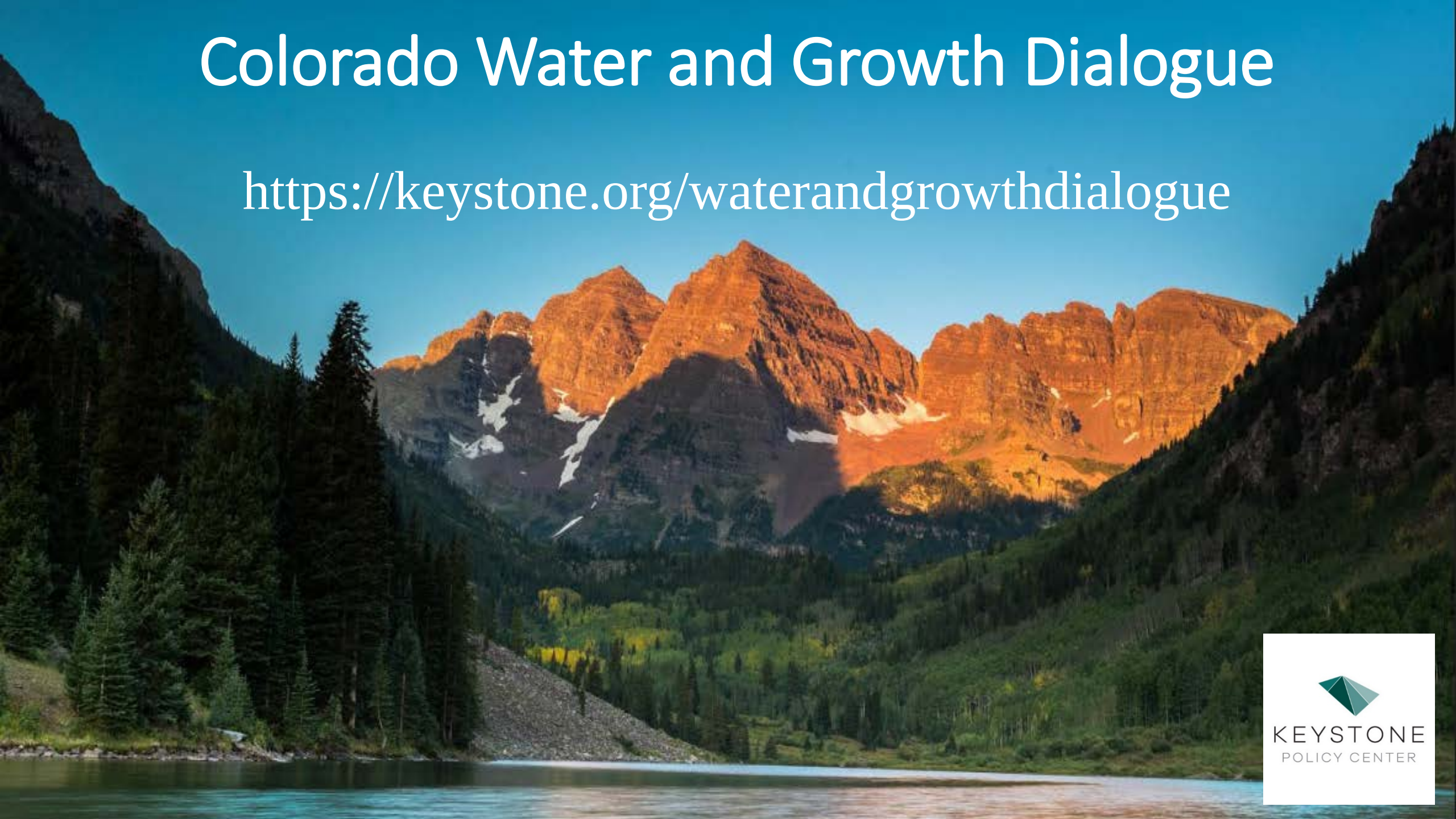
# Colorado Water and Growth Dialogue

https://keystone.org/waterandgrowthdialogue



KEYSTONE
POLICY CENTER

# Outline

- Collaborators
- Goals of the project
- Clarion Report
- Residential Density Impacts on Water Demand
- Residential Land Use and Water Demand Tool
- Strategic levers

# Collaborators

**Funders**

Colorado Water Conservation Board

Denver Water

Gates Family Foundation

Lincoln Institute of Land Policy

National Science Foundation

Walton Family Foundation

**Steering Committee**

Greg Fisher – Denver Water

Tom Gougeon – Gates Family Foundation

Peter Pollock – Lincoln Institute of Land Policy

Ray Quay – Arizona State University, Decision Center for a Desert City

Flo Raitano – Denver Regional Council of Governments

Kevin Reidy – Colorado Water Conservation Board

Marc Waage – Denver Water

Lyle Whitney – City of Aurora

Matthew Mulica (facilitator) – Keystone Policy Center

**Technical support:**

Don Elliott – Clarion Associates

Mitch Horrie - Denver Water

Daniel Jerrett - DRCOG

Ralph Marra - SW Water Resources Consulting

Justin Martinez - DRCOG

David Sampson - DCDC ASU

Jeremy Stapleton - Sonoran Institute

Summer Waters - Sonoran Institute

**Working Group:**

Clark Anderson - Community Builders

Drew Beckwith - Western Resources Advocates

Susan Daggett - Rocky Mountain Land Use Institute

Tom Cech - One World One Water Center

Mizraim Cordero - Denver Metro Chamber of Commerce

Barry Gore - Adams County Economic Development

**Working Group (con't):**

Steve Gordon - City of Denver

Peter Grosshuesch - Town of Breckenridge

Karen Hancock - City of Aurora

Julio Iturreria - Arapahoe County

Peter Kenney - Civic Results/Metro Mayors' Caucus

Mara MacKillop - Colorado Water Conservation Board

Becky Mitchell - Colorado Water Conservation Board

Gene Myers - New Town Builders

Chuck Perry - Perry Rose, LLC

Greg Peterson - Colorado Ag Water Alliance

Ben Rubertis - Genus Architecture

Jeff Tejral - Denver Water

Chris Treese - Colorado River District

Heidi Williams - City of Thornton

Susan Wood - Denver Regional Transportation District/CO APA

# *A Growing Opportunity*

- By 2050, Colorado's population is projected to double, greatly increasing the demand for water.
- Colorado is already a  water short state.
- By 2050, most people will live in buildings that are yet to be built.
- To date, there has been little integration of land and water planning

# The Colorado Water and Growth Dialogue

*"If we grow the next 5 million people like we grew the first, there won't be enough water"*

*"Before we spend the political capital required to reduce landscaping and increase density, we need to know whether these things will move the needle"*

## Goals:

- Demonstrate how much water can be saved through the integration of water and land use planning;
- Develop a consensus-based set of recommended strategies;
- Provide local communities with data, information and a tool box of strategies so that they may make better informed decisions

# Clarion Report

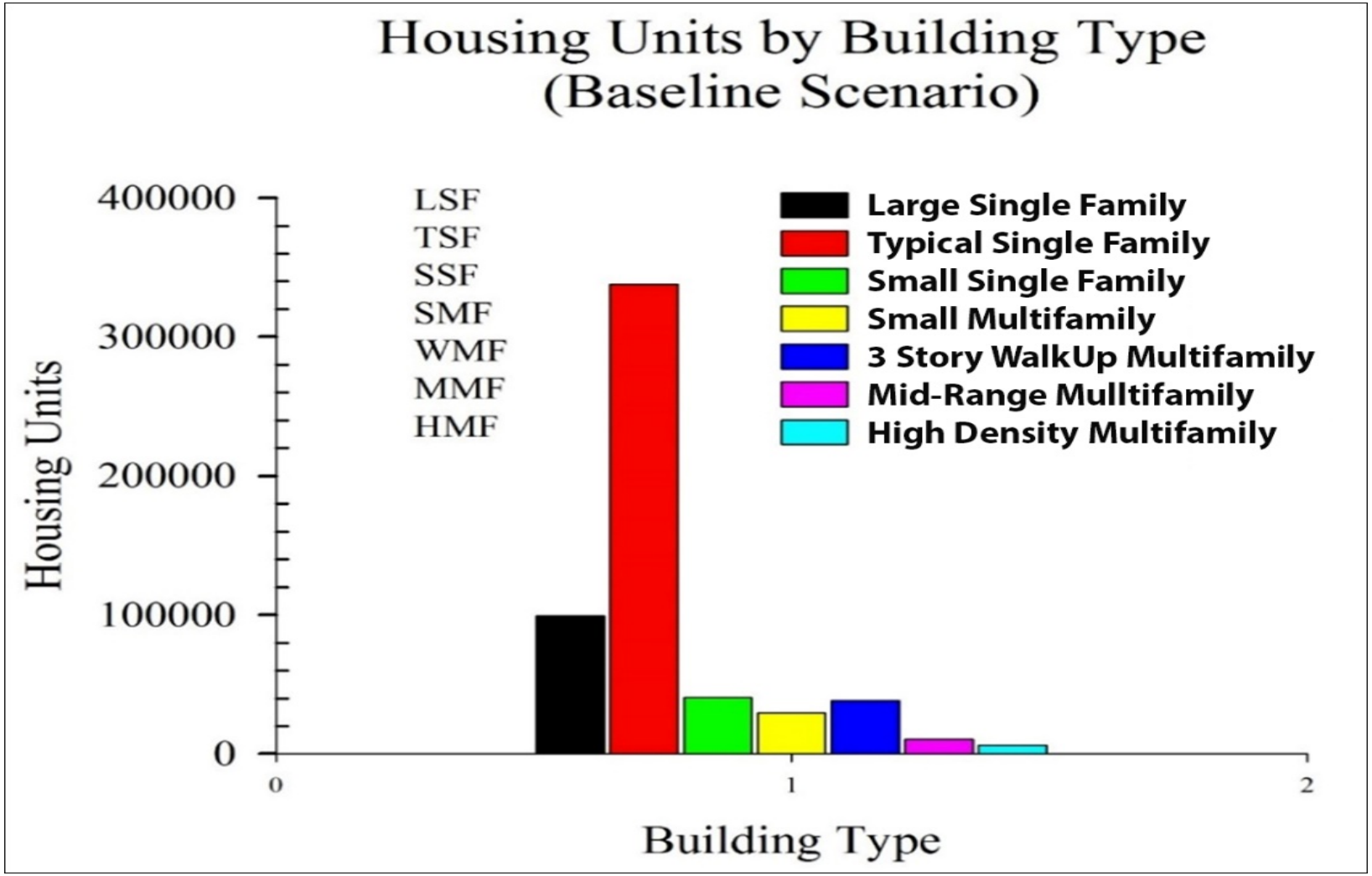
- Clarion Associates developed a report that identified existing studies linking land use planning and water demand reduction, and suggested land use forms that might further that goal.

- The following 4 recommended land use pattern changes helped the dialogue focus on what to examine:
  - Land use patterns that are recommended for further examination
    - Build smaller single-family parcels
    - Changing from single-family to multifamily
    - Build denser multifamily
    - Enact landscape restrictions

# Density

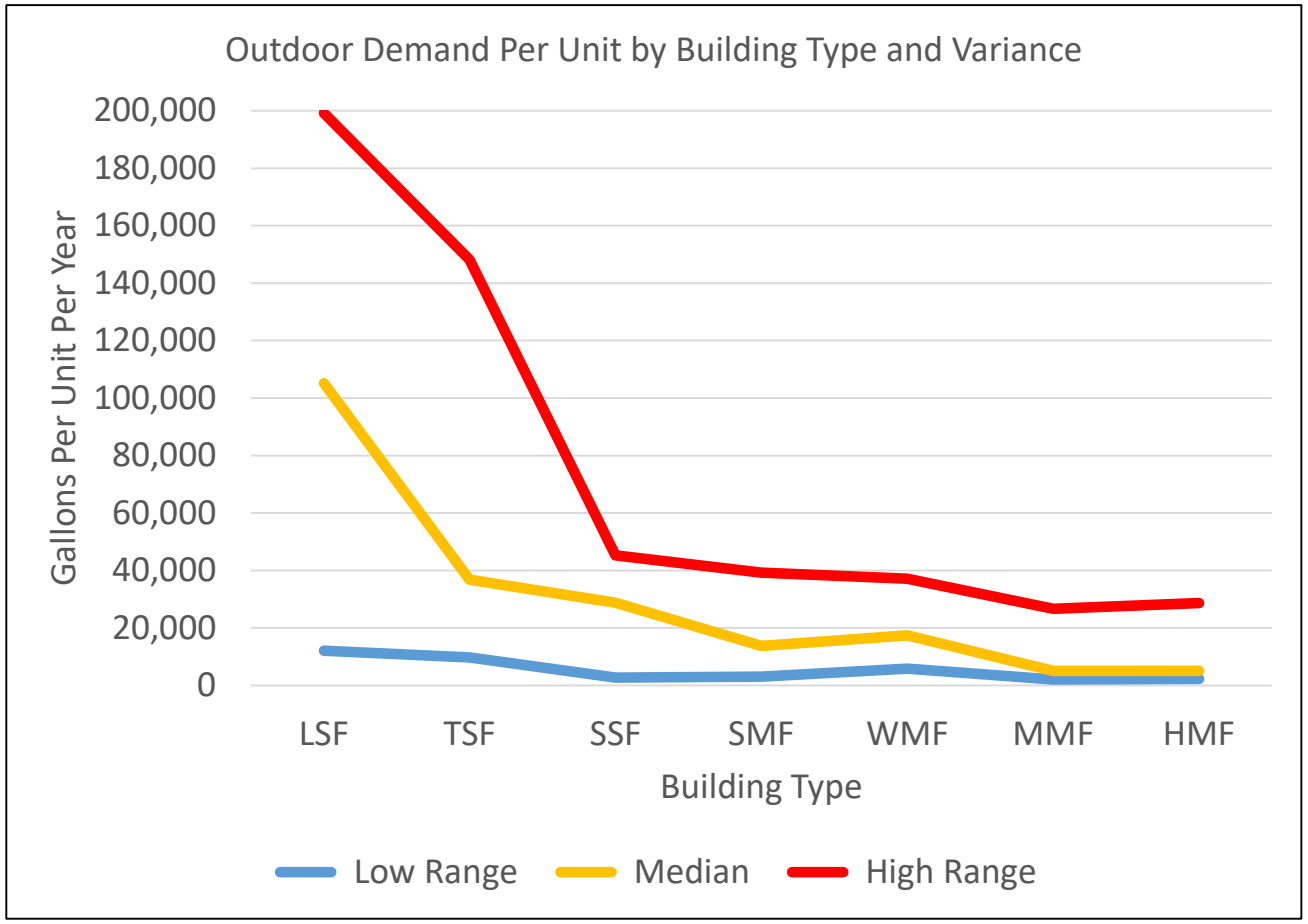
| 2010 Census | People per Square Mile |
|---|---|
| New York | 27,000 |
| | 26,000 |
| | 25,000 |
| | 24,000 |
| | 23,000 |
| | 22,000 |
| | 21,000 |
| | 20,000 |
| | 19,000 |
| | 18,000 |
| San Francisco | 17,000 |
| | 16,000 |
| | 15,000 |
| | 14,000 |
| | 13,000 |
| Chicago | 12,000 |
| | 11,000 |
| | 10,000 |
| | 9,000 |
| Baltimore | 8,000 |
| | 7,000 |
| **Denver Water Service Area 2050** | 6,000 |
| St. Louis | 5,000 |
| **Denver Water Service Area 2010** | 4,000 |
| | 3,000 |
| | 2,000 |
| Nashville | 1,000 |

# Allocation of Building Types 2040



# Strategic Insights- Density Increases

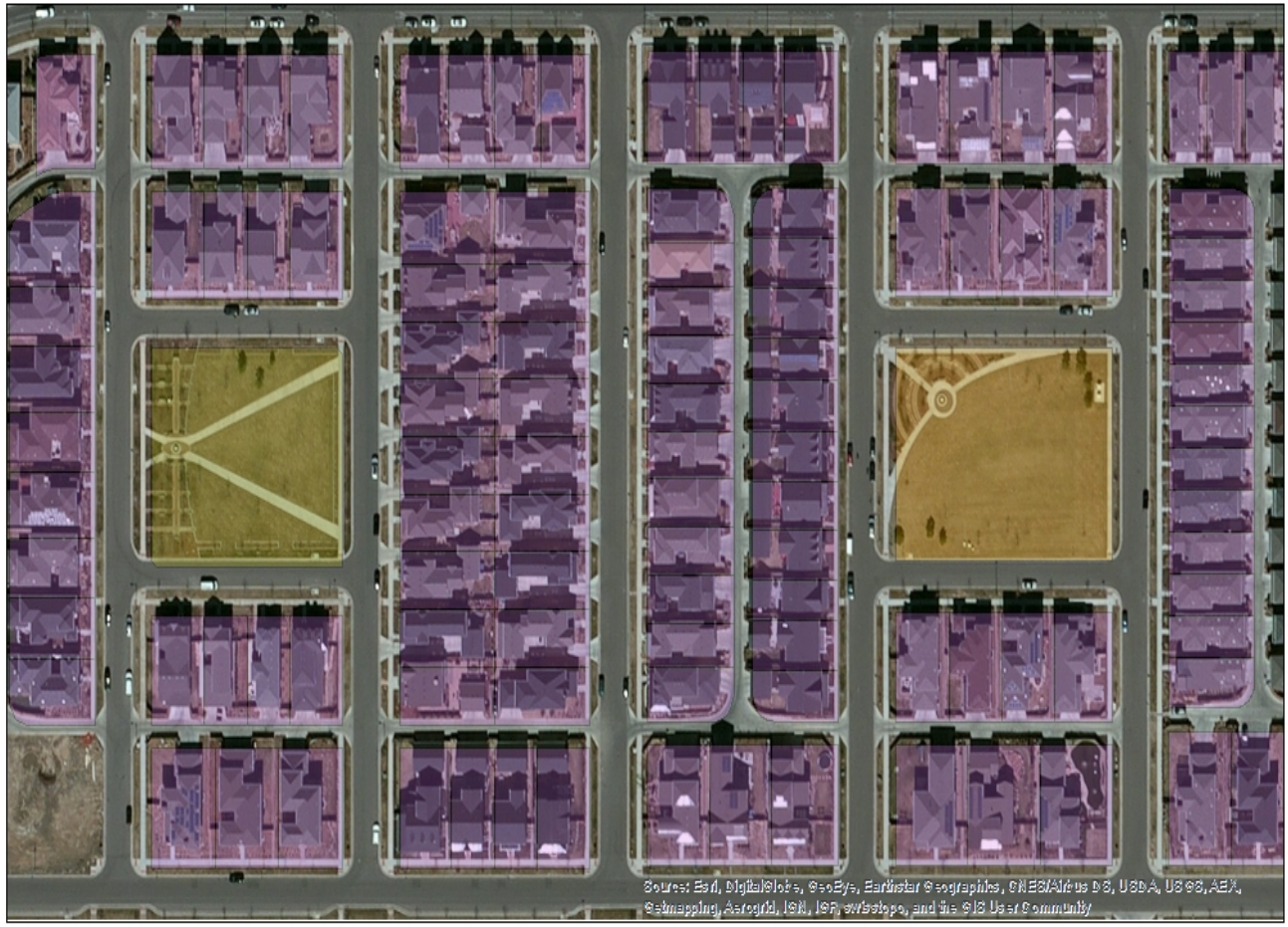
- Household movement from the Large Single Family and Traditional Single Family to any other building types provides the largest total water demand reductions of new housing and can result in 50% to 60% of the full potential from the more complex scenarios
- Scenarios that do not include LSF and TSF have little benefit.



# Strategic Insights – Density Increases

- Increasing density may decrease water demand of new growth in the range of 2% to 19%, with higher resource cost density increases associated with the higher (water) savings.
- Lower resource cost density increases may achieve 3% to 8% reduction for new housing.

## Smaller Single Family Lots




**Legend**

**D_CLASS_CN**

- SINGLE FAMILY
- VCNT LAND 0-1 ZONE
- VCNT LAND R-2, RS-2 ZONE

0 125 250 Feet

N

# Strategic Insights - Efficient landscaping

- Increasing the efficiency of irrigation may decrease water demand of new growth in the range of 5 to 25%, and be as effective, if not more, at reducing demand as increasing housing density.

- Combining low “resource cost” residential density increases with low “resource cost” reductions of irrigation may achieve reductions in total residential water demand of new growth by 5 to 15%.

- Education of homeowners is a critical step to achieving savings

**40% turf**

**20% turf**

**No turf**

# Residential Land Use and Water Demand Tool

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**Key**

| Changeable User Input | Calculated Output |
|---|---|

## Table 1. Population Distribution by Product Type

| Scenario Name | | | |
|---|---|---|---|
| Total Population | 100,000 | 100,000 | 100,000 |
| Large Single Family Population | 25,000 | 10,000 | 5,000 |
| Typical Single Family Population | 10,000 | 25,000 | 5,000 |
| Small Single Family Population | 25,000 | 10,000 | 25,000 |
| Townhome Population | 10,000 | 25,000 | 10,000 |
| 3-Story Walkup Population | 5,000 | 20,000 | 25,000 |
| Mid-Range Multifamily Population | 5,000 | 5,000 | 20,000 |
| High Density Multifamily Population | 20,000 | 5,000 | 10,000 |

## Table 2. User Assumptions

| Persons per Household | |
|---|---|
| Large Single Family | |
| Typical Single Family | |
| Small Single Family | |
| Townhome | |
| 3-Story Walkup | |
| Mid-Range Multifamily | |
| High Density Multifamily | |

| Indoor GPCD | |
|---|---|
| Large Single Family | |
| Typical Single Family | |
| Small Single Family | |
| Townhome | |
| 3-Story Walkup | |
| Mid-Range Multifamily | |
| High Density Multifamily | |

| Average Units per Acre | |
|---|---|
| Large Single Family | |
| Typical Single Family | |
| Small Single Family | |
| Townhome | |
| 3-Story Walkup | |
| Mid-Range Multifamily | |
| High Density Multifamily | |

| Seasonal GPSF (pervious) | |
|---|---|
| Large Single Family | |
| Typical Single Family | |
| Small Single Family | |
| Townhome | |
| 3-Story Walkup | |
| Mid-Range Multifamily | |
| High Density Multifamily | |

## Table 3. User Guides

| Units per Acre Guide |
|---|
| **Product Type Observations** |
| Large Single Family |
| Typical Single Family |
| Small Single Family |
| Townhome |
| 3-Story Walkup |
| Mid-Range Multifamily |
| High Density Multifamily |

| Seasonal Gallons per Square Foot Guide | |
|---|---|
| **Seasonal GPSF (Pervious)** | Ty |
| Inefficient for Bluegrass | |
| Efficient for Bluegrass | |
| Highly Efficient for Bluegrass/Some Xeriscape | |
| Xeriscape | |
| Little or No Seasonal Use | |

| Seasonal GPSF (Pervious) Observations |
|---|
| Large Single Family |
| Typical Single Family |
| Small Single Family |
| Townhome |
| 3-Story Walkup |
| Mid-Range Multifamily |

## Table 4. Model Output

| Estimated Acres of Development | #DIV/0! | #DIV/0! | #DIV/0! |
|---|---|---|---|
| Pervious Area Required (acres) | 0 | 0 | 0 |
| Annual Indoor Demand, AF | 0 | 0 | 0 |
| Annual Seasonal Demand, AF | 0 | 0 | 0 |
| Total Annual Demand, AF | 0 | 0 | 0 |
| Overall GPCD | 0 | 0 | 0 |
| AF per Acre per Year | #DIV/0! | #DIV/0! | #DIV/0! |

Population & Product Type Model | Guide to Product Types

Search the web and Windows

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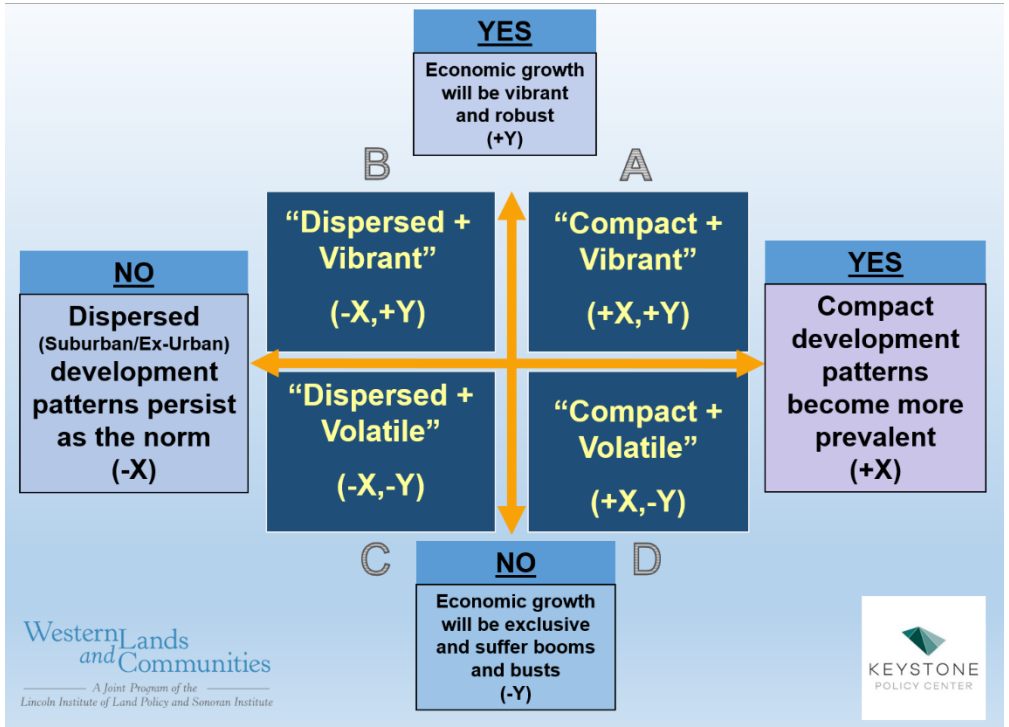
# Recommended Strategic Levers

**How can changes in urban form and landscaping practices for new growth and redevelopment assist in meeting future urban water demand along the Colorado Front Range?**

**Strategies were tested** to see how well they performed in a variety of plausible futures that varied in terms of **future housing preferences**, the **strength of the economy**, and **innovations in transportation technology** such as autonomous vehicles, which may either reinforce sprawling land use patterns or help in concentrating residential development along transit corridors.

**The strategies that worked well across the range of futures were selected for further consideration.**



# Recommended Strategic Levers

- Encourage the consideration of higher residential densities as a means to reduce water demand
- Adopt landscaping policies to lower future water demand from population growth
- Incorporate a One Water approach into planning
- Incorporate aspects of water planning into long range planning

# Recommended Strategic Levers

- Share success stories and case studies
- Develop, track, and refine new metrics that link water use to land use
- Encourage water smart development through a suite of new local development standards and incentives
- Develop water smart design guidelines and standards for government-owned buildings, public spaces and rights-of-way

All reports, tools, and resources are available free of charge at:

https://keystone.org/waterandgrowthdialogue

Thanks!

Matthew Mulica
Keystone Policy Center
mmulica@keystone.org