Colorado's Water Supply Future

Joint Roundtable Arkansas/Metro/South Platte Overview of Strategies to Meet Colorado's Future Water Supply

Denver, Colorado

May 13, 2009

Overview

- Scenarios for Colorado's water supply future
- Conservation strategy
- Overview of agricultural transfer strategy and new supply development strategy
- Agricultural transfer strategy
- New supply development

Scenarios for Colorado's Water Supply Future

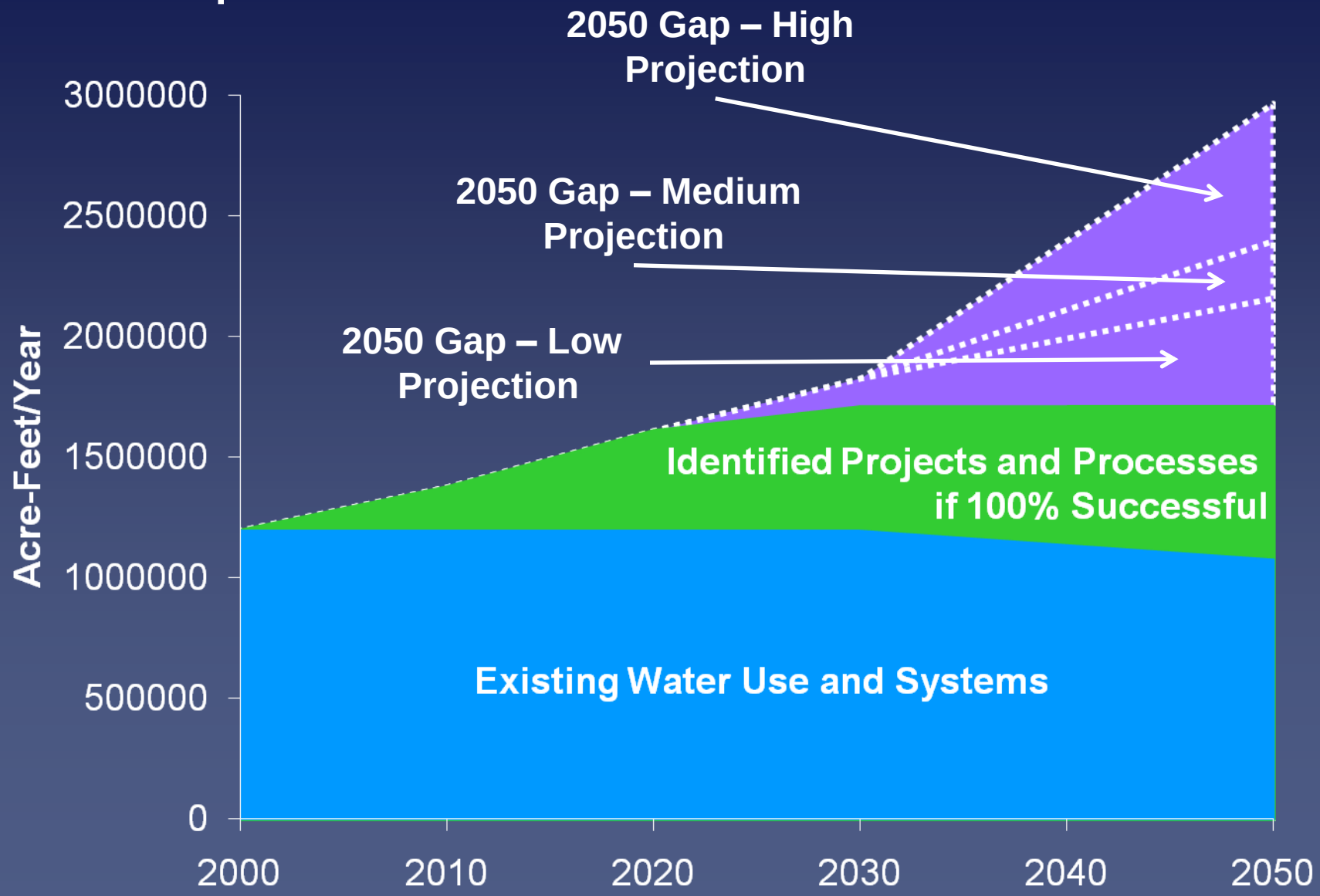
Scenarios will Address the Following Water Needs

- Municipal & Industrial
- Agricultural
- Environmental & Recreational

Development of Scenarios

- Overview of Water Needs
  - M&I (short-term and long-term)
  - Agricultural
  - Environmental Needs
- Scenario Development for M&I Needs
  - Low to High Demand
  - Low to High Supply
- Scenario Portfolios for M&I Needs

State of Colorado Projected M&I Water Use and Gaps



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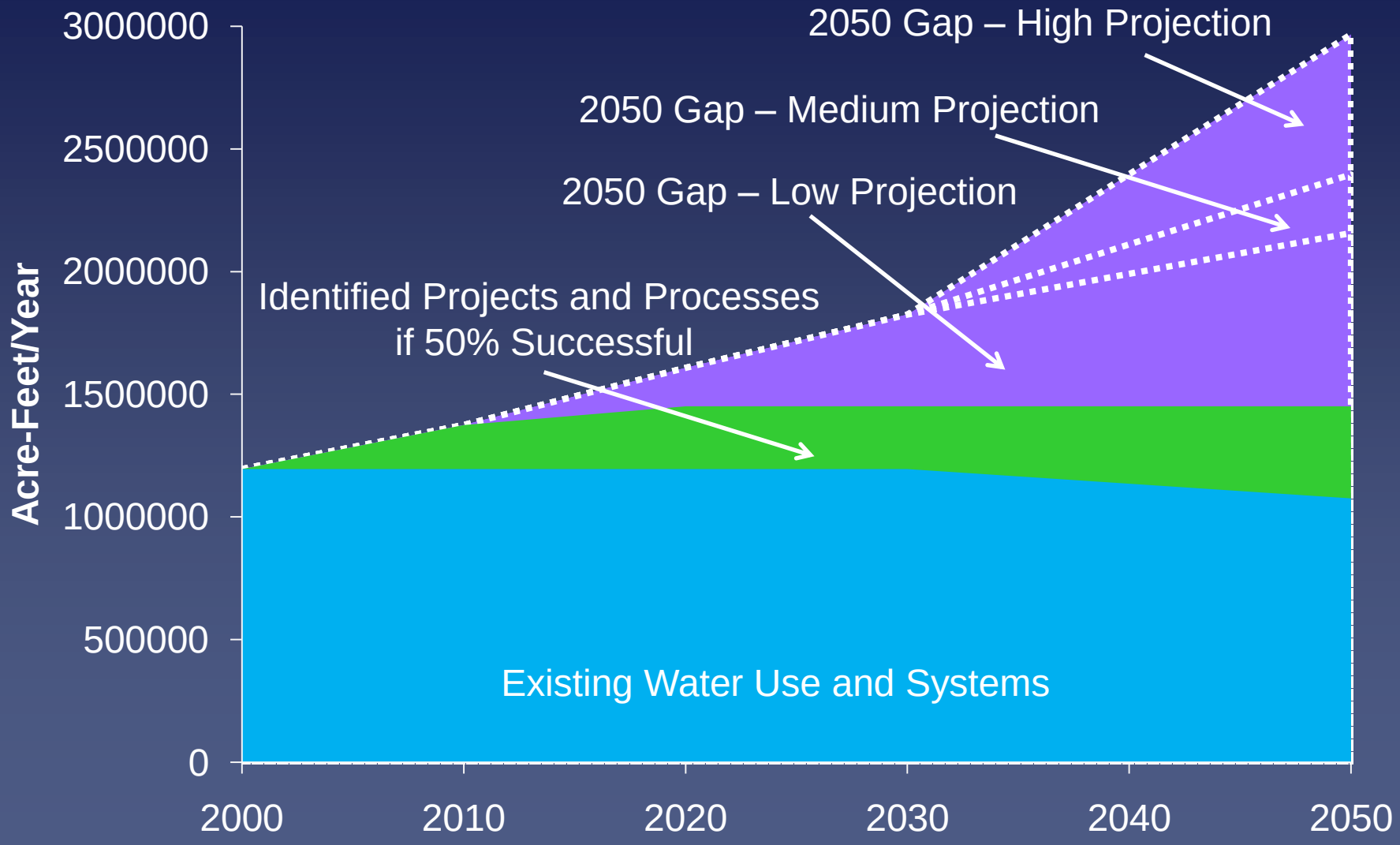

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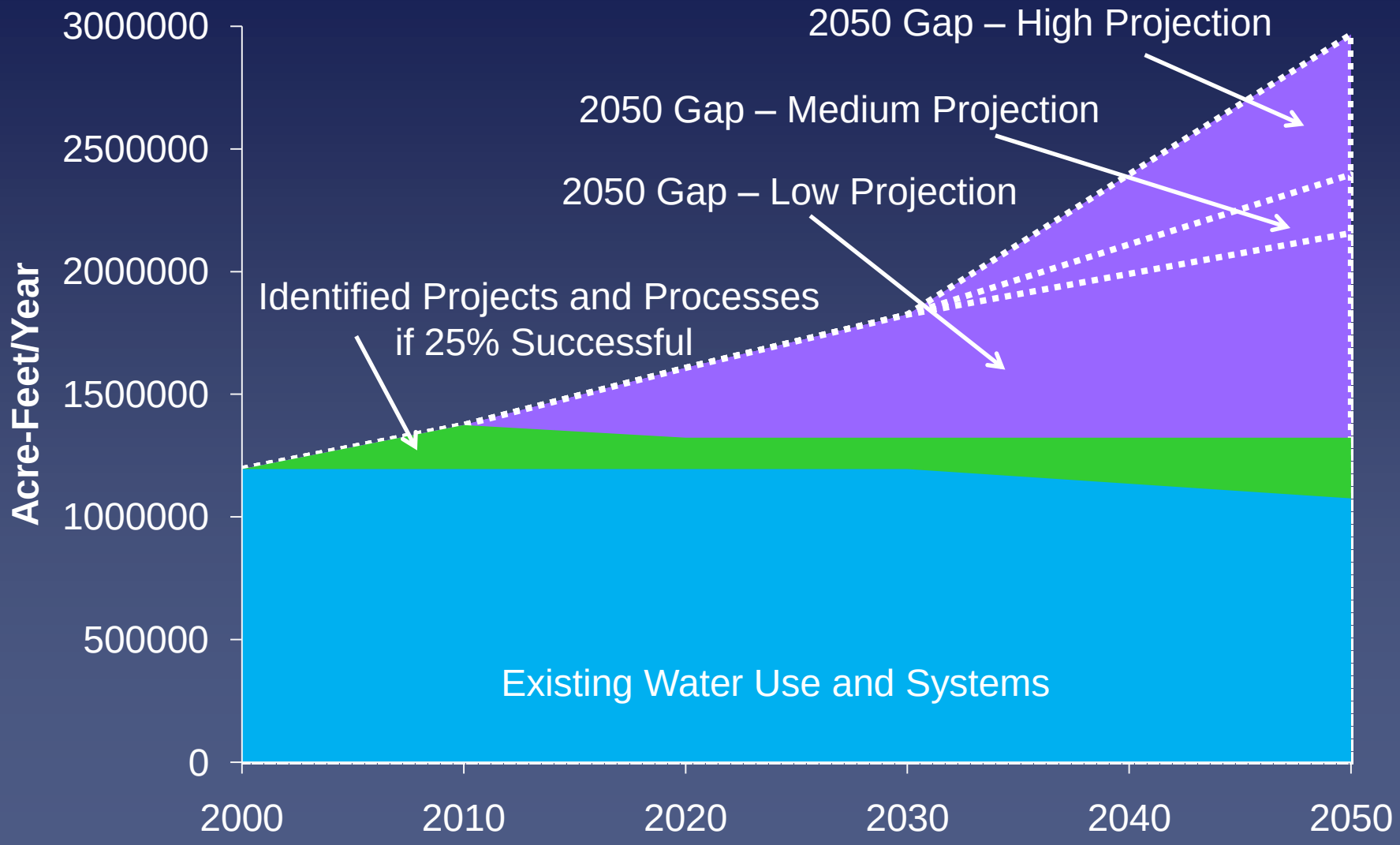
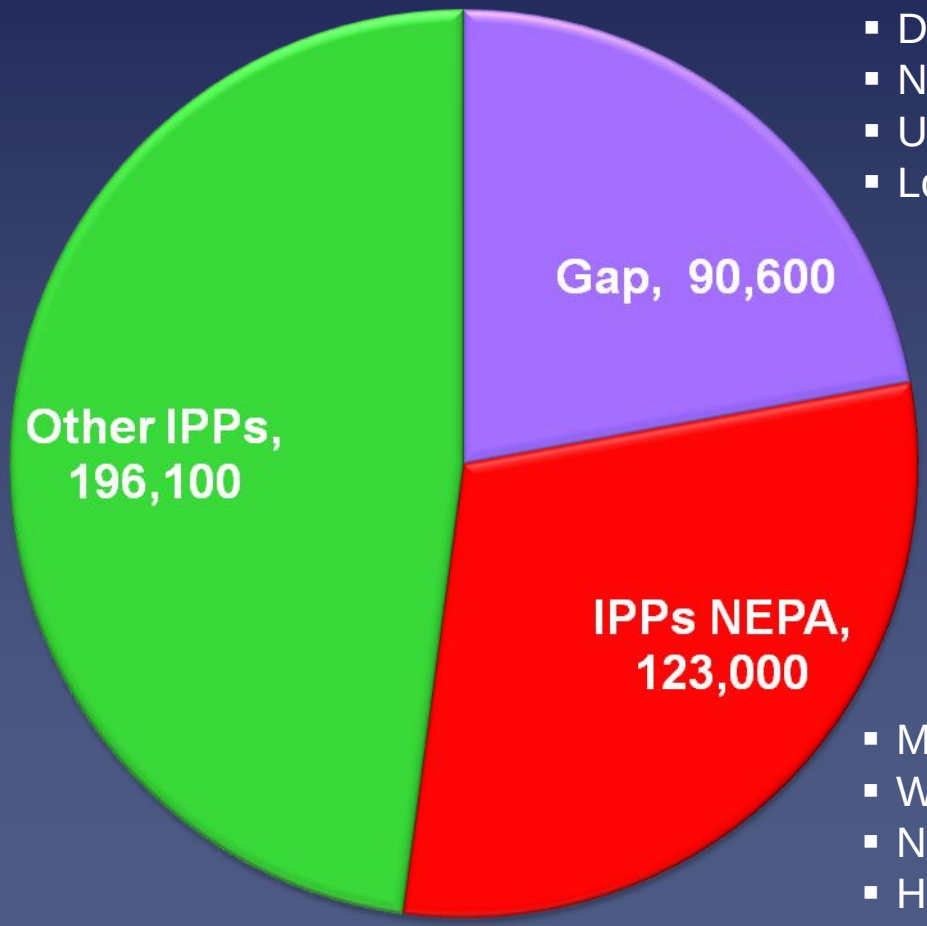


In 2030, the South Platte and Metro Basins will have 409,700 of New M&I Demand

- 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

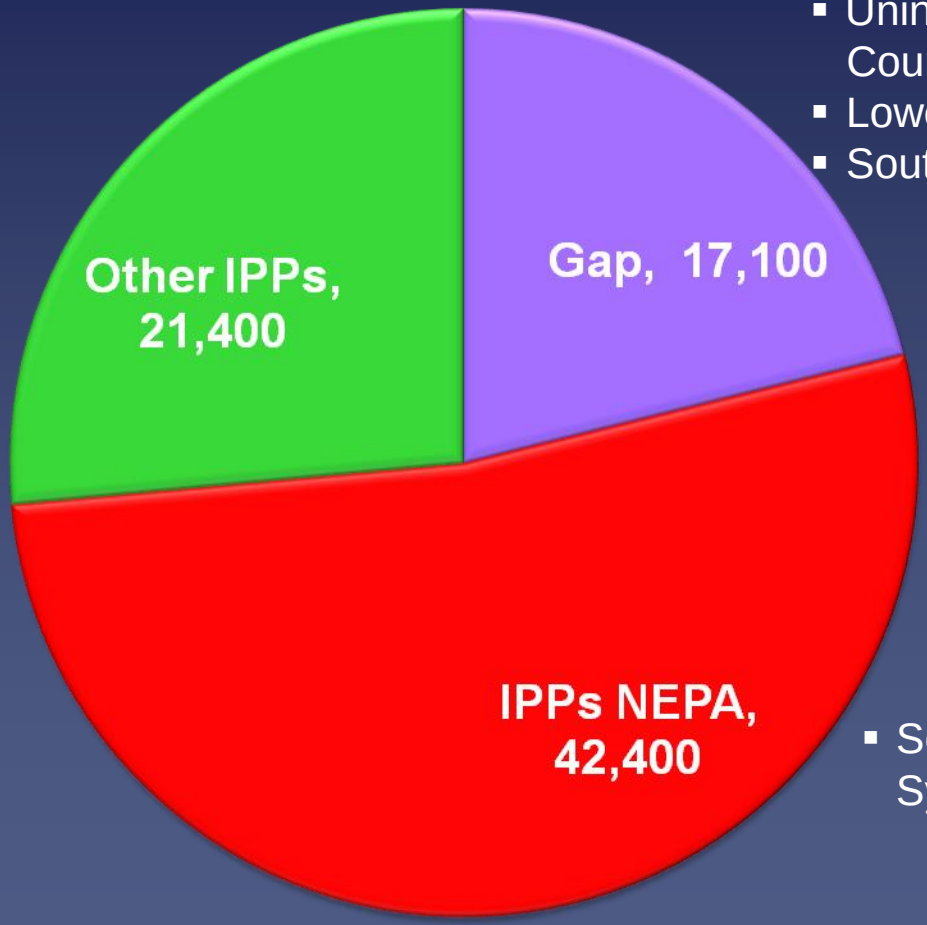


- South Metro
- Denver Metro
- Northern
- Upper Mountain
- Lower Platte

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

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

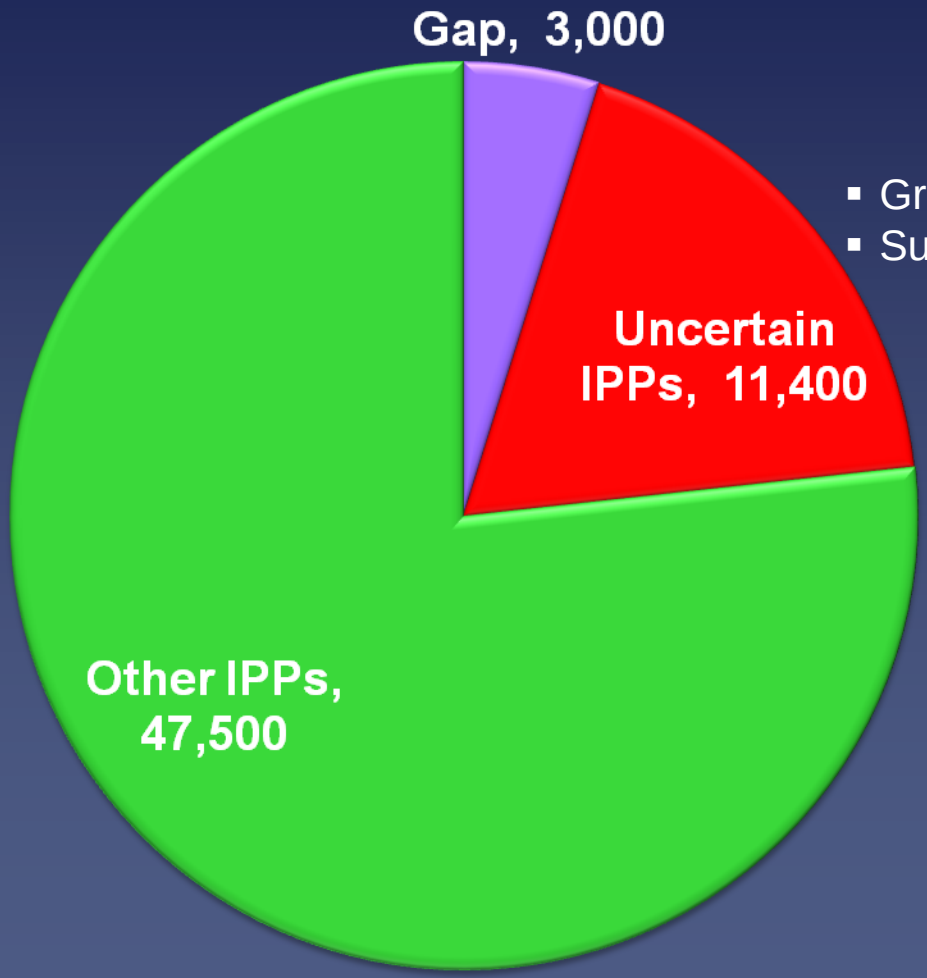


- Upper Arkansas
- Unincorporated El Paso County
- Lower Arkansas
- Southwestern Arkansas

- Southern Delivery System

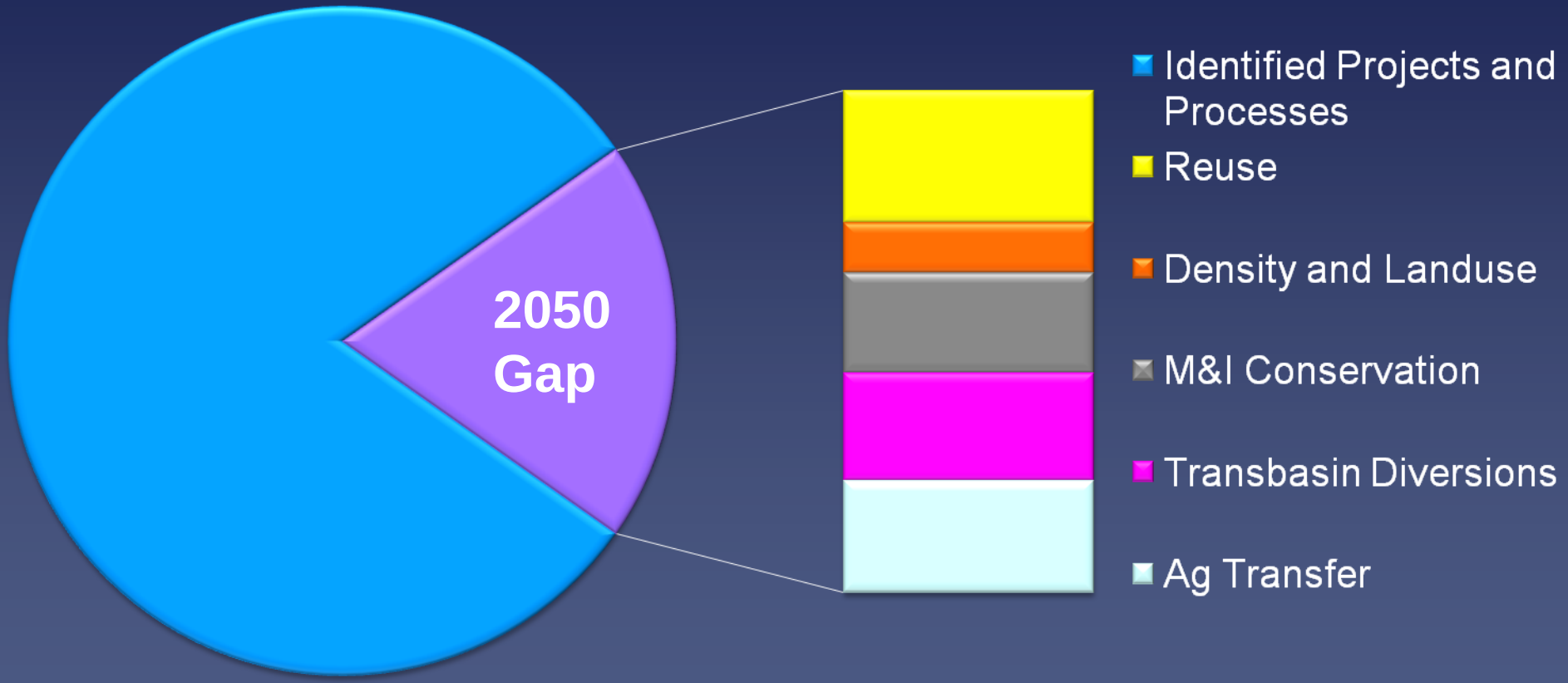
In 2030, the Colorado Basin will have 61,900 of New M&I Demand

- 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



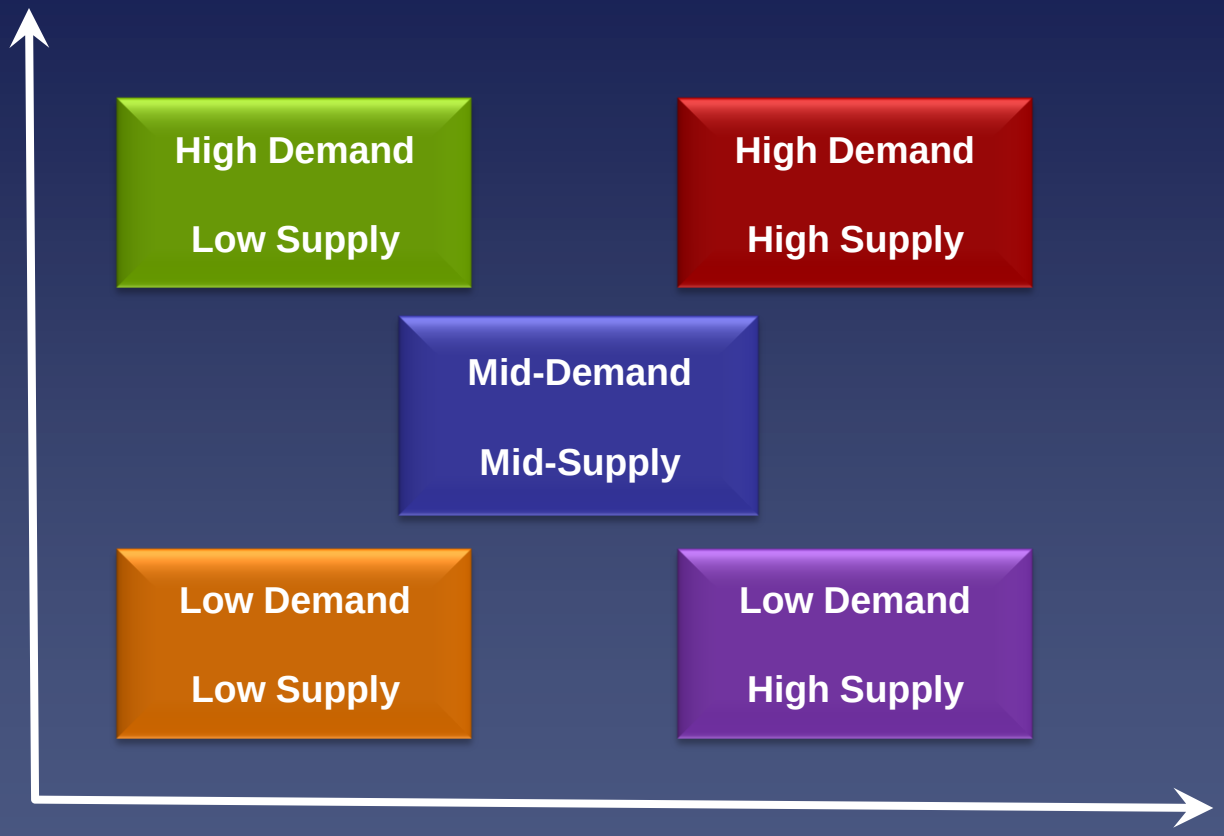
- Grand County
- Summit County

Example of Portfolio to Meet 2050 M&I Needs



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

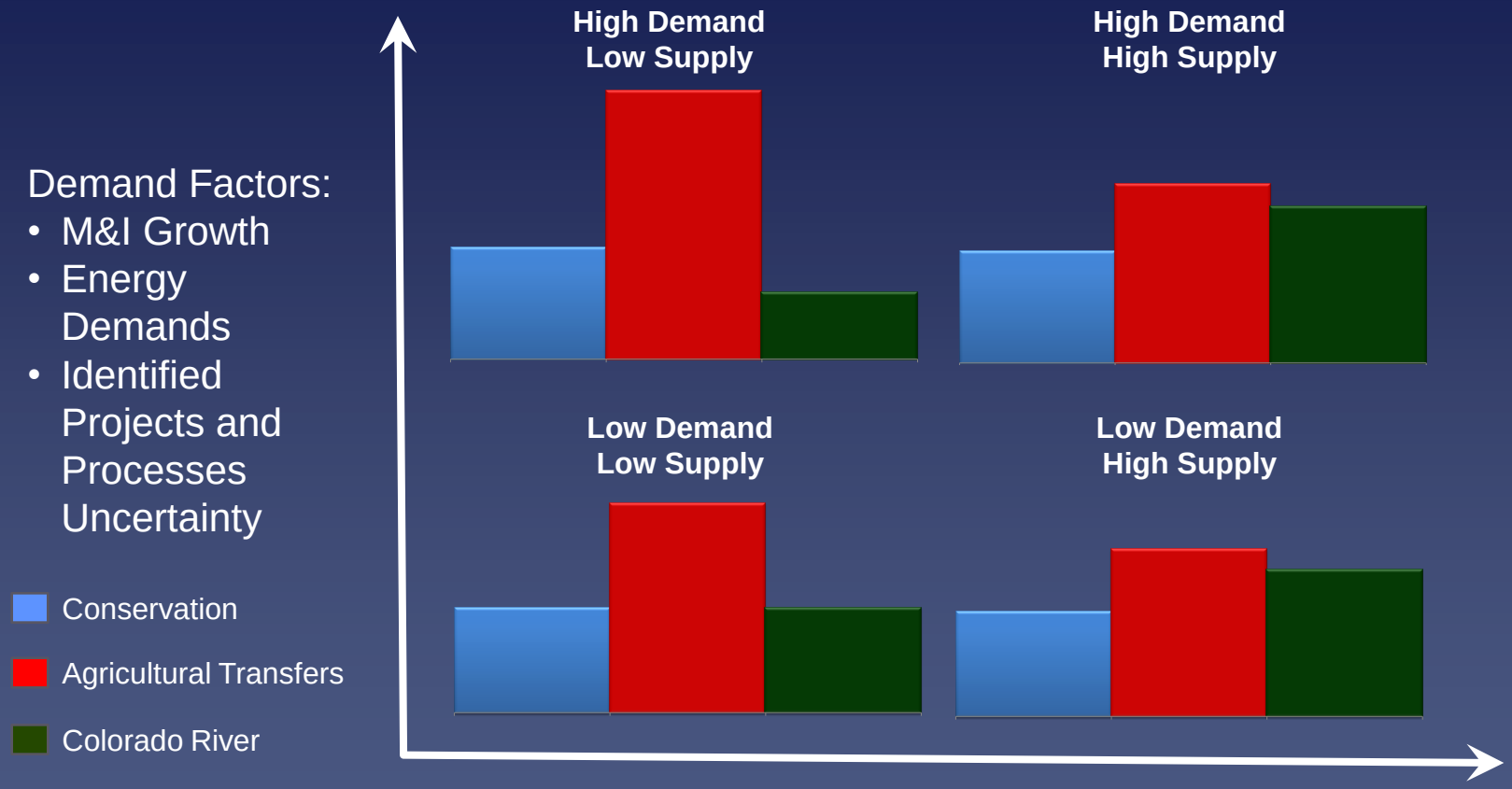
Water Supply Strategies

- 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

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

Scenarios for Colorado's Water Supply Future

M&I Demand Scenario

medium

Percentage of Identified Projects & Processes that are successful?

50% <--enter in percentage of 0% to 100%

Percent M&I Conservation

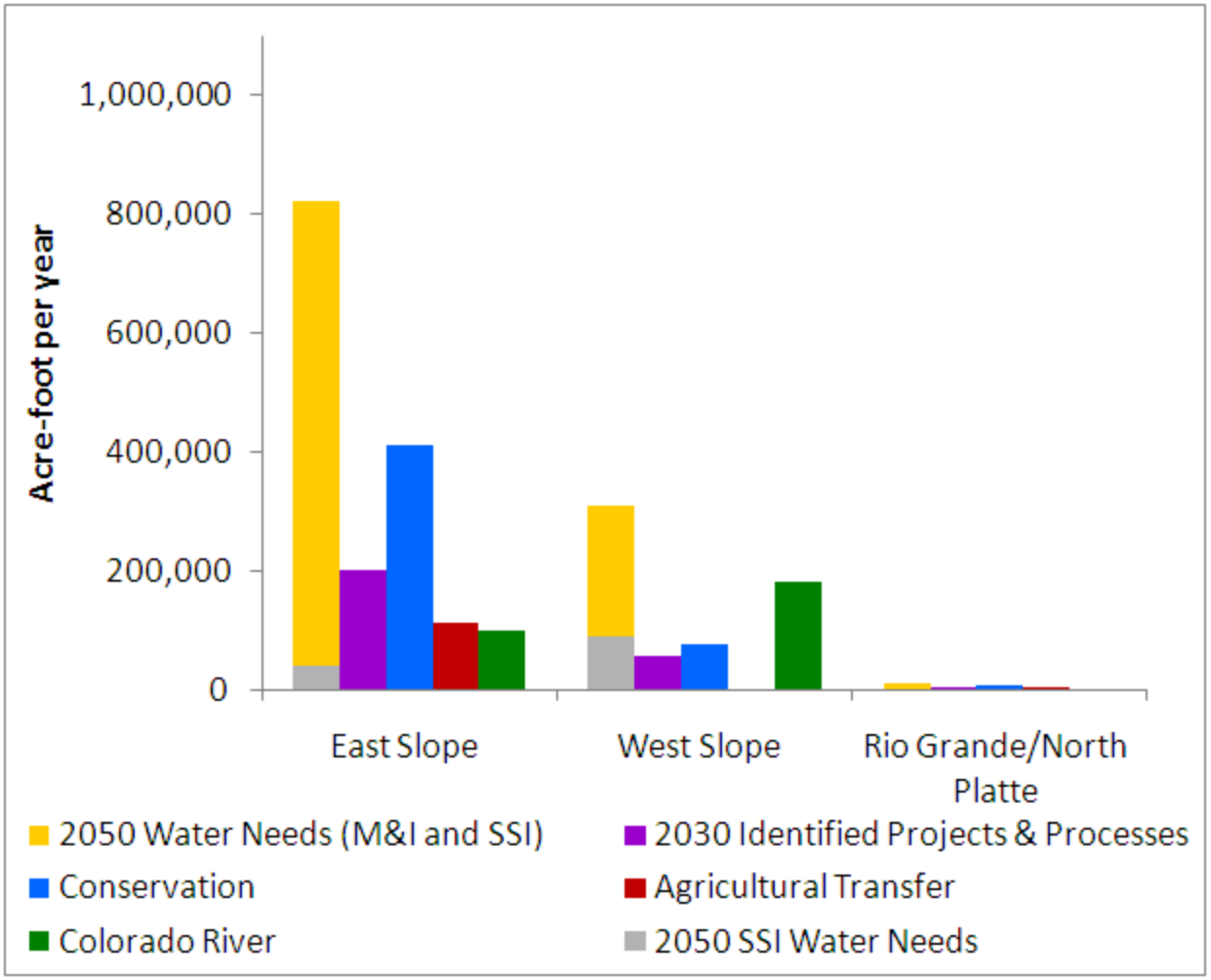
30%

What percentage of M&I conservation savings is utilized for drought reserve and reliability

30% <--enter in percentage of 0% to 100%

Supply Scenario

medium



Percentage of consumable water that is reused in the basin?

0%

Reduction in irrigated acres in 2050 based on scenarios

What percent of reuse is direct reuse or reuse through exchange?

Direct Reuse Reuse through exchange

10%/90%

Scenarios for Colorado's Water Supply Future

M&I Demand Scenario

high

Percentage of Identified Projects & Processes that are successful?

50% <--enter in percentage of 0% to 100%

Percent M&I Conservation

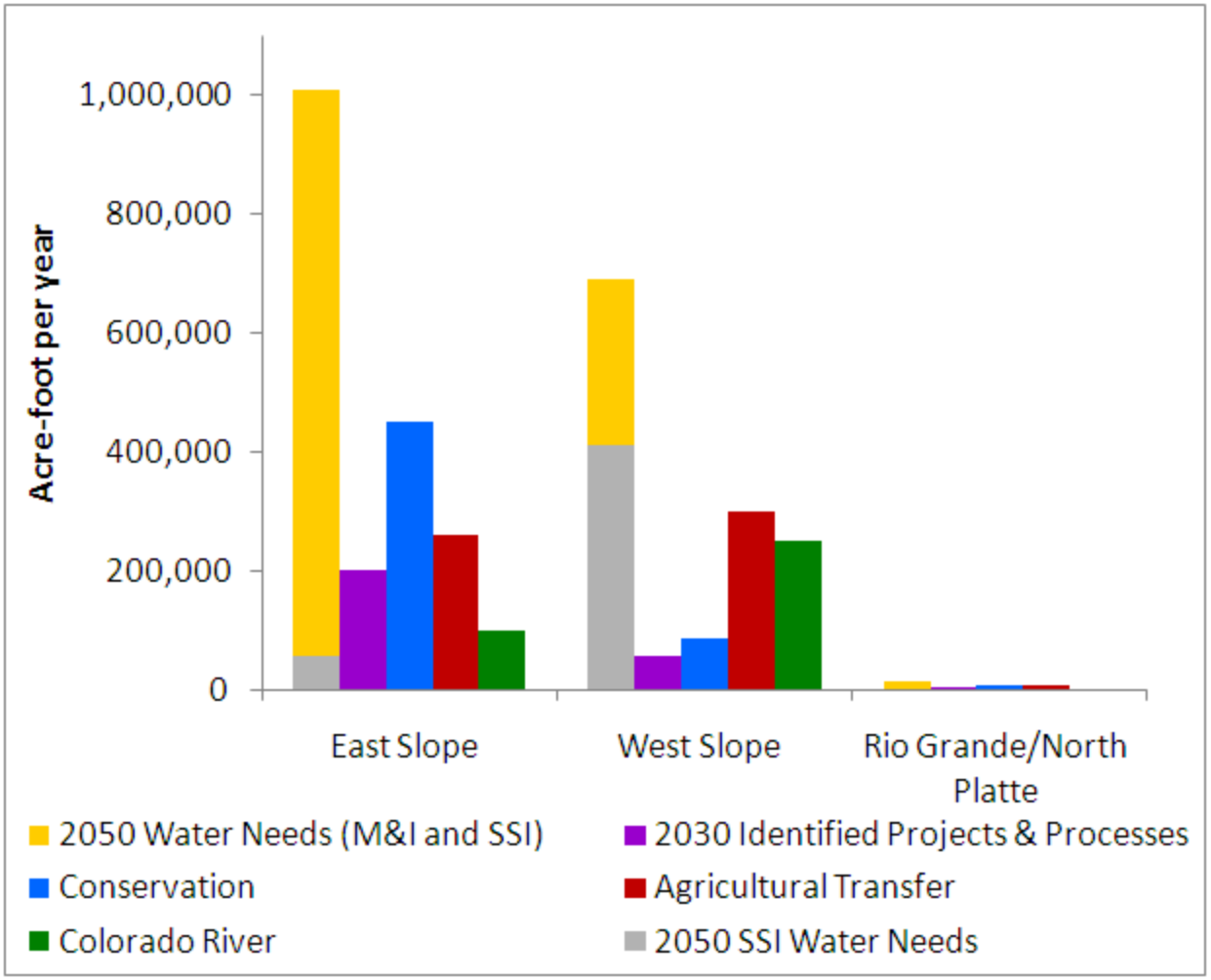
30%

What percentage of M&I conservation savings is utilized for drought reserve and reliability

30% <--enter in percentage of 0% to 100%

Supply Scenario

medium



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Reduction in irrigated acres in 2050 based on scenarios

What percent of reuse is direct reuse or reuse through exchange?

Direct Reuse Reuse through exchange

10%/90%

Conservation Strategy

Conservation Strategy

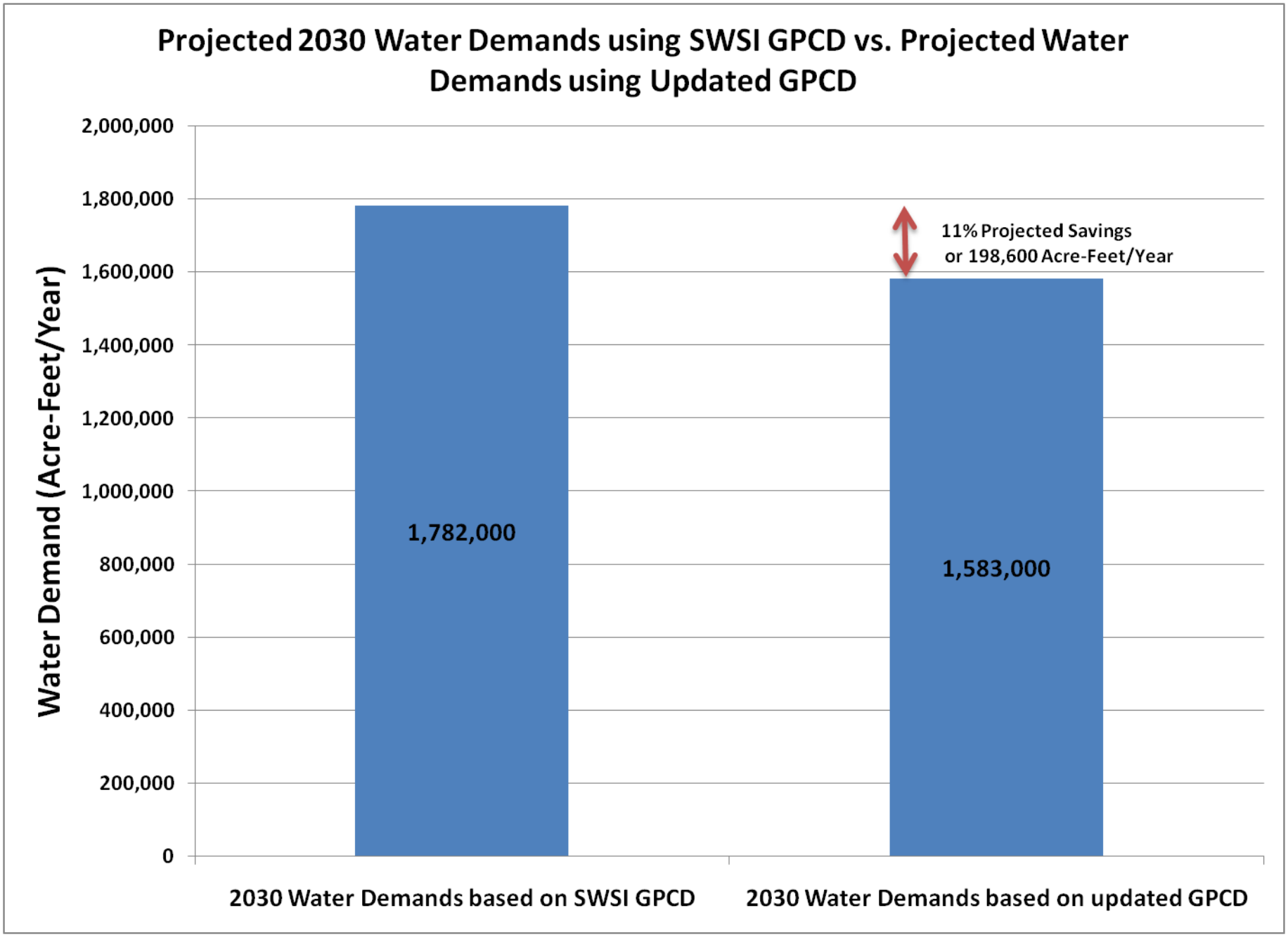
- 20 to 40 percent savings analyzed for each basin
- Management practices identified
- Overview of initial results
- Feedback on how much this strategy will reduce overall 2050 demands

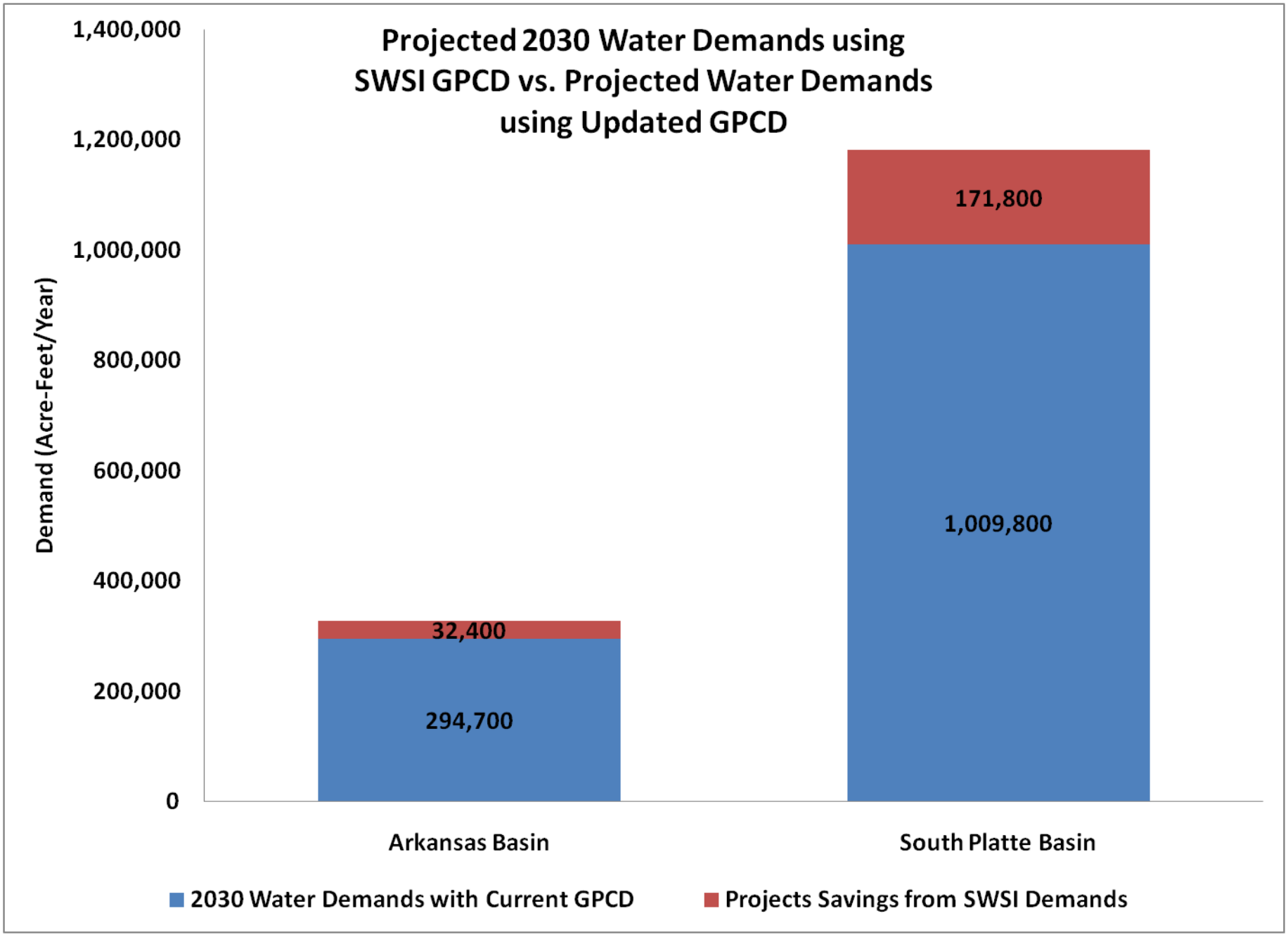
Overview of Conservation Strategy Approach

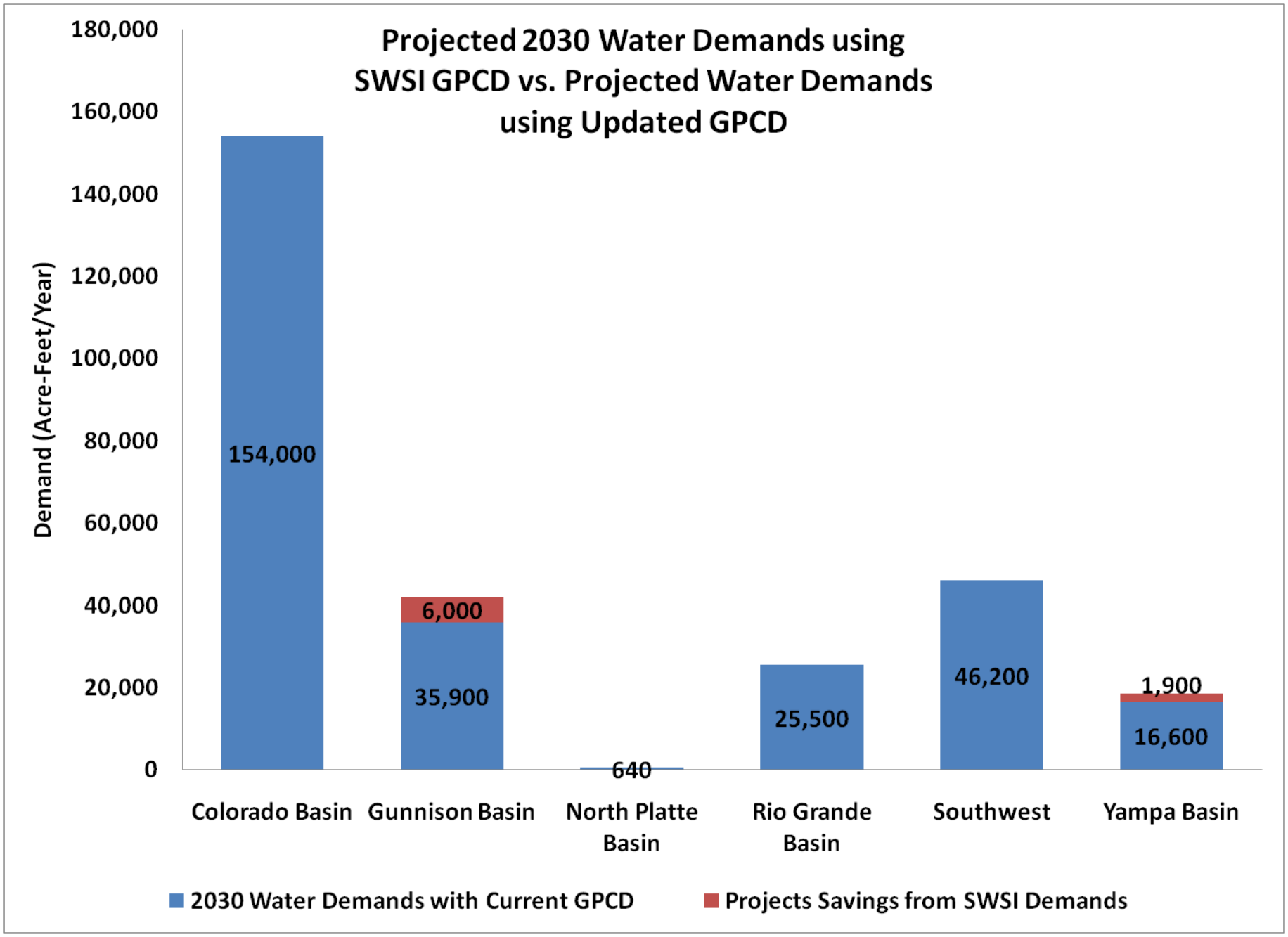
- Used SWSI 1 as baseline
- Estimated percent reduction in water usage at 2050 at 20 percent, 30 percent, and 40 percent reduction levels from SWSI 1
- Examine measures identified in SWSI 2 that could be utilized to achieve reduction levels
- Review results with major water providers and Basin Roundtables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

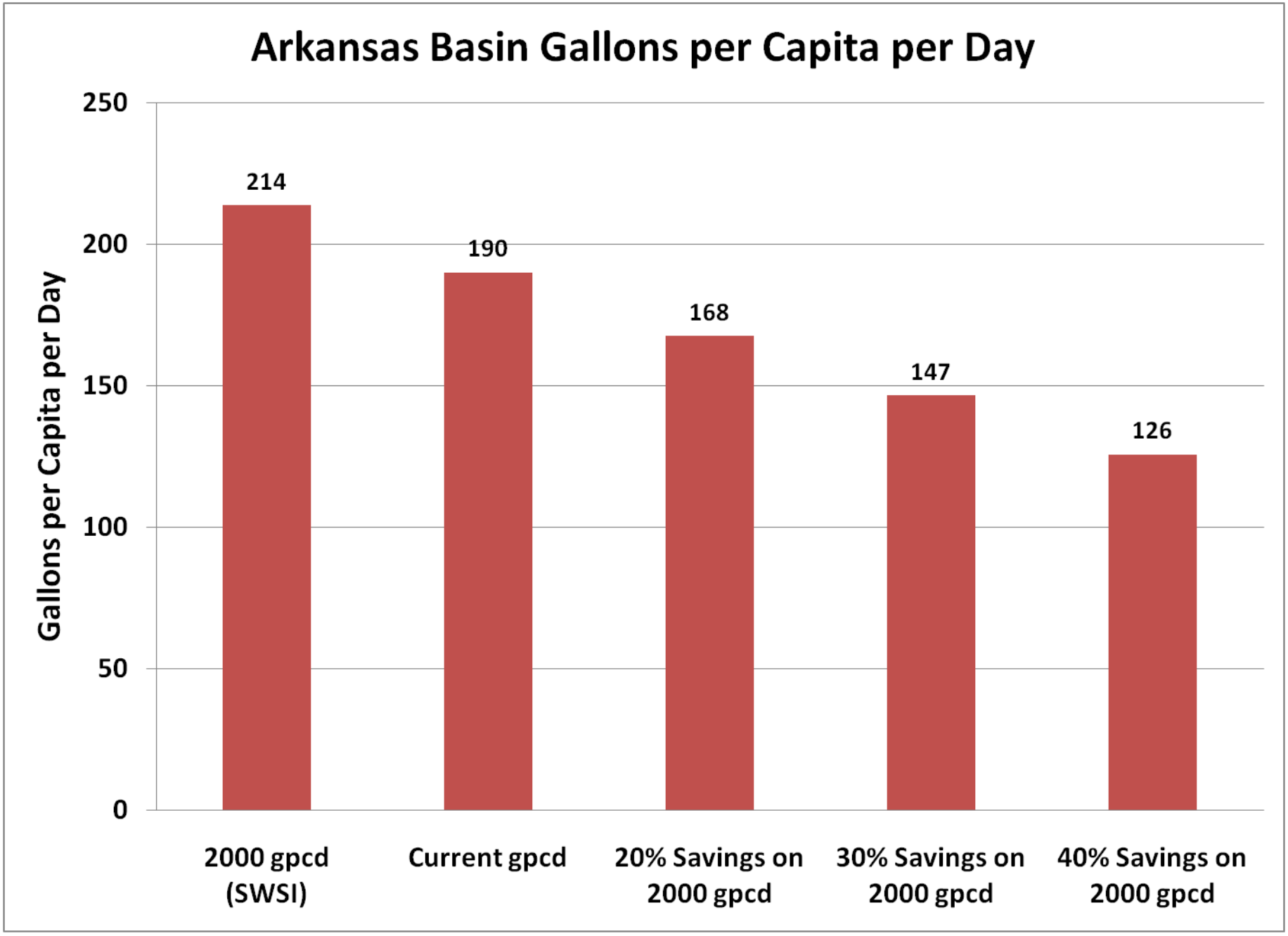
Initial Results

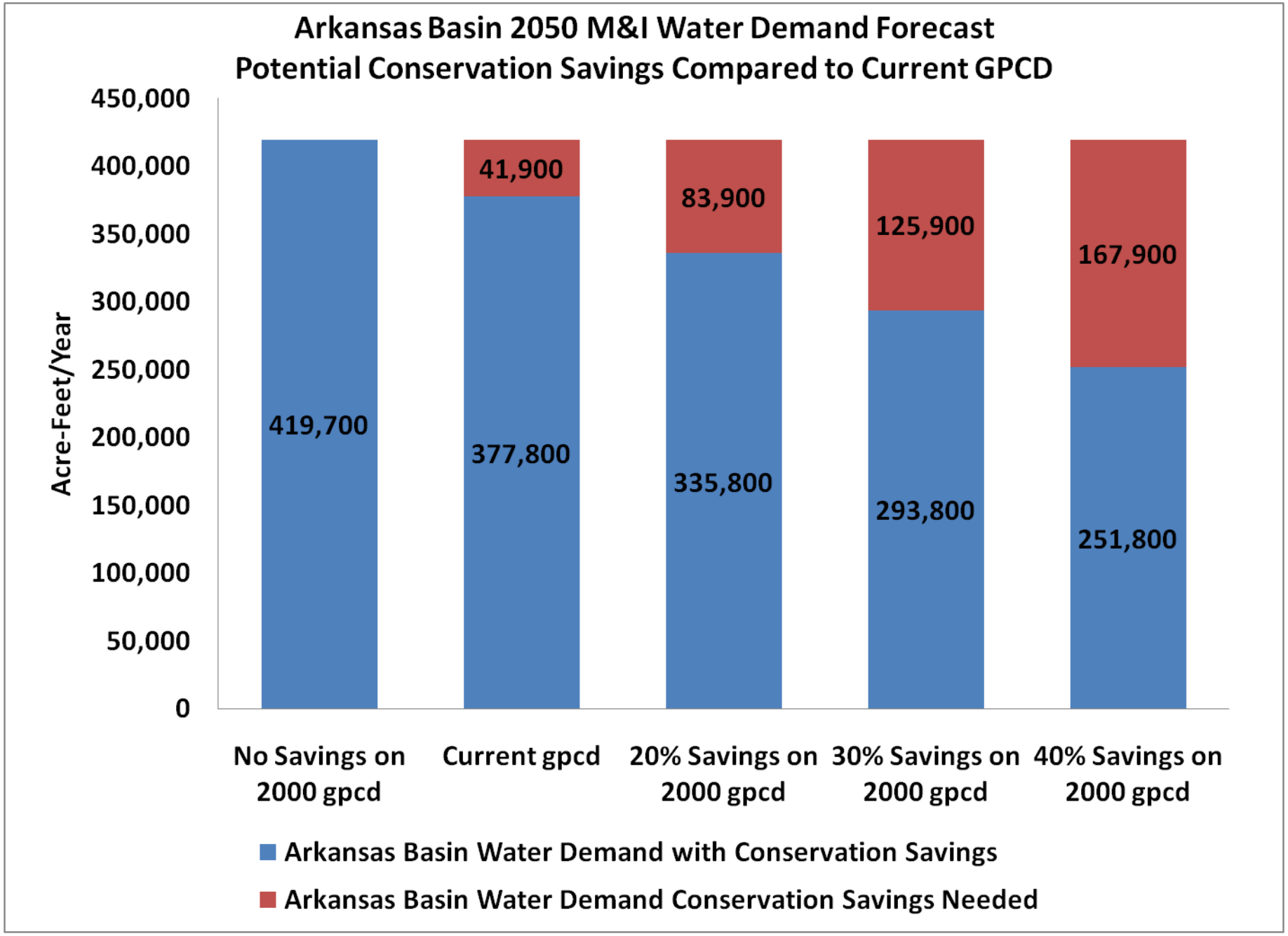
- What progress have we made in meeting 2030 demands with respect to demand reductions from conservation?
- What demand reductions should be implemented by 2050?
- What conservation best management practices could be used to implement these reductions?
- What do other states require regarding conservation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

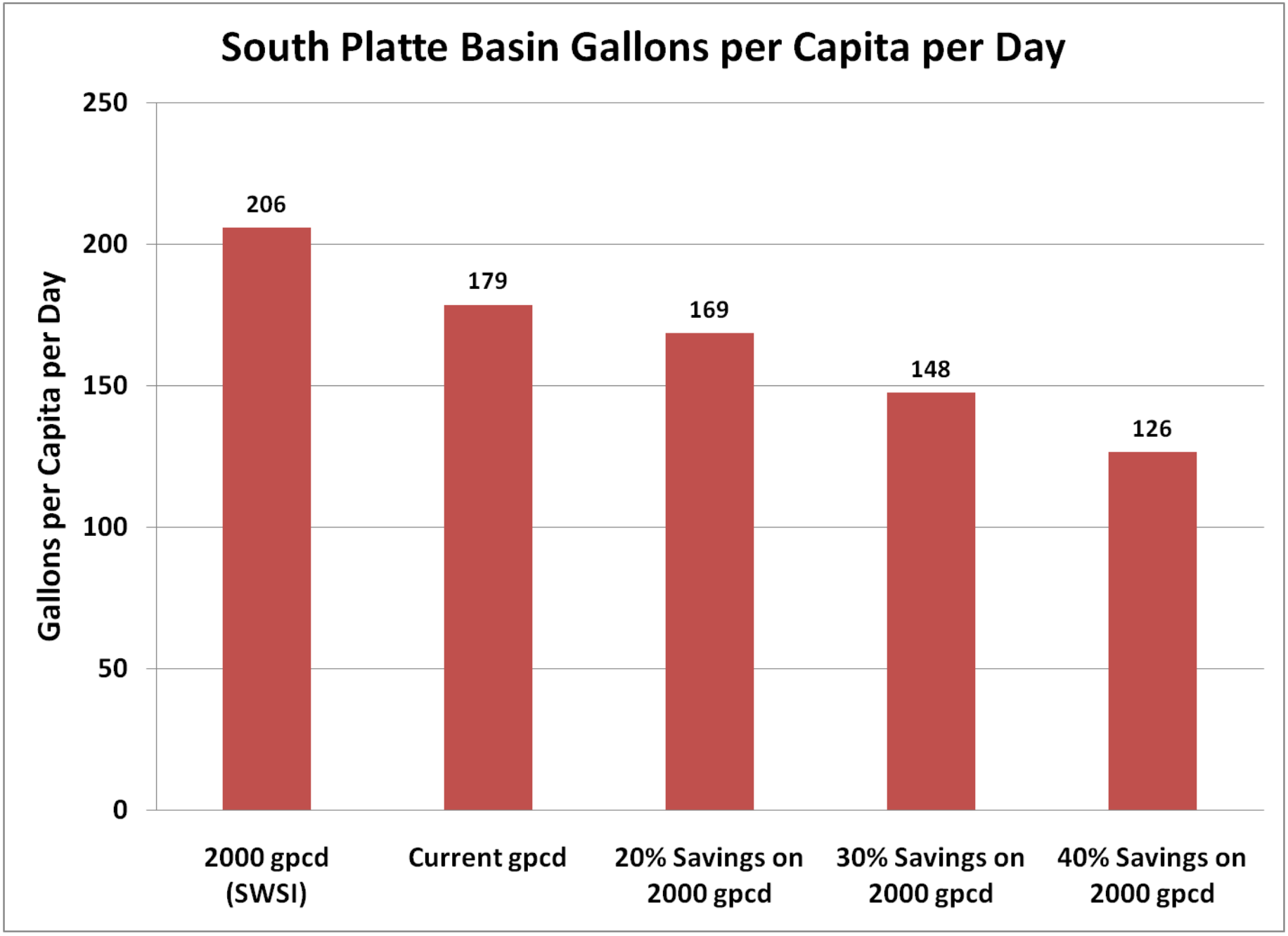

Projected 2030 Water Demands using SWSI GPCD vs. Projected Water Demands using Updated GPCD
Water Demand (Acre-Feet/Year)
2,000,000
1,800,000
1,600,000
1,400,000
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
1,782,000
1,583,000
11% Projected Savings
or 198,600 Acre-Feet/Year
2030 Water Demands based on SWSI GPCD
2030 Water Demands based on updated GPCD

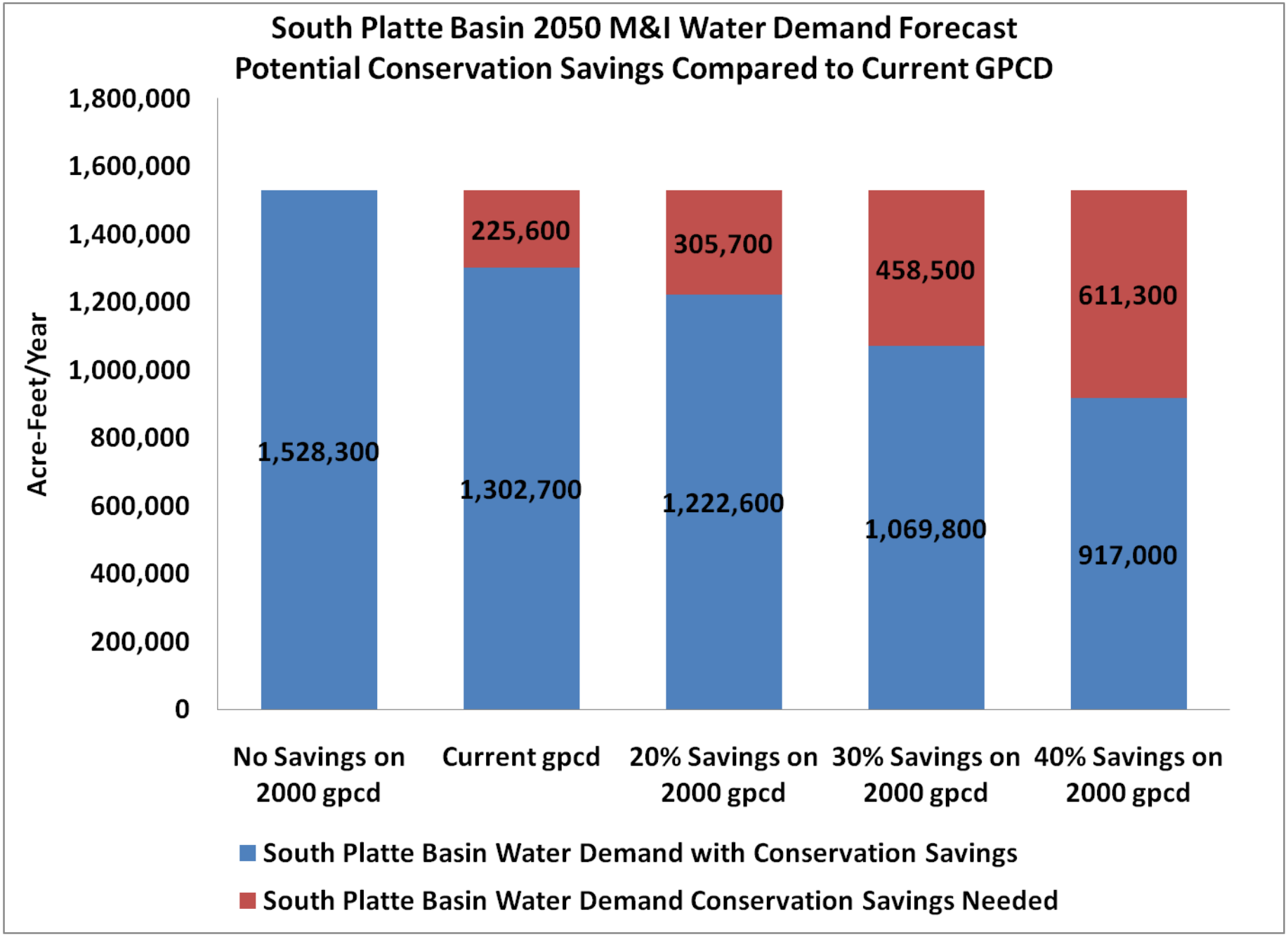

Projected 2030 Water Demands using SWSI GPCD vs. Projected Water Demands using Updated GPCD
Demand (Acre-Feet/Year)
1,400,000
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
32,400
294,700
171,800
1,009,800
Arkansas Basin
South Platte Basin
2030 Water Demands with Current GPCD
Projects Savings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


Arkansas Basin Gallons per Capita per Day
Gallons per Capita per Day
250
200
150
100
50
0
214
190
168
147
126
2000 gpcd (SWSI)
Current gpcd
20% Savings on 2000 gpcd
30% Savings on 2000 gpcd
40% Savings on 2000 gpcd


Arkansas Basin 2050 M&I Water Demand Forecast
Potential Conservation Savings Compared to Current GPCD
Acre-Feet/Year
450,000
400,000
350,000
300,000
250,000
200,000
150,000
100,000
50,000
0
419,700
41,900
377,800
83,900
335,800
125,900
293,800
167,900
251,800
No Savings on 2000 gpcd
Current gpcd
20% Savings on 2000 gpcd
30% Savings on 2000 gpcd
40% Savings on 2000 gpcd
Arkansas Basin Water Demand with Conservation Savings
Arkansas Basin Water Demand Conservation Savings Needed


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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Acre-Feet/Year
1,800,000
1,600,000
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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

South Platte Basin Example

Conservation Measure	Preliminary Project Saving at 2050
Turf Replacement	99,800 AFY to 199,500 AFY
Leak Detection Programs	35,200 AFY to 58,600 AFY
Toilet Rebates	50,800 AFY
Conservation Orientated Water Rates	19,500 AFY
Washer Rebates	14,700 AFY to 34,800 AFY
Cooling Towers	1,480 AFY to 11,700 AFY
Rebates for Landscape Retrofits other than Turf Replacement	2,900 AFY to 9,600 AFY
Residential Landscape Audits	3,300 AFY to 10,000 AFY
Residential Indoor Audits	2,000 AFY to 6,000 AFY
Submetering in Multi-family Housing	2,600 AFY to 7,500 AFY
Commercial Landscape Audits	1,300 AFY to 4,800 AFY
Commercial Indoor Audits	600 AFY to 3,200 AFY
Total Project Savings	234,200 AFY to 416,000 AFY

Arkansas Example

Conservation Measure	Preliminary Project Saving at 2050
Turf Replacement	27,900 AFY to 55,700 AFY
Leak Detection Programs	11,300 AFY to 18,900 AFY
Toilet Rebates	14,200 AFY
Conservation Orientated Water Rates	5,400 AFY
Washer Rebates	4,100 AFY to 9,700 AFY
Cooling Towers	410 AFY to 3,300 AFY
Rebates for Landscape Retrofits other than Turf Replacement	800 AFY to 2,700 AFY
Residential Landscape Audits	900 AFY to 2,800 AFY
Residential Indoor Audits	600 AFY to 1,700 AFY
Submetering in Multi-family Housing	700 AFY to 2,100 AFY
Commercial Landscape Audits	400 AFY to 1,300 AFY
Commercial Indoor Audits	200 AFY to 900 AFY
Total Project Savings	66,900 AFY to 118,700 AFY

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

Conservation Strategy Next Steps

- Identify benefits, implementation issues, potential attributes and acceptability
- Cost Estimates
- Utilize demand reductions as baseline conditions for meeting 2050 water needs
- Analyze other conservation elements such as sharing of conserved water and the infrastructure and institutional arrangements required

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	

Overview of Agricultural Transfer Strategy and New Supply Development Strategy

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

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

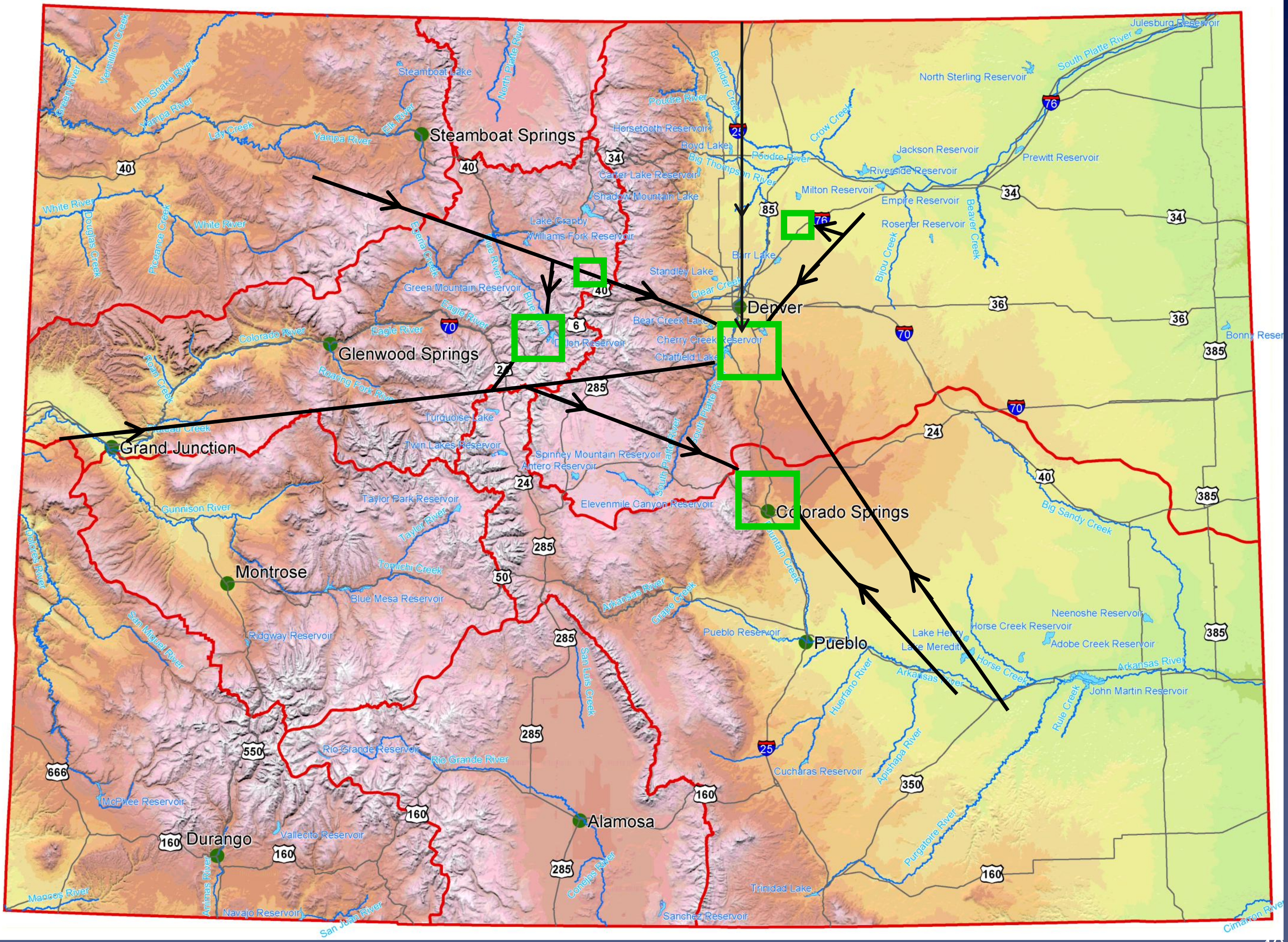
Assumptions for Today's Analysis for the Agricultural Transfer Strategy and New Supply Development Strategy

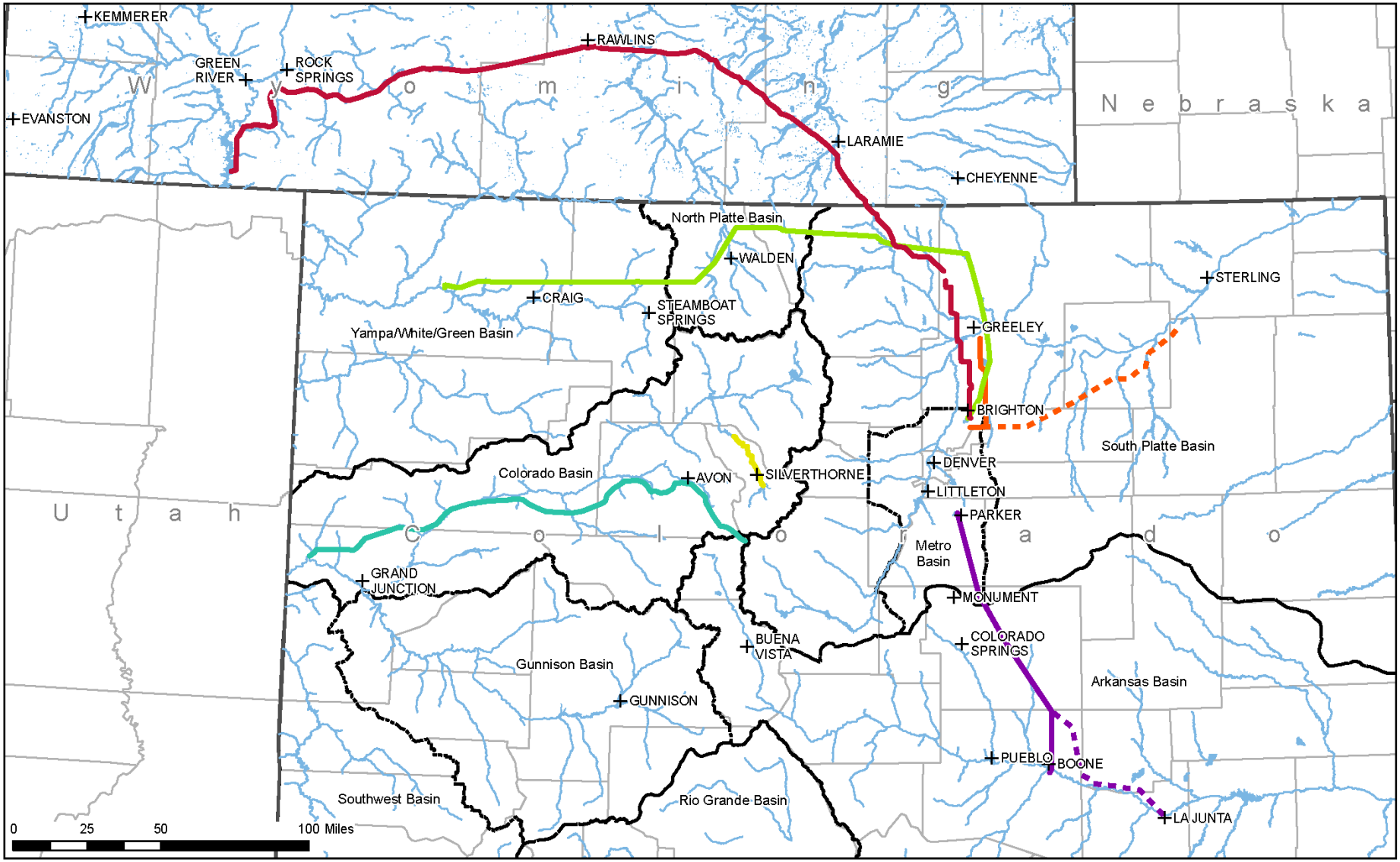
- Delivery of similar water quality
- With exception of Green Mountain concept, strategies will deliver water in the range of 100KAF to 250KAF

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


Steamboat Springs
Glenwood Springs
Grand Junction
Denver
Colorado Springs
Montrose
Pueblo
Alamosa
Durango
Steamboat Lake
North Platte River
Poudre River
Boxelder Creek
Horsetooth Reservoir
Boyd Lake
Big Thompson River
Carter Lake Reservoir
Shadow Mountain Lake
Lake Granby
Williams Fork Reservoir
Green Mountain Reservoir
Eagle River
Dillon Reservoir
Standley Lake
Clear Creek
Bear Creek Lake
Cherry Creek Reservoir
Chatfield Lake
Barr Lake
Milton Reservoir
Crow Creek
Jackson Reservoir
Riverside Reservoir
Empire Reservoir
Prewitt Reservoir
Julesburg Reservoir
South Platte River
North Sterling Reservoir
Beaver Creek
Bijou Creek
Bonny Reser
Green River
Vermillion Creek
Little Snake River
Yampa River
Elk River
Lay Creek
White River
Douglas Creek
Piceance Creek
Colorado River
Roan Creek
Roaring Fork River
Plateau Creek
Turquoise Lake
Twin Lakes Reservoir
Spinney Mountain Reservoir
Antero Reservoir
Elevenmile Canyon Reservoir
Taylor Park Reservoir
Taylor River
Tomichi Creek
Blue Mesa Reservoir
Gunnison River
Dolores River
San Miguel River
Ridgway Reservoir
Arkansas River
Grape Creek
Fountain Creek
Pueblo Reservoir
Lake Henry
Lake Meredith
Horse Creek Reservoir
Neenoshe Reservoir
Adobe Creek Reservoir
Horse Creek
Big Sandy Creek
John Martin Reservoir
Rule Creek
Huerfano River
Apishapa River
Cucharas Reservoir
Purgatoire River
Trinidad Lake
Rio Grande Reservoir
Rio Grande River
San Luis Creek
Conejos River
Sanchez Reservoir
McPhee Reservoir
Vallecito Reservoir
Navajo Reservoir
Animas River
Mancos River
San Juan River
Cimarron River
25
76
70
34
36
385
40
24
285
50
550
666
160
350
6
85



Legend

- Colorado River Return Reconnaissance Study Concept
- Flaming Gorge Concept
- Yampa River Concept
- Middle South Platte Concept
- Lower South Platte Concept
- Lower Arkansas Concept 1
- Lower Arkansas Concept 2
- Green Mountain Concept
- Colorado Basins

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Agricultural Transfer Strategy

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

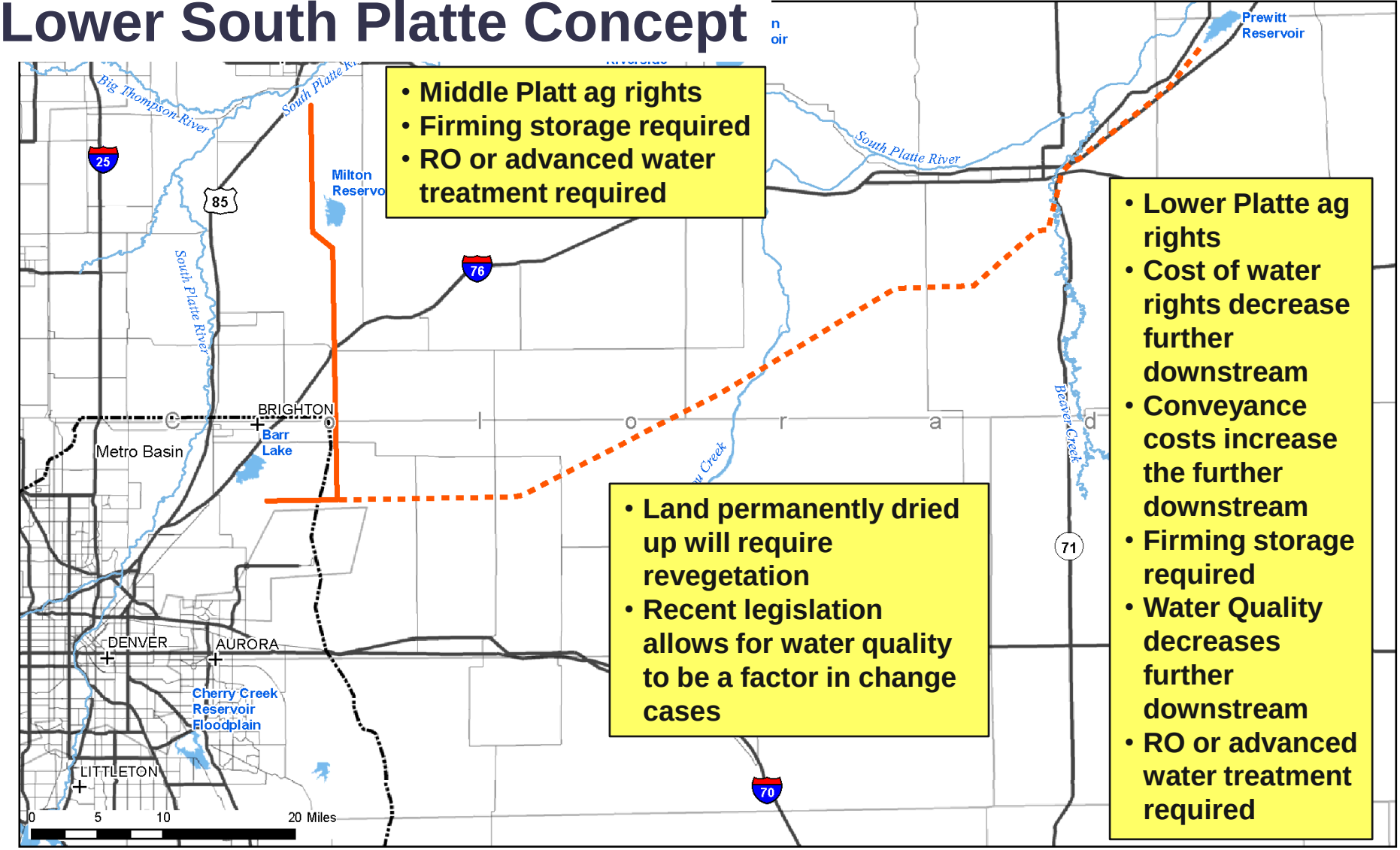
Alternative Agricultural Water Transfer Methods - Arkansas Basin (Grant Awards)

Name of Project	Name of Applicant
Lower Arkansas Valley Super Ditch Company	Lower Arkansas Valley Water Conservancy District
High Line Canal Water Leasing Project	High Line Canal Company
The Effect of Land Fallowing and Water Rights Leasing on Corn Yield, Nutrient Needs and Economics in the Lower Arkansas River Valley of Colorado	Colorado State University (Southern Regional Extension Office

Alternative Agricultural Water Transfer Methods – South Platte Basin (Grant Awards)

Name of Project	Name of Applicant
Alternative Water Transfers in the South Platte Basin Using the Farmers Reservoir and Irrigation Company System	Farmers Reservoir and Irrigation Company
Lower South Platte Irrigation Research and Demonstartion Project	Parker Water and Sanitation District
Development of Practical Alternative Agricultural Water Transfer Measures for Colorado Irrigated Agriculture	Colorado Corn Growers

Lower South Platte Concept



Legend

- Cities
- Highways
- Other Roads
- Rivers and Streams
- Lakes and Reservoirs
- Colorado Basins
- Middle South Platte Concept
- Lower South Platte Concept

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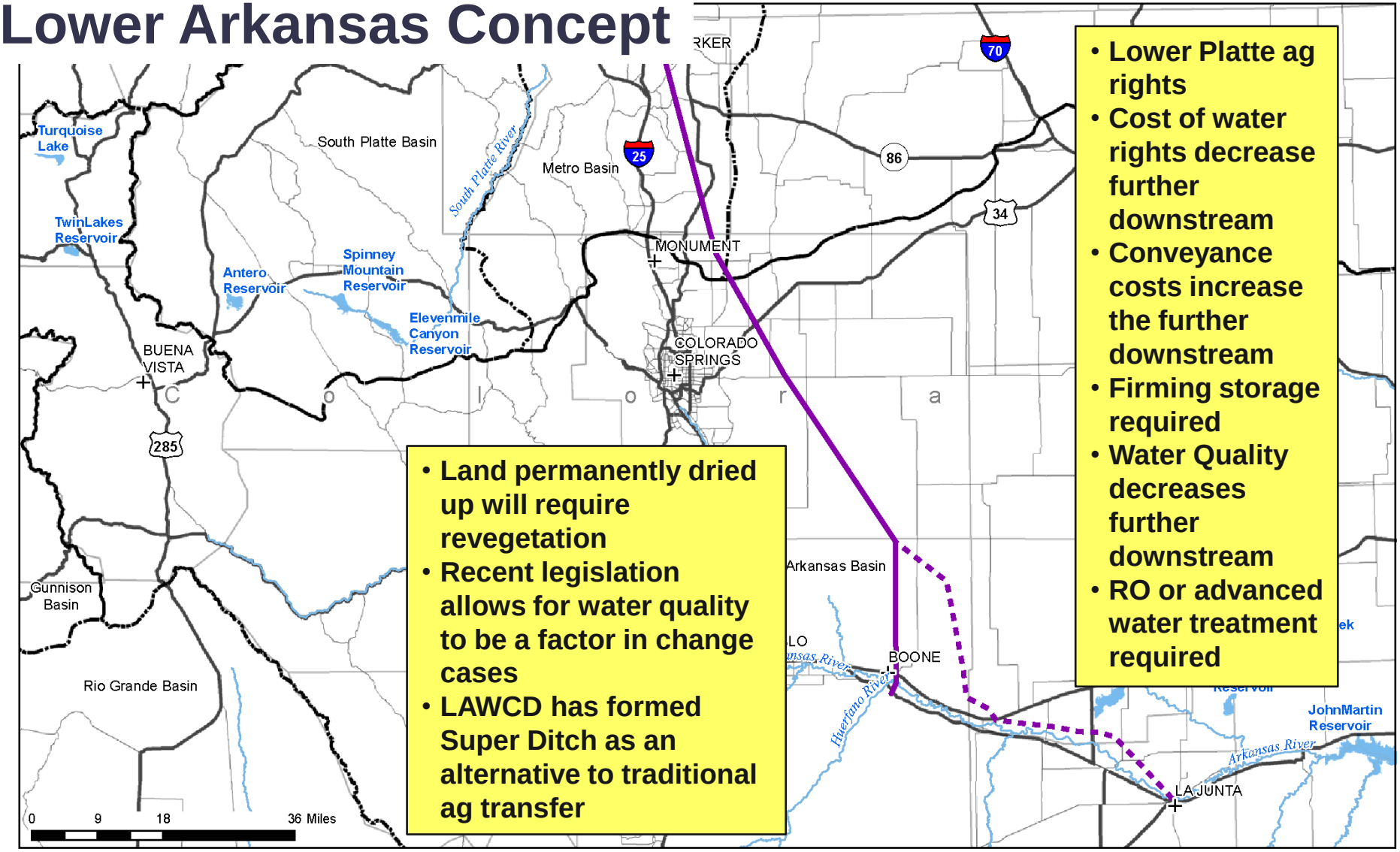
Lower South Platte Concept
Example of Benefits, Impacts, and Attributes

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

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

Legend

- Cities
- Highways
- Other Roads
- Rivers and Streams
- Lakes and Reservoirs
- Colorado Basins
- Lower Arkansas Concept 1
- Lower Arkansas Concept 2

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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	

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

New Supply Development

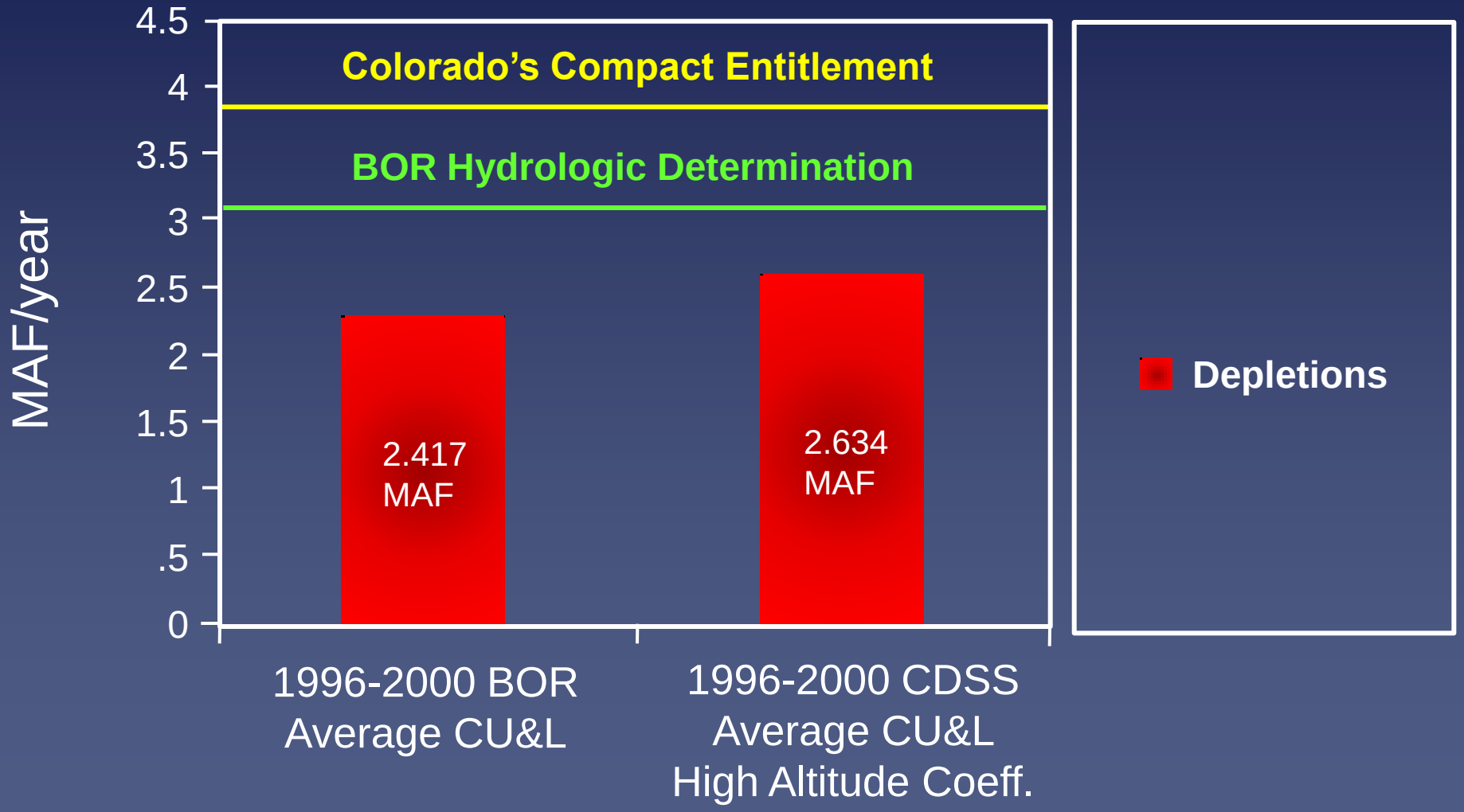
Colorado River Compact Entitlements

	Colorado River Compact "Full Development" Scenario	BOR Hydrologic Determination Scenario
Consumptive Use Available to Upper Basin States	7.5 MAF	6.0 MAF
Colorado's Share (51.75%) of Upper Basin CU Allocation	3.85 MAF	3.08 MAF

Range for Supply on Colorado River System

- Quantitative Estimates may be further refined by Water Supply Availability Study (including climate change considerations) and Risk Management Strategies

1996-2000 State of Colorado – Colorado River Depletions



Colorado River Water Compact
CU Allocation Available to Colorado
(Allocation – existing CU = Remaining Allocation)

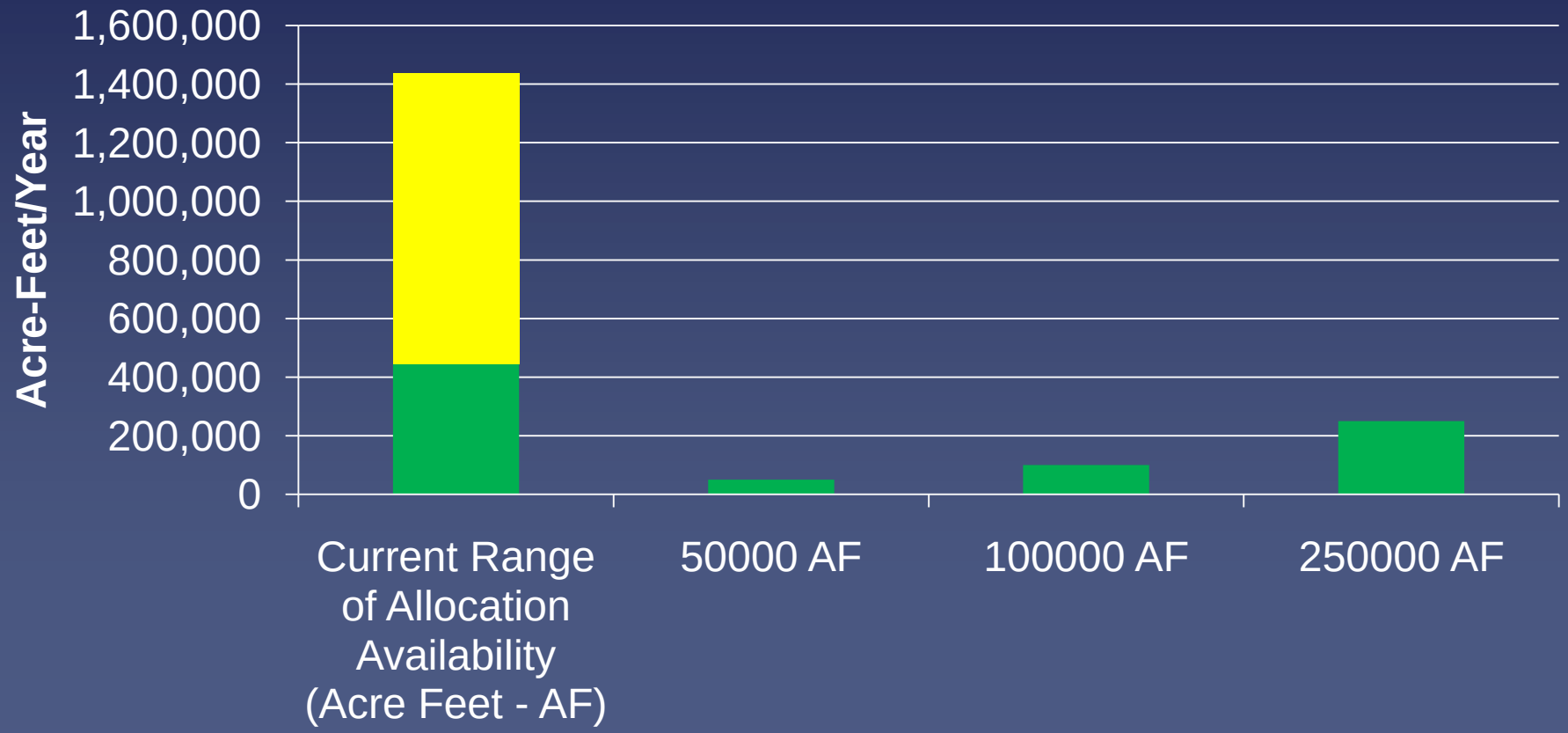
- Scenario 1 - Full Supply
  - 3.855 MAF - 2.417 MAF = 1.438 MAF remaining using BOR CU&L
  - 3.855 MAF - 2.634 MAF = 1.221 MAF remaining using CDSS with High Altitude Coeff.

Colorado River Water Compact
CU Allocation Available to Colorado
(Allocation – existing CU = Remaining Allocation)

- Scenario 2- BOR Hydrologic Determination
  - 3.079 MAF – 2.417 MAF = 662,000 AF remaining using BOR CU&L
  - 3.079 MAF – 2.634 MAF = 445,100 AF remaining using CDSS High Altitude Coeff.

Currently, depending on the planning scenario Colorado has between 445,000 AF and 1,438,000 AF of future development opportunity on the Colorado River System

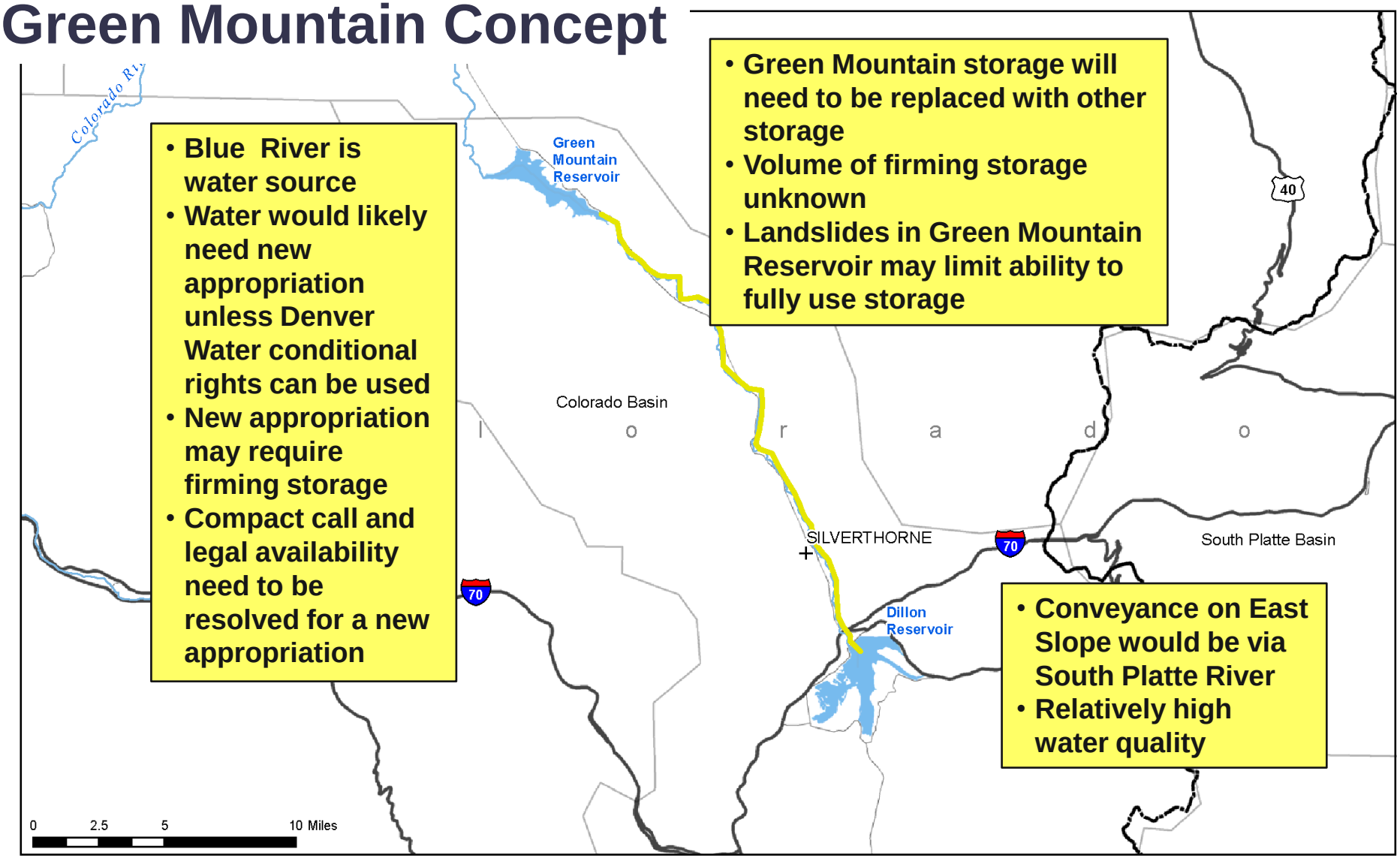
Water Supply Strategies – Range of Possible Colorado River Development is within the Range of Colorado's Remaining Allocation



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

Green Mountain Concept



- Blue River is water source
- Water would likely need new appropriation unless Denver Water conditional rights can be used
- New appropriation may require firming storage
- Compact call and legal availability need to be resolved for a new appropriation

- Green Mountain storage will need to be replaced with other storage
- Volume of firming storage unknown
- Landslides in Green Mountain Reservoir may limit ability to fully use storage

- Conveyance on East Slope would be via South Platte River
- Relatively high water quality

Legend

- Cities
- Highways
- Other Roads
- Rivers and Streams
- Lakes and Reservoirs
- Colorado Basins
- Green Mountain Concept

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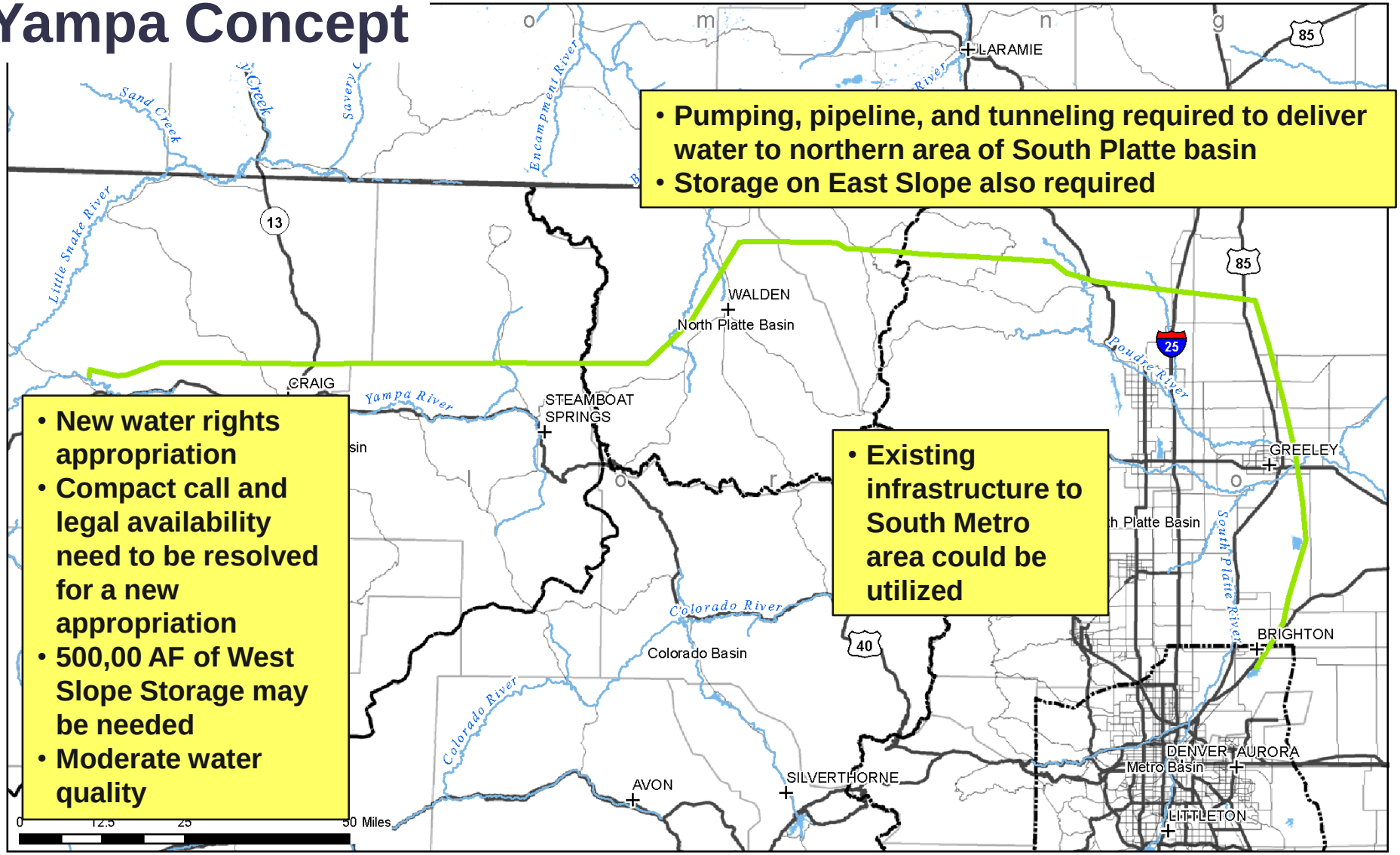
Green Mountain Concept
Example of Benefits, Impacts, and Attributes

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

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		

Yampa Concept



Legend

- Cities
- Highways
- Other Roads
- Rivers and Streams
- Lakes and Reservoirs
- Colorado Basins
- Yampa River Concept

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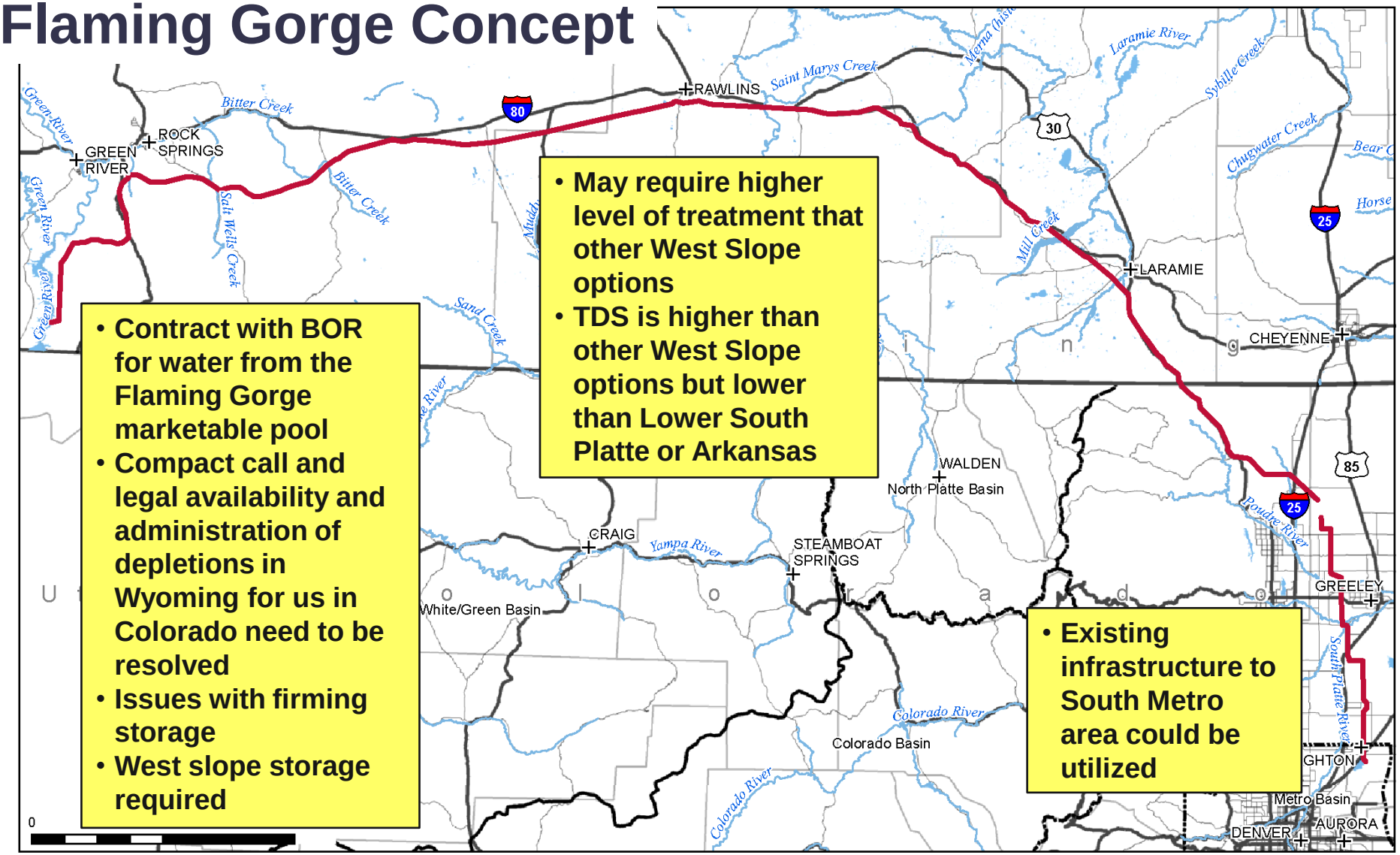
Yampa Concept
Example of Benefits, Impacts, and Attributes

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	

Flaming Gorge Concept



- Contract with BOR for water from the Flaming Gorge marketable pool
- Compact call and legal availability and administration of depletions in Wyoming for us in Colorado need to be resolved
- Issues with firming storage
- West slope storage required

- May require higher level of treatment that other West Slope options
- TDS is higher than other West Slope options but lower than Lower South Platte or Arkansas

- Existing infrastructure to South Metro area could be utilized

Legend

- Cities
- Highways
- Other Roads
- Rivers and Streams
- Lakes and Reservoirs
- Colorado Basins
- Flaming Gorge Concept

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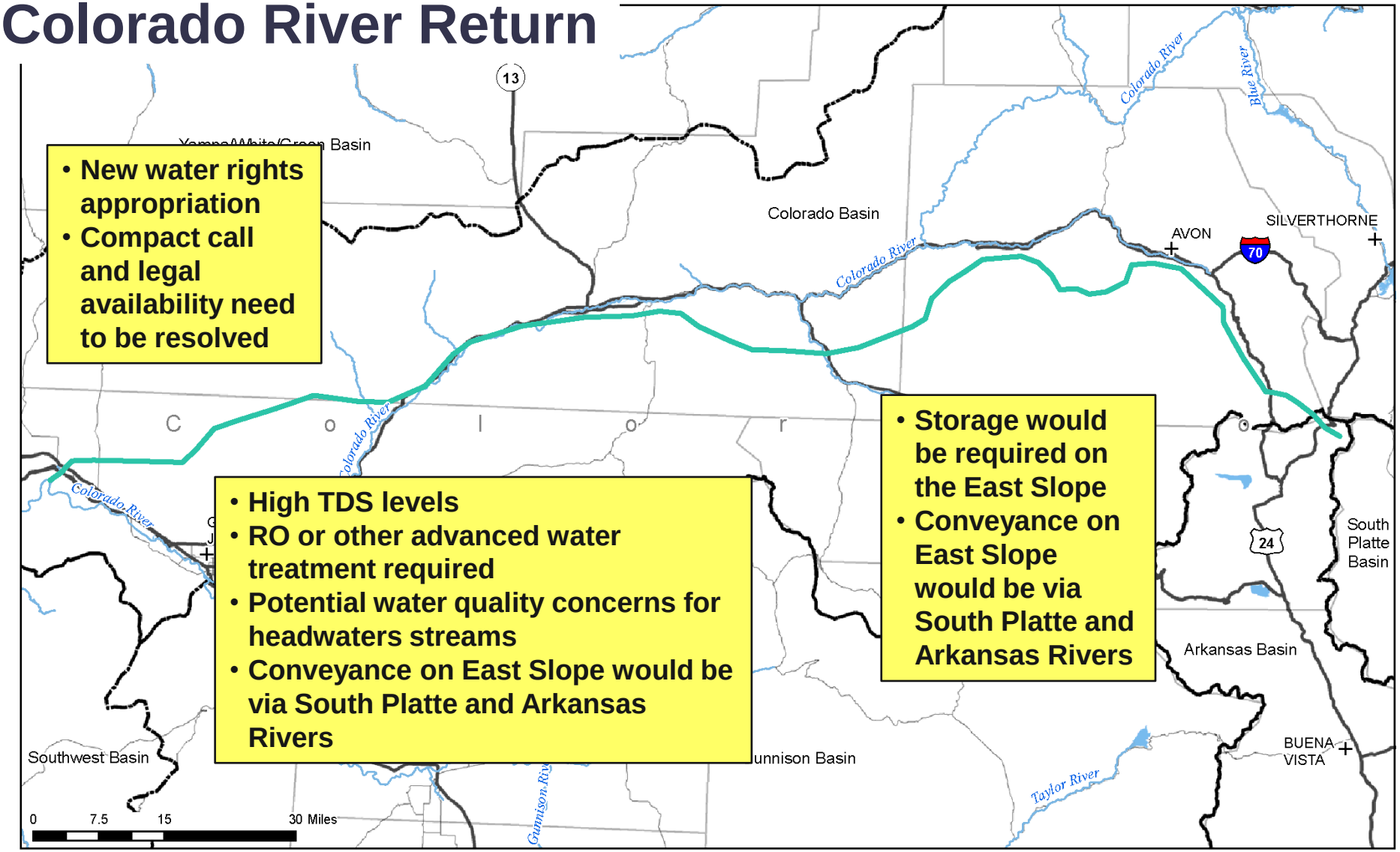
Flaming Gorge Concept
Example of Benefits, Impacts, and Attributes

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	

Colorado River Return



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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**	

Integration of Nonconsumptive Needs

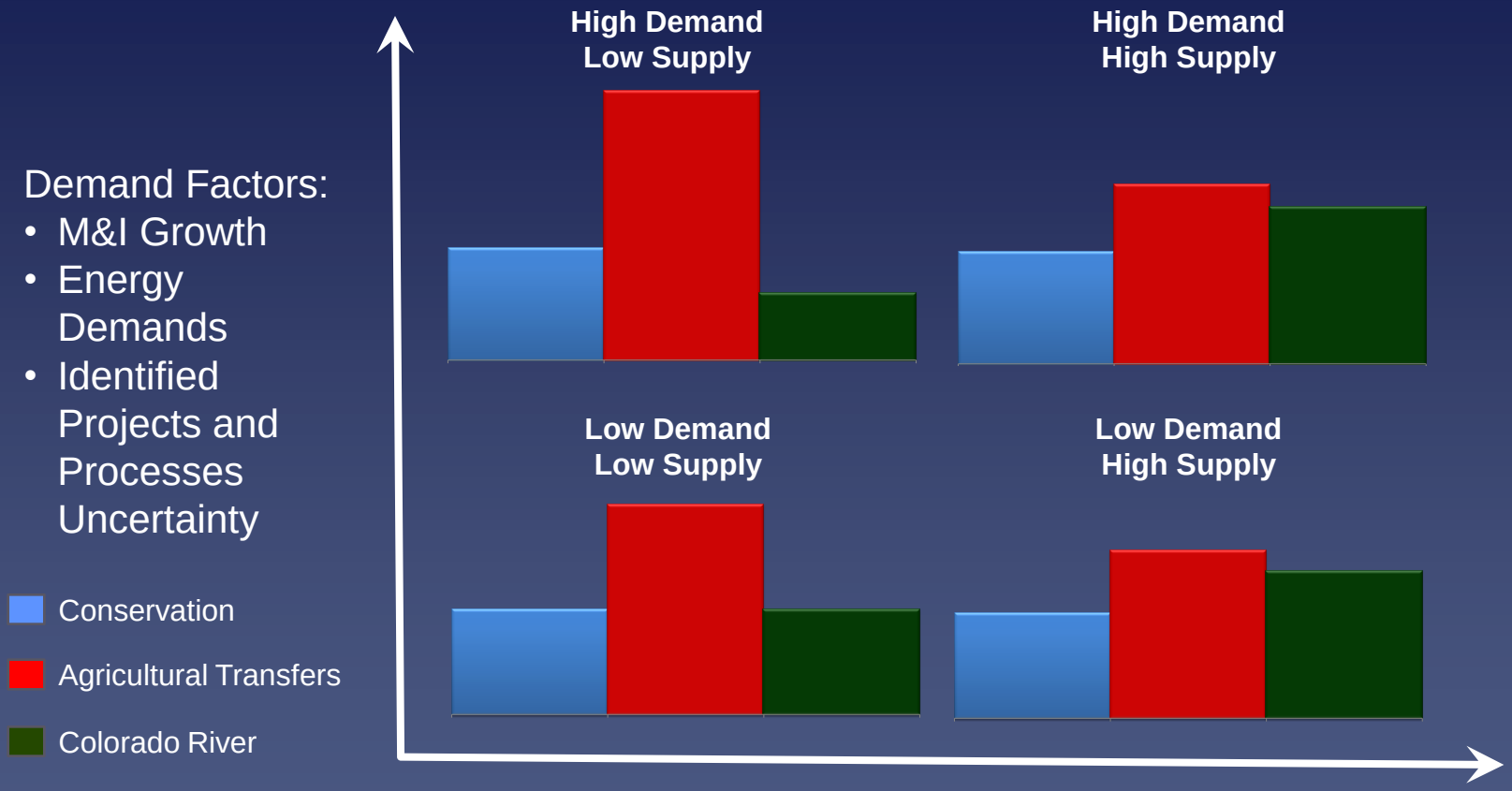
- Statewide map of priorities
- CWCB in process of identifying existing protections
- Priority areas addressed during strategy development
  - Qualitative need
  - Quantitative need
  - Non-flow related needs

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)

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

Scenarios for Colorado's Water Supply Future

M&I Demand Scenario

medium

Percentage of Identified Projects & Processes that are successful?

50% <--enter in percentage of 0% to 100%

Percent M&I Conservation

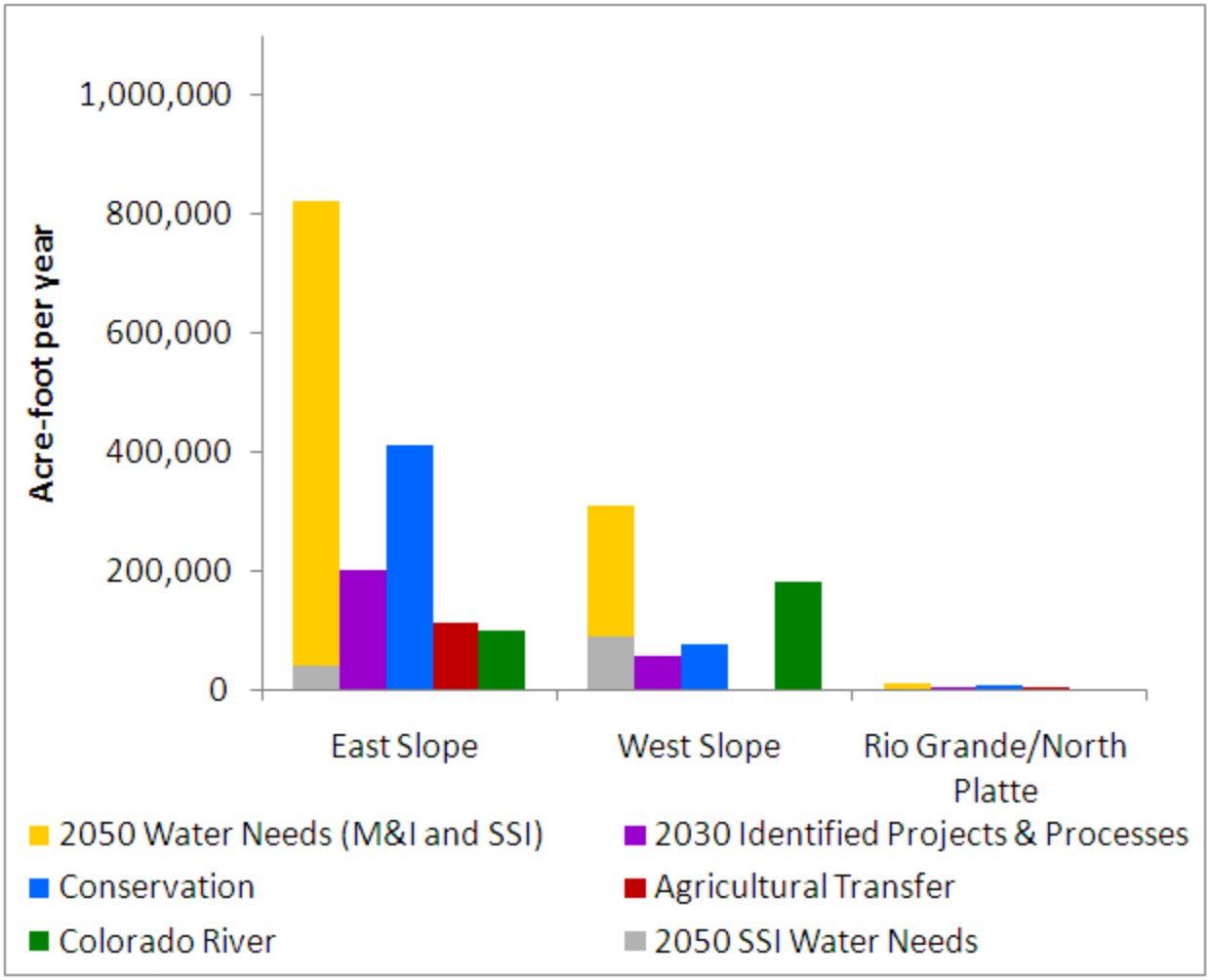
30%

What percentage of M&I conservation savings is utilized for drought reserve and reliability

30% <--enter in percentage of 0% to 100%

Supply Scenario

medium



Percentage of consumable water that is reused in the basin?

0%

Reduction in irrigated acres in 2050 based on scenarios

What percent of reuse is direct reuse or reuse through exchange?

Direct Reuse Reuse through exchange

10%/90%

Scenarios for Colorado's Water Supply Future

M&I Demand Scenario

high

Percentage of Identified Projects & Processes that are successful?

50% <--enter in percentage of 0% to 100%

Percent M&I Conservation

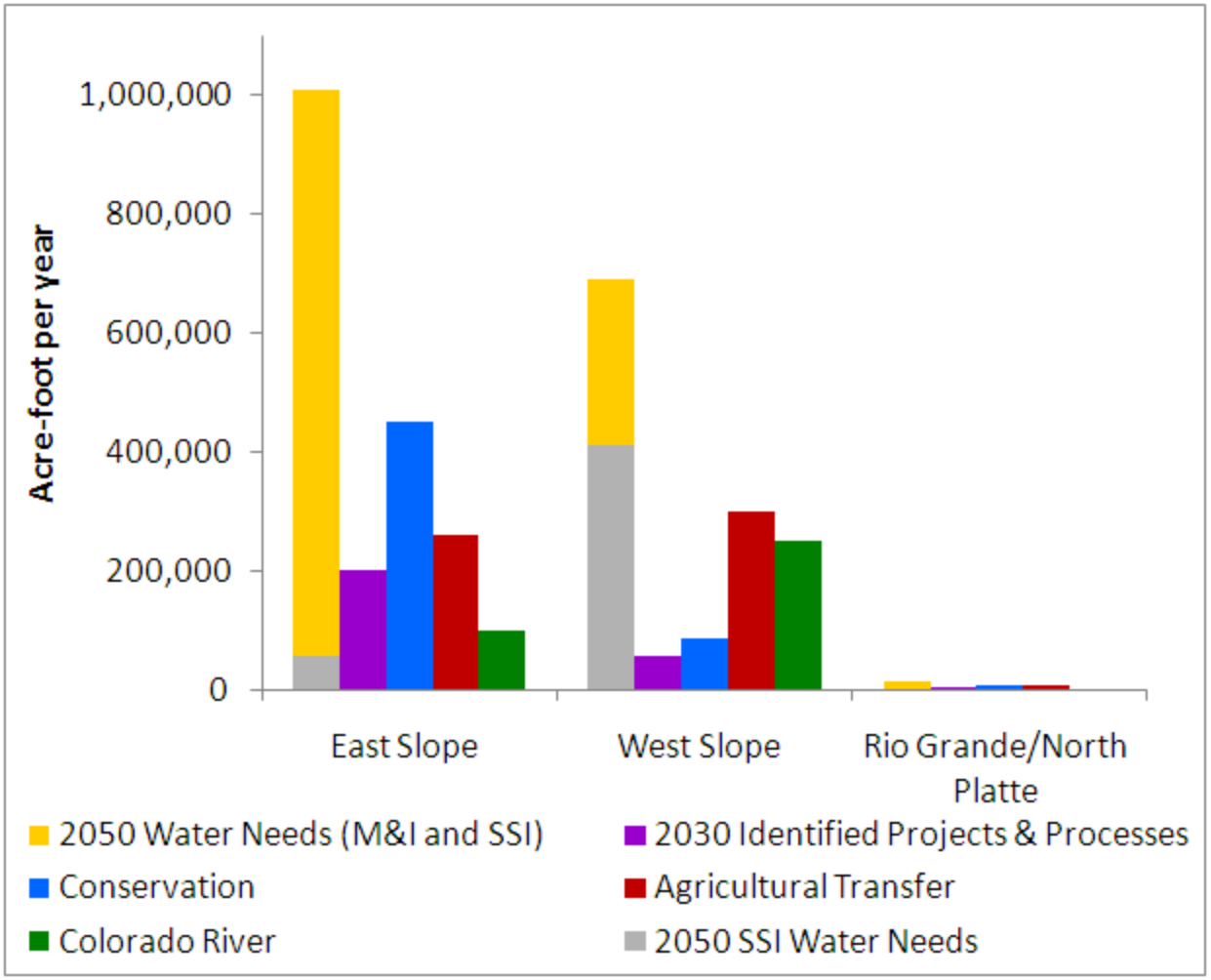
30%

What percentage of M&I conservation savings is utilized for drought reserve and reliability

30% <--enter in percentage of 0% to 100%

Supply Scenario

medium



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Direct Reuse Reuse through exchange

10%/90%