Colorado's Water Supply Future

South Platte Basin Roundtable Meeting

Longmont, CO

April 12, 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

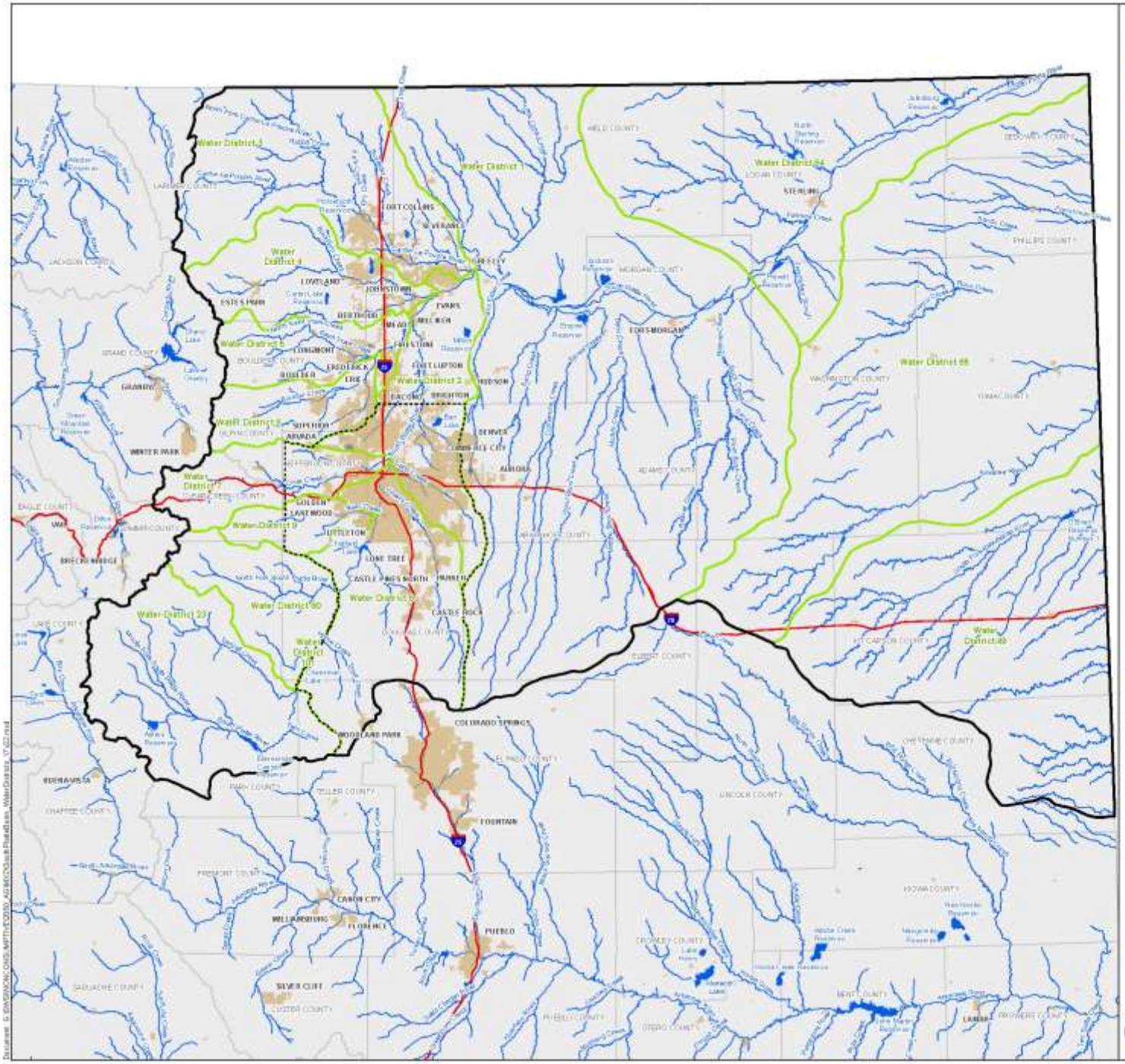


Figure X-X
South Platte Basin
Water Districts

2050 Colorado
Agricultural Demands

CDM

DRAFT

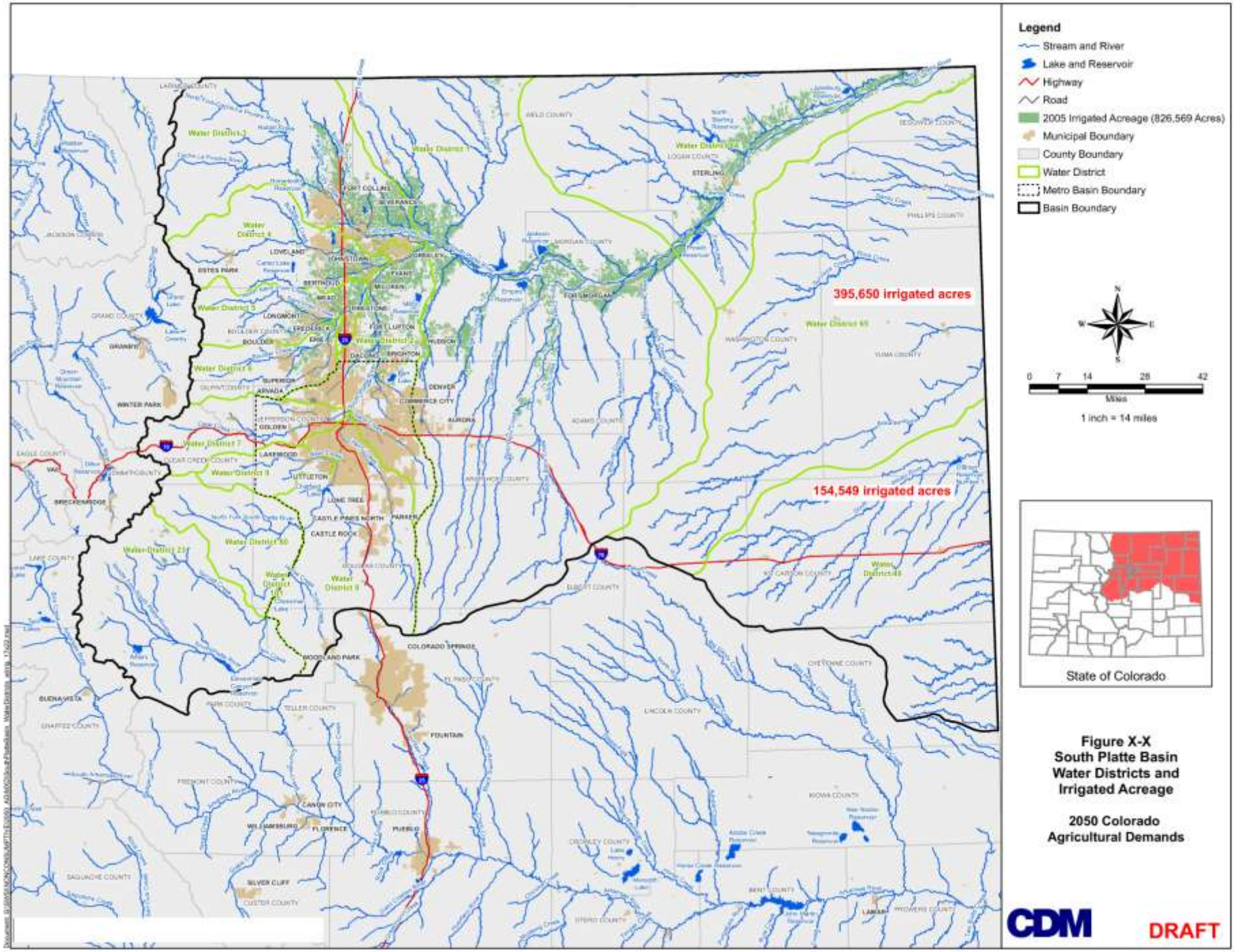


Figure X-X
South Platte Basin
Water Districts and
Irrigated Acreage

2050 Colorado
Agricultural Demands

CDM

DRAFT

Current Agricultural Acres, Demands, and Shortages

- Agricultural Acres
  - Agricultural acres estimated based on aerial image data from Colorado DSS (2005)
- Agricultural Demands
  - StateCU model used to estimate Irrigation Water Requirement (IWR) and Water Supply Limited (WSL) consumptive use values
- Agricultural Shortages
  - Shortage = IWR - WSL

Current Agricultural Acres, Demands and Shortages by Water District

South Platte and Metro BRTs minus Republican River Basin

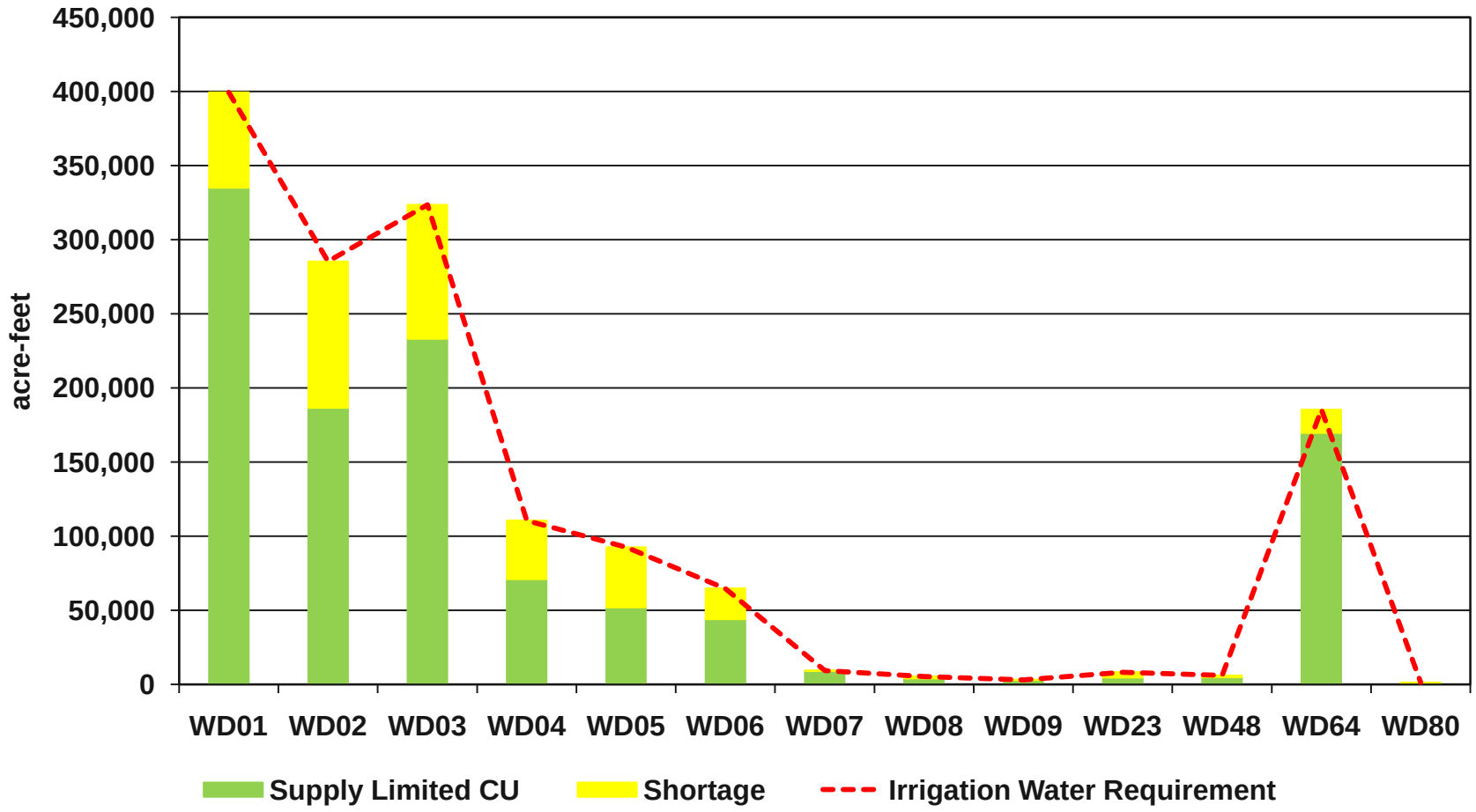
Water District	Irrigated Acres	Irrigation Water Requirement (Acre-Feet)	Supply Limited CU (Acre-Feet)	Shortage (Acre-Feet)	Percent Shortage
WD1-South Platte Greeley to Balzac	231,593	399,426	334,911	64,515	16%
WD2-South Platte Denver Gage to Greeley	153,485	285,314	186,577	98,738	35%
WD3-Cache La Poudre River	181,574	323,591	233,086	90,505	28%
WD4-Big Thompson River	60,864	110,614	70,858	39,756	36%
WD5-St. Vrain Creek	50,191	92,574	51,918	40,656	44%
WD6-Boulder Creek	35,011	64,784	43,856	20,928	32%
WD7-Clear Creek	4,756	9,392	9,267	125	1%

Current Agricultural Acres, Demands and Shortages by Water District

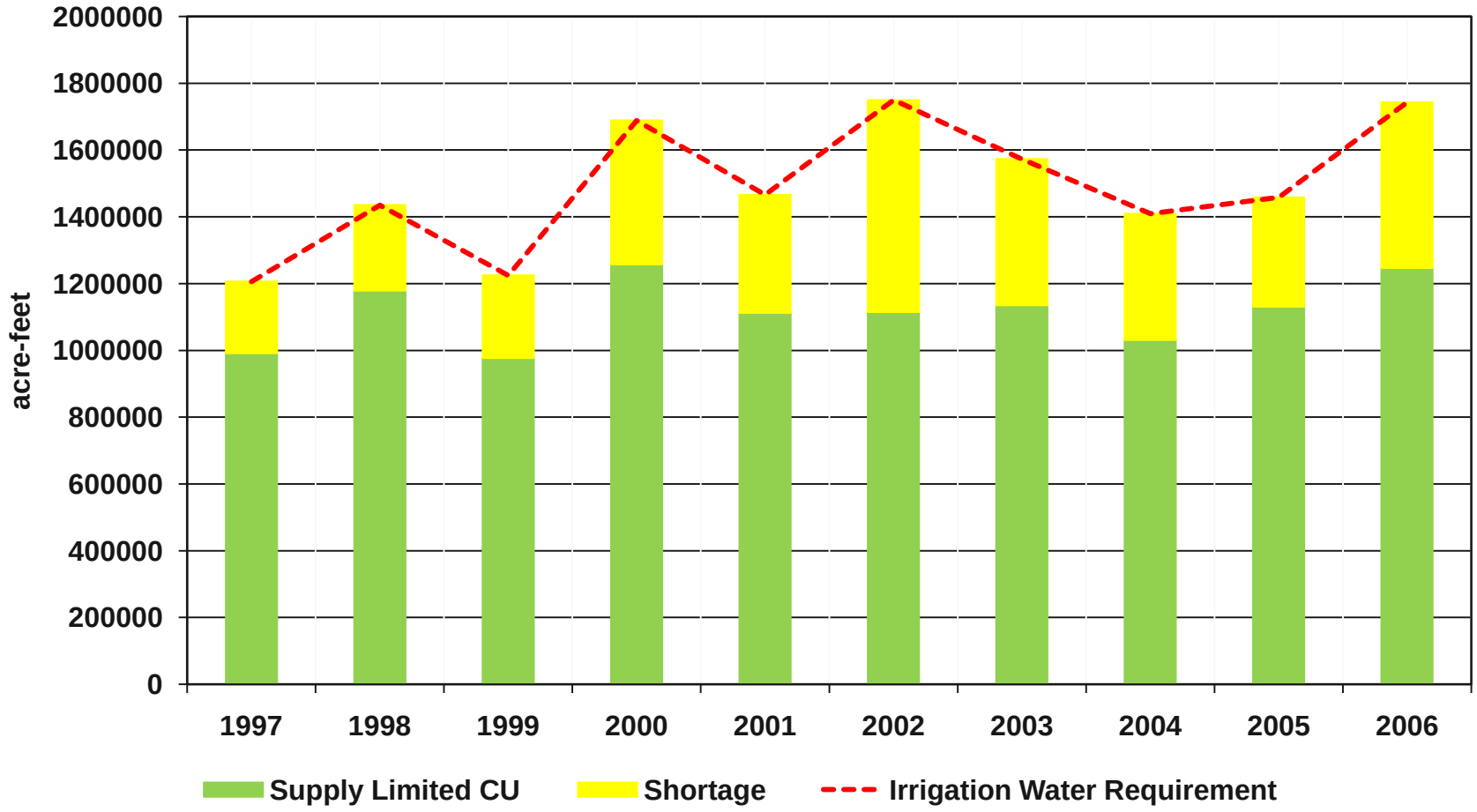
South Platte and Metro BRTs minus Republican River Basin (con't)

Water District	Irrigated Acres	Irrigation Water Requirement (Acre-Feet)	Supply Limited CU (Acre-Feet)	Shortage (Acre-Feet)	Percent Shortage
WD8-South Platte Cheesman to Denver Gage	3,188	5,471	3,930	1,542	28%
WD9-Bear Creek	1,627	3,199	2,830	369	12%
WD23-Upper South Platte	5,120	8,348	4,570	3,778	45%
WD48-Laramie River	3,977	6,128	4,744	1,384	23%
WD64 - South Platte: Balzac to Stateline	98,181	185,372	169,640	15,732	8%
WD80-North Fork of South Platte	978	1,419	1,035	385	27%
Total	**830,545**	**1,495,633**	**1,117,219**	**378,414**	**25%**

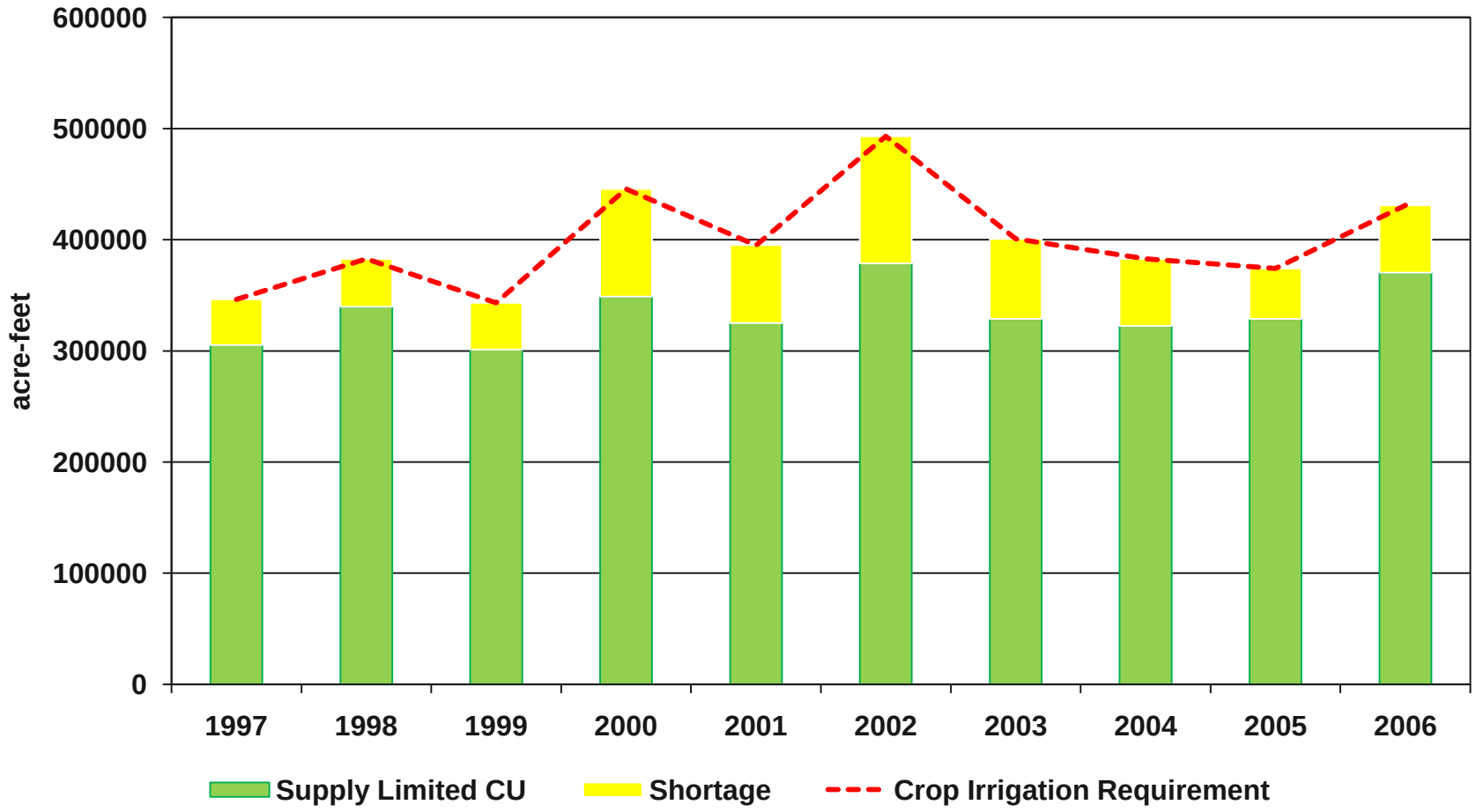
South Platte 10-Year Average by Water District Agricultural Demands and Shortages



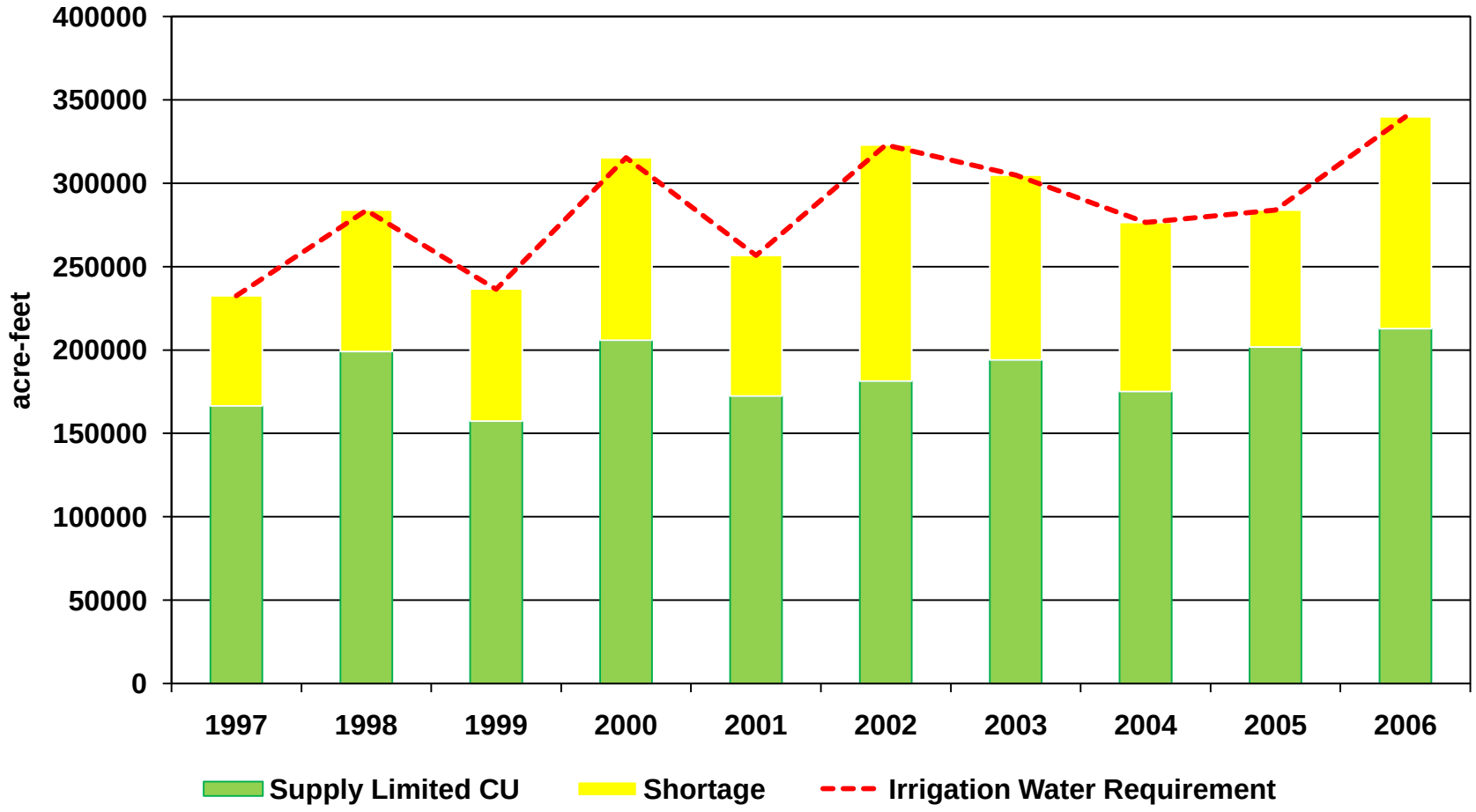
South Platte Basin 10-Year Summary Agricultural Demands and Shortages



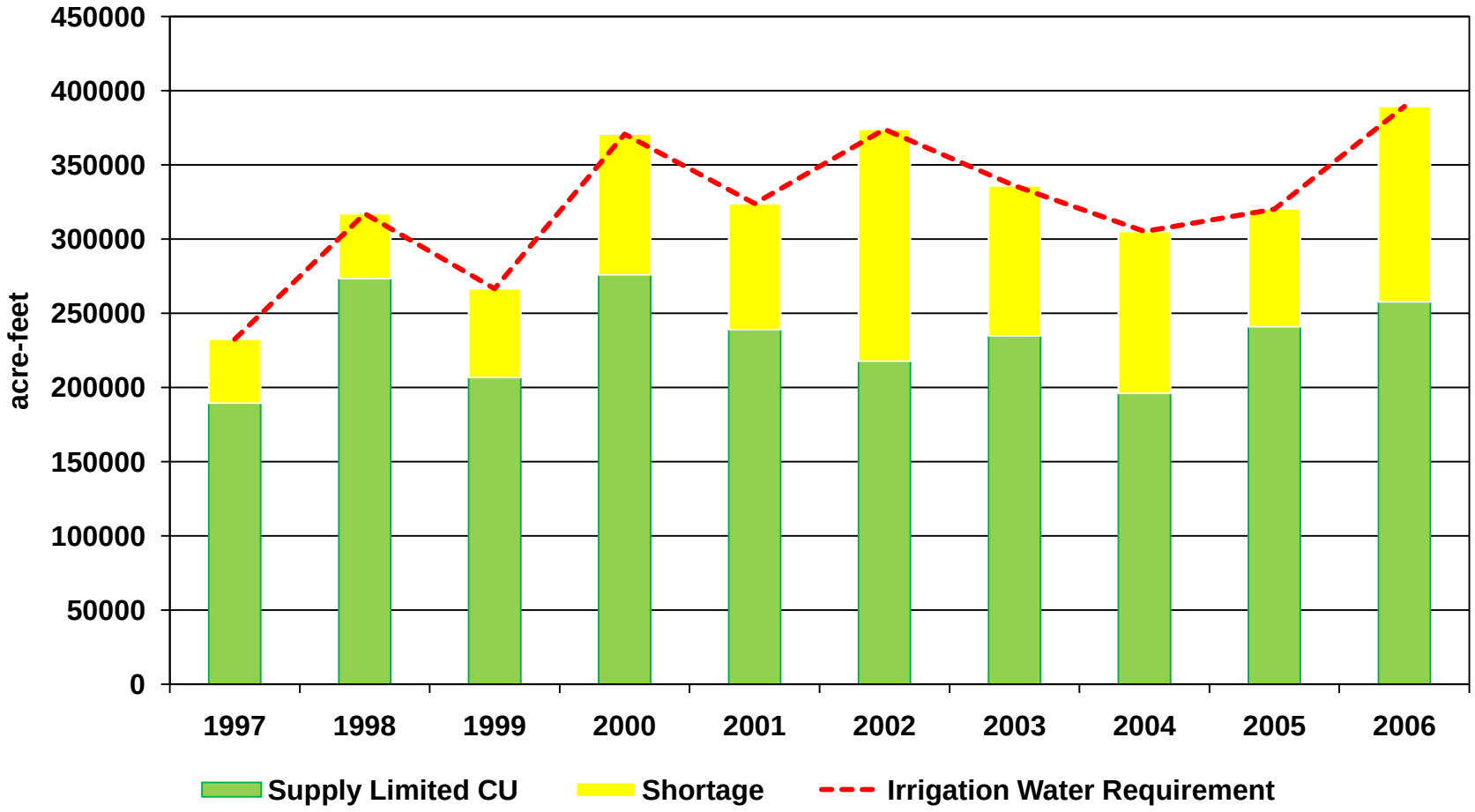
Water District 1 - South Platte Greeley to Balzac Agricultural Demands and Shortages



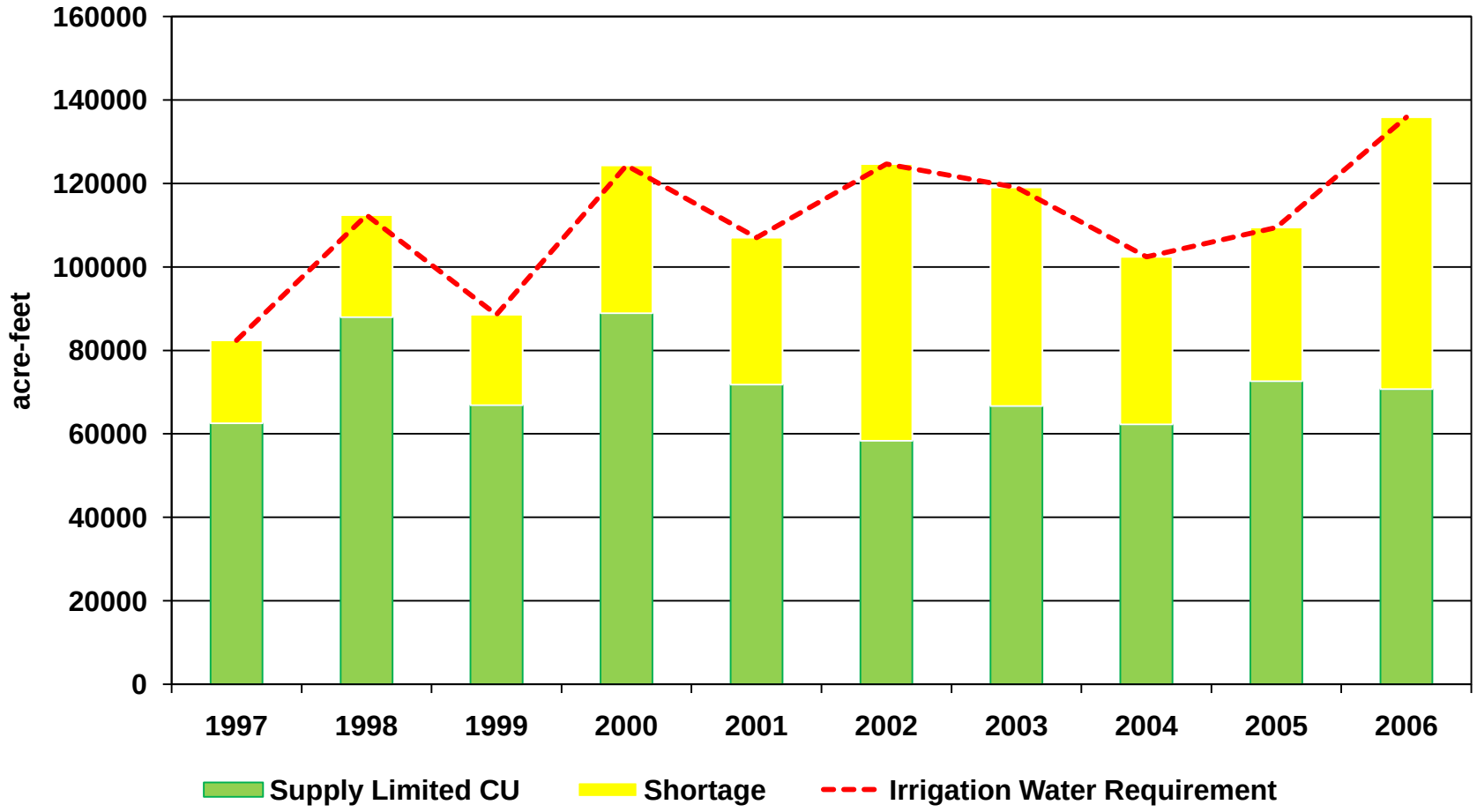
Water District 2 - South Platte Denver Gage to Greeley
Agricultural Demands and Shortages



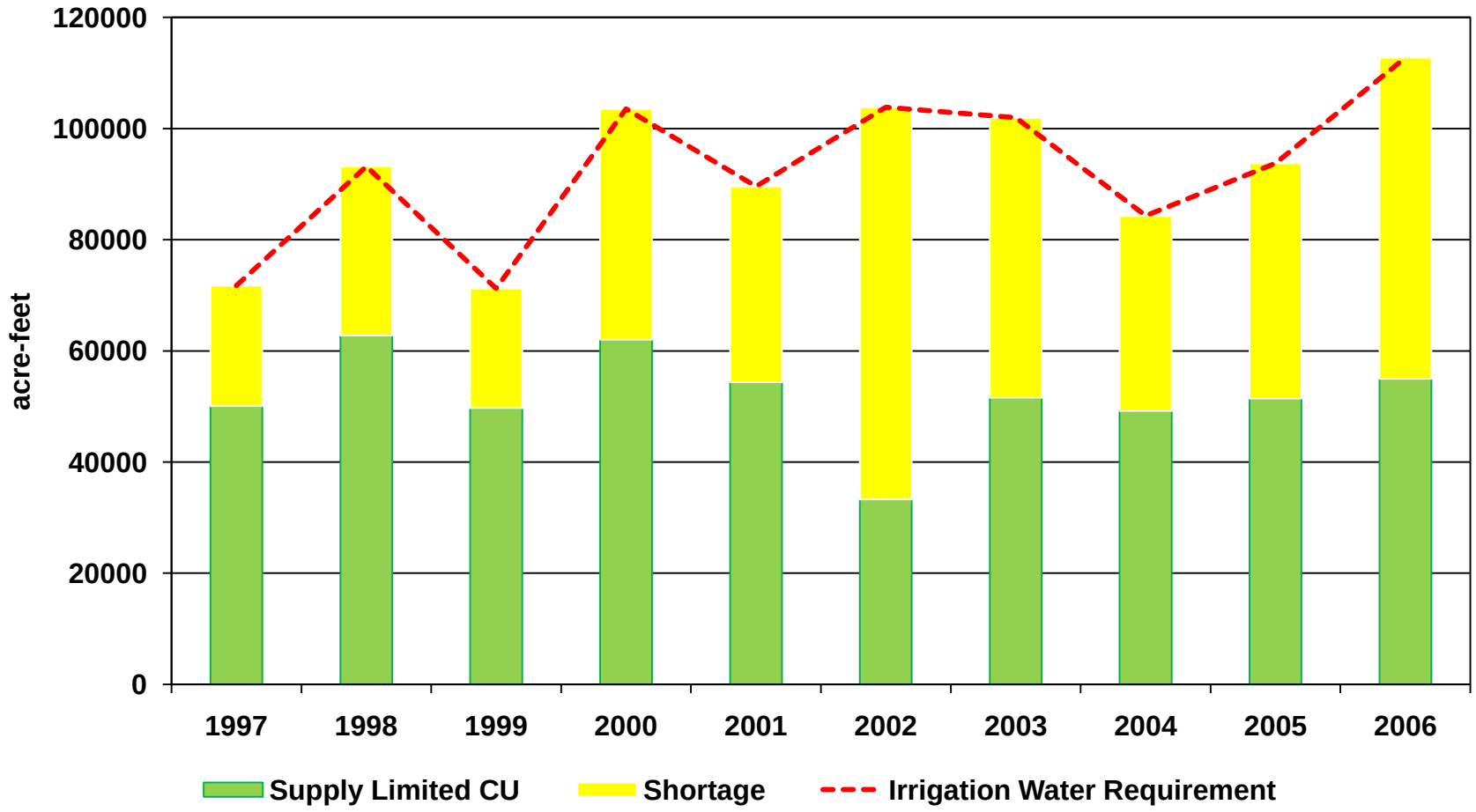
Water District 3 - Cache La Poudre River Agricultural Demands and Shortages



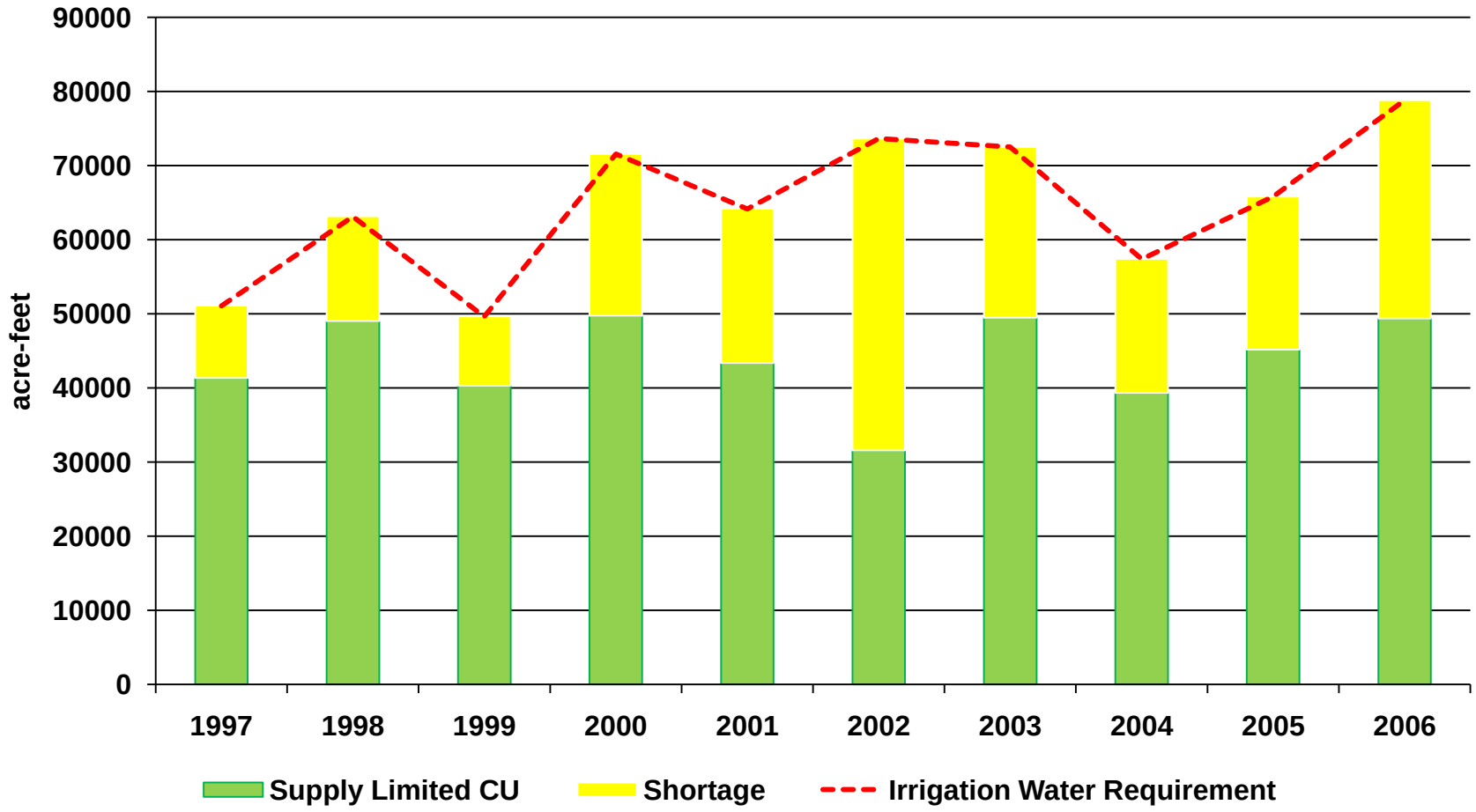
Water District 4 - Big Thompson River Agricultural Demands and Shortages



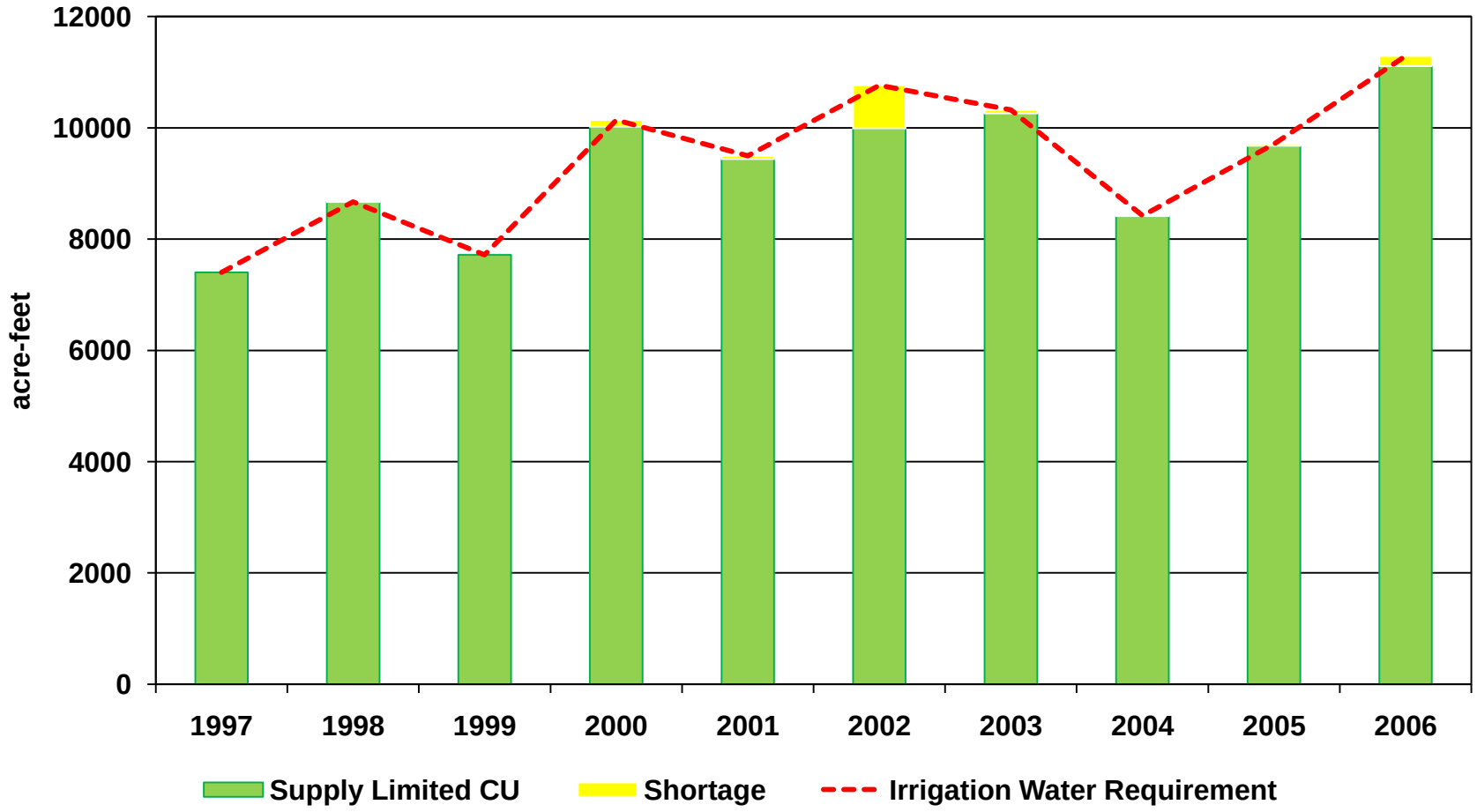
Water District 5 - St. Vrain Creek Agricultural Demands and Shortages



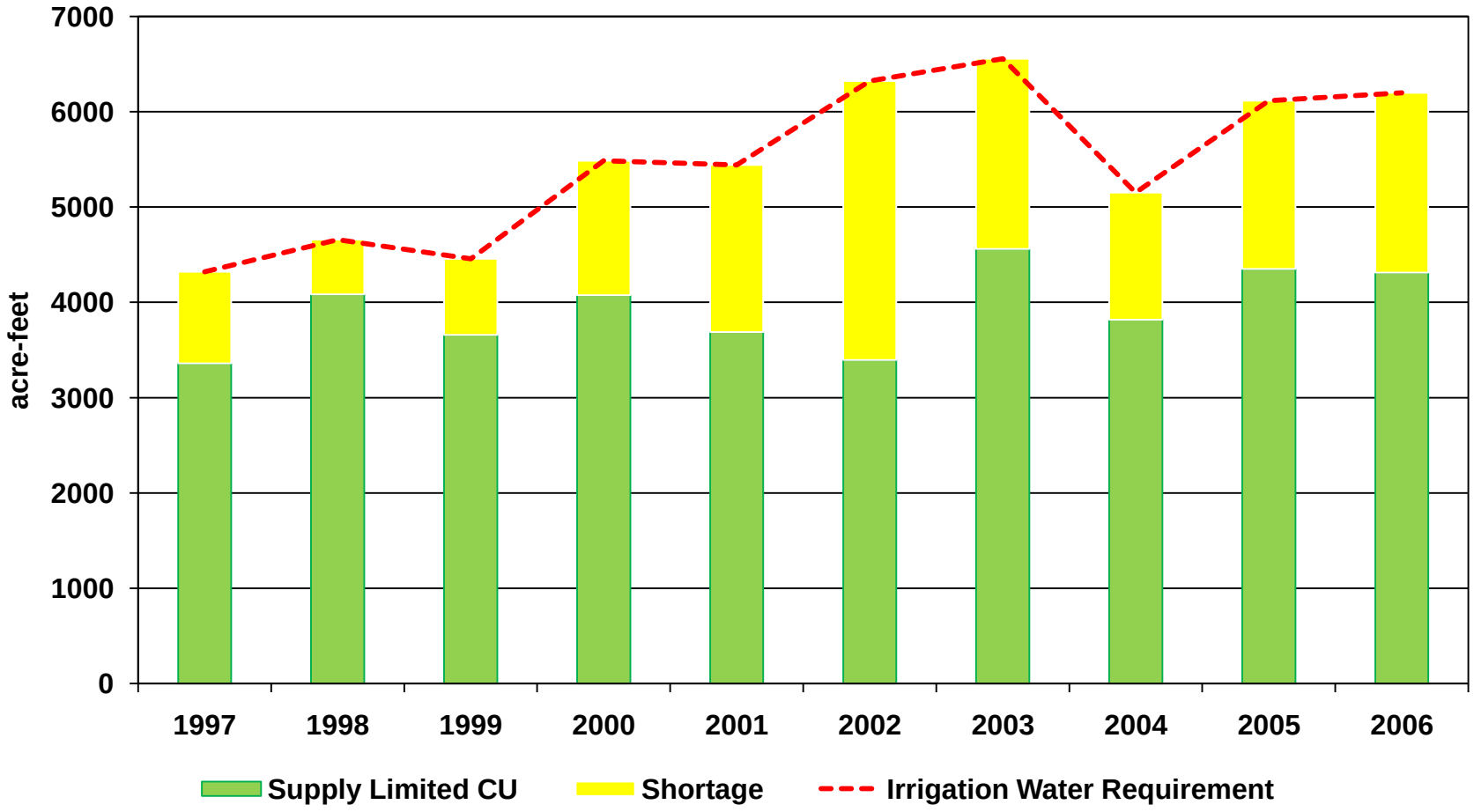
Water District 6 - Boulder Creek
Agricultural Demands and Shortages



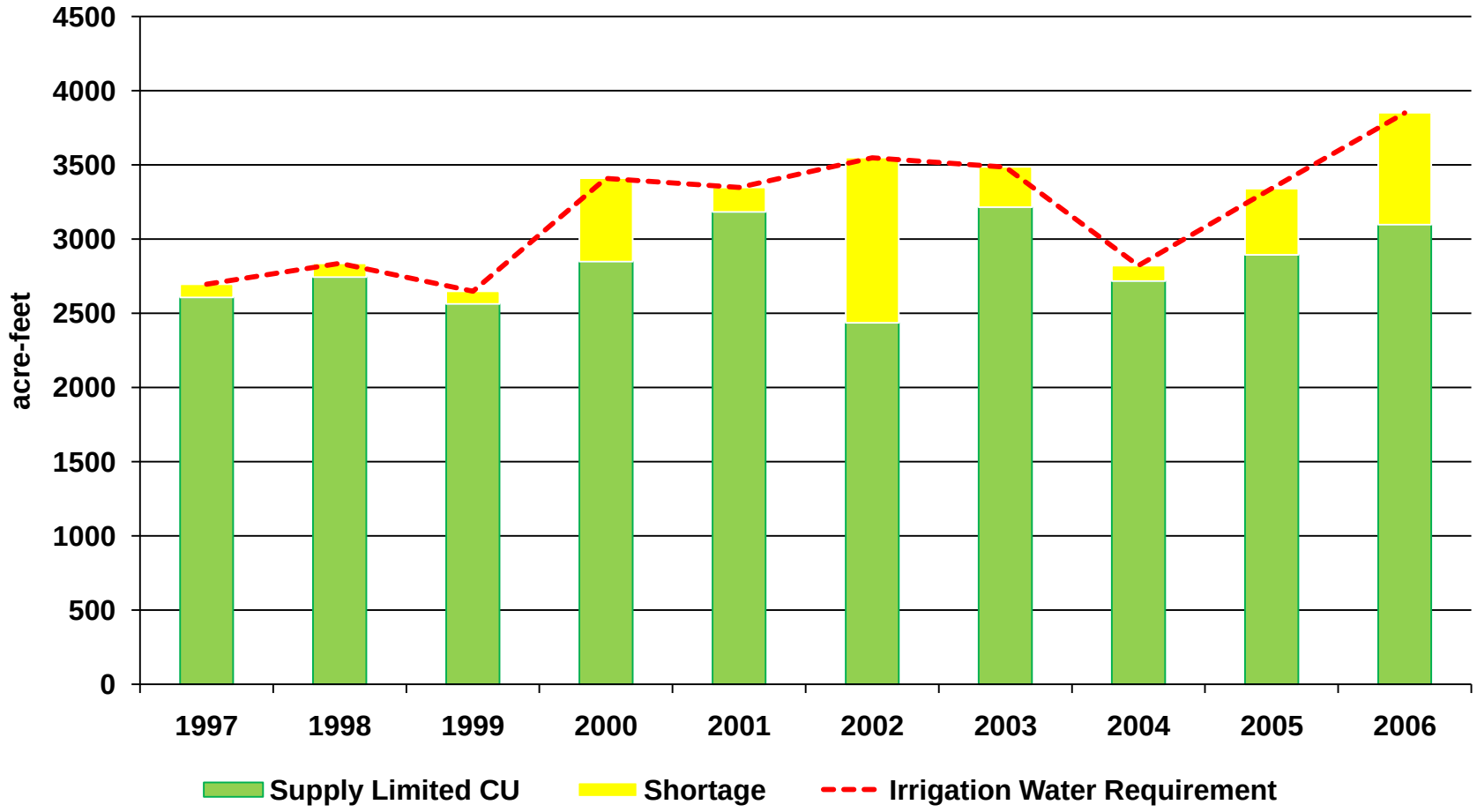
Water District 7 - Clear Creek
Agricultural Demands and Shortages



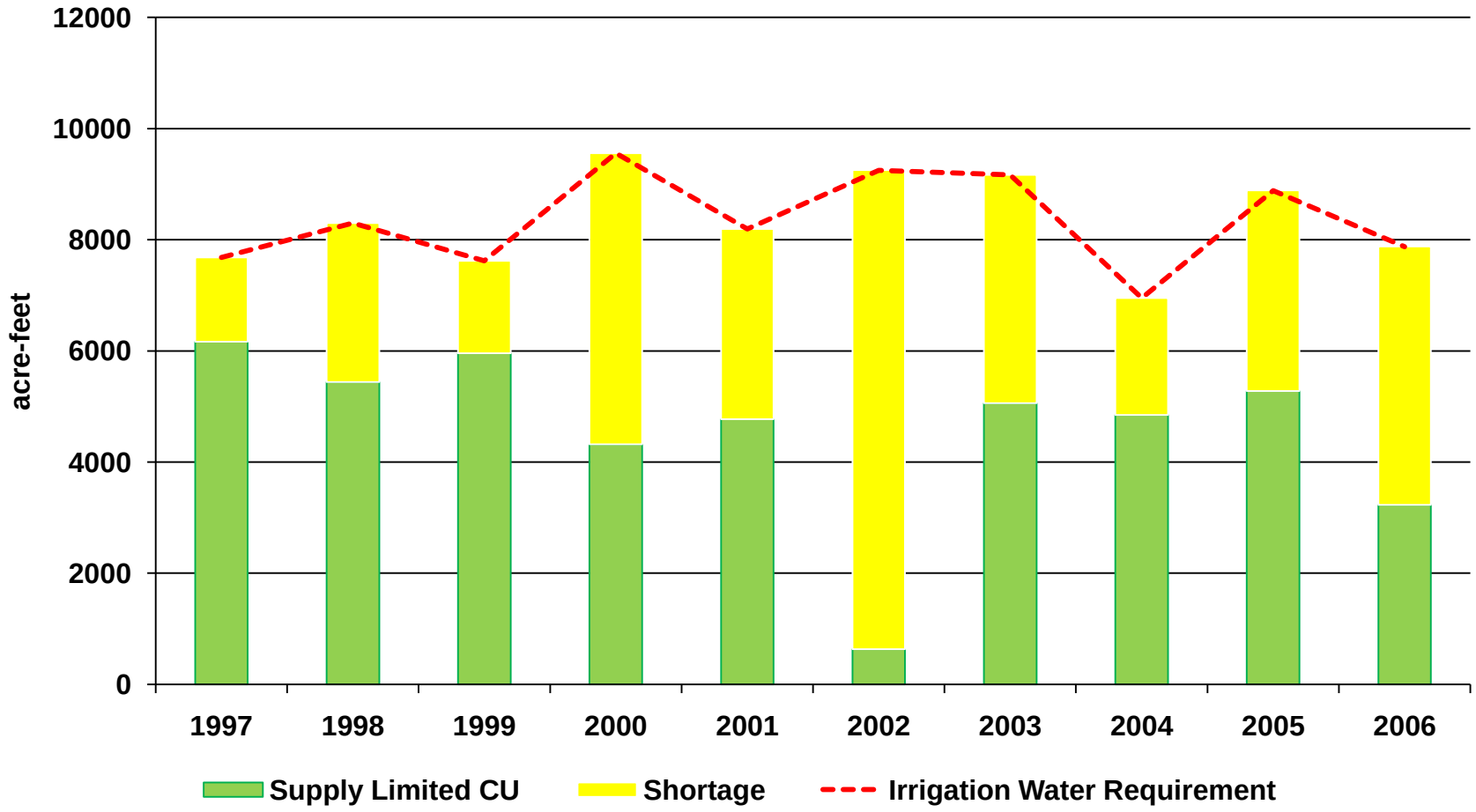
Water District 8 - South Platte Cheesman to Denver Gage
Agricultural Demands and Shortages



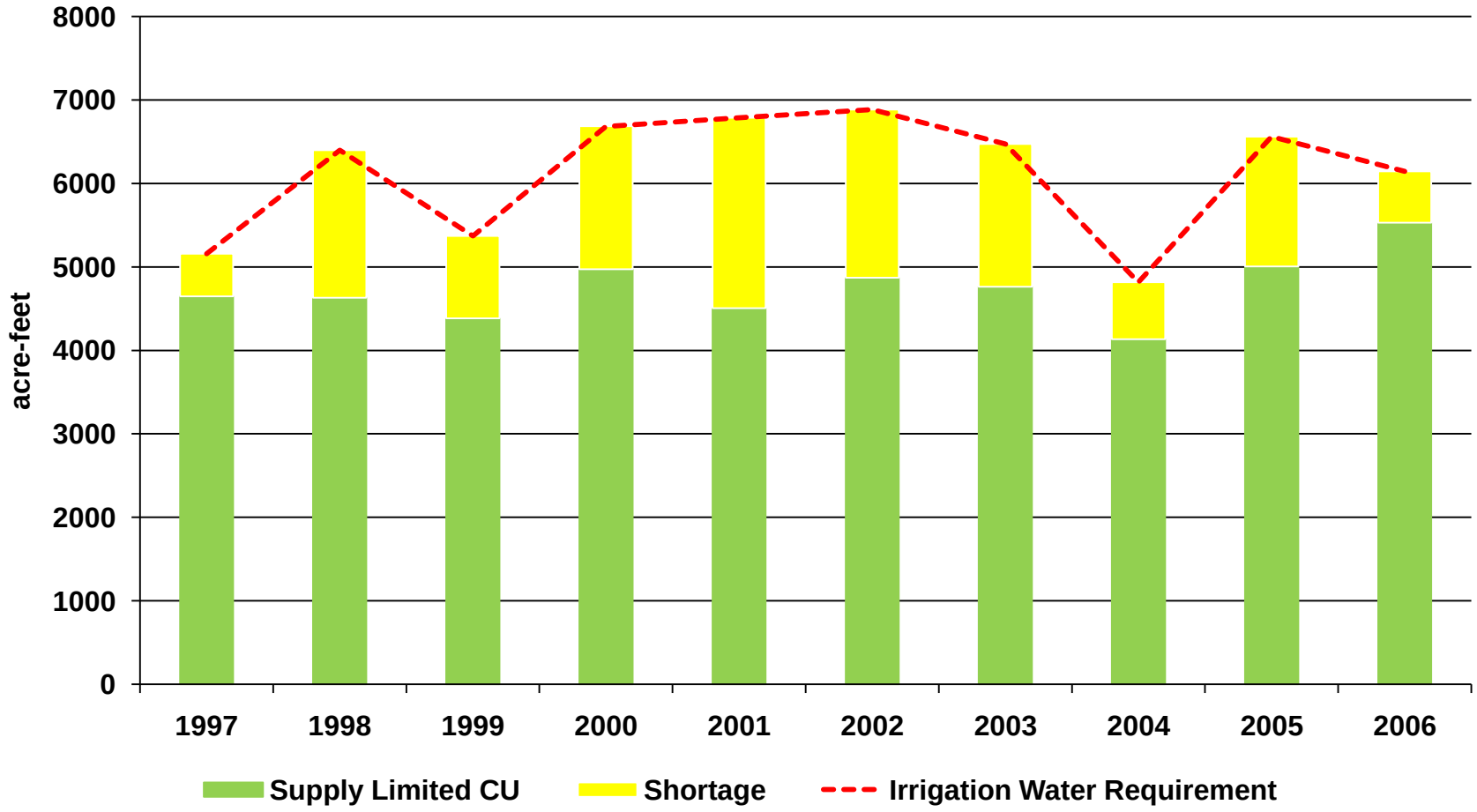
Water District 9 - Bear Creek
Agricultural Demands and Shortages



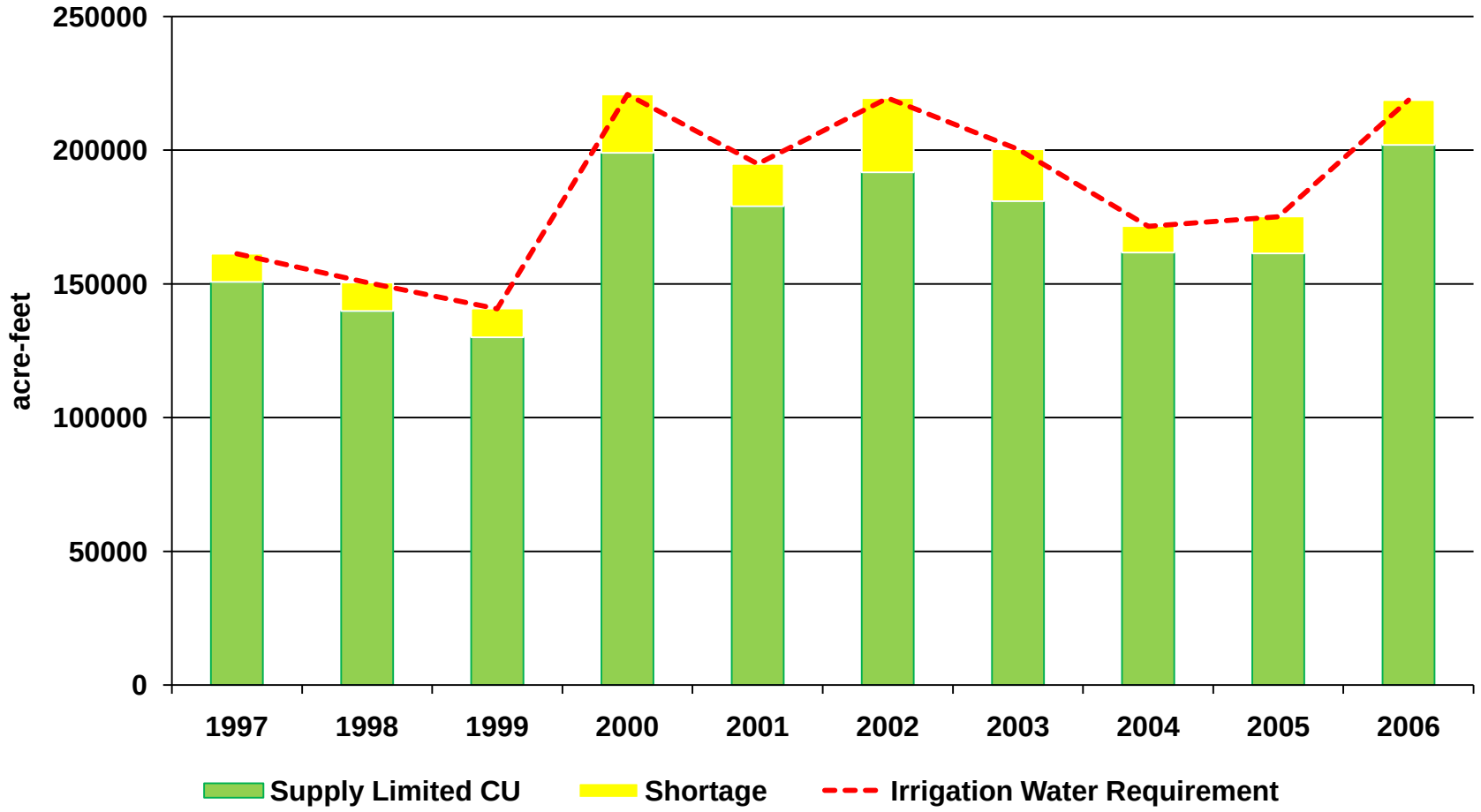
Water District 23 - Upper South Platte Agricultural Demands and Shortages



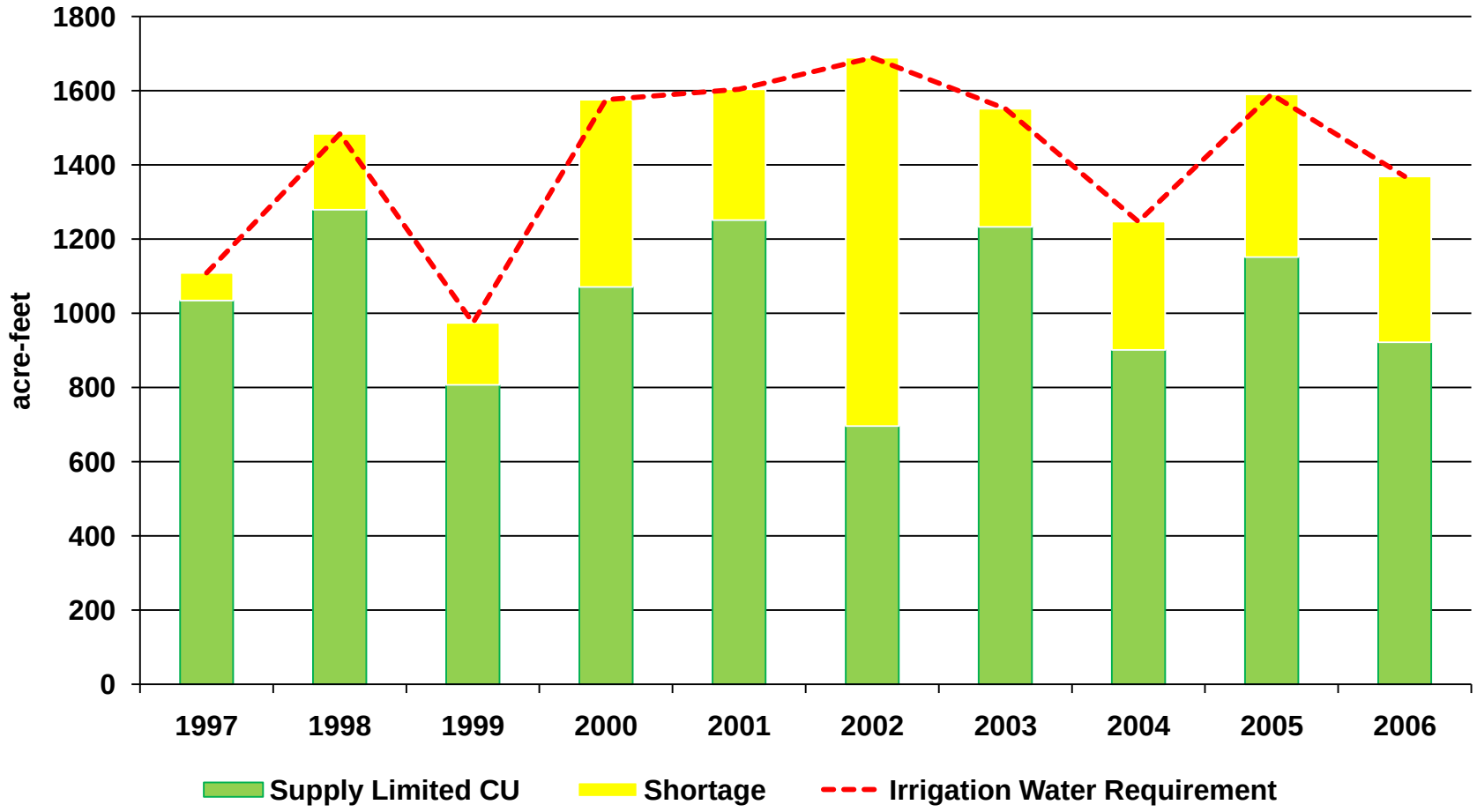
Water District 48 - Laramie River Agricultural Demands and Shortages



Water District 64 - South Platte: Balzac to Stateline Agricultural Demands and Shortages



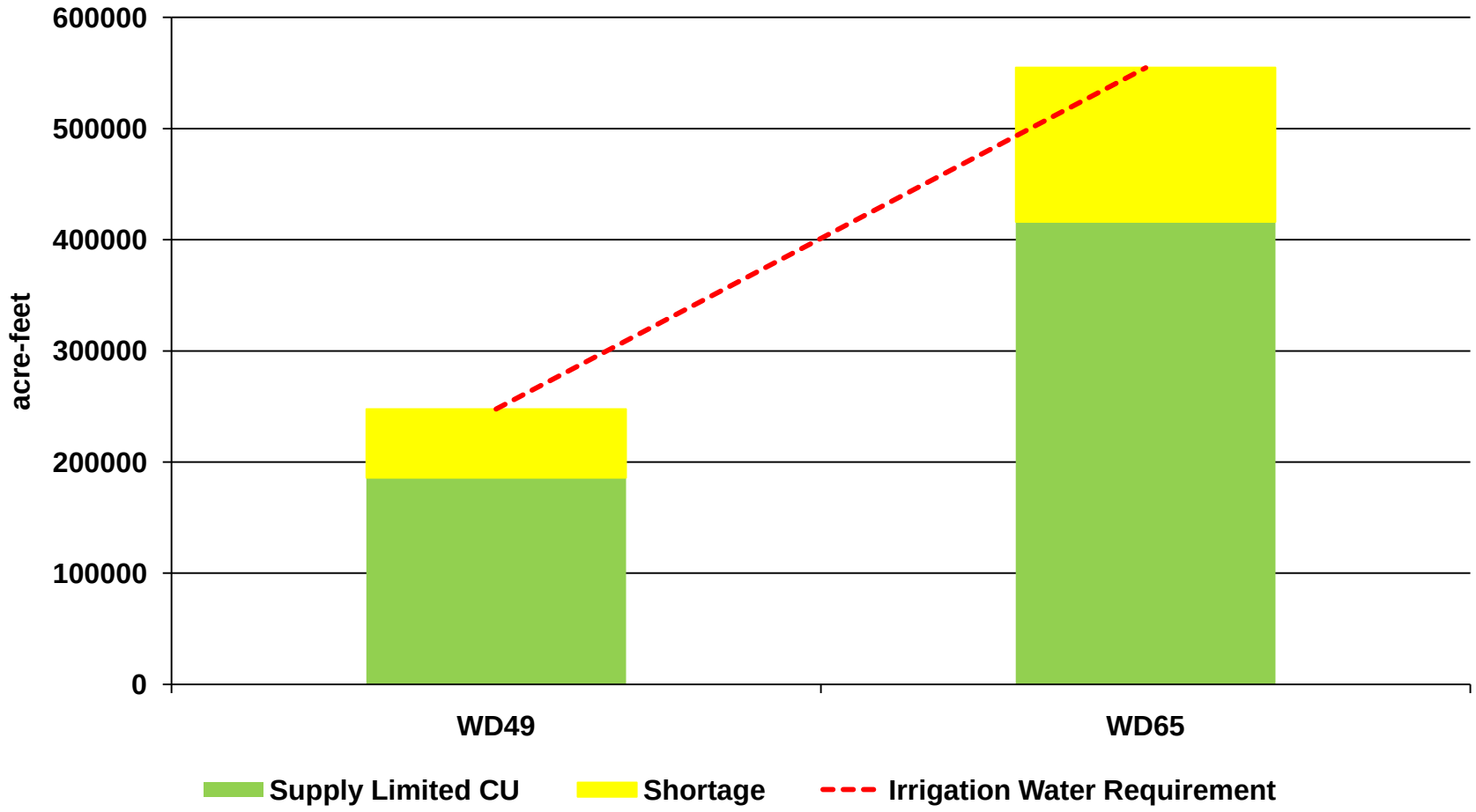
Water District 80 - North Fork of South Platte Agricultural Demands and Shortages



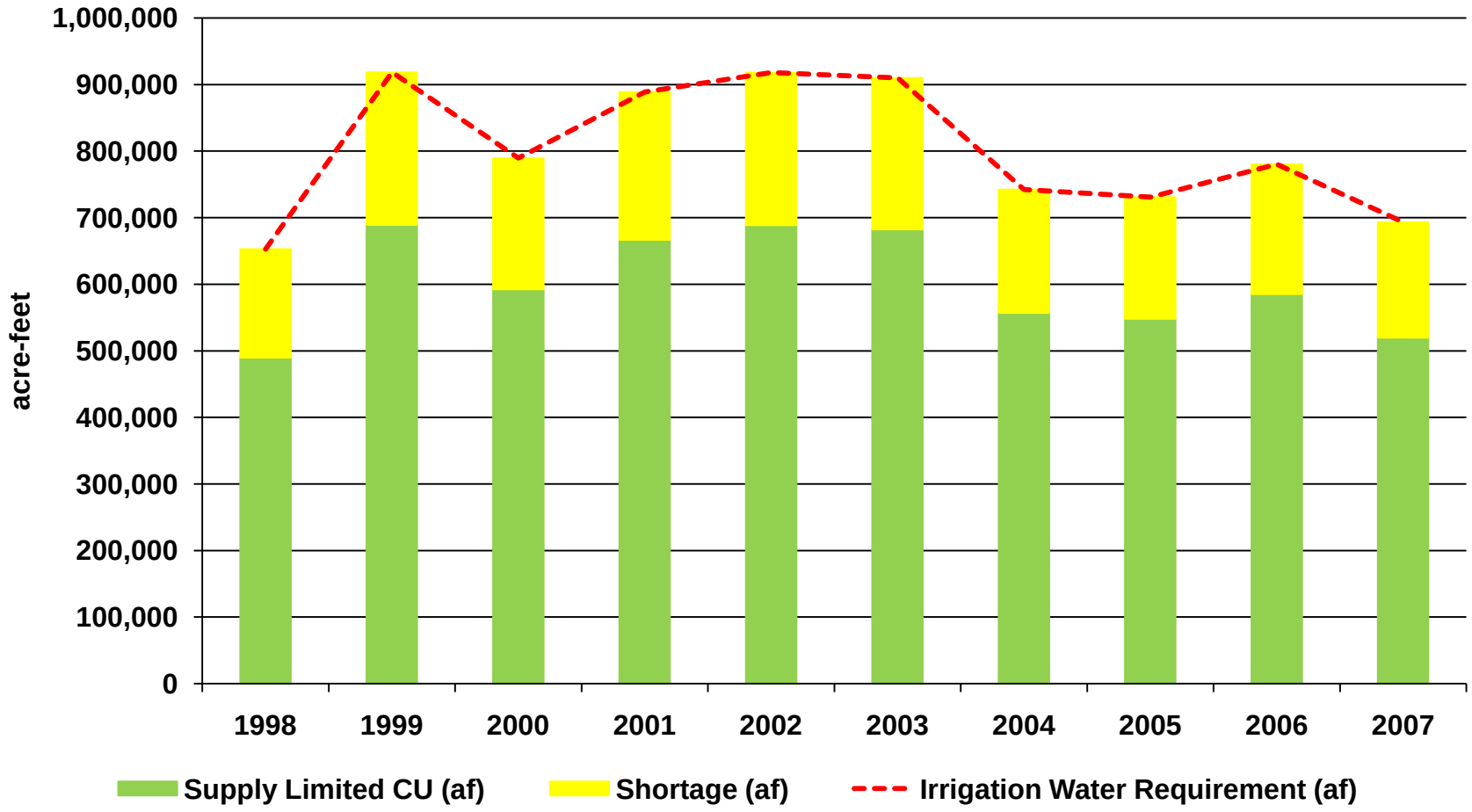
Current Agricultural Acres, Demands and Shortages by Water District –Republican River Basin

Water District	Irrigated Acres	Irrigation Water Requirement (Acre-Feet)	Supply Limited CU (Acre-Feet)	Shortage (Acre-Feet)	Percent Shortage
WD49-Republican River	154,549	247,652	185,739	61,913	25%
WD65-Arikaree River	395,650	554,767	416,075	138,692	25%
Total	**550,199**	**802,419**	**601,814**	**200,605**	**25%**

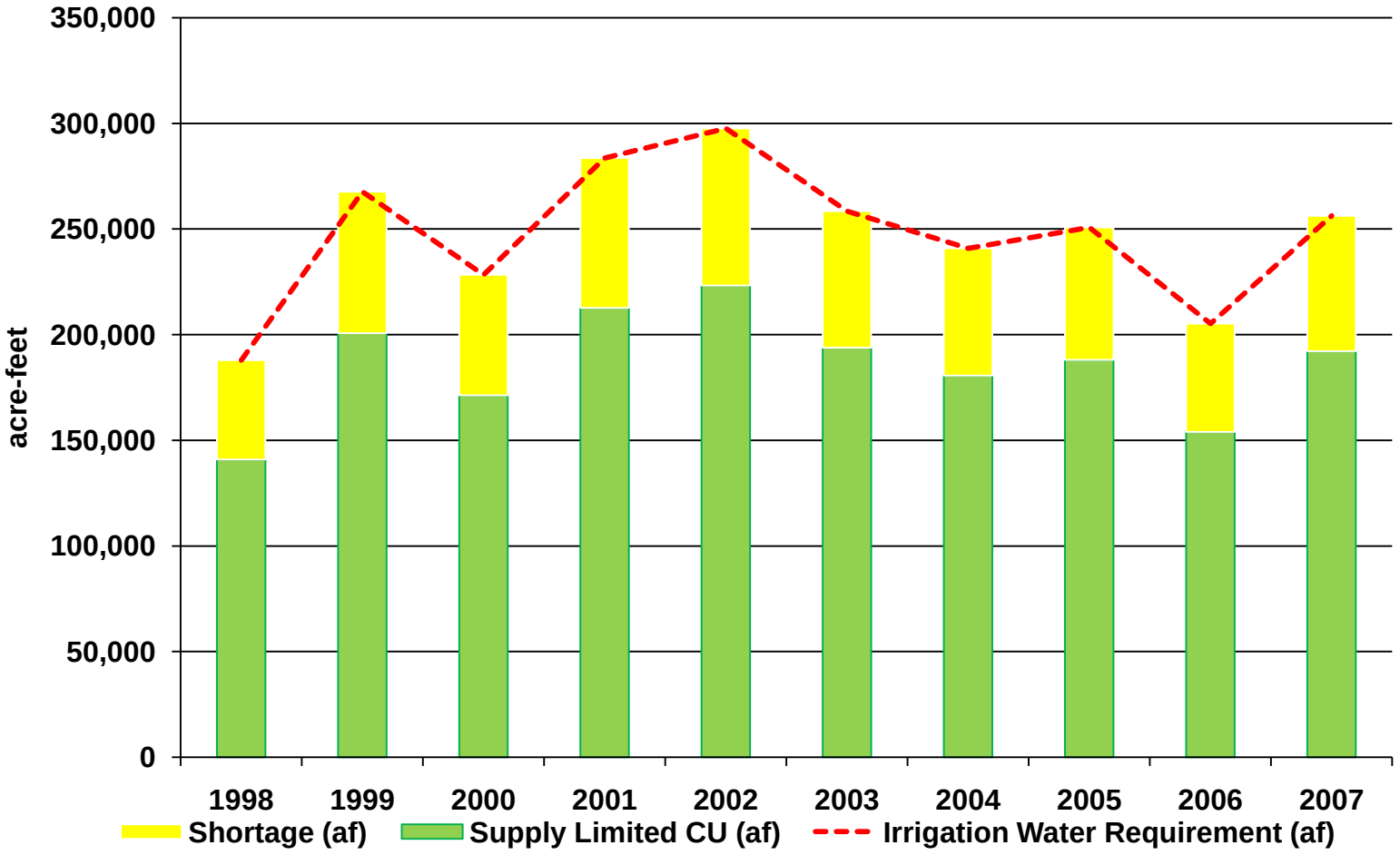
10-Year Average by Water District Agricultural Demands and Shortages



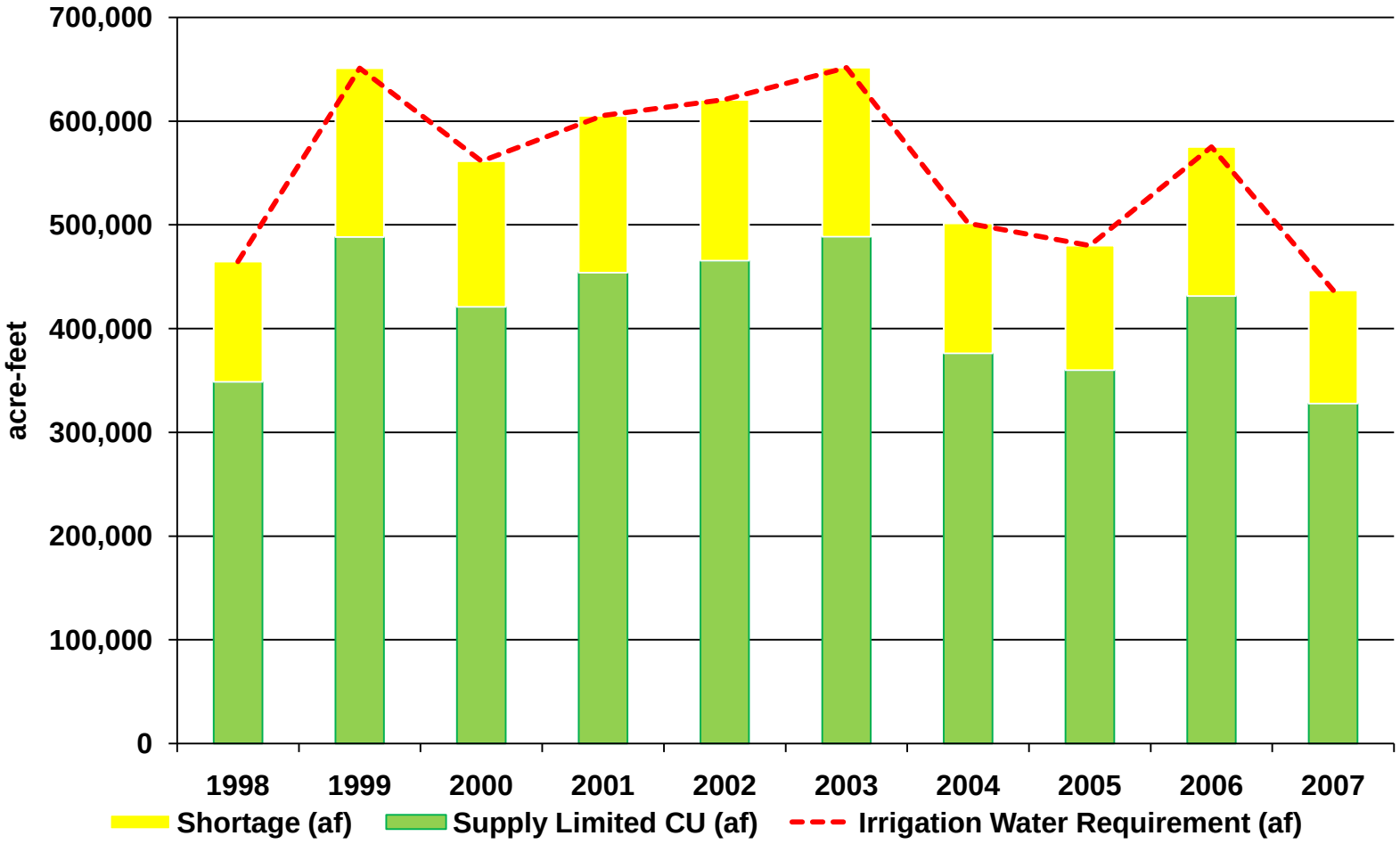
Republican River Basin 10-Year Summary Agricultural Demands and Shortages



Water District 49 - Republican River Agricultural Demands and Shortages



Water District 65 - Arikaree River 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 - South Platte Basin

Water District	Decrease in Irrigated Acres Due to Urbanization		Current Irrigated Acres	Decrease in Irrigated Acres Due to Agricultural to Municipal Transfers	Decrease in Irrigated Acres Due to Other Factors	2050 Irrigated Acres	
	Low	High				Low	High
WD1-South Platte Greeley to Balzac	11,372	14,016	231,593	13,850	14,000	189,727	192,371
WD2-South Platte Denver Gage to Greeley	8,388	10,350	153,485	–	–	143,135	145,097
WD3-Cache La Poudre River	10,923	13,242	181,574	–	–	168,332	170,651
WD4-Big Thompson River	4,708	5,705	60,864	–	–	55,159	56,156
WD5-St. Vrain Creek	3,130	3,794	50,191	–	–	46,397	47,061
WD6-Boulder Creek	1,233	1,509	35,011	–	–	33,502	33,778
WD7-Clear Creek	282	443	4,756	–	–	4,313	4,474

Draft 2050 Irrigated Acres - South Platte Basin

Water District	Decrease in Irrigated Acres Due to Urbanization		Current Irrigated Acres	Decrease in Irrigated Acres Due to Agricultural to Municipal Transfers	Decrease in Irrigated Acres Due to Other Factors	2050 Irrigated Acres	
	Low	High				Low	High
WD8-South Platte Cheesman to Denver Gage	407	592	3,188	–	–	2,596	2,781
WD9-Bear Creek	365	524	1,627	–	–	1,103	1,262
WD23-Upper South Platte	42	55	5,120	–	–	5,065	5,078
WD48-Laramie River	381	459	3,977	–	–	3,518	3,596
WD64-South Platte Balzac to Stateline	630	768	98,181	–	–	97,413	97,551
WD80-North Fork of South Platte	38	60	978	–	–	918	940
Total	**41,898**	**51,517**	**830,545**	**13,850**	**14,000**	**751,178**	**760,797**

Draft 2050 Irrigated Acres – Republican Basin

Water District	Decrease in Irrigated Acres Due to Urbanization		Current Irrigated Acres	Decrease in Irrigated Acres Due to Agricultural to Municipal Transfers	Decrease in Irrigated Acres Due to Other Factors	2050 Irrigated Acres	
	Low	High				Low	High
WD49 – Republican	525	751	154,549	–	–	153,799	154,024
WD65 – Arikaree	1,569	2,132	395,683	–	–	393,551	394,114
Total	**2,094**	**2,883**	**550,232**	–	–	**547,349**	**548,138**

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.

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
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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**

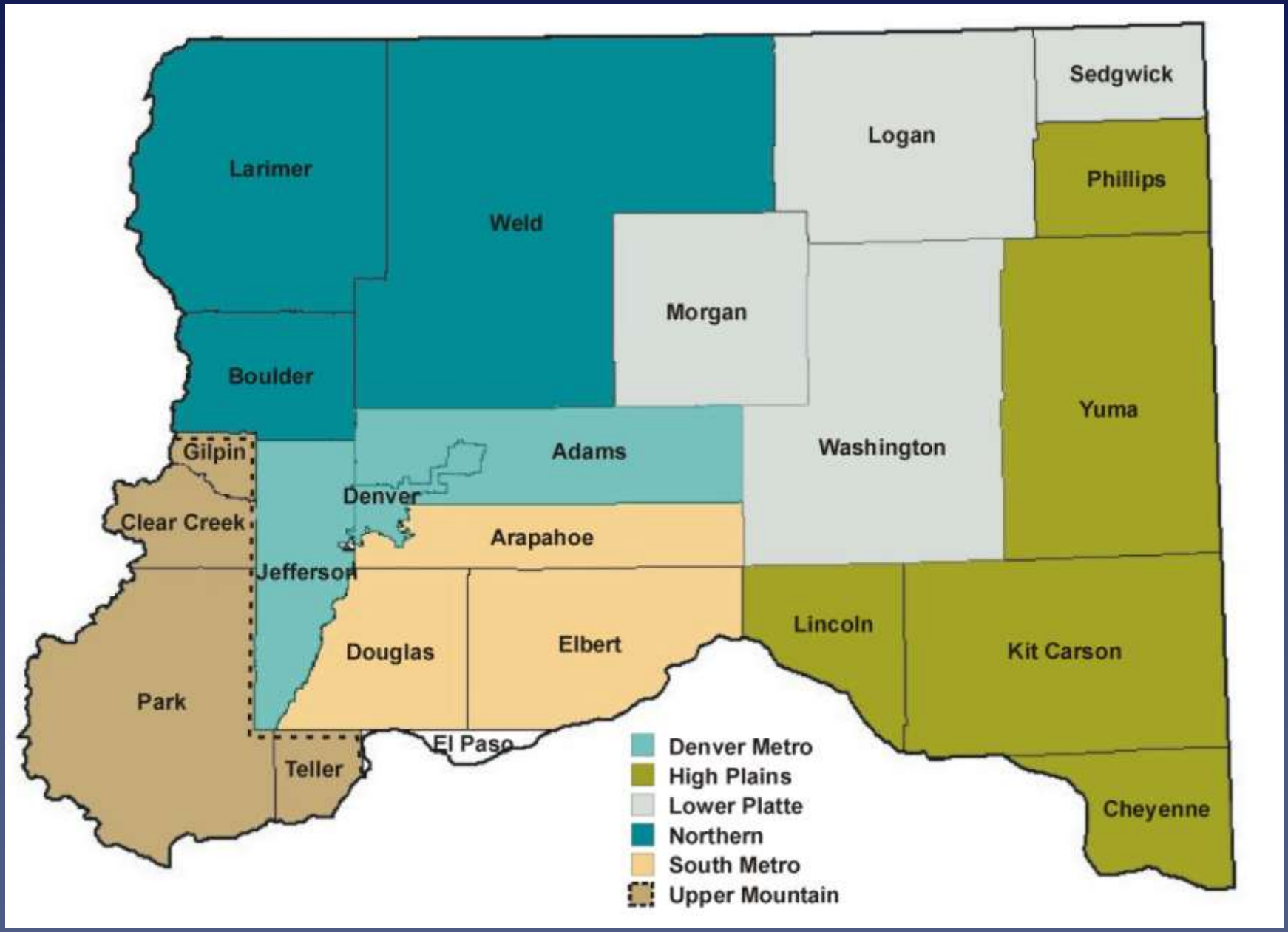
Note: All changes assume normalized hydrologic conditions and no additional constraints to water supplies.

Preliminary Gap Analysis

Methodology

- Interviewed largest providers in basin to determine plans, projects, and processes to meet 2050 water demands
- Aggregated this information at the county 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

South Platte Sub-basins



Draft Gap Analysis

County	Current Demand (AFY)	2050 Demand (AFY)		2050 Water Needs (AFY)		Identified Projects and Processes (AFY)		Gap Identified by Providers (AFY)	Information/ Real Gap (AFY)	
		Low	High	Low	High	Low	High		Low	High
Northern	199,200	365,200	425,800	166,000	226,600	146,500	146,500	4,350	19,500	80,100
Upper Mountain	12,100	25,000	29,800	12,900	17,700	11,600	16,000	–	1,300	1,700
Lower Platte	19,100	31,800	37,100	12,700	18,000	6,400	9,000	–	6,300	9,000
High Plains	8,900	11,100	13,200	2,200	4,300	2,200	4,300	–	0	0
Total	**239,300**	**433,100**	**505,900**	**193,800**	**266,600**	**166,700**	**175,800**	**4,350**	**27,100**	**90,800**

Discussion

- Information vs. real gap
- Methods for meeting gap
  - Urbanization onto agricultural lands
  - Ag to municipal transfers
  - Conservation
  - In-Basin project
  - Firming of existing water rights