

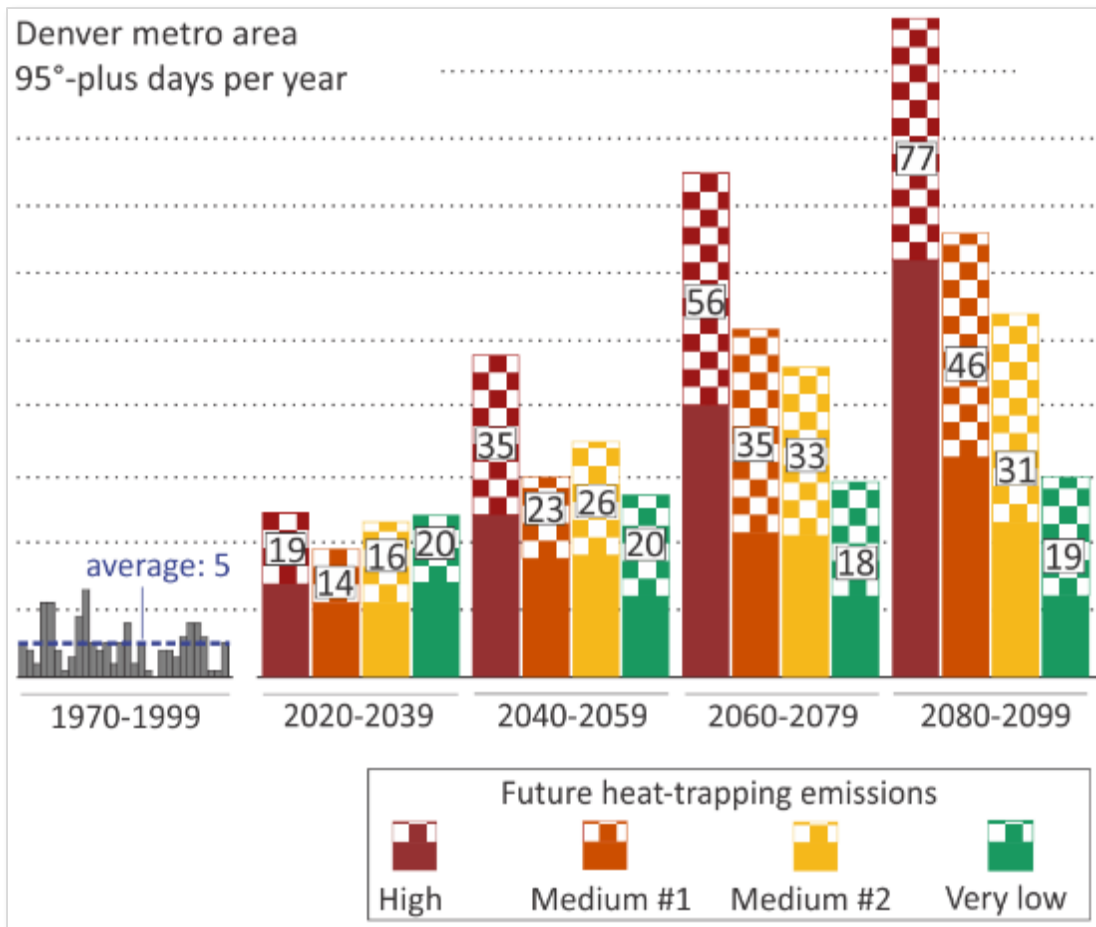
Water, Green Infrastructure & Climate Change

Blueprint Denver Task Force

August 24, 2017

Climate Change Impacts

Temperature will increase



Fewer extreme cold months, more extreme warm months

Urban heat island: 3rd worst

Vegetation stress

Increased wildfire risk & threat to watersheds

Lower stream flows

| Climate Change Impacts

Precipitation *variability* will increase

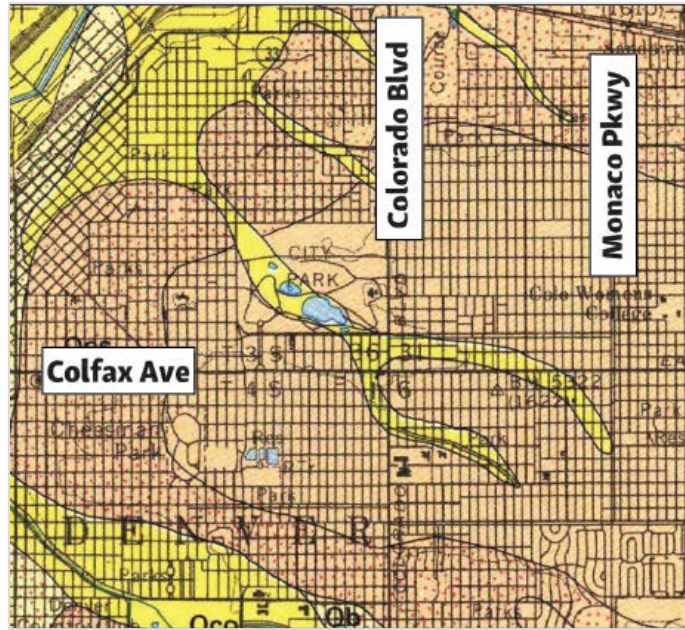


Wetter-than-normal years



Drought years expected to increase in severity and frequency

Climate Change in the Urban Environment

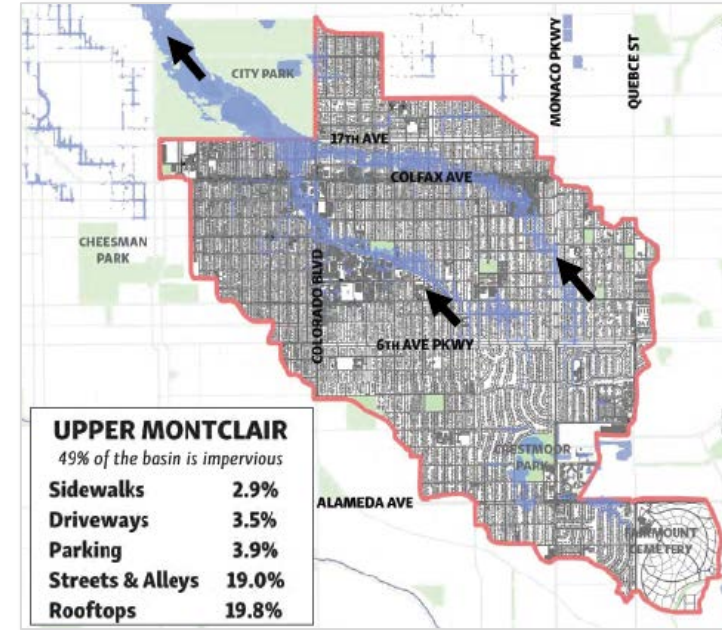


Building over natural waterways

Deteriorating Infrastructure

Increasing impervious

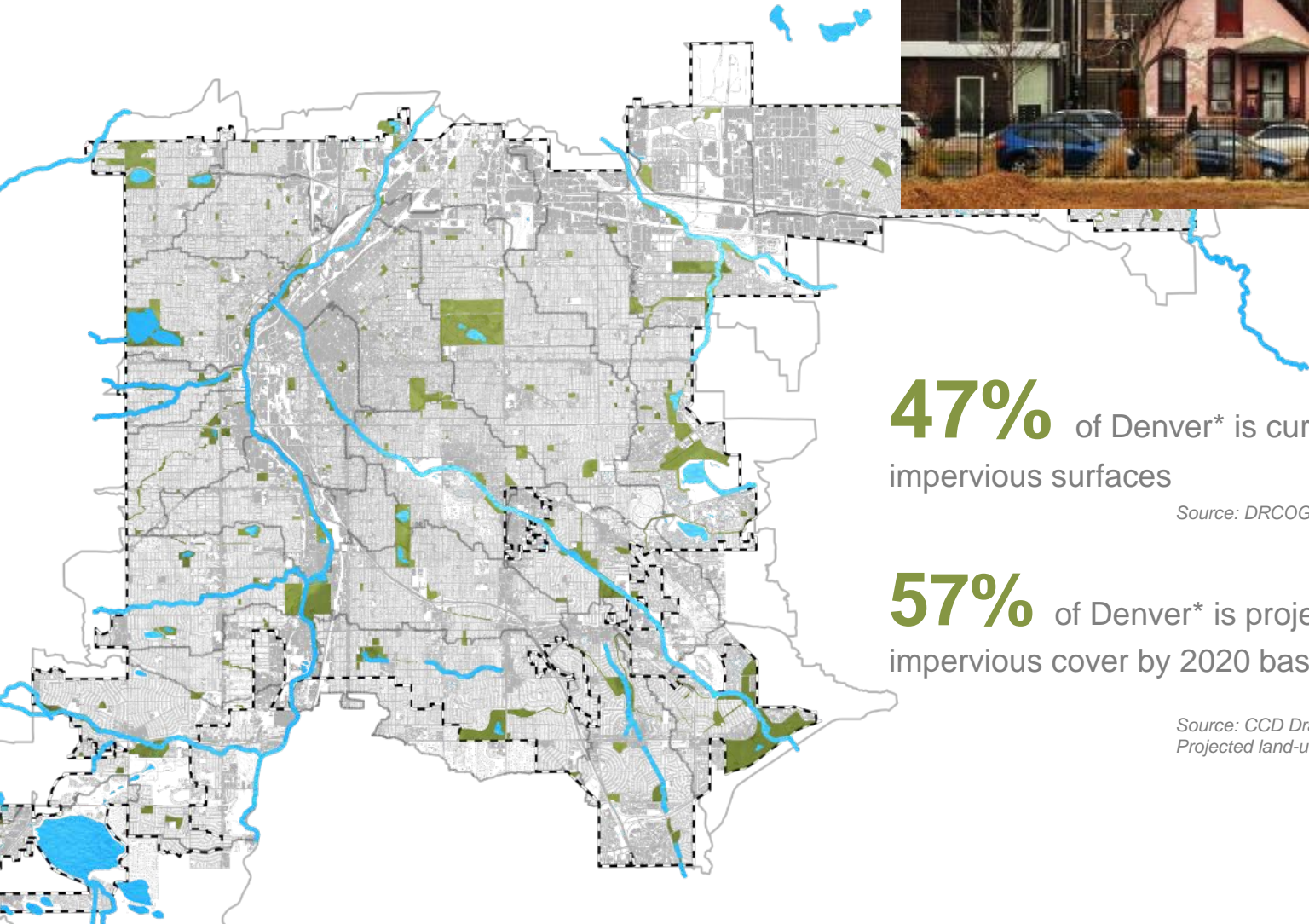
Precipitation Variability



Growing Water Quality & Quantity Challenges



More Density =
More Impervious Area



47% of Denver* is currently covered in
impervious surfaces

Source: DRCOG LiDAR Data

57% of Denver* is projected to have
impervious cover by 2020 based on future land use

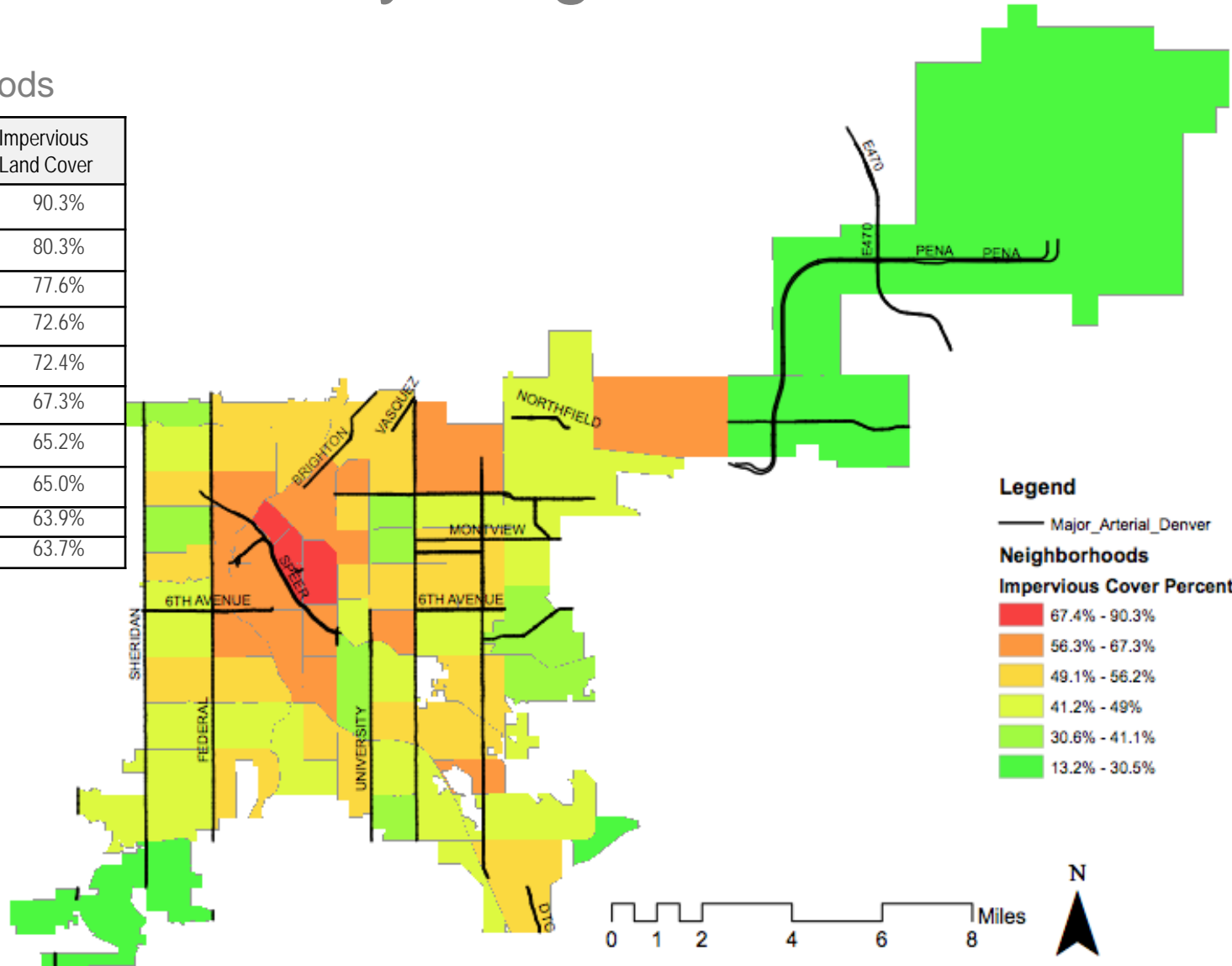
*Source: CCD Drainage Master Plan, 2014
Projected land-use change on Blueprint Denver, 2002*

CU Boulder Study (draft)

Impervious Cover by Neighborhood, 2016

Top 10 Neighborhoods

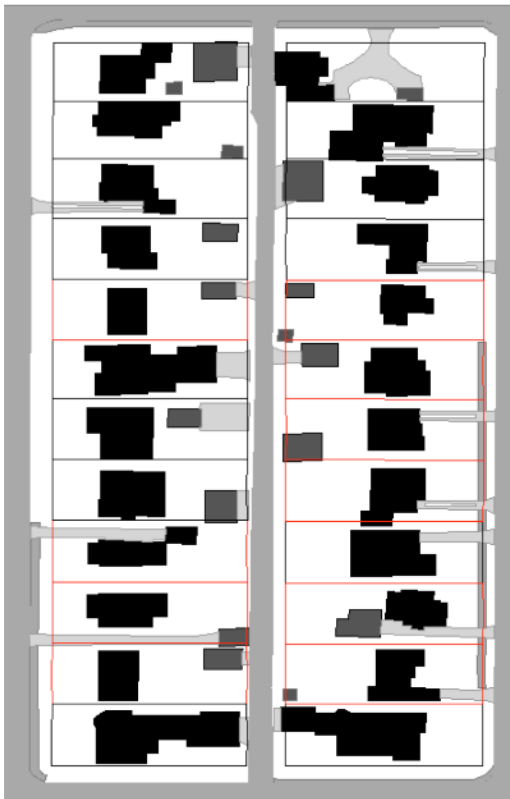
Rank	Neighborhood	Impervious Land Cover
1	CBD	90.3%
2	North Capitol Hill	80.3%
3	Civic Center	77.6%
4	Union Station	72.6%
5	Capitol Hill	72.4%
6	Cherry Creek	67.3%
7	Five Points	65.2%
8	City Park West	65.0%
9	Sun Valley	63.9%
10	Auraria	63.7%



Cory-Merrill Neighborhood (*draft*)

Development Pattern, 2004-2016

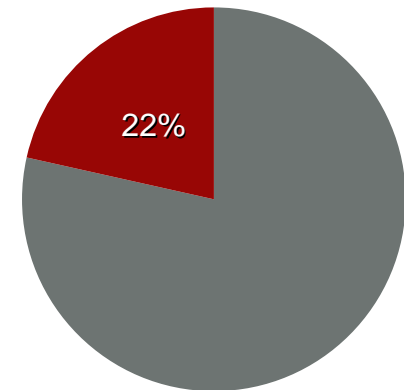
2004



2016



Total Increase in Impervious Surface



Element	2004	2016	Change
# of Structures	42	36	-6
# of Garages/Sheds(Detached)	18	12	-6
Area of Structures(SqFt.)	42561	54500	11939
# of Driveways/Parking	22	27	5
Area of Driveways/Parking(SqFt.)	8846	7942	-904
Total Area(SqFt.)	51407	62442	11035

Development patterns project how change occurs in future

Why Green Infrastructure

Natural or built systems that use vegetation and soils to manage stormwater runoff

More resilient approach than relying on gray alone

benefits

scales



Benefits of Green Infrastructure



- Improve water quality
- Reduce flood risks
- Reduce Urban Heat Island effect
- Improve air quality
- Absorb local carbon emissions
- Improve public health outcomes
 - Increase physical activity
 - Improve mental wellbeing
 - Reduce stress
 - Lower traffic speeds and reduce injury crashes
- Improve property values

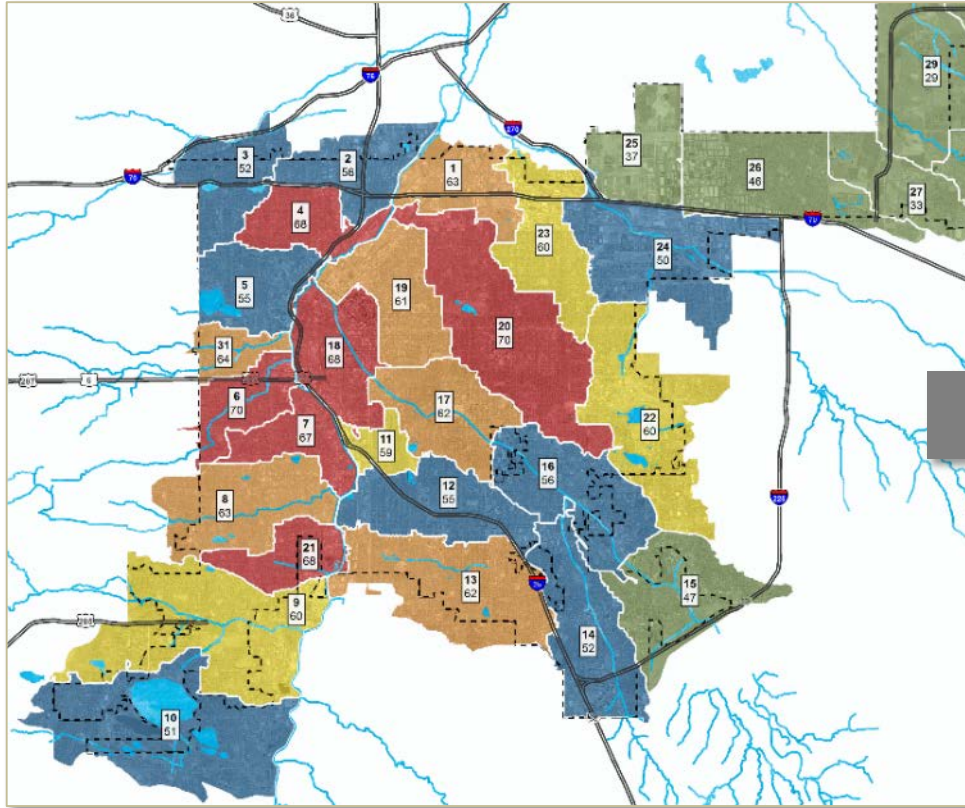
Sub/Regional Scale Projects



Site-Scale Projects



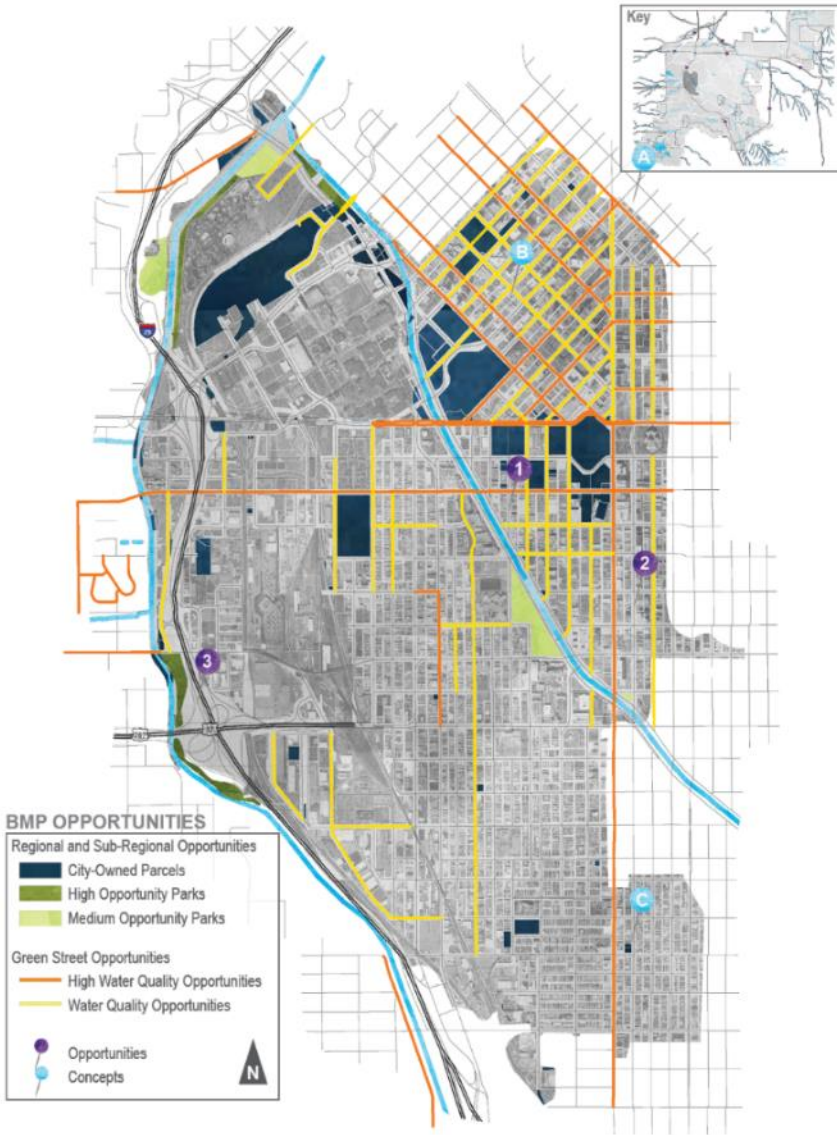
Green Infrastructure Planning



Data driven analysis



Implementation strategy that meets multiple city goals

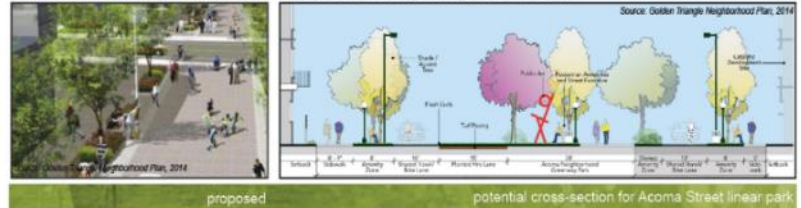


[central platte valley opportunities]

- 1 Speer Boulevard
Proposed: Rain Gardens in Median



- 2 Acoma Street
Proposed: Urban Neighborhood Greenway (Golden Triangle Neighborhood Plan)



- 3 Frog Hollow
Proposed: Extended Detention Basin



green streets

9.74 miles | high priority green street opportunities
16.98 miles | green street opportunities

The process to identify site-scale opportunities (Section 4.4) resulted in a network of green street opportunities in each basin. Streets projects were considered high priority if potential partner opportunities exist and/or the project would offer significant water quality benefits. While streets represent one of the largest sources of urban stormwater pollution, they also represent one of the best opportunities for the installation of green infrastructure. Practices suitable for use within the right-of-way are illustrated in Denver's Ultra-Urban Green Infrastructure Guidelines: <https://www.denvergov.org/content/denvergov/en/wastewater-management/stormwater-quality/ultra-urban-green-infrastructure.html>.

park opportunities

High Potential Park Opportunities:

- Frog Hollow Park
- Platte River Park
- Speer Boulevard Park
- Milstein Park

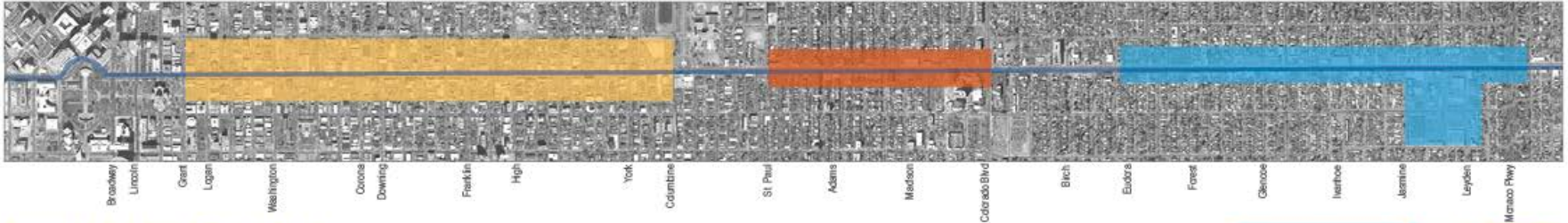
Medium Potential Park Opportunities:

- Centennial Park
- Gates Crescent Park
- Sunken Gardens Park

New water quality facilities in parks will be considered if they do not impact or limit park use or function. All park related projects will require further study, approval by the Department of Parks and Recreation (DPR), and a public involvement process. The designer must work with Denver Parks Planning during all phases to ensure compliance with DPR standards and specifications.

D [Enhancing Colfax Multi-Modal Connections]

Collaboration Opportunity]



Proposed Bus Rapid Transit Along East Colfax

After an extensive study of Colfax Corridor Connections and mobility alternatives, the City and County of Denver, the City of Aurora, and the Regional Transportation District (RTD) are working together to pursue federal funding for a proposed Bus Rapid Transit (BRT) line that would extend the length of the East Colfax Corridor. Initial targets for anticipated construction would be 2019-2020. In addition to addressing the growing need for improved transportation along the Colfax Corridor, the project will add numerous street level amenities, resulting in a much more inviting and safer corridor for pedestrians and bicyclists. The study anticipates that the implementation of a BRT line will significantly increase property values along the corridor as a result of the investment the project is expected to attract.

The proposed BRT improvements span two of the city's high priority basins for water quality (City Park/Park Hill and Central Platte Valley) and three medium priority basins (Five Points/Capital Hill, NE Park Hill, and Westerly Creek). A green streets analysis identified Colfax and many intersecting streets as high priority streets for water quality improvements. This, combined with the momentum of the project and its partners, and the engagement of the Colfax corridor (particularly the Business Improvement Districts or BIDs) present a unique opportunity for the city to implement green infrastructure along the corridor. Bumpouts that are already planned to increase pedestrian safety at crossings can be designed to be stormwater

planters that improve water quality and add green space. Trees will be important tools for shading BRT riders and if designed as tree trenches or pits, can also help better manage stormwater on-site while cooling the overall environment of the street.



Many proposed stops include bumpouts and landscaping to enhance pedestrian safety.
Source: Colfax Corridor Connections, 2015

Green Infrastructure and Transit

Incorporating green infrastructure in transit street design is an important way to ensure water quality treatment is located in one of the places it is needed most: the public right-of-way. Treating street runoff is critical to improving the health of Denver's urban waterways. Not only are streets a major source of stormwater runoff, they also represent the largest source of urban pollutants including sediment, heavy metals, automotive fluids, nutrients, and trash. As part of the stormwater conveyance system, roads collect and carry runoff directly to the underground storm drain network which then pipes these pollutants directly to receiving waterways.

In addition to playing an important role in improving Denver's water quality, green infrastructure complements transit goals by calming traffic, enhancing rider comfort

while waiting for transit, and by creating opportunities for safer pedestrian crossing when used in bus bulbs and curb extensions. Green infrastructure also enhances the pedestrian environment by improving aesthetics, helping cool local temperatures, improving air quality, and providing a buffer between vehicles and pedestrians and cyclists. Green infrastructure investments, particularly in commercial corridors, also help create a sense of place and can increase property values.



Green infrastructure can create a safer and more pleasant environment for bus riders and pedestrians.

Business Improvement Districts and Streetscape Design

As the City and RTD make significant investments along the Colfax corridor, several Business Improvement Districts (BIDs) are also looking to enhance the corridor by establishing their own Streetscape Design Standards. The timing of these many activities present an opportunity to work with the community to incorporate green infrastructure practices in proposed design standards and guidelines along the highly visible corridor that is also in one of the city's high priority water quality basins.



The above design plan comes from the Colfax-Mayfair BID's East Colfax Streetscape Design project that is underway. Like all three plans that are underway, green space, enhanced pedestrian safety, and creating a unique sense of space are all key design elements that green infrastructure can help achieve.

Colfax BIDs

Upper Colfax BID (est. 1989)

- Grant St. - Columbine St.
- 14th Ave. - 16th Ave.
- Streetscape design effort taking place in 2016



Bluebird BID (est. 2014)

- St Paul St. - Colorado Blvd.

Colfax-Mayfair BID (est. 2014)

- Eudora St. - Monaco + Mayfair Town Center (14th and Krameria)
- Streetscape design effort taking place in 2016



Blueprint Task Force Discussion

In Summary:

Already have challenges due to historical development patterns

Current development patterns are adding to challenges;

in particular the increase in impervious surfaces

Green Infrastructure addresses and solves many environmental, economic, and social challenges

Discussion

- How can Blueprint direct growth patterns with impervious cover and other climate change challenges in mind?
- Can green infrastructure be prioritized in all contexts and typologies?
- Are there high level policy recommendations that can be incorporated into BP that establish impervious limits?
- What planning tools can be used to:
 - Limit the increase of impervious areas while promoting density?
 - Encourage implementation of more green infrastructure?
 - Establish qualitative standards for green infrastructure?