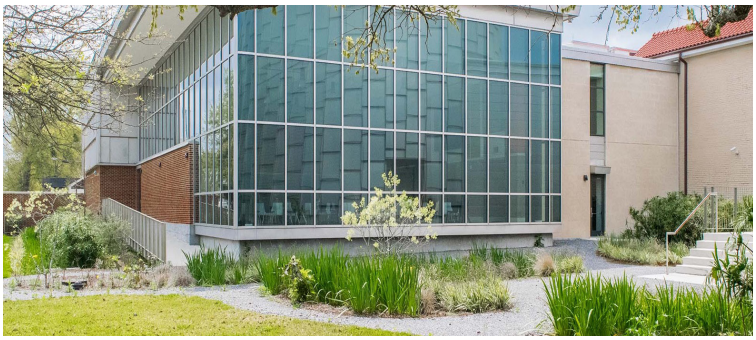
Green Infrastructure



Maumus Center, St. Bernard Parish.[1]

Gene Green Beltway 8 Park in Houston, Texas.[2]

DESCRIPTION	Range of measures that use plant or soil systems; permeable pavement or other permeable surfaces or substrates; stormwater harvest and reuse; landscaping or rewilding to store, infiltrate or evapotranspirate stormwater and reduce flows to sewer systems or to surface waters. Includes greenways, rain gardens, tree trenches, bioswales and green roofs.
HOW DOES IT MITIGATE FLOOD RISK?	+ **Stormwater management:** Reduced peak flows or total runoff from precipitation events. + **Flood attenuation:** The reduction in peak discharge of a flood by temporary storage of water or the slowing of channel flows. + **Groundwater recharge:** Downward movement of water from the surface to subsurface aquifers.
WHAT OTHER BENEFITS DOES IT PROVIDE?	+ **Habitat restoration/enhancement:** Changing the physical, chemical, or biological characteristics of a site with the goal of returning or improving the natural functions to the lost or degraded native habitat. + **Improved water quality:** Increasing suitability of water for a particular use based on selected physical, chemical and biological characteristics. + **Carbon sequestration:** The process by which carbon dioxide is removed from the atmosphere and held in solid form in the landscape. + **Recreation:** Providing recreational opportunities such as birdwatching and hiking. + **Open space:** Lands where there are no buildings, storage, fill, significant pavement or other encroachments to flood flows. + **Urban heat island and air quality improvements:** Mitigating temperatures in urbanized areas that experience higher temperatures due to extensive development and local improvements to air quality through reduced particulates and absorption of gaseous pollutants.
SCALABILITY	Small-scale application with potential for cumulative effects at watershed scale.

Advantages Relative to Traditional Flood Management	Potential Barriers or Issues Relative to Traditional Flood Management	Potential Synergies with other NBS
+ Can be applied incrementally, often at parcel scale. + Contributions can be made on public and private land.	+ Lack of knowledge and capacity of state and local professionals regarding the proper design and integration of green infrastructure concepts into traditional project scoping. + Lack of green infrastructure standards and limited technical resources. + Perception of higher costs and unknown performance. + Unfamiliarity with maintenance requirements and costs. + Conflicting codes and ordinances.	Green infrastructure encompasses a suite of approaches for urban areas which can be designed synergistically to achieve multiple flood risk management and environmental benefits.

Green Infrastructure

RESOURCES

EVALUATION TOOLS

- **National Stormwater Calculator:** https://www.epa.gov/water-research/national-stormwater-calculator
- **USGS Software and Models, Methods for Estimating Groundwater Recharge In Humid Regions:** https://water.usgs.gov/ogw/gwrp/methods/software/
- **USACE Ecosystem Restoration Model Library:** https://cw-environment.erdc.dren.mil/model-library.cfm?CoP=Restore&Option=Search&Type=Restore&Id=ALL
- **INVEST Habitat Quality:** http://releases.naturalcapitalproject.org/invest-userguide/latest/urban_flood_mitigation.html
- **Visualizing Ecosystems for Land Management Assessment (VELMA) Model:** https://www.epa.gov/water-research/visualizing-ecosystem-land-management-assessments-velma-model-20
- **INVEST Carbon Storage and Sequestration:** http://releases.naturalcapitalproject.org/invest-userguide/latest/carbonstorage.html
- **INVEST Coastal Blue Carbon:** http://releases.naturalcapitalproject.org/invest-userguide/latest/urban_flood_mitigation.html
- **Automated Geospatial Watershed Assessment (AGWA) Tool**: https://www.epa.gov/water-research/automated-geospatial-watershed-assessment-agwa-tool
- **INVEST Urban Cooling:** http://releases.naturalcapitalproject.org/invest-userguide/latest/urban_cooling_model.html
- **i-Tree Eco:** https://www.itreetools.org/tools/i-tree-eco
- **i-Tree Streets:** https://www.itreetools.org/tools/i-tree-streets

DESIGN SUPPORT

- **Green Infrastructure Municipal Handbook:** https://www.epa.gov/green-infrastructure/green-infrastructure-municipal-handbook
- **Green Infrastructure Design and Implementation:** https://www.epa.gov/green-infrastructure/green-infrastructure-design-and-implementation
- **Harris County Low Impact Development Design Criteria Manual:** https://www.hcfcd.org/Resources/Technical-Manuals/Harris-County-Low-Impact-Development-Design-Criteria-Manual?folderId=16300&view=gridview&pageSize=10
- **Homeowners:** https://www.thisoldhouse.com/driveways/21018862/best-drainage-systems-to-deal-with-storm-water
- **Resource Guide for Planning, Designing and Implementing Green Infrastructure in Parks:** https://floodresilience.net/resources/item/resource-guide-for-planning-designing-and-implementing-green-infrastructure-in-parks/

CASE STUDIES

- **Green Light New Orleans:** https://www.greenlightneworleans.org/rainbarrels.html
- **Louisiana Certified Habitat Program:** https://www.lnps.org/louisiana-certified-habitat

LOUISIANA WATERSHED INITIATIVE

1 https://www.danabrownassociates.com/maumus-center/
2 https://www.epa.gov/sites/default/files/2017-05/documents/gi_parksplaybook_2017-05-01_508.pdf