law or in equity against any person or persons violating or attempting to violate any covenant or restriction or to restrain any such violation. Any failure by the county land use administrator, any owner or the association to enforce any covenant or restriction herein contained shall in no event be deemed a waiver of the right to do so thereafter. If the county land use administrator, an owner or the association prevails in any action against any person or persons to enforce any provision hereof, they shall be entitled to recover from such person or persons his costs and reasonable attorney's fees.

13.3.2 The invalidity or unenforceability of any covenant, restriction, term or other provision of Article 13, as determined by a court of competent jurisdiction, shall not impair or adversely affect the validity or enforceability of any other covenant, restriction, term or provision hereof, which shall be and remain valid and enforceable to the fullest extent permitted by law. The provisions of this Article 13 shall be governed by and interpreted under the laws of the State of New Mexico and are binding upon each owner, and the owner's successors and assigns.

Metering Examples	
City of Aspen	Dedicated landscape water meters/submeters shall be installed for all non-residential irrigated landscapes of 5,000 square feet or more.
Town of Dillon	Sec. 18-1-100. Installation of water meters required. (a) A property owner shall be required to install a water meter (or water meters) on his or her property upon the occurrence of the following: (1) The sale or transfer of the property. (2) The construction of a building or any other construction for which a water tap is purchased from the Town. (3) The remodeling, reconstruction, addition, modification, repair, replacement or refurbishing of any existing building or water-using property, which remodeling, reconstruction, addition, modification, repair, replacement or refurbishing increases the value of the property by an amount equal to or exceeding 50 percent. (b) For the purposes of this section, the sale or transfer of a property shall be defined as the exchange, sale or transfer of any right, title or interest in the property to any other party.
Town of Basalt	All duplexes shall be required to have two separate service lines, curb stops, water taps and water meters.
Santa Fe County, N.M.	The county established in its water supply standards a total water budget for new development: *Except for water harvested using rainwater catchment systems and graywater, the annual water use for domestic purposes for new residential dwellings constructed on any lot created after the effective date of this ordinance shall not exceed 0.25 acre foot per year or such lower amount as may be established in the development order approving the land division.* In 2002 the county adopted its Voluntary Well Monitoring Program, which included an ordinance requiring all development on wells to include meters. **7.13.11.5. Domestic Well Use Metering Program.** 1. All development utilizing a well shall participate in the well-use metering program. 2. Meters shall be installed on wells for any development subject to the SLDC. All meters shall be a Santa Fe County-approved meter. The meter shall be read by the property owner annually and meter readings shall be provided to the administrator no later than April 30 of the same calendar year. Submissions shall include name and address of well owner, location of well, Office of State Engineer (OSE) well permit number, meter reading, date of meter reading, number of residences served by the well make and model of meter and photograph of the meter. If a property is required to submit meter readings to the OSE, these readings may be sent to the administrator in lieu of the above requirement. 3. All properties that are required to report water meter readings as a condition of plat approval shall have the name and address of the property owner entered into the database when the building permit is issued. 4. All properties that are required to have water meters shall also be required to test their water meter for reading accuracy every 10 years and replace if necessary. 5. Failure to submit the meter reading will result in the same penalties as outlined in Section 14.4. 6. When water is used in excess of the amount allocated to the property, the first year a letter with educational/informational materials on how to reduce water use will be sent to the water user, and they will be required to submit water meter readings every 6 months to track their progress. All subsequent water usage violations will result in the same penalties as outlined in Section 14.4.

2019 Irrigation Tap Fees (gallons/square foot/year)	Fee Per Square Foot of Irrigated Area	
	Potable	Reclaimed
High Water (> 10 GSF)	$2.47	$1.97
Medium Water (3-10 GSF)	$1.24	$0.99
Low Water (<3 GSF)	$0.62	$0.49
Zero Water (no irrigation after establishment)	0	0

2019 Tap Fees			
Lot Size in Square Feet	Standard Water Acquisition Fee	Water Acquisition Fee with Conservation Incentive: 50% or Less Irrigated Area	Water Acquisition Fee with Conservation Incentive: 30% or Less Irrigated Area
< 9,000	$4,875	$2,438	$1,024
9,001-13,000	$5,688	$2,844	$1,706
>13,001	$6,500	$3,250	$1,950

Building Local Capacity for Regulatory Enforcement

More advanced efficient outdoor watering regulations include monitoring and enforcement of outdoor water efficiency standards. This includes certification programs for landscape professionals and inspections and audits of landscape and irrigation installations. The trainings, certifications and audits are paid for through a combination of application and tap fees, administrative fees and service charges.

There are many types of certified landscape professionals from landscape architects to landscape technicians. Offering training programs can help build local capacity for landscape code implementation. Within Colorado, there are numerous programs available including CSU's online landscape technician program and the Associated Colorado Landscape Contractors of Colorado certification program.

Irrigation audits consist of three main activities: site inspection, performance testing and scheduling testing. The City of Aspen found that there were no professionals certified in the region to provide inspections. To enhance local capacity to meet the new landscape ordinance, the City of Aspen elected to become a Professional Certifying Organization (PCO) for a Qualified Water Efficient Landscaper Program (QWEL), a WaterSense labeled certification for irrigation system audits. The training certifies third party water auditors who learn about principles of proper plant selection for the local climate, irrigation system design and maintenance, and irrigation system programming and operation. In addition to QWEL, the Irrigation Association also provides resources and training for communities to develop irrigation audit certification programs.

Local governments commonly implement compliance with landscape code requirements through fee schedules. Fees can be based on hourly, standard, or percentage of construction costs and can be for the total process or by phase (plan review, inspection, reinspection). Fees do add to the costs of a building. However, water efficiency does save a property owner long-term. An evaluation of the State of California's model landscape code, which requires specific plant materials and irrigation systems installed by certified landscapers and irrigation inspection, found that the total costs of landscape installation increased between 30 and 35 percent.

Case Studies

Landscape Regulations

The City of Aspen's Water Efficient Landscaping Standards is featured throughout this resource chapter as a model for the headwaters region. A case study produced by the city is available here.

Winter Park adopted landscape regulations and guidelines for certain commercial and multifamily districts. The guidelines limit lawns as an accent to site development, recommend the use of efficient irrigation systems and recommend plant materials appropriate for a high alpine environment, including native grasses and wildflowers and a grass blend of 80 percent tall fescue, 10 percent bluegrass and 10 percent other grasses.

Silverthorne requires for commercial properties and new residential projects of four units or more with common area to:

- Use automatic irrigation systems with drip emitters, moisture sensors or a rain shut off device.
- Use Colorado native or drought-tolerant species suited to semi-arid environments. Seventy-five percent of the landscaped area is required to be living plants with the remaining 25 percent to be natural non-plant materials such as bark, wood chips and rocks.
- Limit sod to pedestrian traffic, recreational and erosion control areas.

Castle Rock is often featured as a model for their regulatory approach to water-efficient landscaping, in particular their incorporation of nearly all the efficient irrigation system best practices. Landscape plans are evaluated through a lens of three performance criteria: water efficiency, environmental sustainability, and aesthetics and quality of life. Some of these criteria include but are not limited to:

- A maximum water allowance of 15 inches per growing season.
- The integration of LID for stormwater management.
- Protection of the city's environment, including views, nature, wildlife, habitat, flora and fauna.

Their landscape code requires all development, except single family and duplex residential applications, to comply with the following standards.

- All landscape area larger than 500 square feet must have permanent irrigation systems, including for pots and planters.
- For irrigated landscape areas between 500 and 2,500 square feet, a combined tap is permitted; for between 2,500-5,000 a dual meter is required; and for areas greater than 5,000 square feet, a dedicated irrigation tap is required.
- Plant grouping by hydrozones is required.
- Irrigation widths of less than 4 feet in width are not allowed without approval. For areas less than 10 feet in width and for trees, shrubs, perennials and groundcover, only drip and subsurface irrigation systems are permitted. Turf and natural areas are allowed to use overhead irrigation as long as the area is wider than 10 feet. Native grass may be temporarily irrigated for establishment purposes and only permanently irrigated on slopes equal to 3:1.
- Smart irrigation controllers, battery backup or nonvolatile memory is required on all controllers with central control systems recommended for 10,000 square feet or larger.
- Meters must have shutoff valves; passing backflow prevention test is required for issuance of certificate of occupancy; and flow sensors and rain sensors are required.
- For overhead sprinklers, pop-up height must match the mature height of the plant material being irrigated with a minimum pop-up height of 6 inches for turf areas and 12 inches for native, wildflower or perennial areas. All pop-up spray heads must have internal check valves, internal pressure regulation, and matched precipitation rate spray or rotary nozzles.

- An irrigation system efficiency goal of 75 percent distribution uniformity must be met demonstrated by an irrigation audit.
- Lastly, the Town may conduct follow-up audits as deemed necessary at the expense of the customer.

The city also includes design standards for the incorporation of nonorganic design elements including mulching specifications for type, application and depth; prohibitions on the incorporation of plastic; edging material standards; and requirements for recycled water in water features and wind shutoff devices.

Flagstaff, Ariz. has a comprehensive landscape ordinance with explicit goals for supporting sustainability and the region's high-altitude environment. Uniquely, the code specifies three permitted hyrdozones most suitable to the Flagstaff climate:

- Hydrozone 1, or the oasis zone, which is an optional zone with high to moderate water use. Specific standards are outlines for this zone with requirements for graywater or reclaimed water and irrigation systems with separate valves.
- Hyrdozone 2 is a transition zone with low water-use plants. Mulching, active and passive rainwater harvesting systems, and non-potable water sources with low-volume irrigation are promoted.
- Hydrozone 3 is a periphery zone for very low water-use plants with the highest drought tolerance requiring little to no supplemental water. Native plants and vegetation are promoted. Mulching, active and passive rainwater-harvesting systems, and non-potable water sources with low-volume irrigation are promoted.

Flagstaff has also developed low-impact development standards and integrated those standards into their landscape code (10-50.60.070D) as well as a specific section on the use of pesticides and herbicides (10-50.60.080B).

Case Studies

Outdoor Water Conservation Ordinances

The primary water supply source for the Town of Eagle, Colo., is Brush Creek. The prolonged drought and a growing population had been negatively impacting the watershed's health and threatening the town's water supply due to extremely low summer flows. In 2018, recognizing that outdoor watering and summer peak demand were adding to stressors on Brush Creek, the town adopted Water Irrigation Conservation Ordinance 21, which limited outdoor irrigation by season, time of day and day of week as well as by water waste. It additionally includes drought management restrictions that address four different stages with increasing limitations on water use. The town strictly enforces the regulations beginning with a warning, followed by a warning letter and a fine for the second and third offenses, respectively. The fourth offense is considered a criminal offense with a significant fine of $2,650.00 and possible jail time.

The City of Aspen has also adopted a number of water-conservation and efficiency regulations. Their drought-related water-shortage restrictions provide good model language for other communities, including specific reduction targets by percentage of total use for each drought stage, beginning with a 10-percent reduction in Stage 1 to a 30-35-percent reduction by Stage 3. The initiation of water restrictions also triggers a tiered rate structure that can be announced and implemented within 48 hours.

A good example of a comprehensive water conservation ordinance is Bernalillo County, N.M., ordinance, which includes standards for all development types. Outdoor watering standards include:

- Water restrictions for season (April-October) and time-of-day prohibitions (7 a.m. to 11 p.m.) for spray irrigation.
- Emergency water restrictions for drought.
- Water waste prohibitions.
- Indoor standards for new residential development, ranging from meeting a water-use reduction target of 20 percent to being certified Green Build NM Bronze by installing only WaterSense fixtures.
- Outdoor watering standards for different types of development requiring limitations on high water-use plants of between 10 and 30 percent of total plant material, turf limitations to 30 percent of total landscape, smart controllers, limitations on spray irrigation, inclusion of passive water harvesting, soil amendment requirements, and requiring that between 35 and 45 percent of the total landscape be designed to survive without irrigation.
- Remodels that include new plumbing fixtures and landscaping must comply with standards for new development.
- Commercial developments may require a landscape plan and multi-family with more than eight units must submeter units.

The water conservation ordinance is supported by water conservation guidelines for each type of development and a water conservation worksheet to calculate water demand and savings. The Albuquerque Bernalillo Water Authority has been working to reduce its water demand since 1995. The most current water conservation plan aims to achieve a target of 110 gpcd by 2025. Over two decades, the city was able to reduce gpcd by nearly 50 percent, with over half of that attributed to improved irrigation efficiency and landscape enhancements. The city is now shifting its focus to target specific water customers with higher than average water demand.

Case Studies

Another example of a more comprehensive approach is the Water Conservation Ordinance in City of Petaluma, Calif. The City adopted a water conservation ordinance in 2009 that included both indoor and outdoor water efficiency. While the City is currently updating their water conservation standards to comply with new state regulations for a landscape code, the water conservation ordinance provides a good example of how to adopt outdoor water efficiency outside of landscape standards. The water conservation efficiency standards apply to both new and re-development. Requirements included:

- Soil and mulch requirements.
- Installation in residential areas of climate-adapted plants that require occasional, little or no summer water for 80 percent of the plant area, excluding edibles and areas using recycled water, and for 100 percent of the plant area in nonresidential areas.
- In residential areas, limitation on high water-use plant material, including turf, to 20 percent or less.
- Automatic smart irrigation controllers and rain sensors.
- Pressure regulators to ensure the dynamic pressure of the system is within the manufacturer's recommended pressure range.
- Meeting an irrigation distribution uniformity standard of 0.65.
- Limiting overspray and water waste, including a minimum width for overhead sprinklers of 10 feet.
- Flow sensors for landscaped areas greater than 5,000 feet.
- Submeters for nonresidential and multi-family projects and a required irrigation audit.
- A water allowance.
- A water waste prohibition.

This resource also provides examples of a comprehensive water conservation ordinance in other sections for Santa Fe County, N.M.

Model Code Provisions

Model Water Efficient Landscape Code Provisions[1]

Note: These model provisions narrowly address the best practices for the incorporation of water efficiency in a landscape code and does not include the full scope of all landscape code elements, such as design, screening, parking, tree preservation, etc. These standards and application submittal requirements below would be integrated into the relevant sections of a code.

General Provisions

A. Purpose and Objectives

The purpose and intent of water-efficient landscape requirements is to promote a sustainable and resilient landscape as follows:

- Extend water supply and water infrastructure by enhancing efficiency.
- Protect natural landscapes and habitats through incorporation of native plants and natural landscapes.
- Reduce peak season water demand and per capita usage through site design standards and the application of irrigation water budgets.
- Reduce stormwater runoff and impervious surfaces through the integration of Low Impact Design (LID) principles.
- Reduce wildfire risks in fire-prone zones through incorporation of defensible space principles.
- Eliminate outdoor water waste.
- Promote energy efficiency within landscape design.
- Enhance the quality of the urban environment through promotion of well-designed landscapes.

B. Applicability

Landscaping requirements shall apply to <*select and define as appropriate for local context*>:

1. **New Development**. All new nonresidential, multifamily and residential projects consisting of 2 or more lots____ < *or add threshold criteria with a site disturbance area greater than 1,000 square feet or 25 percent of the lot*>.
2. **Existing Development.** Projects that meet the following criteria:
    a. Projects requiring a building permit that cumulatively increase square footage by <*insert criteria such as 50 percent or more*>.
    b. Projects that are a change in use from single-family/duplex to multifamily or single-family to nonresidential use.
    c. Total redevelopment of a lot.
3. **All Public Facilities**.

C. Exceptions

1. Exceptions. Exemptions shall apply to: <*insert relevant to local context*>.

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1 Language for this code section informed by regulations from Colorado Springs; Aspen; Castle Rock; Centennial; Commerce City; Flagstaff, Ariz.; Tucson, Ariz.; Santa Fe, N.M., Santa Fe County, N.M.; and California's Model Landscape Code.

a. *(e.g. agricultural activities, master planned communities where different design standards may apply, golf courses, educational institutions, public right of ways, restoration sites, etc.)*

b. *(e.g. Any individual detached single-family residence or duplex on its own lot and not part of a subdivision application.)*

2. **Existing Compliance.** If a project can demonstrate it already meets the minimum water efficiency and landscape standards, a request for a determination of compliance may be made to the <*planning department*> in writing. The request shall contain:

   a. A description of the site, landscape and irrigation system with supporting materials demonstrating compliance.

   b. A water efficient irrigation audit performed by a certified third-party landscape irrigation auditor.

3. **Alternative Compliance.** If a development can meet the objectives of this code section through alternative or creative methods, an applicant may request approval of an alternative method of compliance by following this process:

   a. A pre-application conference with <*the planning department*> to discuss the request. A written request should be submitted with accompanying rationale and site map.

   b. If approved, the application should include:

      i. A description of site conditions, including topography, soils, existing vegetation, environmental values and identification of limitations.

      ii. An explanation of methods and techniques in the alternative design and how they will achieve the desired objectives.

      iii. The alternative landscape design plan.

D. Definitions

Definitions of technical terms used in this section are *<cite section or include below>.*

Required Application Materials

A. Baseline Conditions. An assessment of existing vegetation, both native and non-native, that is present on the site before disturbance.

B. Water Efficient Landscape Plan. A water efficient landscape plan prepared by a qualified landscape architect, licensed landscape contractor, certified nurseryman or other professional determined by the director to be qualified, that demonstrates how the project will be designed to meet the standards for water efficient landscaping on the site.

1. *<submittal requirements for document size, format, scale, etc.>*
2. Date.
3. Project name.
4. Project contacts.
5. Schematic of landscape design.
6. List of water efficient plant materials.
7. Each hydrozone labeled by a number or letter and delineation of each hydrozone by level of water use: very low, low, moderate, and high.
8. A summary of a soil analysis identifying soil type, soil amendment type, soil amendment volumes, and the condition of the soil related to texture, acidity, salts and plant nutrient availability.
9. Explanation of how topsoil will be stockpiled and reused.
10. Mulch type and application depth.
11. Areas for recreation, edible plants, surface area of water features, etc.

12. Areas irrigated with different water sources including potable water, recycled water and non-potable water.
13. Water features, retaining walls, walls, fences, etc.
14. Location and installation details of stormwater best management practices.
15. Rainwater harvesting technologies.
16. Landscape grading plan.
17. Irrigation system plan, including consistent with the most current version of *Landscape Irrigation Best Practices by the Irrigation Association of the American Society of Irrigation Consultants.*
18. Plan for maintenance of landscape elements, including irrigation system.
19. Signature of licensed landscape architect or licensed/certified landscape contractor.
20. Inspection affidavit.

Water Efficient Landscape Standards

Landscapes shall be designed according to these specifications.

A. Soil Preparation. The soil shall be prepared and amended in accordance with the recommendations of a soil analysis conducted by a certified soil lab.

1. Top Soil. Stripping and stockpiling of topsoil shall conducted during construction for replacement, with soil amendments, during landscape installation.

2. Soil Amendments.

a. Soil amendments for turf, shrubs, perennials and annuals shall be sandy loam to a depth of 6" containing at least 5 percent organic matter by volume.

b. Soil amendments for trees shall be:

i. Sandy loam to a depth of 36 inches containing 1-3 percent organic matter by volume.

ii. In locations with existing good soils, soil shall be turned three times the dimension of the root ball.

3. In locations with hard or compact soil, soil shall be broken up to create adequate drainage.

a. Soil amendments shall be Class I and Class II compost.
b. The percentage of rocks and debris by volume shall be appropriate for the landscape materials installed.

4. <if capacity for inspection, soil inspection will occur if deemed necessary prior to installation of plant material conducted by designated staff or contractors.>

B. Mulch. Mulch shall be applied at a minimum depth of 4 inches with modifications as appropriate for installed plant material. Mulch shall be renewed as needed. Mulch material may be of organic material including, but not limited to: wood, bark nuggets, nut shells, grass clippings, straw, compost and chopped leaves; or inorganic material including gravel, stone, pea gravel, pebbles.

C. Plant Selection and Grouping. Plant materials shall be selected for water efficiency, drought tolerance, use of native species and their relationship to the <*community*> regional ecology as well as geological and topographical conditions:

1. Plants shall be selected from <*Appendix, Manual, or List*>.
2. Plants shall be grouped together by soil suitability and by water use in distinct hyrdozones (very low, low, moderate and high) to increase irrigation efficiency.
3. The landscape design shall promote and preserve native species and natural areas and eliminate where possible or minimize need for irrigation after landscaping is established.

4. *<Plant materials used in bioretention and retention ponds shall be adapted to occasional submersion.>*

D. **Plant Quality**. Plants shall be A-grade or No. 1 grade.

E. **Plant Size**.

Plant Type	Minimum Size
Shade Tree	*2-inch caliper*
Evergreen	*6-foot height*
Ornamental Tree	*1.5-inch caliper*
Shrubs	*5-gallon*
Ornamental Grasses	*1-gallon*

F. **Wildfire Management Constraints**. In high fire-risk and fire-prone areas identified by <*cite ordinance, map or plan*>, landscape design shall integrate fire-resistant landscaping buffers between development and naturally vegetated areas, locate highest water-use hyrdozones adjacent to structures, select fire-resistant plant species nearest structures, and thin fuel species on slopes and adjacent to structure. In case of a conflict between this regulation and fire safety requirements, the fire safety requirements shall control. *<Landscape plans may be reviewed by the wildfire risk manager in highest fire risk zones> and/or <A site inspection by a wildfire specialist is required prior to landscape design.>*

G. **Controlled or Prohibited Materials**. The installation of the following invasive species is prohibited: <*list species*>

H. **Plant Installation**. Groundcover, turf, shrubs, trees and other plant material shall be installed as follows:

1. **Trees.** *<not covered in the scope of this project>*
2. **Groundcover and Shrubs.** *<not covered in the scope of this project>*
3. **Turf.** Turfgrass sod or turfgrass seed shall be cold season grasses with no more than 25 percent Kentucky bluegrass. Recommended turf species includes *<fine fescues, wild ryegrass, blue grama and buffalo grass>*. Turf shall be limited as follows:
    a. Single-family dwelling units shall not have turf in excess of 1,000 square feet or 10 percent of the total lot area, whichever is less.
    b. Multifamily dwelling units shall not have turf in excess of 20 percent of the required common space.
    c. Industrial and commercial development shall not have turf in excess of 1,000 square feet or 3 percent of the required open space, whichever is greater.
    d. Public parks and commercial recreation uses are exempt from turf limitations but shall limit Kentucky bluegrass to active recreation and high traffic areas only.

I. **Height limitations**. Landscape materials may not interfere with the proper operation of solar energy equipment or passive solar design on adjacent parcels.

J. **Water Features**. Decorative water features (e.g. ponds, fountains, pools) shall have recirculating water systems and use recycled water when available.

Outdoor Water Use and Efficient Irrigation Standards

Landscapes shall be designed according to these specifications.

<include A. if utilizing a water allowance>

A. **Landscape Water Allowance.** Where the water supply source allows outdoor use, the estimated outdoor water use shall not exceed the maximum allowed water budget. Methodology for calculation is *<cite methodology and reference location>* .

1. All irrigated landscaped areas must be included in the water budget calculation.
2. The total irrigation need for all hyrdozones cannot exceed the maximum allowed <*water allowance*>.

B. Irrigation System Design. Where irrigation is necessary**,** water-efficient irrigation systems shall be planned and designed to meet the following standards, consistent with the landscape plan and the most current version of *Landscape Irrigation Best Practices by the Irrigation Association of the American Society of Irrigation Consultants.* Irrigation systems shall be designed for site-specific hyrdozones, topography, site orientation, microclimates, prevailing winds and soil type.

1. Dual or multi-program controllers with separate valves and circuits shall be used when the landscape contains more than one type of landscape treatment or for an irrigated area over <*1,000 square feet*> or <*for all commercial, industrial, and multi-family residential developments.*>
2. Smart controllers, such as soil moisture sensing devices and rain sensors, shall be used on projects greater than <*1,000 square feet*> to minimize overwatering.
3. Irrigation systems shall use hydrozones by levels of water use.
4. Permanent irrigation systems (drip, bubblers, low-flow sprinkler heads or similar systems) shall be used on all irrigated landscapes except where hand watering with a hose equipped with a shut off valve is permitted for landscapes of <*less than 1,000 square feet*>.
5. Check valves and anti-drain valves are required for all sprinkler heads.
6. The system shall be designed to ensure that the operating pressure at each emission device is within the manufacturer's recommended pressure range for optimal performance.
7. Overhead spray irrigation is prohibited for use on trees, shrubs and groundcover. Sprinkler heads shall be a WaterSense labeled product and have matched precipitation rates within each valve zone. Sprinkler spacing shall be designed to achieve the highest possible distribution uniformity. All sprinkler heads installed in turfgrass shall have a distribution uniformity of 0.65 or higher.
8. Low-flow sprinkler heads with matched precipitation rates shall be used when spray or rotor type heads are used for shrubs and groundcover.
9. Turf areas shall be sized and shaped for efficient irrigation and elimination of water waste. Minimum pop-up height for sprinklers in turfgrass areas shall be 6 inches. Minimum turf area width shall be 10 feet.
10. *Watering schedule shall comply with <community> water conservation ordinance <cite section>* or <*Watering shall be scheduled between 6 p.m. and 9 a.m.*>
11. Irrigation systems shall be designed to prevent water waste, overwatering and overspray, and drainage of water onto any paved or unplanted surface.

C. Stormwater and Groundwater Recharge. The landscaped areas shall include best management practices for on-site detention of stormwater runoff and groundwater recharge.

1. <*If stormwater management and low impact design standards are in a separate code section, cite compliance with specific sections. For related code language, see NWCCOG Model Water Quality Protection Standards*> All landscaping areas that are an integral part of stormwater management systems shall be designed in compliance with <*code citation*>.
2. <*If no existing regulations*> These practices include but are not limited to:
    a. Infiltration beds, swales and basins that slow stormwater runoff, collect rainwater and prevent water waste.
    b. Constructed wetlands and retention ponds that retain water, absorb excess flow and filter pollution.
    c. Pervious or porous surfaces such as permeable pavers or blocks and porous concrete.

D. Rainwater Harvesting. All single- and multi-family residential properties of four units or less are <*encouraged/required*> to utilize water harvested by rainwater barrels for outdoor watering of landscapes. Rainwater harvesting shall consist of two rain barrels not exceeding 110 gallons of storage per residential unit, as authorized under C.R.S. § 37-96.5-103.

Water Waste Prohibition

A. Water Waste. Waste of water includes, but is not limited to, continuous application of water to lawns or landscaping that results in excessive puddling or runoff of water, failure to repair leaking water service lines and irrigation systems, application of water to impervious surfaces other than for cleaning purposes, and all other applications of domestic water that do not result in a beneficial use of the public water supply.

Special Requirements for Restrictive Covenants

A. Restrictive Covenants Landscaping Requirements. The water demanded by landscapes in residential development, especially turfgrass, peaks in the summer months, straining the water system and environment. Homeowner covenants approved after [effective date of regulations] are prohibited from requiring that the cultivated vegetation within a subdivision be limited to turfgrass, requiring a percentage of a homeowner's property as turfgrass, or prohibiting xeric landscapes.

Maintenance

A. Maintenance Required. All landscaping shall be maintained to support healthy and thriving conditions. Irrigation systems and their components shall be maintained in a fully functional manner consistent with the originally approved design and the provisions of this chapter. A maintenance schedule shall be included in the landscape plan and submitted with the final approval application.

B. Replacement of Plant Material. Replacement of dead or diseased plant material shall be of the same type of plant material as set forth in the approved landscape plan within 45 days of the start of the following growing season. Replacement time shall not exceed one year.

Installation and Assurances

A. Timing of Installation. Approved landscaping and watering systems shall be installed *<and inspected>* in compliance with the approved landscape plan *<prior to issuance of a certificate of occupancy> or <prior to the final building inspection>*. If a landscape and irrigation system cannot be installed prior to issuance of a certificate of occupancy for reasons determined by the *<department to be valid, a maximum 90-day deference can be issued along with a temporary certificate of occupancy>* or *< A certificate of occupancy for a structure or building may be issued prior to the completion of required landscape improvements, if the completion is not possible due to seasonal or weather conditions and if the owner or developer escrows the necessary funds with the zoning administrator for the completion of the landscaping.>*

Water Efficiency Provisions for Inclusion in a Water Conservation Ordinance[2]

Note: These model provisions for outdoor water efficiency can be combined with the model provisions for indoor water efficiency as part of a comprehensive water conservation ordinance.

General Provisions

A. Purpose

As an invaluable natural resource that sustains the ecological, economic, and social vitality of the community, <*jurisdiction*> is committed to ensuring a resilient and sustainable water supply through implementation of water conservation and efficiency practices.

- To protect the health and quality of water bodies.
- To conserve potable and non-potable water resources.
- To reduce peak summer demand therefore extending the capacity of existing water supply and infrastructure.

B. Applicability

These requirements shall apply to development <*select and define as appropriate for local context*> within <*jurisdiction boundary*>. Where a conflict exists between these regulations and any other regulations applicable to the same area, the more stringent requirement shall control.

1. **New Development**. All new residential projects consisting of <*2 or more lots*>, all commercial and multifamily projects, and all nonresidential projects.
2. **Existing Development.** Projects that meet the following criteria:
    a. Projects requiring a building permit that cumulatively increase square footage by <*insert criteria such as 50 percent or more*>.
    b. Projects that are a change in use from single-family/duplex to multifamily or single-family to nonresidential use.
    c. Total redevelopment of a lot.
3. **All Public Facilities**.

C. Exemptions.

A request for exemption shall be made to the <*person/department*> in a letter that contains the explains the reason an exemption is being requested, the duration of time for requested exemption, the location of the requested exemption, and other data and information that will support the exemption request.

Efficient Outdoor Water Use Requirements

A. Plant Materials

1. Compost, at a rate of a minimum of four cubic yards per one thousand square feet of permeable area, is <*required/recommended*> to a depth of six inches into the soil.
2. A minimum three-inch layer of mulch is <*required/recommended*> to be applied on all exposed soil surfaces of planting areas.
3. The use of native and drought-tolerant plants is <*required/recommended*> for the majority of the landscaped area with the placement of high-water use plants required adjacent to the structure. A list of plants can be found < *See Ch. 3, page 53, for mountain region lists>.*
4. Turfgrass sod or turfgrass seed shall be low water cold season grasses with no more than 25 percent Kentucky bluegrass. Recommended turf species includes <*fine fescues, wild ryegrass, blue grama and buffalo grass*>.
5. Turf shall be limited as follows:

2 Language informed by Town of Eagle, CO; Bernalillo County, NM, City of Aspen, CO; Santa Fe County, NM.

1. Single-family dwelling units shall not have turf in excess of <*1,000 square feet or 10 percent of the total lot area*>, whichever is less.
2. Multifamily dwelling units shall not have turf in excess of <*20 percent of the required common space>.*
3. Industrial and commercial development shall not have turf in excess *of <1,000 square feet or 3 percent of the required open space>,* whichever is greater.
4. <*Parks and*> Golf courses shall be designed to limit high-water-use turf and plants to those areas with heavy usage or foot traffic, such as <*athletic fields, playgrounds*> golf course tees, greens, and fairways.

6. Common areas, street medians, streetscapes, ornamental landscapes of developments shall be designed to use medium and low water use turf and plants.

B. Outdoor Irrigation

1. Irrigation Efficiency
   Development shall use effective water conservation measures and best management practices, using the most current version of *Landscape Irrigation Best Practices by the Irrigation Association of the American Society of Irrigation Consultants,* that are feasible and reasonable including:
   a. Evapotranspiration or soil moisture irrigation control.
      i. Smart controllers, such as soil moisture sensing devices and rain sensors, shall be used on projects greater than <*1,000 square feet*> to minimize overwatering.
      ii. Dual or multi-program controllers with separate valves and circuits shall be used when the landscape contains more than one type of landscape treatment or for an irrigated area over <*1,000 square feet*> or <*for all commercial, industrial, and multi-family residential developments.>*
   b. Irrigation system efficiency improvements.
      i. Permanent irrigation systems (drip, bubblers, low-flow sprinkler heads or similar systems) shall be used on all irrigated landscapes except where hand watering with a hose equipped with a shut off valve is permitted for landscapes of *<less than 1,000 square feet>.*
      ii. The system shall be designed to ensure that the operating pressure at each emission device is within the manufacturer's recommended pressure range for optimal performance.
      iii. Overhead spray irrigation is prohibited for use on trees, shrubs and groundcover. Low-flow sprinkler heads shall be used when spray or rotor type heads are used for shrubs and groundcover.
      iv. Sprinkler heads shall be a WaterSense labeled product and have matched precipitation rates within each valve zone. Sprinkler spacing shall be designed to achieve the highest possible distribution uniformity. All sprinkler heads installed in turfgrass shall have a distribution uniformity of 0.65 or higher.
      v. Turf areas shall be sized and shaped for efficient irrigation and elimination of water waste. Minimum pop-up height for sprinklers in turfgrass areas shall be 6 inches. Minimum irrigated turf area width shall be 10 feet.
   c. Leak detection and repair systems or programs.
2. Seasonal and Time of Day Irrigation Restrictions
   a. No outdoor watering shall be permitted prior to <*spring season date*> and after *<fall season date>.*
   b. All spray irrigation during the period beginning on <*date*> and ending on <*date*> of each year must occur between 6:00 p.m. and 9:00 a.m. This restriction shall not apply to drip irrigation and low precipitation bubblers, hand watering, or watering of containerized plants and plant stock.

3. Irrigation Day of Week Restrictions
    a. For residential uses:
        i. No residential outdoor watering on Mondays.
        ii. Even numbered addresses water on Tuesday, Thursday, and Saturdays.
        iii. Odd numbered addresses water on Wednesday, Fridays, and Sundays.
    b. For non-residential uses (schools, parks, government, commercial, industrial, churches)
        i. Water on Mondays, Wednesdays, and Fridays.

C. Water Features

1. Recirculating water systems shall be used for water features.
2. Where available, recycled water shall be used as a source for decorative water features.
3. Covers shall be used for all outdoor pools and spas.

D. Rainwater Harvesting

1. For all residential properties of 4 units or less, households are <*encouraged/required*> to utilize water harvested by rainwater barrels for outdoor watering of landscapes of 2 rain barrels not exceeding 110 gallons of storage per unit authorized under *C.R.S §37-96-103*.
2. The use of rain gardens to increase infiltration and filtering of stormwater is *<required/recommended>* for parking lots and residential development.

E. Water Waste and Fugitive Water

The following waste of water shall be prohibited.

1. Landscape irrigation water applied in such a manner, rate and/or quantity that it causes runoff onto adjacent property or public right-of-way;
2. Landscape irrigation water which leaves a sprinkler, sprinkler system, or other application device in such a manner or direction as to spray onto adjacent property or public right-of-way;
3. Flow resulting from temporary failures or malfunctions of water supply system when the failure or malfunction is not repaired within <*48*> hours.

F. Restrictive Covenants

1. Traditional turf landscapes in residential development peaks in the summer months placing a significant burden on the water system and environment. Any homeowner covenants created in subdivisions approved following the adoption of this requirement are prohibited from requiring that the cultivated vegetation within a subdivision be limited to or a designated percentage of a homeowner's property as turfgrass is prohibited.

Emergency Water Restrictions

<insert based on drought management plan>

<if no drought management plan, include general language stating the local government has the ability to adopt additional water efficiency and conservation measures not included in the ordinance in the case of a drought or emergency in order to protect water resources.>

Enforcement

A. Compliance

Applicants shall: *<select the appropriate method of compliance>*

- *<Submit a Water Use Efficiency Compliance Form to the <building department> for verification prior to construction.>* or
- *<Submit a Water Use Efficiency Compliance Form to the <building department> certified by a licensed landscape professional before or at the time of final building inspection.>*

B. Violations and Enforcement

<for jurisdiction with a utility>

For a first violation of the requirements of this ordinance, the *<jurisdiction>* shall issue a written notice. For a second violation within the preceding twelve (12) calendar months, a surcharge in the amount of *<$ amount>* shall be charged to the customer's water bill>. Each subsequent offense shall have a fine of *<$ amount>*. After a fifth or any subsequent violation, the *<jurisdiction>* shall have a fine of *<$ amount>* and *<may restrict water service to the customer>.* Full service may be restored no later than 48 hours after payment of all charges and termination of action resulting in violation. The *<municipality >* shall have the right to enforce compliance including injunction or court action.

<for jurisdiction without a utility>

The *<jurisdiction's departments given authority of enforcement>* may enforce any and all of the water conservation regulations with the following fines scheduled allowed for violation of the ordinance. Violations at a single address per day constitute a single offense.

1st violation	Written Notice.
2nd violation with 12 months	<fine $ amount>
3rd violation	<fine $ amount>
4th violation	<fine $ amount>
5th violation	<fine $ amount> and possible legal action

Chapter 4
Reducing Indoor Water Demand

Chapter 4 Contents

Best Practices Summary: Indoor Water Efficiency

1. **Match Plumbing Standards to Colorado's WaterSense Rule (HB 19 1231)**

Colorado adopted a plumbing fixture, appliance, and equipment rule that is stricter than national standards.

Lavatory Faucet	0.5 gpm
Lavatory Faucet	1.5 gpm
Showerhead	2.0 gpm
Flushing Urinal	0.5 gpf
Flushometer Valve Toilet, Commercial	1.28 gpf
Tank Toilet	1.28 gpf
Kitchen Faucet/Aerators, Residential	1.8 gpm
Spray Sprinkler Bodies	Water Sense
Dishwasher, Commercial	Energy Star
Steam Cookers, Commercial	Energy Star

2. **Update Green Building Standards to Go Beyond State and National Standards**

In communities with green building codes, the standards should exceed WaterSense standards.

- Ultra-high efficiency toilets and urinals with flush rates less than 1.28 gpf and 0.5 gpf, respectively
- Lavatory faucets with flow rates less than 1.5 gpm and aerators
- Showerheads with flow rates less than 2.0 gpm and a maximum total number of showerheads
- Kitchen faucets with a flow of less than 1.5 gpm and aerators
- Energy Star washing machines and dishwashers
- Retrofits of inefficient plumbing fixtures
- Total percentage of fixtures in a unit that exceed WaterSense and/national standards
- Water using commercial fixtures and equipment
- Submetering for multiple units or indoor/outdoor water use.
- Energy Star or tankless hot water systems

3. **Include Indoor Water in Water Waste Provision**

Along with outdoor water waste, include a requirement to repair indoor leaks, including a leaking pipe, a leaking valve, or a leaking faucet.

4. **Require Retrofits for Redevelopment and/or Resale**

For communities with a high percentage of the housing stock pre-1994, require retrofits at redevelopment or transfer of ownership. Certificates of compliance which are self-submitted, verified by third party, or verified by staff can be issued for:

- Retrofits on resale or purchase.
- Retrofits on reconnection for water service.
- Retrofits on building permit.

5. **Adopt Commercial Indoor Water Efficiency Standards, Especially in Tourism Based Economies**

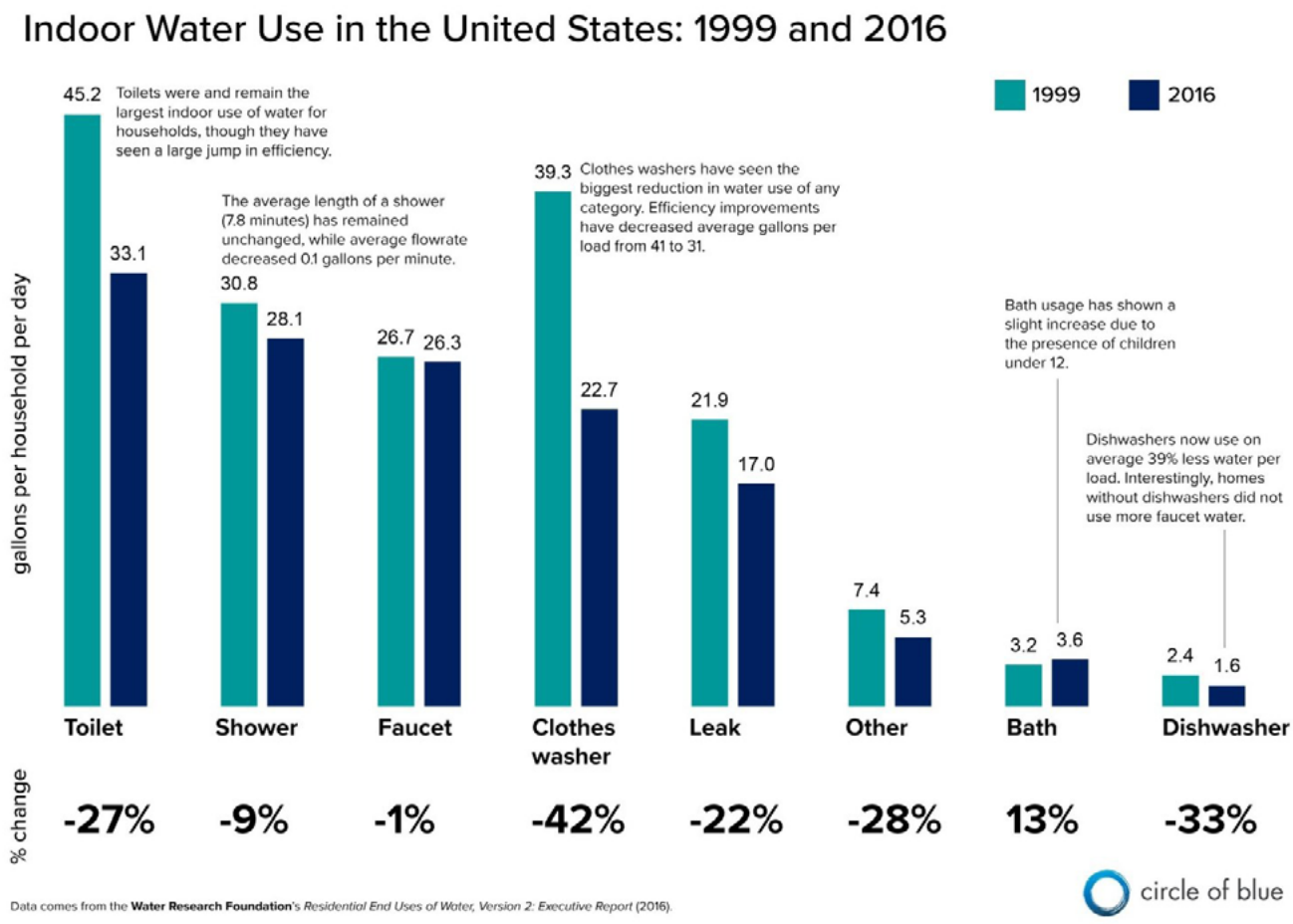
Adopt indoor water efficiency standards for non-residential commercial and multi-family development for water efficient plumbing fixtures, appliances, and equipment in new construction, remodels, and redevelopment. In tourism-based economies, additional standards should be included for the restaurant and lodging sector.

Restaurants	Hotels
• EnergyStar appliances (dishwaters, ice machines, etc.) • Low flow pre-rinse valves and spray nozzles (1.3 gpm) • Serve water on request • Mandatory annual audits • Closed system steamers • Energy Star dishwashers • Energy Star ice machine • WaterSense toilets and faucets • Metered faucets • Low flow aerators on faucets • Waterless urinals and ultra-low flow urinals	• Limits on frequency of washing linens. • EnergyStar appliances (laundry, ice machines, dishwasher) • Pool covers • Recirculating water features • Efficient cooling towers • High efficiency bathroom fixtures • Require an annual water audit and water conservation strategy

Making Indoor Water Use More Efficient

Why Indoor Water Efficiency Matters

Waterwise plumbing fixtures, appliance, and equipment can save significant amounts of water complementing other conservation program approaches. The 1993 Federal Energy Policy Act established a national efficiency standard for all toilets, showers, urinals, and faucets manufactured in the United States after 1994. Ever since water savings across American have increased due to technological efficiency. Using toilets as a comparison, a toilet pre-1994 used 3.5 gallons per flush compared to the higher efficiency toilets of today that use 1.6 gallons per flush. For a household, this results in saving between 8,000 and 20,000 gallons per year. Local communities have benefited regardless of whether they have adopted any local water conservation and efficiency standards.



Following up on the success of the 1992 Energy Star program, the US Environmental Protection Agency (EPA) created the WaterSense Program in 2006, a voluntary national certification program for plumbing products that are required to be a minimum of 20 percent more efficient than the federal standards. Up until December 2010, the federal government prohibited states from adopting standards, such as WaterSense, that were stricter than the federal standard. Following a change in federal policy, states across the U.S. have since adopted statutes in favor of the more efficient WaterSense and Energy Star products.[1] In 2015, Colorado adopted the WaterSense Law HB 19-1231, which is being phased in over multiple years and limits retailers and wholesalers from distribution of certain plumbing fixtures and appliances that do not meet minimum efficiency standards.

1 The State of California has adopted the most aggressive water efficiency standards being slightly more efficient than Colorado. Toilets and urinals less than 1.28 gpf , lavatory faucets no more than 1.2 gpm, kitchen faucets no more than 1.8 gpm, public lavatory faucets no more than 0.5 gpm.

WATER-EFFICIENT INDOOR PRODUCTS & SYSTEMS - U.S. GREEN STANDARDS, CODES, & VOLUNTARY INITIATIVES

Standard/Guideline	ANSI Apprvd	Application	Maxi-mum Water Pressure (PSI)	Water Closets - Toilets (Maximum gpf)	Urinals (Maxi-mum gpf)	Private Lavatory Faucet (Maximum flow rate-gpm) See definition below	Public Lavatory Faucet (Maximum flow rate-gpm) See definition below	Metering Faucet self-closing (Gallons per cycle)	Residen-tial Kitchen Faucet (Maxi-mum flow rate-gpm)	Residential Showerhead (Maximum flow rate-gpm)	Residential Showering Compartment (Maximum flow rate-gpm)	Residen-tial Dish-washer (Gallons Per Full Wash & Rinse Cycle)	Residential Clothes Washer (Water Factor - WF = gal per cu.ft. of capacity)	Comm'l Pre-Rinse Spray Valve (Max flow rate-gpm)	Comments
				Plumbing Fixtures and Fittings					Residential-type Fixtures, Fittings, & Appliances						
Primary Organization Authoring U.S. National Product or Federal Standards (if any) >>>>			None	ASME/CSA	ASME/CSA (vitreous china) and IAPMO (plastic)	ASME/CSA	ASME/CSA	ASME/CSA	ASME /CSA	ASME/CSA	None	U.S. DOE	U.S. DOE	ASME /CSA	
U.S. National Product Standard	Voluntary until enacted into law, code, or other regulation		NR	1.6 (1.28 for those designated "high efficiency")	1.0 (0.5 for those designated "high efficiency")	2.2 (1.5 for those designated "high efficiency")	0.5	0.25 (NOTE: no flow rate maximum)	2.2 (classified as "sink" faucet in the std.)	2.5 (2.0 for those designated "high efficiency")	Not covered	5.0 (std size)	Top load: 8.4 Front load: 4.7	1.6 (1.28 for designated "high efficiency")	
U.S. Energy Policy Act(s) (EPAct - various dates) AND Energy Independence and Security Act of 2007	Mandatory - all installations		NR	Conventional =1.6 Blowout = 3.5	1.0	2.2 @ 60 psi	≤2.2 @ 60 psi; National std & model plumbing codes set at 0.5-gpm maximum	0.25 (no flow rate maximum)	2.2	2.5	Not covered	5.0 (std size)	Top: 6.5 Front: 4.7	1.0, 1.2, and 1.28 depending upon "product class"	
Green Globes - Green Building Initiative (GBI) - (Points-based system)	YES	Voluntary points-based system - Covers all but low-rise residential (1 to 3 stories)	NR	GBI provides no water pre-requisites, thereby allowing up to the 1992 Federal maximums for toilets, urinals, faucets and showerheads.								GBI provides no pre-requisites, thereby only requiring compliance with the prevailing Federal standard as shown in the line above.			A point-based ANSI standard with no 'green' efficiency prerequisites.
USGBC - LEED Version 4 New Construction Rating System (Points-based system)	NO	Voluntary - (single family residences covered in another LEED product)	NR	Water Efficiency Pre-Requisite: *"Employ strategies that in aggregate use 20% less water than the water use fixtures and fittings baseline calculated for the building (not including irrigation or process water)."*								Energy Star or equivalent		1.3	LEED mandates a 20% water use reduction threshold (from a calculated baseline). Points may be earned for reductions in excess of 20%.
NAHB National Green Building Standard™ (NGBS) ICC 700-2015 (Points-based system)	YES	Voluntary - Residential: new homes, renovations, and additions	NR	WaterSense HET (1.28 or 1.2) OR waterless toilet	≤ 0.5, including waterless	1.5; Self-closing, motion sensor, metering, or pedal-activated	NA	Included as part of private lavatory faucet provisions	NR	≤1.6 to 2.5 with varying points depending upon flow rate. Provides for matching auto-matic compen-sating valve.	Maximum of 2.5-gpm per compartment	Energy Star	Energy Star	NA	Requires humidifiers to be recirculating type. Standard finalized, approved by ANSI, and published in 2016.
USGBC - LEED for Homes V.4	NO	Voluntary - new homes	60 inside	WaterSense HET - average flush volume of all toilets ≤ 1.1	NR	WaterSense Faucet ≤ 1.5	NA	Pre-requisite	NR	WaterSense and ≤ 1.75	Maximum of 1.75-gpm per compartment	Energy Star	Energy Star	NA	

Standard/Guideline	ANSI Apprvd	Application	Maxi-mum Water Pressure (PSI)	Water Closets - Toilets (Maximum gpf)	Urinals (Maxi-mum gpf)	Private Lavatory Faucet (Maximum flow rate-gpm) See definition below	Public Lavatory Faucet (Maximum flow rate-gpm) See definition below	Metering Faucet self-closing (Gallons per cycle)	Residen-tial Kitchen Faucet (Maxi-mum flow rate-gpm)	Residential Showerhead (Maximum flow rate-gpm)	Residential Showering Compartment (Maximum flow rate-gpm)	Residen-tial Dish-washer (Gallons Per Full Wash & Rinse Cycle)	Residential Clothes Washer (Water Factor - WF = gal per cu.ft. of capacity)	Comm'l Pre-Rinse Spray Valve (Max flow rate-gpm)	Comments
				Plumbing Fixtures and Fittings					Residential-type Fixtures, Fittings, & Appliances						
US EPA WaterSense Single-Family New Home Specification V.1.2 - 2014	NO	Voluntary - new homes	60	WaterSense HET (1.28 avg)	WaterSense HEU (0.5)	WaterSense Faucet (1.5; lower limit of 0.8 min.)	NA	NR	2.2	WaterSense 2.0	Maximum of 2.0-gpm per compartment of ≤ 2,160 sq.in. NOTE: max flow provisions include both potable and recirculated water. Additional space increments must be served by separate controls.	Energy Star	Energy Star + WF of ≤ 6.0	NA	V.1.2 specification released 2014.
IAPMO Water Efficiency and Sanitation Standard (WE-Stand) - 2017	YES	Voluntary until enacted into law by local or state jurisdiction	NR	WaterSense +1.28	Flushing: WaterSense HEU (0.5). Non-water: Requires upstream drainage discharges.	WaterSense Faucet (1.5; lower limit of 0.8 min.)	0.5	0.25 (no flow rate maximum)	1.8 with an override allowing a temporary flow of 2.2	WaterSense 2.0	Total of 2.0-gpm per total compartment of ≤1,800 sq. in. Additional showerhead allowed for each addit space increment of 1,800 sq in. or part thereof. Exception for "accessible" compartment with a hand shower.	Energy Star	Energy Star	1.3 and comply with Water-Sense. Requires automatic shut-off	The WE-Stand replaced the earlier IAPMO Green Plumbing & Mechanical Supplement
ASHRAE Standard 189.1 *AND* ICC International Green Construction Code (IgCC)	ASHRAE std. 189.1 only	IgCC covers all construction EXCEPT that covered by the NGBS (ICC 700-2008 - see above). Voluntary until enacted into law by local or state jurisdiction	NR	Tank-type: WaterSense HET 1.28 Flushometer Valve/Bowl Combination: 1.28 NOTE: maximum full flush volume on dual flush: 1.28	Flushing: WaterSense HEU (0.5). Non-water: Requires upstream drainage discharges.	WaterSense Faucet 1.5; lower limit of 0.8 minimum	0.5	0.25 (no flow rate maximum)	1.8 with temporary override allowing a flow of 2.2	WaterSense 2.0	Total of 2.0-gpm per compartment of ≤2,600 sq. in. Additional 2.0-gpm allowed for each addit space increment of 2,600 sq in. or fraction thereof. Exception for "accessible" compartment in accordance with the IPC.	Energy Star + 3.8 for full size & 3.5 for compact size	Energy Star + WF of ≤ 5.4	1.28 and comply with Water-Sense. Requires automatic shut-off	Water bottle filling stations required adjacent to at least 50% of drinking fountains

gpf	Gallons per flush	**ASHRAE**	American Society of Heating, Refrigerating, and Air-Conditioning Engineers
gpm	Gallons per minute	**NAHB**	National Association of Home Builders
gpc	Gallons per cycle	**USGBC - LEED**	United States Green Building Council - Leadership in Energy & Environmental Design
psi	Water pressure in pounds per square inch	**IAPMO**	International Association of Plumbing & Mechanical Officials
HET	High-Efficiency Toilet	**ASME**	American Society of Mechanical Engineers
HEU	High-Efficiency Urinal	**ICC**	International Code Council
CSA	Canadian Standards Association	**WF**	Water Factor - gallons per cycle per cubic foot of washer capacity
DOE	U.S. Department of Energy	**NA**	Not applicable **NR** Not Required or Not Recognized

Lavatory faucet in "private" installation "Private" is defined by the Uniform Plumbing Code, the International Plumbing Code, and the National Standard Plumbing Code as inclusive of residences, hotel guest rooms, and hospital patient rooms.

Lavatory faucet in "public" installation "Public": All installations not otherwise defined as "private"

Understanding Green Building Standards, Plumbing and Building Codes and Third-Party Certifications

A plethora of standards, rating, and certification programs are available to guide the development of sustainable and high-performance buildings and communities.[1] Water efficiency has become a focus as water scarcity has moved to the forefront. This list below includes links to some of the most recent standards, codes, and third party certifications.

- 2015 International Plumbing Code (IPC), (ICC)
- 2018 International Plumbing Code
- 2018 Uniform Plumbing Code, (IAMPO)
- International Green Construction Code (IgCC). A comprehensive code with standards for energy conservation, water efficiency, and commissioning, and enforcement procedures and guidelines for existing building renovations.
- ICC 700 National Green Building Standard. The standard defines green building for single-family and multi-family homes, residential remodeling, and site development projects while allowing enough flexibility to incorporate regionally appropriate best green practices.
- ANSI/ASHRAE/USGBC/IES Standard 189.1, *Standard for the Design of High-Performance Green Buildings Except Low-Rise Residential Buildings* this standard provides minimum requirements for site, design, construction and operations in mandatory, code-enforceable language. ASHRAE 189.1 can be used as a jurisdictional compliance path for the IgCC.
- Water Efficiency and Sanitation Standard (IAMPMO 2017) The first ANSI standard that focuses solely on achieving safe and efficient water use in both residential and non-residential buildings.
- US Green Building Council LEED Water Efficiency (WE v.4) addresses water holistically, looking at indoor use, outdoor use, specialized uses, and metering.
- In 2020, Residential Energy Services Network will release its water efficiency rating system, HERSH2O which builds off of RESNET's nationally recognized Home Energy Rating System (HERS®) Index. HERSH2O is a system for rating whole-house water efficiency that includes both indoor and outdoor uses.
- WaterSense Labeled Home is a third-party certification program of indoor and outdoor water efficient homes that reduce water use by 20%.

1 The National Institute of Building Sciences Whole Building Design Guide offers a comprehensive review of the different green building standards, ratings, and certification programs. https://www.wbdg.org/resources/green-building-standards-and-certification-systems

The prohibition on sale of products in Colorado does not prevent the installation of products that do not meet the state requirements unless prohibited by local regulations. Additionally, the state statute does not cover the full suite of more efficient products. Local government have an opportunity to align their minimum water efficiency standard to the state as well as expand standards to include additional fixtures, appliance, and equipment.

There are three options available to local governments to regulate indoor water efficiency standards that can ensure development takes full advantage of technological advancements. These options include adoption of:

1. A water conservation ordinance with standards for indoor water efficiency.
2. Sustainable development standards that promotes green construction and design practices through a points-based compliance system.
3. A plumbing code with stronger water efficiency standards.

Selecting the appropriate approach depends upon the policy goals of a community, its development review capacity, and existing development regulations. To support a local government in determining the most appropriate approach to increase water efficiency, this chapter provides best practices for as well as model water conservation ordinance language for indoor water use.

Uniform Building and Plumbing Codes

Communities have many options in pursing more sustainable building construction with many different third-party programs, model codes or development of their own codes based on models.[2] Addressing building and plumbing codes went beyond the scope of this resource guide. There are many resources already available including the Western Resource Advocates *Integrating Water Efficiency Into Land Use* resource guide (Part III: Additional Strategies, 10. Building and Plumbing Codes, Pages 184 – 199) which offers guidance and case studies on this topic. Also helpful is a comprehensive summary prepared by the Alliance for Water Efficiency and Keoeller and Company in 2016 comparing water savings across all the U.S. green building standards, codes, and initiatives clarifying the differences in water efficiency between the different codes for different fixtures and appliances.

Indoor Water Efficiency Best Practices

The standards presented below offer local governments options for wanting to increase indoor water efficiency. A jurisdiction should work with water providers to review water demand and determine the potential benefit to the water supply of including indoor water demand standards. An assessment of the pros and cons of pursing indoor water efficiency regulations might include:

- A review of water demand by sector
- Identification of largest commercial water users
- A review of housing structures older than 1994
- An estimate of the total number of toilets older than 1994
- Percentage of building permits that are redevelopment or remodels

Best practices are summarized below.

Match Standards to State and National Minimum Efficiency Requirements

Each community should review their development, building and plumbing codes for consistency with both national and state water efficiency standards. The principle differences between the state and other standards are highlighted below. Codes should adopt the Colorado standards as the minimum for the fixtures, appliances, and equipment included in the state rule.

2 Comparison of green building codes by EPA. https://www.epa.gov/smartgrowth/comparison-green-building-standards?std1=1&std2=1&std3=1&std4=1&std5=1&std6=1

Comparison of Colorado Water Efficiency Statute, EPA Programs, and Federal Standards						
		Year of Implementation				
	CO Regulatory Standard	2017	2019	2021	Federal Standard	Energy Star or WaterSense Maximum Water Use
Lavatory Faucet	0.5 gpm	X			0.5 gpm	0.5 gpm or less
Public Lavatory Faucet, Metered	--				0.25 gpc	N/A
Lavatory Faucet	1.5 gpm		X		2.2 gpm	1.5 gpm
Showerhead	2.0 gpm		X		2.5 gpm	2.0 gpm
Flushing Urinal	0.5 gpf		X		1.0 gpf	0.05 gpf
Flushometer Valve Toilet, Commercial	1.28 gpf			X		1.28 gpf
Tank Toilet	1.28 gpf		X		1.6 gpf	1.28 gpf
Kitchen Faucet/Aerators, Residential	1.8 gpm	X			2.2 gpm	2.2 gpm
Spray Sprinkler Bodies	Water Sense			X	--	0.5 gpm at 30 psi
Dishwasher, Commercial	Energy Star			X	--	Depends on type[3]
Steam Cookers, Commercial	Energy Star			X	--	Depends on type[4]
Pre-rinse valves, Commercial	--	4.7-6.5 IWF				1.3 gpm
Clothes Washers, Residential	--	3.2 to 4.3 IWF				
Dishwashers, Residential	--	3.5-5.0 gpc 3.5 gpc or less				
Gallons per minute (gpm) *Gallons per flush (gpf)* *Gallons per cycle (gpc)* *International Water Factor (IWF)*						

3 EnergyStar Commercial Dishwater Specifications. https://www.energystar.gov/products/commercial_food_service_equipment/commercial_dishwashers/key_product_criteria

4 Energy Star Commercial Steam Cookers https://www.energystar.gov/ia/products/downloads/Steamer_Product_Factsheet_Final.pdf

Update Green Building Water Efficiency Standards

To supplement uniform building and plumbing codes, local governments can adopt green building standards as part of development regulations to achieving sustainable development outcomes addressing energy, water, pollution, and other resource management goals. These codes can either be very prescriptive with mandatory elements required for development approval or performance-based offering developers different ways to meet the required total points necessary for approval. Standards specifically related to water efficiency and conservation may include:

- Plumbing fixtures and fittings
- Residential appliances
- Water treatment equipment
- Outdoor irrigation and landscaping
- Pools, fountains, and spas
- Cooling towers
- Water features
- Water reuse and alternative water sources
- Specialty commercial appliances and equipment (food, medical, laundries, etc.)
- Metering/submetering
- Water pressure

Many communities within the headwaters have already made a significant commitment to sustainability adopting their own sustainability codes.[5] The best practices offered here are intended to support local governments with a review of their water efficiency related standards in light of the State of Colorado's adoption of WaterSense and EnergyStar efficiency requirement for product and to expand options for achieving water efficiency.

Demonstration of Green Building Code

		Water Conservation		
		1-4	1.18	High efficiency dual flush toilets. (2 points per toilet) High efficiency < 1.4 gpm toilets. (1 point per toilet)
		2	1.19	Low flow shower heads < 2gpm & no more than one spray head per shower. (1 point per head)
		1	1.20	Hot water recirculating pump with tempature sensor/timer.
		3	1.18	Energy Star® water efficient clothes washer.
		46	***Sub Total***	

The standards in this code illustrate a performance-based point allocation for meeting water efficiency standards. Points are awarded for a toilet based on a standard that does not meet the minimum Water Sense toilet gallons per flush required by the state. The award of points for a showerhead with a flow of less than 2 gpm, a maximum per shower unit, an Energy Star washing machine and a recirculating hot water pump goes beyond the state standard.*

Note: "High efficiency < 1.4 gpm toilets" should read "1.4* ***gpf* *toilets."*

Efficiency standards for fixtures, appliances, and equipment should require a higher standard than what is required in state and national standards. Points should not be awarded for an applicant that is simply meeting the minimum requirement. With Colorado's adoption of the WaterSense law, what was once a higher standard has now become the norm. This policy shift offers jurisdictions with green building standards an opportunity to adopt more efficient standards as well as expand to include previously unincluded fixtures, appliances, and equipment. Standards include:

5 Communities include Eagle County, Pitkin County, City of Aspen, Town of Breckenridge and Town of Frisco.

- Ultra-high efficiency toilets and urinals with flush rates less than 1.28 gpf and 0.5 gpf, respectively.
- Lavatory faucets with flow rates less than 1.5 gpm and aerators.
- Showerheads with flow rates less than 2.0 gpm and a maximum total number of showerheads.
- Kitchen faucets with a flow of less than 1.5 gpm and aerators.
- Energy Star washing machines and dishwashers.
- Retrofits of inefficient plumbing fixtures.
- Total percentage of fixtures in a unit that exceed WaterSense and/national standards.
- Water using commercial fixtures and equipment.
- Submetering for multiple units or indoor/outdoor water use.
- Energy Star or tankless hot water systems.

Example of Green Building Performance Standard	
Boulder County[6]	(g) Water Efficiency - High Efficiency Fixtures: Up to 6 points High-efficiency fixtures can reduce indoor water use by 30 to 40 percent. Faucets, showers, baths, and toilets typically account for two-thirds of indoor water use in a home, and one-third of total water use. Green Points are awarded according to the following: • 2 points—25 percent of all fixtures • 4 points—50 percent of all fixtures • 6 points—75 percent of all fixtures One or more of the following requirements must be met by installing high-efficiency (low flow) fixtures: *(note flow and flush rates need review)* • The average flow rate for all bathroom faucets must be less than or equal to 1.5 gallons per minute (gpm). The average flow rate for all shower heads must be less than or equal to 2.0 gpm. • The average flow rate for all toilets, including dual-flush toilets, must be less than or equal to 1.28 gpf (gallons per flush). A common dual-flush toilet has a 1.6 gpf and a 0.8 gpf. This makes an average of 1.2, which would qualify. Application: Indicate the total number of fixtures and the number and location of high efficiency fixtures on building permit plan notes. Include receipts and specification sheet for fixtures in building permit sleeve before final plumbing inspection.

In cases where water conservation is a high priority, local government can offer additional benefits for development that exceeds the green building code minimum to achieve specific water efficiency targets.[7] For meeting additional water saving standards, incentives could include:

- Fast track permitting for building permits.
- Fee reductions.
- Floor Area Ratio bonus.
- Height bonus.
- Number of unit bonus.

6 Boulder County Green Building Standards https://www.uni-groupusa.org/PDF/Boulder%20CO%20green-points-guideline-booklet-1-201306271201.pdf

7 Green Zoning: Creating Sustainable Communities Through Incentives Zoning https://www.hks.harvard.edu/sites/default/files/centers/rappaport/files/schaffner_waxman.pdf

Example of Incentives	
Eagle County, CO	Projects achieving HERS 50 or less, or LEED gold will receive a 25% building permit rebate, not to exceed $5,000.
City of Seattle, WA	• Fast-track permitting for building permits. • 50% reduction in building permit fee with a maximum of $1,000 per building but no person or organization shall receive more than $5,000 in permit fee refunds. • FAR bonus for meeting and exceeding LEED standards.

Include Indoor Water Use in Water Waste Provision

While many water waste regulations often focus on outdoor water waste, a requirement for repair of indoor water leaks within a specific time frame can also be included. Repairing leaks as soon as possible is important for protecting the water supply, but this can place a financial burden on some property owners. To ease that burden, water providers and local governments have developed zero interest leak repair loan funds to ease the impact.

Example of Water Waste Requirement	
City of Tucson, AZ	Failure to repair a controllable leak, including a broken sprinkler head, a leaking valve, or a leaking faucet.
Bernalillo County, NM	Flow resulting from temporary water supply system failures or malfunctions. These failures or malfunctions shall be repaired within 48 hours of notification or the system shut off until repair can be completed.
City of Santa Fe, NM	25-2.12 Domestic Water Leak Repair Loan Program Available for residential customers on a one-time basis solely for paying a leak repair contractor. The loan needs to be within the adopted range, extended at zero interest, and repaid according to the minimum monthly payments. The city may assess a fee for the placement of the lien which will be removed upon full loan repayment.

Require Retrofits for Redevelopment and/or at Resale

With new development being much more efficient than pre-1994 development, requiring retrofits of older homes may offer significant water savings. Requirements can include:

- Retrofits on resale or purchase.
- Retrofits on reconnection for water service.
- Retrofits on building permit.

The largest scale of where this is occurring on a regulatory basis is in California where state statute requires local governments to adopt local regulations requiring retrofits of older pre-1994 fixtures in residential and commercial buildings during additions, redevelopment and/or retrofit on resale.[8] However, local jurisdictions outside of California have adopted this approach as part of their water conservation ordinances.

8 Summary of California Senate Bill 407 http://buildingincalifornia.com/wp-content/uploads/2014/02/SB407WaterConserving-PlumbingFixturesHandout.pdf

Example of Retrofit Requirements	
City of Santa Fe, NM	25-2.6 Water Conservation Ordinance Indoor Conservation. Requires all new and remodeling construction and all replacement of existing plumbing fixtures to meet water conservation plumbing standards with deadlines for non-residential compliance. Plumbing fixtures included: toilets and urinals, non-metered and metered faucets, showerheads. A certificate of compliance is certified by a licensed contractor at final plumbing inspection.
The City of Las Vegas, NM	17-1-26 Water Conservation Ordinance Section VII.B. Indoor Uses All new construction, remodeling, and replacements of existing plumbing fixtures requires meeting plumbing standards to meet national standards, with hotels required to also include recirculating hot water systems. Compliance is verified by a certificate of compliances completed by a licensed mechanical contractor or plumbing permittee at final plumbing inspection.
City of Santa Cruz, CA Retrofit on Resale	All existing residential, commercial, and industrial buildings with showers, toilets, and urinals, are required prior to transferring title or sale, to retrofit to high efficiency plumbing fixtures (showerheads to 2 gpm, toilets to 1.28 gpf, and urinals to .5 gpf. The seller is responsible for complying with the retrofit requirements and for obtaining a water conservation certificate unless the buyer and the seller agree to transfer responsibility to the buyer by completing a transfer of responsibility form.
City of DeKalb, GA Retrofit on Reconnection	County Water Supply Article II Section 25-45 and For residential development, requires person selling a property built before 1993 to disclose to potential purchasers prior to the execution of any contract to purchase and sell such property to upgrade toilets, faucets, and showerheads to be compliant with established water efficiency flow and flush rates (WaterSense). A purchaser is not allowed to obtain water service from the county unless a certificate of compliance is provided with the application for water service. The utility may request to inspect for verification and fines are enforced if non-compliant.

Adopt Commercial Indoor Water Efficiency Standards

Non-residential water use, especially in the headwaters large tourism sector of hotels and restaurants, may offer an opportunity to increase water efficiency.[9] Below is a summary of how restaurants and hotels can become more water efficient. These standards could also apply to other institutional uses.

Restaurants

According to research, water use in food service establishments accounts for approximately 15 percent of the total water use in commercial and institutional facilities in the United States.[10] Water demand varies depending upon the type of restaurant. Restaurant kitchen equipment and processes followed by restrooms account for the majority of water use. To reduce water demand in the food service industry, the following can be included in water efficiency standards:

9 The Pacific Institute conducted a comprehensive review of California's commercial sector to calculate potential savings. This report provides insight into methodologies for estimating savings as well as research demonstrating water use by industry. https://pacinst.org/wp-content/uploads/2013/02/appendix_e3.pdf

10 EPA Saving Water in Restaurants https://www.epa.gov/sites/production/files/2017-01/documents/ws-commercial-fact-sheet-restaurants.pdf

- EnergyStar appliances (dishwaters, ice machines, etc.)
- Low flow pre-rinse valves and spray nozzles (1.3 gpm)
- Serve water on request
- Mandatory annual audits
- Closed system steamers
- Energy Star dishwashers
- Energy Star ice machine
- WaterSense toilets and faucets
- Metered faucets
- Low flow aerators on faucets
- Waterless urinals and ultra-low flow urinals

Example of Restaurant Requirements	
City of Santa Fe, N.M.	All public and private eating establishments shall provide water or other beverages only upon request. A statement of the ordinance provision is required to be communicated on the menu, table tent, or posting for restaurants and catering.
City of Millbrae, Calif.	In addition to high efficiency toilets and faucets, requires Energy Star dishwashers and water efficient food steamers, ice machines, and pre-rinse spray valves.

Hotels and Resorts

Research on hotel water demand vary widely depending upon the type of hotel. A study conducted of the average water use per room for hotels in Aspen ranged from 70 gallons per day per room for an economy hotel to 175 gallons per day per room for a deluxe hotel.[11] Factors such as the age of the hotel, on or off-site laundry, landscaping, and pools all factor into a hotels water demand as well. According to the EPA, pools are surprisingly a small percentage of water demand. Bathrooms and restrooms are the largest use followed by laundry operations and landscaping. Requiring water efficient plumbing fixtures can result in the most water savings. Requirements for hotels may include:

- Limits on frequency of washing linens.
- EnergyStar appliances (laundry, ice machines, dishwasher)
- Pool covers
- Recirculating water features
- Efficient cooling towers
- High efficiency bathroom fixtures
- Require an annual water audit and water conservation strategy

11 Water Management, Inc. (WMI) calculates that guest use toilets 4.8 times/day, hand wash with each toilet use for an average duration of 6 seconds per use plus 2 additional minutes/day, and shower use/day average duration of 8 minutes/use based on average occupancy is 1.5 guests/room and an occupancy rate of 80%. They estimate the water use for a typical guest room with older toilets regardless of the hotel type as 53 gallons per day/room.

Example of Lodging Requirements	
City of Santa Fe, NM	In addition to all new and redeveloped commercial development being required to meet plumbing fixture upgrades, lodging facilities must meet two additional requirements. They must notify guest at check-in that for guest staying more than one night, linens are not changed more than 1 x in 4 days unless a justified health reason and swimming pools must be covered when not in use.
City of Las Vegas, NV	In addition to all new and redeveloped commercial development being required to meet plumbing fixture upgrades, lodging facilities must install recirculating hot water heaters for hotels and motels for new construction and notify guest at check-in that for guest staying more than one night, linens are not changed more than 1 x in 4 days unless a justified health reason.

Require Submetering for Multi-unit Residential Development

The State of Colorado requires metering for a property, but not submetering for every unit. In order to manage data and information about water usage, many communities are moving to requiring submetering for any property with more than a duplex or for apartment, condominiums, or multi-family that will use over a total number of gallons.[12]

Example of Submetering Requirements	
City of Westminster, CO	8.7.4 (D) A separate tap must be installed for each premise, unit or structure served, except where two or more premises, units or structures are located on a single subdivided lot under single or condominium ownership, in which case one tap may be permitted. In this instance, all units must be individually metered or sub-metered. An exception may be granted if an additional structure is an accessory use of the principal structure and the accessory use by itself does not exceed one water resources service commitment. If any additional accessory water fixtures require the upsizing of an existing water tap, any associated water tap fees will be due. (E) The provisions of this paragraph and shall be the property of the owner, who shall be responsible for maintenance, repair and use of submeter.
CalGreen Non-Residential Code[13]	Buildings or additions in excess of 50,000 square feet that house more than 1 tenant shall be provided with separate water submeters when any individual tenant will consume more than 100 gallons of water per day. Any tenant which will consume more than 1000 gallons of water per day and is not served by an individual master water meter shall be provided with a separate submeter.

12 Western Resource Advocates Submetering Fact Sheet https://westernresourceadvocates.org/download/2386/.

13 CalGreen Summary https://riversideca.gov/building/pdf/handouts/CAL-GREEN-CODE-REQMTS-NONRES-2016-update%201-6-2017.pdf

Include Indoor Water Efficiency Requirements in Water Shortage Ordinance

During water restrictions commercial indoor water conservation can complement outdoor watering restrictions. Options include:

- For hotels limits on frequency of washing linens
- Serve water on request
- Prohibition or restriction on washing exterior and hard surfaces.
- Prohibition on refilling of pools and water features.

Example of Water Shortage Requirements	
Soquel Creek Water District	During its Stage 3 Water Shortage Emergency Restrictions, commercial customers are required to reduce overall water use by 25%. • Post signs to display 'save water'. • Restaurants may only serve drinking water upon customer request. • Lodging establishments must give customers the option to forgo daily linen service. • No hosing down of hard or paved surfaces (except when necessary for health and safety and use of a positive shut-off valve or pressure sprayer is required). • No exterior washing of structures (unless for sanitation and health purposes or in preparation to paint or stain and a pressure washer is used).

Clarify Rules for Compliance and Enforcement

While the greatest water savings come from requiring all development to comply with indoor water efficiency, options are available for compliance including different compliance requirements for residential and nonresidential based on square footage, number of units, water demand and value. Verification of compliance is done through different mechanisms best suited to the capacity of a local government. As with other oversight responsibilities, a jurisdiction can opt for a filing fee to cover administrative costs. Finally, penalties for non-compliance can be issued for failure to comply.

Examples of Applicability	
City of Santa Fe, N.M.	Water conservation plumbing standards apply for all new and remodeling construction and all replacements of existing plumbing fixtures. In addition, all existing nonresidential water users and property with more than three (3) rental units are required to retrofit their facilities within a deadline of adoption of the ordinance.
Bernalillo County, N.M.	New single family and small multifamily are required to meet one of the three options for water efficiency. Remodels and additions are required to use WaterSense labeled plumbing fixtures. All new commercial, institutional, and large multi-family applying for a building permit are required to complete a worksheet to reduce water use by 20%. For remodels that affect more than 50% of fixtures or increase the floor area ratio more than 50% will use WaterSense plumbing fixtures.
City of Millbrae, Calif.	• Any new construction. • All additions with new or expanded water use. • Remodels involving one or more of the following: kitchen, bathroom(s), remodel of a building which exceeds fifty thousand dollars in construction valuation, remodeling involving fifty percent or more of the building interior. • Expanded water service (except for fire sprinkler systems).
Eagle County	ECObuild applies to all new residential R3 (single family, duplex, townhouse) construction per the currently adopted building code, as well as additions/ reconstruction over 50% of the existing floor area, and exterior energy uses such as snowmelt, spas, and pools over sizes listed in Section 4-825.
Verification Mechanisms	
Inspection at site visit or final plumbing inspection and/or an independent third-party inspector for C.O.O.	City of Santa Fe requires a Certificate of Compliance. For all new and remodeling construction, all the requirements regarding water conserving devices mentioned in subsections shall be certified by a certificate of compliance by a licensed mechanical contractor or plumbing permittee before or at the time of the final plumbing inspection.
A self-submission checklist submitted at the issues of permit/service	City of Scottsdale, Ariz., Residential Checklist Eagle County, ECObuild Checklist
Enforcement can be compliance form included with disclosure forms or stand-alone documents.	In Santa Cruz, Calif., the seller is responsible for complying with the retrofit requirements and for obtaining a water conservation certificate unless the buyer and the seller agree to transfer responsibility to the buyer by completing a transfer of responsibility form and a seller disclosure form.

A less common compliance and verification model is requiring a “water permit”, similar in function to a building permit, for new water connections or where development will increase prior water demand. The water district in Monterrey, California in coordination with the local governments in the service area coordinate on water and building permits to establish and review the water budgets of customers who are:

- New customers or new construction
- Remodels/additions
- Addition of swimming pools
- Change in a water meter size or submetering
- Change in business use

Case Studies

Indoor Water Conservation Ordinances

The City of Millbrae, California adopted an Indoor Water Efficiency Ordinance to update their Indoor Water Efficiency Regulations in their municipal code. The requirements apply to all new residential and commercial constructions, bathroom additions that expand water use, and remodels with exclusions for historic sites and wastewater system functional requirements. Applicants are required to complete a checklist to the city for verification of compliance.

City of Millbrae Indoor Water Efficiency Requirements		
Fixture	**Residential – One- or Two-Family**	**Multifamily, Commercial or Nonresidential**
Toilets	≤ 1.28 gpf, and ≥ 500 grams	≤ 1.28 gpf, and ≥ 500 grams
Urinals	≤ 0.5 gpf	≤ 0.5 gpf
Shower heads	≤ 1.5 gpm	≤ 1.5 gpm
Bathroom faucets	≤ 0.5 gpm	≤ 0.5 gpm
Kitchen faucets	≤ 1.5 gpm	≤ 1.5 gpm
Clothes washers	≤ 6.0 water factor	≤ 6.0 water factor
Dishwashers	≤ 6.5 gal/cycle or Energy Star qualified	Energy Star qualified
Cooling towers	N/A	≥ 5 – 10 cycles or ≥ 2.5 LSI
Food steamers	N/A	Boilerless, or self-contained
Ice machines	N/A	≤ 25 gal/100 lbs ice, or air cooled
Pre-rinse spray valves	N/A	≤ 1.15 gpm
Automatic vehicle wash facilities	N/A	≥ 50% or more of water used must be recycled on site
Commercial refrigeration	N/A	Closed loop, or air cooled
Water meters	Separate meter for outdoor landscaping > 5,000 sq. ft.	Sub-meters, and separate meter for outdoor landscaping > 5,000 sq. ft.

The City of Petaluma, Calif., adopted a water-conservation ordinance in 2009. The requirements for indoor water efficiency apply to new single-family residential, multifamily and commercial development. The City is currently updating the Water Conservation Regulations to comply with new state standards which will be similar to the City of Millbrae.

Case Studies

City of Petaluma Indoor Water Efficiency Requirements			
Fixture	**Single Family**	**Multifamily**	**Commercial**
Toilets	List of qualifying HET	List of qualifying HET	List of qualifying HET
Urinals	--	≤ 0.5 gpf	
Shower heads	≤ 2.0 gpm and no more than 1/unit	≤ 2.0 gpm and no more than 1/unit	≤ 2.0 gpm and no more than 1/unit
Bathroom faucets	≤ 1.5 gpm	≤ 1.5 gpm	≤ 1.5 gpm
Kitchen faucets	≤ 2.2 gpm	≤ 2.2 gpm	≤ 2.2 gpm
Clothes washers	≤ 6.0 water factor	≤ 6.0 water factor	≤ 4.5 water factor
Dish washers	--	Energy Star qualified	Energy Star qualified
Cooling towers	--	--	Meet building code
Ice machines	--	--	Air cooled
Pre-rinse spray valves	--	--	≤ 1.6 gpm
Water meters	Separate meter for outdoor landscaping > 5,000 sq. ft.	Sub-meters for each dwelling unit	

Bernalillo County, N.M. is a large metropolitan county in the arid southwest with a scant 9.5 inches of precipitation a year. In the late 1990s the county adopted an aggressive four-pronged approach to reducing groundwater pumping through conservation, reuse, aquifer storage and recovery, and a renewable supply from the San Juan-Chama Drinking Water Project. The county adopted a water conservation ordinance in 2007 for both indoor and outdoor water demand.

The indoor requirements apply to all new development with different requirements for single family and small multifamily, commercial and large multifamily, and remodels and additions. For single family & small multifamily, new development has an option of meeting one of these three options:

1. Reduce indoor water use by 20% using plumbing fixtures that are more efficient than the plumbing code
2. Meet Green New Mexico Bronze Certification
3. Install all WaterSense/EnergyStar fixtures for toilets, faucets, dishwashers, and clothes washer as well as an efficiently designed hot water system

For commercial, large multifamily, and institutional, all new development must reduce water demand by 20% using plumbing fixtures more efficient than the plumbing code. All remodels for single family and small multifamily developments are required to use WaterSense fixtures for any new plumbing installed. Remodels of commercial and multifamily development where more than 50% of the existing fixtures or where the remodel will increase the floor area ratio more than 50% are required to use WaterSense fixtures.

The county has two forms: a new or remodel residential water conservation form certifying compliance with Option 3 for indoor water efficiency or the water conservation measures worksheet, an excel spreadsheet for Option 1 which covers indoor and outdoor water use. Prior to obtaining a Certificate of Occupancy, a development must be inspected by a water conservation compliance officer. The county has succeeded in reducing water demand to 127 gallons per capita, reducing the total overall demand while continuing to grow, and has seen aquifer levels rebound.

Case Studies

Pima County and the City of Tucson, AZ adopted parallel plumbing codes in 1989 requiring water-efficient fixtures in all new residential and commercial construction and for building renovations and water recycling systems for evaporative cooling systems, decorative fountains, and water features. For new commercial, industrial, and public construction, development must include metered faucets, efficient public urinals that use less than one gallon per flush, and water efficient refrigeration and cooling towers.

The City of San Diego, Calif., adopted a retrofit ordinance intended to bring pre-1994 structures and plumbing fixtures into compliance. The water conserving plumbing standards requires all structures, prior to a change in property ownership, to be certified that it is compliant with water saving plumbing fixtures that meet the national standard, at a minimum. The program is managed by the water utility who verifies the Water Conservation Certificate for a $10 filing fee which the seller files submits prior to close of escrow. A seller and buyer may mutually agree to transfer the responsibility of the retrofit to the buyer by filing a Transfer of Responsibility Certificate. The buyer must them complete the retrofit within 90 days. If a property has already received a Water Conservation Certificate, a seller only needs to verify prior to sale. The utility manages an online data base for verification.

Model Code Provisions

Model Indoor Water Efficiency Provisions for Inclusion in a Water Conservation Ordinance

Note: this section can be combined with the Model Outdoor Water Use Efficiency Standards in a single water conservation ordinance.

General Provisions

A. **Purpose**

As an invaluable natural resource that sustains the ecological, economic and social vitality of the community, *<jurisdiction>* is committed to ensuring a resilient and sustainable water supply through implementation of water efficient development practices that will:

- To protect the health and quality of water bodies.
- To conserve potable and non-potable water resources.
- To reduce peak summer demand therefore extending the capacity of existing water supply and infrastructure.

B. **Applicability**

The requirements of this section shall apply to the following developments:

1. All new residential and non-residential development.
2. All additions involving water using fixtures.
3. Residential and non-residential remodels of kitchens and bathroom.
4. Residential and non-residential remodels exceeding *<$50,000>* or that is includes 50% or more of the building.

C. **Exemptions**

The requirements of this section shall not apply to the following:

1. Development with plumbing fixtures and appliances that already meet water efficiency standards.
2. Registered local, state, or federal historic sites.
3. Remodels where, in the discretion of the <jurisdiction>, the drainage or wastewater system is incompatible with the water efficiency standards for reasons of public health or safety.

Efficient Indoor Water Use Requirements

A. **Indoor Water Use**

1. **Residential Development**. For all residential development, including new construction, remodels, and additions, all fixtures and appliance shall meet the following standards:
    a. Toilets shall not exceed 1.28 gallons per flush.
    b. Showerheads must not use more than 2 gallons per minute.
    c. Lavatory and/or bar faucets must not exceed 1.5 gallons per minute.
    d. Kitchen and/or utility sink faucets must not exceed 2.2 gallons per minute.

e. All residential dishwashers must not exceed 4 gallons per cycle. *<or All residential dishwashers must have EPA's Energy Star label.>*

f. All residential clothes washers must have water factor not to exceed 4.3. *<or All clothes washers must have Energy Star label.>*

2. **Non-residential Development**. For all non-residential development and multi-family development, including new construction, remodels and additions, all fixtures and appliance shall meet the following standards:

    a. Toilets shall not exceed 1.28 gallons per flush.

    b. Urinals shall not exceed 0.5 gallons per flush.

    c. Showerheads must not use more than 2 gallons per minute.

    d. Lavatory faucets must be self-closing and not exceed 1.5 gallons per minute. All faucets must be equipped with an aeration device.

    e. Kitchen and/or utility sink faucets must not exceed 2.2 gallons per minute.

    f. All residential dishwashers must not exceed 4 gallons per cycle. *<or All residential dishwashers must have EPA's Energy Star label.>*

    g. All residential clothes washers shall have water factor not to exceed 4.3. *<or All clothes washers must have Energy Star label.>*

    h. Commercial clothes washing machines shall have a water factor of 4.5 or lower.

    i. Each dwelling unit must be separately metered or sub-metered.

    j. Water features shall be recycling.

3. **Food Services**. Restaurants and food service establishments, in addition to other non-residential requirements for water efficient plumbing fixtures and appliances, shall be required to meet the following additional standards:

    a. Pre-rinse hand-held dish-rinsing wands must not exceed 1.6 gallons per minute and must utilize positive shut-off valves.

    b. Ice makers shall be air-cooled.

    c. Water shall be served only upon request. A statement of the ordinance provision is required to be communicated on the menu, table tent, or posting for restaurants and catering.

4. **Lodging.** Lodging facilities, in addition to other requirements for non-residential water efficient plumbing fixtures and appliances, shall be required to meet the following additional standards:

    a. Towels and linens shall not be changed more than 1 time in 4 days unless a justified health reason.

    b. Swimming pools must be covered when not in use.

    c. Ice makers shall be air-cooled.

Enforcement

A. Compliance

Applicants shall: *<select the appropriate method of compliance>*

- Submit a Water Use Efficiency Compliance Form to the <*building department*> for verification prior to construction.
- Submit a Water Use Efficiency Compliance Form to the <*building department*> certified by a licensed mechanical contractor or plumbing permittee before or at the time of the final plumbing inspection.

Chapter 5

Policy and Development Code Review by Region

Chapter 5 Contents

Approach

The policy review was conducted by the consultants to identify the presence of policy elements across the 28 QQ communities to:

1. Establish a comparative baseline for the headwater communities
2. Better understand what policies are currently being implemented to achieve water conservation and efficiency in the Colorado headwater communities.
3. Identify potential model policy language or local case studies to be included in the water savings white paper.

To identify the presence and quality of the development codes and plans during the policy review scan, a coding key was utilized indicating the following:

Blue and red indicate that these communities were targeted to inform case studies or for the research to inform the development of model policies or code language.

Presence of element, no quality rating applied	
Presence of element, strong standard	
Presence of element, potential model	

Review Methodology

The policy scan included two policy reviews. First, a review of existing policy documents to look for the inclusion and comprehensiveness of water supply and demand summaries, water conservation programs, and water resource related goals and strategies. Documents reviewed included water plans (such as water supply plans or water efficiency plans from water districts, basins, utilities, etc.), comprehensive or master plans, as well as community sustainability or resiliency plans. Second, a review of development regulations was done to determine how land use regulations were supporting water conservation and efficiency. The regulations reviewed included water supply standards, zoning, landscape ordinances, water protection or conservation standards, and, to a minimal extent, building and plumbing codes.

To collect data from each community, a survey was distributed to identified team leaders tasked with gathering information from the relevant water districts, utilities, and planning departments. The total response rate was about 50% for the 28 communities reviewed. For communities that did not complete a survey, the project consultants gathered data from publicly online land use policy and regulations. For communities who did not submit a survey, information related to water providers including water supply and demand balance, rate structures, and water conservation programs was not available.

Summary: Eagle County, Eagle, Gypsum, Minturn, Red Cliff, Vail

This region has demonstrated capacity for regional cooperation throughout the Eagle River watershed as well as interest in water conservation and efficiency as demonstrated by communities and organizations in Eagle County participating in a Growing Water Smart workshop in 2018 as well as other initiatives.

Findings

Comprehensive Plans

All communities should consider a water element or greatly augmenting the inclusion of water resource management in current sections as part of future updates.

Water Supply Standards

Eagle County, Gypsum, and Minturn have water supply standards that clearly outline expectations for future water supply. The Eagle River Water and Sanitation District in cooperation with Eagle County has been moving towards water budgeting and includes the requirement for a water budget to estimate new development demand during the approval process for PUDs. These regulations could be updated to be more explicitly consistent with the State statute as well as integrate best practices and incentivize conservation.

Compact Form and Land-use Patterns

The communities all have high quality zoning districts that promote higher densities. The question for each community is to determine the potential water savings that could come from applying a more water efficient development pattern as a greater percentage of total development. Methodologies for linking water and land use are in the Appendix. An assessment by each zone district calculating the average water demand in that district could prove useful in understanding how the use of zoning and density could contribute to water savings and/or minimize water demand as the community grows.

Water Quality Protection Standards

While this region does explicitly express goals for protecting water quality, standards vary across communities. Eagle County, Red Cliff, Vail, and Gypsum all use environmental reviews to assess impacts to hydrological systems. Minturn and Vail have adopted watershed ordinances to permit review of projects that may have a negative impact on drinking water supplies. Minturn has a strong erosion mitigation and stormwater ordinances that include best practices for reducing runoff. Setback requirements, while present, are not very strong. Gypsum includes erosion and stormwater standards in their public works manual. A regional review of policies and comparison against the QQ's Model Water Quality Protection Standards could identify gaps for code updates that would strengthen water quality protection.

Outdoor Watering

Eagle County and the Town of Eagle are the only jurisdictions to require efficient irrigation practices. Most jurisdictions landscape ordinances are tailored to address aesthetic purposes and provide standards for mitigating visual impacts. Only Eagle County's landscape ordinance includes water conservation and efficiency as a policy goal. The Town of Eagle does, however, have a water conservation ordinance linked to its drought management strategy that includes outdoor watering restrictions during a designated 6-month period to reduce water demand and impacts to Brush Creek. While most of the communities landscape ordinances recommend native plants, Minturn requires them although homeowner's may still modify their landscape post-occupancy. Across the region, there are significant opportunities for reducing outdoor water demand through water conservation and efficiency standards.

Indoor/Commercial Water Conservation

Health and education institutions, restaurants and hotels can be large water consumers, especially in tourism-based economies. Currently, commercial water conservation standards are not being utilized by any jurisdictions. An assessment of regional water demand by the commercial sector would help to understand potential benefits from this kind of ordinance.

Plumbing and Building Codes

An in-depth review of plumbing and building codes was outside the scope of this project. A cursory review found the following opportunities. It may be beneficial to review and integrate commercial water efficiency standards into the commercial building code and integrate water conservation and efficiency into the green building code. Gypsum's water conservation ordinance includes a requirement requiring water efficient/low flow fixtures for all new commercial, industrial, and non-residential constructions including toilets, shower heads, spigots and faucets. Given the State passed a regulation requiring EPA WaterSense appliances and fixtures for sales in Colorado, communities should discuss the implications of this change on their desired goals. For example, whether they need to become consistent with or want requirements stronger than the State policy. There are additional savings that could be gained by any fixtures not currently covered under the State rule. Many of these same water efficiency standards could be required for or incentivized for residential development and could be explored.

Eagle County Sustainable Community Index

Eagle County utilizes a development review tool to rate the quality of project proposals against County standards. The tool applies a points system for river setbacks and water quality plans, protection of existing vegetation, reductions in stormwater runoff, compact form and/or clustering, protection of sensitive land and environments, limitation and type of turf and xeriscaping. This tool could be reviewed to consider how certain areas of the county may have weighted criteria to better incentivize achieving specific goals such as water quality and conservation where it might have the greatest impact.

Redevelopment and Point of Sale

Currently, this tool is not being utilized in this region. This tool is often included in a water conservation ordinance or landscaping ordinance and is applied to either a minimum square footage redevelopment project or as a certificate of approval required for resale of property. The ordinance requires meeting a minimum water conservation and efficiency standard such as fixture or appliance retrofits or water wise landscape upgrades during application for redevelopment or at point of sale.

Comprehensive Plan Summary

A comprehensive plan is important because it provides the greatest opportunity for educating the community about the water system, establishing a community vision that includes water, and linking water to growth and development. Comprehensive plans were reviewed using a rubric (see table below) that standardized the rating system for six indicators. Where comprehensive plans did not contain information, other plans were examined for water related goals and strategies including water supply plans, water efficiency plans, drought management plans, or basin plans. However, information from these other types of plans were not included in the comprehensive plan review below.

	1	2	3	4
Water Supply	Does not provide a summary of water supply.	Includes only a summary of the total AF not broken down by source.	Incudes a total summary of water supply broken down by source: total ground and total surface.	Includes a summary of water supply by each sources and total water available per source.
Water Use Per capita	Does not provide water use per capita.	Includes water use per capita but does not provide how it has changed over time.	Includes water use per capita and provides how it changed over time.	Includes water use per capita, provides how it changed over time, and explains why it changed.
Water Demand By Sector	Does not provide a summary of total water demand.	Includes a summary of total water demand, but only as a total number in AF.	Includes a summary of total water demand by revenue and non-revenue in AF.	Provides a summary of total water demand for each sector (e.g. R, C, I, Ag, NR).
Water Trends	Does not summarize water demand trends.	Provides a summary of total water demand over time, but not broken down by use. (metric can be AF, gpcd, or per acre)	Provides a summary of total water demand over time but only by revenue and non-revenue.	Provides a summary of total water demand over time by each sector (e.g. R, C, I, Ag, NR).
Water Budget	Does not include a summary of the water supply and demand balance.	Explains total water rights in AF but does not include summary of water supply/demand balance.	Explains total water rights in AF (supply) and current demand (AF) but does not include a summary balance.	Includes a complete water supply and demand balance. May also include plans to address current or projected imbalance.
Water Infrastructure	Does not provide a summary of water treatment, distribution, and storage infrastructure.	Includes a summary of total capacity of water infrastructure, but not of gaps.	Includes a summary of total capacity of water infrastructure and gaps, but not plans for upgrades.	Includes a summary of total capacity of water infrastructure, gaps, and plans for upgrades.

Community Comprehensive Plan Scoring

	Water Supply	Water Use Per Capita	Water Demand by Sector	Water Trends	Water Budget	Water Infrastructure
Eagle	1	1	1	1	1	2
Eagle County	4	1	1	1	1	2
Gypsum	1	1	1	1	1	1
Minturn	1	1	1	1	1	1
Red Cliff*						
Vail	1	1	1	1	1	1

**No comprehensive plan online available for review*

Land Use Regulations Summary

Adequate Water Supply Requirements

These standards outline water supply requirements for new, and sometimes redevelopment, as part of the development review process.

An ordinance for the provision of…	Eagle	Eagle County*	Gypsum	Minturn	Red Cliff	Vail
Water supply for new development		•	•	•		
A water budget for new development		•				
Water rights to accompany new development	•	•	•			

**Included in the Eagle County Planned Unit Development ordinance and water supply standard*

** Gypsum includes a water budget in annexation and subdivision improvement agreements executed with subdivisions.*

Site Development Standards for Water Quality

	Eagle	Eagle County	Gypsum	Minturn	Red Cliff	Vail
Development standards in sensitive areas through clustering or limiting development densities.				•		
Develop standards for stream buffers and setbacks to protect water quality.			•	•	•	•
Vegetation protection standards that minimize disturbance to vegetation within the riparian corridor.			•	•		
Site level soil erosion mitigation standards for new development to reduce sedimentation and protect water quality from land disturbance.	•	•	•	•		•
Stormwater management standards that utilize best practices for low impact design reducing storm event runoff and increasing water infiltration.		•	•	•		•
Design standards integrating best practices for low impact design to reduce runoff and increase infiltration.		•		•		
Zoning districts that require lower densities and/or cluster development to protect surface and groundwater sensitive areas.						
Designated surface and/or groundwater districts with standards to minimize contamination of streams and shallow aquifers that will protect existing water sources/supplies (e.g. watershed overlays or groundwater protection zones)				•		•

** Eagle County, Red Cliff, and Vail can require Environmental Impact Reviews.*
**Gypsum's PUD promotes clustering to protect sensitive areas.*
**Eagle County's PUD includes a purpose statement for maintaining water quality and quantity.*

Water-Efficient Land Use Pattern: Compact Form

	Eagle	Eagle County	Gypsum	Minturn	Red Cliff	Vail
Higher densities and smaller lot sizes by right	•	•	•	•	•	•
Mixed use by right				•	•	•
Housing types by right other than single family (MF, duplex, etc.)	•	•	•	•		•
Rural conservation cluster subdivisions		•				
Development incentives for water efficient development (density bonuses, reduced fees)						
Designated growth areas or infill areas with infrastructure available for higher density development		•	•	•		
Planned development policy with water efficiency benefit						
Annexation policy with water efficiency benefit						

Efficient Outdoor Water Use: Landscaping Standards

	Eagle	Eagle County	Gypsum	Minturn	Red Cliff	Vail
Landscape Standards	•	•	•	•		•
Includes purpose statement with mention of water efficiency		•	•			
Landscape plan requirement	•	•		•		•
Water demand estimates in landscape plan						
Landscape plan evaluation methodology						
Turf limitations (type of turf, square footage limitations)						
Total landscaped area square footage limitation (maximum)		•	•			
Total landscaped area minimum square footage requirements	•					
Plant selection list						
Drought tolerant/xeric/native recommendations	•	•	•			•
Drought tolerant/xeric/native requirement				•		
Soil enhancements and mulching						
Requirement						
Recommendation						
Irrigation efficiency practices						
Drip irrigation		•	•			
Hand with shutoff nozzle						
Length of irrigation requirements for new landscaping		•				
Water schedules for outdoor irrigation voluntary						
Time of day						
Day of week						
Water schedules for outdoor irrigation requirement						
Time of day						
Day of week						
Water budgets for outdoor water use						
Rainwater harvesting standards						
Water waste limitations	•		•	•		
Site inspections				•		
Code enforcement and fines for violations			•	•		
Emergency water use restrictions for drought periods	•		•	•		

**Gypsum requires a landscape plan at subdivision approval and building permit stage which is formalized in the development agreements.*

Efficient Indoor Water Use: Building & Plumbing Code

Detailed policy scans of building and plumbing codes were not conducted on building and plumbing codes if a survey was not completed. Where plumbing codes were cross referenced in the development regulations, for example commercial conservation and efficiency standards, they were reviewed.

	Eagle	Eagle County	Gypsum	Minturn	Red Cliff	Vail
Plumbing efficiency standards to promote water conservation for residential use						
Water efficiency plumbing fixture requirement						
Water efficient appliance requirement						
Plumbing efficiency standards to promote water conservation for commercial or industrial use						
Water efficient plumbing fixtures			●			
Water efficient appliance requirement						
Commercial standards for high water consumption uses (car washes, restaurants, hotels, laundromat, golf course, etc.)						
Pre-rinse spray valve						
Water recycling system						
Greywater reuse						
Cooling system						
Decorative water features						
Water saving signage						
Drinking water restrictions						
Metering for new development			•	•		
Submetering for new multifamily						
Fee incentive for new development to incorporate water efficient fixtures, appliances, etc.						
Requirement for plumbing retrofit on resale or for rehabilitation of property to receive CO						
Tap availability limitations						
Tap fee incentives for water conservation						

Summary: Grand County, Granby, Grand Lake, Fraser, Kremmling, Hot Sulphur Springs, Winter Park

Findings

Comprehensive Plans

All communities should consider a water element or greatly augmenting the inclusion of water resource management in sections as part of future updates.

Outdoor Watering

Most jurisdictions landscape ordinances are tailored to address aesthetic purposes and provide standards for mitigating visual impacts. Winter Park has developed a high-quality landscaping guideline for aesthetics. It does include some water conservation components (irrigation, mulching, turf and native plant selection), but would benefit from requiring a water budget with the landscape plan which would benefit the town's ability to assess the potential water savings. The other communities have no or minimal landscaping requirements.

Redevelopment and Point of Sale

Currently, this tool is not being utilized in this region. This tool is often included in a water conservation ordinance or landscaping ordinance and is applied to either a minimum square footage redevelopment project or as a certificate of approval required for resale of property. The ordinance requires meeting a minimum water conservation and efficiency standard such as fixture or appliance retrofits or water wise landscape upgrades.

Commercial Water Conservation

Health and education institutions, restaurants and hotels can be large water consumers. Currently, commercial water conservation standards are not being applied in this region. An assessment of regional water demand by the commercial sector would help to understand potential benefits from this kind of ordinance.

Compact Form and Land Use Patterns

The communities all have high quality zoning districts that promote higher densities. The question for each community is to determine the potential water savings that could come from applying a more water efficient development pattern as a greater percentage of total development. Methodologies for linking water and land use are in the Appendix. An assessment by each zone district calculating the average water demand in that district could prove useful in understanding how the use of zoning and density could contribute to water savings and/or minimize water demand as the community grows.

Water Quality Standards

While this region does explicitly express goals for protecting water quality, standards vary across communities. Stream setbacks range from 30 up to 150 feet in Fraser when ecological values are. Erosion and stormwater manuals from Grand County and the water district have been adopted by Fraser and provide guidance to protect water quality. Both Fraser and Granby adopted water quality protection districts. A regional review of policies and comparison against the QQ's *Model Water Quality Protection Standards* could identify gaps for code updates that would strengthen water quality protection.

Plumbing and Building Codes

In-depth review of plumbing and building codes were not conducted. It may be beneficial to integrate commercial water efficiency standards into the commercial building code and integrate water conservation and efficiency into the green building code.

Comprehensive Plan Summary

A comprehensive plan is important because it provides the greatest opportunity for educating the community about the water system, establishing a community vision that includes water, and linking water to growth and development. Comprehensive plans were reviewed using a rubric (see table below) that standardized the rating system for six indicators. Where comprehensive plans did not contain information, other plans were examined for water related goals and strategies including water supply plans, water efficiency plans, drought management plans, or basin plans. However, information from these other types of plans were not included in the comprehensive plan review below.

	1	2	3	4
Water Supply	Does not provide a summary of water supply.	Includes only a summary of the total AF not broken down by source.	Incudes a total summary of water supply broken down by source: total ground and total surface.	Includes a summary of water supply by each sources and total water available per source.
Water Use Per capita	Does not provide water use per capita.	Includes water use per capita but does not provide how it has changed over time.	Includes water use per capita and provides how it changed over time.	Includes water use per capita, provides how it changed over time, and explains why it changed.
Water Demand By Sector	Does not provide a summary of total water demand.	Includes a summary of total water demand, but only as a total number in AF.	Includes a summary of total water demand by revenue and non-revenue in AF.	Provides a summary of total water demand for each sector (e.g. R, C, I, Ag, NR).
Water Trends	Does not summarize water demand trends.	Provides a summary of total water demand over time, but not broken down by use. (metric can be AF, gpcd, or per acre)	Provides a summary of total water demand over time but only by revenue and non-revenue.	Provides a summary of total water demand over time by each sector (e.g. R, C, I, Ag, NR).
Water Budget	Does not include a summary of the water supply and demand balance.	Explains total water rights in AF but does not include summary of water supply/demand balance.	Explains total water rights in AF (supply) and current demand (AF) but does not include a summary balance.	Includes a complete water supply and demand balance. May also include plans to address current or projected imbalance.
Water Infrastructure	Does not provide a summary of water treatment, distribution, and storage infrastructure.	Includes a summary of total capacity of water infrastructure, but not of gaps.	Includes a summary of total capacity of water infrastructure and gaps, but not plans for upgrades.	Includes a summary of total capacity of water infrastructure, gaps, and plans for upgrades.

Community Comprehensive Plan Scoring

	Water Supply	Water Use Per Capita	Water Demand By Sector	Water Trends	Water Budget	Water Infrastructure
Fraser	1	1	1	1	1	1
Granby*						
Grand County	1	1	1	1	1	1
Grand Lake	1	1	1	1	1	1
Hot Sulphur Springs*						
Kremmling*						
Winter Park	1	1	1	1	1	2

**comprehensive plans unavailable online for review*

Land Use Regulations Summary

Adequate Water Supply Requirements

These standards outline water supply requirements for new, and sometimes redevelopment, as part of the development review process.

An ordinance for the provision of	**Fraser**	**Granby**	**Grand County**	**Grand Lake**	**Hot Sulphur Springs**	**Kremmling**	**Winter Park**
Water supply for new development	•	•	•				•
A water budget for new development							
Water rights to accompany new development		•					

Site Development Standards for Water Quality

	Fraser	**Granby**	**Grand County**	**Grand Lake**	**Hot Sulphur Springs**	**Kremmling**	**Winter Park**
Development standards in sensitive areas through clustering or limiting development densities.		•	•				
Develop standards for stream buffers and setbacks to protect water quality.		•	•				•
Vegetation protection standards that minimize disturbance to vegetation within the riparian corridor.							•
Site level soil erosion mitigation standards for new development to reduce sedimentation and protect water quality from land disturbance.	•	•	•			•	•
Stormwater management standards that utilize best practices for low impact design reducing storm event runoff and increasing water infiltration.	•						•
Design standards integrating best practices for low impact design to reduce runoff and increase infiltration.							•
Zoning districts that require lower densities and/or cluster development to protect surface and groundwater sensitive areas.							
Designated surface and/or groundwater districts with standards to minimize contamination of streams and shallow aquifers that will protect existing water sources/supplies (e.g. watershed overlays or groundwater protection zones)	•	•					•

*Water supply protection district in Granby, Fraser

Water Efficient Land Use Pattern: Compact Form

	Fraser	Granby	Grand County	Grand Lake	Hot Sulphur Springs	Kremmling	Winter Park
Higher densities and smaller lot sizes by right	•	•		•			•
Mixed use by right	•			•			•
Housing types by right other than single family (MF, duplex, etc.)	•			•		•	•
Rural conservation cluster subdivisions				•			
Development incentives for water efficient development (density bonuses, reduced fees)							
Designated growth areas or infill areas with infrastructure available for higher density development				•			
Planned development policy with water efficiency benefit							
Annexation policy with water efficiency benefit							

Efficient Outdoor Water Use: Landscaping Standards

	Fraser	Granby	Grand County	Grand Lake	Hot Sulphur Springs	Kremmling	Winter Park
Landscape Standards	•						
Includes purpose statement with mention of water efficiency							
Landscape plan requirement						•	•
Water demand estimates in landscape plan							
Landscape plan evaluation methodology							
Turf limitations (type of turf, square footage limitations)							
Total landscaped area square footage limitation (maximum)							
Total landscaped area minimum square footage requirements							
Plant selection list							•
Drought tolerant/xeric/native recommendations							•
Drought tolerant/xeric/native requirement							
Soil enhancements and mulching							
Requirement							•
Recommendation							
Irrigation efficiency practices							
Drip irrigation							•
Hand w/shut off nozzle	•						
Length of irrigation requirements for new landscaping							
Water schedules for outdoor irrigation voluntary							•
Time of day							
Day of week							
Water schedules for outdoor irrigation requirement	•						
Time of day	•						
Day of week							
Water budgets for outdoor water use							
Rainwater harvesting standards							
Water waste limitations							
Site inspections							
Code enforcement and fines for violations	•						
Emergency water use restrictions for drought periods	•						•

Efficient Indoor Water Use: Building & Plumbing Code

Detailed policy scans of building and plumbing codes were not conducted on building and plumbing codes if a survey was not completed. Where plumbing codes were cross referenced in the development regulations, for example commercial conservation and efficiency standards, they were reviewed.

	Fraser	Granby	Grand County	Grand Lake	Hot Sulphur Springs	Kremmling	Winter Park
Plumbing efficiency standards to promote water conservation for residential use							
Water efficiency plumbing fixture requirement							
Water efficient appliance requirement							
Plumbing efficiency standards to promote water conservation for commercial or industrial use							
Water efficient plumbing fixtures							
Water efficient appliance requirement							
Commercial standards for high water consumption uses (car washes, restaurants, hotels, laundromat, golf course, etc.)							
Pre-rinse spray valve							
Water recycling system							
Greywater reuse							
Cooling system							
Decorative water features							
Water saving signage							
Drinking water restrictions							
Metering for new development	•					•	
Submetering for new multifamily							
Fee incentive for new development to incorporate water efficient fixtures, appliances, etc.							
Requirement for plumbing retrofit on resale or for rehabilitation of property to receive CO							
Tap availability limitations							
Tap fee incentives for water conservation							

Summary: Gunnison County, Crested Butte

This region includes the County, Crested Butte and four additional communities not in the QQ (Mt. Crested Butte, South CB, Almont and City of Gunnison). There are strong ecological and recreational tourism interests in the region and water quality is a significant concern for the Gunnison River and its tributaries.

Findings

Comprehensive Plans

All communities should consider a water element or greatly augmenting the inclusion of water resource management in current sections as part of future updates.

Water Supply Regulations

Gunnison and Crested Butte both have substantive water supply standards. The county's offers opportunity as a case study for other counties of an ordinance that meets state requirements. The regulations could be updated to be stronger, include best practices and incentivize conservation.

Landscape Ordinance

Current landscape ordinances do not maximize water conservation and efficiency opportunities. Gunnison County's landscape ordinance is tailored primarily for aesthetic purposes and mitigating visual impacts while Crested Butte's is a tree ordinance. Crested Butte's code does include some limits for outdoor watering.

Redevelopment and Point of Sale

This tool is often included in a water conservation ordinance or landscaping ordinance and is applied to either a minimum square footage redevelopment project or as a certificate of approval required for resale of property. The ordinance requires meeting a minimum water conservation and efficiency standard such as fixture or appliance retrofits or water-wise landscape upgrades. Crested Butte includes this as an option in Section 13-2-60, Installation of Water Conservation Devices, with the intent to increase use of water efficient fixtures. This regulation has been in effect for many years and could be evaluated to determine potential savings from retrofits.

Commercial Water Conservation

Education and health-based institutions, restaurants and hotels can be large water consumers. Given the tourism-based economy, an assessment of regional water demand by the commercial sector would help to understand potential benefits from a new ordinance targeting these sectors.

Compact Form and Land Use Patterns

Both Gunnison County and Crested Butte have zoning districts that promote higher densities. While Crested Butte is considered nearly built out, other communities and the county growth areas could benefit from an assessment to understand water demand and land-use patterns to determine the potential water savings that could come from applying a more water efficient development pattern as a greater percentage of total development. Methodologies for linking water and land use are in the appendix. An assessment by each zone district calculating the average water demand in that district could prove useful in understanding how the use of zoning and density could contribute to water savings and/or minimize water demand as the community grows.

Water Quality Standards

This region does explicitly express goals for protecting water quality. Both communities have standards for erosion control and stormwater management. Additionally, Crested Butte's Watershed Protection District uses express statutory authority under § 31-15-707(1)(b) to extend its regulatory jurisdiction beyond the town limits over the area 5 miles upstream from the points of intake for its water supply system. Certain development

within the Crested Butte Watershed District must conduct a thorough environmental analysis. The county uses an additional water protection standard that includes buffers, in addition to the erosion and stormwater protection standards, to protect vegetation and minimize contamination. However, the standard 25-foot buffer and exemption of residential development under 10,000 square feet may not offer intended protections. There is an opportunity to strengthen the water quality protection standard for the county. A regional review of policies and comparison against the QQ's Model Water Quality Protection Standards could identify gaps for code updates that would strengthen water quality protection.

Plumbing and Building Codes

In-depth review of plumbing and building codes were not conducted. It may be beneficial to integrate commercial water efficiency standards into the commercial building code and integrate water conservation and efficiency into the green building code. Water efficiency standards for residential development should also be explored. Crested Butte does have a conservation ordinance within Section 13-2-60 requiring water efficient toilets, shower heads, and faucets for new and remodeled properties. Given the state passed a regulation requiring EPA WaterSense appliances and fixtures for new development, the standards identified should be made consistent or stronger than the State policy. Additionally, the ordinance should be reviewed to evaluate whether additional savings could be gained by any fixtures not covered under the State rule. Given this rule expanded what was covered beyond Crested Butte's list of fixtures, the retrofit requirement can now be expanded to the fixtures under state rule if the ordinance is updated.

Comprehensive Plan Summary

A comprehensive plan is important because it provides the greatest opportunity for educating the community about the water system, establishing a community vision that includes water, and linking water to growth and development. Comprehensive plans were reviewed using a rubric (see table below) that standardized the rating system for six indicators. Where comprehensive plans did not contain information, other plans were examined for water related goals and strategies including water supply plans, water efficiency plans, drought management plans, or basin plans. However, information from these other types of plans were not included in the comprehensive plan review below.

	1	2	3	4
Water Supply	Does not provide a summary of water supply.	Includes only a summary of the total AF not broken down by source.	Incudes a total summary of water supply broken down by source: total ground and total surface.	Includes a summary of water supply by each sources and total water available per source.
Water Use Per capita	Does not provide water use per capita.	Includes water use per capita but does not provide how it has changed over time.	Includes water use per capita and provides how it changed over time.	Includes water use per capita, provides how it changed over time, and explains why it changed.
Water Demand By Sector	Does not provide a summary of total water demand.	Includes a summary of total water demand, but only as a total number in AF.	Includes a summary of total water demand by revenue and non-revenue in AF.	Provides a summary of total water demand for each sector (e.g. R, C, I, Ag, NR).
Water Trends	Does not summarize water demand trends.	Provides a summary of total water demand over time, but not broken down by use. (metric can be AF, gpcd, or per acre)	Provides a summary of total water demand over time but only by revenue and non-revenue.	Provides a summary of total water demand over time by each sector (e.g. R, C, I, Ag, NR).
Water Budget	Does not include a summary of the water supply and demand balance.	Explains total water rights in AF but does not include summary of water supply/demand balance.	Explains total water rights in AF (supply) and current demand (AF) but does not include a summary balance.	Includes a complete water supply and demand balance. May also include plans to address current or projected imbalance.
Water Infrastructure	Does not provide a summary of water treatment, distribution, and storage infrastructure.	Includes a summary of total capacity of water infrastructure, but not of gaps.	Includes a summary of total capacity of water infrastructure and gaps, but not plans for upgrades.	Includes a summary of total capacity of water infrastructure, gaps, and plans for upgrades.

Community Comprehensive Plan Scoring

	Water Supply	Water Use Per Capita	Water Demand By Sector	Water Trends	Water Budget	Water Infrastructure
Crested Butte	1	1	1	1	1	1
Gunnison County	1	1	1	1	1	1

Land-Use Regulations Summary

Adequate Water Supply Requirements

These standards outline water supply requirements for new, and sometimes redevelopment, as part of the development review process.

An ordinance for the provision of	Crested Butte	Gunnison County
Water supply for new development		
A water budget for new development		•
Water rights to accompany new development		

Site Development Standards for Water Quality

	Crested Butte	Gunnison County
Development standards in sensitive areas through clustering or limiting development densities.		
Develop standards for stream buffers and setbacks to protect water quality.		•
Vegetation protection standards that minimize disturbance to vegetation within the riparian corridor.		•
Site level soil erosion mitigation standards for new development to reduce sedimentation and protect water quality from land disturbance.		•
Stormwater management standards that utilize best practices for low impact design reducing storm event runoff and increasing water infiltration.		•
Design standards integrating best practices for low impact design to reduce runoff and increase infiltration.		
Zoning districts that require lower densities and/or cluster development to protect surface and groundwater sensitive areas.		
Designated surface and/or groundwater districts with standards to minimize contamination of streams and shallow aquifers that will protect existing water sources/supplies (e.g. watershed overlays or groundwater protection zones)		

Efficient Outdoor Water Use: Landscaping Standards

	Crested Butte	Gunnison County
Landscape Standards	*	•
Includes purpose statement with mention of water efficiency		
Landscape plan requirement		•
Water demand estimates in landscape plan		•
Landscape plan evaluation methodology		
Turf limitations (type of turf, square footage limitations)		
Total landscaped area square footage limitation (maximum)		
Total landscaped area minimum square footage requirements		
Plant selection list		
Drought tolerant/xeric/native recommendations		•
Drought tolerant/xeric/native requirement		
Soil enhancements and mulching		
Requirement		
Recommendation		
Irrigation efficiency practices		
Drip irrigation		
Hand w/shut off nozzle		
Length of irrigation requirements for new landscaping	•	
Water schedules for outdoor irrigation voluntary		
Time of day		
Day of week		
Water schedules for outdoor irrigation requirement		
Time of day	•	
Day of week	•	
Water budgets for outdoor water use		
Rainwater harvesting standards		•
Water waste limitations	•	
Site inspections		
Code enforcement and fines for violations	•	
Emergency water use restrictions for drought periods		

**Is a tree standard*

Water-efficient Land-use Pattern: Compact Form

	Crested Butte	Gunnison County
Higher densities and smaller lot sizes by right	•	
Mixed use by right	•	
Housing types by right other than single family (MF, duplex, etc.)	•	•
Rural conservation cluster subdivisions		•
Development incentives for water efficient development (density bonuses, reduced fees)		
Designated growth areas or infill areas with infrastructure available for higher density development		•
Planned development policy with water efficiency benefit		
Annexation policy with water efficiency benefit		

Efficient Indoor Water Use: Building and Plumbing Code

Detailed policy scans of building and plumbing codes were not conducted on building and plumbing codes if a survey was not completed. Where plumbing codes were cross referenced in the development regulations, for example commercial conservation and efficiency standards, they were reviewed.

	Crested Butte	Gunnison County
Plumbing efficiency standards to promote water conservation for residential use		
Water efficiency plumbing fixture requirement	●	
Water efficient appliance requirement		
Plumbing efficiency standards to promote water conservation for commercial or industrial use		
Water efficient plumbing fixtures		
Water efficient appliance requirement		
Commercial standards for high water consumption uses (car washes, restaurants, hotels, laundromat, golf course, etc.)		
Pre-rinse spray valve		
Water recycling system		
Greywater reuse		
Cooling system		
Decorative water features		
Water saving signage		
Drinking water restrictions		
Metering for new development	•	
Submetering for new multifamily		
Fee incentive for new development to incorporate water efficient fixtures, appliances, etc.		
Requirement for plumbing retrofit on resale or for rehabilitation of property to receive CO		
Tap availability limitations		
Tap fee incentives for water conservation		

**Crested Butte conservation device includes toilets, shower heads, and faucets for all units new and renovations.*

Summary: Pitkin County, Aspen, Basalt, Carbondale, Glenwood Springs

This region has demonstrated capacity for regional cooperation through the Roaring Fork Watershed Plan as well as interest in water conservation and efficiency as demonstrated by Roaring Fork Regional Water Efficiency Plan.

Findings

Comprehensive Plans

Basalt's comprehensive plan had the strongest explanation of the town's water system. These communities have additional information about water supply and demand available in their water efficiency plans. However, all communities should consider a water element or greatly augmenting the inclusion of water resource management in current sections as part of future updates.

Water Supply Regulations

Basalt required a dedication of water rights or fee in lieu for all new development and annexations except for single family dwellings. Basalt also has clear standards for water rights dedication, including calculation of water demand and ability to review the proposed development for compliance. Pitkin County should consider a zoning overlay district to address hydrological variability and adopt water adequacy requirements that align with the state statute.

Landscape Ordinance

Aspen's landscape ordinance is the strongest in the QQ region and could serve as a model to other communities. Basalt requires landscaping for aesthetic purposes in some districts. Pitkin County's landscape ordinance mitigates visual impacts of commercial developments and protects trees. Carbondale's landscape ordinance only applies to non-residential and multifamily units (>3 units). Carbondale's sustainability code includes options including limiting site disturbance, preservation of topsoil, mulching, turf limitation, xeriscaping, drip irrigation, hyrdozones, irrigation timer controls, and rain sensors. The regional Water Efficiency Plan identified a model regional landscape ordinance as a goal.

Redevelopment and Point of Sale

This tool is often included in a water conservation ordinance or landscaping ordinance and is applied to either a minimum square footage redevelopment project or as a certificate of approval required for resale of property. The ordinance requires meeting a minimum water conservation and efficiency standard such as fixture or appliance retrofits or water wise landscape upgrades. Aspen's landscape ordinance includes a requirement for all new construction with internal work that demolishes greater than 50% of the existing structure.

Commercial Water Conservation

Health and education institutions, restaurants and hotels can be large water consumers. Currently, commercial water conservation standards are not being utilized. An assessment of regional water demand by the commercial sector would help to understand potential benefits from this kind of ordinance.

Compact Form and Land Use Patterns

The communities all have high quality zoning districts that promote higher densities. Carbondale has one of the stronger codes for promoting compact form. The question for each community is to determine the potential water savings that could come from applying a more water efficient development pattern as a greater percentage of total development. Methodologies for linking water and land use are in the Appendix. An assessment by each zone district calculating the average water demand in that district could prove useful in

understanding how the use of zoning and density could contribute to water savings and/or minimize water demand as the community grows.

Water Quality Standards

While this region does explicitly express goals for protecting water quality, standards vary across communities. Aspen and Basalt both define environmentally sensitive areas (ESAs). Aspen's water quality protection applies to within 100-feet of designated rivers with a river setback, natural vegetation protection, and requires an erosion and stormwater management plan for developments. Basalt's protection standards apply within 150 feet of designated rivers and prohibits construction in the 50-foot buffer as well as riparian and wetland vegetation destruction. Pitkin County includes a strong standard with a 100-foot setback with a non-disturbance zone from rivers and 25-foot from isolated wetlands and riparian areas. The standard aims to protect water quality, prevent erosion, and protect riparian habitat. Glenwood Springs includes most standards under the limits to disturbance criteria in the Sensitive Areas Protection that includes erosion mitigation, vegetation protection, water conservation, steam and wetland protection, and minimal site disturbance. All communities have floodplain standards to limit water pollution. A regional review of policies and comparison against the QQ's Model Water Quality Protection Standards could identify gaps for code updates that would strengthen water quality protection.

Plumbing and Building Codes

In-depth review of plumbing and building codes were not conducted. In 2018, Basalt adopted a new Sustainable Building Code with a points system for new and redevelopment. It includes points for site development erosion control, native landscaping, water efficient landscaping with turf and plant standards, indoor water efficiency to achieve 20-40% reductions, and tankless water heaters. Carbondale and Glenwood Springs both adopted the International Energy Conservation Code, 2009 Version with amendments. In Carbondale the code includes limiting site disturbance, preservation of topsoil, erosion mitigation, mulching, turf limitations, xeriscaping, drip irrigation, hyrdozones, irrigation timer controls, rain sensors, and efficient plumbing fixtures and appliances. It may be beneficial to integrate commercial water efficiency standards into the commercial building code and integrate water conservation and efficiency into the green building code.

Comprehensive Plan Summary

A comprehensive plan is important because it provides the greatest opportunity for educating the community about the water system, establishing a community vision that includes water, and linking water to growth and development. Comprehensive plans were reviewed using a rubric (see table below) that standardized the rating system for six indicators. Where comprehensive plans did not contain information, other plans were examined for water related goals and strategies including water supply plans, water efficiency plans, drought management plans, or basin plans. However, information from these other types of plans were not included in the comprehensive plan review below.

	1	2	3	4
Water Supply	Does not provide a summary of water supply.	Includes only a summary of the total AF not broken down by source.	Incudes a total summary of water supply broken down by source: total ground and total surface.	Includes a summary of water supply by each sources and total water available per source.
Water Use Per capita	Does not provide water use per capita.	Includes water use per capita but does not provide how it has changed over time.	Includes water use per capita and provides how it changed over time.	Includes water use per capita, provides how it changed over time, and explains why it changed.
Water Demand By Sector	Does not provide a summary of total water demand.	Includes a summary of total water demand, but only as a total number in AF.	Includes a summary of total water demand by revenue and non-revenue in AF.	Provides a summary of total water demand for each sector (e.g. R, C, I, Ag, NR).
Water Trends	Does not summarize water demand trends.	Provides a summary of total water demand over time, but not broken down by use. (metric can be AF, gpcd, or per acre)	Provides a summary of total water demand over time but only by revenue and non-revenue.	Provides a summary of total water demand over time by each sector (e.g. R, C, I, Ag, NR).
Water Budget	Does not include a summary of the water supply and demand balance.	Explains total water rights in AF but does not include summary of water supply/demand balance.	Explains total water rights in AF (supply) and current demand (AF) but does not include a summary balance.	Includes a complete water supply and demand balance. May also include plans to address current or projected imbalance.
Water Infrastructure	Does not provide a summary of water treatment, distribution, and storage infrastructure.	Includes a summary of total capacity of water infrastructure, but not of gaps.	Includes a summary of total capacity of water infrastructure and gaps, but not plans for upgrades.	Includes a summary of total capacity of water infrastructure, gaps, and plans for upgrades.

Community Comprehensive Plan Scoring

	Water Supply	Water Use Per Capita	Water Demand By Sector	Water Trends	Water Budget	Water Infrastructure
Aspen	2	1	1	1	1	2
Basalt	3	3	2	2	2	3
Carbondale	1	1	1	1	1	1
Pitkin County	1	1	1	1	1	1
Glenwood Springs	3	1	2	1	1	2

**No comprehensive plan online available for review*

**Does have stronger water adequacy requirements in designated hydrological zones by staff review.*

Land Use Regulations Summary

Adequate Water Supply Requirements

These standards outline water supply requirements for new, and sometimes redevelopment, as part of the development review process.

An ordinance for the provision of…	Aspen	Basalt	Carbondale	Pitkin County	Glenwood Springs
Water supply for new development	•	•	•	•	
A water budget for new development			•		
Water rights to accompany new development		•		•	

**Pitkin does have stronger water adequacy requirements in designed hydrological zones.*

Site Development Standards for Water Quality

	Aspen	Basalt	Carbondale	Pitkin County	Glenwood Springs
Development standards in sensitive areas through clustering or limiting development densities.		•		•	•
Develop standards for stream buffers and setbacks to protect water quality.	•	•	•	•	
Vegetation protection standards that minimize disturbance to vegetation within the riparian corridor.	•	•			
Site level soil erosion mitigation standards for new development to reduce sedimentation and protect water quality from land disturbance.	•	•		•	•
Stormwater management standards that utilize best practices for low impact design reducing storm event runoff and increasing water infiltration.	•	•			
Design standards integrating best practices for low impact design to reduce runoff and increase infiltration.					
Zoning districts that require lower densities and/or cluster development to protect surface and groundwater sensitive areas.					
Designated surface and/or groundwater districts with standards to minimize contamination of streams and shallow aquifers that will protect existing water sources/supplies (e.g. watershed overlays or groundwater protection zones)					

** Aspen uses an Environmentally Sensitive Areas review process for areas.*

** Glenwood Springs uses Sensitive Areas Protection standards*

Water Efficient Land Use Pattern: Compact Form

	Aspen	Basalt	Carbondale	Pitkin County	Glenwood Springs
Higher densities and smaller lot sizes by right	•	•	•	•	•
Mixed use by right	•	•	•		•
Housing types by right other than single family (MF, duplex, etc.)	•	•	•		•
Rural conservation cluster subdivisions				•	
Development incentives for water efficient development (density bonuses, reduced fees)					
Designated growth areas or infill areas with infrastructure available for higher density development	•	•		•	
Planned development policy with water efficiency benefit	•	•			
Annexation policy with water efficiency benefit		•			

Efficient Outdoor Water Use: Landscaping Standards

	Aspen	Basalt	Carbondale	Pitkin County	Glenwood Springs
Landscape Standards	●	•	•	•	•
Includes purpose statement with mention of water efficiency	•		•		
Landscape plan requirement	•		•		
Water demand estimates in landscape plan	•				
Landscape plan evaluation methodology	•				
Turf limitations (type of turf, square footage limitations)		•			
Total landscaped area square footage limitation (maximum)					
Total landscaped area minimum square footage requirements			•		
Plant selection list		•		•	
Drought tolerant/xeric/native recommendations	•	•			
Drought tolerant/xeric/native requirement			•		
Soil enhancements and mulching					
Requirement	•				
Recommendation					
Irrigation efficiency practices	•	•	•		•
Drip irrigation					
Hand w/shut off nozzle					
Length of irrigation requirements for new landscaping					
Water schedules for outdoor irrigation voluntary		•			
Time of day					
Day of week					
Water schedules for outdoor irrigation requirement					
Time of day			•		
Day of week			•		
Water budgets for outdoor water use	•				
Rainwater harvesting standards					
Water waste limitations	•	•	•		
Site inspections	•	•			
Code enforcement and fines for violations	•	•	•		
Emergency water use restrictions for drought periods	●	•	●		•

**Carbondale includes rain gardens in parking lot and landscaped island as an option.*

**Pitkin revegetation standards require native species.*

Efficient Indoor Water Use: Building & Plumbing Code

Detailed policy scans of building and plumbing codes were not conducted on building and plumbing codes if a survey was not completed. Where plumbing codes were cross referenced in the development regulations, for example commercial conservation and efficiency standards, they were reviewed.

	Aspen	Basalt	Carbondale	Pitkin County	Glenwood Springs
Plumbing efficiency standards to promote water conservation for residential use		●	●		
Water efficiency plumbing fixture requirement					
Water efficient appliance requirement					
Plumbing efficiency standards to promote water conservation for commercial or industrial use					
Water efficient plumbing fixtures					
Water efficient appliance requirement					
Commercial standards for high water consumption uses (car washes, restaurants, hotels, laundromat, golf course, etc.)					
Pre-rinse spray valve					
Water recycling system					
Greywater reuse					
Cooling system					
Decorative water features					
Water saving signage					
Drinking water restrictions					
Metering for new development	•	•			•
Submetering for new multifamily		•			
Fee incentive for new development to incorporate water efficient fixtures, appliances, etc.					
Requirement for plumbing retrofit on resale or for rehabilitation of property to receive CO					
Tap availability limitations					
Tap fee incentives for water conservation					

**Basalt submeters duplexes.*
**Glenwood Springs is reported to have adopted the 2009 IECC code with amendments but was not located online.*

Summary: Routt County, Steamboat Springs, Yampa

Water Supply Adequacy

Steamboat Springs has a municipal utility. The code includes a well written water rights dedication process and adequate water supply standard. This standard should be considered a municipal model for the Headwaters with clear expectations for being granted a development permit for development. Routt County's lacks specificity to help assess for adequate supply based on the State Statute.

Landscape Ordinance

Steamboat Springs' landscape code includes many good elements, including xeriscape principles, but they are standards that are voluntary recommendations, not mandatory. Automatic irrigation systems are required, but without any requirements for including efficient technologies. Steamboat does permit a landowner to request a separate outdoor water meter. Routt County does have commercial and industrial landscaping standards, but they are intended to mitigate visual impacts.

Redevelopment and Point of Sale

Currently, this tool is not being utilized in any of the QQ communities. This tool is often included in a water conservation ordinance and can require that building permits for redevelopment of properties, generally a minimum square footage, or a certificate for resale of properties to meet minimum water conservation and efficiency standards such as toilet or appliance retrofits or water wise landscape upgrades.

Commercial Water Conservation

Restaurants and hotels can be large water consumers. Currently this tool is not being utilized. An assessment of regional water demand by the commercial sector would help to understand potential benefits from standards to increase efficiency.

Compact Form and Land-use Patterns

Given the resort quality of the region, there are high quality zoning districts that promote higher densities. Steamboat Springs utilizes a form-based code to permit more traditional neighborhood design with smaller lots, reduced setbacks, and zero lot lines. They also include a goal for water conservation and efficiency in their review criteria for PUDs. Routt County utilizes a cluster ordinance. Future land use planning should determine the potential water savings that could come from applying a higher density development pattern as a greater percentage of total development. A density assessment by district and comparing water demand patterns across districts could prove useful in understanding how the use of zoning and density might be used to minimize the water demand of future development.

Water Quality Standards

Steamboat Springs incorporates rain gardens and low impact design into its code for parking lots. It also has a watershed protection ordinance, riparian setbacks, and revegetation requirements intended to reduce erosion. Routt County incorporates many best practices for protecting water quality including stream setbacks, erosion mitigation, and stormwater management. Routt County also has explicit 1041 regulations that cover the Yampa River. While this region does explicitly express goals for protecting water quality, standards vary across the communities. A regional review and comparison of standards could identify gaps for community updates that would strengthen water quality protection.

Plumbing and Building Codes

In depth review of plumbing and building codes were not conducted. It may be beneficial to integrate commercial water efficiency standards into the commercial building code and integrate water conservation and efficiency into the building code.

Comprehensive Plan Summary

A comprehensive plan is important because it provides the greatest opportunity for educating the community about the water system, establishing a community vision that includes water, and linking water to growth and development. Comprehensive plans were reviewed using a rubric that standardized the rating system for six indicators. Where comprehensive plans did not contain information, other plans were examined for water related goals and strategies including water supply plans, water efficiency plans, drought management plans, or basin plans to inform the white paper development. However, information from other plans were not included in the comprehensive plan review below.

	1	2	3	4
Water Supply	Does not provide a summary of water supply.	Includes only a summary of the total AF not broken down by source.	Incudes a total summary of water supply broken down by source: total ground and total surface.	Includes a summary of water supply by each sources and total water available per source.
Water Use Per capita	Does not provide water use per capita.	Includes water use per capita but does not provide how it has changed over time.	Includes water use per capita and provides how it changed over time.	Includes water use per capita, provides how it changed over time, and explains why it changed.
Water Demand By Sector	Does not provide a summary of total water demand.	Includes a summary of total water demand, but only as a total number in AF.	Includes a summary of total water demand by revenue and non-revenue in AF.	Provides a summary of total water demand for each sector (e.g. R, C, I, Ag, NR).
Water Trends	Does not summarize water demand trends.	Provides a summary of total water demand over time, but not broken down by use. (metric can be AF, gpcd, or per acre)	Provides a summary of total water demand over time but only by revenue and non-revenue.	Provides a summary of total water demand over time by each sector (e.g. R, C, I, Ag, NR).
Water Budget	Does not include a summary of the water supply and demand balance.	Explains total water rights in AF but does not include summary of water supply/demand balance.	Explains total water rights in AF (supply) and current demand (AF) but does not include a summary balance.	Includes a complete water supply and demand balance. May also include plans to address current or projected imbalance.
Water Infrastructure	Does not provide a summary of water treatment, distribution, and storage infrastructure.	Includes a summary of total capacity of water infrastructure, but not of gaps.	Includes a summary of total capacity of water infrastructure and gaps, but not plans for upgrades.	Includes a summary of total capacity of water infrastructure, gaps, and plans for upgrades.

Community Comprehensive Plan Scoring

	Water Supply	Water Use Per Capita	Water Demand By Sector	Water Trends	Water Budget	Water Infrastructure
Steamboat Springs	1	1	1	1	1	1
Yampa	2	2	1	2	2	2
Routt County*						

**not reviewed*

Land Use Regulations Summary

Adequate Water Supply Requirements

These standards outline water supply requirements for new, and sometimes redevelopment, as part of the development review process.

An ordinance for the provision of	**Steamboat Springs**	**Yampa**	**Routt County**
Water supply for new development			●
A water budget for new development			
Water rights to accompany new development			

Site Development Standards for Water Quality

	Steamboat Springs	Yampa	Routt County
Development standards in sensitive areas through clustering or limiting development densities.			●
Develop standards for stream buffers and setbacks to protect water quality.	●		●
Vegetation protection standards that minimize disturbance to vegetation within the riparian corridor.			
Site level soil erosion mitigation standards for new development to reduce sedimentation and protect water quality from land disturbance.			●
Stormwater management standards that utilize best practices for low impact design reducing storm event runoff and increasing water infiltration.			●
Design standards integrating best practices for low impact design to reduce runoff and increase infiltration.			●
Zoning districts that require lower densities and/or cluster development to protect surface and groundwater sensitive areas.			
Designated surface and/or groundwater districts with standards to minimize contamination of streams and shallow aquifers that will protect existing water sources/supplies (e.g. watershed overlays or groundwater protection zones)			●

Water-efficient Land-use Pattern: Compact Form

	Steamboat Springs	Yampa	Routt County
Higher densities and smaller lot sizes by right			
Mixed use by right			
Housing types by right other than single family (MF, duplex, etc.)			
Rural conservation cluster subdivisions			●
Development incentives for water efficient development (density bonuses, reduced fees)			
Designated growth areas or infill areas with infrastructure available for higher density development			
Planned development policy with water efficiency benefit			
Annexation policy with water efficiency benefit			

Efficient Outdoor Water Use: Landscaping Standards

	Steamboat Springs	Yampa	Routt County
Landscape Standards	●		●
Includes purpose statement with mention of water efficiency			
Landscape plan requirement			
Water demand estimates in landscape plan			
Landscape plan evaluation methodology			
Turf limitations (type of turf, square footage limitations)			
Total landscaped area square footage limitation (maximum)			
Total landscaped area minimum square footage requirements	●		
Plant selection list			
Drought tolerant/xeric/native recommendations	●		●
Drought tolerant/xeric/native requirement			
Soil enhancements and mulching			
Requirement			
Recommendation			
Irrigation efficiency practices			
Drip irrigation			
Hand w/shut off nozzle			
Length of irrigation requirements for new landscaping			
Water schedules for outdoor irrigation voluntary			
Time of day			
Day of week			
Water schedules for outdoor irrigation requirement			
Time of day			
Day of week			
Water budgets for outdoor water use			
Rainwater harvesting standards			
Water waste limitations			
Site inspections			
Code enforcement and fines for violations			
Emergency water use restrictions for drought periods			

Efficient Indoor Water Use: Building & Plumbing Code

Detailed policy scans of building and plumbing codes were not conducted on building and plumbing codes if a survey was not completed. W here plumbing codes were cross referenced in the development regulations, for example commercial conservation and efficiency standards, there were included.

	Steamboat Springs	Yampa	Routt County
Plumbing efficiency standards to promote water conservation for residential use			
Water efficiency plumbing fixture requirement			
Water efficient appliance requirement			
Plumbing efficiency standards to promote water conservation for commercial or industrial use			
Water efficient plumbing fixtures			
Water efficient appliance requirement			
Commercial standards for high water consumption uses (car washes, restaurants, hotels, laundromat, golf course, etc.)			
Pre-rinse spray valve			
Water recycling system			
Greywater reuse			
Cooling system			
Decorative water features			
Water saving signage			
Drinking water restrictions			
Metering for new development	●	●	
Submetering for new multifamily			
Fee incentive for new development to incorporate water efficient fixtures, appliances, etc.			
Requirement for plumbing retrofit on resale or for rehabilitation of property to receive CO			
Tap availability limitations			
Tap fee incentives for water conservation			

Summary: Summit County, Breckenridge, Dillon, Frisco, Silverthorne

This region's communities are already collaborating through the Blue River Regional Water Efficiency Plan on how to incorporate water conservation and efficiency into land use. The participating communities have expressed interest in water efficiency incentives for redevelopment, landscape ordinances to reduce outdoor watering demand, and integrating water conservation and efficiency into the existing Summit County Green Building Code.

Comprehensive Plans

Comprehensive plans in the region include varying information about the regional water system. The region has excellent data about its watersheds, water supply and demand, and current practices. Inclusion of this information in comprehensive planning would serve to educate the community and build support for future policy actions.

Landscape Ordinance

Current landscape ordinances are tailored primarily for aesthetic purposes and mitigating visual impacts. Only Frisco and Silverthorne include water conservation and efficiency as a goal. All of the towns have commercial landscaping standards that require a minimum square footage as opposed to limits to landscaped area.

Redevelopment and Point of Sale

Currently, this tool is not being utilized in this region. This tool is often included in a water conservation ordinance or landscaping ordinance and is applied to either a minimum square footage redevelopment project or as a certificate of approval required for resale of property. The ordinance requires meeting a minimum water conservation and efficiency standard such as fixture or appliance retrofits or water wise landscape upgrades.

Commercial Water Conservation

Education and health institutions, restaurants and hotels can be large water consumers. Apart from Frisco's current policies to provide glasses of water only by request in their drought restrictions, there are no additional commercial water conservation standards being utilized. An assessment of regional water demand by the commercial sector would help to understand potential benefits from a new ordinance.

Compact Form and Land Use Patterns

The communities all have high quality zoning districts that promote higher densities. The question for each community is to determine the potential water savings that could come from applying a more water efficient development pattern as a greater percentage of total development. Methodologies for linking water and land use are in the Appendix. An assessment by each zone district calculating the average water demand in that district could prove useful in understanding how the use of zoning and density could contribute to water savings and/or minimize water demand as the community grows.

Water Quality Standards

While this region does explicitly express goals for protecting water quality, standards vary across communities. A regional review and comparison of QQ's Model Water Quality Protection Standards could identify gaps for community updates that would strengthen water quality protection.

Plumbing and Building Codes

In depth review of plumbing and building codes were not conducted. It may be beneficial to integrate commercial water efficiency standards into the commercial building code and integrate water conservation and efficiency into the green building code.

Comprehensive Plan Summary

A comprehensive plan is important because it provides the greatest opportunity for educating the community about the water system, establishing a community vision that includes water, and linking water to growth and development. Comprehensive plans were reviewed using a rubric (see table below) that standardized the rating system for six indicators. Where comprehensive plans did not contain information, other plans were examined for water related goals and strategies including water supply plans, water efficiency plans, drought management plans, or basin plans. However, information from these other types of plans were not included in the comprehensive plan review below.

	1	2	3	4
Water Supply	Does not provide a summary of water supply.	Includes only a summary of the total AF not broken down by source.	Incudes a total summary of water supply broken down by source: total ground and total surface.	Includes a summary of water supply by each sources and total water available per source.
Water Use Per capita	Does not provide water use per capita.	Includes water use per capita but does not provide how it has changed over time.	Includes water use per capita and provides how it changed over time.	Includes water use per capita, provides how it changed over time, and explains why it changed.
Water Demand By Sector	Does not provide a summary of total water demand.	Includes a summary of total water demand, but only as a total number in AF.	Includes a summary of total water demand by revenue and non-revenue in AF.	Provides a summary of total water demand for each sector (e.g. R, C, I, Ag, NR).
Water Trends	Does not summarize water demand trends.	Provides a summary of total water demand over time, but not broken down by use. (metric can be AF, gpcd, or per acre)	Provides a summary of total water demand over time but only by revenue and non-revenue.	Provides a summary of total water demand over time by each sector (e.g. R, C, I, Ag, NR).
Water Budget	Does not include a summary of the water supply and demand balance.	Explains total water rights in AF but does not include summary of water supply/demand balance.	Explains total water rights in AF (supply) and current demand (AF) but does not include a summary balance.	Includes a complete water supply and demand balance. May also include plans to address current or projected imbalance.
Water Infrastructure	Does not provide a summary of water treatment, distribution, and storage infrastructure.	Includes a summary of total capacity of water infrastructure, but not of gaps.	Includes a summary of total capacity of water infrastructure and gaps, but not plans for upgrades.	Includes a summary of total capacity of water infrastructure, gaps, and plans for upgrades.

Community Comprehensive Plan Scoring

	Water Supply	Water Use Per Capita	Water Demand By Sector	Water Trends	Water Budget	Water Infrastructure
Breckenridge	2	3	2	2	3	3
Dillon	2	1	2	1	1	2
Frisco	1	1	1	1	1	1
Silverthorne	1	1	1	1	1	1
Summit County	2	2	2	3	3	3

Water Supply and Demand Summary

Essential to linking land use and water demand management is an understanding of water supply and demand trends. This information is required to be included by state statute for certain sized water providers in their water supply plans and in water efficiency plans. While uncommon in Colorado, many county or regions collaborate on regional water studies to inform policy making. In this summary, water supply and demand information

is included for the communities that returned surveys. However, due to the low survey response rate, this information was not available for all communities. Communities with utilities or water providers were the most likely to provide information.

Community Water Supply and Demand Balance

	Breckenridge	Dillon	Frisco	Silverthorne
Has not calculated current water supply and demand balance.	●			
Water budget is currently balanced, but shortage projected for future if trend continues.		●	●	●
Water budget currently balanced and projected to remain balanced over next 25 years.				

Water Conservation Programs

These are programs provided by the utilities or water district that aim to reduce household water consumption through voluntary programs, rate structures, and educational activities aimed at behavior change. In some communities, there are multiple water providers. In the cases of counties, they may not have a utility, but the water districts in the county may offer these water conservation programs and could be collaborative partners in a county conservation strategy.

Activities	Breckenridge	Dillon	Frisco	Silverthorne
Cash for grass/turf replacement				
Rebates for fixtures and appliances	●			
Water efficient product giveaways	●			
Conservation education for consumers	●	●	●	●
Landscaping education for property owners				●
Landscaping education for landscaping professionals				●
Water efficiency rebates				
Water audits	●	●	●	●
Water metering	●		●	●
Rate structuring	●		●	●
Other				

Water Rate Structuring

Activities	Breckenridge	Dillon	Frisco	Silverthorne
Drought Demand Pricing				
Excess Use	●			●
Inclining Block			●	●
Indoor/Outdoor				
Penalties	●			
Scarcity Pricing				
Seasonal Pricing				
Sliding Scale				●
Spatial Pricing				
Time of Use				
Water Budget				
Other				

Land Use Regulations Summary

Adequate Water Supply Requirements

These standards outline water supply requirements for new, and sometimes redevelopment, as part of the development review process.

An ordinance for the provision of	Breckenridge	Dillon	Frisco	Silverthorne	Summit County
Water supply for new development	•	•	•		•
A water budget for new development					
Water rights to accompany new development					

Site Development Standards for Water Quality

	Breckenridge	Dillon	Frisco	Silverthorne	Summit County
Development standards in sensitive areas through clustering or limiting development densities.	●				●
Develop standards for stream buffers and setbacks to protect water quality.	●	●	●		●
Vegetation protection standards that minimize disturbance to vegetation within the riparian corridor.	●				
Site level soil erosion mitigation standards for new development to reduce sedimentation and protect water quality from land disturbance.	●		●		●
Stormwater management standards that utilize best practices for low impact design reducing storm event runoff and increasing water infiltration.	●	●			
Design standards integrating best practices for low impact design to reduce runoff and increase infiltration.		●			
Zoning districts that require lower densities and/or cluster development to protect surface and groundwater sensitive areas.					●
Designated surface and/or groundwater districts with standards to minimize contamination of streams and shallow aquifers that will protect existing water sources/supplies (e.g. watershed overlays or groundwater protection zones)					

Water-efficient Land-use Pattern: Compact Form

	Breckenridge	Dillon	Frisco	Silverthorne	Summit County
Higher densities and smaller lot sizes by right	●	●	●	●	●
Mixed use by right	●	●	●	●	
Housing types by right other than single family (MF, duplex, etc.)	●	●	●	●	
Rural conservation cluster subdivisions			●		
Development incentives for water efficient development (density bonuses, reduced fees)					
Designated growth areas or infill areas with infrastructure available for higher density development					
Planned development policy with water efficiency benefit					
Annexation policy with water efficiency benefit					

Efficient Outdoor Water Use: Landscaping Standards

	Breckenridge	Dillon	Frisco	Silverthorne	Summit County
Landscape Standards	●	●	●	●	
Includes purpose statement with mention of water efficiency					
Landscape plan requirement	●		●	●	
Water demand estimates in landscape plan				●	
Landscape plan evaluation methodology	●				
Turf limitations (type of turf, square footage limitations)					
Total landscaped area square footage limitation (maximum)					
Total landscaped area minimum square footage requirements	●	●	●	●	
Plant selection list	●		●		
Drought tolerant/xeric/native recommendations	●	●		●	
Drought tolerant/xeric/native requirement			●		
Soil enhancements and mulching					
Requirement	●	●		●	
Recommendation					
Irrigation efficiency practices					
Drip irrigation	●			●	
Hand w/shut off nozzle	●				
Length of irrigation requirements for new landscaping	●		●		
Water schedules for outdoor irrigation voluntary					
Time of day			●		
Day of week			●		
Water schedules for outdoor irrigation requirement					
Time of day	●		●		
Day of week	●		●		
Water budgets for outdoor water use					
Rainwater harvesting standards					
Water waste limitations		●			
Site inspections					
Code enforcement and fines for violations			●		
Emergency water use restrictions for drought periods	●				

Efficient Indoor Water Use: Building and Plumbing Code

Detailed policy scans of building and plumbing codes were not conducted on building and plumbing codes if a survey was not completed. Where plumbing codes were cross referenced in the development regulations, for example commercial conservation and efficiency standards, they were reviewed.

	Breckenridge	Dillon	Frisco	Silverthorne	Summit County
Plumbing efficiency standards to promote water conservation for residential use					
Water efficiency plumbing fixture requirement					
Water efficient appliance requirement					
Plumbing efficiency standards to promote water conservation for commercial or industrial use					
Water efficient plumbing fixtures					
Water efficient appliance requirement					
Commercial standards for high water consumption uses (car washes, restaurants, hotels, laundromat, golf course, etc.)					
Pre-rinse spray valve					
Water recycling system					
Greywater reuse					
Cooling system					
Decorative water features					
Water saving signage					
Drinking water restrictions			●		
Metering for new development					
Submetering for new multifamily					
Fee incentive for new development to incorporate water efficient fixtures, appliances, etc.					
Requirement for plumbing retrofit on resale or for rehabilitation of property to receive CO					
Tap availability limitations					
Tap fee incentives for water conservation					

Appendix A
Resources

Western Resource Advocates

1. Integrating Water Efficiency Into Land Use Planning In The Interior West: A Guidebook For Local Planners
2. A Guide to Designing Conservation Oriented Water System Development Charges
3. Submetering Fact Sheet

Colorado Water Conservation Board Water Efficiency Plan Guidance

1. Best Management Practices for Implementing Water Conservation and Demand Management through Land Use Planning Efforts.

Colorado Division of Water Resources

1. Rainwater Collection Rules

Environmental Law and Policy Center

1. Land Use Tools to Protect Groundwater Quality: Overlay Districts.

American Planning Association

1. https://planning.org/divisions/groups/water/
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1. https://scholarlycommons.pacific.edu/cgi/viewcontent.cgi?article=1197&context=facultyarticles

Outdoor Water Use

1. Green Strategies for Colorado Landscapes, Associated Landscape Contractors of Colorado.
2. Soil Amendments From Colorado Extension, Choosing a Soil Amendment.
3. City of Colorado Springs Grass Choices, PDF.
4. EPA Water Budget Tool and Resources.
5. Federal Energy Management Program, Estimating Unmetered Landscapes.
6. EPA WaterSense, Water Efficiency Management Guide Landscaping and Irrigation.
7. DOLA Planning for Hazards, Model Landscape Ordinance.
8. CSU Rain Garden Guide.
9. Bioretention Best Practices

Indoor Water Use

1. Enterprise Community Partners Step-By-Step Retrofit Process for Multifamily
2. Going Beyond Code: A Guide to Creating Green Building Programs and Energy Efficient and Sustainable Communities
3. EPA Water Efficiency Management Guide Bathroom Suite
4. EPA Water Efficiency in Restaurants
5. EPA Water Efficiency in Hotels
6. Illinois Model Water Use Conservation Ordinance
7. EPA Best Practices to Avoid Supply Expansion

Appendix B
Glossary of Common Terms

Acre-foot: the volume of water equivalent to covering one acre of land to a depth of one foot, equal to 43,560 cubic feet or 325,851 gallons.

Aquifer: a formation, group of formations or part of a formation containing sufficient saturated permeable (able to pass through) material that could yield a sufficient quantity of water that may be extracted and put to beneficial use.

Augmentation Plan: a way for junior appropriators to obtain water supplies through terms and conditions approved by a water court that protects senior water rights from the depletions caused by the new diversions. It typically will involve storing junior water when in priority and releasing that water when a call comes on, purchasing stored water to release when a river call comes on, or purchasing senior irrigation water rights and changing the use of those rights to offset the new users' injury to the stream.

Augmentation Water: water that is added, left, or replaced in a stream system to offset out-of-priority diversions.

Dual Flush Toilet: A high efficiency toilet that is designed with two flush volumes, a reduced flush for liquid waste and a full flush for solid waste.

EnergyStar: A US Dept. of Energy program which provides certification to buildings and consumer products which meet certain standards of energy efficiency.

Flushometer Valve Activated Toilet: A toilet that flushes by a valve that discharges a predetermined quantity of water to the fixture and is actuated by direct water pressure. A flushometer uses a metal water-diverter with an inline handle to flush tankless toilets or urinals.

Gravity Tank Type Toilet: A toilet with a tank that is located above or integral with the toilet for the purposes of flushing the fixture by the force of gravity.

High Efficiency Plumbing Fixtures and Fittings: Fixture that are more efficiency than the Energy Policy Act of 1992 standards.

High Efficiency Toilet (HET): Fixture that flushes at 20% below the 1.6 gallons per flush maximum or less with a maximum flush of 1.3 gallons per flush.

High Efficiency Toilet Dual Flush: Fixtures that flush at 0.8 to 1.1. and 1.6 gallons per flush.

High Efficiency Urinal (HEU): Fixture that flushes at 0.5 gallons per flush or less.

Gravity Fed Style Flush: Fixture that flush at 1.28 gallons per flush.

Manual Faucet: A faucet that is actuated and closed through manual operation.

Metering Faucet: A faucet that dispenses water of an adjustable, but predetermined volume or for a predetermined period of time.

Non-potable Reuse: secondary treatment of return flows, such as effluent from wastewater treatment, that is made available for onsite irrigation or sale to commercial uses (e.g. golf courses, parks commercial/industrial cooling).

Pressure Assist Toilet: Fixture that flush at 1.1 – 1.2 gallons per flush.

Retrofit: substitute new or modernized parts or systems for older fixtures.

Self-Closing Faucet: A faucet that is designed to cease water flow when the activating mechanism is released.

Waterless Urinal: A dry urinal.

WaterSense Products: A US Environmental Protection Agency program which provides certification to plumbing products which meet certain standards of water efficiency.

Water Supply Side Management: meeting demand with new water resources.

Water Demand Side Management: managing consumptive demand itself to postpone or avoid the need to develop new resources. A demand management plan may involve a wide range of demand management measures including:

- cost-reflective pricing
- universal customer metering
- reticulation leakage detection and repair programs and pressure reduction
- a communication strategy, including a community education campaign
- customer advisory services
- the use of incentives for installation and/or retrofitting of water efficient equipment
- reduction of water use by the water utility
- regulation of the efficiency of water using appliances, especially in new buildings
- use of reclaimed water (e.g. wastewater/gray water) to reduce the need for fresh water supplies
- water use restrictions, either on a temporary or permanent basis

Water-Related Plans: Plans related to water resource management that support water conservation and efficiency.

- **Drought Preparedness Plan**: includes drought and emergency response strategies, a plan of action to respond to water shortage conditions, and provisions to educate and inform the public.
- **Water Efficiency Plan** (Utility or Provider): Including measures to control lost and unaccounted for water, considers water rate structures that encourage efficient use of water, plans for public information and education programs on water conservation, and efficient land use planning.
- **Water Supply Plan** (Utility or Provider): describes the service area, transmission facilities, monthly system production data, historic demand for the past five years, and projected demands for the next 5, 10 and 20 years. Climate resilient plans take longer time frames.

Water Budget: This term has multiple meanings in water planning depending upon the context. While in context of the hydrological cycle, a water budget is the quantification of the in and out flows of a hydrological system, in general, it is useful to think of a water budget as a calculation of water demand for a type of use. Different applications of water budget include:

a) **Water Balance** (basin management tool): A water budget, also referred to as “water balance,” reflects the relationship between inflow and outflow of water through a hydrological unit. It provides a comparison of the supply of water and the demand for water. A water budget is calculated with an equation that will include:

    - Potential Evapotranspiration (PE): All the water that could enter the air from plants and evaporation if present.
    - Precipitation (P): All moisture from the atmosphere, rain, snow, hail and sleet.
    - Surplus: Water above what is lost naturally from the soil (when P is greater than PE)

- Deficit: Water that would be lost above what is in the soil if it were present (when P is less than PE)

Availability of water depends on various factors such as the natural (variable) water cycle; availability of water in lakes, rivers, aquifers, wetlands and other water bodies; and the usage of water in a region. Water budgets are used in utility, basin, watershed or water efficiency plans to understand gaps between supply and demand.

b) Water budget as a development review tool: In the development approval process where a determination of water availability and adequacy is required, a water budget is the summary of the total water demand estimated for new development. The methodology to determine a development's water budget can vary. The most common methodologies include:

- Per capita per unit.
- Per standardized unit for a household.
- Per historical use.
- Per individual indoor and outdoor calculations.

This demand calculation is the compared to existing supplies to determine if sufficient water is available over a specified time period. This water budget may be used solely for the development review process or may set a baseline for a development where the water provider monitors for compliance over time.

c) Outdoor water budget as an irrigation management tool: An outdoor water budget is a water management tool used to estimate the amount of water a landscape will require. It can be calculated for a single irrigation event, on a weekly or monthly basis, or even annually. The landscape water budget takes into account reference evapotranspiration data, plant type(s), purpose and functionality of the landscape, irrigated landscape area, irrigation efficiency, water quality, and rainfall. It is used as part of a development approval application to determine estimated water demand and/or a requirement of a landscape plan.

d) Indoor water budget as indoor efficiency tool: An indoor water budget can calculate a baseline for how much water a unit type may use. It can also be used to demonstrate the value of additional conservation and/or efficiency strategies that can added during development or post occupancy. An indoor water budget is calculated based on the flow rates of the fixtures and the appliances provided by the builder (i.e. commodes, faucets, showerheads, dishwashers) and added by the homeowner (i.e. clothes washer).

e) Household water budgets as a water rate structure tool: For utilities, a water budget is the amount of water a residential customer is allotted during a specific month based on the size and type of their house, quantity of outdoor landscaping, and past usage levels. Water budgets help promote water conservation by incentivizing water customers to stay within their budget as they will pay more if they exceed their budget.

Appendix C
Methodologies for Population, Water Demand and Land-use Projections

Methodology to Assess Development Patterns

To determine the appropriate mix of densities that will accommodate future growth and achieve a desired water conservation goal requires access to information, analysis, and consensus on the baseline conditions. For land use and water planners the first challenge in working together on a comprehensive plan will usually be determining what information is available, the accuracy and reliability of information, and what information is missing. Data availability varies widely and will depend upon the local regulations and the capacity to collect and analyze information. One of the biggest challenges is that water providers billing systems may be set up for financial and accounting purposes without any customer segmentation and water demand data.

Many communities working to integrate water and land use soon realize they need strategies in their comprehensive plan that include improving information gathering and/or monitoring systems. Where data is lacking, it might be necessary to use proxies or the best available data at the time with a longer-term strategy for increasing capacity and information accuracy.

Calculating Current and Future Population

The very first step to connect water and land use patterns is to confirm population trend data. Population forecasting is not exact and there are many different methodologies, some more appropriate to different contexts than others. It is not uncommon for different jurisdictions and organizations to use different data sets adapted for specific service area or to have data sets provided by a consultant without an understanding of the underlying assumptions. It is important to have population data that is consistent or aligned across sectors. This is particularly important for smaller and more rural communities as demographic forecasting accuracy tends to increase as:

- the size of the population increases (state versus community).
- the projection time period decreases (10 years versus 50 years).
- the level of migration decreases (slow growing rather than fast-growing community).

To address this uncertainty, it is useful to utilize a high, medium and low forecast range rather than a single future population target and growth rate. This helps ease the potential political tensions around the accuracy of data and instead supports thinking of population forecasts as an adaptive, or if – then, management tool.

Discussions about growth and development assumptions should include the following:

- Do we agree on our historic and emerging growth and development trends?
- Do we agree on the drivers of growth in our region? (trendline, current and planned development capacity, economic plans and activities, demographic trends, etc.)
- Do we agree on what might limit growth in our region?
- Do we understand and agree on the methodology for calculating population?

Counting Part-Time Residents

Part-time residents can be a significant challenge in communities with a large percentage of second home owners. A functional population is defined as the number of people occupying space in the community on a 24 hour per day, seven-day-per-week basis. One approach is to give a value to the part-time resident population as a proportion of how much time they are expected to spend in the area. For example, if an individual life in the community in for three months of the year, they are counted as one-quarter (.25) of a full-time resident. Four quarte- time residents would be equivalent to one full-time resident.

Data Sources

- Colorado State Demographer website
- The Census Population Estimates
- The Census Population and Housing Estimates
- Census American Fact Finder
- Local Council of Government
- Headwaters Economics Economic Profile System

Additional local data useful for tracking changes in a community's population trends that will help inform or validate forecasting includes the factors outlined in the following table.

Development Data Types and Sources	Water Data Types and Sources
• Tax assessor data can inform total parcels, ownership, value, parcel size, and location. This data informs the spatial analysis. • Building permits indicate trends and what type of structures are being built. • School enrollments, birth and death registration	• Total number of taps • Meter data to measure historical use. • Billing system data on water use sectors and consumption information. • State well permits for total number of wells. • USGS report on hydrology • Sewer treatment production data

Calculating Current and Future Water Demand

Each water provider may have their own methodology for calculating demand based on what tracking systems they use in their organization. The simplest calculation methodologies for future water demand rely on a linear relationship where population growth and a measure of water demand per person equal total new water demand. Depending upon the water use information available in a community, the water measure might be based on a national standard or historical data from the utility as per capita consumption. This calculation

methodology assumes that individuals across all development types use the same amount of water. Evidence has proven this is not the case.

Water demand varies by housing type and occupant income, total amount of outdoor landscaping, business type, and density. The form a community development pattern takes can heavily influence future water demands. To address the coarseness of simple linear projections, more fine scale methodologies to assess a development pattern's impact on water demand have been developed, but still evolving. They require more detailed breakdowns of information and a level of analytical capacity that may not be available everywhere. The finer scale processes involve understanding the differences in water demand of different types of structures by:

1. Builds a typology of housing types. A typology classifies existing parcels and buildings by total number of units and building type. The building type reflects what is currently available such as: large lot single family, small lot single family, duplex, hi-rise multi-family, school, hospital, etc.
2. Assesses historical water usage. To inform the calculation of averages of water demand by building type, an analysis of segmented water data is done.
3. Utilizes geospatial mapping/GIS. An analysis to understand the spatial relationships between water use, density, and the different typologies helps build out scenarios of future land use patterns.
4. Projects future water demand. Using population projects to determine the need for housing, growth is allocated to the development types that will be encouraged in the comprehensive plan and development codes.

Utilizing slightly different versions of this methodology, many metropolitan areas around the West, including Denver and Westminster, are able to track water use per acre rather than generalized water use per capita to inform their land use and water planning.

Resources for Water Demand Forecasting

Where demand data is not available for planning, many communities rely on water demand assumptions collected at the state or national level. Water demand across the U.S. has declined by 10-20 percent since the 1980s. While a conservation ethic has been part of this decline, the decline is primarily due to significant efficiency improvements in fixtures and appliances and is not necessarily reflective of water efficiency or conservation practices.

- 80-100 gallons per capita per day for indoor use (Colorado Waterwise).
- 350 gallons per day per household of four (EPA).
- Individual wells (CO Division of Water Resources).
    - 0.3 acre-foot per year.
    - Use for four large domestic animals: 0.05 acre-foot per year.
    - Use for each 1,000 square feet of lawn irrigation: 0.05 acre-foot per year.

The State of Colorado offers guidance on future water demand and water-saving calculations in the CWCB water efficiency plan guideline. The following resources also offer information to help inform how a community should approach calculating future water demand.

- California recognized the need to develop community capacity to meet statewide standards for reporting on water efficiency and conservation. The developed this resource in 2010: Methodologies for Calculating Baseline and Compliance Urban Per Capita Water Use.
- The Pacific Institute released a useful resource, A Community Guide to Calculating Future Water Demand. It outlines some of the methodological concerns with water demand forecasting and provides a checklist to utilize when 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.

Calculating Water Savings from Increased Residential Density

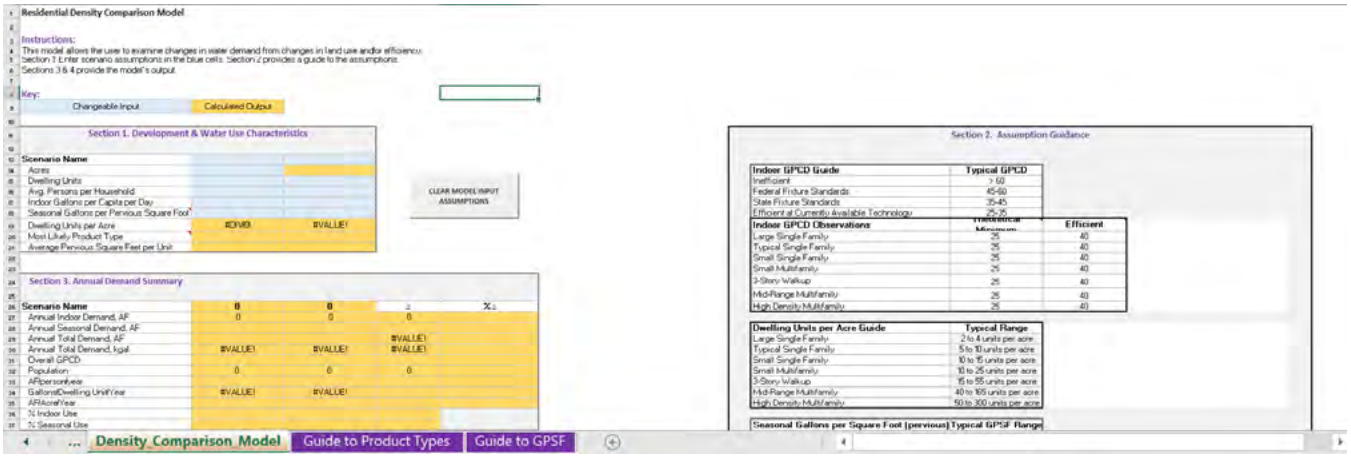
To support the development of *Colorado's Water Plan*, in 2010 the CWCB released a technical memo that outlined a basic assumption for Colorado to use in estimating water savings that might result from increased density based on research done in California. It assumes:

- Outdoor water use, primarily landscape irrigation, accounts for half of residential water use.
- Increasing density per acre by 20% yields a 10% water savings per capita. This savings comes primarily by reducing lot size, therefore reducing demand for outdoor landscaping.
- This linear relationship can be used to project the impact on water demand by allocating future population growth into designated land areas (in acres) and a range of development densities.
- Increased density may result in more water supply necessary per acre. However, at the basin level, it will reduce per capita demand to meet population growth.

The CWCB methodology used to calculate scenarios for water demand savings is based on different densities. The application of this tool is most useful for assessing water savings created by shifting the total percentage of a community's development from exurban and suburban residential patterns (e.g. 4 lots per 0.6 acres up to 1 lot per 5 acres) into higher densities in designated future growth areas. To calculate water savings, this methodology requires knowing:

- The density of the current population (current population divided by current area). Area would be defined by square miles.
- The net new population (total new population minus current population).
- The future area (current area plus new area for growth).
- The density of the net new population (net new population divided by new area).

The Colorado Water and Growth Dialogue was a collaborative project led by the Keystone Policy Center and Colorado State University to explore land use and water efficiency in Colorado. As part of the project, they worked with Denver Water to model water demand by building type and exploratory scenario analysis to examine the relationships between increasing density, outdoor efficiency, and total demand. While this was a research process to explore methodologies, the project found that when people move from living on larger lot or traditional single-family homes to other building types, it resulted in the largest reductions in total water demand for new housing. This project created the Land Use and Water Demand Tool, an excel spreadsheet, that can be used by other communities who lack data to explore water demand based on different housing typologies. While it cannot be used as a predictive tool, it is useful to being exploring the relationship between density and land use.



Appendix D

Summary of State of Colorado Legislation Linking Water and Land Use

Title 29: Local Government Land Use Control and Conservation Act

Article 20. Local government Regulation of Land Use

Part 3: Adequate Water Supply §29-20-301-306

301. Legislative Declaration

(1) The General Assembly:

(a) Finds that, due to the broad regional impact that securing an adequate supply of water to serve proposed land development can have both within and between river basins, it is imperative that local governments be provided with reliable information concerning the adequacy of proposed developments' water supply to inform local governments in the exercise of their discretion in the issuance of development permits;

(b) To that end, declares that while land use and development approval decisions are matters of local concern, the enactment of this part 3, to help ensure the adequacy of water for new developments, is a matter of statewide concern and necessary for the preservation of public health, safety, and welfare and the environment of Colorado;

(c) Finds that it is necessary to clarify that, where a local government makes a determination whether an applicant for a development permit has demonstrated the proposed water supply is adequate to meet the needs of the development in accordance with the requirements of this part 3, the local government, in its sole discretion, not only makes the determination but also possesses the flexibility to determine at which stage in the development permit approval process the determination will be made; and

(d) Further finds that it is also necessary to clarify that the stages of the development permit approval process are any of the applications, or any combination of the applications, specified in section 29-20-103 (1) as determined by the local government, and that none of the stages are intended to constitute separate development permit approval processes for purposes of section 29-20-303.

302. Definitions

(1) "Adequate" means a water supply that will be 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.

(2) "Water supply entity" means a municipality, county, special district, water conservancy district, water conservation district, water authority, or other public or private water supply company that supplies, distributes, or otherwise provides water at retail.

303. Adequate Supply for Development

(1) A local government shall not approve an application for a development permit unless it determines in its sole discretion, after considering the application and all of the information provided, that the applicant has satisfactorily demonstrated that the proposed water supply will be adequate. A local government shall make such determination only once during the development permit approval process unless the water demands or supply of the specific project for which the development permit is sought are materially changed. A local government shall have the discretion to determine the stage in the development permit approval process at which such determination is made.

(2) Nothing in this part 3 shall be construed to require that the applicant own or have acquired the proposed water supply or constructed the related infrastructure at the time of the application.

304. Water Supply Requirements

(1) Except as specified in subsections (2) and (3) of this section, an applicant for a development permit shall submit estimated water supply requirements for the proposed development in a report prepared by a registered professional engineer or water supply expert acceptable to the local government. The report shall include:

(a) An estimate of the water supply requirements for the proposed development through build-out conditions.

(b) A description of the physical source of water supply that will be used to serve the proposed development.

(c) An estimate of the amount of water yield projected from the proposed water supply under various hydrologic conditions.

(d) Water conservation measures, if any, that may be implemented within the development.

(e) Water demand management measures, if any, that may be implemented within the development to account for hydrologic variability.

(f) Such other information as may be required by the local government.

(2) If the development is to be served by a water supply entity, the local government may allow the applicant to submit, in lieu of the report required by subsection (1) of this section, a letter prepared by a registered professional engineer or by a water supply expert from the water supply entity stating whether the water supply entity is willing to commit and its ability to provide an adequate water supply for the proposed development. The water supply entity's engineer or expert shall prepare the letter if so requested by the applicant. At a minimum, the letter shall include:

(a) An estimate of the water supply requirements for the proposed development through build-out conditions.

(b) A description of the physical source of water supply that will be used to serve the proposed development.

(c) An estimate of the amount of water yield projected from the proposed water supply under various hydrologic conditions.

(d) Water conservation measures, if any, that may be implemented within the proposed development.

(e) Water demand management measures, if any, that may be implemented to address hydrologic variations.

(f) Such other information as may be required by the local government.

(3) In the alternative, an applicant shall not be required to provide a letter or report identified pursuant to subsections (1) and (2) of this section if the water for the proposed development is to be provided by a water supply entity that has a water supply plan that:

(a) Has been reviewed and updated, if appropriate, within the previous ten years by the governing board of the water supply entity.

(b) Has a minimum twenty-year planning horizon.

(c) Lists the water conservation measures, if any, that may be implemented within the service area.

(d) Lists the water demand management measures, if any, that may be implemented within the development.

(e) Includes a general description of the water supply entity's water obligations.

(f) Includes a general description of the water supply entity's water supplies.

(g) Is on file with the local government.

305. Determination of Adequate Water Supply

(1) The local government's sole determination as to whether an applicant has a water supply that is adequate to meet the water supply requirements of a proposed development shall be based on consideration of the following information:

(a) The documentation required by section 29-20-304.

(b) If requested by the local government, a letter from the state engineer commenting on the documentation required pursuant to section 29-20-304.

(c) Whether the applicant has paid to a water supply entity a fee or charge for the purpose of acquiring water for or expanding or constructing the infrastructure to serve the proposed development.

(d) Any other information deemed relevant by the local government to determine, in its sole discretion, whether the water supply for the proposed development is adequate, including, without limitation, any information required to be submitted by the applicant pursuant to applicable local government land use regulations or state statutes.

Title 30 Government – County

Article 28 County Planning & Building Codes. Part 1 County Planning.

Definition of a Subdivision §30-28-101 (10)(a)

(10)(a) "Subdivision" or "subdivided land" means any parcel of land in the state which is to be used for condominiums, apartments, or any other multiple-dwelling units, unless such land when previously subdivided was accompanied by a filing which complied with the provisions of this part 1 with substantially the same density, or which is divided into two or more parcels, separate interests, or

interests in common, unless exempted under paragraph (b), (c), or (d) of this subsection (10). As used in this section, "interests" includes any and all interests in the surface of land but excludes any and all subsurface interests.

(b) The terms "subdivision" and "subdivided land", as defined in paragraph (a) of this subsection (10), shall not apply to any division of land which creates parcels of land each of which comprises thirty-five or more acres of land and none of which is intended for use by multiple owners.

(c) Unless the method of disposition is adopted for the purpose of evading this part 1, the terms "subdivision" and "subdivided land", as defined in paragraph (a) of this subsection (10), shall not apply to any division of land.

(I) Which creates parcels of land, such that the land area of each of the parcels, when divided by the number of interests in any such parcel, results in thirty-five or more acres per interest.

Adoption of Master Plans §30-28-106 (3)(IV)

(IV) The general location and extent of an adequate and suitable supply of water. If the master plan includes a water supply element, the planning commission shall consult with the entities that supply water for use within the county or region to ensure coordination on water supply and facility planning, and the water supply element shall identify water supplies and facilities sufficient to meet the needs of the public and private infrastructure reasonably anticipated or identified in the planning process. Nothing in this subparagraph (IV) shall be construed to supersede, abrogate, or otherwise impair the allocation of water pursuant to the state constitution or laws, the right to beneficially use water pursuant to decrees, contracts, or other water use agreements, or the operation, maintenance, repair, replacement, or use of any water facility.

Subdivision Regulations §30-28-133 (3)(c)(d)

(3) Subdivision regulations adopted by a board of county commissioners pursuant to this section shall require subdividers to submit to the board of county commissioners data, surveys, analyses, studies, plans, and designs, in the form prescribed by the board of county commissioners, of the following items:

(c) A plat and other documentation showing the layout or plan of development, including, where applicable, the following information:

(I) Total development area.

(II) Total number of proposed dwelling units.

(III) Total number of square feet of proposed nonresidential floor space.

(IV) Total number of proposed off-street parking spaces, excluding those associated with single-family residential development.

(V) Estimated total number of gallons per day of water system requirements where a distribution system is proposed.

(VI) Estimated total number of gallons per day of sewage to be treated where a central sewage treatment facility is proposed, or sewage disposal means and suitability where no central sewage treatment facility is proposed.

(VII) Estimated construction cost and proposed method of financing of the streets and related facilities, water distribution system, sewage collection system, storm drainage facilities, and such other utilities as may be required of the developer by the county.

(VIII) Maps and plans for facilities to prevent storm waters in excess of historic runoff, caused by the proposed subdivision, from entering, damaging, or being carried by conduits, water supply ditches and appurtenant structures, and other storm drainage facilities.

(d) Adequate evidence that a water supply that is sufficient in terms of quality, quantity, and dependability will be available to ensure an adequate supply of water for the type of subdivision proposed. Such evidence may include, but shall not be limited to:

(I) Evidence of ownership or right of acquisition of or use of existing and proposed water rights.

(II) Historic use and estimated yield of claimed water rights.

(III) Amenability of existing rights to a change in use.

(IV) Evidence that public or private water owners can and will supply water to the proposed subdivision stating the amount of water available for use within the subdivision and the feasibility of extending service to that area.

(V) Evidence concerning the potability of the proposed water supply for the subdivision.

(6) No board of county commissioners shall approve any preliminary plan or final plat for any subdivision located within the county unless the subdivider has provided the following materials as part of the preliminary plan or final plat subdivision submission:

(a) Evidence to establish that definite provision has been made for a water supply that is sufficient in terms of quantity, dependability, and quality to provide an appropriate supply of water for the type of subdivision proposed.

(b) Evidence to establish that, if a public sewage disposal system is proposed, provision has been made for such system and, if other methods of sewage disposal are proposed, evidence that such systems will comply with state and local laws and regulations which are in effect at the time of submission of the preliminary plan or final plat.

(c) Evidence to show that all areas of the proposed subdivision which may involve soil or topographical conditions presenting hazards or requiring special precautions have been identified by the subdivider and that the proposed uses of these areas are compatible with such conditions.

Referral & Review Documents for Material Injury to Water Rights §30-28-136 (h)(I)(II)

(I) To the state engineer for an opinion regarding material injury likely to occur to decreed water rights by virtue of diversion of water necessary or proposed to be used to supply the proposed subdivision and adequacy of proposed water supply to meet requirements of the proposed subdivision. If the state engineer finds such injury or finds inadequacy, he shall express such finding in an opinion in writing to the board of county commissioners, stating the reason for his finding, including, but not limited to, the amount of additional or exchange water that may be required to prevent such injury. In the event the subdivision is approved notwithstanding the state engineer's opinion, the subdivider shall furnish to all potential purchasers a copy of the state engineer's opinion prior to the sale or a synopsis of the opinion; except that the subdivider need not supply the potential purchaser with a copy of such opinion or synopsis if, in the opinion of the board of county commissioners, the subdivider has corrected the injury or inadequacy set forth in the state engineer's finding.

(II) A municipality or quasi-municipality, upon receiving the preliminary plan designating said municipality or quasi-municipality as the source of water for a proposed subdivision, shall file, with the board of county commissioners and the state engineer, a statement documenting the amount of water which can be supplied by said municipality or quasi-municipality to proposed subdivisions without causing injury to existing water rights. The state engineer shall file, with said board of county commissioners, written comments on the report. If, in the judgment of the state engineer, the report is insufficient to issue an opinion, the state engineer shall notify the board of county commissioners to this effect, indicating the deficiencies.

Title 31 Government – Municipal Powers and Functions of Cities and Towns

Article 23 Planning and Zoning

Part 2 Planning Commission Master Plan §31-23-206 (1)(d)

(d) The general location and extent of an adequate and suitable supply of water. If the master plan includes a water supply element, the planning commission shall consult with the entities that supply water for use within the municipality to ensure coordination on water supply and facility planning, and the water supply element shall identify water supplies and facilities sufficient to meet the needs of the public and private infrastructure reasonably anticipated or identified in the planning process. Nothing in this paragraph (d) shall be construed to supersede, abrogate, or otherwise impair the allocation of water pursuant to the state constitution or laws, the right to beneficially use water pursuant to decrees, contracts, or other water use agreements, or the operation, maintenance, repair, replacement, or use of any water facility.

Title 29 Local Government Land Use Control and Conservation

Article 20 Local Government Regulation of Land Use

Part 1 Local Government Land Use Control Enabling Act

Definitions §29-20-103

(1) "Development permit" means any preliminary or final approval of an application for rezoning, planned unit development, conditional or special use permit, subdivision, development or site plan, or similar application for new construction; except that, solely for purposes of part 3 of this article:

(a) Each application included in the definition of development permit constitutes a stage in the development permit approval process.

(b) "Development permit" is limited to an application regarding a specific project that includes new water use in an amount more than that used by fifty single-family equivalents, or fewer as determined by the local government.

Division of Water Resource Review Guidance for Subdivision Water Supply Plans

The SEO'S March 2005 Updated Memorandum Regarding Subdivisions provides guidance to local government on the water supply plan review requirements for subdivisions. The excerpts here pertain to the headwaters region while information on other regions, specifically for non-tributary regions, is not included.

The *Water Supply Information Summary* form that is included with this memo as *Attachment C* on page 11 may be used as a guide and in many cases will be sufficient. However, for many subdivisions the water supply plan must include a water supply report.

The Water Supply Information Summary or the report should identify, at a minimum:

- The number of lots.
- The type of use and the demand, by lot.
- The total water requirement.

Source is a Municipality or Quasi-Municipality

If the water supply is to be provided by a municipality or quasi-municipality (i.e. a Water District, a Water and Sanitation District, etc.), the SEO will review the submittal to ensure that it includes:

a. A letter of commitment from the municipality or quasi-municipality referencing the subdivision name (as submitted to the county) and a level of commitment in terms of uses to be served.

b. As required by C.R.S. 30-28-136(1)(h)(II), a report from the municipality or quasi-municipality documenting the amount of water that can be supplied to the subdivision, containing the following:

i. A summary of the water rights owned and controlled by the municipality.

ii. The anticipated yield of these rights in both an average and dry year.

iii. The present demand on the municipality, and the anticipated demand due to commitments for service entered into by the municipality that are not yet supplied.

iv. The amount of uncommitted firm supply the municipality has available for future commitment and development.

v. A map of the municipality's service area. The above information should be provided in a manner that demonstrates that the municipality has sufficient water resources to meet its commitments in terms of an overall annual water supply and daily availability. Note that, for many of these providers, the SEO maintains files that document the firm water supplies and the amount of water that has been committed to subdivisions. If that information is on file, this statement may not be necessary. The SEO may request updated information from the municipality or quasimunicipality if it appears the information has not been updated within three calendar years, or when the commitments reach a total that is close to the firm yield (approximately 90 percent).

c. Proposed uses that correspond to the uses of the municipality or quasimunicipality's water rights.

d. For a Subdivision located in a Designated Basin, proposed place of use (the Subdivision) that corresponds with the place of use listed on Permit or Determination of Water Right.

Source is Wells Withdrawing Tributary Ground Water or any Designated Groundwater from a Non-Denver Basin Aquifer

If the water supply is to be provided by wells withdrawing tributary groundwater or designated groundwater from any non-Denver Basin aquifer:

a. The SEO will review the submittal to ensure that all uses are consistent with the uses in a court-decreed augmentation plan or, if in a designated basin, the uses in a commission approved replacement plan.

c. State statute requires that the SEO provide an opinion regarding the water supply's adequacy to meet the requirements of a proposed subdivision [C.R.S. 30-28-136(h)(I)]. Therefore, the SEO will review the submittal to ensure that there is evidence that a water supply is physically adequate. This evidence should be in the form of a hydrologist's or geologist's report that may include information from a test well or wells.

Division of Water Resources Additional Policy Guidance

1. Concerning The Evaluation Of New Divisions Of Land By Subdivision, Subdivision Exemption, And Cluster Development When Considering Proposals For Water Supply From Proposed Wells Or Existing Wells Policy 2011-1 provides guidance for subdivision of 35-acres and larger with existing wells.
2. Additional DWR policy and guidance for wells can be found at:

   http://water.state.co.us/groundwater/GWAdmin/Pages/SubdivisionWSP.aspx

   http://water.state.co.us/groundwater/GWAdmin/Pages/AugPlans.aspx

   http://water.state.co.us/groundwater/wellpermit/DividingLandWithWells/Pages/default.aspx

   http://water.state.co.us/DWRDocs/Policy/Pages/WellPermittingPolicies.aspx

Title 37 – Water and Irrigation Water Conservation

Article 96.5 – Rooftop Precipitation Collection

Small-capacity rooftop precipitation collection permitted §37-96.5-103.

(1) Precipitation from a rooftop may be collected if:

(a) No more than two rain barrels with a combined storage capacity of one hundred ten gallons or less are utilized.

(b) Precipitation is collected from the rooftop of a building that is used primarily as a single-family residence or a multi-family residence with four or fewer units.

(c) The collected precipitation is used for outdoor purposes including irrigation of lawns and gardens.

(d) The collected precipitation is used on the residential property on which the precipitation is collected.

(2) A person shall not use precipitation collected under this article for drinking water or indoor household purposes.

(3) The state engineer may curtail rain barrel usage pursuant to section 37-92-502 (2)(a).

Article 97 – Water Meter Requirement for Water Providers Mandatory use of Metered Water Delivery and Billing Systems, § 37-97-103

(1) Every water service supplier providing water in this state shall provide a metered water delivery and billing service to its customers according to the following schedule:

(a) For any new construction serviced by such water service supplier, including but not limited to construction for residential, commercial, or industrial use, meters shall be installed at the time of such construction.

(b) For any existing construction with unmetered taps, meters shall be installed on fifty percent of such taps on or before January 1, 2000. For any taps remaining unmetered as of January 1, 2000, meters shall be installed on fifty percent of such taps on or before January 1, 2005, and on all remaining unmetered taps on or before January 1, 2009.

(2) Billing of such water services based on the metered service shall begin no later than ninety days from the date of the installation of the meter.

(3) Any increase in the rates charged for such water service attributed to such installation and billing service requirements shall be based upon the actual costs of such installation and billing service. Such increase may recover the total cost of providing such service to the customers of the water service provider.

(4) Nothing in this section shall preclude a water service supplier from providing such metered water delivery and billing service prior to the dates specified in subsections (1) and (2) of this section or from seeking a corresponding rate increase necessitated by the provision of such service prior to those dates.

(5) Within an industrial customer operation, multiple water uses shall not be considered separate service connections. Deliveries to any customer other than a detached single-family residential customer who may be subject to this article may be metered by the use of a single meter for the entire customer or operation.

(6) A mobile home park, as defined in section 38-12-201.5 (3), C.R.S., which makes water service available to tenants but does not bill such tenants for water as a separate item is exempt from the provisions of this article.

Water Efficient Indoor and Outdoor Fixtures

HB 19-1231 Summary

Initiated in September 2016, SB 103 required that manufacturers who sell new plumbing fixtures to distributors, wholesalers, retailers, developers, and homebuilders in Colorado to sell those labeled WaterSense. In 2019, the State updated the regulations in HB 19-1231. The update keeps in place the 2016 requirements, but includes new requirements beginning in 2020. It includes the following water related fixtures and appliances.

From the Act			From EnergyStar.Gov and WaterSense/epa.gov
Fixture	**Effective Date**	**Standard**	**Potential Savings**
Low-efficiency plumbing fixture	September 2019	Prohibits sale of a new low-efficiency plumbing fixture, other than a flushometer-valve water closet. "Low-efficiency plumbing fixture" means any of the following plumbing fixtures or fittings that is not a Watersense-listed plumbing fixture: (a) a lavatory faucet; (b) a shower head; (c) a flushing urinal; (d) a flushometer-valve water closet; or (e) a tank-type toilet or tank-type water closet.	WaterSense labeled bathroom sink faucets and accessories that use a maximum of 1.5 gpm can reduce a sink's water flow by 30% or more from the standard flow of 2.2 gpm. WaterSense labeled showerhead use no more than 2.0 gpm compared to 2.5 gpm for a standard fixture. WaterSense labeled flushing urinals use no more than 0.5 gpf. WaterSense labeled bathroom sink faucets and accessories that use a maximum of 1.5 gpm can reduce a sink's water flow by 30% or more from the standard flow of 2.2 gpm.
	January 2021	Prohibits sale of new low-efficiency flushometer-valve water closet.	
Residential kitchen faucets and replacement aerators	January 2017	Must not exceed a maximum flow rate of 1.8 gpm at 60 psi, with optional temporary flow of 2.2 gpm (provided they default to a maximum flow rate of 1.8 gpm at sixty psi after each use)	
Public lavatory faucets and replacement aerators	January 2017	Not exceed a maximum flow rate of 0.5 gpm at 60 psi "Public lavatory faucet" means a fitting designed and marketed for installation in a nonresidential bathroom, which bathroom is exposed to walk-in traffic.	

Flushometer-valve water closets (commercial toilet)	January 2021	Watersense specification for flushometer-valve water closets, version 1.0, must meet the water efficiency and performance criteria and other requirements of that specification.	WaterSense labeled flushometer-valve toilets, whether single- or dual-flush, use no more than 1.28 gpf, which is a 20% savings over the federal standard of 1.6 gpf. WaterSense has also included a minimum flush volume of 1.0 gpf to ensure plumbing systems have adequate flow to function effectively.
Spray sprinkler bodies	January 2021	Watersense specification for spray sprinkler bodies, version 1.0, must include an integral pressure regulator and must meet the water efficiency and performance criteria and other requirements of that specification.	
Water coolers	January 2021	EnergyStar, Version 2.0, must have an "on" mode with no-water-draw energy consumption less than or equal to the following values as measured in accordance with the test requirements: • 0.16 kilo watt-hours per day for cold-only units and cook and cold units; • 0.87 kilowatt-hours per day for storage-type hot and cold units; • 0.18 kilowatt-hours per day for on-demand hot and cold units.	
Commercial dishwashers	January 2021	EnergyStar	About 40 percent more energy efficient and 50 percent more water efficient than standard models
Commercial steam cookers	January 2021	EnergyStar	Up to 60 percent more energy efficient and up to 90 percent more water efficient than standard models

The act does not preempt any local government from prescribing more restrictive water conservation or energy efficient requirements. The also provides for protection for repeal of the federal standards for both EnergyStar and WaterSense. In the event they were to be repealed, the minimum standard for product prior to repeal would remain in effect.