

Hixon Center for Urban Sustainability

CASE STUDY

Bioswales for Stormwater Runoff

Green City



Climate Issue: Urban Flooding

Cities worldwide face flooding issues.

- Urbanization leads to more hard surfaces
- These surfaces do not absorb water when it rains
- At the same time, climate change is causing extreme weather events
- Many cities have aging stormwater infrastructure that cannot handle increased water runoff, resulting in urban flooding
- Flooding leads to water pollution, disrupted ecosystems, infrastructure damage and health risks.

Bioswales are an innovative solution to reduce local flooding and filter water runoff.

What is a Bioswale?

A bioswale is green infrastructure designed to capture and clean stormwater through natural infiltration, plant uptake and absorption. Flowing stormwater enters the structure and is filtered by the soil. The filtered water recharges the groundwater before draining to the nearest water body.



1. **Each bioswale** is graded with a U-shape profile, where material in the center is lower than the soil at the edges. This helps water pool and properly drain.
2. **The inlet and raised bump** help channel water into the bioswale.
3. **Plants, shrubs, and perennials** are vegetation best suited to withstand flooding and drought. Peastone gravel helps aid in quick drainage, protect against erosion, and prevent weed growth.
4. **Edging installed along the sides** provides visual awareness and can help prevent the unintended growth of grass and weeds.
5. **The gabion** is a wire cage filled with larger aggregate stones compared to the rest of the bioswale, which has a top layer mix of sand and peastone above larger stones. This allows for more rapid drainage.

Evaluation Criteria

Before installation, city engineers should evaluate sites for:

- Localized flooding concerns
- Proximity to existing storm drains
- Infrastructure impediments (e.g. parking meters, fire hydrants, trees, etc.)
- Location within the floodplain
- Existing utilities
- Slope and natural water flow.

Once complete and approved, construction can begin.

New Haven: A Bioswale Success Story

As of 2023, more than 250 bioswales have been installed in New Haven, Connecticut. Annually, the bioswales have been found to:

- Remove **70% to 75%** of stormwater runoff
- Filter out **93% of copper** in stormwater, amounting to almost **3 pounds of copper**
- Prevent up to **4 million gallons** of runoff from entering Long Island Sound.

If fully implemented within New Haven, bioswales could prevent **11.6 billion gallons** of runoff from entering Long Island Sound.

Beyond the environmental benefits, bioswales have a social impact. In New Haven, partnerships between the City, Urban Resources Initiative, EMERGE CT, Common Ground School, and Greater New Haven Water Pollution Control Authority have provided important training and employment opportunities.

With a predicted increase in sea level of **20 inches or more by 2050** and a **14% increase in days with precipitation over one inch in CT**, bioswales are an innovative solution to reduce urban flooding.

For more information on this case study, contact **Professor Gabe Benoit** at gaboury.benoit@yale.edu. Case study based off of research conducted through the **Benoit Lab** at Yale School of the Environment.