

To: The Colorado Water Conservation Board of Directors

From: Ken Ransford, 970-927-1200, [kenransford@comcast.net](mailto:kenransford@comcast.net)

Date: September 15, 2015

Re: Ken Ransford's comments on Colorado's Water Plan

The Colorado River Basin Roundtable identified the six themes below in its basin implementation plan, and these are reproduced on page 51 of Colorado's Water Plan.

- I. Protect and restore healthy streams, rivers, lakes and riparian areas
- II. Sustain agriculture
- III. Secure safe drinking water
- IV. Develop local water conscious land use strategies
- V. Assure dependable basin administration
- VI. Encourage a high level of basin wide conservation

My personal comments below are organized according to these 6 themes. I have been the recorder at Colorado Basin roundtable meetings since 2005, and the voting recreation representative since 2010. I conclude with a list of six issues that Colorado's Water Plan has failed to address.

I. **Protect and restore healthy streams, rivers, lakes and riparian areas**

1. **How will climate change affect Colorado?** Your table summarizing the effect that climate change will have on Colorado is excellent; Table 4-1 on page 66. Please follow up with a table that indicates how much that Colorado's irrigated acreage will decline if temperatures increase 2.5° or 5° F and crop consumption needs increase 10% to 25%. Similarly, how much additional water will be required to keep bluegrass and other exotic shrubs adequately watered with hotter temperatures.
2. **"Keeping a stream flowing can be beneficial for aquatic life."** This statement on page 89 comes across as trite. At a minimum, this should be changed to read, "keeping a stream flowing is *essential* for aquatic life." On page 88, the plan states that 13,500 stream miles are "focus areas" for non-consumptive needs, only 15% of Colorado's estimated 90,000 miles of streams. All rivers are important. The plan repeatedly refers to preserving endangered or imperiled fish species (see page 108), but there is so much more to a healthy river than the triage needed to keep endangered or threatened species on life support.
3. **If we could leave as much water as possible in the stream, how would we do it?** Colorado's Water Plan does not ask this question, but I believe the public is interested in this question. When SGM Engineering, the author of the Colorado Basin Implementation Plan, asked the open-

ended question “What approaches do you favor to meeting future water needs,” environmental conservation was the most common response offered by the public.<sup>1</sup>

4. **The Colorado Basin says “All basins should make protecting streams a priority”** (Section 6.2, page 143). On page 140, the Arkansas Basin fails to mention improving stream flows in its nine environmental and recreation goals; in fact, improving stream flows is rarely mentioned in Colorado’s Water Plan. When it is, it is typically in the context of instream flows that have an established priority right. A stream in Colorado has no right to a healthy flow.

Colorado’s Water Plan says that Colorado will use its litigation fund to oppose any efforts by federal agencies to require bypass flows in order to maintain stream health unless it is for an instream flow with a correspondingly junior priority date (section 9.1, page 325). I believe this is a bad state policy.

5. **Why are Arkansas rafting flows are at risk?** Please explain the Arkansas Basin’s concern that recreation rafting flows on the Arkansas River may be at risk in Section 3 on page 38, and what could be done to protect these rafting flows.
6. **Provide more analysis of instream flows.** Colorado’s Water Plan describes how many instream flows there are (1,595 decreed instream flow rights on 9,180 river miles, Section 9.3, page 344) but it does not describe how effective they are when river flows are low. I added up the total acre feet of all instream flows that have a priority date before 1900, and they total to about 0.3% of the water diverted for agriculture in a typical year. Instream flows are not very meaningful since most valuable agricultural diversion rights have priority dates before 1900. As written, the plan can mislead readers that the instream flow program is more effective than it actually is in maintaining healthy stream flows.

At a minimum, the plan should be clear that instream flow rights are so junior they do not prevent rivers from being dewatered. This also raises a fundamental weakness in “Colorado’s Water Plan.” It has been written by the agency charged with managing many aspects of state water policy. As such, it tends to gloss over any flaws or weaknesses the agency has as opposed to being candid about them.

7. **Explain new dams in Colorado’s water future.** Colorado’s Water Plan never directly states whether any new dams should be built or enlarged, but it refers to them throughout the plan. Table 4.4 on page 74 suggests that there is space for 1.7 to 4.2 million additional acre feet in existing dams that store 500 acre feet or more. Does this suggest we do not need any new dams? Table 6.2-3 on page 128 suggests there’s 780,000 acre feet potential additional storage. Does this suggest we need new dams? If so, where? The IBCC has identified 9 potential new storage sites (Section 6.5 on page 231), but where are they?

The CWCB sets water policy and planning in the state (Section 2.4, pages 25, 27), and the plan should include a list of all dams in the state that have been identified for construction, expansion, or rehabilitation in the BIPs. That is the true essence of the statewide water plan. The

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<sup>1</sup> Colorado Basin Implementation Plan, SGM, July 1, 2014 draft, page 18; April 17, 2015 draft pages 38-39.

state has also estimated it will cost \$20 billion to bring the state's water infrastructure, including dams, to a satisfactory level; Section 9.2, page 332. There should be a list of projects that add up to \$20 billion.

## II. Sustain agriculture

1. **Agricultural consumption should be referenced, not diversions.** Colorado's Water Plan states that agriculture *diverts* 34% of water in Colorado; Section 5, page 87. This reference should instead be to how much water is *consumed* in Colorado by agriculture. The plan should also address that the water right we measure is the diversion right, but the water right we own is the consumption right. There is a lot of confusion about this. Irrigators regularly divert far more than their consumption right, in part because water court focuses on historic diversion records in water change cases.
2. **Irrigated acreage is overstated.** Colorado's Water Plan states that 3,466,000 acres are irrigated in Colorado, and that agriculture consumes 4.7 million acre feet.<sup>2</sup> The CDSS website and the USDA 2012 Ag Census both indicate we irrigate about 2.5 million acres in Colorado.<sup>3</sup> The higher figure of 3,466,000 overstates the amount of agriculture available to sustain Colorado's population and understates the percentage of agriculture we could lose with ag-dryup.

The Colorado Basin White Paper states that Colorado should adopt a policy of food security. The biologist Edward O. Wilson says an acre can grow enough food to sustain 3 people living a primarily vegetarian diet.<sup>4</sup> At that rate, 3,466,000 acres sustains a population of 10.5 million. This may be three times higher than the population that can be sustained by Colorado agriculture as indicated in the table below.<sup>56</sup>

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<sup>2</sup> Irrigated acreage is reported at Table 6.2-3, page 128, and crop consumption is in Section 5 on page 78.

<sup>3</sup> The CDSS website reports Colorado's 7 water divisions have 2,501,670 total irrigated acres, derived from GIS data; see <http://cdss.state.co.us/basins/Pages/SouthPlatte.aspx>. The USDA 2012 agricultural census reports that Colorado had 2,867,957 irrigated acres in 2007, and 2,516,785 irrigated acres in 2012. See, Irrigated farmland by county from the USDA Census of Agriculture, Table 10, Irrigation: 2012 and 2007, [http://www.agcensus.usda.gov/Publications/2012/Full\\_Report/Volume\\_1,\\_Chapter\\_2\\_County\\_Level/Colorado/st08\\_2\\_010\\_010.pdf](http://www.agcensus.usda.gov/Publications/2012/Full_Report/Volume_1,_Chapter_2_County_Level/Colorado/st08_2_010_010.pdf).

<sup>4</sup> The Future of Life, E. O. Wilson, (Knopf, 2002). See, How Many People Can Earth Support?, by Natalie Wolchover, Oct. 11, 2011, <http://www.livescience.com/16493-people-planet-earth-support.html>.

<sup>5</sup> Total acreage lost by 2050 in this table from unsustainable groundwater, IPPs, and urban sprawl is 635,000 acres. By comparison, SWSI 2010 estimates that 490,300 to 717,800 acres will be lost by 2050 depending on how large the gap is and how successful IPP implementation is. In the Republican Basin 35,000 acres have already been retired, leaving of 74000 acres to be withdrawn from production. This is rounded to ) SWSI 2010, Table 4-11, Future Irrigated Acres by River Basin, page 4-27, <http://cwcb.state.co.us/water-management/water-supply-planning/Documents/SWSI2010/SWSI2010.pdf>.

<sup>6</sup> Colorado Basin White Paper, page 7, 2013.

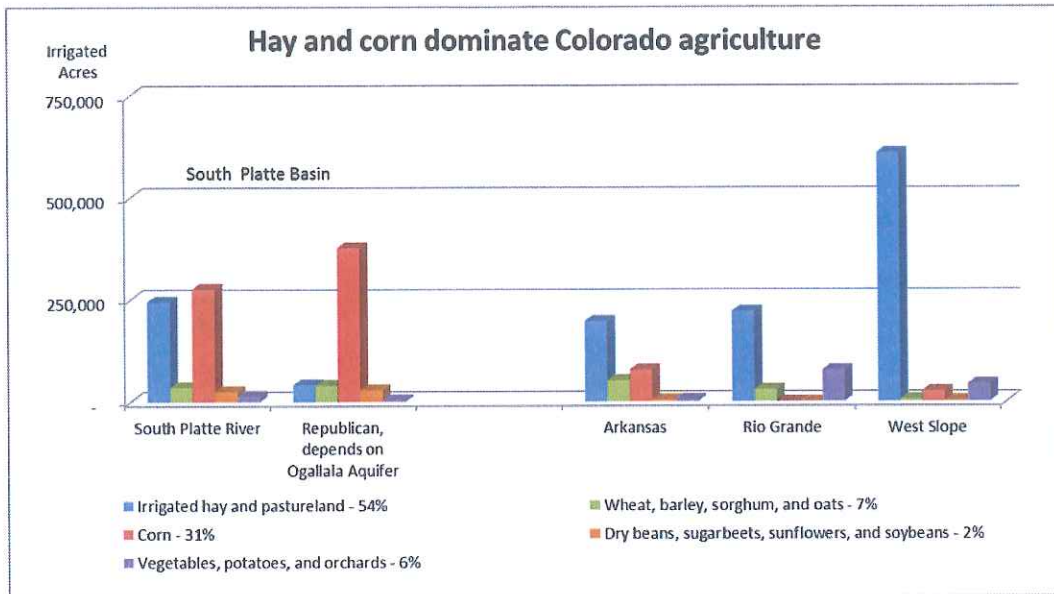
	Acres	Population sustained
Current irrigated acres according to CDSS & USDA 2012 Ag Census	2,500,000	7,500,000
Less: Dryup in Rio Grande (80,000 acres) and Republican Basin (75,000) from unsustainable groundwater	-155,000	
Less: Acres lost to ag dryup from 455,000 af of IPPs (assume 1.4 af yield per acre)	-325,000	
Less: Acres lost from urban sprawl onto agricultural land	-155,000	
Equals: remaining agricultural land	1,865,000	5,595,000
Less: 20% increased crop water requirements from hotter climate	-365,000	
Equals: remaining agricultural land by 2050	1,500,000	4,500,000
Lost acreage in Republican Basin due to Ogallala dry up	-375,000	
Equals: remaining agricultural land by 2080	1,125,000	3,375,000

3. **Describe Colorado agriculture.** We predominately grow hay and corn, and 69% of 2012 agriculture revenue came from livestock sales, predominately cattle, but Colorado's Water Plan does not describe agriculture this way.<sup>7</sup> Colorado's Water Plan also does not describe the wide range of crop water requirements between municipal bluegrass (30"), alfalfa (20-25"), pasture hay (17-20"), corn (12-15") and small vegetables (9-10").<sup>8</sup> The plan states there are barriers to entry to young farmers, but does not explain what these barriers are; section 6.5, page 237. Young farmers are likely interested in growing crops for human consumption like vegetables, potatoes, and orchards, and these crops are grown on only 6% of all irrigated acreage. One major impediment to Colorado agriculture is the high cost of water court, which inhibits transferring irrigation water from one farm to another. The plan could address this issue by discussing the failed Flex Plan legislation the past several sessions.

<sup>7</sup> This table is created by categorizing irrigated acreage by crop type by county. This graph is created from the USDA 2012 Agriculture Census. Pasture land is from Table 12, potatoes are from Table 1, and all remaining acreage is from Table 10,

[http://www.agcensus.usda.gov/Publications/2012/Full\\_Report/Volume\\_1\\_Chapter\\_2\\_County\\_Level/Colorado](http://www.agcensus.usda.gov/Publications/2012/Full_Report/Volume_1_Chapter_2_County_Level/Colorado).

<sup>8</sup> J. Schneekloth J, Andales, A., "Seasonal Water Needs and Opportunities for Limited Irrigation for Colorado Crops," CSU Extension, Sep 2009, <http://www.ext.colostate.edu/pubs/crops/04718.pdf>.



**4. Compare outdoor municipal landscape consumption with agriculture consumption.**

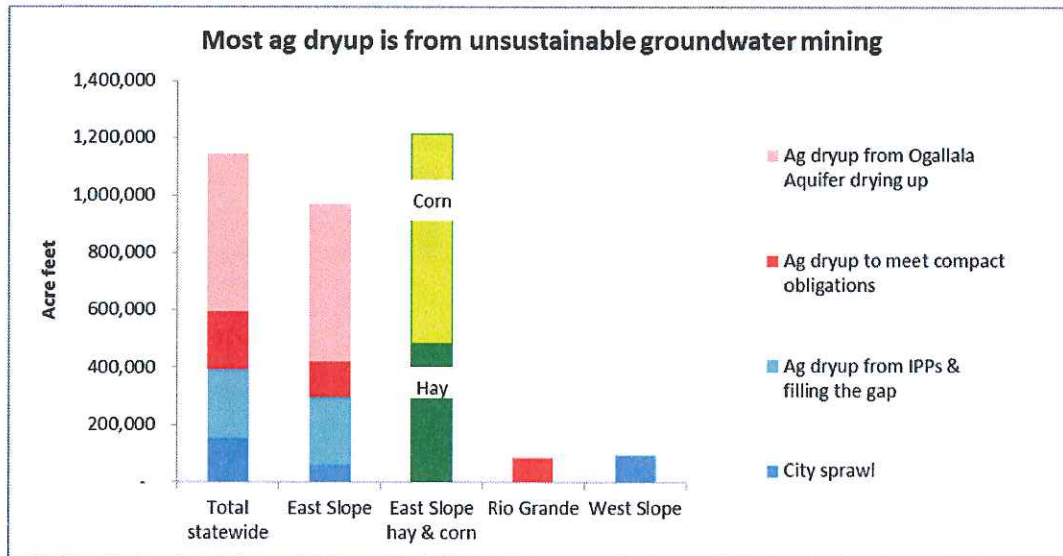
Colorado's Water Plan does not emphasize enough that indoor water use is largely available for reuse, but outdoor landscaping consumes water that is lost to the system. Each acre of blue grass dries up almost 2 acres of corn, since corn consumes 16" of water and bluegrass consumes about 30."

**5. Additional agricultural water needs will mislead readers.** Table 6.2-3 on page 128 suggests that there is an agricultural water gap of nearly 1.5 million acre feet, and that the basin implementation plans have identified 780,000 acre feet of additional storage opportunities. Where are these dam locations? Lake Mead and Powell combined storage in April 2015 was only 40% of capacity, the lowest since Lake Powell began filling in 1963, and the inescapable conclusion is that holding back more water in Colorado for agriculture is unrealistic. Table 6.2-3 on page 128 implies that we just have to build or enlarge more dams to solve this problem, but can we get 1.5 maf more water when we already over-use our allotment by 1 maf of unsustainable groundwater mining?

**6. South Platte and Arkansas irrigation water needs cannot be satisfied by the West slope.**

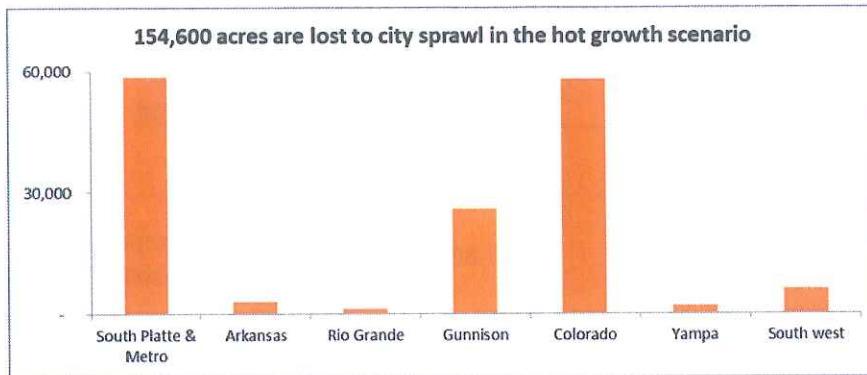
Ogallala aquifer groundwater pumping irrigates about 500,000 acres in the Republican Basin and 200,000 acres in the Arkansas Basin, and that is not sustainable. The plan does not mention this fact. Another 300,000 acres will be lost from Identified Projects and Processes that take water from agriculture or city sprawl on the East slope if the South Platte and Arkansas basins only strive for low conservation. This means the Front Range will likely lose about a million acres of hay and corn. According to the 2012 USDA Ag Census, there are 1,215,286 irrigated acres growing hay (483,816 acres) and corn (731,470 acres) in the South Platte and Arkansas basins. The good news is that corn and hay can be imported from adjacent states that receive more rainfall so that the Front Range's livestock and dairy industries, which account for 72% of

agricultural revenue earned on the Front Range, can continue to thrive. The West slope cannot solve this problem. The water plan needs a graph similar to the following to explain this relationship to Colorado citizens.



7. **Agriculture and recreation are ideal for multipurpose projects.** Recreation and agriculture can both benefit from irrigation efficiency improvements that divert less water from streams but apply it to fields more efficiently, and this could be emphasized more. Water consumption goes up when fields are sprinklered because water is delivered to plants more efficiently. Several legislative efforts have failed in recent years to improve recreational river access, or to permit irrigation efficiency improvements to leave instream flow savings in the stream, but Colorado’s Water Plan fails to mention any of these legislative efforts or why they have failed. Making irrigation practices more efficient is the single most important improvement that we can make to Colorado streams, particularly on the West Slope.
8. **Explain projected farm acreage lost to city sprawl.** Colorado’s Water Plan refers frequently to agriculture lost to city sprawl, but it does not summarize it for every basin like the graph below does.<sup>9</sup> Also, “sprawl” is a more descriptive term than “urbanization” which could refer to going to more plays or eating out more.

<sup>9</sup> SWSI 2010 estimates that 154,600 acres will be lost to urbanization, and these numbers were used to create the graph. See, SWSI 2010, Table 4-11, Future Irrigated Acres by River Basin, page 4-27 (So Platte includes 300 & 600 acres lost from Repub Basin), <http://cwcb.state.co.us/water-management/water-supply-planning/Documents/SWSI2010/SWSI2010.pdf>.



9. **Rio Grande “may” lose 80,000 acres;** Section 6.2 on page 133. If this dryup is certain, then “may” ought to be replaced with “must.” Colorado’s Water Plan says that 19 counties and 20% of the population rely on groundwater, but it does not state how much of this groundwater use is unsustainable; Section 4 on page 59.
10. **What is the Arkansas Basin’s “critical IPP.”** Please identify the critical IPP that the Arkansas BIP references on page 130 in Section 6.2. The Arkansas Basin ignores land use in its basin implementation plan (Section 6.3.3 on page 184). It should adopt a municipal gpcd target and outdoor landscaping water budgets (both of which are absent from municipal conservation tools described in Section 6.3.1 on page 166), and come up with a concrete land use plan that attempts to preserve agriculture and reduce municipal water consumption before embarking on a critical IPP.
11. **Explain Colorado’s water budget.** We now consume 5.4 million acre feet a year in Colorado, but 1 maf of this, nearly 20%, comes from unsustainable groundwater mining as indicated by Jeff Lukas (author of *Climate Change in Colorado*, CWCB 2014) in the table below. We are retiring 109,000 acres in the Republican River Basin and 80,000 acres in the Rio Grande Basin because we are not meeting Compact obligations, and the Front Range is mining the Denver Aquifer by about 30,000 acre feet per year. Colorado’s Water Plan describes the Ogallala Aquifer as “one of the largest water bodies in the United States,” but fails to emphasize that it is being unsustainably mined (pages 46-47). Scientists predict it could dry up within 75 years, and as soon as 25 years at current withdrawal rates in western Kansas and southeastern Colorado where it is shallow.<sup>10</sup>

<sup>10</sup> McGuire et al., “Water in Storage and Approaches to Ground Water Management, High Plains Aquifer,” USGS, Circular 1243, 2000.

Colorado's water balance	Million acre-feet	%	Explanation
Precipitation	95	100%	
Instant evapotranspiration	-80	-84%	Hotter temperatures will exacerbate this
Equals: Amount left on surface	15	16%	This ends up in rivers
Less: Water owed to other states in interstate compacts	-10.6	-11%	
Equals: Amount left for Colorado	4.4	5%	
Less: Water consumed in Colorado	5.4	6%	
Equals: Deficit	-1.0	-1%	Groundwater mining supplies this

### III. Secure safe drinking water

1. **Low flows are the problem.** Colorado's Water Plan correctly states that "Lower streamflows could lead to increasing concentrations of pollutants" in Table 4.1 on page 66. However, it never suggests that increasing stream flows is a solution, despite using the word "flow" 467 times in the plan. The Water Quality Control Commission is barred by statute from ever acquiring instream flows to improve water quality; Section 7.3, page 294. Colorado's Water Plan says the relationship between water quality and quantity is very complex on page 292, yet generally the solution is to add more water by increasing stream flows.
2. **The problem, again, is Colorado water law.** The Water Quality Control Commission must consult with the CWCB before taking any action that could cause material injury to water rights. Section 7.3, page 297. This puts 19<sup>th</sup> century water rights ahead of municipal drinking water. British Columbia recently overhauled its 105-year water law by passing the Water Sustainability Act, and it permits the water minister to curtail diversions if necessary to meet critical environmental flow thresholds.<sup>11</sup> There is no comparable curtailment authority in Colorado.

### IV. Develop local water conscious land use strategies

1. **Discuss sustainable growth.** Colorado's Water Plan opens with the statement that people love Colorado, as evidenced by the state's population growth from 1 million in 1930 to 5 million in 2005. At that rate of growth (2.2% per year), Colorado will have 28 million people in 2090. Our

<sup>11</sup> Water Sustainability Act, Section 88, available online at <http://engage.gov.bc.ca/watersustainabilityact/>.



population growth rate will be 1.7% per year if we grow to 10 million people by 2050 under the Hot Growth Scenario. Colorado's Water Plan claims that this growth is inevitable in Section 5 on page 80. Failing to address what population is sustainable while blithely stating that growth is inevitable is irresponsible.

On page 79 the plan states half the population growth is due to residents born in Colorado. The US Census Bureau projects that US indigenous population growth (births minus deaths) is 0.5% of the population in 2015, dropping steadily to 0.2% by 2060. If Colorado grows at the same indigenous growth rate, our population would be 6.2 million in 2060, and 6.8 million in 2100, compared to 5.4 million in 2015. If we grow to 10 million in 2050, the Hot Growth scenario, it turns out that only 14% is indigenous growth. The rest is from 3.9 million people moving here.<sup>12</sup>

2. **Planning for the Hot Growth Scenario is not realistic.** Colorado's Water Plan says that we should prepare for all 5 scenarios in Section 6.1 on page 100, including the Hot Growth scenario which has the highest water demands and least municipal conservation. The Colorado Basin Roundtable's six themes can only be achieved under the Adaptive Innovation scenario. The plan should delete the sentence at the bottom of page 100, "The challenge is not to pick the most likely or attractive future; rather, it is to develop the capacity to develop for all of them."
3. **SSI growth ought to address renewable energy.** The plan's increased SSI demand by 2050 of 50,000 to 130,000 af on page 86 is likely too high for two reasons: (1) it includes 40,000 af for oil shale development in the Yampa Basin, and (2) per capita water demands for thermoelectric power generation will increase 12% from 11.4 gpcd to 12.8 gpcd.<sup>13</sup> This is counter to the nation's plan to reduce carbon emissions by 30% by 2030 from 2005 levels. The plan should indicate how the SSI figures for power generation were derived, and what percentage of Colorado's electricity demand is expected to come from renewable energy sources in 2035 or 2050.
4. **Is local control an excuse to not conserve water?** Under 50% of Colorado cities have impact fees; page 24. The low conservation strategy anticipates that only 10% of utilities will have water budget-based water rates, only 5% of utilities will charge conservation-oriented tap fees, and less than 50% of cities and counties will have conservation-oriented plumbing and building codes in 2050; table 5-2 on page 83. The medium conservation targets are not much better. Given the Colorado River Basin's anticipated population growth, increasing temperatures, and expected 3.2 million acre foot decline in Colorado River supplies, the low conservation targets are shocking.

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<sup>12</sup> US Census Bureau 2012 National Population Projections: Summary Tables, Table 1. Projections of the Population and Components of Change for the United States: 2015 to 2060 (NP2012-T1), <https://www.census.gov/population/projections/data/national/2012/summarytables.html>.

<sup>13</sup> CWP tracks SWSI 2010 which projects that SSI needs increase from 187,760 af in 2008 to 322,090 af in 2050 under the high growth scenario. This includes 41,800 af for oil shale development in the Yampa Basin, which is looking less likely. Total acre feet needed for thermoelectric power generation increases from 64,500 af (11.4 gpcd, based on 2008 population of 5.05 million) to 143,000 af (12.8 gpcd, assuming 10 million 2050 population). SWSI 2010, Table 4-8, Summary of Self-Supplied Industry Demands by basin, page 4-16, <http://cwcb.state.co.us/water-management/water-supply-planning/Documents/SWSI2010/SWSI2010.pdf>.

The plan could address why it has been so hard to reach consensus in Colorado to practice more aggressive municipal conservation. The common explanation—concern for local control—is unsatisfactory. Colorado’s Water Plan states that municipal conservation is the cheapest water available (Section 6.3.1 on page 159), and that higher levels of conservation will require broad political and public support (page 169), but it offers no recommendations about how to obtain that political support.

Karen Raucher of Stratus Consulting emphasized that utilities are likely the best source of information about water conservation and climate change at the January 2015 Water Congress convention. By deferring to “local control,” the CWCB has abdicated its leadership role. Could it be that “local control” is a euphemism masking agriculture’s fear that any limits on municipal water use will reduce demand for irrigation water, thus reducing its value for farmers who want to “sell and dry?”

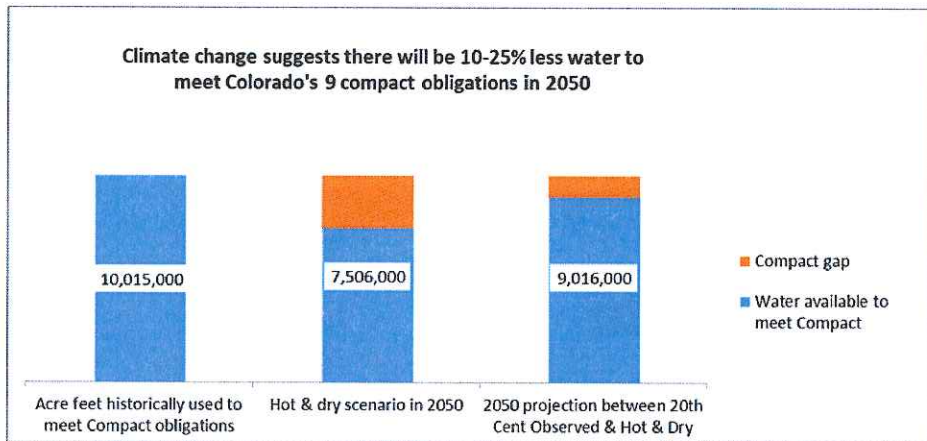
5. **Provide a model water-smart land use code.** As a member of the Roaring Fork Planning Commission, Eagle County’s planning and zoning board, I recently reviewed and suggested edits to Eagle County’s land use code for water use in development applications. Eagle County’s draft ordinance had minimal references to water-smart fixtures, xeriscape plant water requirements, bluegrass turf areas, or water budgets.<sup>14</sup> The CWCB could greatly aid the state by providing a model land use code, especially for smaller planning departments in rural Colorado.
6. **Population growth is causing groundwater reliance.** Colorado’s Water Plan states in Section 3 on page 45, “*The lack of new major water storage in recent decades . . . has led to reliance on nonrenewable groundwater in Douglas and Arapahoe Counties (emphasis added).*” I recommend that you delete this sentence. I believe that groundwater reliance results from runaway population growth and Colorado law that permits it to occur (Nevada law forbids groundwater mining). Douglas County has led the nation in population growth for much of the last 30 years, growing 8.4% per year from 25,153 to 285,465 residents from 1980 to 2010.
7. **The South Platte and Arkansas Roundtables recommend Low to Medium Conservation** but the Colorado, Gunnison, and Southwest roundtables all recommend that the state adopt high municipal conservation; Section 6.3.3 on pages 184-188. The plan positions the South Platte/Metro roundtable as the statewide leader in conservation in Section 6.3.1 on page 168, but when it comes to integrating land and water planning, the South Platte/Metro roundtables meekly suggest on page 187 that this deserves further study (even though 92% of the participants at a 2013 joint Front Range roundtable meeting said land and water planning should be coordinated; see page 182). The Arkansas roundtable basin implementation plan all but ignores land use; page 184. It is misleading to imply the South Platte/Metro roundtables are leaders in municipal conservation. The Colorado, Gunnison, and Southwest roundtables are the leaders because they are the only ones recommending high municipal conservation going forward in their basin implementation plans.

8. **Building in the wildland urban interface is not addressed.** The plan discusses forest health and the risk of post-fire erosion in Section 7 on page 281, but it does not address the risk of building in the WUI. Two of the country's most expensive fires have occurred in the past 5 years in Black Forest and Waldo Canyon near Colorado Springs, and today we are rebuilding the homes that burned in the WUI there on the same lots. The map on page 282 indicating the risk of post-fire erosion is coincidentally describing the region where WUI development is greatest, but Colorado's Water Plan ignores building in the WUI.

V. **Assure dependable basin administration**

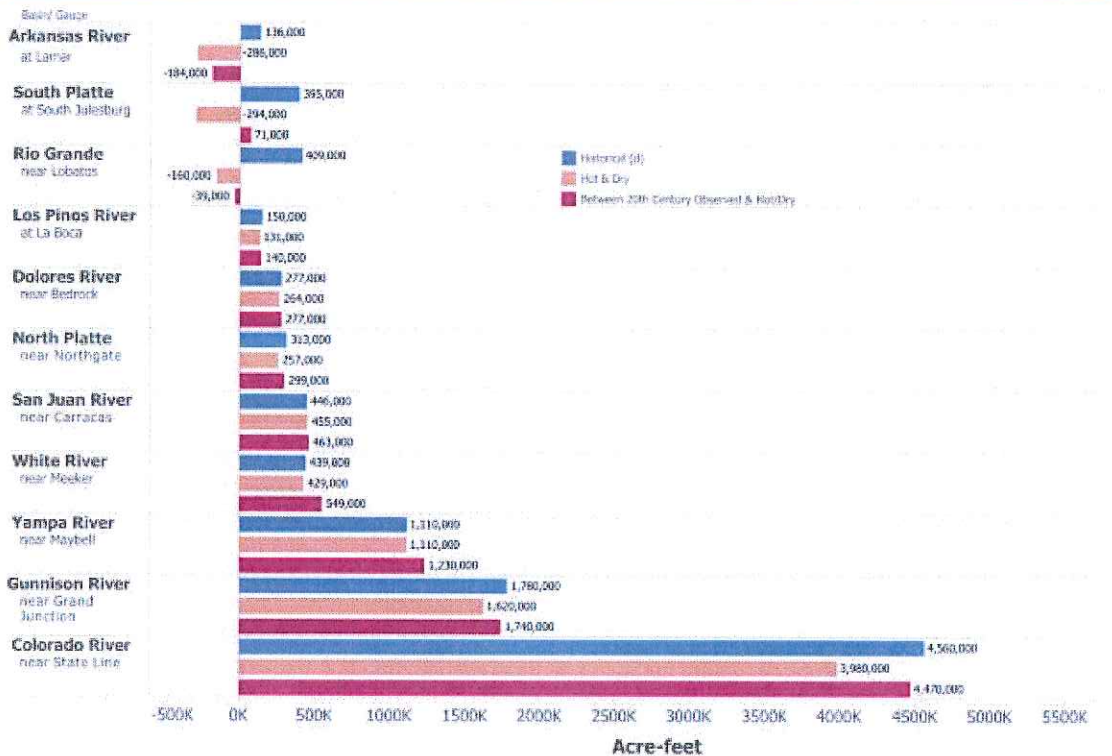
1. **The Shoshone Call is a matter of statewide not regional concern.** This and the Cameo call are crucial to maintaining the health of the Colorado River and the communities that depend on it. The plan mentions the Shoshone Call on in Section 3 page 51, but describes it in provincial terms: "the Shoshone Hydroelectric Plant [is] identified as crucial to meeting the [Basin's] fifth theme." We believe these two water rights have statewide implications, both to protect West Slope stream health, and also because so many Colorado residents recreate on the West Slope.
2. **What is the risk of a Compact Call?** Colorado's Water Plan states in Section 4 on page 71 that dust on snow events could reduce Colorado River runoff by 5%; if so, how much less water will be available for development by Upper Basin States and Colorado? The plan does not address the risk of further developing water in the Colorado River basin.
3. **Comment on how fast other Colorado River Basin states growing.** In Appendix B, you state how other basin states are working to meet their gap. Demographers predict that 70 million people will rely on the Colorado River by mid-century, up from nearly 40 million today. Five of the seven fastest growing states over the past 70 years are in the Colorado River Basin: Nevada (1<sup>st</sup> fastest growing at 4.7% per year), Arizona (second fastest, 3.7%), California (fifth fastest, 2.4%), Utah (sixth fastest, 2.3%), and Colorado (seventh fastest, 2.2%). New Mexico is the tenth fastest growing state, at 2% per year. It will become harder than ever to evade a Compact Call in the face of this growth.
4. **West Slope agriculture will bear a Compact Call.** The plan states in Section 8 on page 312 that California, Arizona, and Nevada have contributed \$2 million to a fund to operate pilot projects to reduce agricultural water consumption. How does this impact western Colorado? Colorado's Water Plan does not explain how the water bank will be administered or what farmers can participate. Will the water bank be operated to favor streams that have the most depleted flows in order to generate the greatest environmental benefit?
5. **The graph of projected 2050 depleted flows in figure 4-10 needs a summary table.** This is a very important graph, but it fails to highlight that there will be 10-25% less water available to meet the state's 9 compact obligations by 2050 as the following graph does.

This graph should be added to Colorado's Water Plan:



The existing graph on page 70 in Colorado's Water Plan is shown below. It obscures the pending shortage, and it is hard to know what to glean from this graph. It also double-counts the Gunnison river, since it is counted in both the Gunnison and Colorado River totals.

**Figure 4-10: Projected Depleted Flows for 2050 (acre-feet per year)**



Projected depleted flows for 2050 in acre-feet per year at eleven different sites around the state using the aforementioned classifications of historical, hot and dry and between 20<sup>th</sup> century observed and hot and dry.

6. **Water law reform is understated in the plan.** Colorado's Water Plan states that there is little waste in agricultural water use and there is no incentive to divert more than crops can consume (Section 6.3.4, pages 193-194). It also states that prior appropriation is remarkably flexible (Section 9.1, page 325). These statements are hard to justify. Since 1993, CDSS diversion records indicate that the 12 largest ditches on the Crystal River have averaged nearly 62,000 acre feet diversions each year, nearly 23 acre feet for each of the 2,714 acres that are irrigated according to GIS records. On the Roaring Fork River, CDSS diversion records indicate that the 12 largest ditches have diverted nearly 115,000 acre feet annually on average, 44 acre-feet for each of the 2,625 irrigated acres identified in GIS mapping. In the Grand Valley, the two largest irrigation ditches divert 11 acre-feet per year to irrigate 42,000 agricultural acres and 27,000 urban acres. Yet, agricultural consumption is typically only about 2 acre-feet per year and blue grass consumption slightly higher at 2.5 acre feet per year.

At the Colorado Basin roundtable meeting on June 22, 2015, engineer Seth Mason was asked, "How important is the perception by Crystal River irrigators that if they don't divert all the water they can they will lose it?" He simply answered, "Tons." In a recent Pro Publica series on the Colorado River, Jim Lochhead said, "I would abolish Colorado water rights law and start all over again with a clean slate."<sup>15</sup> Colorado water law is high maintenance. The Colorado Basin Roundtable has identified water law reform as crucial to efficient and dependable basin administration. Colorado's Water Plan skirts this important issue.

7. **Concern with reforming the permitting process.** Colorado's Water Plan proposes to speed up the permitting time for new projects such as the Moffat or Windy Gap firming projects by having the CDPHE and DNR endorse a project before the Final Environmental Impact Statement or Record of Decision are released; Figure 9.4-2, page 364. Many Colorado Basin Roundtable members are likewise concerned about the lengthy and high cost of permitting. However, having the state endorse a project before the EIS and ROD are released will further politicize what is already a very political process.

Lane Wyatt of the Northwest Colorado Council of Governments recommends an alternative way to speed up the process, called *frontloading*, where all stakeholders meet and describe their concerns and objectives as soon as a project is proposed. In my opinion, much permitting delay results from parties trying to limit the scope of environmental review so that certain stakeholder concerns are kept off the table. An example of this is the South Platte/Metro roundtables' recommendation that lower gpcd targets should only be considered a "demand reducer" rather than a "least damaging alternative" (Table 9.4-3, page 371, discussed further below).

8. **How effective is cloud-seeding?** The plan references cloud-seeding on in Chapter 4 on page 75, but a recent University of Wyoming study conducted in the Medicine Bow Mountains just north

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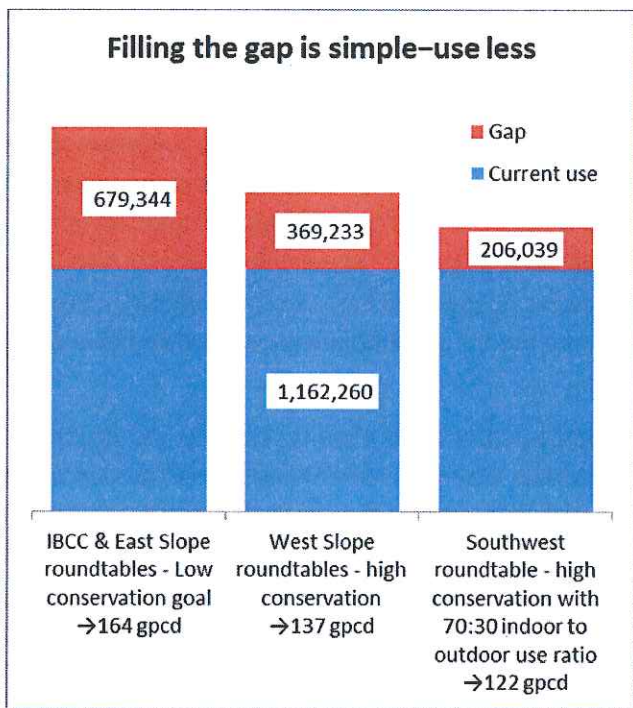
<sup>15</sup> Lustgarten, Abrahm, "Use It or Lose It," ProPublica, June 8, 2015, <https://projects.propublica.org/killing-the-colorado/story/wasting-water-out-west-use-it-or-lose-it>.

of Colorado suggests runoff barely increased from 0.4% to 3.7%.<sup>16</sup> The reader may get the mistaken impression that cloud-seeding will solve Colorado’s water problems.

9. **The Conceptual Framework is not an agreement.** In many places Colorado’s Water Plan refers to the Conceptual Framework as a “conceptual agreement.” It should be referenced throughout the plan as a Conceptual Framework.

VI. **Encourage a high level of basin wide conservation**

1. **What effect would the Southwest roundtable’s 70:30 conservation target have?** The Southwest roundtable recommends that only 30% of water used in new real estate development can be used outdoors, with 70% used indoors. Colorado’s Water Plan mentions this in several locations (pages 122, 136, 170, 188, page 13 of the July 1, 2014, IBCC Conceptual Agreement draft in Appendix D). If the state adopted this policy, how much would it lower future demand? The graph below attempts to explain this relationship, based on statewide conservation targets. The gap is directly related to how much water Colorado residents use.



2. **What is breakeven gpcd?** If we decided to minimize agricultural dryup and agreed there was no more water available to divert from streams, what gpcd target would citizens have to meet? I estimate 120 gpcd, significantly less than the 205 gpcd we used in 2008 as reported in SWSI

<sup>16</sup> Study: Cloud seeding increased snowfall, AZ Central, Channel 12, December 11, 2014, <http://www.azcentral.com/story/news/local/arizona/2014/12/10/study-cloud-seeding-increased-snowfall/20229349/>.

2010<sup>17</sup> It is also 22% lower than Denver Water's projected 129 gpcd by 2050 (Table 6.3 1-2, page 169), since Denver Water is not including SSI demand of 25 gpcd in its gpcd target (increasing total daily citizen per capita use to 154 gpcd). It appears the South Platte/Metro basin is encouraging universal use of gpcd numbers since it suggests "further standardization of the term 'per capita water use' " on page 169. This would help us adopt statewide indoor and outdoor gpcd targets by 2035 and 2050.

Western Resource Advocates recommends a 1% reduction per year in municipal water use between 2010 and 2050, which would reduce per capita water use from 205 gpcd to 123 gpcd over 40 years.<sup>18</sup> Denver has been on this downward trajectory since the 2002 drought. The plan fails to discuss the 1% per year reduction recommended in *Filling the Gap* in the municipal conservation actions recommended on pages 171. Albuquerque residents now use 135 gpcd.<sup>19</sup>

3. **Is active conservation borne by existing residents or only future residents?** It is unclear whether the active conservation savings described in Table 5-1 on Page 82 come from current or future residents. Are current residents expected to use less water?
4. **Demand management should not be a tool of last resort.** Colorado's Water Plan claims that demand management, a confusing term that masks a simple concept—using less water—should be the last tool out of the box (Section 9, page 327). In contrast, the Colorado Basin roundtable believes that a new transmountain diversion should be the last tool out of the box, and that efficiency, conservation and reuse should be exhausted before any additional transmountain diversions occur.<sup>20</sup>
5. **The South Platte/Metro roundtables say conservation should be a "demand reducer," rather than a "least damaging alternative"** (Section 9.4, page 371). This difference means that water gpcd use can only be used to estimate future demand (such as by stating that a project serving 25,000 people using 150 gpcd generates demand of 2,100 af, while 120 gpcd would require only 1,680 af). By implication, the South Platte/Metro roundtable claims that it is inappropriate to suggest that reducing water use to 120 gpcd is a less damaging alternative. This is further evidence of the South Platte/Metro roundtables' unwillingness to conserve.
6. **What is the clear and concise need for a projects bill?** The plan discusses several ways to fund a new projects bill in Chapter 9. The 416-page plan intimates the projects identified in the basin implementation plans will serve as the "clear and concise need" (Section 9, page 339). The plan lists 987 projects in the 8 river basins that cost a total of \$1.645 billion, an average of \$1.66

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<sup>17</sup> SWSI 2010 determined that 5,051,500 residents used 1,162,500 acre feet in 2008. This amounts to 205.4 gpcd:  $(205.4 \text{ gpcd} \times 5,051,500 \text{ pop} \times 365 \text{ days}) / (325,851 \text{ gals in af}) = 1,162,500 \text{ total 2008 water demand}$ . See, SWSI 2010, Table 4-9, Summary of M&I and SSI Demands for Each Basin and Statewide (AFY), page 4-17, <http://cwcb.state.co.us/water-management/water-supply-planning/Documents/SWSI2010/SWSI2010.pdf>

<sup>18</sup> *Filling the Gap*, Western Resource Advocates, 2011, page 24.

<sup>19</sup> Gallons per capita per day (gpcd) use is probably down close to 135, which is the goal the ABCWUA set in 2013 to reach by 2024; Fleck, John, "Total ABQ water use lowest in 30 years," Albuquerque Journal, January 11, 2014, <http://www.abqjournal.com/334881/news/albuquerques-total-water-use-in-2013-lowest-in-30-years.html/attachment/albuquerque-used-less-water-last-year#main>.

<sup>20</sup> Colorado Basin Whitepaper, 2013, page 6.

million each.<sup>21</sup> But this is only a fraction (8%) of the \$20 billion the plan says is needed for Colorado's water infrastructure in Section 9.2 on page 332. The plan does not compare the cost of building new projects with the cost of conservation, nor does it estimate the need for new projects under lower population growth or higher conservation scenarios. Until the questions asked here and by the Colorado Basin roundtable are addressed, it is premature to prepare or support a projects bill referendum for the public to vote upon.

#### **Conclusion - What Colorado's Water Plan does not address:**

1. What is the value of agriculture to our economy? How do we maximize it?
2. If Colorado had a policy of food sustainability, how many people can Colorado agriculture reasonably support today and under a future, dryer climate?
3. What is per capita gpcd use, and what is the breakeven gpcd necessary to attain the twin policy goals of keeping ag dryup to a minimum, and leaving as much water in streams as we can?
4. How effective are instream flows in low flow periods like the 2002 or 2012 droughts? What would it take to improve this?
5. If we had a policy to leave as much water in streams as possible, how would we do it?
6. What is the cost per acre foot of municipal conservation compared to new storage?

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<sup>21</sup> 513 municipal & industrial and agricultural projects (totaling \$892 million) are described in Section 6.5, pages 223-231, and 474 environmental projects totaling \$752 million are described in Section 6.6 on pages 257-263.