


# Green Infrastructure Guide to Downtown Colorado



## Executive Summary



**COLORADO**  
Department of Transportation

# Introduction

Green spaces offer various benefits to communities, and their inclusion can be achieved by implementing green infrastructure. While resources on green infrastructure typically focus on large urban environments, this summary aims to fill the information gap for smaller communities in Colorado. The original guide was created as a capstone project by a team of graduate students from the University of Colorado Boulder’s Masters of the Environment Program, in collaboration with the Colorado Department of Public Health and Environment (CDPHE). This executive summary was created for brevity and clarity by the Colorado Department of Transportation (CDOT). The information provided in this summary is based on research, interviews, and visits to green infrastructure installations across Colorado.

Green infrastructure has numerous advantages over other forms of infrastructure, as it replicates natural processes while having an engineered use. It aids in restoring the natural water balance, accommodates population growth, and provides amenities while addressing environmental concerns. Incorporating green infrastructure can play a

vital role in promoting community engagement, safety, accessibility, public health, and environmental well-being. Additional benefits include improved water quality, enhanced aesthetics, reduced urban heat, and increased property values.

## Case Study: Ramp-Up Ridgway

The Ramp-Up Ridgway project, located in the town of Ridgway, CO near the San Luis mountains, is an example of successful implementation of Green Infrastructure within a CDOT-sponsored project. The town had success in beautifying their downtown streetscapes with a range of native plantings. These plantings worked well within the environment to collect runoff and prevent pollution. Some challenges were encountered as the town did not originally develop a maintenance plan for the infrastructure.



Streetscape scene of a Colorado state highway. Source: Colorado Downtown Streets



# Types of Green Infrastructure

## Bioswales

Bioswales are shallow, sloped, vegetated channels designed to slowly move stormwater to a storm drain, detention pond, or other erosion control measure. Due to their linear nature, bioswales are well suited for running parallel to streets and can serve as an alternative to traditional concrete curbs and gutters. This placement often works best in the transition zones between rural or residential areas and downtown centers. Bioswales are also frequently used to create functional and attractive parking lot medians.

## Street Trees

Street trees are planted within the streetscape, either in road medians or between the street and sidewalk. Street trees are a popular method of improving the character of the street as well as providing shade for pedestrian comfort. With thoughtful design, street trees can become high performance trees, which are street trees that live longer and assist with stormwater management. This can be done through the use of tree grates and permeable pavers around the tree, which allow for runoff from the sidewalk to infiltrate into a tree pit or trench. Curb cuts can also be designed to allow street runoff to enter the tree trenches and be filtered or absorbed.

## Rain Gardens

A rain garden has two key characteristics: It is a constructed low point that collects stormwater runoff and uses plants that can withstand occasional inundation. Rain gardens take in runoff from surrounding impervious surfaces like sidewalks, parking lots, and streets and funnel it to a low point where it collects and

slowly infiltrates. While bioswales are linear and sloped to move water to a destination, rain gardens are wide and meant to retain water so that it can infiltrate the soil.

## Permeable Pavements

Permeable pavement is a category of pavement that is built with enough void space to allow stormwater to filter through. Specifically, a subset known as Permeable Interlocking Concrete Pavers (PICP) have proven to be a popular and successful option for Colorado.

## Planter Boxes

Planters are a popular and versatile design element for adding vegetation to downtown streets. They can be placed in the furnishings or amenity zone, the area between the curb and the sidewalk to act as a physical and visual barrier for pedestrians, or to border storefronts to boost the street's visual appeal. They can be designed with open bottoms so that stormwater infiltrates slowly into the ground, or they can have a liner and an overflow pipe that discharges filtered water to the stormwater system. Designs vary and can be a great opportunity to showcase the downtown's character.



A downtown streetscape in Aspen uses street trees and permeable pavement, two forms of green infrastructure.



# Project Implementation

Implementing green infrastructure in communities can be a challenging task that requires time, teamwork, and funding. However, the numerous benefits and positive impacts of green infrastructure on public spaces and community well-being align with the goals and vision of many communities. Incorporating green infrastructure into long-term town planning provides an opportunity to address future maintenance needs, foster partnerships across departments, and leverage additional funding sources. This guide serves as a valuable tool to help communities select green infrastructure options that align with their local values and needs.

In implementing any project, consider the following factors:

- **Timing:** Allow sufficient time to coordinate funding sources, involve the community, and determine how green infrastructure fits into existing public infrastructure.
- **Collaboration:** Build partnerships with experienced communities that have already implemented green infrastructure to streamline processes.
- **Jurisdiction:** Collaborate early with CDOT on state-managed rights-of-way.
  - CDOT does not use Green Infrastructure (GI) for transportation projects the department maintains. Local agencies are allowed to utilize GI.
  - If a local agency project uses GI (such as the Denver Federal Green Blvd. Project) then the local agency needs an Inter-governmental Agreement with CDOT for the operation and maintenance they will perform on those structures that treat CDOT ROW.
  - Refer to the [CDOT Municipal Separate](#)

[Storm Sewer System \(MS4\) Permit](#) and the [Drainage Design Manual Chapter 16](#) for more information.

- **Funding Sources:** Consider several funding sources, such as:
  - Stormwater utilities (SWUs) and associated stormwater fees
  - Private resident management of stormwater infrastructure
  - The State-Revolving Fund (SRF) program
  - State agencies such as CDPHE, the Department of Local Affairs (DOLA), CDOT, and the Colorado Water Resources and Power Development Authority
  - Federal agencies such as the Environmental Protection Agency (EPA), the United States Department of Agriculture (USDA), Economic Development Administration (EDA), and Federal Emergency Management Agency (FEMA).
- **Construction:** Communicate clearly with parties as deviations from standard practices are likely to occur.
- **Climate:** Colorado's arid climate and variations in temperature, elevation and precipitation throughout the state should be considered when choosing appropriate vegetation.
- **Soil composition:** Areas with expansive soils can cause damage to infrastructure. Reference technical specifications for construction.
- **Maintenance:** Establish an Operation & Maintenance (O&M) plan for GI. This can be developed in collaboration with contractors and city departments. Seek feedback from departments responsible for maintenance and include them in design development. Train town staff and community volunteers for effective maintenance.

