

Chapter 12

Current Status of Water Management Planning and Implementation

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Abstract

One of the central assessment themes evaluated by the Drought & Water Supply Assessment regards the preparedness of water users for drought in Colorado – in the past, present and future. The assessment instrument was designed to deliver information on each of the following subjects:

- *Water supply planning*
- *Drought management planning components and mechanisms*
- *Drought tools utilized*
- *Water conservation planning*
- *Water conservation tools used*

The results of the data collection and analysis efforts are discussed in this chapter including a presentation of how many entities have formal drought and water conservation planning in place, by geography and segment, and what types of drought and conservation tools are most effective for each participant's particular location and water use. Significant differences that exist regarding planning and standard practices between municipal and agricultural water users are highlighted.

Introduction

Water availability within the State of Colorado is perceived as a significant limitation to current water supply across all divisions and water use segments. Management of current water supplies would therefore be expected to be of immediate importance to water planners and managers statewide. Inasmuch as water supply management begins with planning, the assessment evaluated the level of water, drought and conservation planning that exists within Colorado's water user organizations and by water user entities as a means to judge the overall state of drought preparedness within Colorado.

For those with existing plans, the assessment was used to identify management components and tools that are formally incorporated into current policies and programs. Participants with plans were asked to identify those drought and conservation management tools that are the most effective in managing water supply and demand. The results of this portion of the assessment will help the state identify the degree of drought preparedness and water planning and management as a whole across the state. With this information, the state will be better positioned to allocate state resources to provide and meet technical assistance and other requisite guidance to its citizenry, in general, and water users, specifically, in the planning for and mitigation of future droughts and periods of water scarcity.

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Water Supply Master Plan:

A comprehensive plan in which a water management entity addresses all technical and political issues related to providing sufficient quantity and quality of water for the entities' clients.

Drought Management

Plan: A plan in which an entity or entities address the measures and responses needed to prepare for, monitor, and mitigate the effects of drought.

Water Conservation Plan:

A plan that outlines how a water management entity or user will improve water use efficiency over the long-term and how this fits within their overall water management needs.

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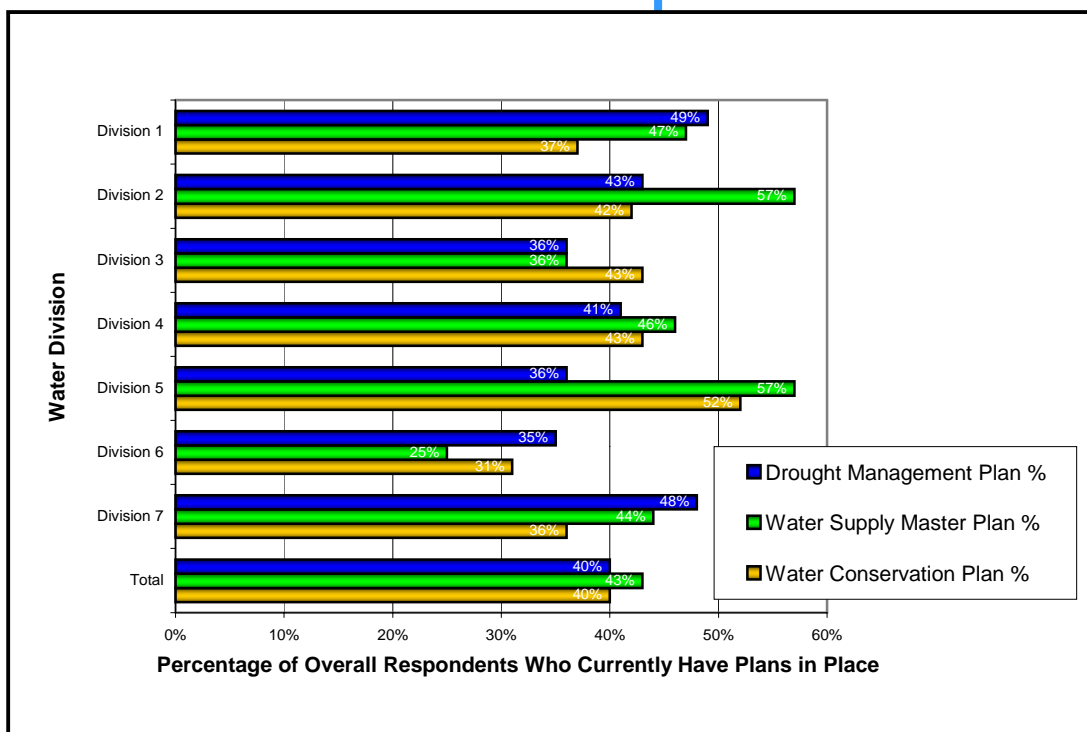
Of course significant differences exist between planning efforts maintained by agricultural and municipal entities. Many agricultural entities plan using informal, yet well tested, methods on a crop-to-crop, or year-to-year basis. In addition, agricultural entities often rely on grassroots and other informal communication methods to coordinate drought management and water conservation efforts. Municipalities, which generate revenue from water sales for water planning, typically manage water supplies over a much longer time horizon – of three to five years or longer. Municipalities also have formal communication pathways from staff to decision-makers and the community by necessity. These basic differences translate to different levels of overall planning and communications for these segments of users. Nonetheless, both segments have the need for planning ahead to manage and prepare for drought, since droughts will undoubtedly occur and have potentially far reaching impacts. The difference between the segments and successful methods for each segment will be highlighted in this Chapter.

Summary of Planning Efforts Statewide

The assessment analyzed three primary types of planning efforts across the state: 1) water supply master plans; 2) drought management plans; and 3) water conservation plans. The existence of these plans was analyzed for each of the seven Colorado Water Divisions as well as by water user segment. As indicated in Figure 12-1, approximately 40% of those surveyed have these plans in place.

One might imagine that entities with one type of plan in place (“planners”), such as a drought management plan, would be more likely to have another type of plan in place; but assessment results do not support this expectation. For example, only slightly more than half of those with water supply

Figure 12-1: Water Management and Planning in Colorado



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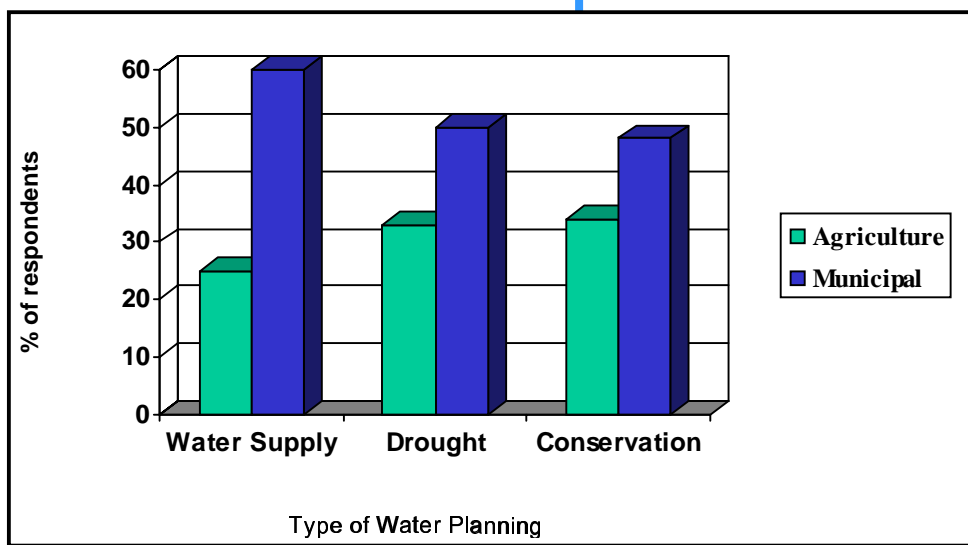
master plans had drought management plans and of those who had drought management plans, 59% had water supply master plans. Indeed, only 16% had implemented all three plans compared to more than a third who had none of these plans in place.

Interestingly, having a water supply master plan (which includes approximately 40% of those surveyed) does not seem to translate into confidence that such plans are effective in managing drought, as only about two in five respondents rated such preparations as somewhat or highly effective. Furthermore, the continuing severity of the drought seems to have prompted a noticeable increase in planning activities; nearly 30% of those with plans had implemented them within the last year. Without this large surge of planning effort during the past drought year, the percentage of entities without a water supply master plan would have been nearly 70%.

When reviewing these three water management plans across the eight segment types defined in the assessment – municipal, agricultural, state, federal, power, industry, Water Conservation District, and other¹ – a disparity consistently appears between the municipal and agricultural segments, as illustrated in Figure 12-2. Sixty percent of municipal entities stated

that they had a water supply master plan in place, while only 25% of their agricultural counterparts indicated the same. With respect to drought management plans, about half of the municipal segment had plans in place, as opposed to about one-third of the agricultural segment. (Note that only 30% of respondents who did not currently have a drought management plan indicated that they plan to develop one in the future. Nearly 50% of municipal respondents were among this latter group as opposed to less than twenty percent of agricultural respondents.)

Figure 12-2: Level of Planning for Agricultural and Municipal Water Users



¹ Other entities: a collection of twenty-three entities, ranging from tribes, to home owners associations (HOA's), etc., not fitting into any of the other described entities of Federal, State, Agriculture, Municipal, Power, Industry, or Water Conservation Districts.

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Water conservation plans were maintained by 40% of the respondents, with 48% of municipal and 34% of agricultural entities having these plans. Only 22% of state entities have plans, which is the lowest percentage of any segment. Conversely, industry has the highest percentage of participants with plans at 56%. The range for Divisions was less pronounced – Division 6 is at the 31% level and Division 5 is at 52%.

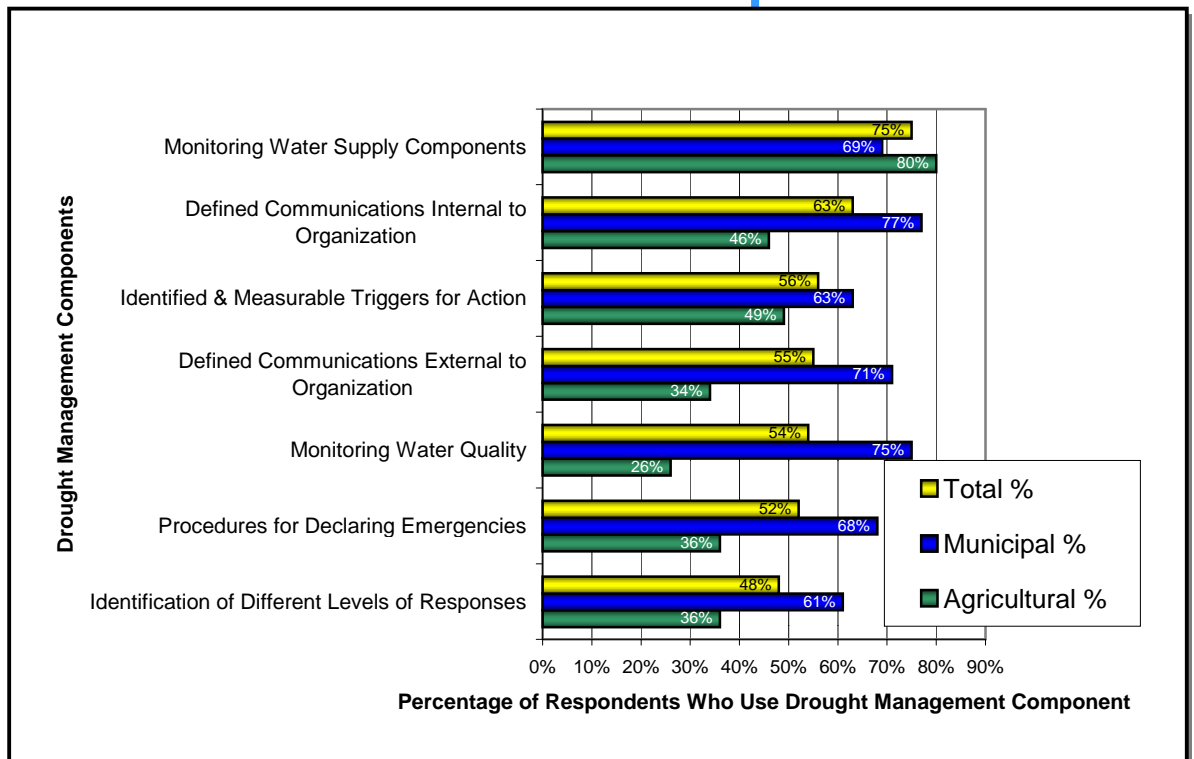
Drought Planning

To evaluate the quality of the content of the various drought management plans, the survey instrument requested information regarding management components within each plan. As expected, there were significant differences between the various plan components, especially with respect to the municipal and agricultural users, as illustrated in Figure 12-3.

Three out of every four entities with a drought plan monitor their water supply, which is an effective and appropriate management component of any drought plan, with slightly more agricultural entities performing this activity than municipal entities. It is unclear however, how many of the agricultural entities utilize the water supply data in a formal fashion, since about one-half have identified measurable

“triggers” to indicate that drought conditions exist, and fewer still have formal internal or external communication mechanisms defined. Roughly one in three agricultural entities have formal means to declare emergencies or identify different levels of response to drought. In contrast, municipalities with plans appear to focus on

Figure 12-3: Drought Management Components Used in Colorado



communications. More than seven out of every ten municipal entities with plans have formal communication channels defined both internal and external to the organizations. In addition, more than six out of every ten have defined formal triggers for drought, and different levels of drought, incorporated into their planning process. More than two-thirds have formal procedures for declaring drought. Inclusion of management components is appropriate and necessary for meaningful drought management. To this point, it appears that the majority of those municipalities with drought management plans apparently have the appropriate type of management components related to monitoring, triggers, and communications in place to allow for meaningful drought management response.

Unfortunately, roughly half of Colorado's municipalities appear to have no drought management plans. In addition, fewer agricultural entities have drought management plans, and those that do, do not appear to have adequate definition of response actions in place. In fact, it appears based on the survey results, that less than one of every six agricultural entities have formal drought responses in place to declare drought, define drought, or communicate that drought responses are needed internal or external to the organization. Of course the planning needs of agricultural water users are different than the planning needs of municipal entities. However, agricultural water users can still benefit from formal planning as a means to prepare for and mitigate drought impacts. The assessment also probed into the use of specific drought management tools such as aquifer storage and recovery, cloud seeding, and water restrictions. Figure 12-4 details the use of these types of tools in Colorado, in order by frequency of use, including a breakdown by municipal and agricultural use.

Among divisions, water conservation programs stood out as the most popular tool used to manage drought. This is somewhat ironic since water conservation is not deemed by the experts as an effective tool for managing short-term water scarcities for municipal use. Water conservation programs are effective in helping water users manage both their water supply and water demand over the long term. For some agricultural entities, however, water conservation programs are effective for drought management when connected to short-term activities such as alternative irrigation practices.

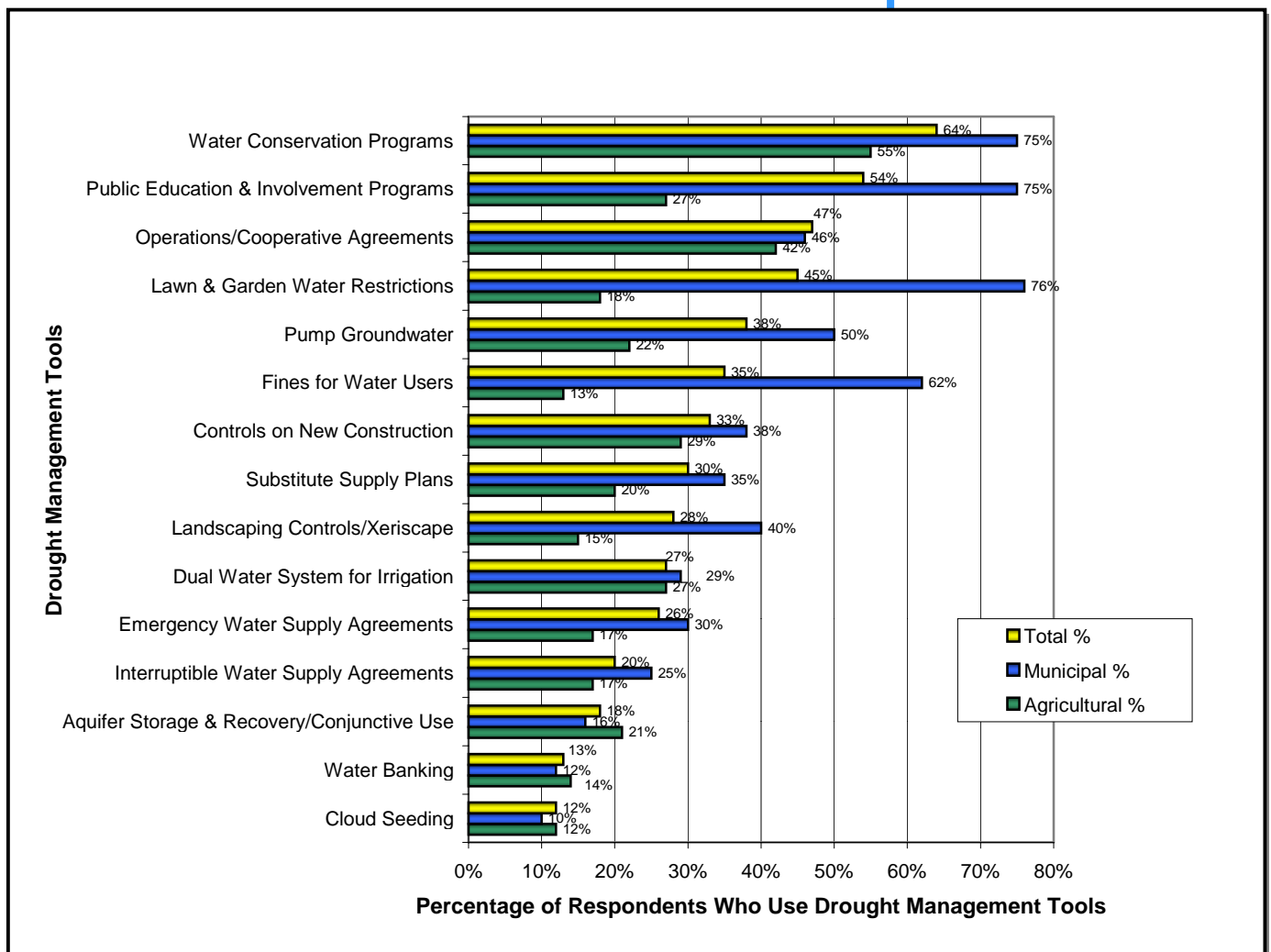
Drought management requires shorter term reactions to periods of water scarcity especially for municipal uses, not typically addressed by water conservation practices. In fact, only 14% of municipal entities using water conservation indicated that this was one of the best tools for drought management as shown in Figure 12-5. Among segments, the most popular drought management tool varied

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substantially. Each of the tools listed below was rated as the most popular by at least one segment (noting that *segments shown in italics had statistically the same most popular rating for more than one tool*) :

- Water conservation programs: industry, agriculture, *municipal*
- Public education and involvement programs: federal, other, *water conservancy district, municipal*
- Lawn and garden water restrictions: *municipal*
- Operational/cooperative agreements: state, power, *water conservancy district*

Figure 12-4: Drought Management Tools Used in Colorado



There are a few interesting points of note. The municipal segment clearly relies on the short-term restriction of water use to manage drought through the use of lawn watering restrictions, fines for water use (in severe conditions) and to a lesser extent, land use controls and

xeriscaping. These are effective controls for municipalities, as indicated in Figure 12-5, especially when coupled with public education and involvement programs. Municipal water suppliers clearly favor, and in fact rely, on public communications as a means to manage drought. Although some municipalities rely on other means to manage drought, such as using cooperative agreements, pumping groundwater, using controls or new constructions, etc., the best individual tools as indicated by the survey respondents are public education and involvement programs and watering restrictions coupled with fines for water use.

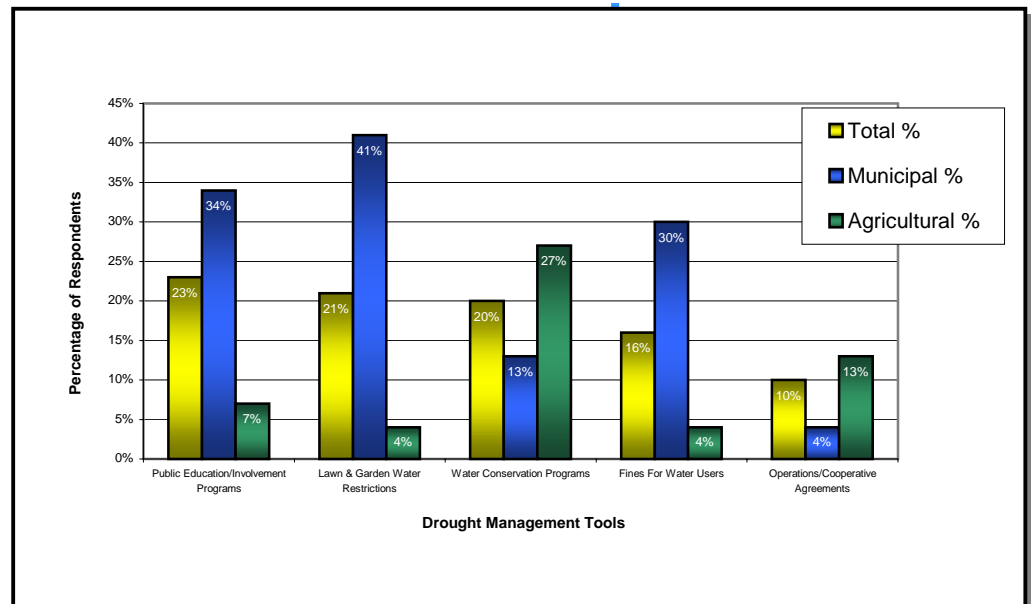
The agricultural community relies on water conservation programs and cooperative agreements to manage

drought. Water conservation in the case of agricultural applications relates to short-term changes in irrigation practices and crop selection. Unlike water conservation for municipal entities, in which long-term water supply and demand management occurs, agricultural entities can and do use water conservation practices to manage and mitigate drought. The difference

between these water user segments is that agricultural water conservation can include methods to reduce short-term water use such as planting drought tolerant crops, changing irrigation and planting practices, and leasing water rights to other users. Water conservation practices for agricultural entities can be revised from year to year.

As will be seen in the following chapter, which is related to water conservation, agricultural entities view the lining of pipes and ditches as an important tool for water conservation. Clearly, lining of ditches and pipes is more of a long-term response than a short-term one, but its effectiveness in reducing transmission losses is significant and noteworthy.

Figure 12-5: Best Tools for Managing Drought



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In much the same way, cooperative and operational agreements can be effective for the agricultural community because they can exist for the short-term and help to manage operations during periods of water scarcity. Roughly four in ten agricultural water users utilize cooperative agreements to manage drought.

Table 12-1 presents a summary of those tools preferred by the agricultural and municipal segments.

Table 12-1: Preferred Drought Management Tools

Agriculture		Municipal	
Tool	Percentage [†]	Tool	Percentage*
Water conservation	55	Lawn and garden watering restrictions	76
Cooperative agreements	42	Public education	75
Controls on new construction	29	Water conservation	75
Public education	27	Fines for water use	62
Dual water systems	27	Pump groundwater	50

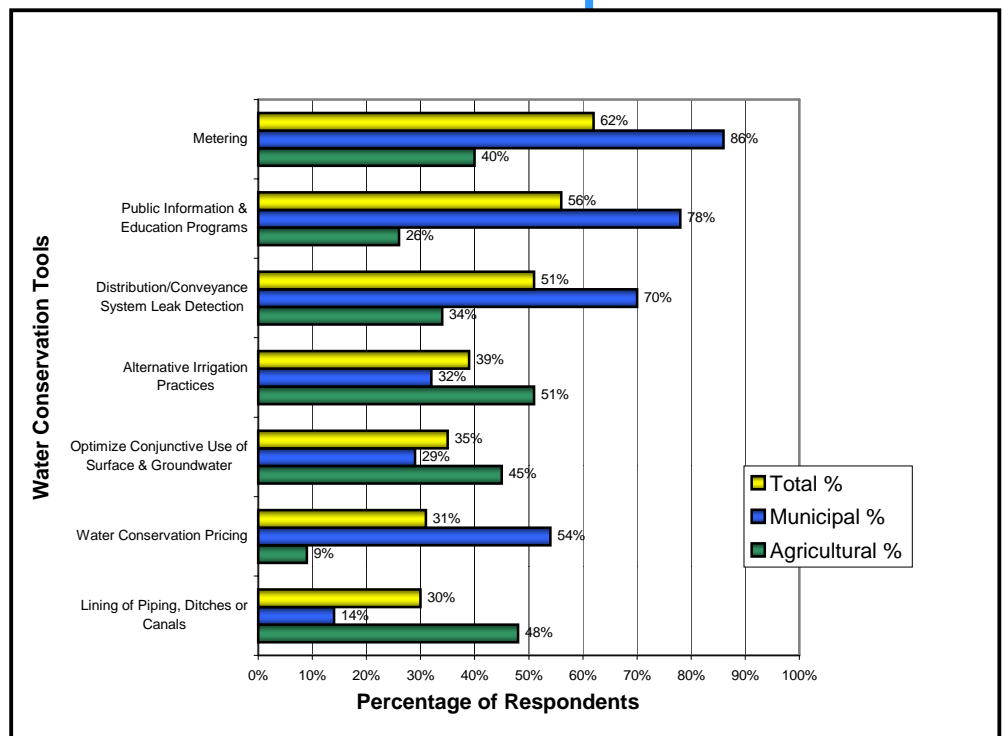
*Percent of water users in segment with plans using the tool

Water Conservation

When examining water conservation plans, the municipal and agricultural segments continue to contrast one another regarding preferred water conservation tools, as indicated in Figure 12-6.

As noted previously, these differences are expected. Agriculture favored the use of alternative irrigation practices, the lining of piping, ditches or canals; and optimizing conjunctive use of surface and groundwater, although no tools were rated favorably by a strong majority. The municipal segment, on the other hand, favored other water conservation tools for their programs including metering (86%), public information & education programs (78%), and system leak detection

Figure 12-6: Tools Used for Water Conservation in Colorado



(70%). Water conservation pricing was also favored by over one-half of the municipal entities responding.

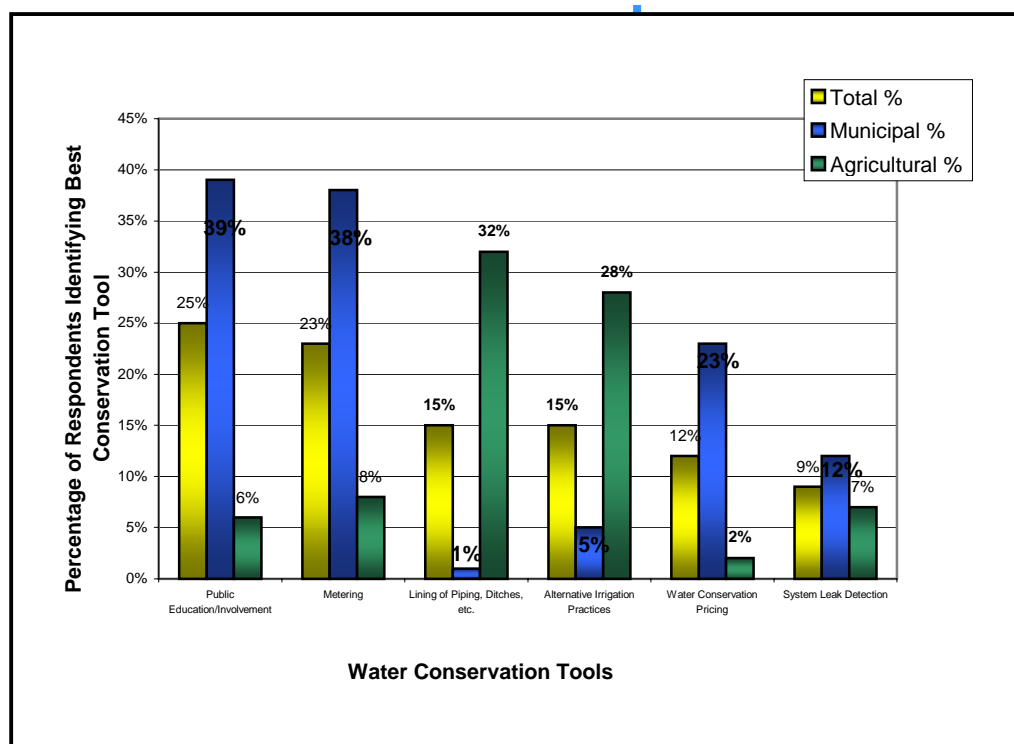
These differences clearly reflect the differences in end water use and infrastructure needs between the agricultural and municipal segments. Figure 12-7 further emphasizes the difference between these two water user segments illustrating that there is nearly no agreement between municipalities and agriculture with respect to the best water conservation tools – with the possible exception of system leak detection.

When looking individually at other segments and divisions, a few noteworthy ratings appear. The federal

segment lends the strongest support of any segment or division to public education (86%), strikingly contrasted with 7% for metering, the top rated water conservation tool overall. Power, on the other hand, offers no support (0%) to public education, but rates the use of recycled water the highest (leading all segments and divisions by about thirty percentage points) at 80% support. Neither federal nor power articulated any support

(0%) for water conservation pricing. The state offered the only majority support (56%) by segment and division to xeriscape promotions. The state's strong support of public education was also near the 80% level. Among segments/divisions, Division 2 gave the highest single tool rating garnered in the entire assessment – to metering, with almost 90% voting in favor. Division 1 provided the second highest metering rating at 72%. On the other hand, even a simple majority in Divisions 3, 4, and 6 did not support metering. All divisions, except Division 6 (32%), supported public information and education in the majority. Interestingly, Division 6 supported not one conservation tool at the majority level.

Figure 12-7: Best Water Conservation Tools



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The best water conservation tools seem to have one trait in common with the best drought management tools: the choices are as varied as the number of divisions and water use segments across Colorado. With respect to water conservation tools, public education and metering were virtually tied with the highest score. These same tools received scant ratings from the agricultural segment where the lining of piping, ditches or canals was the most popular tool, closely followed by alternative irrigation practices. The other segment split the vote with the agricultural and municipal segments by giving the highest ratings to alternative irrigation (29%) and the next highest to public education (24%). Although public education ranked as the best tool overall, it received only a quarter of first place votes, assisted by the Water Conservation District (42%) and federal (36%) segments. The use of recycled water emerged as industry's best tool and was the most popular tool for the power segment. The state's votes were so varied that a best tool could not be identified.

Table 12-2: Best Water Conservation Tools in Order of Preference

Agriculture	Municipal
Lining of ditches and canals	Public information and education
Alternative irrigation practices	Metering
Use of recycled water	Water conservation pricing
Conjunctive use	Distribution/Conveyance system leak detection
Sectioning of canals and ditches	New subdivision platting and covenant requirements
Metering	Xeriscape promotions

Table 12-2 summarizes the similarities and differences between the best conservation tools as identified by the agricultural and municipal segments.

The best tool also varied by division and segment with the most popular tools identified for water conservation shown in Tables 12-3 and 12-4.

Clearly, water users employ a wide range of planning tools and programs. What seems to be effective for one water user may not be the best for another. The varying methods used by the municipal and agricultural segments alone accentuate the outlook that a multi-faceted approach is necessary to carry out the needs of water planning and management.

Discussion Planning

More than one-half of Colorado's municipalities have some kind of water supply, drought management, or water conservation plan in place. In addition, for those with plans:

Table 12-3 Best Water Conservation Tools by Division

Division 1

Public Information and Education (29%)

Division 2

Metering (35%)

Division 3

Public Information and Education (48%)

Division 4

Lining of Piping, Ditches or Canals (22%)

Division 5

Metering (29%)

Division 6

Alternative Irrigation Practices (23%)

Division 7

Public Information and Education (28%)

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- Seven of every ten have formal drought-related communications protocols and procedures.
- Six of every ten have formal levels and triggers for drought.
- Roughly two-thirds have mechanisms to declare drought.

Unfortunately, nearly one-half of Colorado's municipalities do not have any formal water planning in place.

A summary of other relevant observations includes:

- One in four agricultural entities have formal water planning in place.
- One in six (or fewer) agricultural entities have formal drought response in place (including defined levels and triggers, declaration protocols or procedures and/or communications).
- One in five state entities has formal water planning in place.

Drought Management

The municipal and agricultural segments differ widely with respect to drought preparedness and approaches to managing drought. Some positive findings related to the use of drought management tools by the municipal and agricultural segments are:

- Three of every four municipalities with plans have watering restrictions, water fines, and public education and involvement programs in place – all of which are considered to be effective drought management tools.
- Water conservation is not found by municipalities to be effective for drought management – which is appropriate since drought management requires short-term responses to water scarcity versus the long-term water supply and demand controls typically related to municipal water conservation.
- The agricultural water user community with plans relies on water conservation and cooperative agreements to manage drought. The implementation of short-term water “conservation” methods such as changing irrigation methods or planting schemes that will not adversely impact water rights or long-term return flows were found to be effective.

Some other findings with respect to the use of drought management tools by the municipal and agricultural segments are:

- Other water conservation measures that the agricultural segment may rely on such as lining ditches, etc. are long-term water conservation methods that may not be effective in managing drought.

Table 12-4 Best Water Conservation Tools by Segment

Municipal	Public Information and Education
Agriculture	Lining of Ditches and Canals
Power	Use of Recycled Water
Industry	Use of Recycled Water
Water Conservancy District	Public Information and Education
Federal	Public Information and Education
State	Various
Other	Alternative Irrigation

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- Less than one in six agricultural entities have formal drought management tools in place.
- Less than one in two municipalities has coordinated drought management tools.

There are a few other relevant issues to identify when reviewing the overall drought management tools. In particular, there are a number of lesser-used drought management tools that are of critical importance to some water users. These lesser-used tools include:

- Emergency water supplies.
- Aquifer storage and recovery systems (for sustainable groundwater pumping).
- Cloud seeding.

Water Conservation

As with the other planning issues, significant differences exist between the two key water user segments (municipal and agricultural) with respect to their use of water conservation and the respective effectiveness of specific water conservation tools. However, the differences are magnified between segments given that water conservation represents the long-term management of water supply and demand versus drought management, which tends to be effective over a short period of time.

- Municipalities strongly agree on the use and benefit of public education, metering, and system conveyance management, and to a lesser, albeit significant, extent alternative water pricing strategies.
- Agricultural water users agree (not as strongly) on the use and benefit of altering irrigation practices, and the lining of ditches, pipes and canals. Metering, conjunctive use and leak detection efforts were widely identified as tools but did not get wide support for effectiveness from the agricultural community.

Again, there are a limited number of entities with formal plans, and therefore, tools in place.