Colorado's Water Supply Future

Gunnison Basin Roundtable

Montrose, Colorado

May 4, 2009

1

Agenda

- Scenarios for Colorado's Water Supply Future
- Conservation Strategy
- Agriculture Transfer Strategy
- New Supply Development Strategy
- Feedback on Strategies and Next Steps

2

Examine the Engineering Evaluation Elements for Strategies

- Description of strategy or project elements – water source, conveyance and storage, water quality
- Capital costs – permitting, mitigation, land acquisition, pumps, pipe, treatment
- Annual O&M costs – energy, equipment maintenance and replacement

Purpose

Ability to begin to compare tradeoffs between strategies

3

Further Evaluation of Strategies will Include:

- Identification of:
  - Project benefits
  - Implementation issues
  - Potential attributes/additional options
  - Acceptability
- Other evaluation elements:
  - Additional cost elements (water rights or storage)
  - Discuss potential attributes/additional options for ag transfer and new supply development options with Basin Roundtables
  - Incorporate other conservation elements such as sharing of conserved water and the infrastructure and institutional arrangements required
- Qualitative description of how each strategy meets the Vision Statement and Vision Goals

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Scenarios for Colorado's Water Supply Future

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Scenarios will Address the Following Water Needs

- Municipal & Industrial
- Agricultural
- Environmental & Recreational



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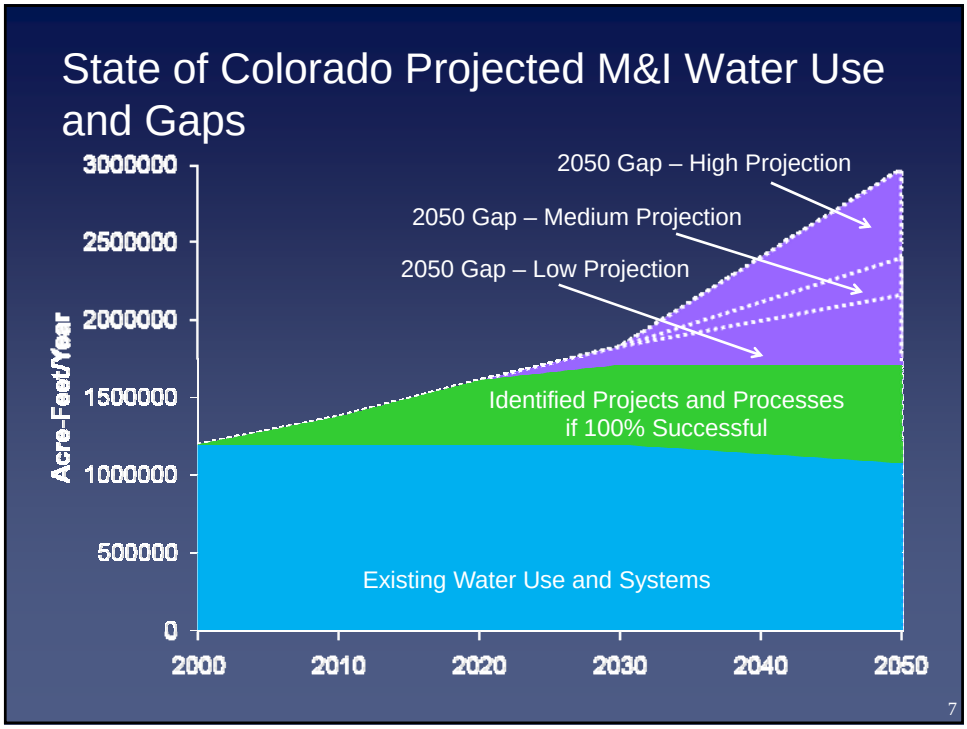
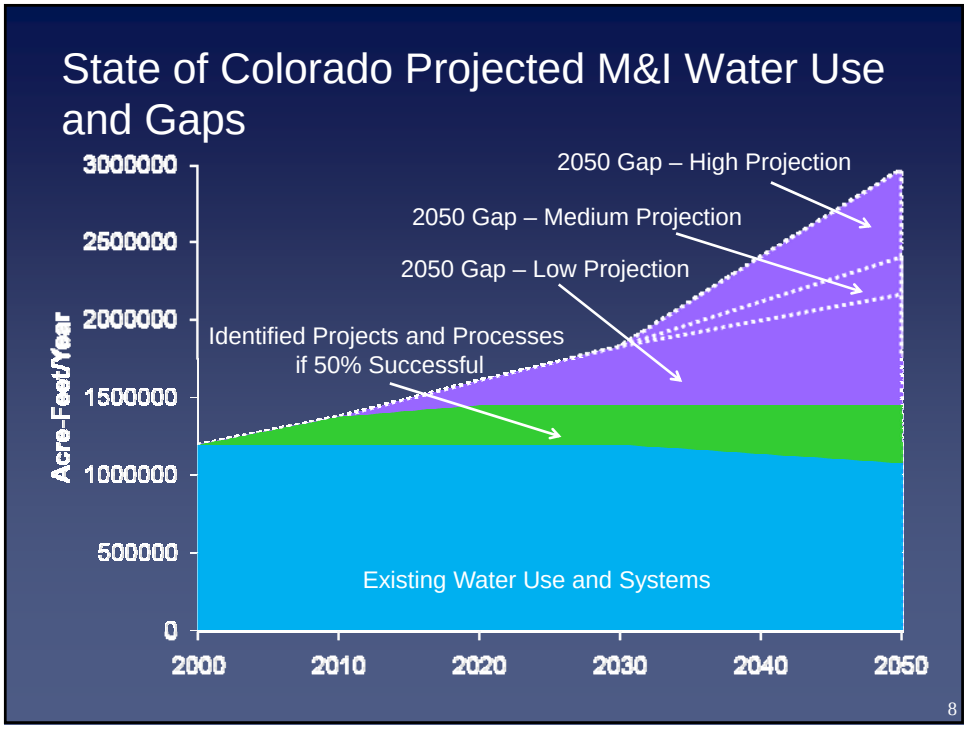

State of Colorado Projected M&I Water Use and Gaps
3000000
2500000
2000000
1500000
1000000
500000
0
Acre-Feet/Year
2000
2010
2020
2030
2040
2050
2050 Gap – High Projection
2050 Gap – Medium Projection
2050 Gap – Low Projection
Identified Projects and Processes if 100% Successful
Existing Water Use and Systems
7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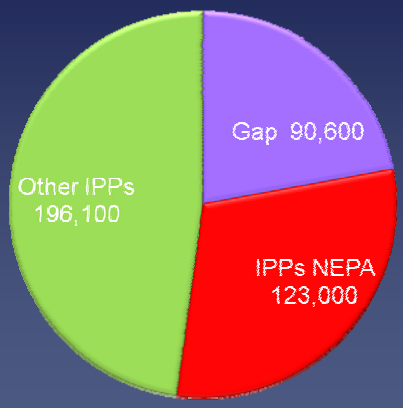
500000
0
Acre-Feet/Year
2000
2010
2020
2030
2040
2050
2050 Gap – High Projection
2050 Gap – Medium Projection
2050 Gap – Low Projection
Identified Projects and Processes if 50% Successful
Existing Water Use and Systems
8

In 2030, the South Platte and Metro Basins will have 409,700 of New M&I Demand

- South Metro Counties Rueter-Hess
- ECCV Northern
- Non-trib GW
- Denver Metro Counties
- Aurora Prairie Waters
- Thornton Poudre Pipeline
- Ag Transfers
- Gravel Lakes
- Northern Counties CBT acquisitions, ag transfers and local storage



- South Metro
- Denver Metro
- Northern
- Upper Mountain
- Lower Platte

- Moffat Firming
- Windy Gap Firming
- NISP
- Halligan-Seaman

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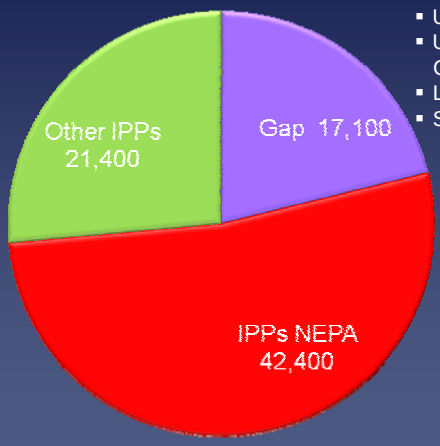
In 2030, the Arkansas Basin will have 80,900 of New M&I Demand

- Arkansas Valley Conduit
- Well augmentation
- Non-trib GW
- PSOP
- Existing water rights
- Agricultural Transfers



- Upper Arkansas
- Unincorporated El Paso County
- Lower Arkansas
- Southwestern Arkansas

- Southern Delivery System

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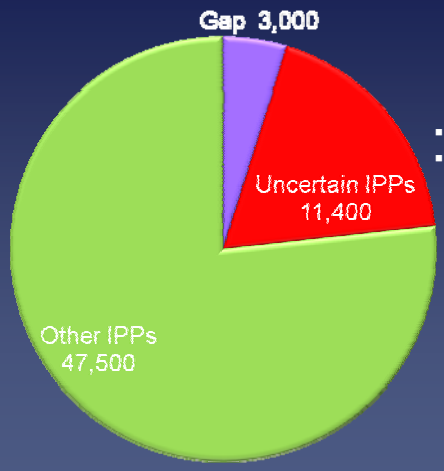
In 2030, the Colorado Basin will have 61,900 of New M&I Demand

- Pitkin County IPPs Existing Supplies
- Ruedi Reservoir
- Mesa City IPPs Existing Supplies, Ag Transfers, Ruedi/Wolford
- Jerry Creek Reservoir
- Garfield City IPPs Existing Supplies
- Ag Transfers
- Eagle City IPPs Existing Supplies
- Ag Transfers
- Eagle River Process



- Grand County
- Summit County

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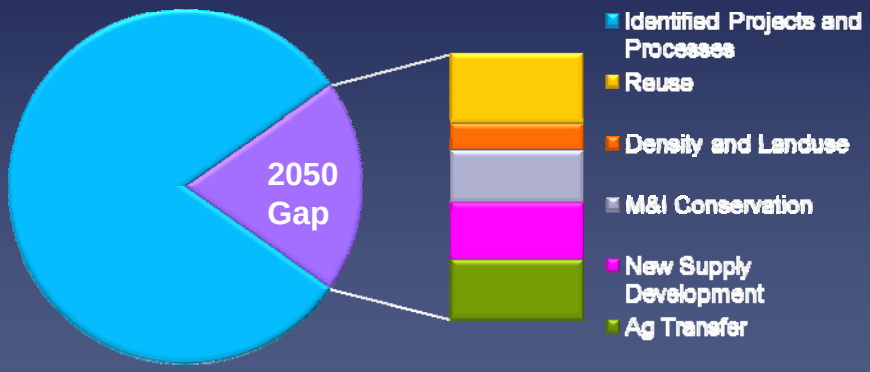
Example of Portfolio to Meet 2050 M&I Needs



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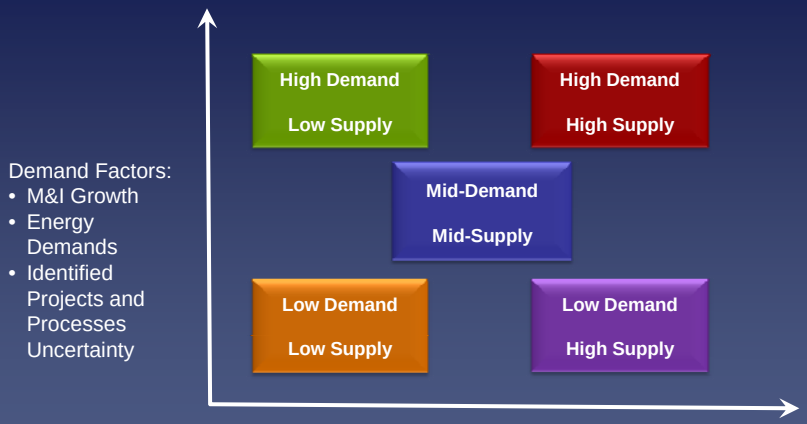
2050 Planning Horizon for Colorado's Water Supply Future



Demand Factors:
- M&I Growth
- Energy Demands
- Identified Projects and Processes Uncertainty

Supply Factors:
- Colorado River Hydrologic Variability
- Climate Change
- Compact Considerations

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Water Supply Strategies

- Water Conservation
- Agricultural Transfers
  - Conventional and alternative transfers
- Development of New Supplies
  - West Slope M&I and Energy
  - Transbasin

These strategies address M&I needs, but options to address agricultural and nonconsumptive needs will be added as strategies are evaluated

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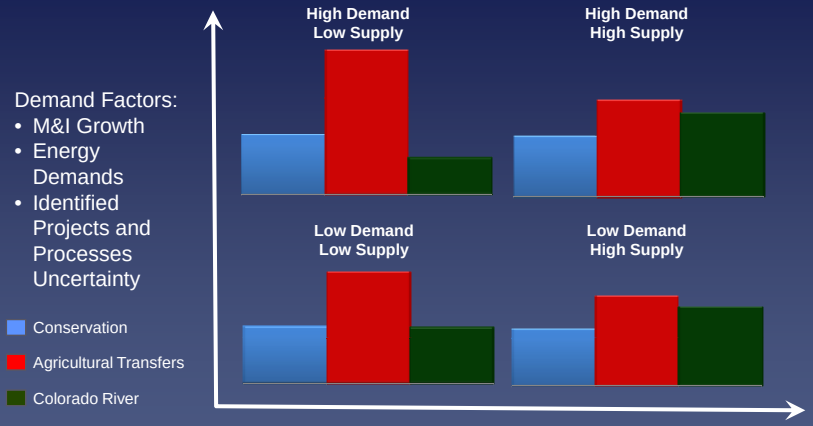
2050 Planning Horizon for Colorado's Water Supply Future

Demand Factors:
- M&I Growth
- Energy Demands
- Identified Projects and Processes Uncertainty



Supply Factors:
- Colorado River Hydrologic Variability
- Climate Change
- Compact Considerations

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Conservation Strategy

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Conservation Strategy

- 20%, 30%, and 40% savings analyzed for each basin
- Management practices identified
- Overview of initial results
- Feedback on how much this strategy will reduce overall 2050 demands

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Overview of Conservation Strategy Approach

- Used SWSI 1 as baseline
- Estimated percent reduction in water usage at 2050 at 20 percent, 30 percent, and 40 percent reduction levels from SWSI 1
- Examine measures identified in SWSI 2 that could be utilized to achieve reduction levels
- Review results with major water providers and Basin Roundtables
- Summarize findings

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Initial Results

- What progress have we made in meeting 2030 demands with respect to demand reductions from conservation?
- What demand reductions should be implemented by 2050?
- What conservation best management practices could be used to implement these reductions?
- What do other states require regarding conservation or demand reporting?

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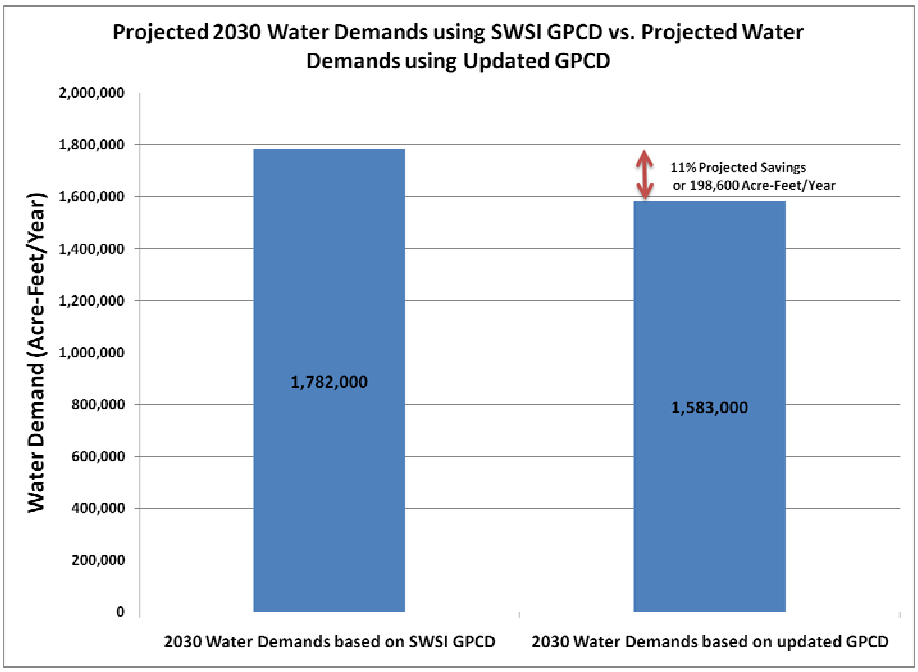
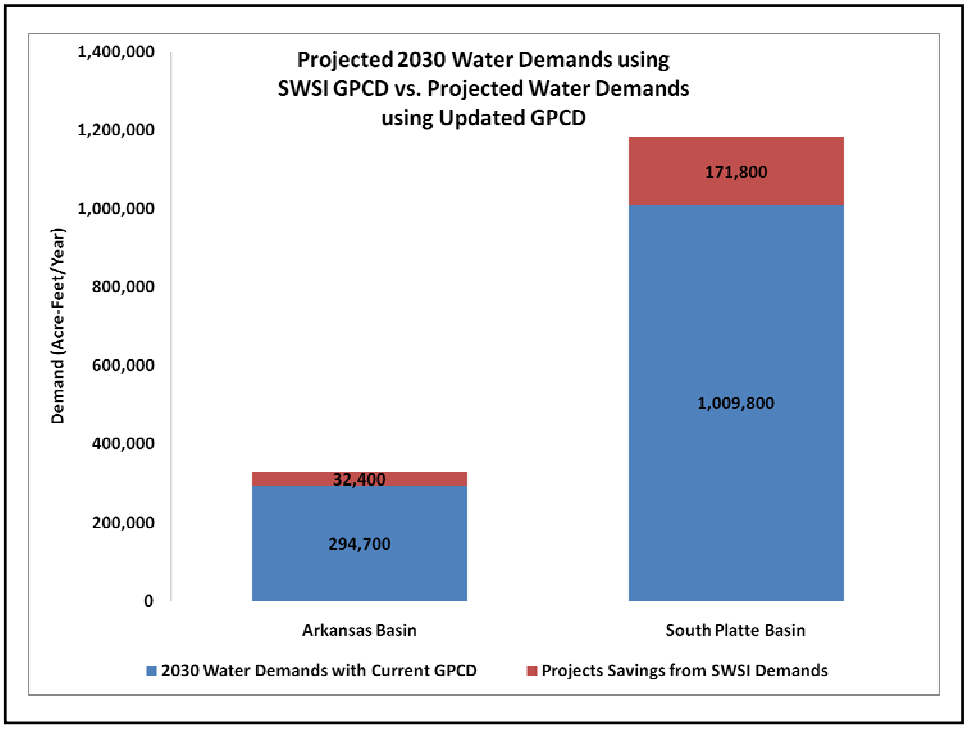
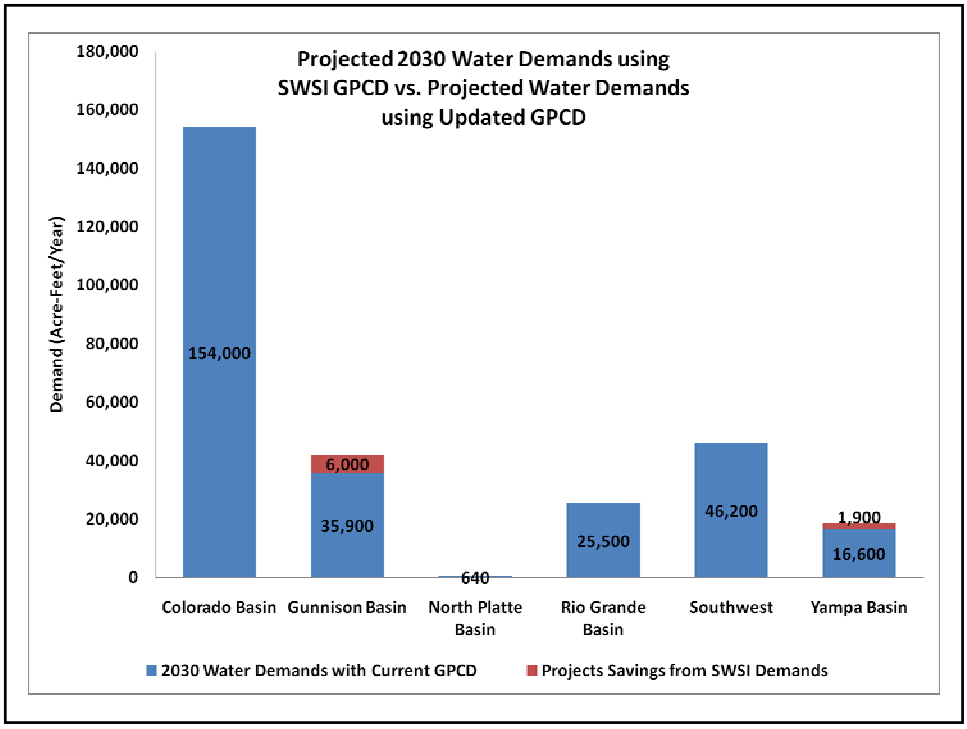
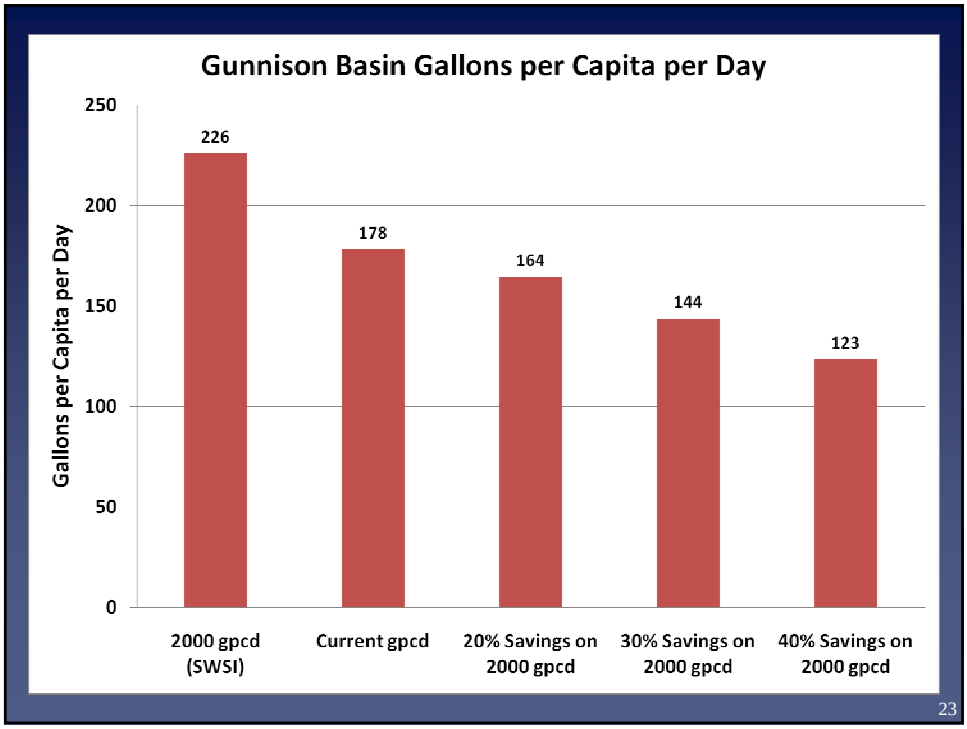
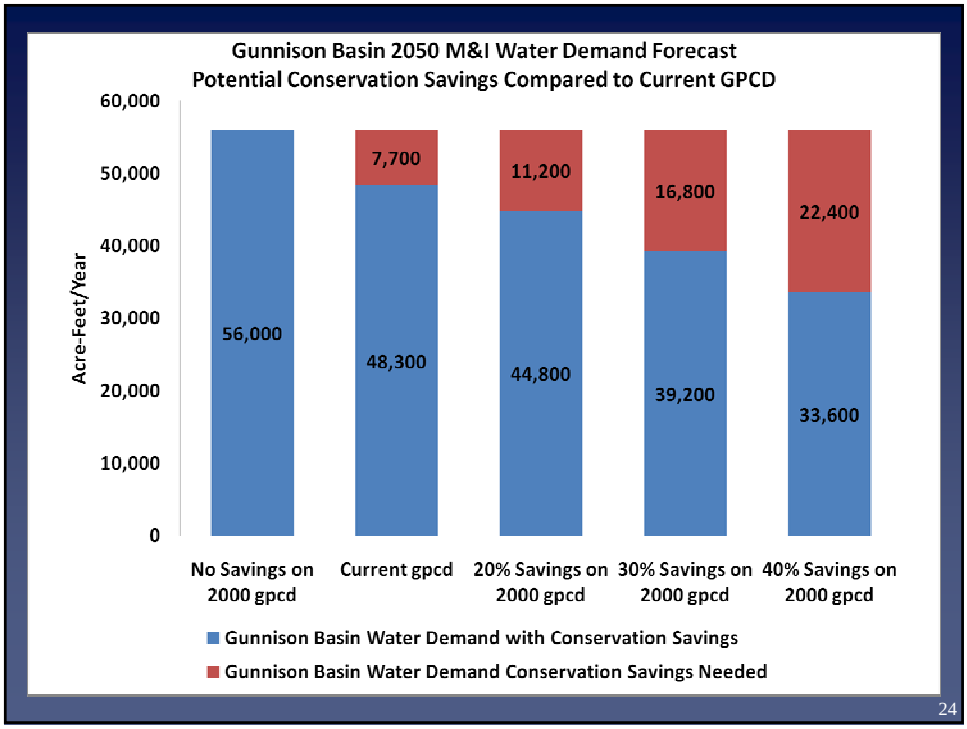



Projected 2030 Water Demands using SWSI GPCD vs. Projected Water Demands using Updated GPCD
Demand (Acre-Feet/Year)
1,400,000
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
171,800
1,009,800
32,400
294,700
Arkansas Basin
South Platte Basin
2030 Water Demands with Current GPCD
Projects Savings from SWSI Demands


Projected 2030 Water Demands using SWSI GPCD vs. Projected Water Demands using Updated GPCD
Demand (Acre-Feet/Year)
180,000
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
154,000
6,000
35,900
640
25,500
46,200
1,900
16,600
Colorado Basin
Gunnison Basin
North Platte Basin
Rio Grande Basin
Southwest
Yampa Basin
2030 Water Demands with Current GPCD
Projects Savings from SWSI Demands


Gunnison Basin Gallons per Capita per Day
Gallons per Capita per Day
250
200
150
100
50
0
226
178
164
144
123
2000 gpcd (SWSI)
Current gpcd
20% Savings on 2000 gpcd
30% Savings on 2000 gpcd
40% Savings on 2000 gpcd
23


Gunnison Basin 2050 M&I Water Demand Forecast
Potential Conservation Savings Compared to Current GPCD
Acre-Feet/Year
60,000
50,000
40,000
30,000
20,000
10,000
0
56,000
7,700
48,300
11,200
44,800
16,800
39,200
22,400
33,600
No Savings on 2000 gpcd
Current gpcd
20% Savings on 2000 gpcd
30% Savings on 2000 gpcd
40% Savings on 2000 gpcd
Gunnison Basin Water Demand with Conservation Savings
Gunnison Basin Water Demand Conservation Savings Needed
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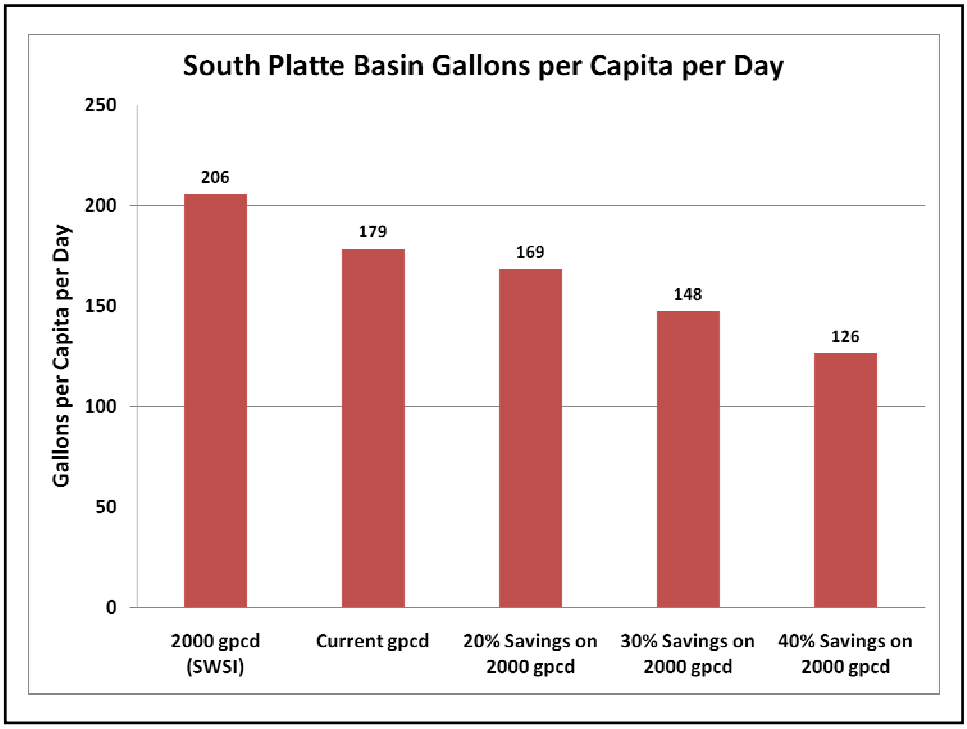
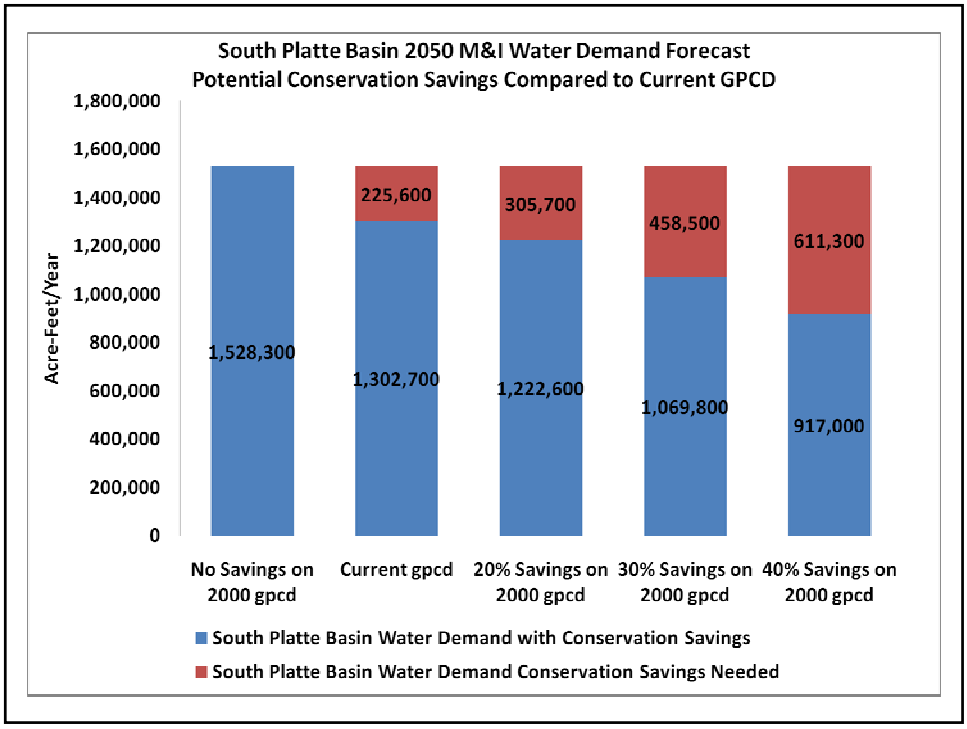

South Platte Basin Gallons per Capita per Day
Gallons per Capita per Day
250
200
150
100
50
0
206
179
169
148
126
2000 gpcd (SWSI)
Current gpcd
20% Savings on 2000 gpcd
30% Savings on 2000 gpcd
40% Savings on 2000 gpcd


South Platte Basin 2050 M&I Water Demand Forecast
Potential Conservation Savings Compared to Current GPCD
Acre-Feet/Year
1,800,000
1,600,000
1,400,000
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
1,528,300
225,600
1,302,700
305,700
1,222,600
458,500
1,069,800
611,300
917,000
No Savings on 2000 gpcd
Current gpcd
20% Savings on 2000 gpcd
30% Savings on 2000 gpcd
40% Savings on 2000 gpcd
South Platte Basin Water Demand with Conservation Savings
South Platte Basin Water Demand Conservation Savings Needed

SWSI 2 Conservation Measures

- Turf replacement
- Utility water loss reduction programs
- Toilet rebates
- Conservation oriented water rates
- Washer rebates
- Cooling towers increased cycle concentration
- Rebates for landscape retrofits other than turf replacement
- Residential landscape audits
- Residential indoor audits
- Sub-metering in multi-family housing
- Commercial landscape audits
- Commercial indoor audits
- Metering of all utility customers

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Conservation Strategy Next Steps

- Complete basin by basin analysis
- Work with water providers and Basin Roundtables to confirm analysis
  - Confirm where 2000 to current savings is permanent or temporary
  - Confirm conservation measures utilized
- Summarize findings

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Conservation Strategy Next Steps

- Identify benefits, implementation issues, potential attributes and acceptability
- Refine Cost Estimates
- Analyze other conservation elements such as sharing of conserved water and the infrastructure and institutional arrangements required
- Analyze municipal use of ditch water
- Analyze impacts of conservation measures
- Additional Refinements
  - Consumptive use vs. diversion demand
  - System wide use vs. residential use
  - Current uses vs. new customers

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M&I Conservation Strategy
Example of Benefits, Impacts and Attributes

Benefits	Impacts	Potential Attributes
Cost effective water supply strategy	**Potential reliability concerns**	**Environmental or recreational flows**
Reduces need for future transbasin diversion	**Consideration of utilities financial model**	
Reduces need for future agricultural transfers	**For higher levels of conservation, potentially severe landscape impacts**	

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Overview of Agricultural Transfer Strategy and New Supply Development Strategy

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Today – Examine the Engineering Evaluation Elements for Strategies

- Description of strategy or project elements – water source, conveyance and storage, water quality

Purpose

Ability to begin to compare tradeoffs between strategies

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Further Evaluation of Strategies will Include:

- Identification of:
  - Project benefits
  - Implementation issues
  - Mitigation
  - Potential attributes/additional options
  - Acceptability
- Other evaluation elements:
  - Capital costs – permitting, mitigation, land acquisition, pumps, pipe, treatment
  - Annual O&M costs – energy, equipment maintenance and replacement
  - Additional cost elements (water rights or storage)
  - Discuss potential attributes/additional options for ag transfer and new supply development options with Basin Roundtables
  - Incorporate other conservation elements such as sharing of conserved water and the infrastructure and institutional arrangements required
- Qualitative description of how each strategy meets the Vision Statement and Vision Goals

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Assumptions for Today's Analysis for the Agricultural Transfer Strategy and New Supply Development Strategy

- Delivery of similar water quality
- With exception of Green Mountain concept, strategies will deliver water in the range of 100KAF to 250KAF

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Water Supply Concepts

- 2 Lower South Platte concepts
- 2 Lower Arkansas concepts
- Green Mountain concept
- Yampa concept
- Flaming Gorge concept
- Colorado River Return Reconnaissance concept

Asked by the IBCC to evaluate additional small-to-medium sized new water supply projects

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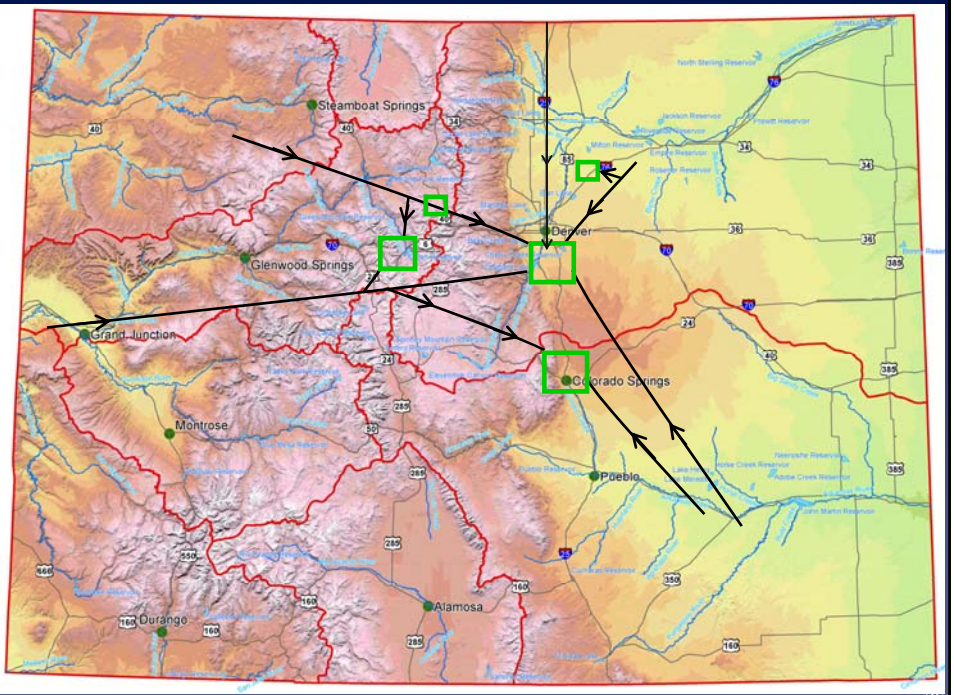

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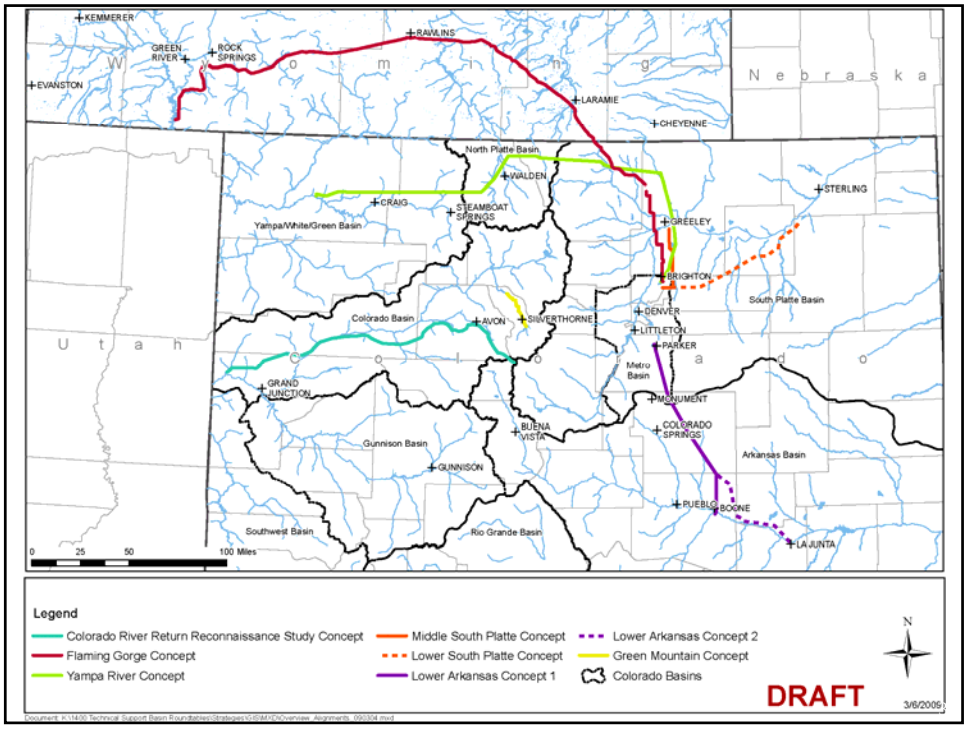

Agricultural Transfer Strategy

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Agricultural Transfer Strategy Overview

- Overview of projects and methods to meet needs matrix for roundtables
- Engineering Evaluation Elements
  - Lower South Platte concept 100,000-250,000 acre-feet
  - Lower Arkansas concept 100,000-250,000 acre-feet
- Example benefits and issues with each project

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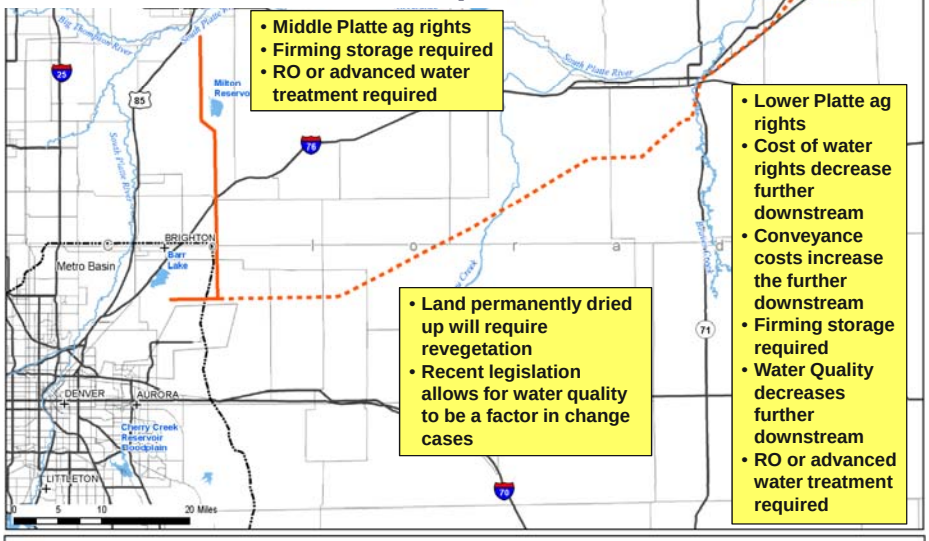
Lower South Platte Concept



Lower South Platte Concept
Example of Benefits, Impacts, and Attributes

Benefits	Impacts	Potential Attributes
Less reliance on additional deliveries from headwaters areas, thus minimizing streamflow impacts in environmentally sensitive areas	Water quality is poor and treatment costs (capital and O&M) are high	Potential to collaborate with remaining agricultural users to construct lower basin storage or recharge facilities to improve agricultural yields or provide for well augmentation
Decreases the need for additional transbasin diversions	Disposal of treatment waste stream concentrate is a challenge and very costly	Shared infrastructure among water providers, resulting in economies of scale for capital and O&M
No net increase in depletions to the river system	Loss of irrigated acreage in production annually regardless of the type of agricultural transfer	Can provide for coordinated acquisition of agricultural rights for either a traditional or alternative transfer preserving higher quality/value agricultural production
	Significant energy requirements for pumping and water treatment	Conjunctive use with non-tributary groundwater can potentially improve the overall project operation

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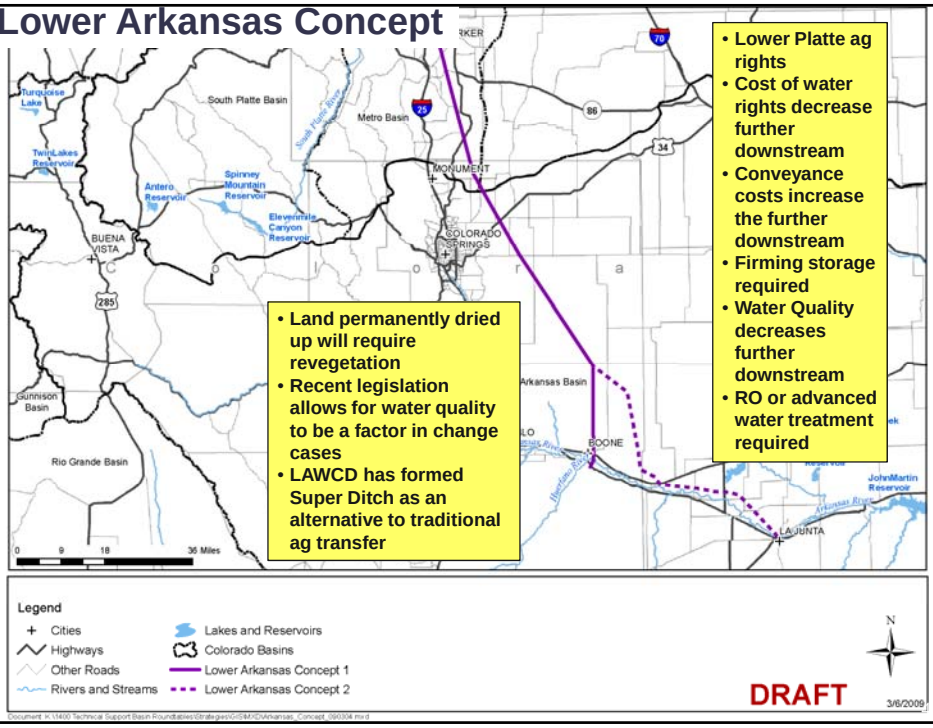
Lower Arkansas Concept



- Land permanently dried up will require revegetation
- Recent legislation allows for water quality to be a factor in change cases
- LAWCD has formed Super Ditch as an alternative to traditional ag transfer

- Lower Platte ag rights
- Cost of water rights decrease further downstream
- Conveyance costs increase the further downstream
- Firming storage required
- Water Quality decreases further downstream
- RO or advanced water treatment required

Lower Arkansas Concept
Example of Benefits, Impacts, and Attributes

Benefits	Impacts	Potential Attributes
Less reliance on additional deliveries from headwaters areas, thus minimizing streamflow impacts in environmentally sensitive areas	Water quality is poor and treatment costs (capital and O&M) are high	Potential to collaborate with remaining agricultural users to construct lower basin storage or recharge facilities to improve agricultural yields or provide for well augmentation
Decreases the need for additional transbasin diversions	Transfer to South Metro Area may be of concern	Shared infrastructure among water providers, resulting in economies of scale for capital and O&M
No net increase in depletions to the river system	Disposal of treatment waste stream concentrate is a challenge and very costly	Can provide for coordinated acquisition of agricultural rights for either a traditional or alternative transfer preserving higher quality/value agricultural production
	Loss of irrigated acreage in production annually regardless of the type of agricultural transfer	Conjunctive use with non-tributary groundwater can potentially improve the overall project operation
	Significant energy requirements for pumping and water treatment	

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Ag Transfer Strategy Next Steps

- Identify benefits, implementation issues, potential attributes and acceptability
- Refine Cost Estimates
- Incorporate alternative ag transfer methods into the strategy
- Work with others (e.g. Dept. of Ag, CSU, Ag Water Alliance) to:
  - Investigate the regional interdependence of agriculture (both within CO and with other western states)
  - Analyze the “tipping point” for agriculture both at the ditch system level and regional level

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New Supply Development

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New Supply Development Strategy Overview

- Overview of projects and methods to meet needs matrix for roundtables
- Engineering Evaluation Elements
  - Green Mountain concept <100,000 acre-ft
  - Yampa concept 100,000 to 250,000 acre-ft
  - Flaming Gorge concept 100,000 to 250,000 acre-ft
  - Colorado River Return Reconnaissance concept 100,000 to 250,000 acre-ft
- Example benefits and issues with each project
- Additional small-to-medium sized projects

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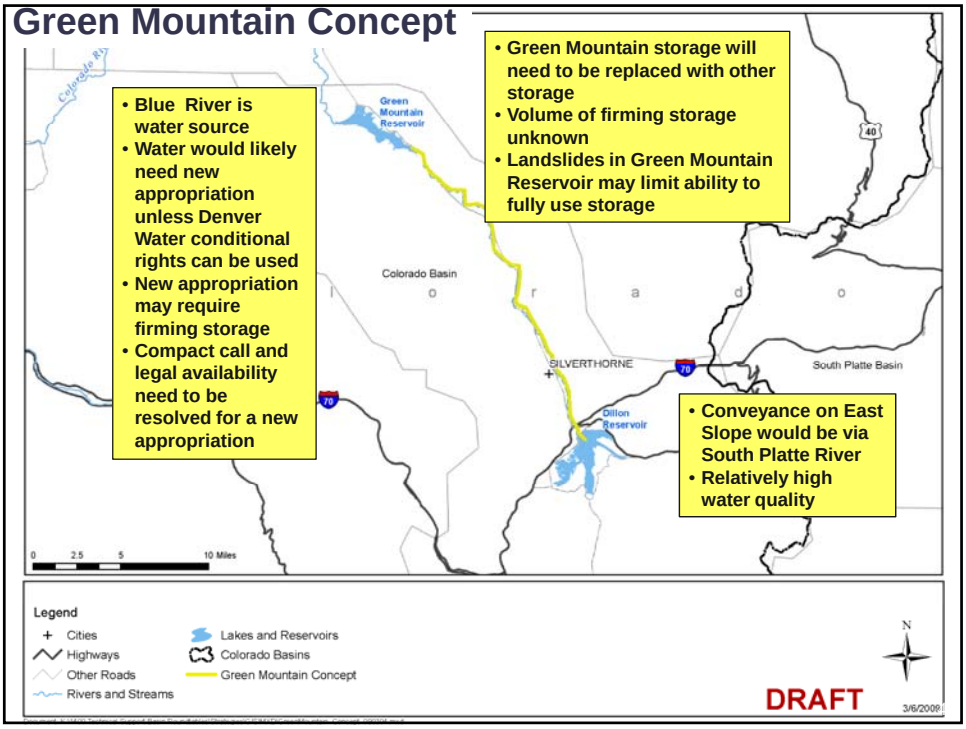
Green Mountain Concept



Green Mountain Concept
Example of Benefits, Impacts, and Attributes

Benefits	Impacts	Potential Attributes
Minimize loss of irrigated acres in South Platte and Arkansas Basins	Potential for increased compact call	Delivery to North Fork of South Platte upstream of Denver Metro area for gravity delivery to Denver Water customers and other water providers
Maximize Colorado's Colorado River compact entitlement	Additional in-basin storage	
Additional flows in Upper South Platte	Diminished flows in rivers below proposed diversions with potential increases in TDS and other water quality impacts	Protect or enhance Blue River flows
Grand County streamflow management	Phosphorus levels in Dillion Reservoir	Exchanges for additional flows in Colorado headwaters
Additional Grand Valley water supplies	Green Mountain Reservoir levels	Multi-purpose storage for endangered species and other Colorado Basin needs

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Green Mountain Concept
Example of Benefits, Impacts, and Attributes (cont.)

Benefits	Impacts	Potential Attributes
Dillon Reservoir Levels	Green Mountain Reservoir/ Wolcott Reservoir Swap	Ability to exchange water for Summit County Municipal and Industrial purposes
Additional water supplies for the upper Blue River		
Additional yield for Clinton Reservoir		
Blue River flow enhancement		Recreation component for Wolcott Reservoir
Additional west slope supplies		
Abandonment of some Eagle River rights		

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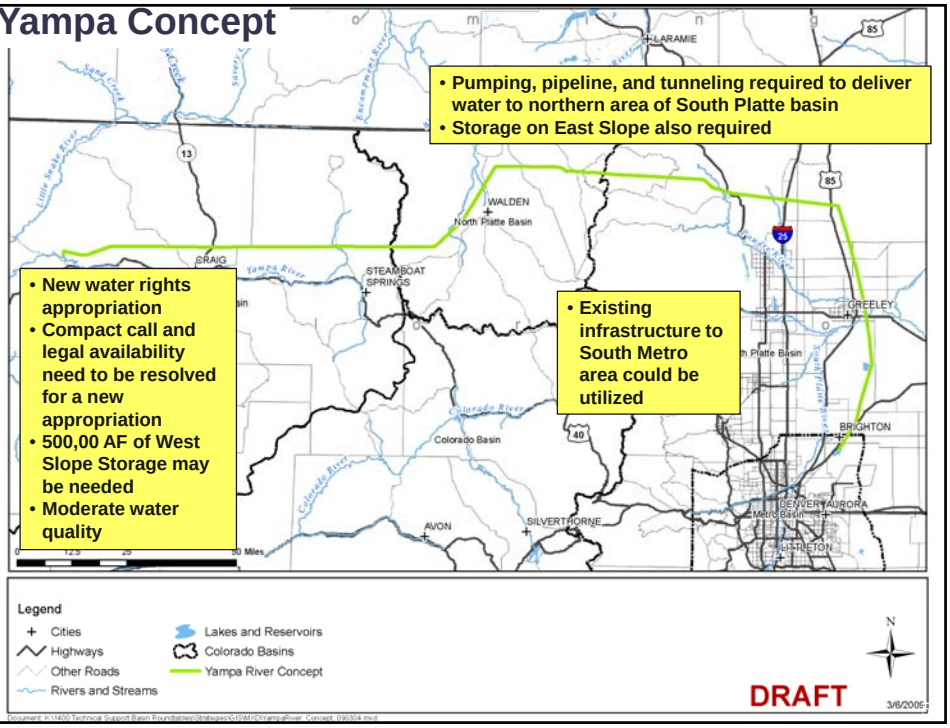
Yampa Concept



Yampa Concept
Example of Benefits, Impacts, and Attributes

Benefits	Impacts	Potential Attributes
Minimize loss of irrigated acres in South Platte and Arkansas Basins	Potential for increased compact call	Multiple Front Range delivery locations
Maximize Colorado's Colorado River Compact entitlement	Large energy requirements	West Slope and East Slope storage
	Endangered species on Yampa and Green Rivers	East Slope hydropower facilities
	Dinosaur National Monument located downstream of proposed diversion	

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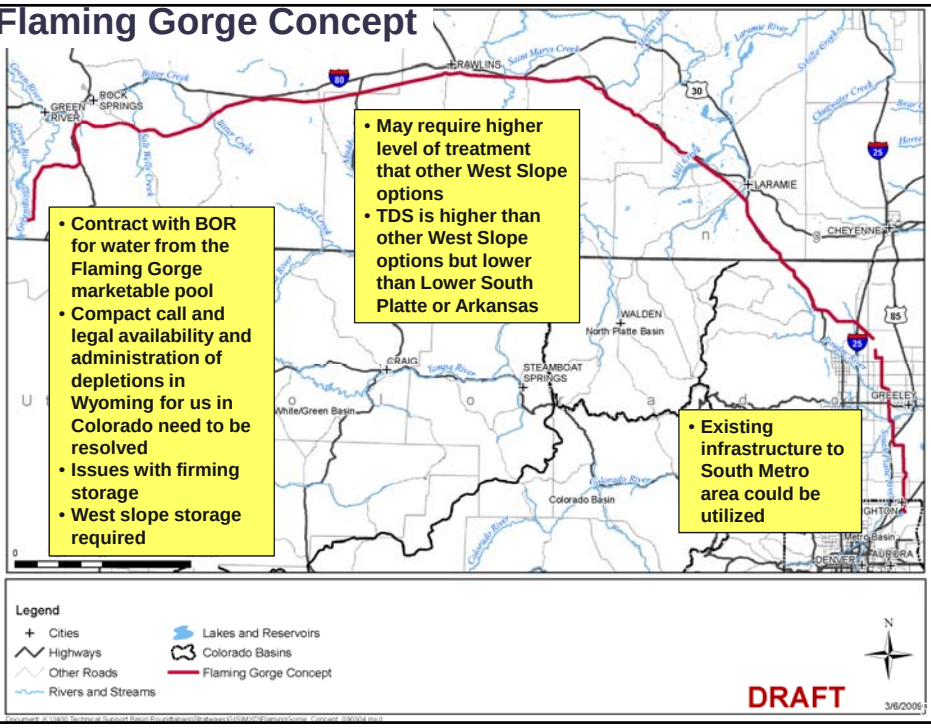
Flaming Gorge Concept



Flaming Gorge Concept
Example of Benefits, Impacts, and Attributes

Benefits	Impacts	Potential Attributes
Minimize loss of irrigated acres in South Platte and Arkansas Basins	Potential downstream endangered fishes and depletion issues	Delivery to in-basin users for agricultural domestic augmentation and instream flows
Acceptable quality water source that may not require advanced water treatment processes	Enlargement or construction of additional storage in South Platte or Arkansas	Exchanges for additional flows in Colorado headwaters
Maximizes State of Colorado's Colorado River Compact entitlement without impacting streamflows Colorado	Large energy requirements	Allows water development while protecting recreational and environmental flows in Colorado River Basin
	Potential for increased compact call	
	Coordinated administration of water rights in the event of a compact call	

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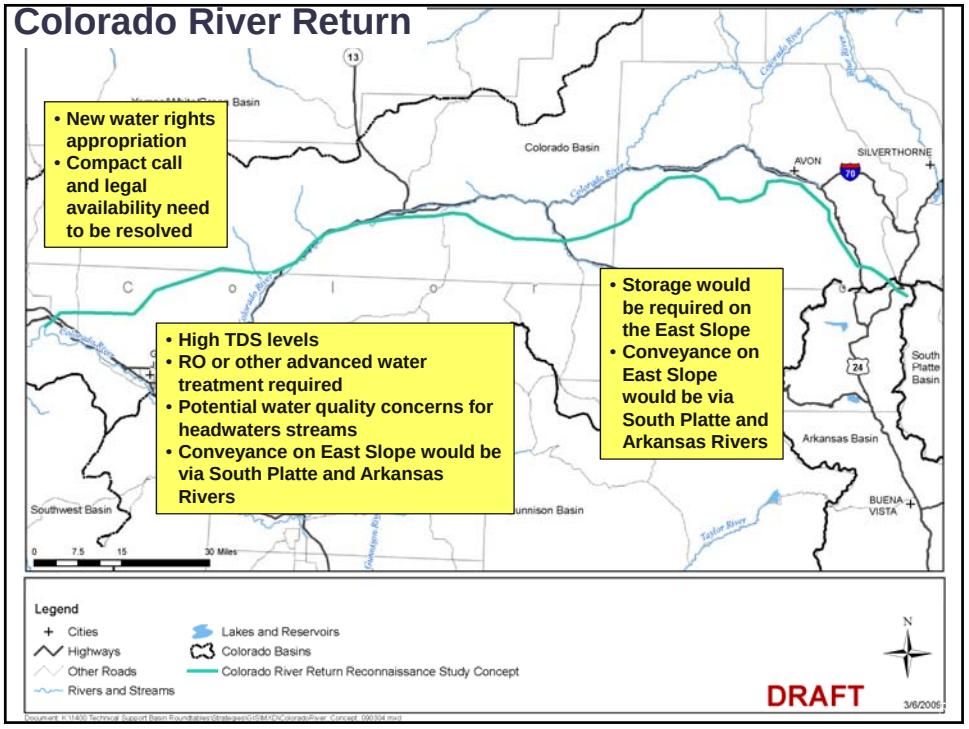
Colorado River Return



Colorado River Return Reconnaissance Example of Benefits, Impacts, and Attributes

Benefits	Impacts	Potential Attributes
Minimize loss of irrigated acres in South Platte and Arkansas	**Water quality is poor and treatment costs (capital and O&M) are high**	**Delivery to in-basin users for ag, domestic augmentation, and instream flows**
Diverts below all major users in Colorado	**Disposal of treatment waste stream concentrate is a challenge and very costly**	**Exchanges for additional flows in Colorado headwaters**
Maximize Colorado's compact entitlement	**Potential for increased compact call**	**Allows water development while protecting recreational and environmental flows in Colorado basin**
Less reliance on additional deliveries from headwaters areas, thus minimizing streamflow impacts	**Stream temperature, nutrients, and TDS in water after treatment will be different than streams receiving discharge from project**	
Additional flows in upper South Platte, Arkansas, and Colorado Rivers, providing for additional environmental and recreational enhancement	**Reduction of flows in the main stem Colorado River and the presence of federally listed fish species below the diversion**	
Multiple basin delivery	**Significant energy requirements**	

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Integration of Nonconsumptive Needs

- Statewide map of priorities
- CWCB in process of identifying existing protections
- Priority areas addressed during strategy development
  - Qualitative need
  - Quantitative need
  - Non-flow related needs

New Supply Development Strategy Next Steps

- Identify benefits, implementation issues, potential attributes and acceptability
- Refine Cost Estimates
- Analyze additional projects in the small to medium range
- Develop details on risk management strategies (risk of additional development of Colorado River water and risk of not developing)

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Risk Management Strategies

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Risk Management and Planning

- Timing and phased development
- Incremental development
- No regrets planning

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Risk Management and Implementation

- West Slope Water Bank
- Compact Delivery via Blue Mesa
- Conjunctive Use of Denver Basin Aquifer
- System Wide Augmentation

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Next Steps in Strategy Analysis

- Evaluation processes
- Tradeoffs
- Risk and uncertainity

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Next Steps in Strategy Analysis

- Feedback on Benefits and Impacts Tables
- Development of Water Supply Portfolios (there is no “silver bullet”)
- Evaluation of Trade-offs
- Evaluation of Risk and uncertainty
- Tie strategies and portfolios back to the IBCC’s Vision Statement and Goals

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Elements of the Visioning Process

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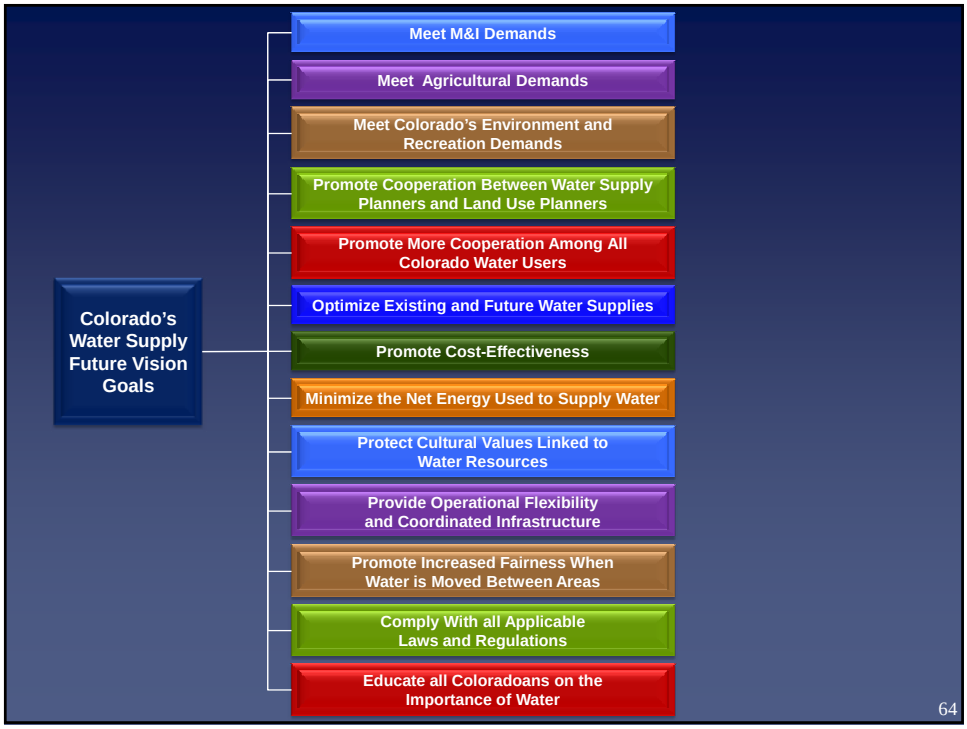

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Roundtable Work

Benefits	Impacts	Mitigation	Potential Attributes

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