Vulnerability, Consequences, and Adaptation Planning Scenarios (VCAPS)

City of Cortez

Final Workshop Report

November 2018

Submitted by:

Western Water Assessment
Cooperative Institute for Research in Environmental Sciences
University of Colorado Boulder

About the Western Water Assessment

Western Water Assessment (WWA) is a university-based applied research program that addresses societal vulnerabilities to climate variability and climate change, particularly those related to water resources. While we are based in Boulder, Colorado and Salt Lake City, Utah, we work across Colorado, Utah, and Wyoming. Our mission is to conduct innovative research in partnership with decision makers, helping them make the best use of science to manage for climate impacts. WWA is part of the Cooperative Institute for Research in Environmental Sciences (CIRES) at the University of Colorado Boulder. Our primary source of funding is NOAA's Regional Integrated Sciences and Assessments (RISA) Program, and we are one of 11 RISA programs operating across the United States.

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Note

This material is based upon work supported by the National Oceanic and Atmospheric Administration (NOAA). Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of NOAA.

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1. Introduction

Cortez, Colorado is the county seat of Montezuma County with a population of 8,709 (U.S. Census Bureau). Though the City holds senior water rights on the Dolores River, the region experiences regular droughts and is currently (in 2018) experiencing its most severe drought since 2002. In fact, this year irrigation water was turned off on August 29th, which is much earlier than the norm of mid-October in previous years. The economy in Cortez is heavily dependent on tourism, with Mesa Verde National Park being a significant draw, and Montezuma County is dependent on agriculture. Both industries are vulnerable to drought impacts.

On Oct. 2-3, 2018, the City of Cortez participated in the Vulnerability, Consequences, and Adaptation Planning Scenarios (VCAPS) workshop, organized by Western Water Assessment (WWA), an applied research program based at the University of Colorado Boulder. VCAPS is a facilitation technique designed to support municipalities in building resilience to weather and climate impacts. Prior to the two-day workshop, WWA staff worked with the Director of City Operations to identify 12 participants including City staff as well as members of the Planning Commission and City Council.

In advance of the workshop, WWA staff conducted phone interviews with each of the workshop participants to collect background information on key concerns and local knowledge associated with climate and weather hazards. Drought was identified as the key hazard of concern for the City, particularly in relation to water supply management. Based on the individual interviews conducted in advance of the workshop, the WWA team crafted the following goals and objectives for the workshop:

1. Raise awareness and build expertise among City staff on regional climate trends and future climate scenarios;
2. Establish a common understanding of the anticipated impacts of climate change on City operations with respect to water availability and water supply management;
3. Take inventory of current initiatives, concerns, and challenges associated with water supply management; and
4. Identify actions to help adapt City operations to mitigate risks associated with drought, in light of scientific uncertainty.

During the workshop, which consisted of two half-day meetings, WWA staff gave a brief presentation on the observed and projected impacts of climate change in Southwest Colorado and potential impacts on water supply (see Appendix C for the workshop agenda). The WWA team then led the group in participatory diagramming exercises in which participants mapped the outcomes and consequences of drought, analyzed existing and anticipated community impacts of drought, identified gaps in knowledge, and brainstormed strategic short- and long-term solutions for mitigating and adapting to increasing drought risks. The remainder of this report will summarize key aspects of the VCAPS process, highlight themes that emerged during the workshop discussions, and synthesize actions identified by workshop participants.

2. Local Climate and Weather Hazards in Cortez: Concerns and Existing Initiatives

Interviews that WWA staff conducted with participants before the workshop helped to identify key concerns and important context for Cortez. Drought is of particular concern to the workshop participants, especially as it impacts the long-term sustainable management of water supply for the City and other communities they support with water treatment.

The City is dependent on the Dolores River for its entire water supply. Within that it has two water rights: one more senior direct flow water right and a second storage right that was acquired more recently. The direct flow water right provides up to 4.2 cfs, or 3,040 acre-feet per year. The City's storage right includes 2,300 acre-feet from McPhee Reservoir, which is managed by the Dolores Water Conservancy District (DWCD). The City water rights total 5,340 acre-feet per year. Due to a lack of infrastructure, the City accesses its direct flow water right and uses their storage water right from McPhee Reservoir.

The DWCD transports water from McPhee Reservoir to a number of agricultural, commercial, residential and governmental users. The City operates its own drinking water treatment system, which is also used by several proximate groups. For example, Montezuma Water District No. 1 is supplied by the City's water system. The existing drinking water treatment system has the capacity to treat the City's available annual water supply. Treated water can be stored in three tanks for high demand periods. Each of the three tanks has a capacity of 2 million gallons, totaling 6 million gallons of storage capacity.

During interviews, participants generally expressed an interest in advancing conservation initiatives, such as landscape planning and tiered payment schedules for water use, as a key strategy to improve water supply in the long-term.

The per capita water demand in Cortez has significantly decreased over the past 30 years. The City used 325 gallons per person per day in 1990, a number which has dropped to 200 gallons per person per day in recent years due to water conservation efforts. This number, even if significantly lower than 30 years ago, is nevertheless still much higher than most cities across the U.S. and the rest of the world. The stated long-term goal of participants is to bring this number down to an average of 180 gallons per person per day by 2022 through conservation efforts and public outreach.

Existing initiatives are focused on water conservation and water supply. For example, each year, the City implements an outdoor watering ban from 10am to 5pm, which starts in the spring and ends in the fall. Cortez installed new water meters that allow for better data collection on the use of water in the town, and they have funded a preliminary engineering report to better understand how efficiently they are using their water supplies. This report will also help the City strategize ways to invest capital for asset replacement. The City is also looking to increase the use of xeriscaping, efficient irrigation, water reuse systems, and rain water harvesting. Cortez is updating its Water Conservation Plan, which must be updated every seven years, and it will begin developing a Drought Mitigation Plan in 2019. The City's Master Plan discusses sustainability and protecting the natural environment but does not include specific content about drought. While the City is updating their water conservation plan and is interested in creating a drought plan, they would like to do more.

Prior to the workshop, participants expressed a desire to learn more about the impacts of climate variability on drought in their region. This includes past changes that can be identified in the paleoclimate record and expected changes that may impact water reserves, reservoir levels, and snowpack. Additional interests include learning what other communities are doing to prepare for and mitigate drought and identifying their community values and goals for climate and weather hazard planning.

3. Observed and Future Climate Change in Southwest Colorado

The following section provides a synthesis of information about observed recent climate trends and projected future changes for Southwest Colorado, as presented by WWA staff during the Cortez VCAPS workshop.

The water budget and drought

Before describing the observed climate trends and projected future climate for the Cortez and the Upper Dolores River Basin, it will be helpful to review the basic water budget (Figure 1). Over the course of the year, the following equation about water in the system is helpful to keep in mind:

Precipitation - Evapotranspiration = Runoff (or streamflow)

Evapotranspiration (ET) is the combined loss of water vapor from the soil, water, snowpack, and vegetation — and it has a profound influence on water availability. In a typical water year (October-September), averaged across the upper Dolores River basin (from snotel data), about 30" of precipitation falls, mainly as snow. About 60% of this precipitation will return to the atmosphere through ET without reaching the upper Dolores River (Figure 1, left). The remaining 40% will run off and be available for use by people and riparian ecosystems within the stream.

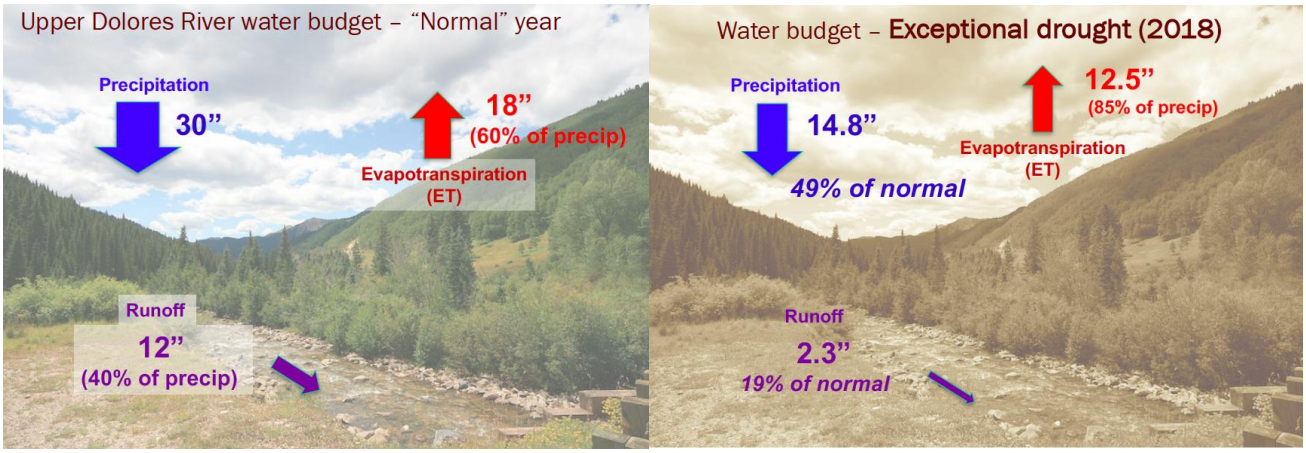

Figure 1. Schematic of the upper Dolores River basin water budget in a normal-precipitation year (left) and in an exceptional drought year (right). During exceptional drought years, such as in 2002 and 2018, the fraction of precipitation that is taken back up by the atmosphere (evapotranspiration; ET) goes up, so runoff is disproportionately reduced compared to precipitation

In 2018, which was an exceptional drought year, precipitation was 49% of normal, or about 15" across the upper Dolores River basin. Because dry weather patterns are also associated with warmer temperatures, exceptional drought years typically have much warmer than normal temperatures, lower humidity, and higher solar radiation. All of these factors tend to increase ET — the atmosphere is "thirstier" for water during a drought. The fraction of precipitation going to ET increases to as much as 85% and thus runoff is disproportionately reduced to 20% of normal (Figure 1, right). Taken together, smaller snowpacks, lower streamflows, parched soils, and dry vegetation associated with exceptional droughts result from both reduced precipitation *and* greater moisture loss through ET.

Observed Precipitation: High variability, no recent trend

Looking at the record of precipitation as averaged across all of Montezuma County (not just the upper Dolores River basin), annual precipitation has had large swings from year to year, and smaller shifts from decade to decade, since 1900. This *natural variability* is mainly caused by fluctuations in the prevailing tracks of storms in fall, winter, and spring that bring moisture from the Pacific Ocean. In the very driest years — 1977, 2002 and 2018 — precipitation was about 50% of the long-term average. While there is no long-term trend in precipitation across Montezuma County, precipitation since 2000 is about 7% lower than the 20th Century average. For water year 2018 (October 2017-September 2018), precipitation was the lowest on record in Montezuma County, and upper Dolores River flows were the second lowest after 2002.

Observed Temperatures: A strong recent warming trend

The record of annually averaged temperatures (over the water year, October-September) for Montezuma County shows a different picture than precipitation (Figure 2). Unlike many other regions of the United States, there was not a strong upward trend in Montezuma County temperature throughout the 20th Century. However, the 21st Century has been significantly warmer than the 20th Century, by 1.6°F. The 2018 water year was the third warmest on record for Montezuma County. Temperatures in 2018 were nearly 4°F warmer than the 20th Century

average, and four of the five warmest years on record have occurred this century. By themselves, warmer temperatures have an overall *drying effect*: ET tends to increase as a fraction of precipitation, snowpacks and streamflows tend to decrease, snowmelt and runoff come earlier, and soils become drier in the summer.

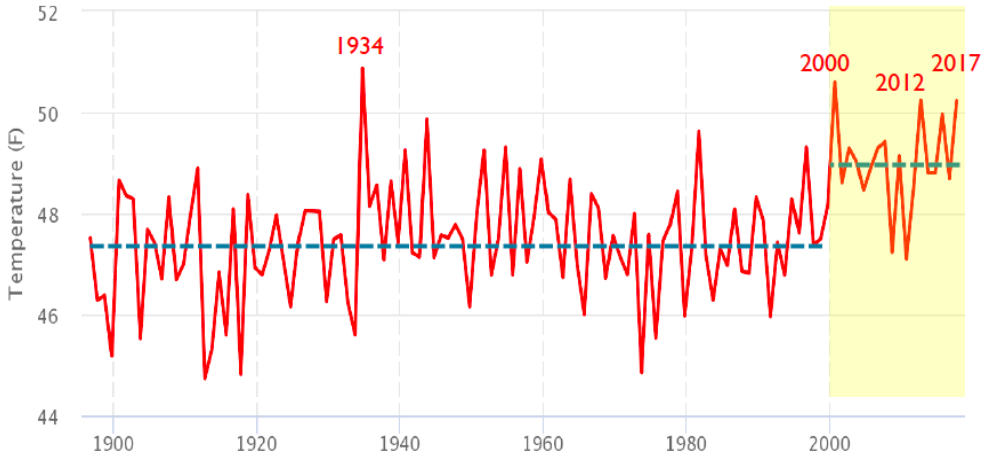

Figure 2. Annual (water-year) average temperature for Montezuma County, 1896-2018. Temperatures since 2000 have been over 1.6°F warmer than the 20th-century average, and 2018 was the third warmest water year on record. (Source: WRCC/DRI https://cefa.dri.edu/Westmap/)

Observed snowpack, streamflow and reservoir storage: Long-term drought persists

The majority of the streamflow in the upper Dolores originates as melting snow; snowpack acts as an enormous seasonal reservoir that accumulates water during the cold season (October-May) and releases it during the spring runoff season (mainly May and June). In the upper Dolores River basin and other basins in western Colorado, there has been small declining trend in the peak spring snowpack, and the snowmelt is occurring earlier, by 1-2 weeks, since the 1980s.

The record of annual streamflow volume for the upper Dolores River above Dolores, CO (there are few diversions above this gage) from 1896-2018 shows large year-to-year variability and smaller decade-to-decade shifts, similar to the record of annual precipitation. Total annual water volume on the upper Dolores River varies from less than 100,000 acre-feet to nearly 600,000 acre-feet (Figure 3). While there is no long-term trend in Dolores River streamflow volume, average water volume since 2000 is 21% lower compared to the 20th century average annual water volume. The period since 2000 includes four drought years with annual streamflow volumes that were less than 50% of the long-term average: 2002, 2012, 2013, and 2018. Streamflow volume in 2018 and 2002 were the second and third lowest on record, respectively (1977 was lower) and only 20% of the 20th Century average. Recent reductions to annual water volume are due to both long-term drought and the impact of warming temperatures due to climate change. The impact of warmer temperatures on droughts since 2000 is evident when reductions in Montezuma County precipitation since 2000 are compared to reductions in Dolores River streamflow volume; precipitation has decreased 7% since 2000, while streamflow volume has decreased 21%.

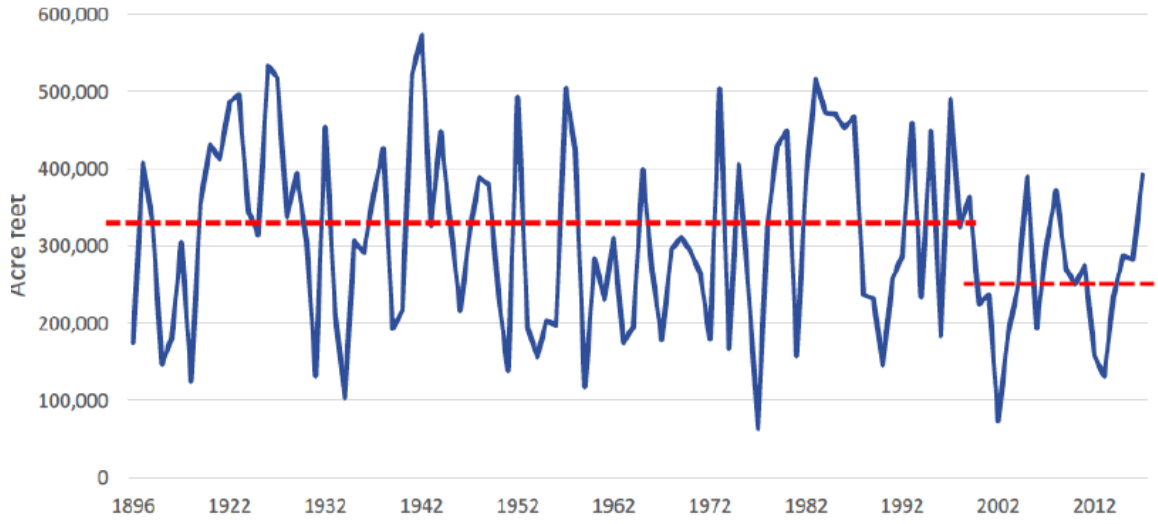

Figure 3. Annual (water-year) streamflow volume (acre-feet) from 1896 - 2017. Average streamflow volume in the 20th century was 318,000 acre-feet; average streamflow volume since 2000 has declined 21% to 250,000 acre-feet. (Source: gage on Dolores River upstream of Dolores, CO, https://www.dwr.state.co.us/streamflow/StreamFlow.aspx)

The Dolores River and McPhee Reservoir are the primary water sources for Cortez. From 1987 to the beginning of the current drought, McPhee Reservoir filled to near its capacity in all but one year (Figure 4). Even since the onset of drought in 2000, McPhee reservoir filled in many years. Figure 4 shows reservoir storage in acre-feet, but reservoir elevation is also important to the management of water resources: at a reservoir elevation of 6,855 feet, water supply for irrigation of agriculture is cut off, and at an elevation of 6,840 feet, the gravity-fed water diversion tunnel for Cortez's municipal water ceases to function. During drought in the early 2000s, McPhee Reservoir elevation reached a low of 6,857 feet; the reservoir elevation currently sits at 6,862 feet.

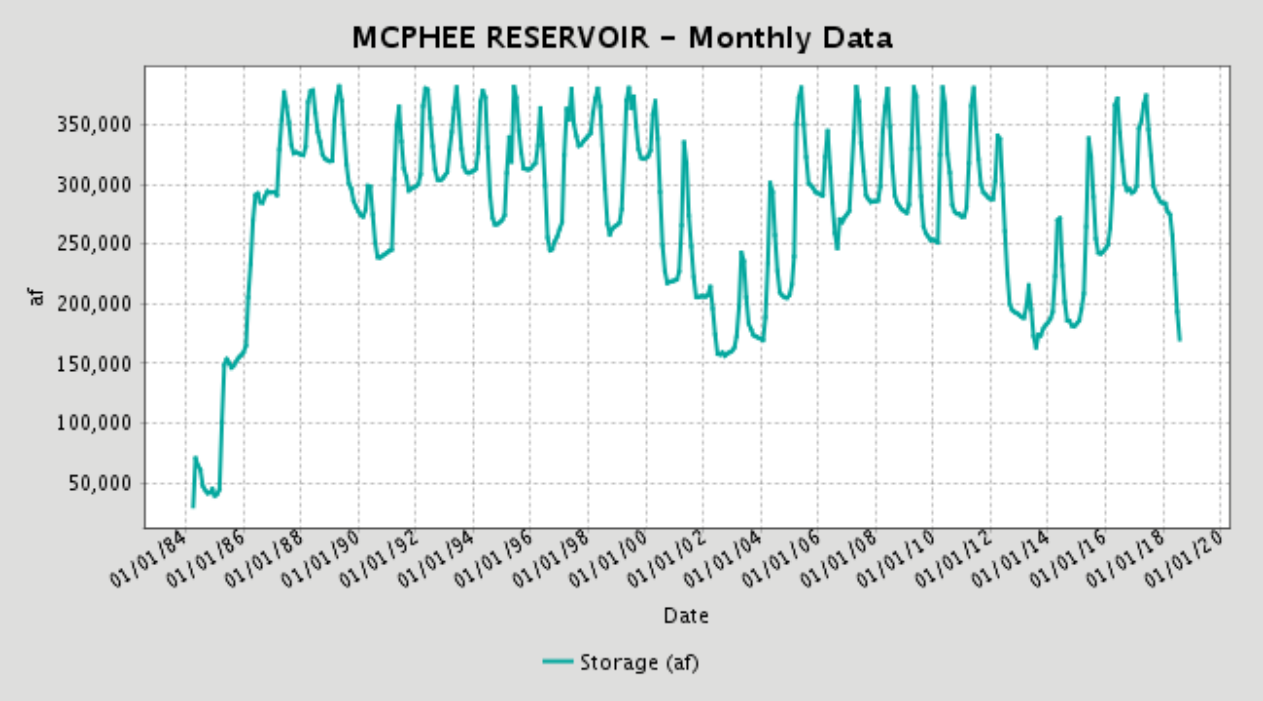

Figure 4. McPhee Reservoir water volume storage in acre-feet (af) from 1984 to 2018. Average storage level over the life of the reservoir is 286,000 af. (US Bureau of Reclamation, https://www.usbr.gov/rsvrWater/HistoricalApp.html)

Moisture-sensitive conifers like Douglas-fir and pinyon pine record information about long-past drought and streamflow in the width of their tree rings. A 450-year record of streamflow for the Dolores River at its confluence with the Colorado River near Cisco, UT shows several individual years that were worse than the lowest recorded annual flow (1977), and one 35-year drought that occurred in the mid-1600s and exceeds the duration and severity of the current 21st Century drought. The current period of drought since 2000 is similar to the 35-year drought that occurred in the mid-1600s, except that the current drought is only 19 years in length and includes several years of near normal precipitation. More severe and longer duration droughts are more likely to occur in the future because higher temperatures (both observed and predicted) will make even average precipitation years look like a drought year due to increased ET.

How recent trends in Montezuma County and the Dolores River are connected with expected future changes

The recent warming observed in Montezuma County and across Colorado is part of a broader warming trend that is documented regionally, nationally, and globally. This unusual and widespread warming is attributed to increasing levels of greenhouse gases, such as carbon dioxide (CO_2), in the atmosphere. CO_2 is now at its highest level in at least 1 million years, according to Antarctic ice cores.

How much will the climate change in the future, and in what ways? Global climate models (GCMs) give us our best view — though still hazy — of future climate. GCMs are computer-based tools that incorporate the fundamental laws and equations of physics and our observations of the Earth

system to project the climate forward in time given assumptions about future emissions of greenhouse gases. Figure 5 below shows climate projections from 20 different climate models, run forward for the 21st Century under two emissions scenarios: a higher-emissions scenario, with no global efforts to restrain emissions, and a lower emissions scenario, which assumes that annual global emissions are reduced by two-thirds after 2040.

Future temperatures: Even warmer, and into uncharted territory

All climate models indicate that the climate of Montezuma County will continue to warm well into the 21st Century (Figure 5). Under the lower-emissions scenario, by 2050, average temperatures are projected to be 4-6°F warmer than the late-20th century average, and 5-7°F warmer by 2080. Under the higher-emissions scenario, the warming would be even greater with temperatures 5-7°F warmer by 2050 and 6-12°F warmer by 2080. Warming will move climate zones higher in elevation. Under either emissions scenario, by 2050, the typical year in Montezuma County would be warmer than the hottest years of the 20th Century. Returning to the water budget described above, this much warmer future climate would create drought conditions even during years of average precipitation, by increasing evapotranspiration.

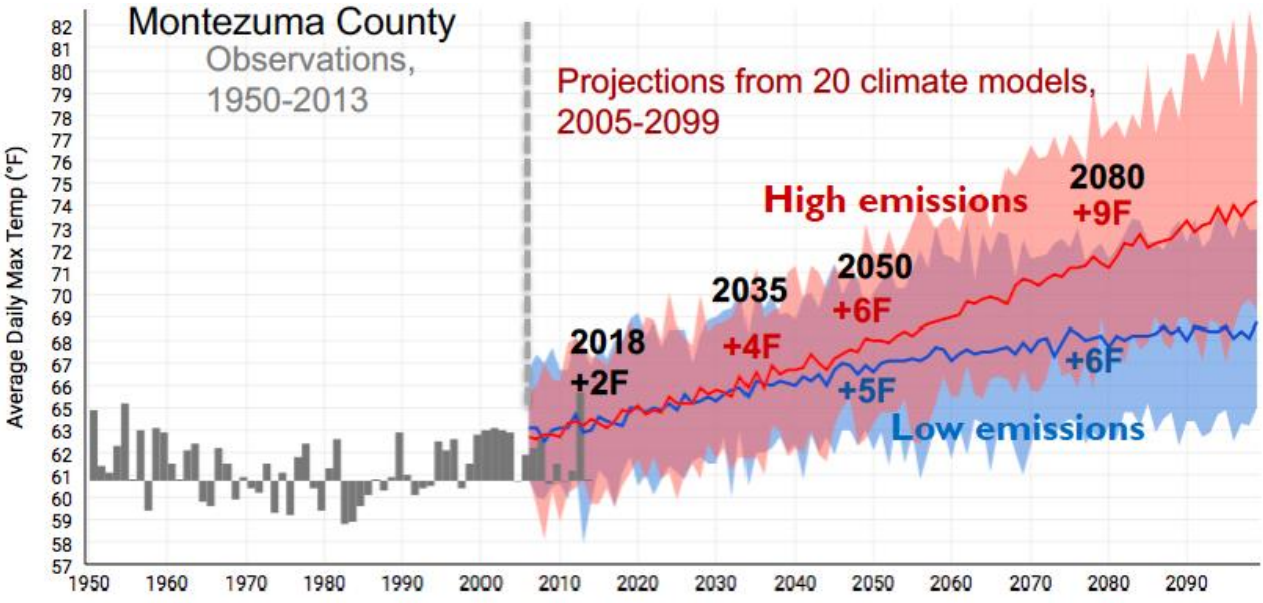

Figure 5. Projected annually-averaged daily high temperatures for Montezuma County, 2005-2099, from 20 climate models under 2 emissions scenarios, compared to observed temperatures, 1950-2013 (Source: NOAA Climate Explorer; https://crt-climate-explorer.nemac.org)

Future precipitation: Unclear changes, but large variability will continue

In contrast with the near-certainty of future warming, it is unclear how annual precipitation will change in Montezuma County by 2050, relative to the late 20th Century. Some climate models show modest increases in annual precipitation, some models show modest decreases, and some models show it remaining about the same. All models show continuation — if not enhancement — of the large year-to-year variability in annual precipitation.

Future snowpack and streamflow: Earlier melt and runoff, probably less overall

Future climate projections like those shown in Figure 6 have been used as inputs to basin-scale hydrology models to estimate how future snowpack and streamflow may change in the future. Most of these hydrology projections show that April 1 Snow-Water Equivalent (SWE)[1] for western Colorado will decline by 5-20% by 2050, due mainly to the effects of warming. These projections also show the snowpack melting 1-3 weeks earlier in spring by 2050. As one would expect with warmer temperatures and declining snowpacks, projections also show that annual streamflows in western Colorado are likely to decrease by 2050, by as much as 20 to 30%.

Global climate models are used to predict future climate. In southwestern Colorado, not all global climate models agree on the direction of change in precipitation and streamflow. Under a less likely climate outcome (less warming plus higher precipitation than today), there could be modest increases in streamflow. For comparison, 21st Century Dolores River streamflow volumes are 21% lower than the 20th Century average, suggesting that 2050 declines in streamflow could be *at least* 20-30%.

Future drought, wildfires, and flooding: More frequent, more intense

The frequency and intensity of droughts is expected to increase in the future due to a warmer climate, even considering the uncertainty in future precipitation trends. Extreme one-year drought events like 2002 and 2018 and prolonged drought events like 2000-2018 will occur more frequently than in the 20th Century, and drought conditions, once established, are likely to persist longer. Multiple studies that have modeled future changes in wildfire all indicate that due to the warming, the fire season will become longer, more severe, and the annual area burned by wildfires across Colorado will increase significantly by mid-century. There is also confidence that the intensity of the heaviest rainfall events will increase with warming temperatures. It is likely that

[1] Snow-Water Equivalent (SWE) is a hydrologic parameter that measures the amount of liquid water, in inches, stored in seasonal mountain snowpack. SWE is used by water managers to estimate how much water will be available for the spring and summer seasons. Historically, April 1st SWE measurements are used as the most important measurement for determining seasonal water supply because it is the approximate time of greatest snow accumulation in the western United States. As temperatures warm in the future, many sites where SWE is measured will reach peak snow accumulation before April 1st, especially at low and mid-elevation sites.

extreme rainfall events will become 10-20% larger overall by 2050. This would increase overall flooding risk, especially in combination with the increasing area that has recently burned.
For more information about climate trends, and climate change impacts for Colorado, see (Lucas et al 2014).

4. VCAPS Workshop: Highlights and Themes

a. Description of the Workshop Process

During the workshop on October 2-3, 2018, participants took part in two discrete diagramming exercises. At the beginning of each exercise, the WWA facilitator asked the group to suggest a specific drought scenario to discuss. Pre-workshop interviews with participants identified water supply management due to drought as the main management concern. During the discussions, one WWA team member facilitated the group discussion while another team member diagrammed the conversation in real-time, using discrete "building blocks" (see Figure 6). WWA built the diagram on a computer and projected it onto a screen so that the participants could see the diagram being populated with ideas as they were being generated. The Cortez group chose the following scenarios to diagram:

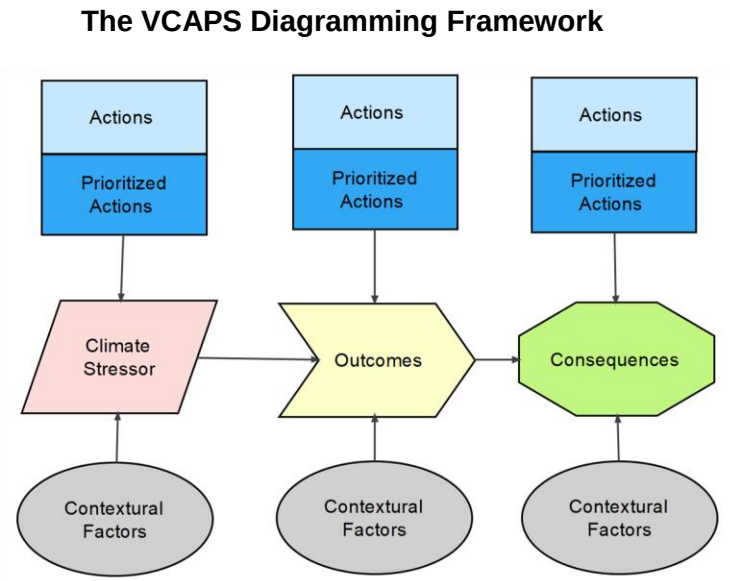

Figure 6. VCAPS diagram building blocks, borrowed from www.seri-us.org

- Drought Scenario 1: current severe (2018) drought;
- Drought Scenario 2: a drought that could trigger a compact call on the Colorado River

During each diagramming exercise, the WWA facilitator led the group through the process of mapping out the impacts of the hazardous event – starting with a ***management concern*** (e.g., water supply management) and ***climate stressor*** (e.g., increased temperature and decreased precipitation), and then identifying the physical and social ***outcomes*** and ***consequences*** that stem from the relevant climate stressors. The WWA facilitator asked questions such as "Why do we care about [climate stressor]?" to guide the group to identify the potential outcomes that would be problematic or concerning for the City. The initial diagramming phase was completed when the outcomes being generated by the discussion started to be related to loss or harm to things the community cares about, such as people, assets, and ecosystems.

Throughout the process, WWA staff listened for mention of ***contextual factors*** -- factors that are unique to Cortez's specific management or community context that influence the City's ability to cope with a particular outcome or consequence. Once the initial diagramming phase was completed, the WWA facilitator then led the group in a discussion of potential ***actions*** that the City could take to address different outcomes and consequences, including "upstream" actions that mitigate the risks of the hazards themselves, and "downstream" actions that help the City to respond to a hazard once it has occurred.

The final versions of the two diagrams are included in Appendix B, and the **actions** from each diagram are summarized in Appendix A. The following sections summarize the key discussion points of each diagramming exercise.

b. Discussion Themes: Drought Scenario 1 (2018-Type Drought)

During the discussions for the first diagramming exercise, the group started with warmer temperatures and reduced precipitation as the key climate stressors relevant to water supply management. The diagram generated throughout the group discussion focused on multiple issue areas: i) reduced water supply, ii) water treatment concerns, iii) water conservation focused on residential use, iv) water conservation focused on irrigation on city properties, v) water conservation focused on declining town aesthetics, vi) increasing wildfire, and vii) impacts to the agricultural community. In talking about these concerns and their impacts, it is helpful to consider the metaphor of "upstream" to refer to impacts that occur early in the diagram, as a direct or near-direct result of the climate stressors and "downstream," or those that occur later in the diagram and have more steps between them and the initial climate stressors.

I. Reduced Water Supply

Reduced water supply was a critical "upstream" concern during the discussion. Reduced flows on the Dolores River would lead to reduced storage levels in McPhee Reservoir, which is the City's source for municipal water. As supply shortages continued from low flows on the Dolores, the reservoir levels would decline (see Figure 7). Reduced water supply would negatively affect outdoor recreation and tourism in Cortez, specifically by reducing river recreation on the Dolores and severely impacting boating opportunities on McPhee. Additionally, lower reservoir levels could increase the cost of water treatment due to changes in water quality, which could raise the rates for municipal water.. Consequences could be a loss of public trust in government and residents feeling that the government is ineffective. Another option would be for the city government to cover the increased costs, but this carries the risk of depleting city reserves and compromising the economic health of the government. Keeping water affordable for residents, small businesses, and other City uses is an important management goal since many in the City value equity and fairness in its cost structure.

The group identified a number of actions to mitigate the risk of reduced water supply due to a 2018-style drought including new infrastructure projects, management alternatives, and education campaigns. The discussed infrastructure projects included new storage options, such as exploring aquifer storage; reuse options for graywater; installing a pumping system if the reservoir levels fall below the access tunnel; and installing a pipe to draw water directly from the Dolores River. Current water management strategies could be altered by implementing tiered rates, which still need to be studied for feasibility and equity, and by establishing pre-emptive triggers that were approved by the City Council and would allow the City to immediately implement restrictions. Education was a priority for the group, who discussed a range of campaigns aimed at youth, newcomers, county commissioners, and homeowners through various media platforms, mailings, meetings, and public outreach at community events.

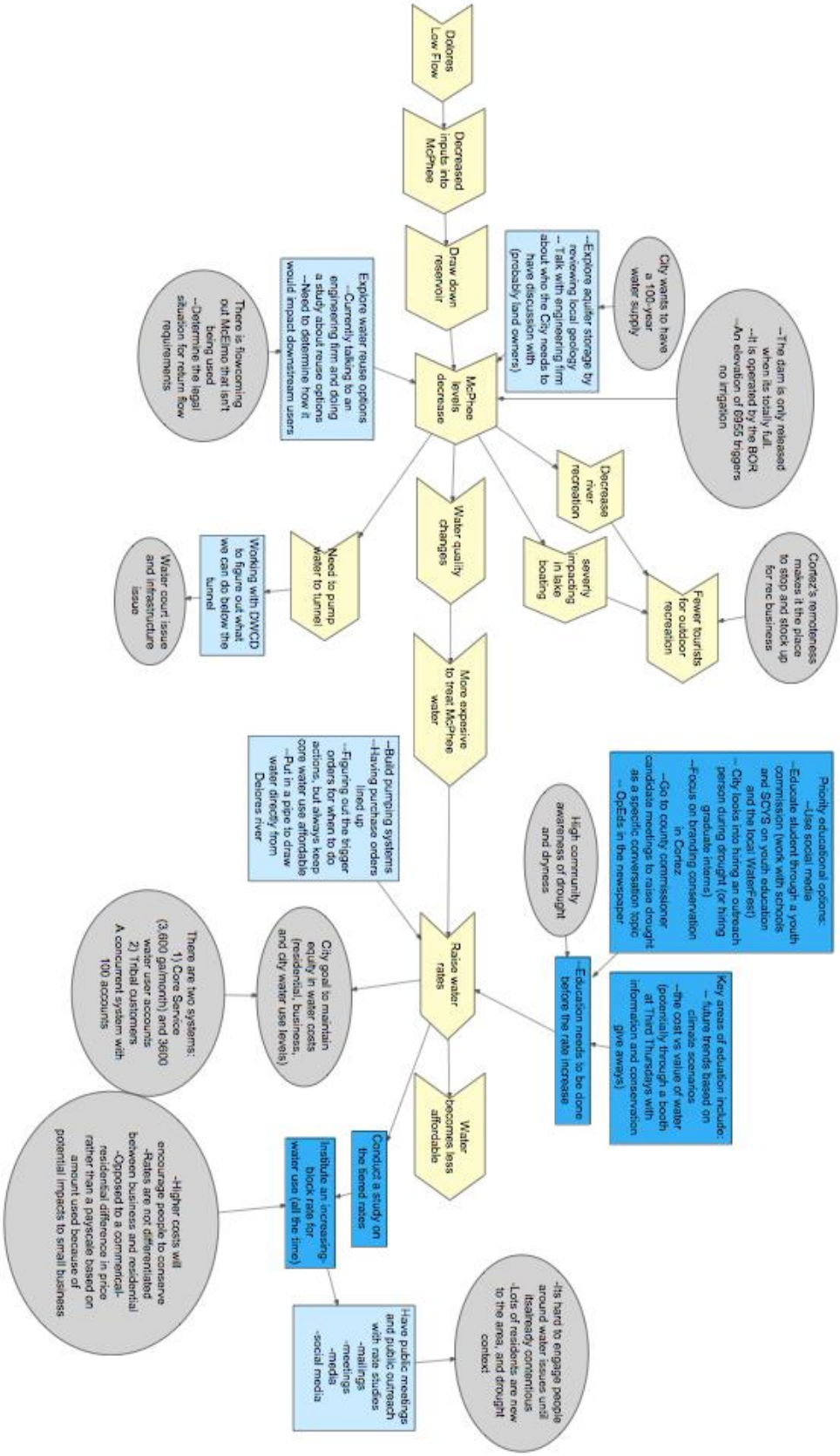

Figure 7. Reduced Water Supply diagram

II. Water Treatment Concerns

Lower than typical flows on the Dolores River may create water treatment challenges, a significant one being algae blooms (see Figure 8). Algae blooms would require different and greater treatment that might alter the taste, odor, and aesthetics of drinking water and potentially upset citizens. While the taste or aesthetics might change, City staff are confident they would still meet water quality regulations, which require they maintain a baseline quality, and that their system is technically advanced enough that they can respond to hydrologic changes. Yet, even if the water quality remains safe, customers might still be unhappy with detectable changes because they have high expectations for the municipal water. Educating the public about water safety—despite changes—would address this, maintaining trust in the municipal water supply.

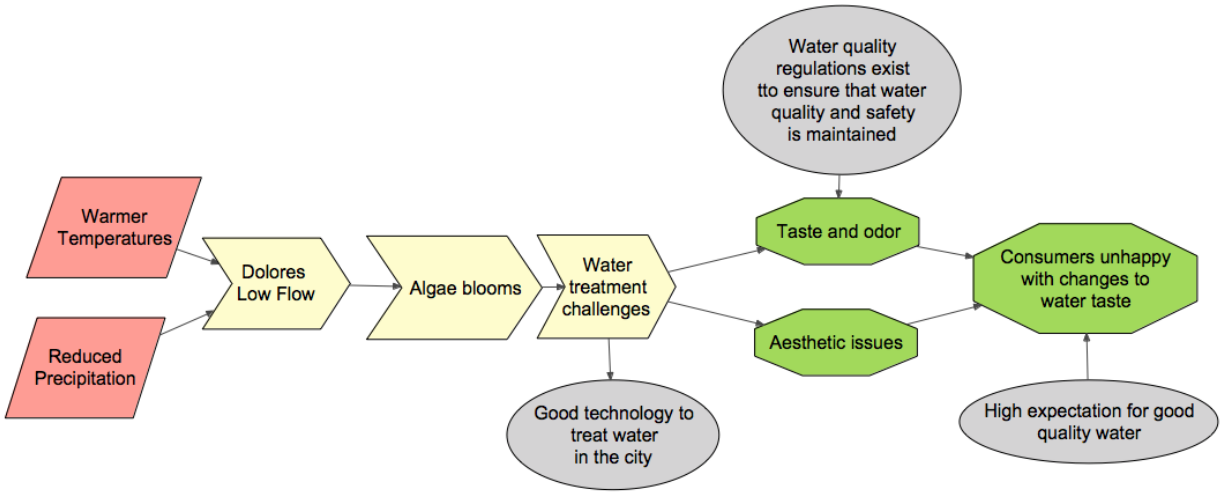

Figure 8. Water Treatment diagram

III. Water Conservation Focused on Residential Water Use

Water restrictions for Cortez residents will be implemented due to drought conditions and decreasing Dolores River flows. Restrictions on how residents use outdoor water might lead to conflict over competing uses of water, i.e., residents seeing municipal water used for City property when they are restricted (see Figure 9). This would only be further intensified by misperceptions about water use with people monitoring and reporting on their neighbors. Further water restrictions, if drought conditions persist, could usher in more stringent restrictions for outdoor water, lead to more conflicts, and ultimately erode the public's trust in the local government.

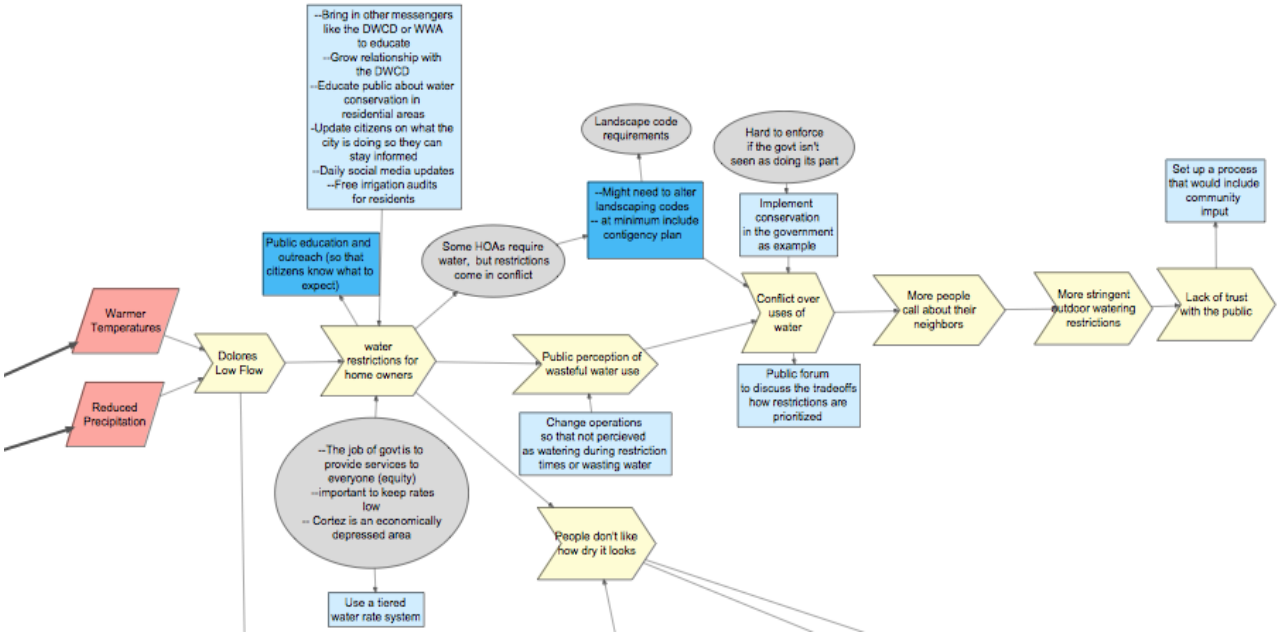

Figure 9. Residential Water Conservation diagram

Water restrictions have a number of contextual factors that mediate their community impacts. The role of the government is to provide services to all residents equally, and this means that rates for critical services like water need to be kept low. Cortez has economically depressed populations, so water restrictions should not increase the price for basic water use but instead use a tiered system that maintains affordable base rates. If the government is seen as not doing its job — either because of increasing costs or not providing services — it will only make it harder for the City to enforce restrictions. Another complication is that local Homeowners Associations (HOAs) often require specific watering practices and have landscape codes to maintain certain aesthetics. This can limit conservation efforts and again lead to conflict.

Participants brainstormed a number of actions to reduce conflicts and promote conservation. Education efforts would work to prevent misperceptions that might lead to conflict and help people prepare for and anticipate different practices required by the watering restrictions. This included a number of education efforts aimed at the general public, collaborations with other groups like the Dolores Water Conservation District, and free conservation audits. Landscaping changes could decrease water demand but would require changing parts of the landscaping code for City and HOA rules for residential changes. Similarly, implementing conservation measures on government properties and changing watering operations so that different departments are not perceived as wasteful in their water use would also help. Drafting a drought contingency plan and planning public forums for community member needs would also be important actions.

IV. Water Conservation Focused on Irrigation of City Properties

Since the City has a large system of parks and green spaces, decreases in irrigation water would require the City to change park management and restrict irrigation on some properties (see Figure 10). Restricted irrigation could lead to less water for school district properties, declining aesthetics of properties in town, decreased quality of the City golf course, and a reduction in City ponds and the wildlife populations in them. The City relies on revenues from golf-related tourism, so if golfers stopped traveling to Cortez due to the poor quality of the greens, there would be a decrease in employment opportunities, less tournament-raised revenues for local nonprofits, and broader negative impacts to the local tourism economy, such as restaurants and hotels. Less water in ponds might lead to algae blooms due to the shallow, warm, stagnant water which would kill the fish and decrease local recreational fishing opportunities. It could even result in a loss of ponds all together which would cause a decline in the duck population, a locally-valued family-friendly activity.

The group brainstormed a number of “downstream” and “upstream” actions for conservation on city properties. One set of “upstream” actions was focused on water reclamation and included implementing a wastewater system (e.g. a purple pipe system for non-potable water) that could capture this water for irrigation use or store it for future use. However, this would require researching relevant state legal restrictions on graywater collection and harvesting. State water law also restricted other water conservation efforts and was considered a significant challenge; participants discussed lobbying and advocacy efforts targeted at changing the “use it or lose it” framework. Another set of actions focused on infrastructure projects — especially for the golf course — include installing drip irrigation underground, artificial turf for recreation, and a micro-hydrologic project to develop power on the water recovery. Converting the landscaping of city properties, where appropriate, to xeriscape could reduce water use while limiting impacts to community recreation.

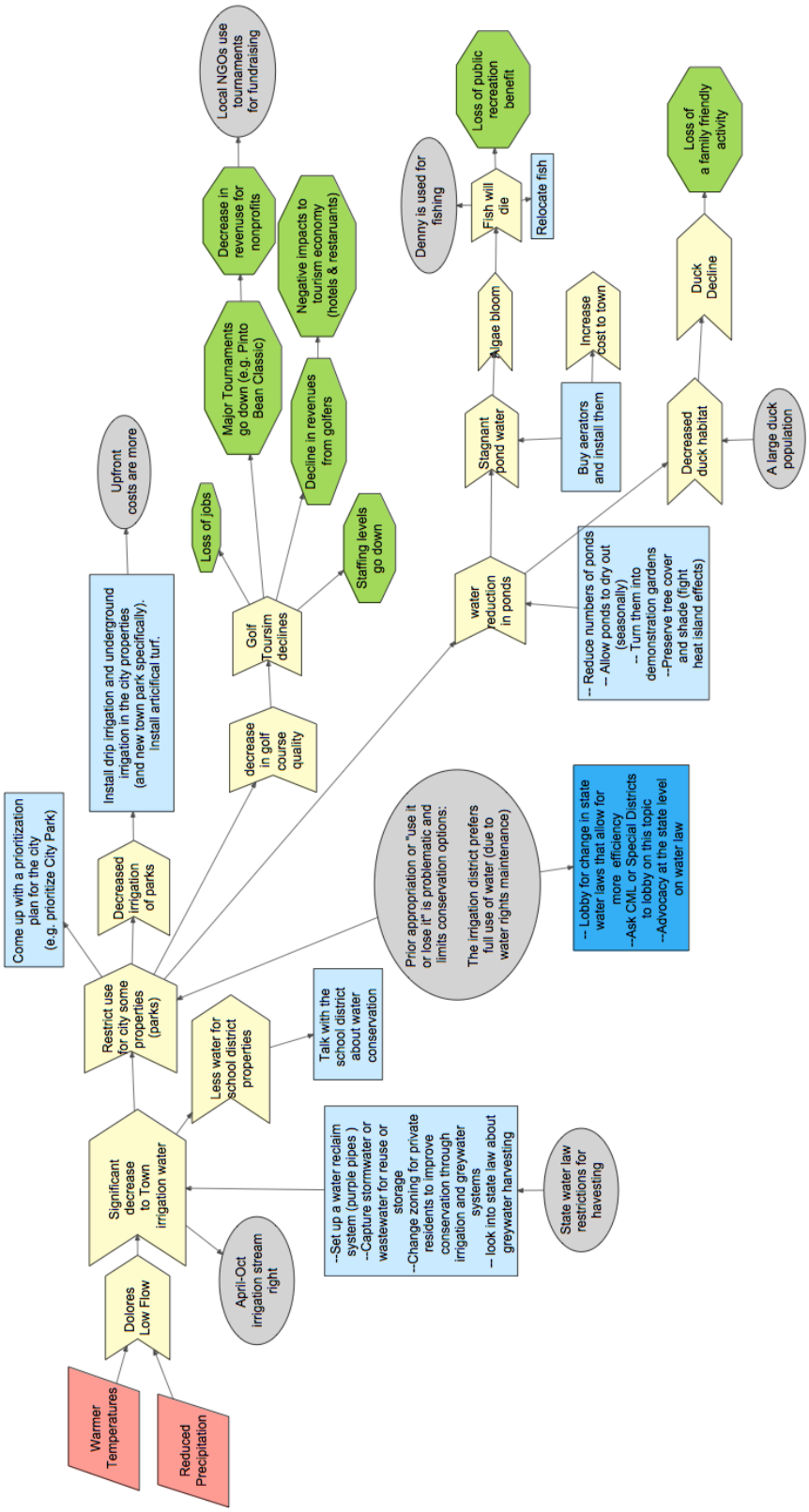

Figure 10. Water Conservation on City Properties diagram

To reduce impacts to the ponds and wildlife, the City could reduce the total number of ponds but keep remaining ones at full levels, allow the ponds to dry out to “show” the drought, increase shade at the ponds to limit evaporation, buy and install aerators to maintain good water quality, or relocate fish to other areas. Other broad actions included developing a property prioritization plan that weighed functionality and aesthetics, using a “phased” or incremental approach to implementing conservation, looking to other drought resilient communities for strategies, educating the public, and creating demonstration gardens.

V. Water Conservation: Declining Town Aesthetics

Both the water conservation issues for residential use and for irrigation of city properties led to a shared “downstream” concern about public responses to changing aesthetics (see Figure 11). A decrease in outdoor water use on private and City properties might result in displeasure from the community about a transition from a green city to a dry one. Declining aesthetics might lead to decreasing property values, possible economic recession and residents either moving away or being unable to move because of their reduced property values. Ultimately, these changes would heighten community stress levels and increase conflict with a disproportionate impact on the low-income community in the city.

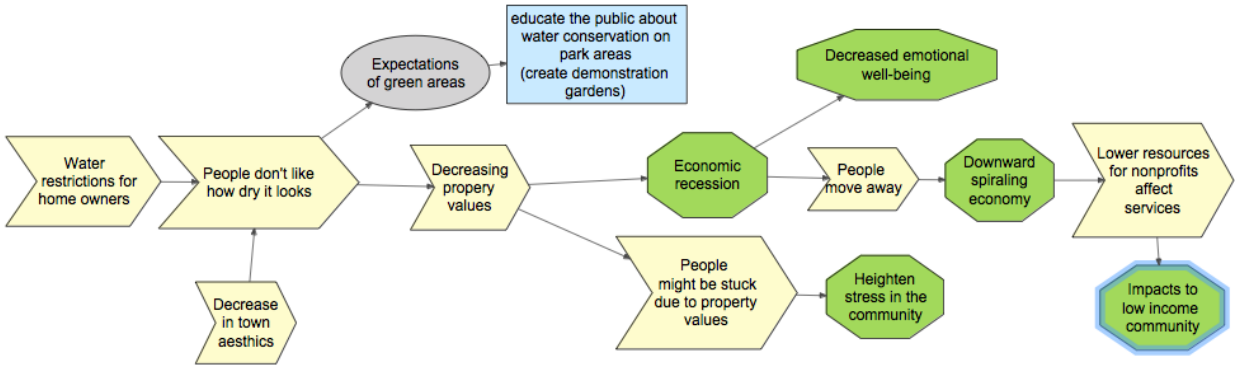

Figure 11. Declining Town Aesthetics due to Water Conservation diagram

Residents enjoy, and have become accustomed to a “green” city that requires significant water inputs, so the main strategy to prevent public dissatisfaction is education. Education efforts will inform the public about the importance of water conservation, the different approaches to conservation, with work to change community expectations for what counts as an aesthetically pleasing landscape. One way to do this might be to create demonstration gardens with attractive native or drought tolerant plants.

VI. Increasing Wildfire

Warmer temperatures will increase wildfire hazards due to a longer “fire weather” season -- dry, hot weather that makes fuel especially flammable. Additionally, reduced flows on the Dolores River due to climate stressors might reduce available water for fighting fires, making fires more difficult and resource-intensive to fight and potentially increasing their spread. Water shortages for firefighting may be more severe in the County than the City.

Increased wildfire threats may result in closures of National Forests due to safety risks, thus limiting recreational opportunities for locals and visitors alike and decreasing wildlife populations (see Figure 12). Forests are key spaces for hunters and guiding services, so their closures, and reductions in wildlife populations, would reduce tourism levels and decrease tourism revenues. Outdoor guiding is an important economic sector locally, and its potential decline would have cascading impacts to other related tourism businesses like hotels and restaurants, stressing the broader community.

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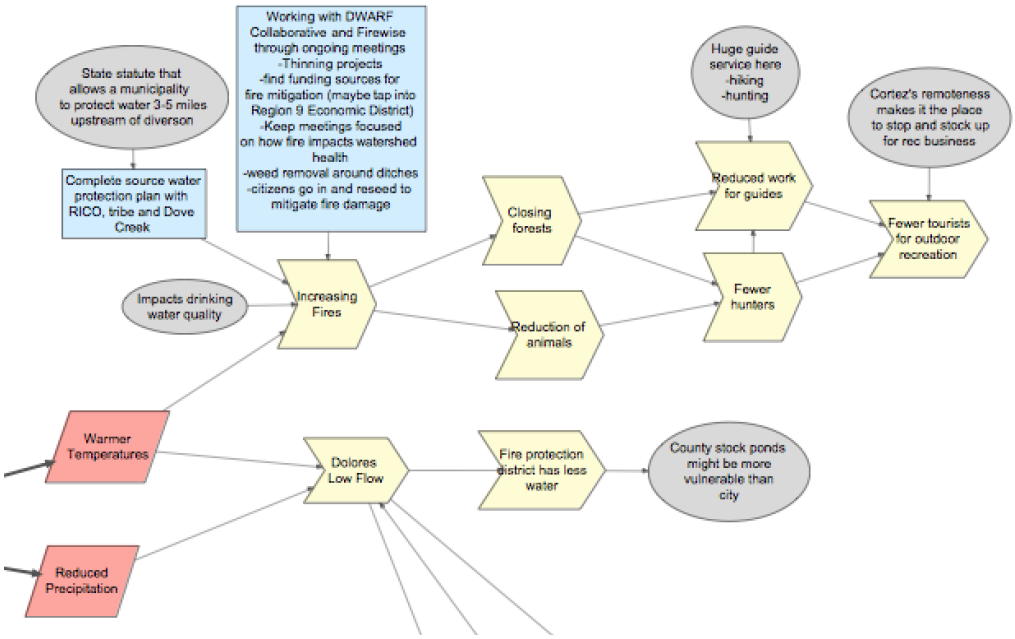


Figure 12. Increasing Wildfire diagram

Many of the “upstream” actions the group discussed involved collaborations with other government entities or nonprofit partners. The City is already working with the Dolores Watershed and Resilient Forest (DWRF) Collaborative and Fire Adapted Partnership and will continue to invest in these relationships to support fire mitigation efforts like thinning to increase defensible space, and weed removal around ditches. This partnership could be especially helpful in keeping wildfire impacts to watershed health and drinking water quality at the forefront of the discussion. The City might partner with groups like the DWRF Collaborative, the Ute Mountain Ute Tribe, and

other water providers to help protect water quality by completing the Source Water Protection Plan to use state authorized power to protect reaches upstream of a diversion. The City also could work with interested citizens to help restore landscapes after fires through reseeding efforts. All of these actions require funding, and it is a priority for the City to find funding for these projects. Region 9 Economic District may have available funding.

VII. Impacts to the Agricultural Community

As with other segments of the community, reduced water supply will also negatively impact the agricultural community. The economic impact on this segment of the community will also have an impact on the City. Figure 13 diagrams the impact of drought on the agricultural sector.

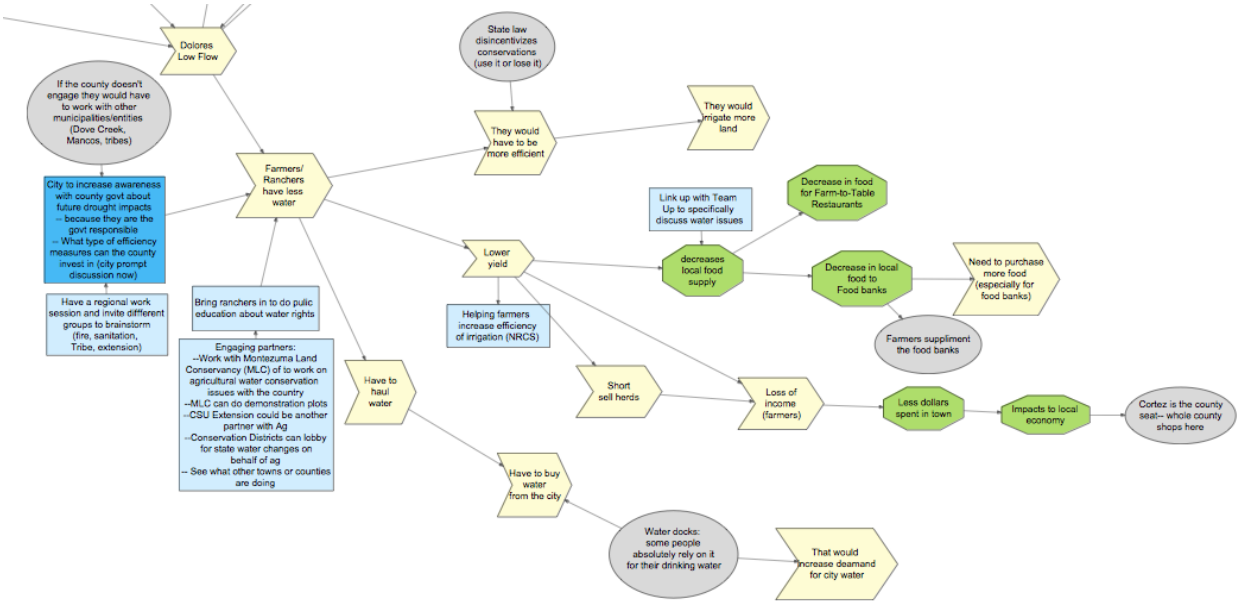


Figure 13. Impacts to the Agriculture Community diagram

Partnering with local and state organizations to promote water conservation, finding ways to adapt to drought conditions, and supporting education efforts will be important for expanding the discussion, brainstorming solutions, and securing buy-in from all parties. The County will be a critical player since they work more closely with the agricultural community than the city does. Forging a strong alliance with the County will be important in developing and implementing a county-wide Water Conservation Plan

Partnering agencies might include: Southwest Basin Roundtable Alliance (SWBRTA), Montezuma Land Conservancy (MLC), Colorado State University Extension (CSU), Natural Resource Conservation Service (NRCS), Dolores Water Conservancy District (DWCD), Montezuma Valley Irrigation Company (MVI), Ute Mountain Ute Tribe, the Cortez Sanitation District, and others with a focus on water. Reaching out to Conservation Districts to lobby the State about problematic elements of water law on behalf of the agricultural community might be productive as well. In an effort to avoid “reinventing the wheel,” the City might want to identify

other cities and counties that have faced similar challenges and analyze what approaches they have adopted to remain resilient in the face of drought.

c. Discussion Themes: Scenario 2: Compact Call on the Colorado River and Water Insecurity

The second drought scenario meant to be a "worst case", was an administrative call on the Upper Basin of the Colorado River Basin by the Lower Basin. The 1922 Colorado River Compact is an agreement that divides the water rights to the Colorado River among seven states and between the U.S. and Mexico. Water rights are divided between the "Upper Basin" and the "Lower Basin" stipulating that if the Upper Basin cannot deliver the agreed amount of water (over a 10-year average), the Lower Basin can make a "compact call," requiring the Upper Basin to send water downstream without being able to use most of it first. This would significantly impact municipal water supplies in the Upper Basin states — like Colorado. A call has never been made, so it is unclear exactly what the process would be.

Unlike the first scenario, a compact call could be made as the result of drought conditions elsewhere while climate conditions remained within normal range in Cortez. A call, however, could drastically reduce the amount of water available in Montezuma County which would have a significant impact.

A compact call would require Upper Basin states to deliver 7.5 million acre feet of water with Colorado responsible for more than half of that amount. This might require releases from McPhee that could empty the reservoir, making municipal water stored in this reservoir unavailable and necessitating the construction of a new pipeline to transport City water to the water treatment plant at a different diversion point of the Dolores River. In an effort to plan ahead for the worst possible scenario, the City might consider a feasibility study to address storage options along with the identification of possible points of diversion from the Dolores.

The compact call would also have other local consequences. If McPhee emptied, it would produce ecological stress, which might have legal implications under the Endangered Species Act. The agricultural community would be heavily impacted, even though the Montezuma Valley Irrigation Company has rights that pre-date the compact. Though it is unknown what *would* happen if a call was placed, it is certain that it would lead to legal battles amongst states and between basins that could last for years. Figure 14 shows the entire diagram for the Colorado River Compact call scenario.

The City's project water stored in McPhee Reservoir has a junior right to the Colorado Compact. The City has a senior right to 4.2 cfs on the Dolores River, from April through October, but they do not have storage for that water. Table 1 outlines the City's water rights and the physical parameters of McPhee Reservoir storage and water delivery. Clarifying the City's water rights, researching options for accessing water left at the bottom of McPhee Reservoir, and expanding storage for raw water near the treatment plant were all discussed as options that would strengthen their water security.

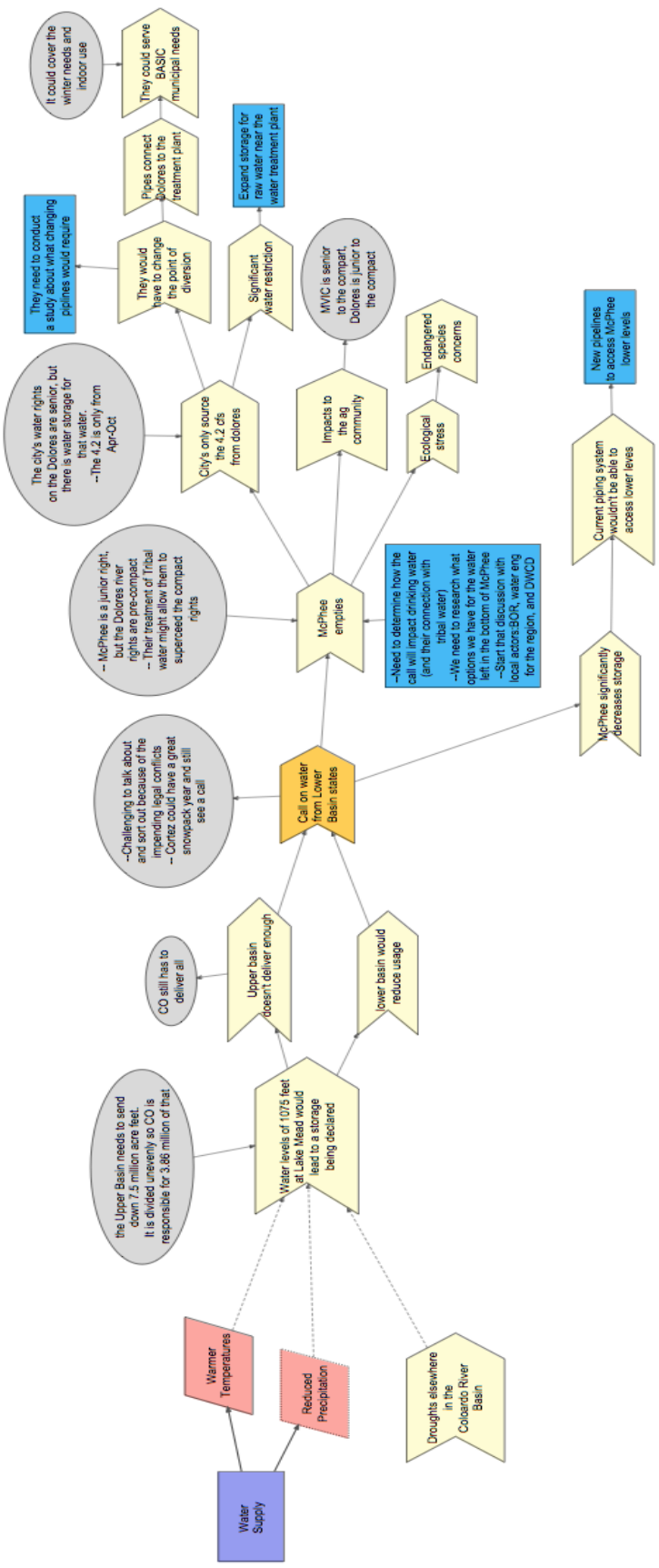


Figure 14. Full diagram of Scenario 2, which depicts the outcomes and consequences of a compact call on the Colorado River.

McPhee Reservoir storage				
Total Storage	381,000 Acre Feet			
Total Active Capacity	229,000 Acre Feet			
Full Reservoir	6924.00’			
M&I Reserve	6858.81’			
Dolores Tunnel (City) Intake		**Elevation**		
Top of Intake Structure		6855.00’		
Top of Tunnel Intake		6853.00’		
Bottom of Tunnel & Sill		6843.00’		
Design Bottom of Channel (Invert)		6842.00’		
City of Cortez Water Rights			**Acre Feet**	**Million Gallons**
McPhee Reservoir M&I			2300	749.5
Direct Flow Water Rights*	4.2 CFS	2.7 MG/D	1780	577.8
Totals			4080	1327.3
Usage in 2017			***2886***	***940.4***

Table 1. McPhee Reservoir storage, Dolores Tunnel intake physical parameters and City of Cortez water rights. Star denotes that direct flow rights are only available during April 1st to October 31st irrigation season.

d. Cross-Cutting Themes.

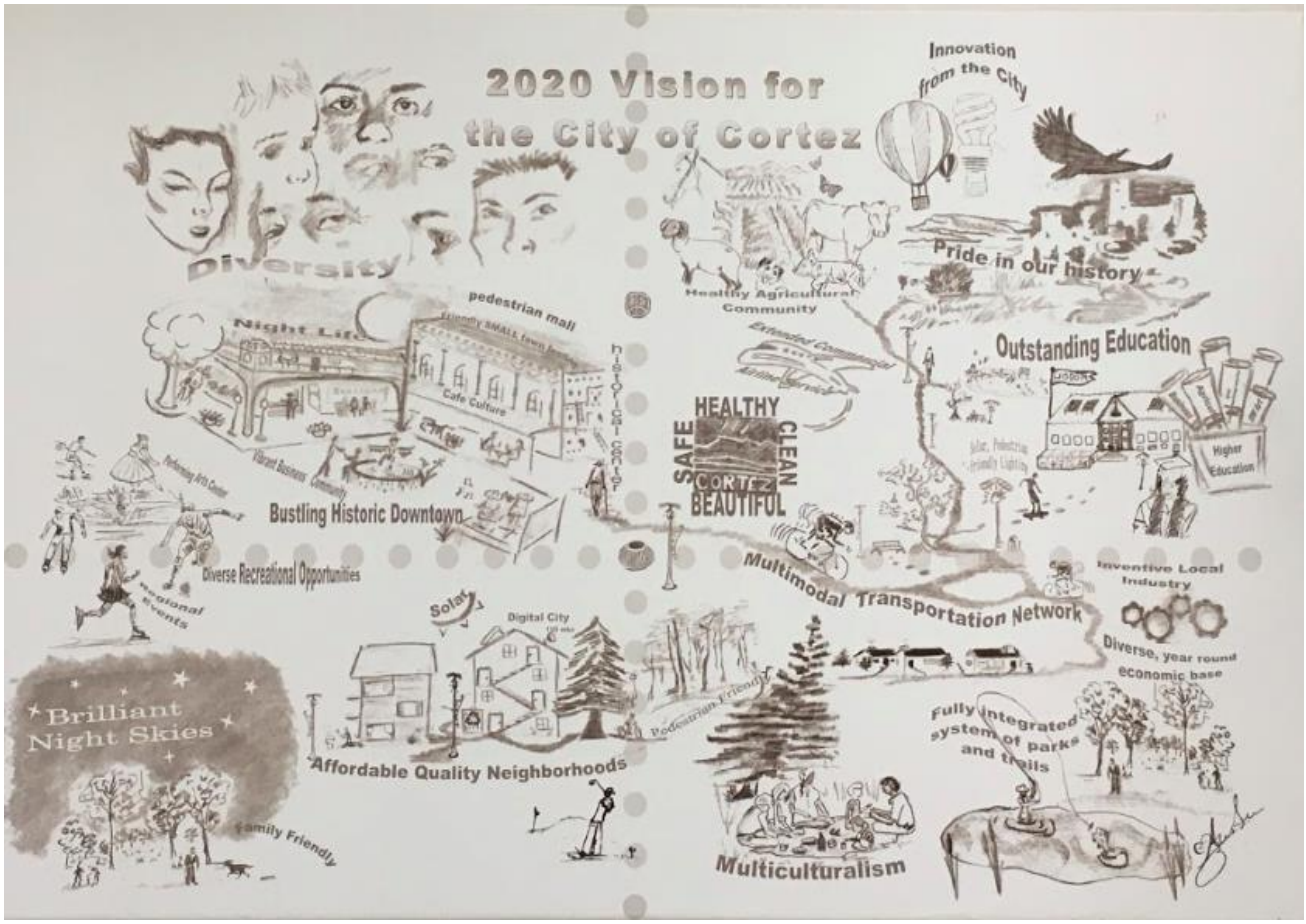
Water Law

Current water law provides little or no incentive to conserve if water rights are lost when the water is not used.

Public Education

Educating the public and other key constituencies within the county and region was identified as a priority. Participants felt the public could benefit from a clear explanation of current conditions, future drought projections, and water conservation measures. A well-executed public outreach campaign would:

- Instill the importance of water conservation.
- Improve individual conservation practices.
- Result in significant reduction in water usage.
- Temper backlash of government water restrictions and reductions in municipal green space.
- Re-define public perceptions of landscaping aesthetics to develop an appreciation of xeriscaping and native vegetation requiring less water.



Equity

Throughout the discussions, participants continued to return to the City's strong commitment to equity in its governance and management actions. There was repeated emphasis on ensuring that base rates for water for human consumption, hygiene, and household use remain affordable. A tiered scale was discussed with higher rates for consumption above basic needs. During periods of critical drought, the possibility of more severe water restrictions was discussed as an option to ensure adequate water to meet basic needs.

5. Participant Reflections and Next Steps

During the final session of the workshop, participants shared reflections on the two-day process:

- The City staff is concerned about drought conditions.
- It is encouraging that the City is taking planning for future drought seriously.
- The drought problem is bigger and worse than some had imagined, and the City's water supply is more vulnerable than previously thought.
- There is a lot of difficult work ahead, and while the issue can feel overwhelming, one starts a one-thousand mile trip with just one step, and the City is already several steps into the process.

- This two-day workshop raised awareness for the whole group so that there is a common understanding about what the future may hold.
- This workshop confirms that to practice conservation, there needs to be a paradigm shift in water rights in the state.

Participants also shared a number of next steps they would like to take:

- Maintain the momentum started by this workshop with future meetings to move drought planning forward.
- Develop a list of priorities and check off completed items to track progress as the group moves forward with a plan.
- Take immediate action to develop a public information campaign.
- Reach out to stakeholder groups to increase awareness around drought.
- Change community expectations of green space and encourage and xeriscaping.
- Explore options for advocacy on state water law and legal advice on the Colorado Compact implications for the City.
- Work with City department heads to ensure all staff are aware of drought planning efforts.
- Work collaboratively to be successful.
- Integrate conservation into the Comprehensive Plan, Land Use Code, and other city requirements and regulations.

6. Conclusion

The VCAPS methodology is one of many approaches available to empower local climate and weather adaptation through structured, deliberate dialogue. Over the course of two half-day meetings, the City of Cortez convened key staff and decision-makers from across the municipality to systematically examine and document local climate concerns; experience and anticipate impacts of climate hazards; review past, current, and planned efforts to mitigate climate risks; consider potential new solutions to address risks across city operations. Nearly all workshop participants expressed the need and desire to continue these discussions. We hope this report and the diagrams generated from the meetings will support this group as they continue the conversation and generate a plan for examining the broad range of vulnerabilities, questions, existing assets, and new ideas that emerged through this process.

References

Lukas, J., and others. 2014. *Climate Change in Colorado: A Synthesis to Support Water Resources Management and Adaptation.* A report for the Colorado Water Conservation Board. Western Water Assessment, University of Colorado Boulder. https://wwa.colorado.edu/sites/default/files/2021-09/Exec_Summary_Climate_Change_CO_Report_2014_FINAL.pdf

Appendices

Appendix 1: Summary of Actions Generated During the Workshop

	Action	Implications
Drought Scenario 1 (2018-Type Drought)		
Issue Area: Reduced Water Supply		
	Consider additional storage options such as existing reservoirs available for City acquisition	Funding; City wants 100-year water supply
	Explore aquifer storage by hiring an engineering or geotechnical firm to review local geology	Funding for feasibility study; approaching land owners for land acquisition where geology supports water storage; City wants 100-year water supply
	Explore water reuse options by consulting with an engineering firm to do a study	Funding for a study and possibly infrastructure
	Consult with water attorneys to determine how water reuse would impact downstream users	Potential negative public perceptions including possible impacts to water rights and water supply for downstream users.
	Conduct education and outreach activities regarding future trends based on climate scenarios	Increase public understanding of *why* water conservation by all is critical
	Conduct education and outreach activities regarding the cost vs. value of water; potentially through a booth at Third Thursdays with information and conservation giveaways, and other community events	Increase public understanding of the costs vs. benefits of quality city water in sufficient quantity
	Education priority: educate students through a youth commission; work with schools and School Community Youth Collaborative on youth education and the local water conference (Waterfest)	Increase youth understanding of water in this region and groom next generation to become ambassadors for conservation
	Hire an outreach coordinator.	Strategic, long term outreach is critical for conveying the necessity of conservation

	Conduct community-wide conservation education through opinion editorials, social media, radio	Outreach will reinforce the importance of City initiatives to conserve water
	Develop a city/region-wide program that brings all water conservation efforts under a single marketing plan with branding	Branding and marketing will reinforce the importance of City initiatives to conserve water
	Conduct a study on tiered rates	Identifies costs and benefits as well as fairness issues resulting from existing and potential incentivized rate structures
	Have public meetings and public outreach with rate studies	Additional staff time required to plan and execute; increase public understanding of incentivized rate structures that promote water conservation
	Consider instituting a permanent increasing block rate for water use	Additional staff time required to develop a rate structure and educate the public; potential negative perceptions; equity issues (could disproportionately impact large families)
	Work with Dolores Water Conservancy District to figure out what we can do below the tunnel	Identify options so City can prepare a worst-case scenario contingency plan
Issue Area: Water Treatment		
	Educate the public that water supplies are safe when there is a change in odor or appearance due to algae and turbidity in the water supply	Additional staff time for implementing media strategies through newspaper / radio / bill inserts / public demonstrations, etc.
Issue Area: Water Restrictions for Homeowners		
	Public education and outreach (so that citizens know what to expect)	Additional staff time; increase public awareness of necessity for water conservation
	Alter landscaping codes, or include contingency plan (HOAs require watering)	This would require Council approval; may change landscape preferences.
	Bring in other partners like the Dolores Water Conservancy District or Western Water Assessment to educate	Staff time to research and reach out to agencies

	Grow relationship with the Dolores Water Conservancy District	Additional staff time
	Educate public about water conservation in residential areas using various methods such as bill inserts, demonstrations	Additional staff time
	Update citizens on what the City is doing keeping them informed through Staff or Mayor's columns; flyers in public buildings	Additional staff time
	Strategic and timely social media updates	Additional staff time
	Implement watering restrictions on City operations so that the City is not perceived as watering during restricted times/wasting water	Additional staff time to research and implement needed changes and to publicize how the City is doing its part
	Implement conservation in government operations to set example	Additional staff time to research and implement
	Host public forums to discuss and seek community input on the trade-offs of how restrictions are prioritized	Additional staff time to plan and execute public forums and develop community ownership; cost to execute
Issue Area: Water restriction for irrigation on City properties		
	Coordinate with the Cortez Sanitation District to investigate the possibility of water reclamation system (purple pipes)	Additional staff time and engineering costs
	Capture stormwater/wastewater for storage or reuse	Infrastructure, permitting and design costs; potentially restrictive quality standards
	Change codes to allow conservation through irrigation and greywater systems for private residences	Would require an ordinance allowing greywater use; might require the development of a greywater control program that meets state and federal requirements
	Look into state law about water harvesting	Increase understanding of current state water law restrictions for water harvesting
	Coordinate with school district to educate youth about water conservation	Additional staff time to work with RE-1 staff

	Lobby for change in state water laws to allow for more efficiency	Additional staff time to find partners; travel expenses to Denver to work with partners
	Ask Colorado Municipal League or Special District Association to lobby on this topic	Additional staff time to meet and lay out concerns and plan
	Develop a prioritization plan for City (e.g. prioritize parks) and set city-wide long-range goal with involvement of all departments	Additional staff time
	Install drip irrigation and underground irrigation on City properties, especially at the new park on the south side of town	Additional staff time and cost of designs and installation
	Consider installing artificial turf	Additional staff time and cost of designs, materials and installation
	Investigate the feasibility of completing the installation of pipes between the golf course and Denny lake to reduce evaporation of irrigation water	Additional cost of engineering, materials and installation
	Weigh functionality with aesthetics on golf course	Staff time to get community input
	More efficiently water City properties throughout the season to decrease overall amount of water used.	Increased water efficiency will allow maintenance of City green space using less water
	Buy and install aerators to prevent stagnant water	Additional costs and staff time
	Relocate fish	Additional costs and staff time; negative public perception; stress to fish
	Reduce number of ponds	Additional costs and staff time; negative public perception
	Allow ponds to dry out seasonally	Negative public perception; aesthetics impacted
	Convert ponds to demonstration gardens	Negative public perception; additional costs
	Preserve tree cover and shade to fight heat island effects	Additional cost and staff time; enhances aesthetics and comfort
Issue Area: Declining town aesthetics		
	Look at which parts of the City could be converted to xeriscape and still be attractive	Additional staff time and costs; negative public perception

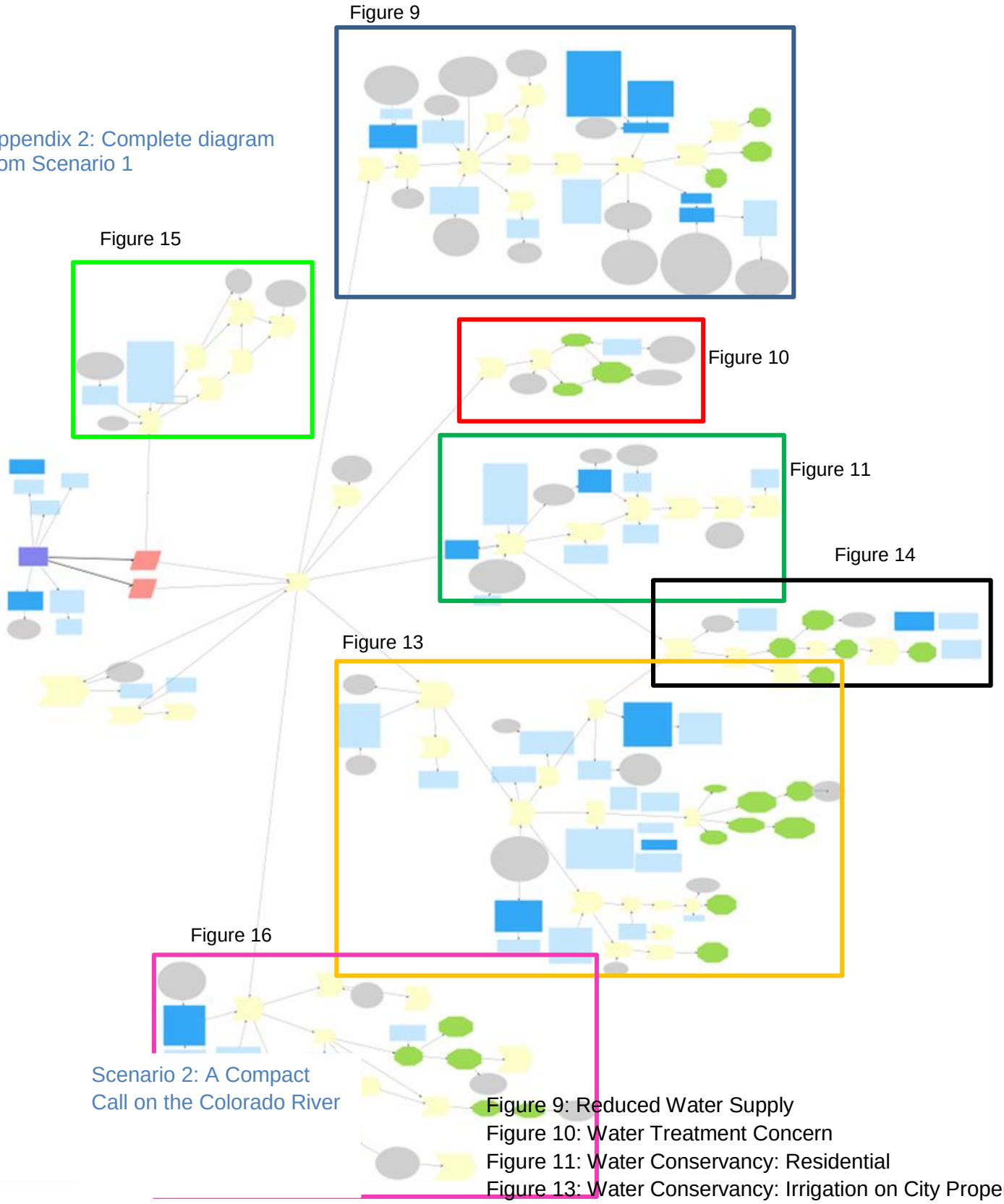
	Use the new park as a demonstration park	Win/Win for City and community
	Xeriscape the median strips and areas between sidewalks and curbs.	Cost; labor; water savings; can be used to educate public
	Retrofit existing landscaping to native plants	Additional staff time and cost
	Find balance between community and individual benefits for water	Saving in one area will free water for other uses
	Look at other successful arid communities for examples	Save time and effort by not "reinventing the wheel"
	Use a phased approach to implement water restrictions	Provides time to educate the public; secure public buy-in
	Explore possibility of using artificial turf on sports fields	Cost; would allow City to continue to have green belts without water
Issue Area: Increasing Fires		
	Work with Dolores Watershed And Resilient Forest Collaborative and Wildfire Adaptive Partnership through ongoing meetings	Additional staff time
	Conduct thinning projects and weed removal around ditches	Additional staff time
	Research funding sources for fire mitigation, i.e., Region 9 Economic Development District	Additional staff time; evaluate return on investment
	Keep meetings focused on how fire impacts watershed health	Focusing on this topic allows for planning to mitigate damage in case of fire; possibly resulting in the availability of federal dollars should a fire occur
	Collaborate with watershed stakeholders, including the County, to mitigate fire damage	Additional staff time; reduce chance of mudslides; enhance appearance of burned areas
	Complete source water protection plan with Rico, Dolores, Ute Mountain Ute Tribe, and Dove Creek	Additional staff time; possible funding for a consultant; a joint long-range plan helps everybody to be better prepared

Issue Area: Less water for Agriculture		
	Share data with Montezuma County regarding future drought impacts	County government is responsible for most of the agricultural areas
	Organize a regional work session with various stakeholders -- fire, sanitation; Ute Mountain Ute Tribe, County Extension Service -- to brainstorm together	More people working on a plan, the better the plan
	Bring ranchers into the discussion to share information about their water rights	Gathering input from other groups impacted in different ways is important
	Work with Montezuma Land Conservancy to partner with agriculture and the County	Success of plan will be greater if plan is developed with input from variety of voices
	Work with Montezuma Land Conservancy, Colorado State University Extension Office and other organizations to establish and manage demonstration plots	Input from a variety of agencies will result in differing approaches and perspectives that may appeal to some members of community
	Reach out to Colorado State University Extension Service to partner regarding the impacts of drought on the agricultural community and brainstorm how impacts might be mitigated	Input from a variety of agencies will result in differing approaches and perspectives that may appeal to some members of community
	Enlist conservation districts to lobby for state water changes on behalf of the agriculture community	May have more contacts and clout than the City alone
Drought Scenario 2: Compact Call on the Colorado River		
Issue Area: Water Insecurity		
	Research options for accessing the water located below the intake valve in McPhee Reservoir	Additional staff time needed to consider options; additional funding for possible engineering studies
	Determine how a Compact Call might impact drinking water supplies and quality	Additional staff time to research impacts; allows City to plan ahead and be prepared for worst case scenarios

	Expand storage for raw water near the water treatment plant	Additional storage would allow City to store water during wet seasons to off-set dry seasons; research storage rights; funding
	Conduct a study to determine what changing pipelines to divert water out of the Dolores River would require, including easements and land acquisition, as well as engineering design	Additional staff time and funding
	Discuss possible scenarios if there is a Compact Call and McPhee Reservoir is emptied with entities, including Bureau of Reclamation, Dolores Water Conservancy District, water engineers from the region	Critical if we are to address this issue in a meaningful way; additional staff time
Cross-cutting themes		
Issue Area: Water Law Complications		
	Correspond with state legislators about possibility of changing state water law	Additional staff time; relationships developed in the process will be invaluable
	Attend Southwest Basin Round Table meetings to encourage them to work on state water law	Additional staff time; ; difficult conversations about water rights management
	Request the Council of State Government (West) and other organizations representing Colorado River stakeholders to help with the region's water law issues	Additional staff time; additional voices and resources increase impact and influence
	Have frank discussions about water rights and their implications for the City	Additional staff time and costs; potentially negative public perceptions
	Approach the Dolores Soil Conservation District to determine if they would be willing to partner with the City	Additional staff time; many voices provide alternative ideas and extra clout
	Form a working group for advocacy	Additional staff time; ; many voices provide alternative ideas and extra clout
Other		
	Make sure that long term planning, like the Comprehensive Plan, includes diversification of economies and growth	Additional staff time for planning and execution

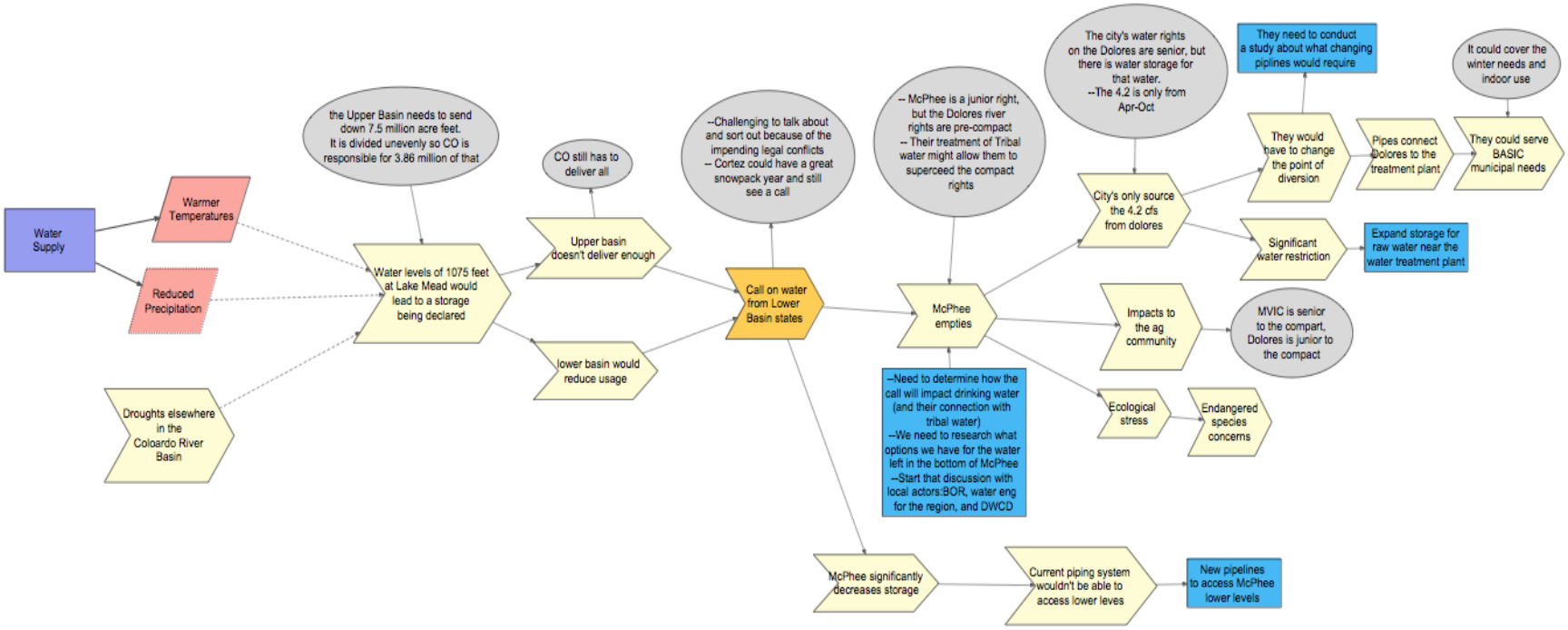
	The Department of Parks and Recreation could lead by example, decreasing water use before businesses and residents are asked to cut back	Additional staff time and costs; could improve public relations image

Appendix 2: Complete diagram from Scenario 1



Scenario 2: A Compact Call on the Colorado River

Figure 9: Reduced Water Supply
Figure 10: Water Treatment Concern
Figure 11: Water Conservancy: Residential
Figure 13: Water Conservancy: Irrigation on City Properties
Figure 14: Water Conservancy: Decline Town Esthetics
Figure 15: Increase in Wildfires
Figure 16: Impact to Agricultural Community


Water Supply
Warmer Temperatures
Reduced Precipitation
Droughts elsewhere in the Coloardo River Basin
the Upper Basin needs to send down 7.5 million acre feet. It is divided unevenly so CO is responsible for 3.86 million of that
Water levels of 1075 feet at Lake Mead would lead to a storage being declared
CO still has to deliver all
Upper basin doesn't deliver enough
lower basin would reduce usage
--Challenging to talk about and sort out because of the impending legal conflicts -- Cortez could have a great snowpack year and still see a call
Call on water from Lower Basin states
-- McPhee is a junior right, but the Dolores river rights are pre-compact -- Their treatment of Tribal water might allow them to superceed the compact rights
McPhee empties
--Need to determine how the call will impact drinking water (and their connection with tribal water) --We need to research what options we have for the water left in the bottom of McPhee --Start that discussion with local actors:BOR, water eng for the region, and DWCD
McPhee significantly decreases storage
Current piping system wouldn't be able to access lower leves
New pipelines to access McPhee lower levels
The city's water rights on the Dolores are senior, but there is water storage for that water. --The 4.2 is only from Apr-Oct
City's only source the 4.2 cfs from dolores
They need to conduct a study about what changing piplines would require
They would have to change the point of diversion
Pipes connect Dolores to the treatment plant
It could cover the winter needs and indoor use
They could serve BASIC municipal needs
Significant water restriction
Expand storage for raw water near the water treatment plant
Impacts to the ag community
MVIC is senior to the compart, Dolores is junior to the compact
Ecological stress
Endangered species concerns

Appendix 3: Workshop Agenda

VCAPS Fall Pilot Project 2018
Workshop Overview & Agenda

City of Cortez
October 2-3, 2018

About the City of Cortez

The City of Cortez is the county seat of Montezuma County, Colorado, with a population of approximately 8,709 (US Census Bureau). The region experiences drought on a cyclical basis, has been in a drought for a number of years, and currently is enduring a severe drought that has led to irrigation water being shut off in August. The City is currently updating its conservation plan and is starting to draft a drought contingency plan, and the VCAPS process may influence and support these projects.

About Western Water Assessment and VCAPS

Western Water Assessment (WWA) is a research group based at the University of Colorado Boulder that supports decision-makers in the Rocky Mountain West to make the best use of science to manage for climate impacts. WWA is partnering with communities across the Rocky Mountain West to pilot the Vulnerability, Consequences, and Adaptation Planning Scenarios (VCAPS) project. VCAPS is a facilitated workshop designed to support municipalities in building resilience to weather and climate change. During VCAPS, cities examine a local weather—or climate—related hazard of concern, analyze existing and anticipated community impacts of that hazard, identify gaps in knowledge, and brainstorm strategic short- and long-term solutions for hazard mitigation and adaptation. While VCAPS is designed as a stand-alone exercise, many communities have used VCAPS as part of a larger community-led adaptation planning process, including initiating dialogue, developing or updating a new local plan, and identifying areas to seek further funding or implementation.

Workshop Goals and Objectives

Through the VCAPS process, the City of Cortez aims to:

1. **Raise awareness** and **build expertise** among city staff of regional climate trends and future climate scenarios;
2. Establish a **common understanding** of the anticipated impacts of climate change on city operations, with respect to water supply;
3. **Take inventory** of current initiatives, concerns, and challenges associated with water supply; and
4. **Identify options** for adapting city operations to mitigate risks associated with drought, in light of scientific uncertainty.

Anticipated Participants

Workshop participants: 12 city staff and members of the Planning Commission and City Council.

Workshop facilitation team: 4 staff and scientists from Western Water Assessment

Workshop Agenda

October 2-3, 2018

City of Cortez Service Center
110 W. Progress Circle
Cortez, CO 81321

Note: Participation is required for the entire duration of the workshop.

DAY 1 Afternoon Session 1:00-5:00pm	**DAY 2** Morning Session 8:00am-12:00pm
1:00-1:30pm *Introductions, Workshop Goals, VCAPS Overview* 1:30-2:00pm *Presentation on Local Weather and Climate Impacts* 2:00-2:20pm *Q&A on Weather and Climate Impacts* **2:20-2:30pm *Break*** 2:30-2:45pm *Overview of VCAPS Diagramming, Ground Rules* 2:45-3:50pm *Scenario 1: How does drought impact Cortez?* **3:50-4:00pm *Break*** 4:00-4:45pm *Scenario 1: What actions can be taken?* 4:45-5:00pm *Wrap-Up, Set Day 2 Agenda*	8:00-8:15am *Review of Scenario 1 Diagram* 8:15-9:00am *Complete Scenario 1 Diagram. Which actions are more feasible?* **9:00-9:10am *Break*** 9:10-10:10am *Scenario 2: How does a more severe drought impact Cortez?* **10:10-10:20am *Break*** 10:20-11:10am *Scenario 2: What actions can be taken?* 11:10-11:30am *Review Scenario 2 Diagram. Which actions are more feasible?* 11:30am-12:00pm *Reflections, Wrap-Up*