

Greening Denver

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Understanding Climate Change



Source: NASA Global Climate Change https://climate.nasa.gov/vital-signs/global-temperature/



Source: National Climate Assessment (http://nca2014.globalchange.gov/)





Generated 4/1/2015 at HPRCC using provisional data.

Regional Climate Centers

Source: High Plains Regional Climate Center (https://hprcc.unl.edu/)

Climate Change in Colorado

Temperature will increase

Fewer extreme cold months, more extreme warm months

Vegetation stress

Increased wildfire risk & threat to watersheds

Lower stream flows



Sources:

Rocky Mountain Climate Organization, (http://www.rockymountainclimate.org/extremes/denver.htm)

Denver Climate Adaptation Plan (https://www.denvergov.org/content/denvergov/en/environmental-health/environmental-quality/climate.html)

Temperature in the Urban Environment

Urban Heat Island Effect: Denver is 3rd worst in Country

Climate Gap & Equity: Low income and people of color more significantly impacted by climate change

- More heat-absorbing environments (more dark roads and buildings, fewer trees and vegetation) = higher UHI effect
- Lack access to coping mechanisms: AC and transportation

Sources: Climate Central (http://www.climatecentral.org/news/urban-heat-islands-threaten-us-health-17919) The Climate Gap (http://college.usc.edu/ geography/ESPE/perepub.html)

Climate Change in Colorado

Precipitation will be more variable

Variability will increase = increase in uncertainty

- Wetter-than-normal years AND
- Drought years (Expected to increase in frequency and severity)

More precipitation falling as rain instead of snow

Earlier peak runoff

Source:

Planning for Variability & Uncertainty: Climate Change and the UDFCD Urban Drainage System (Wright Water Engineers, 2015) Denver Climate Adaptation Plan

Precipitation in the Urban Environment

Building over natural waterways Deteriorating Infrastructure Increasing impervious Precipitation Variability

Growing Water Quality & Quantity Challenges

Climate Gap & Equity

Current Development

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%

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

32% overall increase of impervious cover by 2040

Source: CU Boulder Impervious Forecasting Model

Adaptation & Resiliency

Grey Infrastructure

Community

Engagement

Strategic Planning

Green Infrastructure

Green Infrastructure

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

More resilient approach than relying on grey alone

Many benefits

Many 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

Site-Scale Green Infrastructure

Brighton Boulevard

Carla Madison Recreation Center

Large-Scale Green Infrastructure

Community Amenities

Stormwater Assets

Green Infrastructure Planning

Objectives

- 1. Data Driven: Prioritize basins with greatest WQ needs based on data
- 2. Strategic Prioritization: Identify large & site-scale GI projects by using "Scorecard" criteria
- 3. Proactive: Address wet and dry weather discharges
- 4. Meet Multiple City Goals: Work with other city agencies to maximize collaboration opportunities & 'OPM'

Primary Category	
Existing TMDL	Is drainage basin directly to the SPR & existing TMDL (126 cfu/ml)
303(d) listed waterbody	Does drainage basin contain a water body listed on the 303(d) list (impaired waterway)
Wet weather pollutant loading Dry weather pollutant loading	Average annual pollutant load per land use for wet weather Average annual dry weather pollutant load per area
Disconnected Impervious Area	Density of storm drain network (higher indicates greater need for WQ)
Redevelopment Potential	Per Blueprint (new development over 1 acre requires WQ)
Impervious Area within the ROW	Amount of ROW divided by total basin area (streets largest contributor of pollutants)
Existing Treatment	Amount of treatment expected by existing WQ facilities

Secondary Category	
Park Density	Ratio of park per 10,000 persons
Economics	% of persons in low to moderate income level (HUD defined)
Green-ness	Ratio of total tree canopy coverage divided by basin area
Heat Island Effect	Measure of heat energy absorbed by urban materials
Transportation Pollutant Index	Total vehicle miles traveled

Green Infrastructure Planning

[central platte valley opportunities]

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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.

park opportunities

High Potential Park Opportunities:

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

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- Medium Potential Park Opportunities: • Centennial Park • Sunken Gardens Park
- Gates Crescent 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.

Other City Planning Efforts

Denveright Plans

Neighborhood Planning Initiative

DPR Outdoor Downtown Plan

Pilot Projects

- Asbury & Tejon
- 38th & Holly
- High Line Canal

SITE SCALE

- 21st & Broadway (100%)
 - Federal Blvd
 - Lowell and Evans

Prioritized from Scorecard and Metrics Machine Inform future policies, project budges, etc. Key for continued program improvement

Project Partners

Hampden Heights

Carla Madison Recreation Center

Lowell & Evans

Next Steps: Outreach and Education

Brighton Boulevard Carla Madison Recreation Center Outreach materials:

- Webpage
- Handouts

Develop residential program

• External partnerships

Next Steps: BMP Monitoring

- Understand treatment and other benefits
- Program and design improvement

Questions?

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