Colorado's Water Supply Future

Arkansas Basin Roundtable Meeting

Pueblo, CO

April 14, 2010

Presentation Overview

- CWCB Assistance with Basin Needs Assessments
- Agricultural Demands
  - Current agricultural acres
  - Current agricultural demands
  - Current agricultural shortages
  - Range of 2050 irrigated acres
  - Climate change affects on agricultural demands
- Preliminary M&I Gap Analysis

CWCB Assistance with Basin Needs Assessments

M&I Demands

- CWCB Staff have gathered comments on M&I Demands to 2050 report
- CWCB will respond to comments and revise report – available May/June 2010
- Report will be included as an appendix to statewide update of consumptive and nonconsumptive needs – November 2010

Nonconsumptive Focus Areas Mapping

- CWCB Staff have gathered feedback on report
- CWCB will respond to comments and revise report - available May/June 2010
- Report will be included as a section in the statewide update of consumptive and nonconsumptive needs – November 2010

Nonconsumptive Projects and Methods

- CWCB will examine past studies:
  - Existing studies and plans by "ISF recommending entities"
  - Watershed restoration plans and flood Decision Support System (DSS) for identified restoration projects
  - Other relevant restoration and quantification studies, plans, and processes
  - Other WSRA funded studies or Basin Roundtable studies
- Information will be summarized by focus area
- Results will be included in statewide update of consumptive and nonconsumptive needs – November 2010

Agricultural Shortages

- CWCB will update the agricultural shortages from SWSI 1
- CWCB will summarize results of Yampa WSRA study
- CWCB will review information with roundtables second quarter 2010
- Information will be included in statewide update – November 2010
- CWCB will also review the Alternative Agricultural Transfer Methods Grant Projects

Consumptive Gap Analysis

- CWCB will update M&I gap analysis from SWSI 1 using updated IPP database
- CWCB will update agricultural shortages statewide
- CWCB will review information with roundtables second quarter 2010
- Information will be included in report updating consumptive and nonconsumptive needs statewide – November 2010

Report Summarizing Needs Assessments (November 2010)

- CWCB will provide update of statewide consumptive and nonconsumptive needs based on recent reports and Basin Roundtable Needs Assessment efforts
- Target completion date of report is November 2010

Agricultural Demands

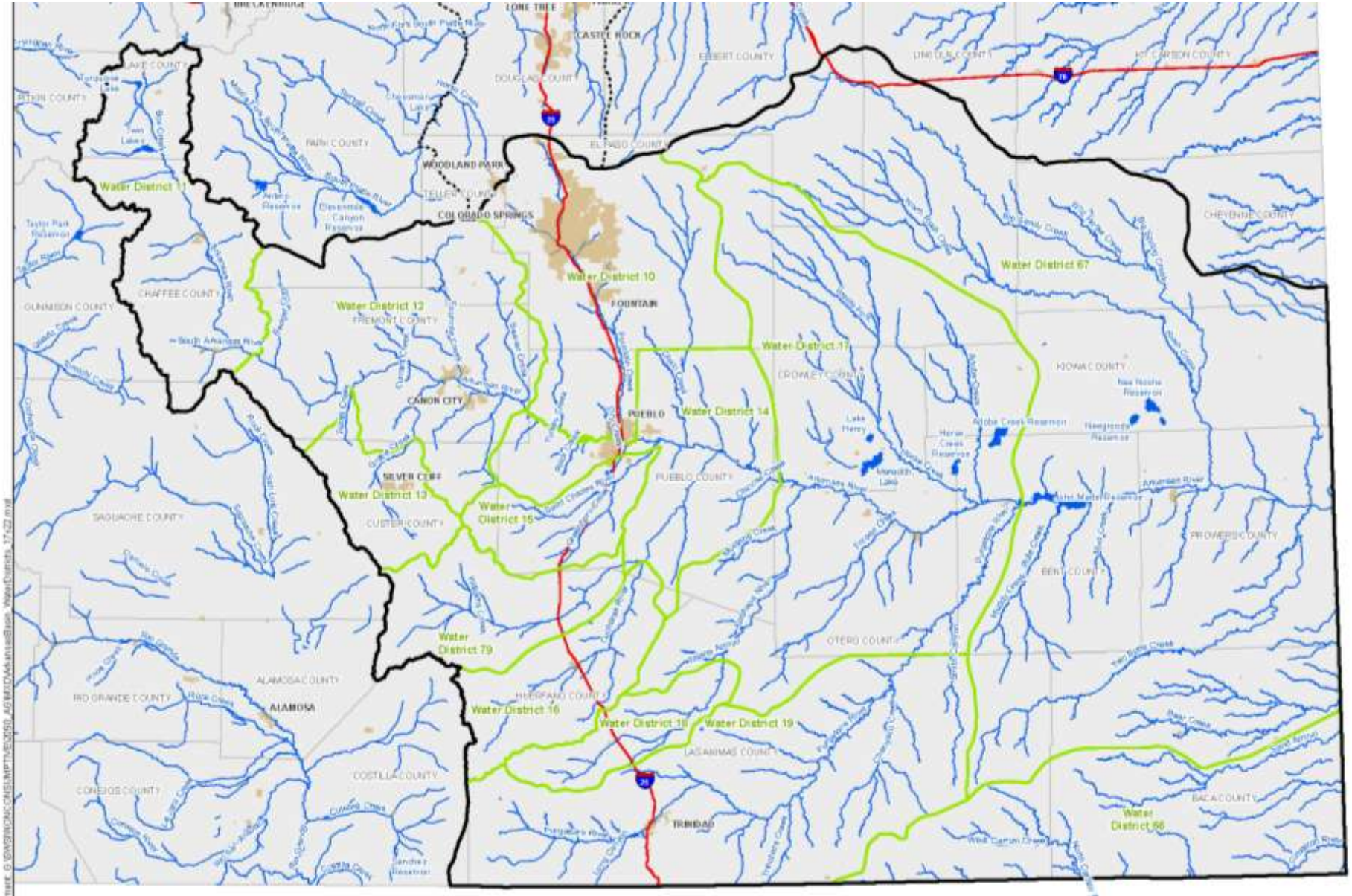
Suggested Approach – Future Demand and Supply without Climate Change

- Same approach as SWSI I – Adjust current demand recently developed for revised acreage
- Irrigation demand (IWR) proportional to acreage
- Non-irrigation demand proportional to acreage
- Shortage proportional to IWR

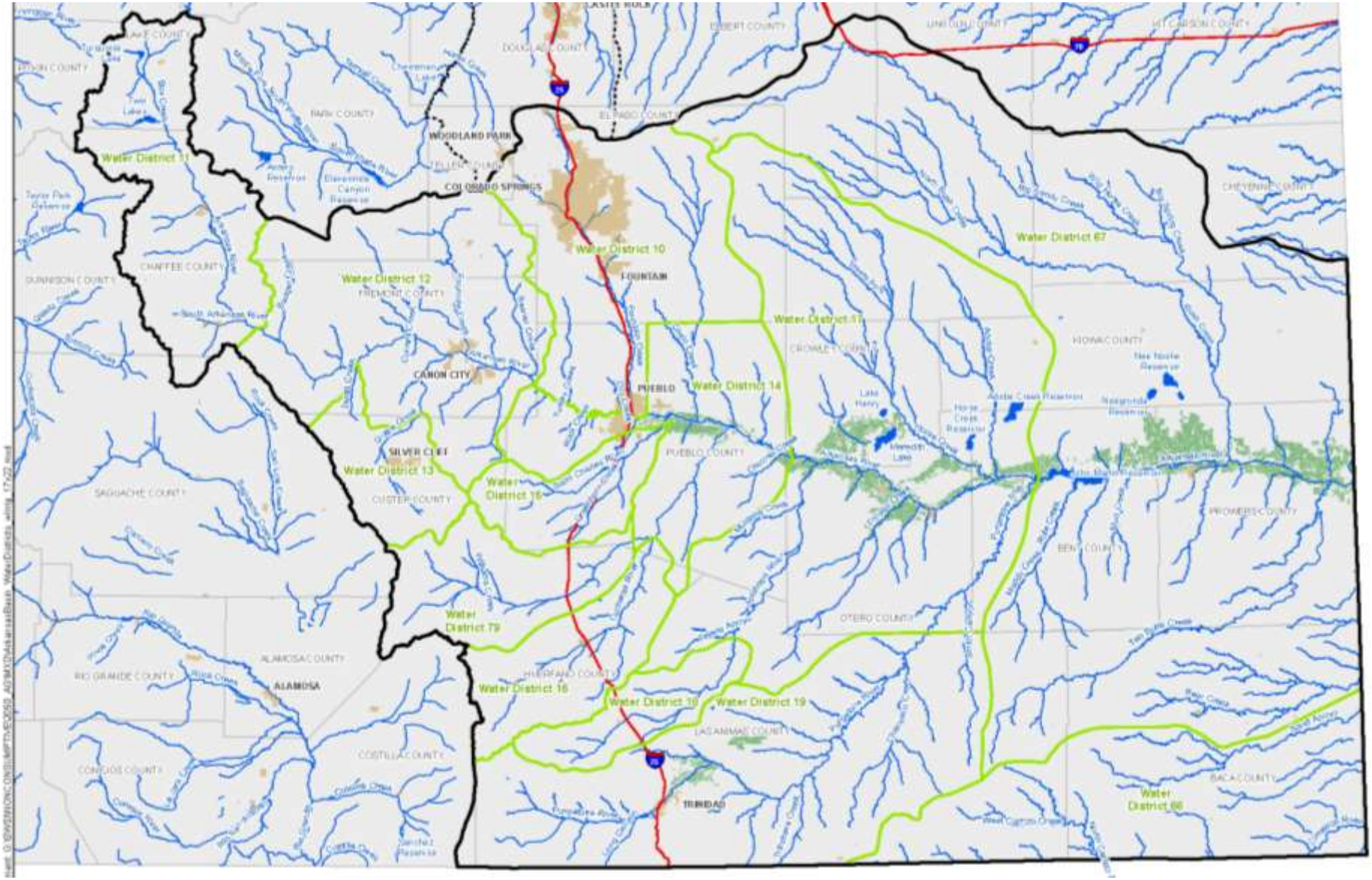
Suggested Approach – Future Demand and Supply with Climate Change

- Use CRWAS results in Colorado River basins
- Treat other basins (east slope) qualitatively
  - No downsized climate models from CRWAS for east slope
  - Front Range Study currently in draft form

Arkansas Basin Roundtable Water Districts



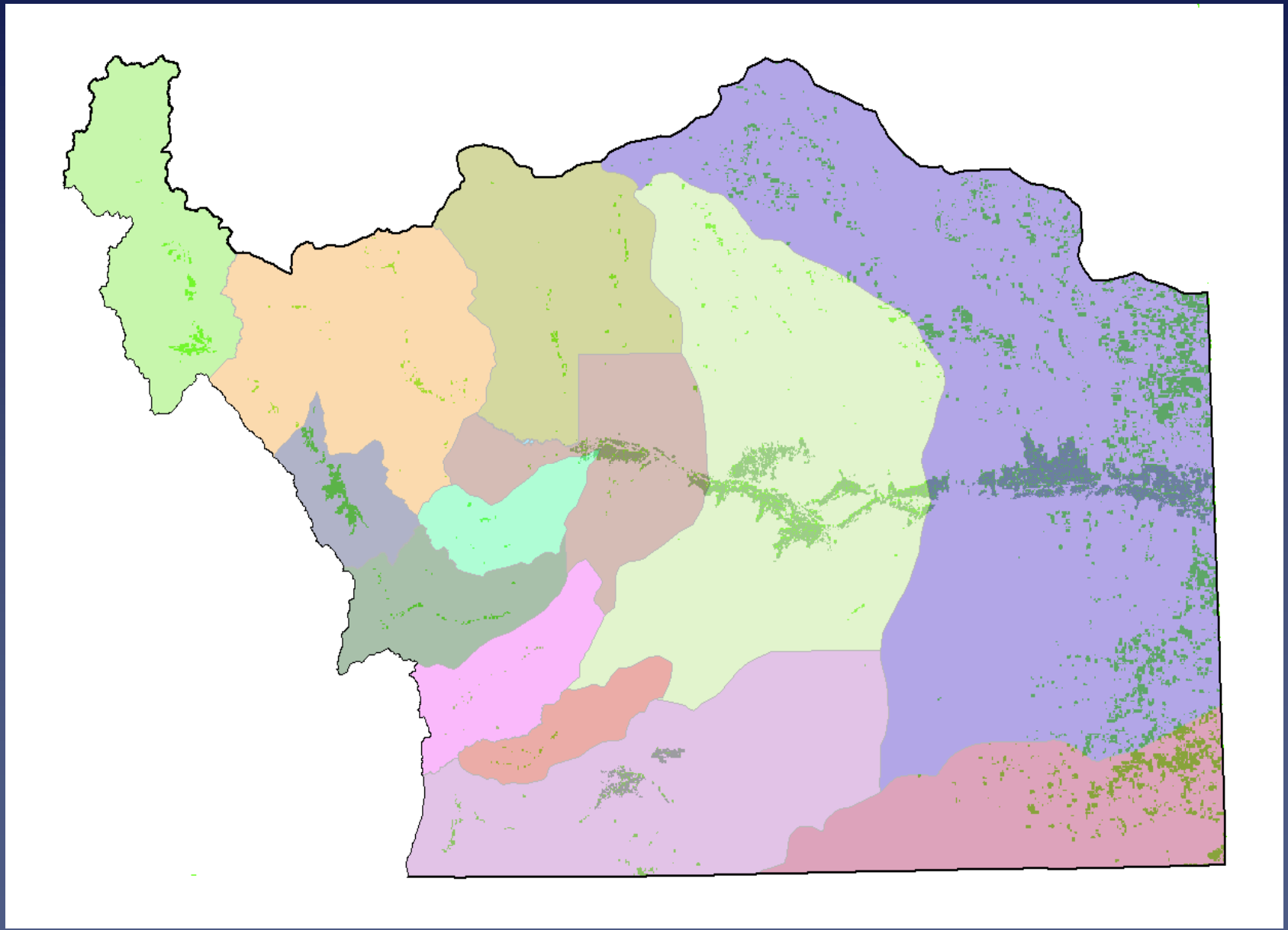
Irrigated Acres Coverage from DWR Division 2



Irrigated Acres Sources

- Division of Water Resources Division 2
- Landsat
- National Land Cover Data

Arkansas Basin Irrigated Acres Distribution



Current Agricultural Acres, Demands, and Shortages

- Agricultural Acres
  - Compilation of sources
- Agricultural Demands
  - Compilation of methods
  - Hydrological Institutional
  - Irrigation Systems Analysis Model
  - StateCU
- Agricultural Shortages
  - Shortage = IWR – WSL (PRWCD and HI)
  - Upper Basin and Aurora/Lake County Decree
  - Transferred shortage percentage to unknown areas

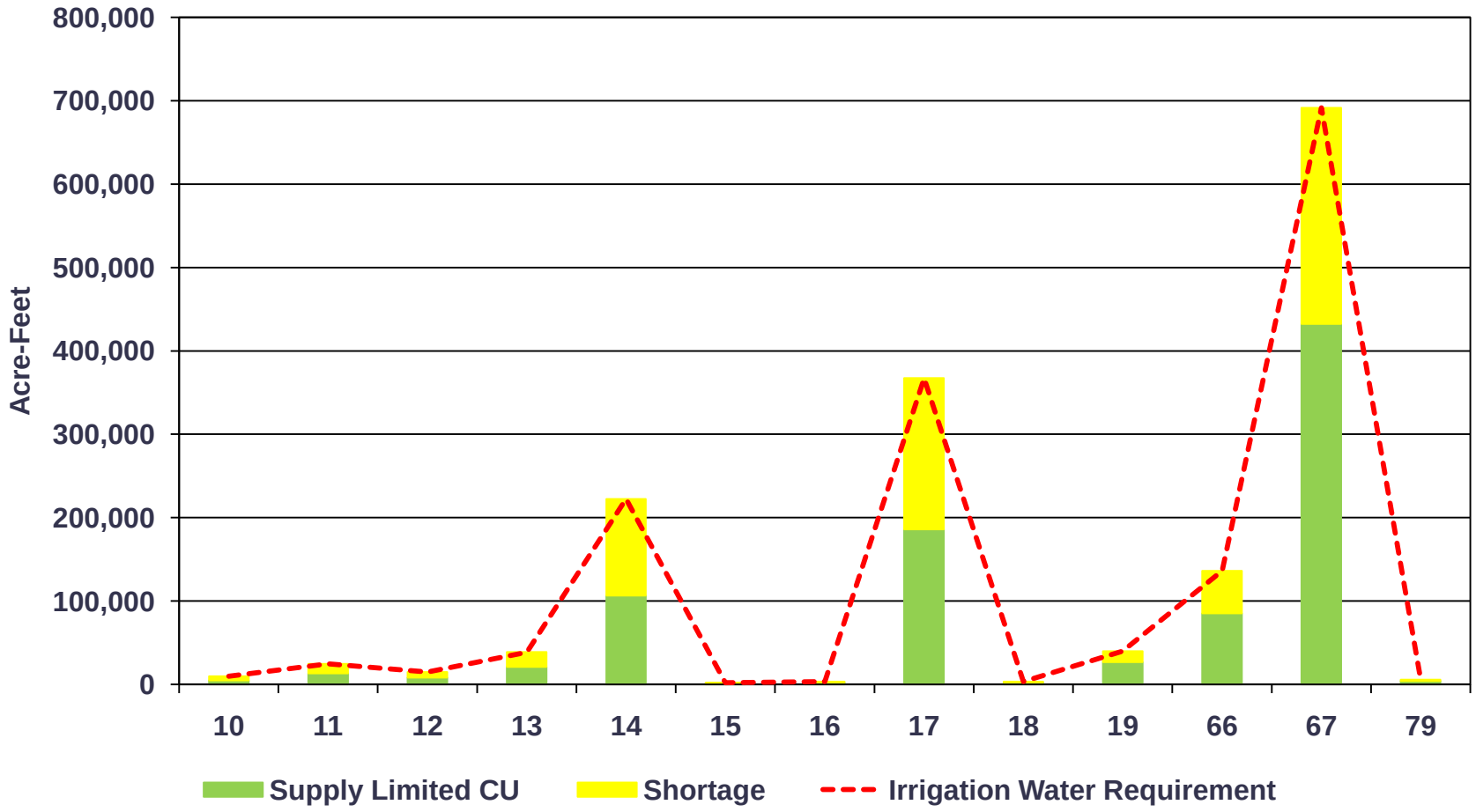
Current Agricultural Acres, Demands and Shortages by Water District

Water District	Irrigated Acres	Irrigation Water Requirement (Acre-Feet)	Supply Limited CU (Acre-Feet)	Shortage (Acre-Feet)	Percent Shortage
WD10-Fountain Creek	4,843	9,865	4,715	5,150	52.2%
WD11-Arkansas: Headwaters to Salida	10,414	24,832	13,327	11,505	46.3%
WD12-Arkansas: Salida to Portland	5,874	14,920	8,007	6,913	46.3%
WD13-Wet Mountain Valley	18,136	38,756	20,800	17,956	46.3%
WD14-Arkansas: Portland to Fowler	90,290	222,398	106,296	116,102	52.2%
WD15-Saint Charles	1,159	2,101	1,406	695	33.1%
WD16-Cucharas River	1,497	3,372	2,256	1,116	33.1%

Current Agricultural Acres, Demands and Shortages by Water District

Water District	Irrigated Acres	Irrigation Water Requirement (Acre-Feet)	Supply Limited CU (Acre-Feet)	Shortage (Acre-Feet)	Percent Shortage
WD17-Arkansas: Fowler to Las Animas	155,482	367,260	185,795	181,465	49.4%
WD18-Apishapa River	1,481	3,319	2,220	1,098	33.1%
WD19-Purgatoire River	17,158	39,858	26,668	13,190	33.1%
WD66-Cimarron River Basin	68,994	136,223	85,147	51,076	37.5%
WD67-Arkansas: Las Animas to Stateline	316,139	691,569	432,268	259,301	37.5%
WD79-Huerfano River	3,152	5,893	3,943	1,950	33.1%
Total	**694,617**	**1,560,366**	**892,847**	**667,518**	**42.8%**

Arkansas Basin Water District Agricultural Demands and Shortages



Prospective Changes in the Number of Irrigated Acres in Colorado by Year 2050

- History and context
- What will cause the change?
- What direction and magnitude will each influence have on irrigated acreage?
- Net effects and outcomes

Historical Trends in Irrigated Acres for Colorado (Statewide) – 1987 to 2007

- Water supply in a given year affects number of irrigated acres, but trend is downward...

	Total Land in Farms		Total Irrigated Acres	
	Millions of Acres	Percent Change from Previous Period	Millions of Acres	Percent Change from Previous Period
1987	NA	NA	3.0	NA
1992	34.0	NA	3.2	6.7
1997	32.6	-4.1	3.4	6.3
2002	31.1	-4.6	2.6	-23.5
2007	31.6	1.6	2.9	11.5
Percent change for 1992-2007 period		**-7.0**		**-10.0**

Source: USDA Census of Agriculture, selected years.

What are the Potential Influences on Changes for the Number of Colorado's Irrigated Acres?

- Urbanization of irrigated lands
- Agricultural water transfers to urban uses
- Demographic factors
- Biofuels production
- Climate change
- Farm programs
- Subdivision of Ag lands and lifestyle farms
- Yield and productivity
- Open space and conservation easements
- Economics of agriculture

Note: For purposes here, we assume normalized hydrologic conditions and current water provisions under existing Colorado water law.

Summary of Prospective Changes in Number of Irrigated Acres in Colorado by Year 2050

	Low (pessimistic)	Medium	High (optimistic)
1. Urbanization of irrigated lands	Calculated	Calculated	Calculated
2. Ag transfers to urban users	Calculated	Calculated	Calculated
3. Demographic changes	No effect	No effect	No effect
4. Bio fuels production	No effect	Negligible, positive	Negligible, positive
5. Climate change	Modest, negative	Modest, negative	No effect
6. Farm programs	No effect	No effect	No effect
7. Subdivision of ag lands and lifestyle farms	Negligible, negative	No effect	No effect
8. Yield and productivity	Negligible, negative	No effect	No effect
9. Open space and conservation easements	No effect	Negligible, positive	Modest, positive
10. Economics of agriculture	No change	Modest, positive	Modest, positive
Net effects (minus No. 1 and 2 above)	**Modest, negative**	**Modest, positive**	**Moderate, positive**

Note: All changes assume normalized hydrologic conditions and no additional constraints to water supplies.

Urbanization of Irrigated Lands

- Examined existing ratio of irrigated lands within urban boundaries
- Estimated population density per urbanized area
- Change in population from 2008 to 2050
- Irrigated Acres Urbanized = Change in Population ÷ Population Density x Ratio of Irrigated Lands to Urban Boundary

Agricultural to Municipal Transfers

- Based on information gathered from CWCB as part of Basin Needs Decision Support System (BNDSS) updates
- Will project on low and high basis

Draft 2050 Irrigated Acres – Arkansas Basin

Water District	Decrease in Irrigated Acres Due to Urbanization		Decrease in Irrigated Acres Due to Agricultural to Municipal Transfers	2050 Irrigated Acres	
	Low	High		Low	High
WD10-Fountain Creek	2,000	2,500	–	2,343	2,843
WD11-Arkansas: Headwaters to Salida	481	783	–	9,631	9,933
WD12-Arkansas: Salida to Portland	2,972	3,851	–	2,023	2,902
WD13-Wet Mountain Valley	1,216	1,529	–	16,607	16,920
WD14-Arkansas: Portland to Fowler	1,942	2,676	–	79,614	80,348
WD15-Saint Charles	187	235	–	924	972
WD16-Cucharas River	112	160	–	1,337	1,385

Draft 2050 Irrigated Acres – Arkansas Basin

Water District	Decrease in Irrigated Acres Due to Urbanization		Decrease in Irrigated Acres Due to Agricultural to Municipal Transfers	2050 Irrigated Acres	
	Low	High		Low	High
WD17-Arkansas: Fowler to Las Animas	2,765	3,627	–	151,855	152,717
WD18-Apishapa River	12	31	–	1,450	1,469
WD19-Purgatoire River	686	947	–	16,211	16,472
WD66-Cimarron River Basin	6	20	–	68,974	68,988
WD67-Arkansas: Las Animas to Stateline	1,252	1,606	–	314,533	314,887
WD79-Huerfano River	112	160	–	2,992	3,040
Total	**13,745**	**18,125**	–	**668,494**	**672,874**

Demographic Trends

- Baby boomers as heads of farm households
- Next generation less interested in continuing to farm
- Who will take over the farm?

Assumption: Farmers will sell to neighbors or corporate operators, but operation will continue in some form. Demographic factors will contribute to ag transfers, easements, etc.

Biofuels Production

- Ethanol will remain leading biofuel for near and intermediate term (2030) if government support remains
- Cellulosic and algae biofuels a long-term possibility; might benefit Colorado ag processing sector, not irrigated acreage
- With solid livestock demand, firming corn prices
- Continued increase in corn acreage, less wheat and hay at lower elevations
- Continued demand for corn irrigation, emphasis on efficiency with constrained water supply

Assumption: Upward pressure in irrigated acreage, but mostly a trade-off with other crops.

Climate Change

- Limited clarity or predictability
- State likely to be warmer and therefore higher consumptive use; more precipitation variability
- More uncertainty for farmers
- Earlier runoff and more competition for water
- Longer growing season at higher elevations

Assumption: Highly uncertain effect. Might discourage irrigated agriculture, spur to ag water transfers, could benefit West Slope agriculture.

Farm Programs

- Always changing, but always there in some form
- Much discussion about elimination of particular support program, or adding another
- Food production a recognized national strategic resource
- Little evidence of significant change

Assumption: No net effect on number of irrigated acres in Colorado.

Subdivision of Ag Lands and Lifestyle Farms

- Lands preserved from urbanization or ag transfers, depending on circumstances
- Less focus on beneficial use of water, less intensity of use
- Less actual irrigation
- Same water tied to same property

Assumption: Contradictory effects. Difficult to determine net effect on number of irrigated acres. Perhaps limited net change?

Yield and Productivity

- Historic gains in productivity generally for agriculture since 1950s
- Technological improvements gradual but continuous in equipment and process

Assumption: Continued gradual improvements likely. Colorado farmers will produce more per acre long-term.

Open Space and Conservation Easements

- Wide variety of open space and easement types and landowners
- Many cities and counties more active in acquiring open space in 1990s and early 2000 years
- Net effect of open space acquisition within urban growth boundaries increased development outside urban planning areas, in some cases on irrigated lands
- Some conservation easements protect irrigated acres, help farm viability, and deter development; larger proportion on non-irrigated lands
- Conservation easement activity closely tied to tax breaks and incentives that might be reined in

Assumption: Rush to purchase open space and put lands with easements transitioning to lower sustainable levels. Will continue to be a factor, although modest in total irrigated acres impacted.

Economics of Agriculture

Range of assumptions from SWSI 2050 population projections:

- World food demand increasing from developing countries
- Acceptance and enhancement from genetic modification modest over long-term
- Trends toward locally produced foods
- Irrigated agriculture more resilient segment
- Prices generally more firm with usual oscillation
- Costs may keep pace with firmer prices, so net income stable
- Government policies have a major impact on agricultural economics

Assumption: Farming, especially irrigated agriculture, will remain a resilient economic sector. Without incentives to reduce this activity, irrigated acreage will remain steady.

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Preliminary M&I Gap Analysis

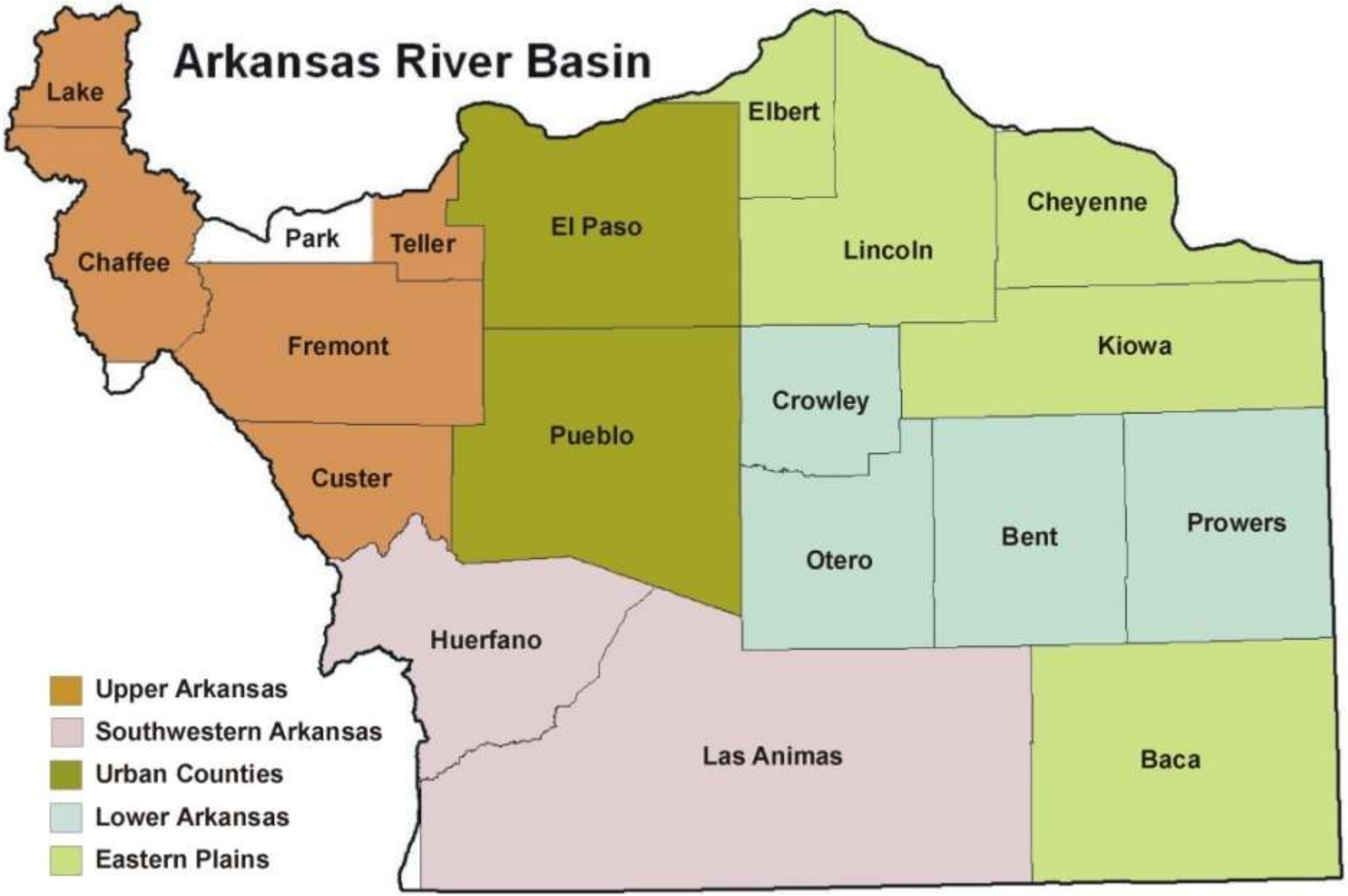
Methodology

- Interviewed largest providers in basin to determine plans, projects, and processes to meet 2050 M&I water demands
- Aggregated this information at the sub-basin level
- Estimate 2050 Low, Medium and High Gaps
  - Use water provider interviews
  - Use SWSI 1 to address information gap
  - Need assistance from roundtables to identify additional gaps
- Future activity – summarize future methods for meeting needs by major categories

Draft M&I Gap Analysis

- Used draft information from June Demands to 2050 report
- Analysis will be updated
  - New population data
  - New water usage data
  - Passive Conservation

Arkansas Sub-basins



Draft M&I Gap Analysis

County	Current Demand (AFY)	2050 Demand (AFY)		2050 Water Needs (AFY)		Identified Projects and Processes (AFY)		Gap Identified in Water Needs Assessment Task Order	Gap Identified by Providers (AFY)	Information/ Real Gap (AFY)	
		Low	High	Low	High	Low	High			Low	High
Upper Arkansas	22,800	41,000	48,500	18,200	25,700	9,500	9,500	7,050	–	8,700	16,200
Urban Counties	159,200	264,700	315,700	105,500	156,500	89,400	97,300	22,600	0	29,600	72,700
Lower Arkansas	8,800	11,400	12,800	2,600	4,000	900	1,100	0	–	1,700	2,900
Eastern Plains	4,600	7,000	7,800	2,400	3,200	2,000	2,000	0	–	400	1,200
South-western Arkansas	6,900	10,700	12,900	3,800	6,000	3,100	3,100	850	–	700	2,900
Total	**202,300**	**334,800**	**397,700**	**132,500**	**195,400**	**104,900**	**113,000**	**30,500**	**0**	**41,100**	**95,900**

Discussion

- Information vs. real gap
- 2050 SSI Needs: 9,700 - 17,600 AFY
- Methods for meeting gap
  - Urbanization onto agricultural lands
  - Ag to municipal transfers
  - Conservation
  - In-Basin project
  - Firming of existing water rights