Colorado's Water
Supply Future

Rio Grande Roundtable Meeting
Alamosa, Colorado

March 10, 2009

Projects and Methods to Meet Identified Water Supply Needs

Basin-Wide Water Needs Assessments

- Identify Consumptive Water Needs (M&I and Agricultural)
- Identify Nonconsumptive Water Needs (Environmental and Recreational)
- Identify Available Water Supplies
- Identify Projects and Methods to Meet Consumptive and Nonconsumptive Water Needs

Path Forward – 2009

- Consumptive Needs Assessment done in Draft
- Nonconsumptive Priority Areas Identified

Focus of 2009:

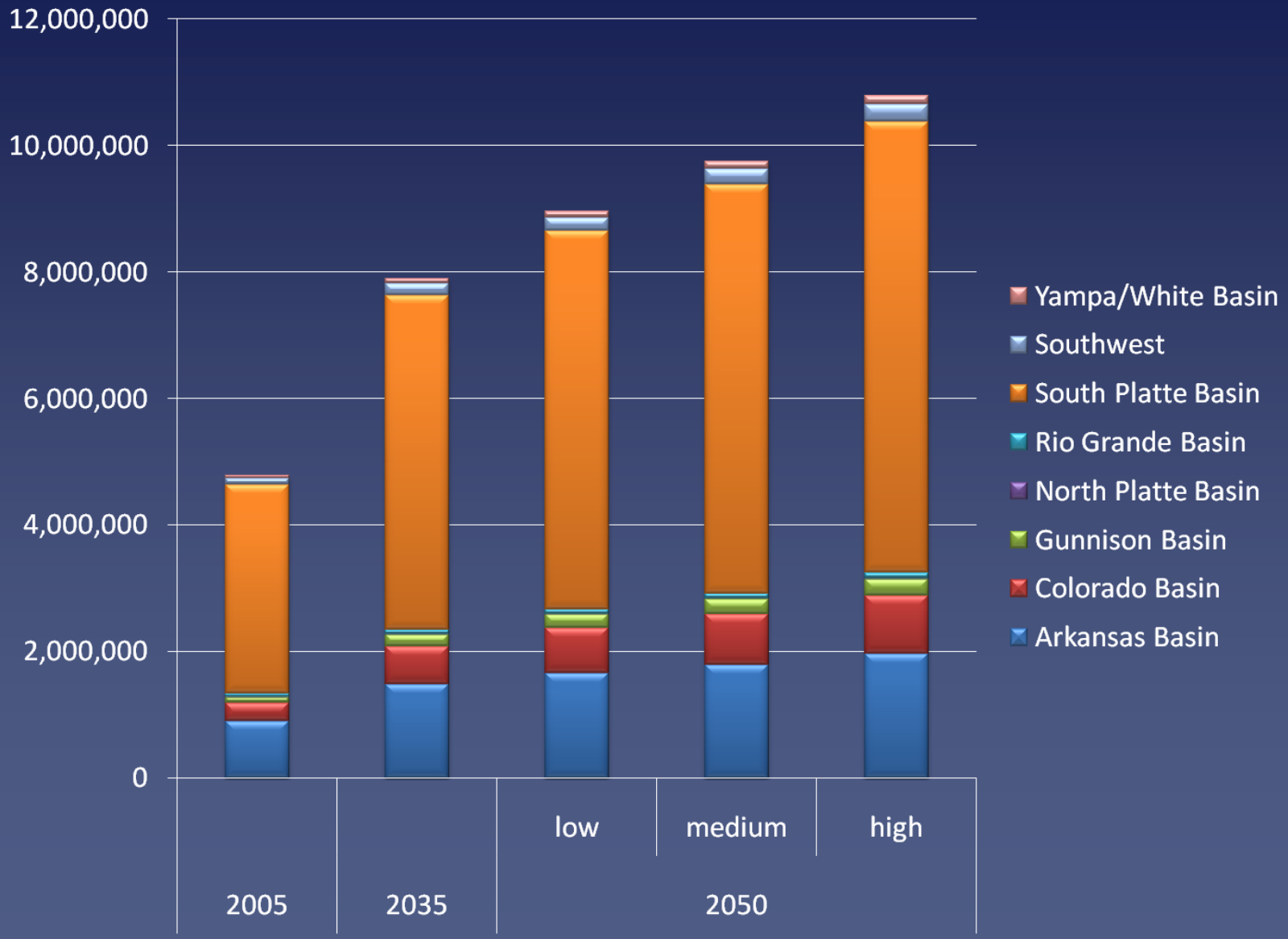
Projects and Methods to Meet Identified Needs (M&I and Nonconsumptive)

Status of Basin Roundtable Needs Assessments

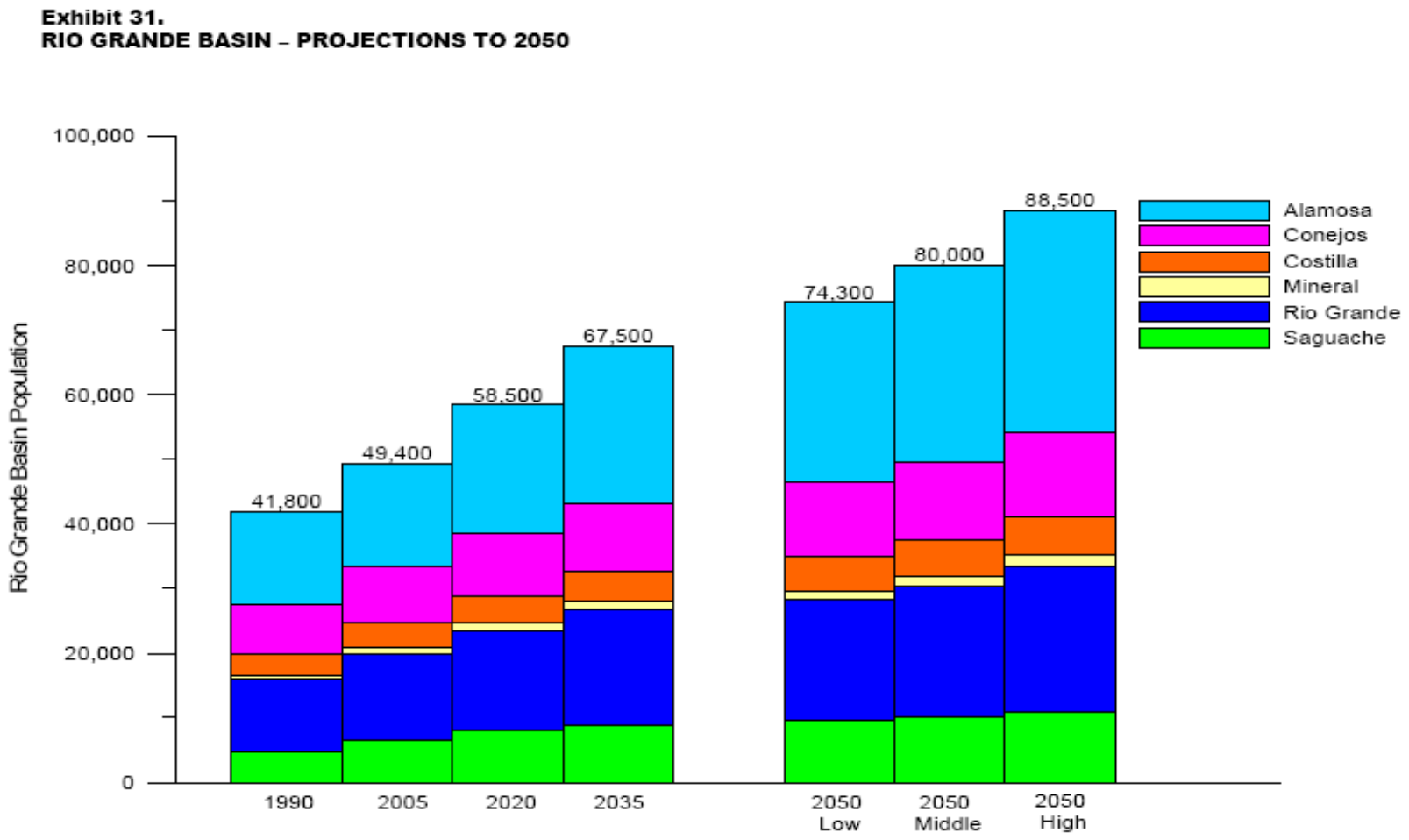
Basin	Consumptive Needs Assessment	Nonconsumptive Needs Assessment	Water Supply Availability Assessment
Rio Grande	• Augment SWSI 1 with Task Order requests - San Luis Valley Groundwater Level Study • Demands to 2050	• Roundtable review mapping	• SWSI 1 • Task Order Request

Visions and Strategies for Colorado's Water Supply Future: M&I Water Demands to 2050

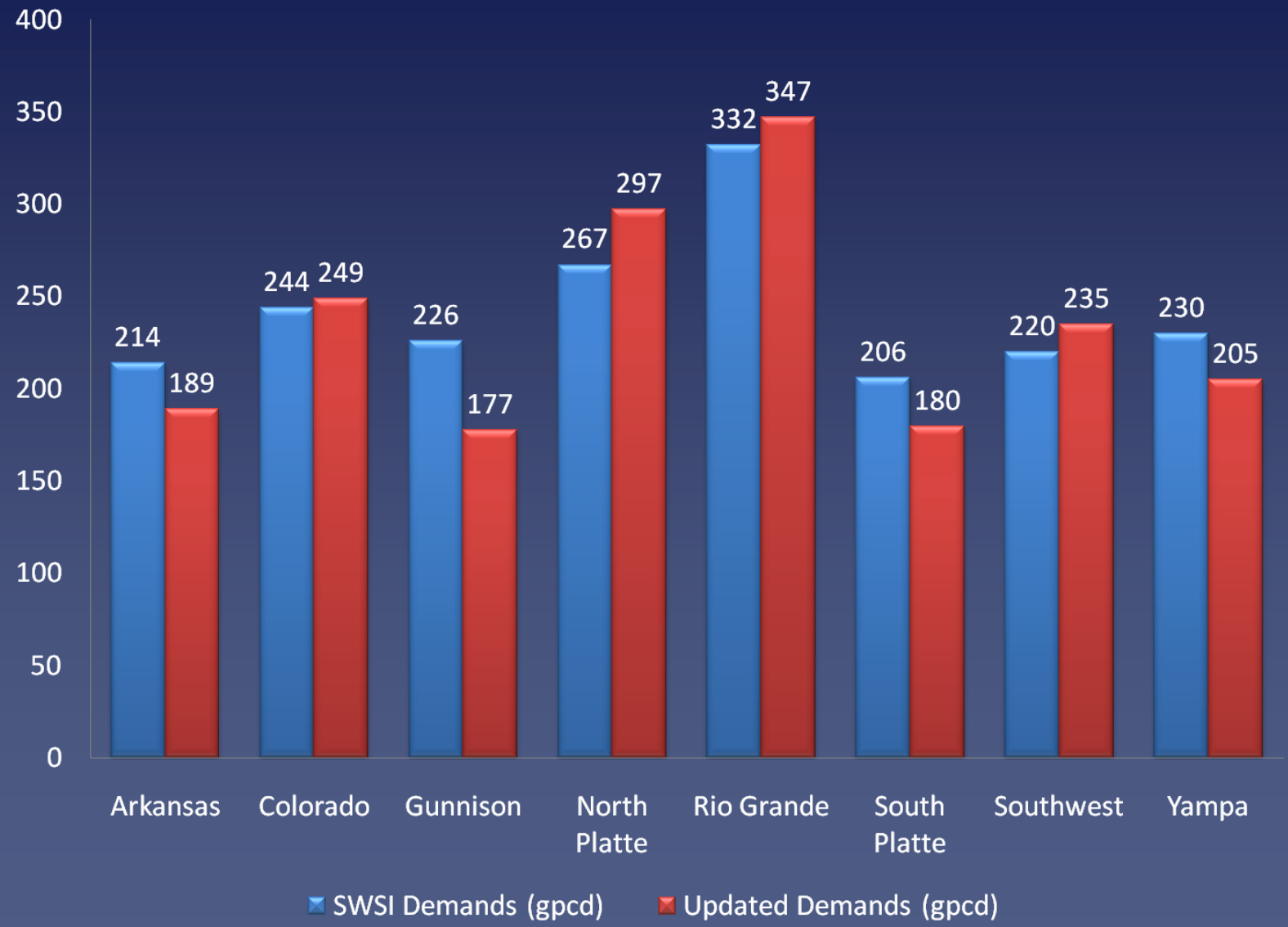
Population Projections



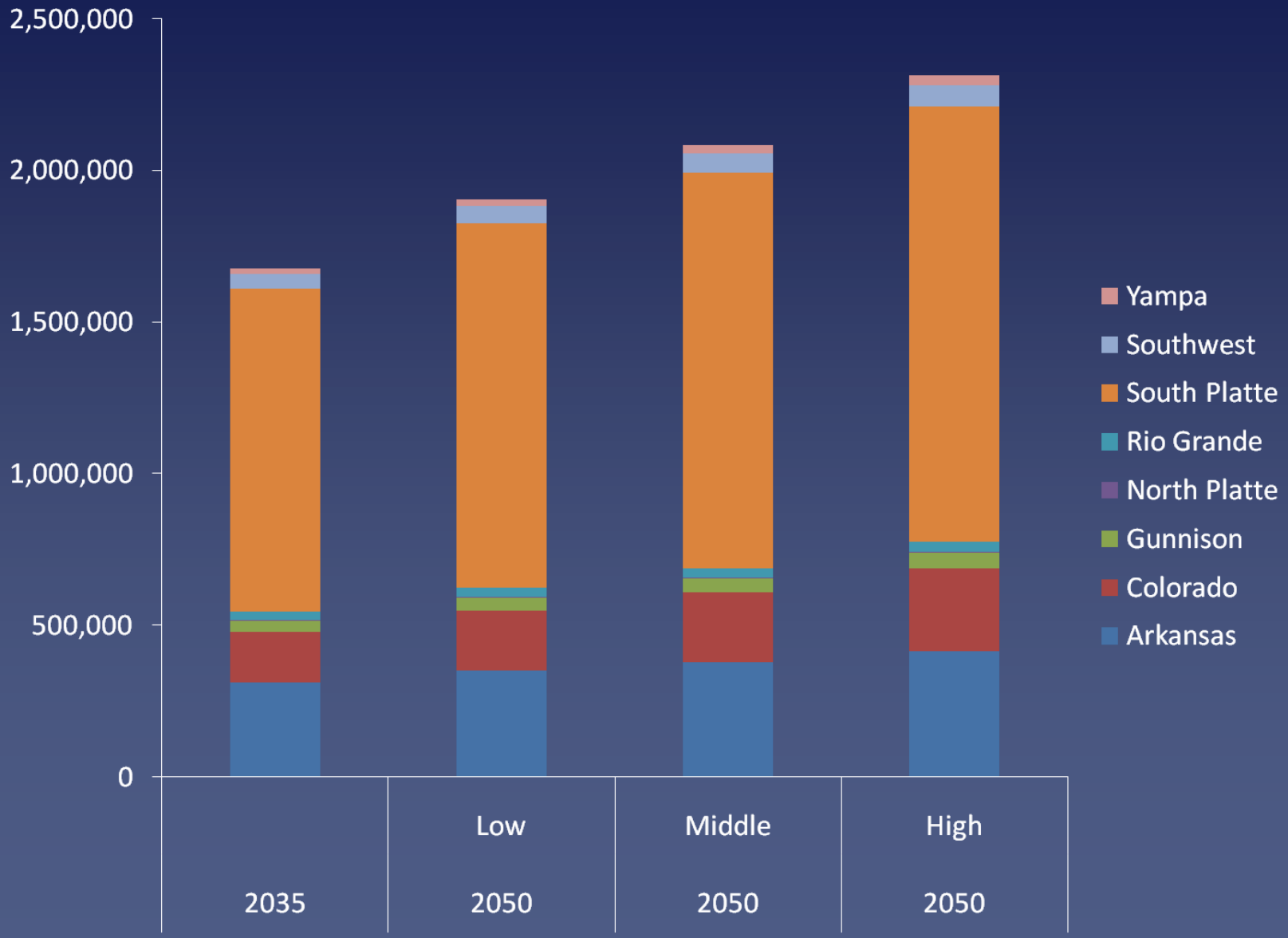
Rio Grande Basin Population Projections



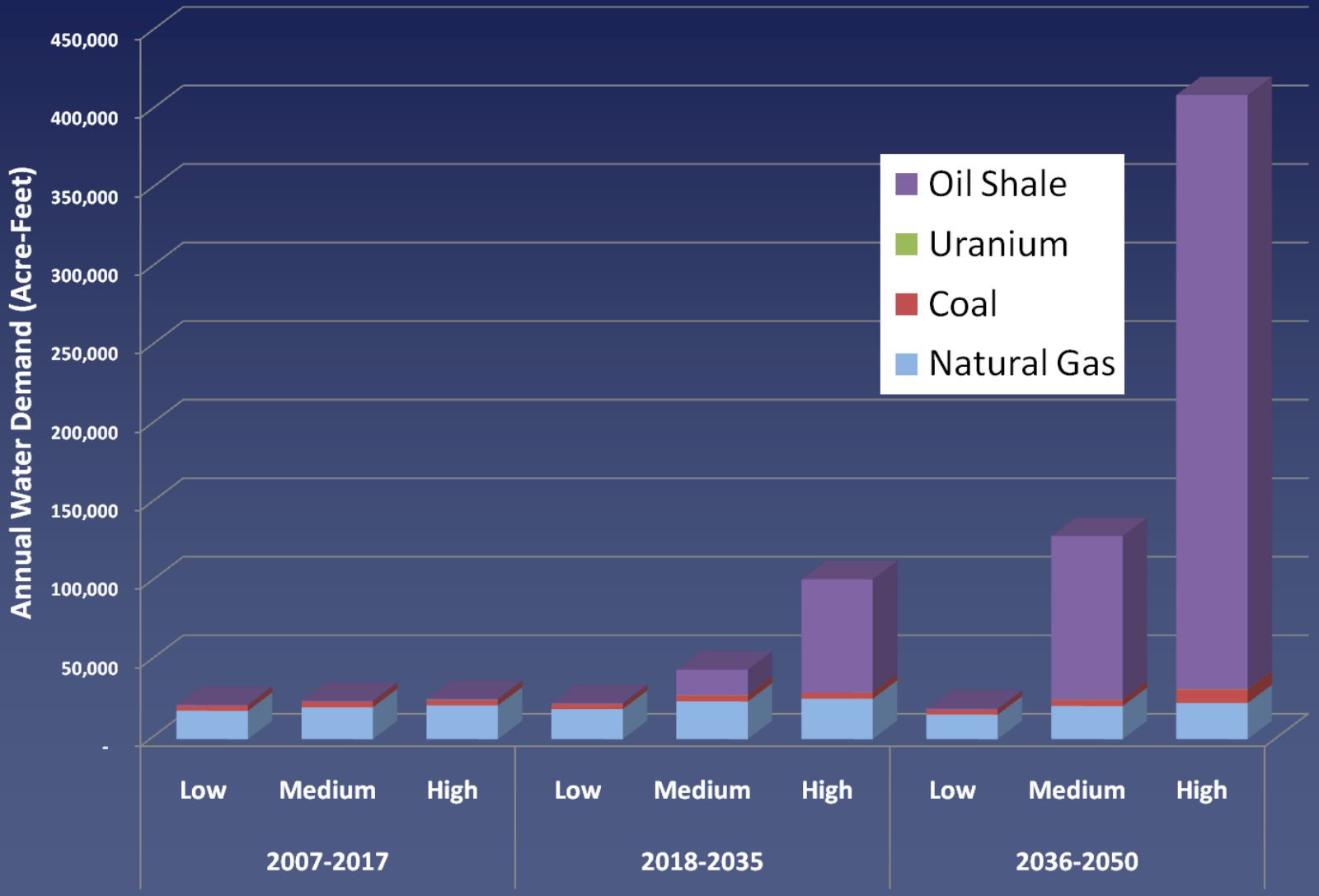
M&I Water Usage Rates by Basin



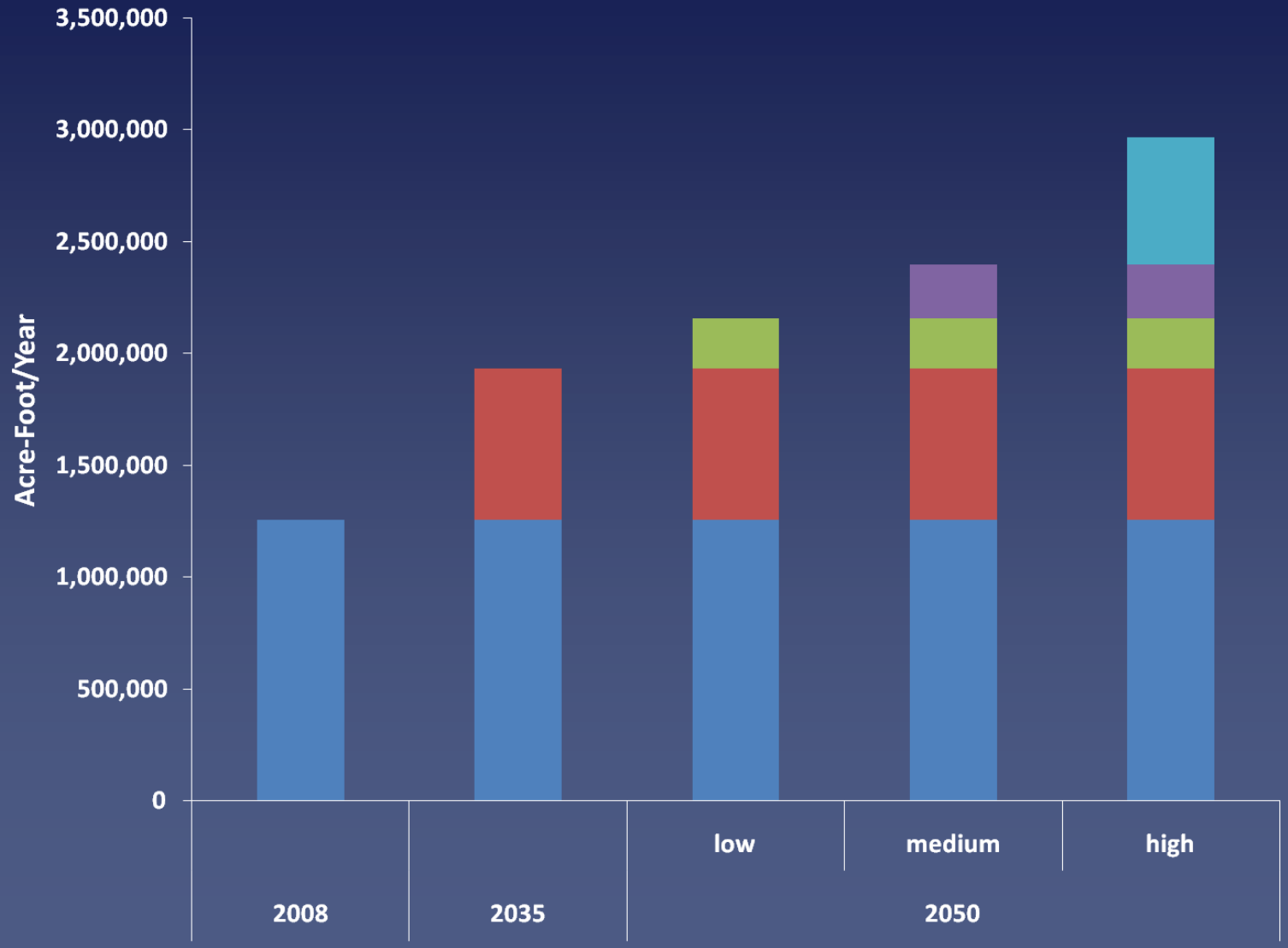
Municipal Water Demands by Basin



Colorado and Yampa/White Energy Demands

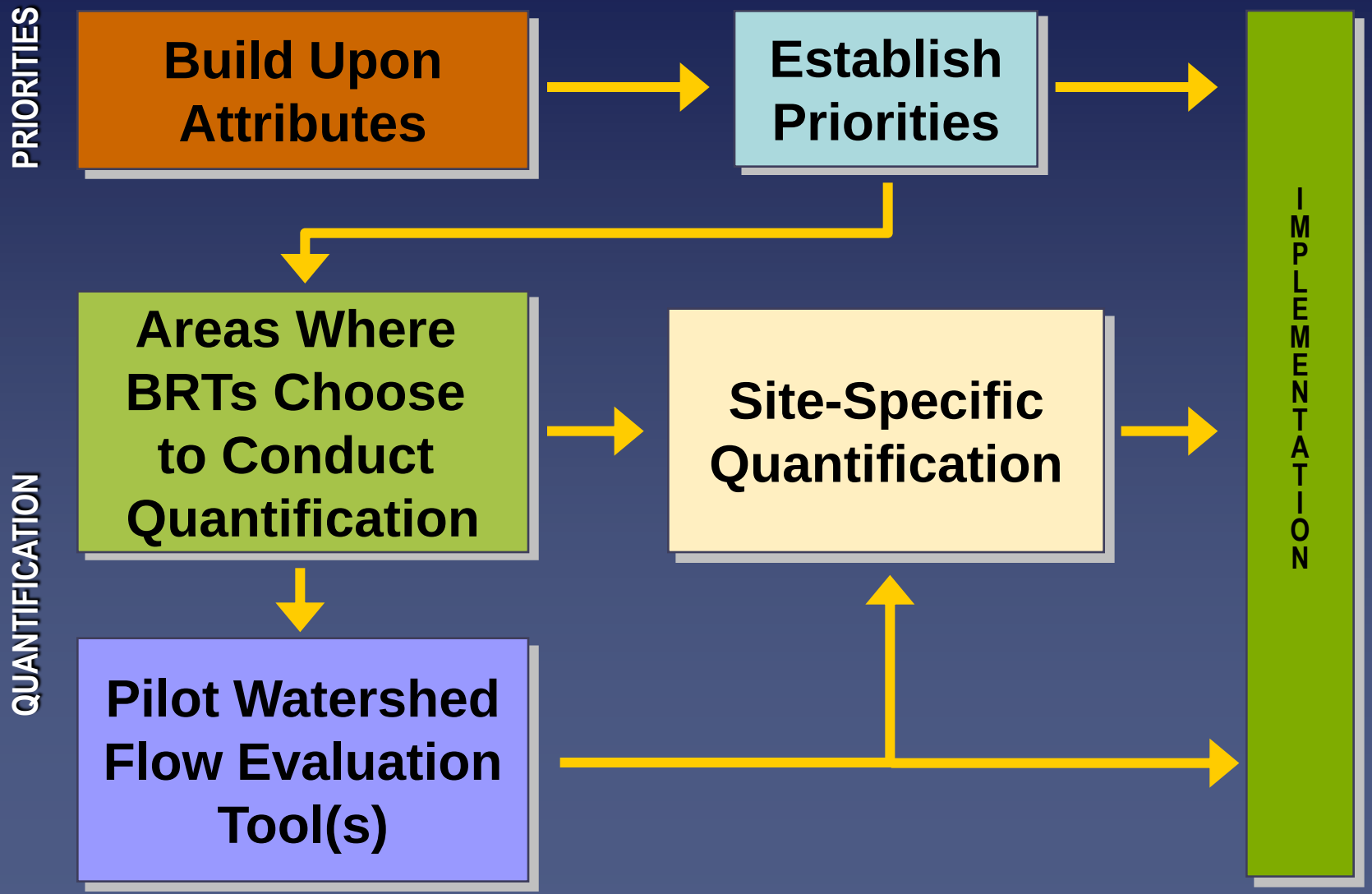


By 2050, Colorado will need up to 1.7 MAF to Meet M&I Demands*

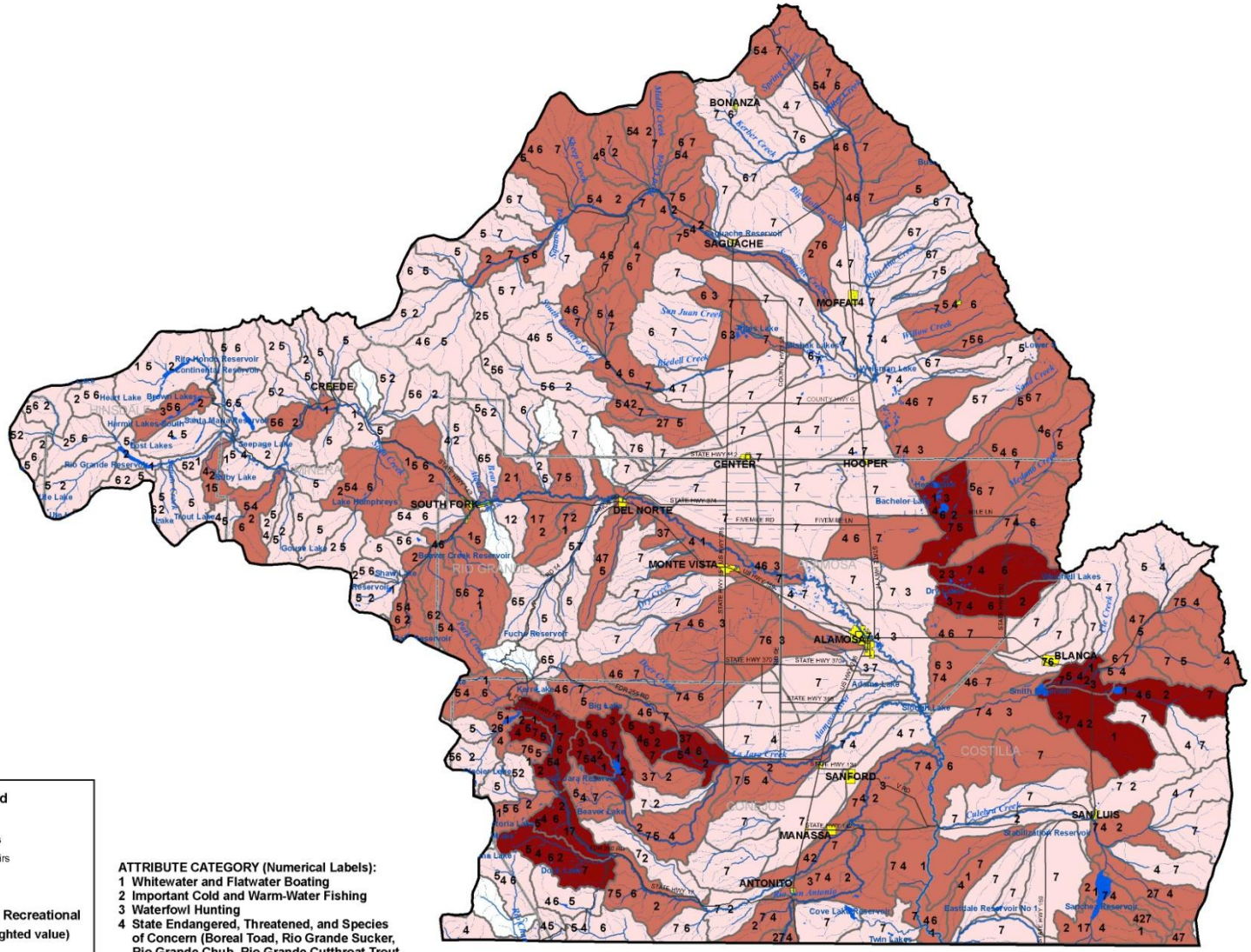


*This does not take into account demand reductions from conservation for future demands

Nonconsumptive Needs Assessment Methodology



Rio Grande Basin Non-Consumptive Needs Assessment
Sample 12-Digit HUC Prioritization Based on Environmental and Recreational Attributes



Legend

- Roads
- Rivers and Streams
- Lakes and Reservoirs
- Cities and Towns
- County Boundary

Environmental and Recreational Attribute Count (weighted value)

- 1 - 3
- 4 - 5
- 6 - 8

Note: Wetlands were assigned a weighted value of 2. All other attribute categories had a weight of 1.

ATTRIBUTE CATEGORY (Numerical Labels):

1. Whitewater and Flatwater Boating
2. Important Cold and Warm-Water Fishing
3. Waterfowl Hunting
4. State Endangered, Threatened, and Species of Concern (Boreal Toad, Rio Grande Sucker, Rio Grande Chub, Rio Grande Cutthroat Trout, Southwestern Willow Flycatcher, Northern Leopard Frog)
5. Special Value Waters (CWCB Instream Flow Waters, Eligible/Suitable Wild and Scenic, WQCD Oustanding Waters)
6. Rare Plants and Significant Riparian Wetland Plant Communities
7. Wetlands (National Wetlands Inventory)

0 4.5 9 18 27 36 Miles

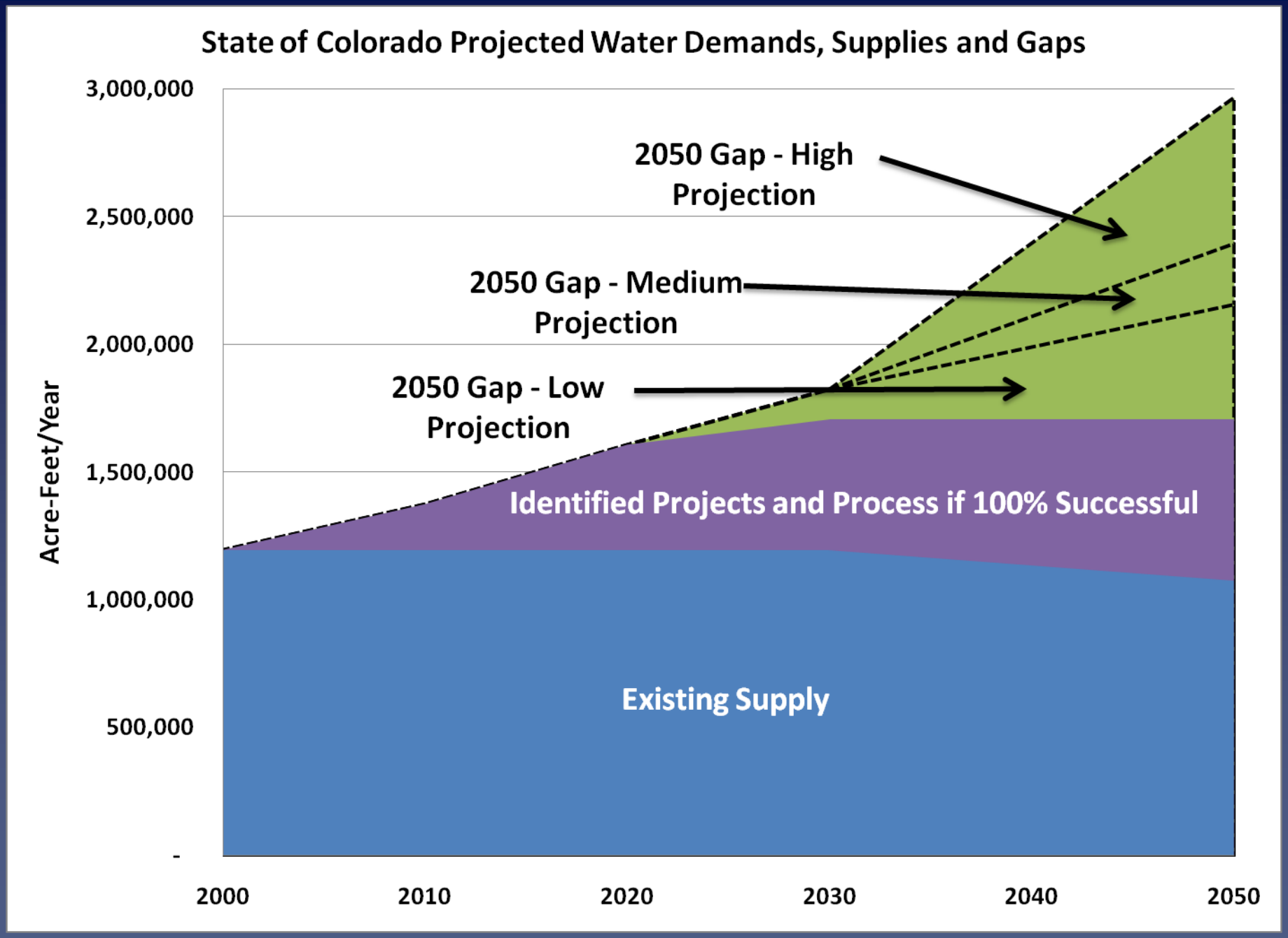
Scale 1:500,000

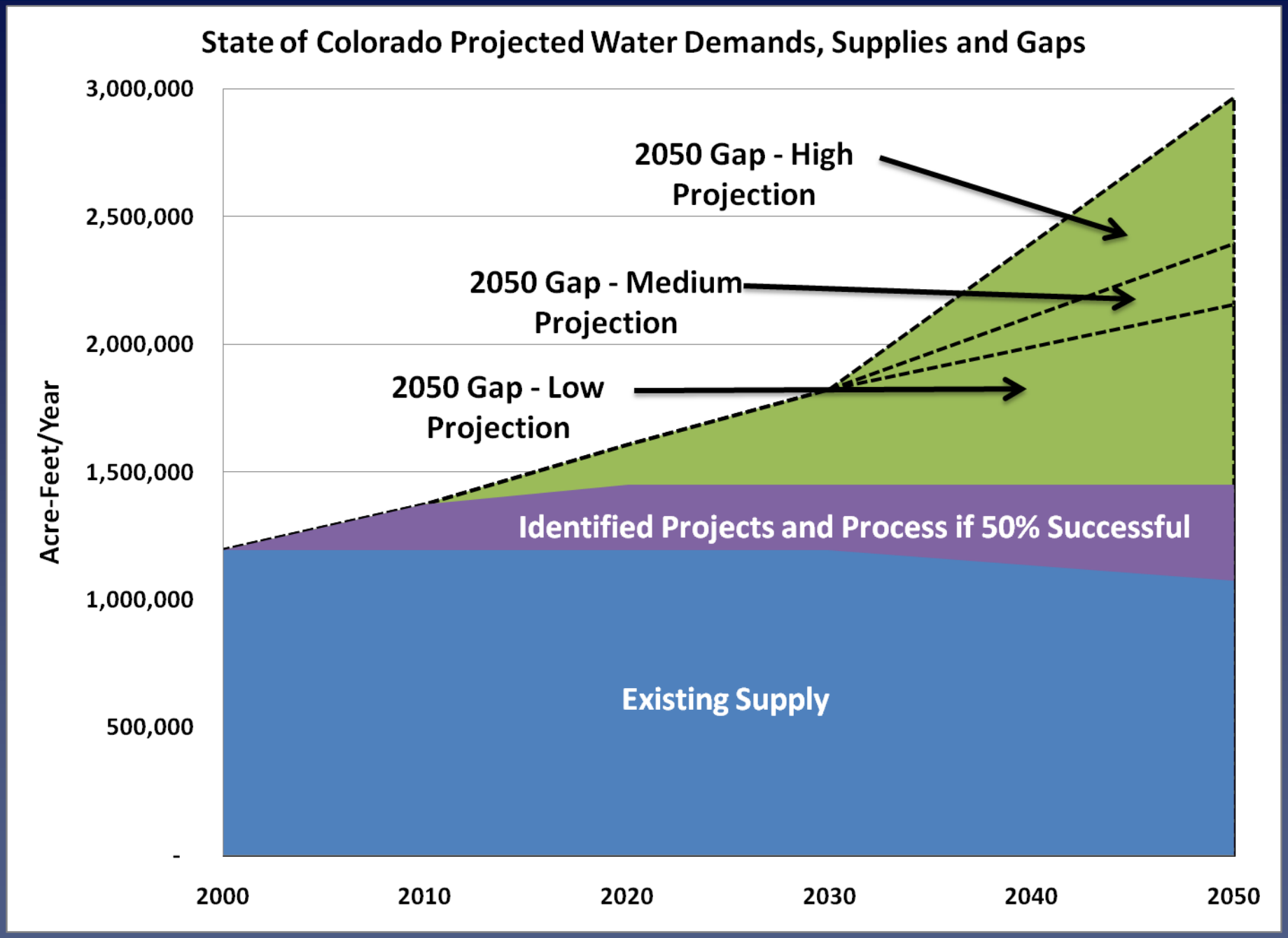
DRAFT

Data from the following sources: See Individual Attribute Maps, USGS, CWCB

Roundtable Action Items

- Finalize map
- Identify projects and methods for priority areas


State of Colorado Projected Water Demands, Supplies and Gaps
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
-
Acre-Feet/Year
2050 Gap - High Projection
2050 Gap - Medium Projection
2050 Gap - Low Projection
Identified Projects and Process if 100% Successful
Existing Supply
2000
2010
2020
2030
2040
2050


State of Colorado Projected Water Demands, Supplies and Gaps
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
-
Acre-Feet/Year
2050 Gap - High Projection
2050 Gap - Medium Projection
2050 Gap - Low Projection
Identified Projects and Process if 50% Successful
Existing Supply
2000
2010
2020
2030
2040
2050

Rio Grande IPPs

Major Identified Projects and Processes in Rio Grande Basin Counties

County	Estimated Demand Met by Identified Projects and Processes and Additional Conservation (AFY)	Identified Projects and Processes
Alamosa	1,900	Existing water rights, groundwater, and augmentation plans
Conejos	500	Existing water rights, groundwater, and augmentation plans
Costilla	—	Existing water rights and groundwater
Mineral	100	Existing water rights, groundwater, and augmentation plans
Rio Grande	900	Existing water rights, groundwater, and augmentation plans
Saguache	800	Existing water rights, groundwater, and augmentation plans
TOTAL	**4,200**	

Detailed Identified Projects and Processes for Rio Grande Basin

County	Major Provider	Remaining Gross Gap (AF)	Supplies Beyond 2030*	Notes	Source
Alamosa	Alamosa, City of	0	Y	Evaluating its water supply options; has a relatively new well in place; surface supply via diversions from a drainage slough and six confined aquifer wells (1,000 feet deep). City recently acquired East Alamosa Water District and its water rights.	BRT2 feedback and Hydrosphere memo 7/8/99
	Unincorporated Alamosa County not served by a water district - San Luis Valley Water Conservancy District augmentation	0	Y	Augmentation of new wells required for parcels < 35 acres. San Luis Valley Water Conservancy District augmentation water available.	Mike Gibson, San Luis Valley Water Conservancy District
Conejos	Antonito, Town of	0	Y	Conejos River surface diversion plus one well at 500 feet.	Rio Grande DSS documentation memo 7/8/99
	Manassa, Town of	0	Y	Have two wells in confined aquifer (800 feet deep).	Rio Grande DSS documentation memo 7/8/99

* **Y = Yes; N = No; U = Unknown**

Detailed Identified Projects and Processes for Rio Grande Basin (cont.)

County	Major Provider	Remaining Gross Gap (AF)	Supplies Beyond 2030*	Notes	Source
Conejos (cont.)	Romeo, Town of	0	Y	Have one well in confined aquifer (689 feet deep). Installing water meters to conserve water and operate within 100 AFY well water right withdrawal limitation.	
	Sanford, Town of	0	N	Have two wells in confined aquifer (±900 feet deep). Present water rights permit withdrawal of 250 AFY. Usage is exceeding water rights. Town is in process of acquiring additional water rights.	
	Unincorporated Conejos County not served by a water district	0	U	Assumed to have wells in confined aquifer. Augmentation required. Agricultural dry-up primary source of augmentation water.	

* **Y = Yes; N = No; U = Unknown**

Detailed Identified Projects and Processes for Rio Grande Basin (cont.)

County	Major Provider	Remaining Gross Gap (AF)	Supplies Beyond 2030*	Notes	Source
Costilla	Town of Blanca	0	U	Have one well in unconfined aquifer.	
	Fort Garland Water and Sanitation District	0	U	Have two wells in unconfined aquifer.	
	Costilla County Conservancy District	0	U	Assumed to have wells in unconfined aquifer. Augmentation required. Agricultural dry-up primary source of augmentation water.	
	San Luis Water & Sanitation District	0	U	Have two wells in unconfined aquifer.	
	Costilla County Water & Sanitation District	±50	N	Served by ±6 wells in unconfined aquifer.	
	Unincorporated Costilla County not served by a water district	0	U	Assumed to have wells in confined aquifer. Augmentation required. Agricultural dry-up primary source of augmentation water.	

* Y = Yes; N = No; U = Unknown

Detailed Identified Projects and Processes for Rio Grande Basin (cont.)

County	Major Provider	Remaining Gross Gap (AF)	Supplies Beyond 2030*	Notes	Source
Mineral	Creede, Town of	0	Y	Has two alluvial wells. Well water right withdrawal limitation is ±470 AFY. Have existing rights and have policy for new developments bring in augmentation water.	Mike Gibson, San Luis Valley Water Conservancy District
	Unincorporated Mineral County not served by a water district - San Luis Valley Water Conservancy District augmentation	0	U	Augmentation of new wells required for parcels < 35 acres. San Luis Valley Water Conservancy District augmentation water available if owner petitions for inclusion.	Mike Gibson, San Luis Valley Water Conservancy District
Rio Grande	Monte Vista, City of	0	U	Have five wells in confined aquifer (800 to 1,000 feet deep).	Rio Grande DSS documentation memo 7/8/99
	Center, Town of	0	U	Have two wells in confined aquifer (785 feet deep).	Rio Grande DSS documentation memo 7/8/99
	Del Norte, Town of	0	U	Have two wells 300 feet deep and a Piños Creek surface water right back-up.	Rio Grande DSS documentation memo 7/8/99

* **Y = Yes; N = No; U = Unknown**

Detailed Identified Projects and Processes for Rio Grande Basin (cont.)

County	Major Provider	Remaining Gross Gap (AF)	Supplies Beyond 2030*	Notes	Source
Rio Grande (cont.)	Unincorporated Rio Grande County not served by a water district - San Luis Valley Water Conservancy District augmentation	0	U	Augmentation of new wells required for parcels < 35 acres. San Luis Valley Water Conservancy District augmentation water available.	Mike Gibson, San Luis Valley Water Conservancy District
Saguache	Baca Subdivision Water System	0	U	Assumed to have wells in confined aquifer. Augmentation required. Agricultural dry-up primary source of augmentation water.	
	Saguache, Town of	0	U	Assumed to have wells in unconfined aquifer. Augmentation required. Agricultural dry-up primary source of augmentation water.	

* Y = Yes; N = No; U = Unknown

Detailed Identified Projects and Processes for Rio Grande Basin (cont.)

County	Major Provider	Remaining Gross Gap (AF)	Supplies Beyond 2030*	Notes	Source
Saguache (cont.)	Crestone, Town of	0	U	Assumed to have wells in confined aquifer. Augmentation required. Agricultural dry-up primary source of augmentation water.	
	Unincorporated Saguache County not served by a water district - San Luis Valley Water Conservancy District augmentation	0	Y	Augmentation of new wells required for parcels < 35 acres. Included in San Luis Valley Water Conservancy District but may need to construct recharge pits for augmentation water for areas not tributary to Rio Grande.	Mike Gibson, San Luis Valley Water Conservancy District

* Y = Yes; N = No; U = Unknown

Potential Future Rio Grande Basin Water Management Options

Project	Sponsor	Type of Project	Additional Storage (AF)	Additional Yield (AFY)	Project Purpose and Notes
National Forest Timber Management	None	Flow augmentation	Not Applicable	Not Available	Increase runoff from national forests.
Rio Grande Headwaters Restoration Project	San Luis Valley Conservancy District Water Task Force - consisting of various interests	River restoration including bank stabilization, J-hooks to redirect flows, riparian fencing, planting of willows and improvement and/or relocation of ditch and canal diversion structures.		Not Available	Purpose is to restore river to historical functions including maintenance of channel capacity, flood protection, riparian habitat, Rio Grande Compact deliveries and access for water diversion.
Ground Water Recharge and Management Project	Rio Grande WCD, San Luis Valley WCD, various ditch and reservoir companies, conservancy districts and Fish and Wildlife Service	Groundwater recharge	Not Applicable	Will increase groundwater storage in underground reservoirs - No estimate at this time.	Oversize the capacity of existing irrigation canals and ditches and dedicate large recharge areas to take advantage of flood flows and flows available under Rio Grande Compact. Enhance recharge of closed basin aquifer to allow better utilization of surface water supplies.

Potential Future Rio Grande Basin Water Management Options (cont.)

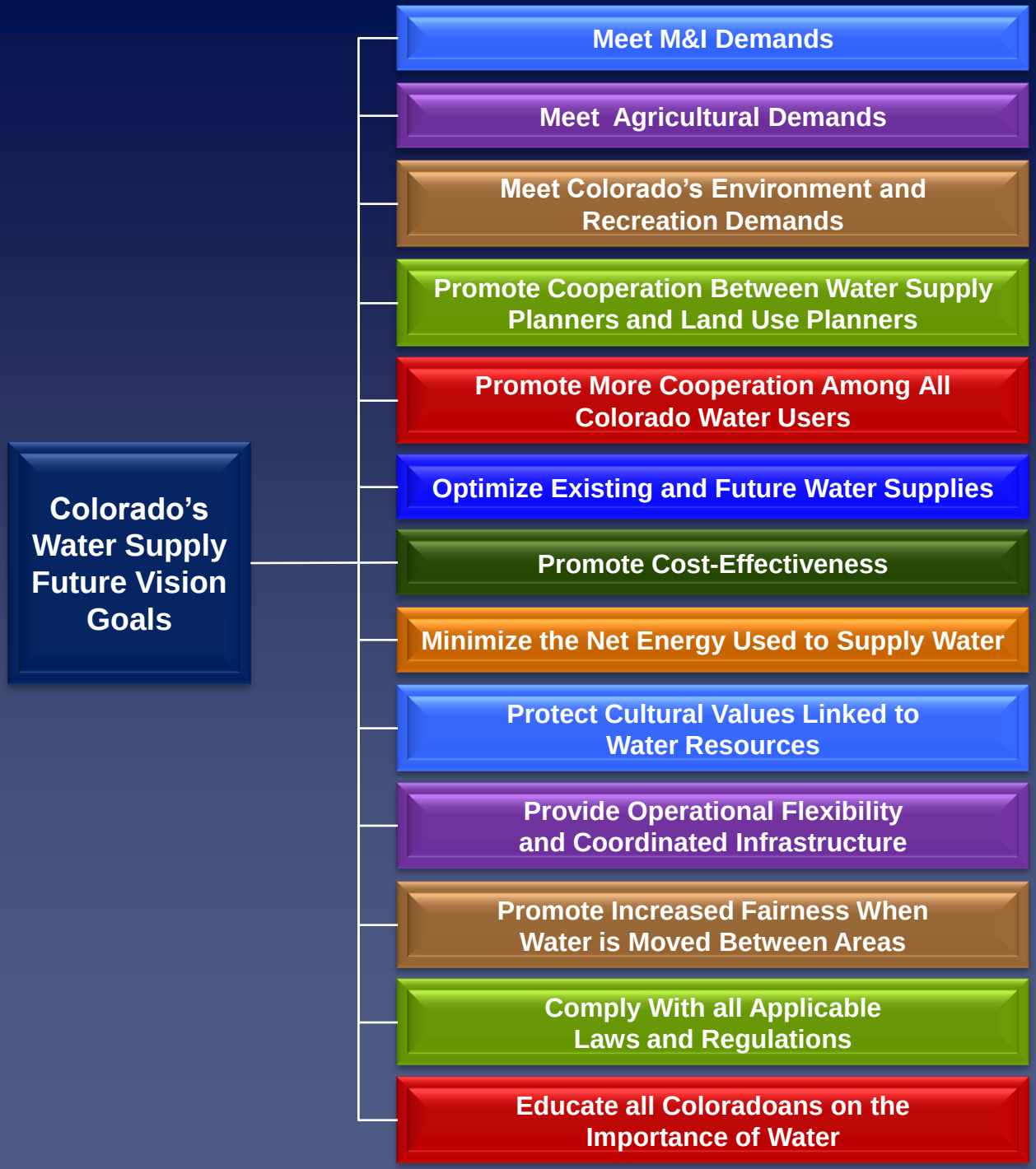
Project	Sponsor	Type of Project	Additional Storage (AF)	Additional Yield (AFY)	Project Purpose and Notes
Creation of Groundwater Management Districts	Rio Grande WCD or San Luis Valley WCD Water Management Subdistrict and various ditch and reservoir companies	Groundwater	Not Applicable	Not Available	Establish groundwater management subdistricts to manage consumption while maximizing aquifer sustainable yield.
Upper Rio Grande Basin Water Operations Review	Bureau of Reclamation and Army Corps of Engineers	Re-operations	Not Applicable	Not Available	Improved management of federal water facilities in Colorado and New Mexico; Enhanced administration of this water by the BOR to ensure no expansion of irrigated acreage in New Mexico.
Expanding Outreach and Education	Rio Grande WCD and San Luis Valley WCD	Public Education	Not Applicable	Not Available	Education Programs and Speakers Bureaus to raise the awareness of the importance of a healthy river and a sustainable water supply and prudent management of entire basin.
Ground and surface water conservation program	None	Conservation	Not Available	Not Available	Maximize beneficial use of surface water and groundwater resources.

Roundtable Action Items

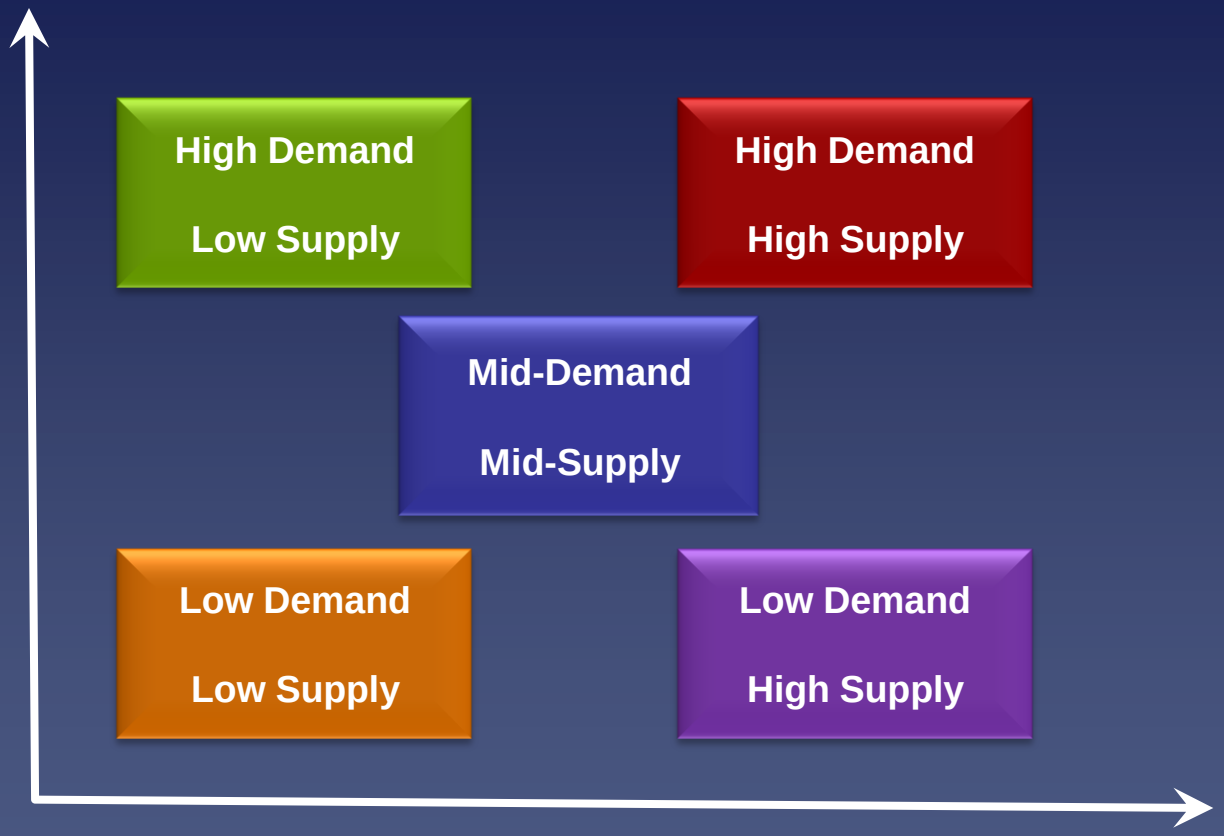
- Review and update IPPs and base options

Development of Water Supply Strategies

Elements of the Visioning Process


Colorado's Water Supply Future Vision Goals
Meet M&I Demands
Meet Agricultural Demands
Meet Colorado's Environment and Recreation Demands
Promote Cooperation Between Water Supply Planners and Land Use Planners
Promote More Cooperation Among All Colorado Water Users
Optimize Existing and Future Water Supplies
Promote Cost-Effectiveness
Minimize the Net Energy Used to Supply Water
Protect Cultural Values Linked to Water Resources
Provide Operational Flexibility and Coordinated Infrastructure
Promote Increased Fairness When Water is Moved Between Areas
Comply With all Applicable Laws and Regulations
Educate all Coloradoans on the Importance of Water

2050 Planning Horizon for Colorado's Water Supply Future

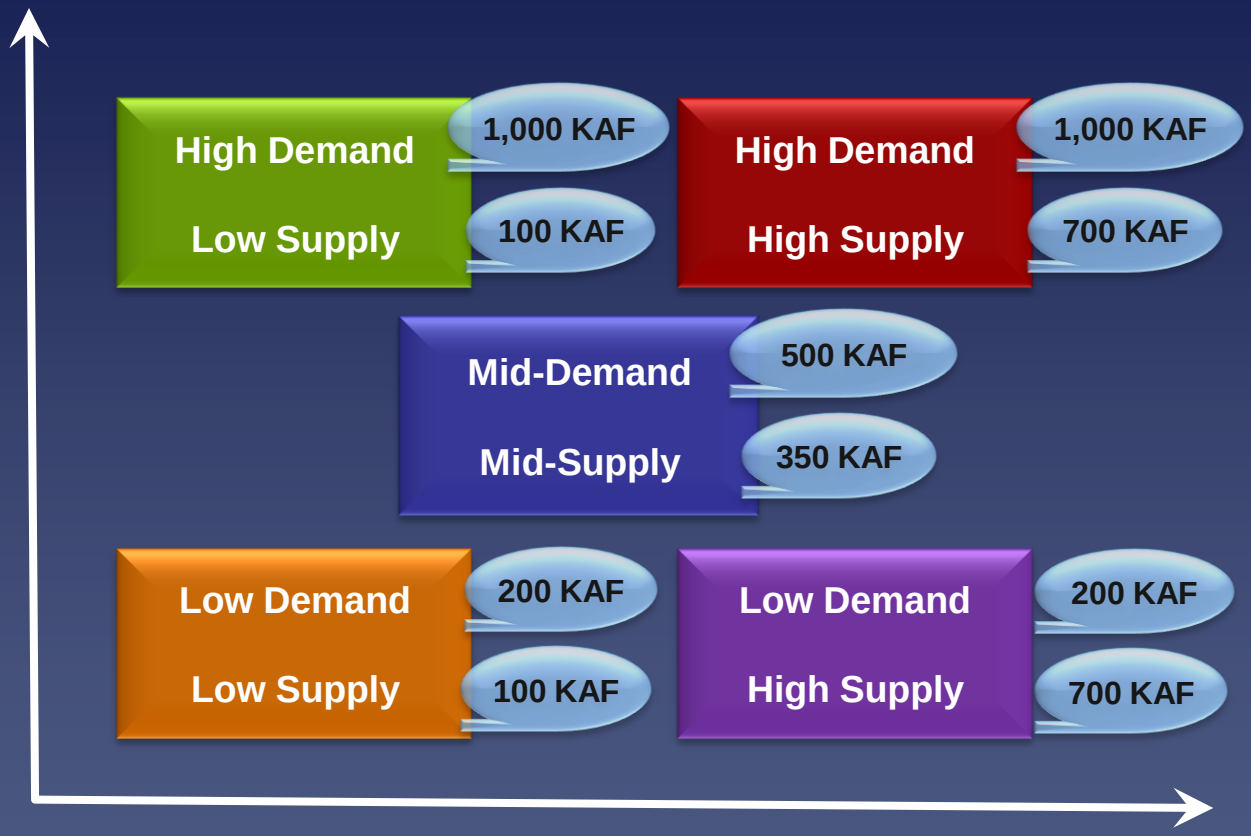


Demand Factors:
- **M&I Growth**
- **Energy Demands**

Supply Factors:
- **Colorado River Hydrologic Variability**
- **Climate Change**
- **Compact Call**

2050 Planning Horizon for Colorado's Water Supply Future

Demand Factors:
- **M&I Growth**
- **Energy Demands**



Supply Factors:
- **Colorado River Hydrologic Variability**
- **Climate Change**
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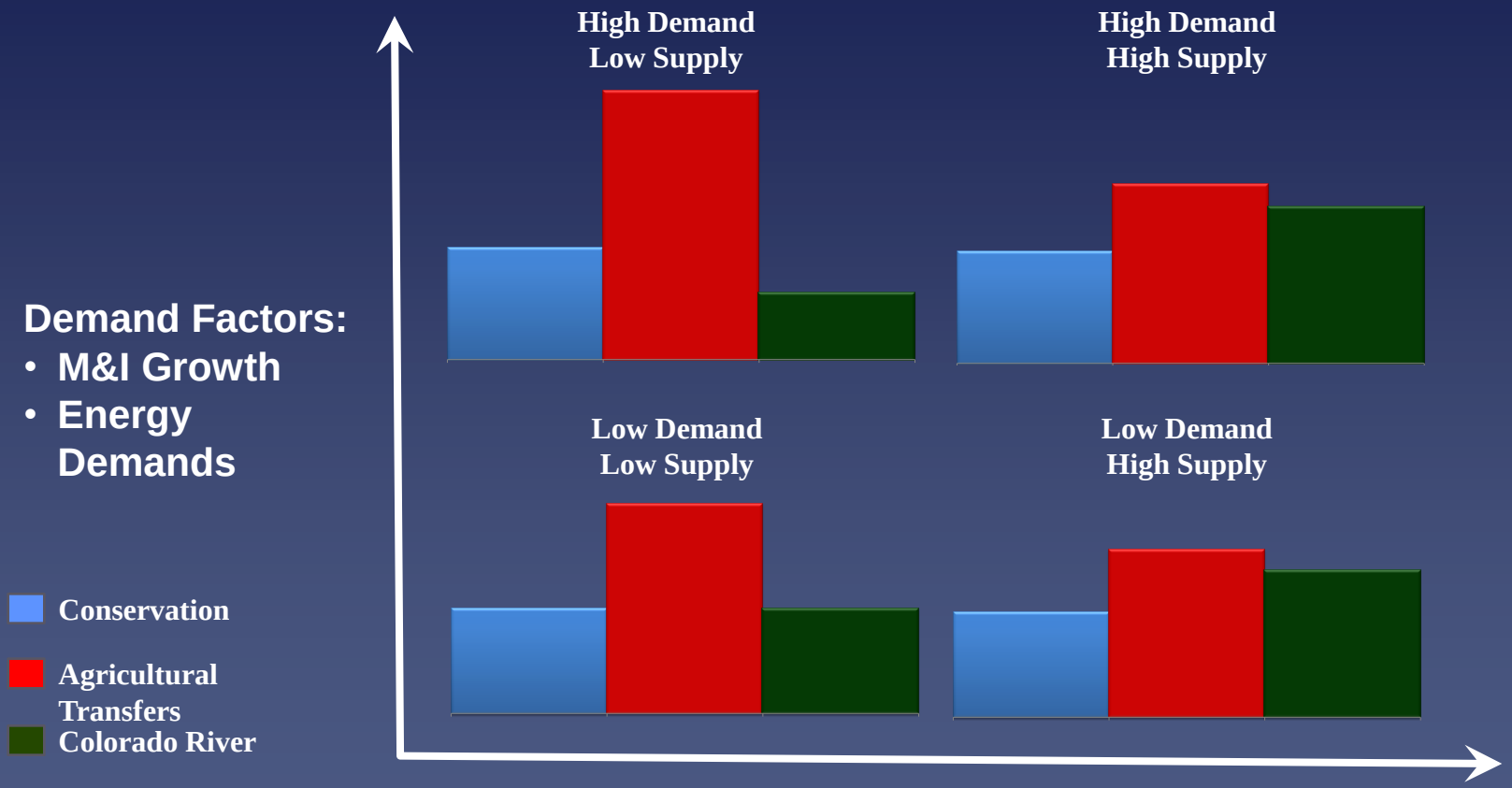
2050 Planning Horizon for Colorado's Water Supply Future

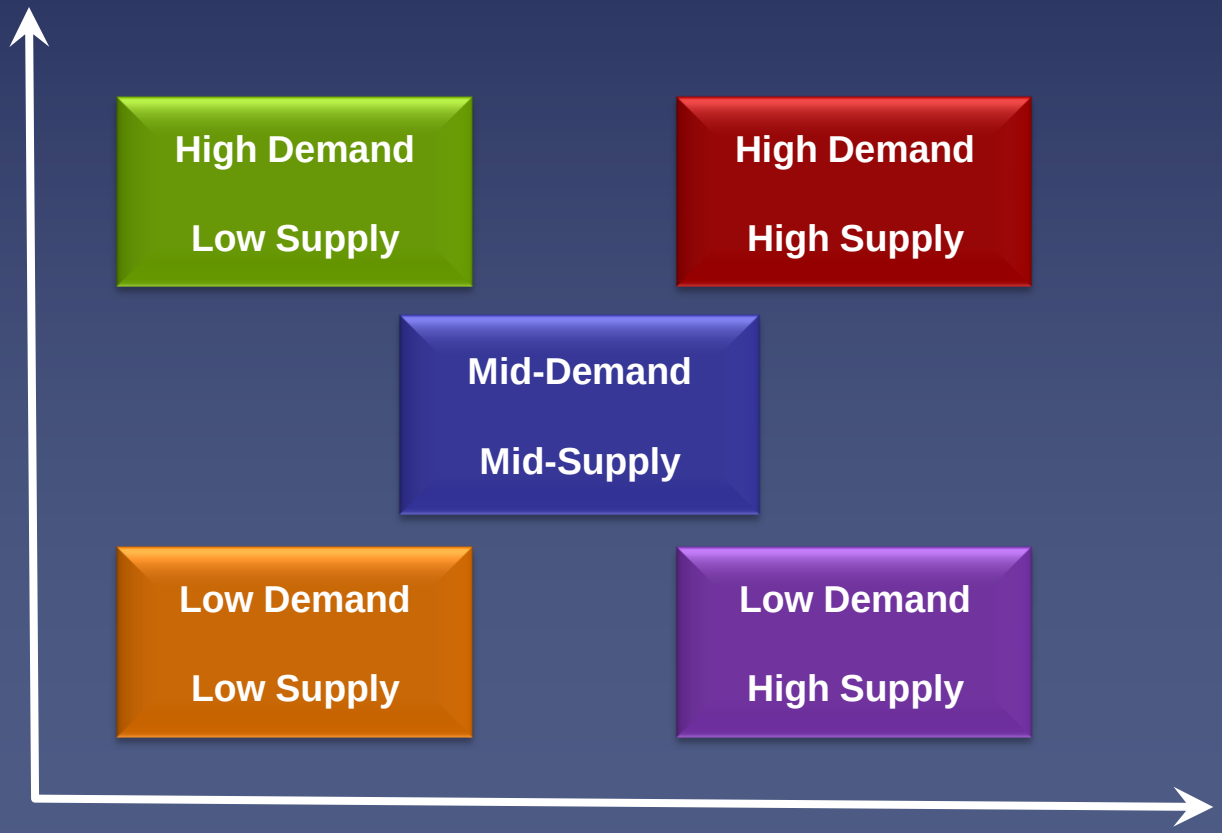
Demand Factors:
- **M&I Growth**
- **Energy Demands**



Supply Factors:
- **Colorado River Hydrologic Variability**
- **Climate Change**
- **Compact Call**

Narratives about Colorado's Water Supply Future

Create a narrative describing what would lead to the 5 different scenarios



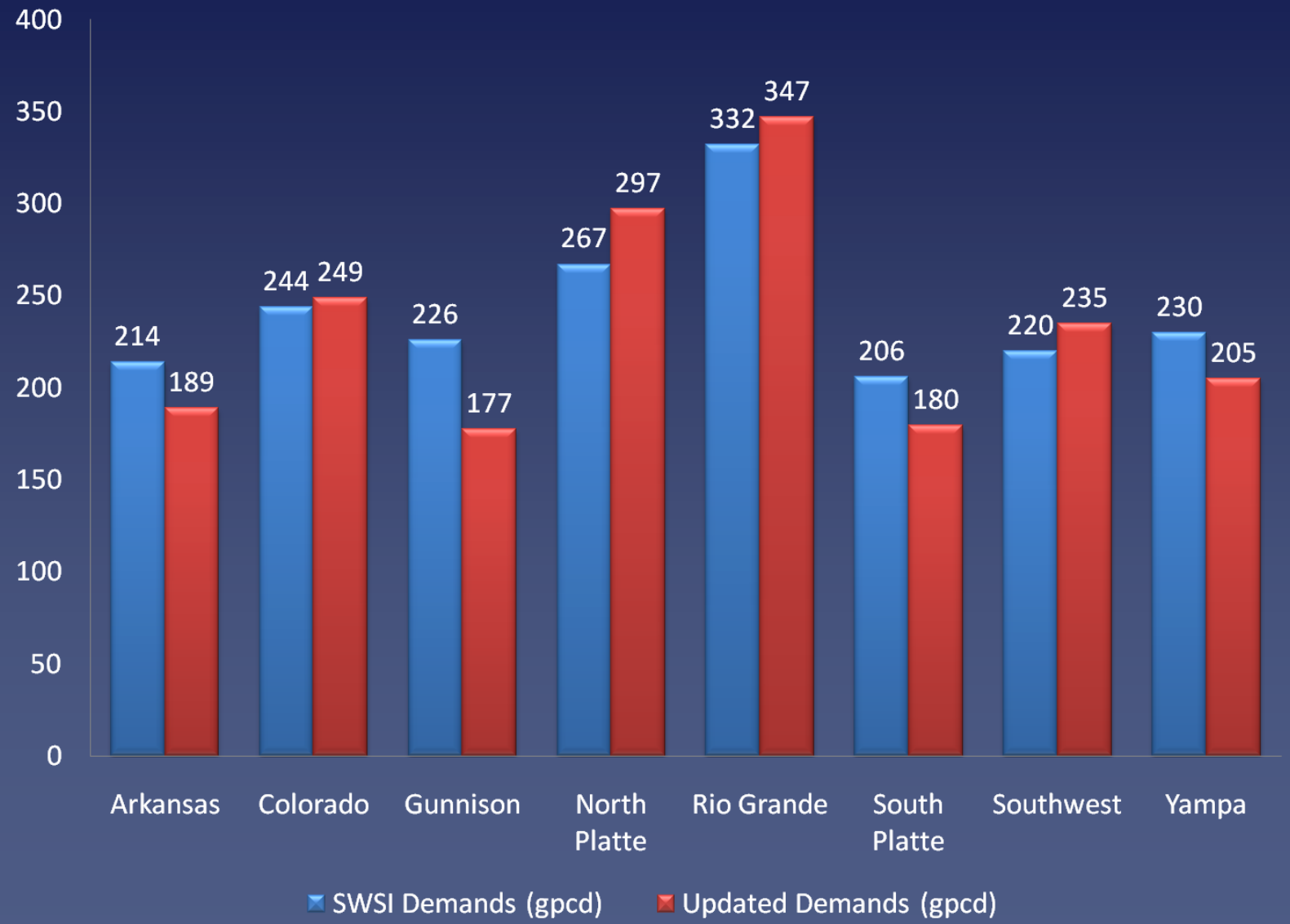
Water Supply Strategies

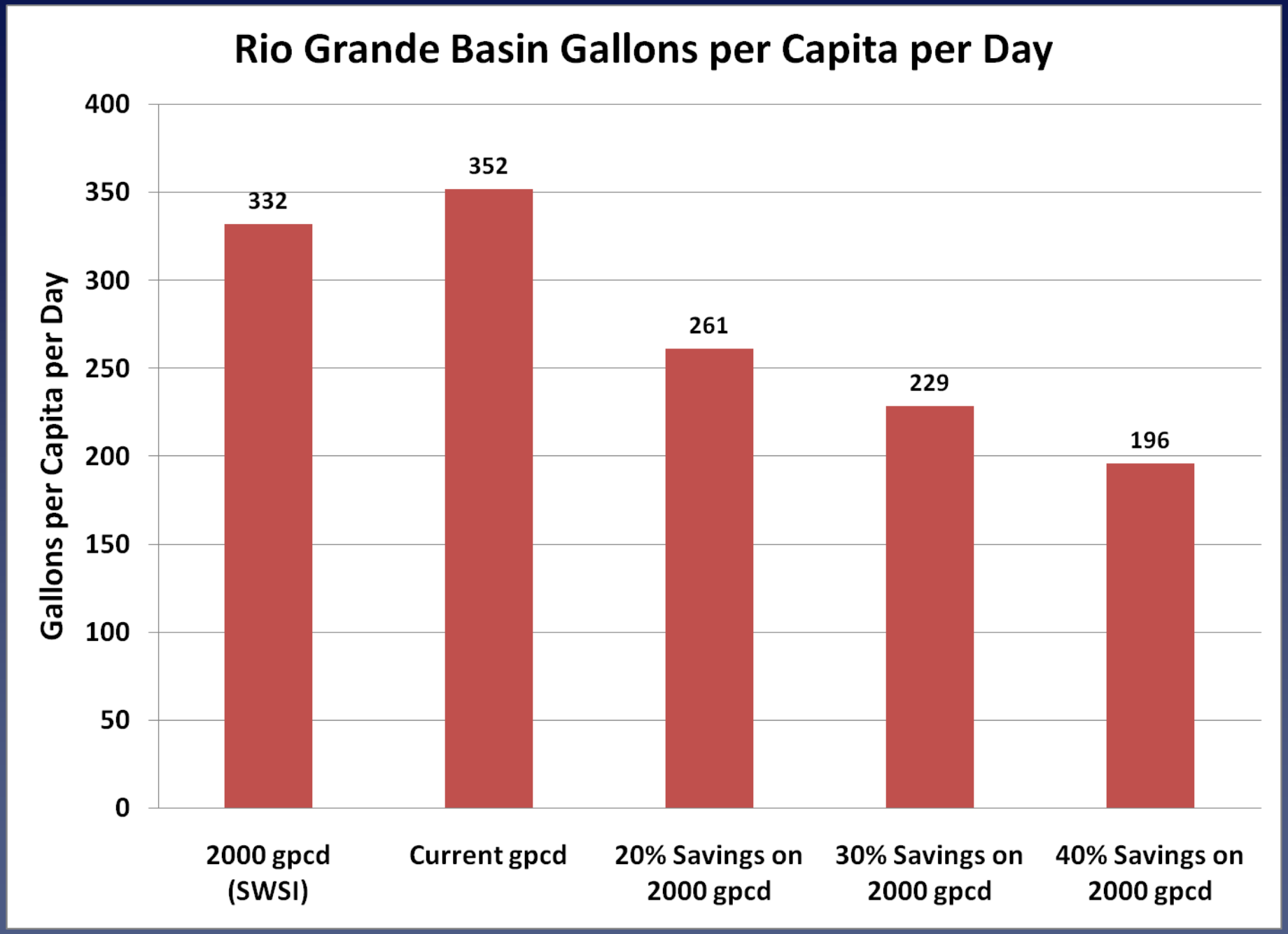
- Water Conservation
- Agricultural Transfers
  - Conventional and alternative transfers
- Development of New Supplies
  - New Storage
  - Transbasin

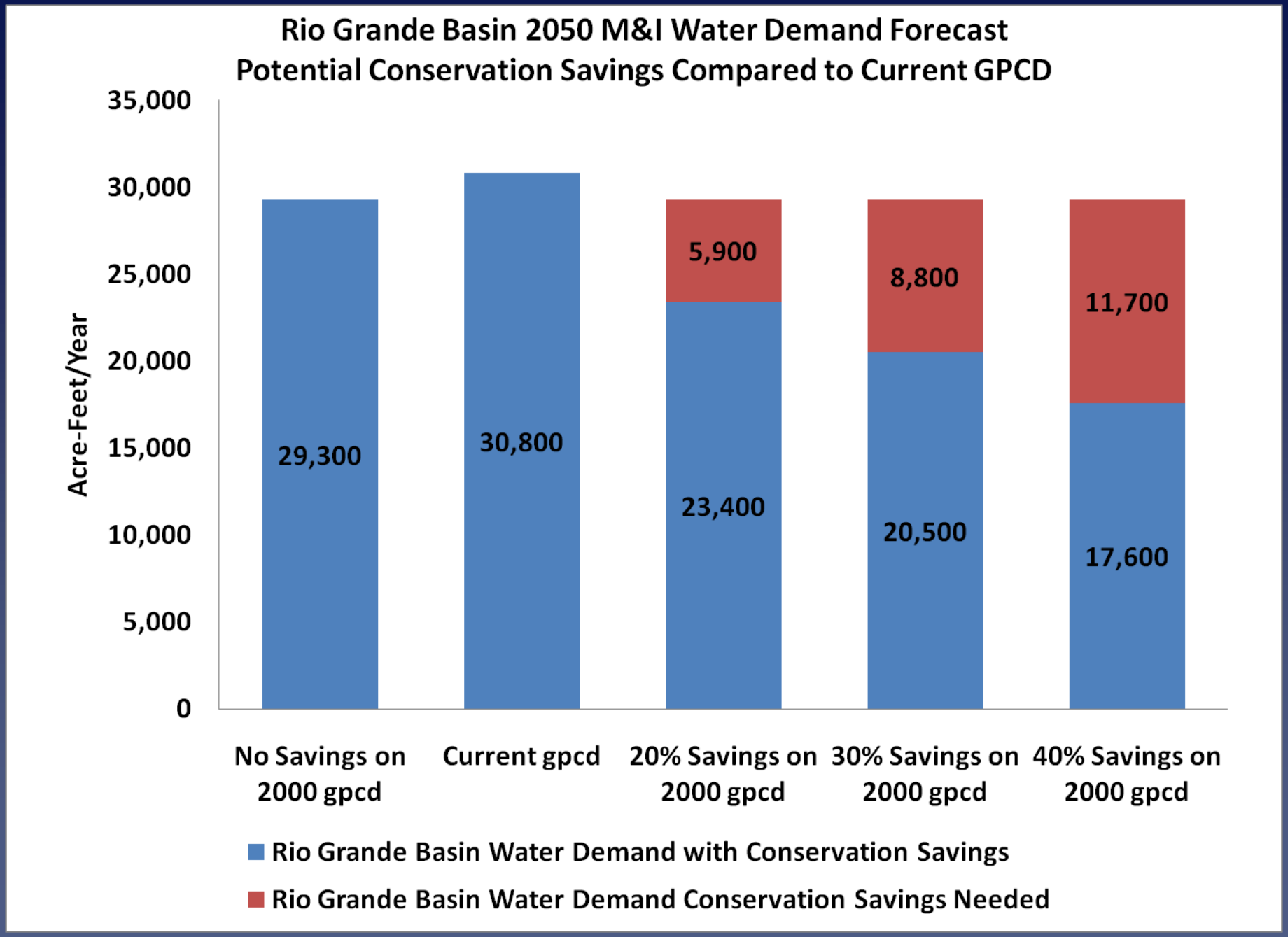
These strategies address M&I needs, but options to address agricultural and nonconsumptive needs will be added as strategies are evaluated

Water Conservation

M&I Water Usage Rates by Basin




Rio Grande Basin Gallons per Capita per Day
Gallons per Capita per Day
400
350
300
250
200
150
100
50
0
332
352
261
229
196
2000 gpcd (SWSI)
Current gpcd
20% Savings on 2000 gpcd
30% Savings on 2000 gpcd
40% Savings on 2000 gpcd

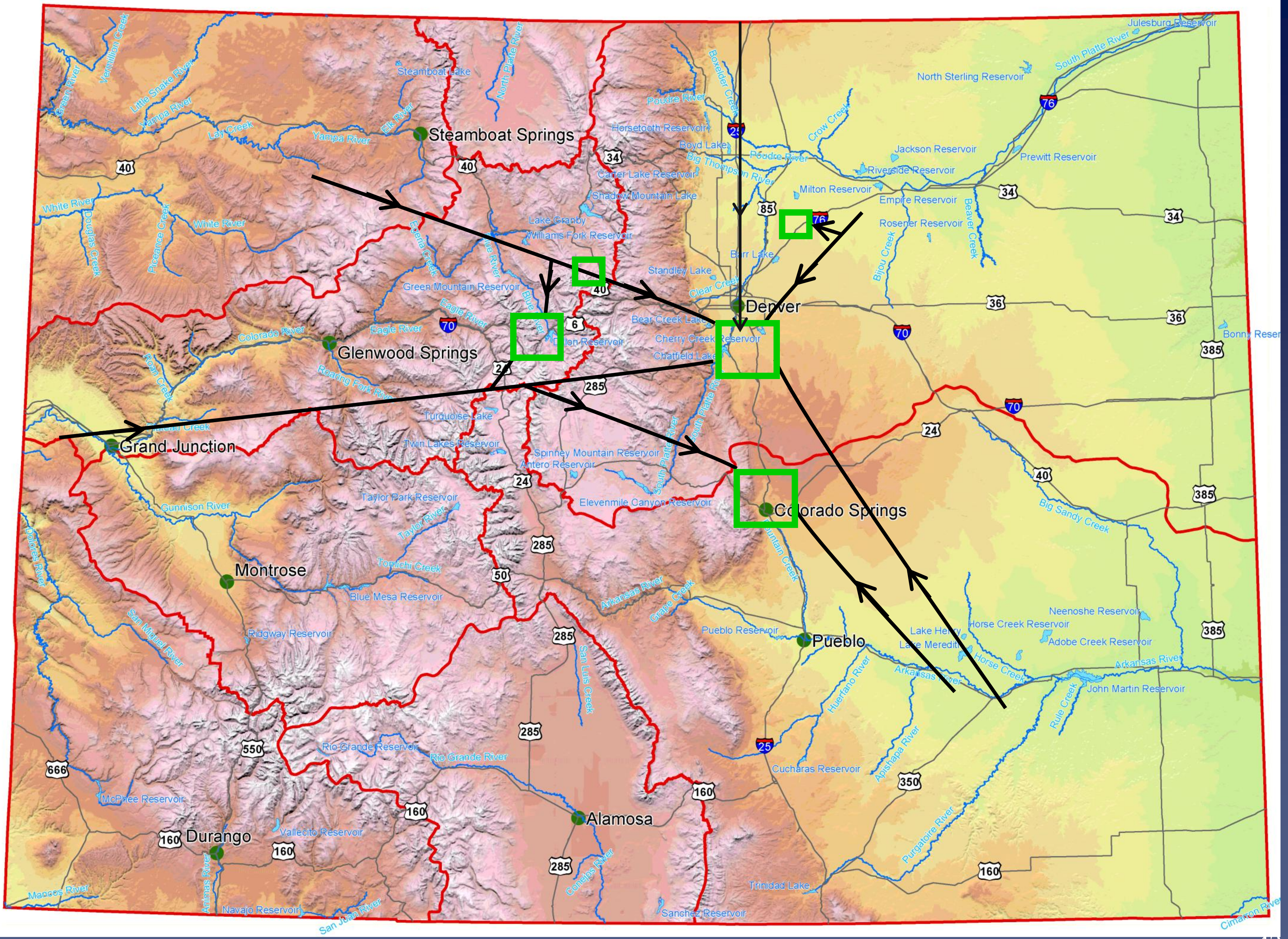

Rio Grande Basin 2050 M&I Water Demand Forecast
Potential Conservation Savings Compared to Current GPCD
Acre-Feet/Year
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
29,300
30,800
23,400
5,900
20,500
8,800
17,600
11,700
No Savings on 2000 gpcd
Current gpcd
20% Savings on 2000 gpcd
30% Savings on 2000 gpcd
40% Savings on 2000 gpcd
Rio Grande Basin Water Demand with Conservation Savings
Rio Grande Basin Water Demand Conservation Savings Needed

Ag Transfer Strategy

- Lower South Platte Transfer
- Lower Arkansas Transfer

Development of New Water Supplies

- Green Mountain Concept <100,000 acre-ft
- Yampa Concept >100,000-250,000 acre-ft
- Flaming Gorge Concept >100,000-250,000 acre-ft
- Big Straw Concept


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

Risk Management Strategies

- West Slope Water Bank
- Compact Delivery via Blue Mesa
- Conjunctive Use of Denver Basin Aquifer
- Timing/Phased Development
- Incremental Development
- System Wide Augmentation

Engineering Evaluation Elements
(Examined by March CWCB/IBCC meeting)

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

Purpose

Ability to compare tradeoffs between strategies

Strategy Evaluation
(Examined after March CWCB/IBCC meeting)

Identification of:

- Project benefits
- Implementation issues
- Potential attributes/additional options
- Acceptability

Other evaluation elements:

- 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

Proposed Technical Work – 2009

MEETING 1

- Present status of needs assessment (SWSI I, “Other appropriate sources,” task orders, WSRA studies)
- Present demands to 2050
- Discuss projects and methods for meeting in-basin needs (SWSI IPPs, SWSI base options, other projects identified since SWSI)
- Review nonconsumptive basin maps final product (attributes and priorities)
- Present approach to evaluating water supply strategies

Proposed Technical Work – 2009

MEETING 2

- Refine demands to 2050
- Screen projects and methods for meeting identified needs
- Discuss next steps on nonconsumptive priority areas (quantification and/or implementation strategies)
- Discuss progress on evaluation of water supply strategies

Proposed Technical Work – 2009

MEETING 3

- Discuss progress on nonconsumptive quantification and implementation strategies
- Discuss progress on projects and methods for meeting identified needs and evaluation of water supply strategies
- Discuss integrating needs assessments with Colorado River supply availability preliminary results

Proposed Technical Work – 2009

MEETING 4

- Present draft results of nonconsumptive quantification and implementation strategies
- Present draft results of projects and methods for meeting identified needs
- Present draft results of evaluation of water supply strategies