

# GREEN & COMPLETE STREETS GUIDEBOOK

*PUBLIC WORKS*

## PREPARED BY

*Devens Field Project Team  
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# ACKNOWLEDGEMENTS

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GRADUATE SCHOOL  
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# How to Use the Guidebook

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- This Green and Complete Streets (GCS) Guidebook was made for **public works directors and staff**.
- It is a one-stop resource for a quick explanation of green and complete streets and their benefits.
- It includes **frequently asked questions** and addresses common concerns of street users.
- **Examples** are provided to visually demonstrate common components of GCS and successful implementation.
- A **Tools & Resources** section lists information where help can be found on a wide range of topics related to GCS.

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# INTRODUCTION

## *What are Green and Complete Streets?*

By design and function, roads and sidewalks are important infrastructure elements. The Federal Highway Administration estimates that more than 20% of U.S. roads are in urban areas, and that roads, sidewalks, and parking lots are estimated to make up almost two-thirds of the total impervious cover, contributing a similar ratio of runoff (Lukes & Kloss 2008). Effective road drainage and stormwater management systems have been overlooked, which is why green infrastructure is being utilized to mitigate stormwater runoff. Effective road design and drainage makes communities more resilient to climate change.

Stormwater management is an important management technique as it reduces the amount of runoff and runoff pollution. Stormwater runoff is generated from rain and snowmelt and often contains harmful pollutants. Green infrastructure has technologies and approaches to best manage runoff, through infiltration, evapotranspiration, and by capturing and reusing stormwater to maintain or restore natural hydrologies (US EPA OMS 2015). Stormwater management is an opportunity to prevent pollution at its source and an element to tackle in building sustainable, resilient municipalities and communities.

Roads present many opportunities for green infrastructure application. One principle of green infrastructure is green streets. Green streets are planned and designed to manage stormwater onsite, whereas traditional street design practices manage stormwater through sewer and pipe systems (R. 03 US EPA 2015). **Green streets** incorporate green infrastructure (GI) which are natural systems that are installed in a community or city to help treat stormwater runoff (“What is green infrastructure?” 2022). GI often uses vegetation, engineered soil, and permeable surfaces to capture and clean stormwater before infiltrating into the ground or discharging to other watercourses. Benefits can include reduced flooding, reduced waste water pumping and treatment costs, and added urban green space. GI also improves air quality through the reduction in particulate matter and other smog pollutants- an important factor for all, especially people with respiratory illnesses. The design and appearance of green streets will vary, but the goals are the same: manage stormwater and provide environmentally enhanced roads.

**Complete streets** seek to shift the focus of a traditional auto-centric street design to one that designs the street for the safety and accessibility of all roadway users, regardless of their mode of travel, age, or ability (Active Transportation Alliance 2014). Complete streets provide the benefit of enhanced safety, along with the improvement of public health by providing safe and accessible places for more active modes of transportation and recreation, increasing physical activity (Zaccaro & Atherton 2018). Complete streets can also improve equity and be an economic driver (Prytherch 2021), can increase local connectivity (Marcus 2019), and can encourage mode shift, which can reduce congestion and reduce fuel usage, decreasing carbon emissions (Glazener & Khreis 2019).

**Green and complete streets** can generate a strong sense of place, known as placemaking. Placemaking is about strengthening the connection between people and the places they share (“What is placemaking?” 2007). Benefits can include increased positive interactions between people, increased sense of inclusion and belonging, and increased comfort and quality of life.



# BENEFITS

## *Why should you care?*

### **Improved Stormwater Management:**

Green streets create aesthetically attractive streetscapes, connecting neighborhoods and creating unique community settings while managing stormwater and reducing erosion. One of the greatest benefits of maintaining green spaces in developments and introducing porous spaces is their effectiveness for stormwater management. Green infrastructure reduces stormwater runoff, improves water runoff quality, and restores groundwater supplies (USDOT 2015). Porous asphalts offer particular advantages in colder climates by reducing the need for deicing salts, chemicals, and sand.

### **Other Maintenance Benefits:**

Porous pavements rarely require deicing chemicals. Though they may be used the amount of deicing chemicals will be significantly less than for impervious pavements (Palmer 2012). Municipal and public works staff may partner with residents and encourage them to adopt green spaces. The community stewards help maintain the adopted space, observe and help monitor water flows, and can attend to planters, community gardens, even adding perennials and native plants. This gives community members opportunity to relate to their natural environments and public works departments a chance to engage with residents about about community maintenance (Green Street Stewards n.d).

### **What are the Direct Operational Benefits of Having Green and Complete Streets?**

- Reduced flooding
- Porous surfaces reduce labor needs for snow clearance
- Reduce or eliminate chemical or sand treatment for snow
- Extended life-cycle of porous paved roads, less frequent replacement and repair.\*
- Lower impact construction and lower cost than gray infrastructure.
- Improve wet weather visibility
- Beautification, healthier work environment
- Opportunity to positively engage with residents, potential for Resident Community Stewards.

\* Maintaining long-term performance of porous asphalt pavements' stormwater management capabilities, surface infiltration rates should be inspected annually during rain events to observe any changes in effectiveness of infiltrating stormwater. University of New Hampshire has created a regular inspection and maintenance guide for porous pavements (UNHSC 2011).



# FAQ

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## ***Do GCS require special equipment or specialized practices for snow removal and maintenance?***

Some modification of snow removal and clean practices may be necessary, though they are neither specialized nor cost prohibitive. Plow as needed after storm events. Special plow blades should be used whenever possible to avoid scarifying the porous asphalt surface. Raised blade is not recommended. Sand should not be used on porous surfaces because it will eventually seep into the system causing it to clog. A clogged system will not work properly. In order to remove any solids and debris that could lead to more permanent clogging of the pavement, it is recommended that porous asphalt pavements be vacuumed at least two times a year or power-washed (UNHSC 2012; Palmer 2012).

## ***How might GCS infrastructure affect maintenance access?***

Using roads and right-of-ways as locations for green infrastructure alleviates access and maintenance concerns by using public space. GCS are built to be seen, easy to access and easy to maintain, since they can work with natural hydrology and consider movements of people throughout.

## ***Do GCS cause more traffic congestion?***

No, on the contrary, one of the benefits of GCS is improved traffic flow as complete streets can ease congestion by allocating space for each mode of transportation.



## ***What are Some Examples of Complete Streets Improvements?***

- Road diets: Add bicycle lanes, inserting a center turn lane, removing excess travel lanes.
- Reduce motor vehicle speeding
- Higher bicycle comfort and use
- Traffic calming: Narrow vehicular lanes, shortening curb radii.
- Decrease crossing distance for pedestrians.
- Improve accessibility
- Raised intersections increase visibility

# FAQ



## ***Why is the GCS approach effective for communities?***

Green and complete streets consider and accommodate for all user types. For many years, streets have been designed with the prioritization of speed and volume of movement. Green and complete streets work for communities because it is not a one-size-fits-all approach, it is context sensitive. Green and complete streets are designed as an inclusive system that connects a network, improves safety, and addresses the transportation needs of all street users. Regardless of where you live, who you are, or how you need to travel, you will get to where you need to be in a safe, reliable, and affordable way.

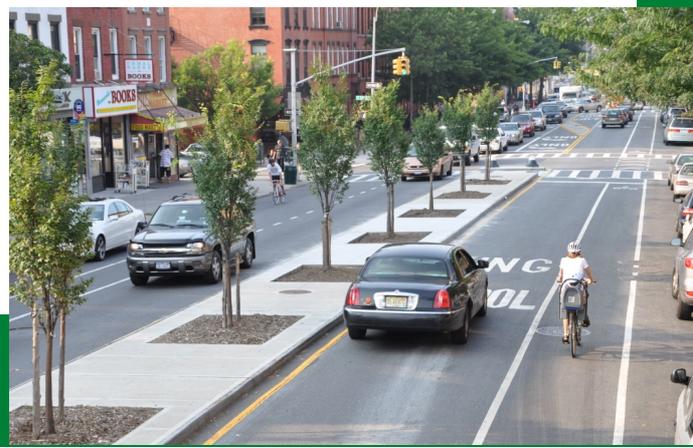
## ***What are some challenges that communities face when adopting a GCS model?***

The biggest obstacle is changing the system and challenging the status quo. Our built environment is predominantly auto-centric and is not reflective of the current and future demands for alternative and multi-modal transportation. There tends to be pushback as many engineers, architects, and developers are used to doing things one way and have not been given the tools and performance metrics to build something differently. Although pushback can be a common challenge, sometimes these professionals want to design something differently but internal factors that they have no control over limit their choices and decisions. Budget and political will are two challenges that can both be overcome through education, advocacy and training.

Pushback also commonly comes from public safety officials and public works officials who are unfamiliar with these approaches. They often think GCS components will cost more to maintain and are the cause of slow emergency response time, when in fact, the opposite is true. Green and complete streets make streets safer, regulate speed to reduce accidents, and have less buried infrastructure making them easier to maintain. GCS are also adaptable to more frequent and intense storm events, which reduces flooding and further improves road safety.

## ***How can complete streets address communities of disinvestment?***

The Complete Streets Coalition created elements of an ideal complete streets policy to set up policies and resolutions that translate into implementation and practice, prioritizing equity. The complete streets approach does not look at one street, but rather at the system to see where multimodal access is most needed and the location of where most disinvestment is occurring. It does this by asking questions such as ‘Where are the places with most incomplete streets?’ and ‘What communities have historically received the least amount of investment?’.



*successful*

# EXAMPLES

**Village of Great Neck Plaza, New York State: Great Neck Road**



**Green and Complete Streets Components:** Changes to the travel lanes, turning restrictions, and pedestrian safety amenities like bulb-out sidewalks to reduce crossing distances and enhance the visibility of pedestrians, pedestrian countdown timers, higher visibility crosswalk markings and warning signs, wider pedestrian median refuges, and a two-foot safety zone between the travel lane and parked vehicles.

**1,600+**  
*Complete Streets Policy have been passed in the United States*

**Hauppauge to Port Jefferson, New York State: Route 347**



**Green and Complete Streets Components:** Traffic calming measures, such as narrower lane widths and lower speed limits, a continuous, 15-mile separate bicycle and shared-use pedestrian path, pedestrian refuge areas, a raised, planted median, high-visibility crosswalks, and pedestrian countdown timers. Transit facility improvements, such as bus stops and solar lighting at new bus shelters

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# EXAMPLES



## Charlotte, North Carolina: East Boulevard



**Green and Complete Streets Components:** Corridor redesign improved pedestrian and bicycle infrastructure connections to bus routes and light rail, and helped to reconnect the neighborhood landuses.

## New York City, New York: 9th Avenue



**Green and Complete Streets Components:** Reduced travel lanes (lane removal and narrowing), protected bike bath, crosswalks, traffic lights / turn signals, and street trees.

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## EXAMPLES: URBAN AREAS

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### *Brady Street in Somerville, MA*



**Green and Complete Streets Components:** Bus/bike only lane, safety zone between bus lane & bike lane, crosswalks, signage, green corridor and street trees.

### *North Fremont Street, City of Monterey, California*



**Green and Complete Streets Components:** Protected bike lanes, bicycle signals are coordinated with traffic signals, crosswalks/crosswalks, and higher curb between street and bike facility.

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## EXAMPLES: SUBURBAN AREAS

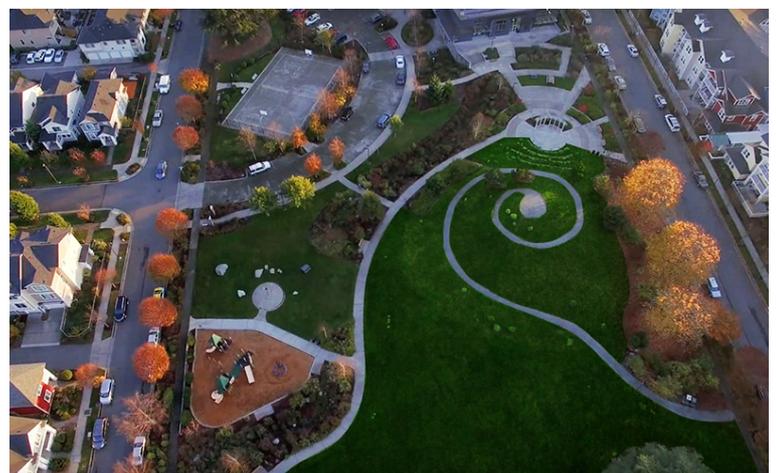
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### *North Avenue in Wauwatosa, just outside Milwaukee, MN*



**Green and Complete Streets Components:** Dedicated painted bike lanes, crosswalks and curb cuts.

### *High Point Neighborhood, Seattle, Washington*



**Green and Complete Streets Components:** Rain gardens, pervious pavement cement, street trees, interconnected pathways for all forms of mobility, curbcuts, large central green space.

*successful*

## EXAMPLES: RURAL AREAS

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### *Trinity Highway in Willow Creek, a community nestled in California's Six Rivers National Forest*



**Green and Complete Streets Components:**  
Dedicated painted bike lanes on either side.

### *Hudson Avenue in Thunder Bay, Ontario, Canada*



**Green and Complete Streets Components:**  
Dedicated active living corridor for pedestrians/bikes and painted buffers.

# CASE STUDY: DEVENS, MA

## Grant Road in Devens, Massachusetts



### Green and Complete Streets Components:

- Reduced travel lane widths
- Raised crosswalks
- Dedicated bike lanes
- Street trees
- Street lights
- Signage

### Why did Devens implement a Green and Complete Streets Policy?

The intent of the Devens Green and Complete Streets Policy is to facilitate the development of safe, universally accessible, convenient and comfortable routes for a wide range of road users by creating a road network that meets the needs of individuals utilizing a variety of transportation modes while using trees, landscaping and related low impact site design features to capture and filter stormwater runoff within the right of way to the maximum extent practicable, in a manner appropriate to the function and context of the facility. This policy will be considered as part of the decision-making process related to all infrastructure planning, design and construction. Learn more [here](#).

### How was Devens able to establish the GCS Policy?

Devens gained community support through education, awareness, incentives, and regulations. The GCS Policy linked above demonstrates how a community can memorialize their commitment to Green and Complete Streets. An example of the educational resources provided by Devens is their [LID case study](#) showing cost comparisons, and the economic, social, and environmental [benefits of street trees](#). The [Devens Green Infrastructure Guidelines](#) is another resourceful tool that recognizes the principles of sustainable development and brings everything together.

# TOOLS & RESOURCES



## Overview of Complete Streets:

[Smart Growth America](#)

## Overview of Green Streets:

[EPA- Learn About Green Streets](#)

[Complete Streets are Green Streets](#)

## A more in-depth guide:

[Complete and Green Streets for All](#)



For more **public health benefits** and **research** on the impacts of green streets, Dr. Kathy Wolf at the University of Washington has conducted many studies. Find more at [Green Cities: Good Health](#)

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# IMAGE REFERENCES

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[Village of Great Neck Plaza, NY: Great Neck Road](#)

[Hauppauge to Port Jefferson, New York State: Route 347](#)

[Charlotte, NC](#)

[NYC 9th Avenue](#)

[Broadway Street in Somerville, MA](#)

[City of Monterey, California](#)

[North Avenue](#)

[Vancouver, Canada](#)

[Trinity Highway in Willow Creek, California](#)

[High Point Neighborhood, Seattle, Washington](#)

<https://hpigreen.com/tag/green-infrastructure-planning/>

## **Other Images**

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