FEMA Fact Sheet

Federal Insurance and Mitigation Administration

# Green Infrastructure Methods

## Purpose

The President's 2015 Opportunity, Growth, and Security Initiative (OGSI); Executive Order 13653 Preparing the United States for the Impacts of Climate Change; the President's 2013 Climate Action Plan; FEMA's Climate Change Adaptation Policy; and the 2014-2018 FEMA Strategic Plan, all identify the risks and impacts associated with climate change on community resilience to natural hazards, and direct Federal agencies to support climate resilient infrastructure.

FEMA is encouraging communities to incorporate methods to mitigate the impacts of climate change into eligible Hazard Mitigation Assistance (HMA) funded risk reduction activities by providing guidance on mitigating flood and drought conditions. FEMA has developed initial guidance on mitigating flood and drought actions including green infrastructure methods, expanded ecosystem service benefits, and three flood reduction and drought mitigation activities: Aquifer Storage and Recovery (ASR), Floodplain and Stream Restoration (FSR), and Flood Diversion and Storage (FDS).

FEMA encourages communities to use this information in developing eligible HMA project applications that leverage risk reduction actions and increase resilience to the impacts of climate change.

## Green Infrastructure Methodology

Green infrastructure is a sustainable approach to natural landscape preservation and storm water management that can be used for hazard mitigation activities as well as provide additional ecosystem benefits. Green infrastructure provides a framework and methodology for implementing flood risk reduction and drought mitigation actions in a manner that also incorporates ecosystem benefits and helps build a community's resilience to the impacts of climate change.

Green infrastructure methods use an ecosystem-based approach to replicate a site's pre-development, natural hydrologic function. Traditional "Gray infrastructure" storm water management systems seek to move excess water as quickly as possible away from homes and properties into storm drains and the storm water system. Green infrastructure seeks to do the opposite by safely capturing as much water as possible on site to facilitate storage, absorption, and infiltration. Using green infrastructure, storm water is typically channeled into in a basin or ditch designed to allow the water to seep or infiltrate the ground and re-charge groundwater supplies, or to slow its passage into the storm drain during peak flow periods to avoid overwhelming the storm water system.

## Green Infrastructure Methods in HMA Projects

Green infrastructure methods for storm water management and flood control may be especially viable in higher-density developed areas such as urban and suburban communities. In particular, green infrastructure methods lend themselves readily to designing and implementing soil stabilization, flood reduction, and drought mitigation projects that provide additional ecosystem benefits. Examples of green infrastructure methods are

presented in the Fact Sheets for Floodwater Storage and Diversion and Floodplain and Stream Restoration.

Many U.S. communities are using green infrastructure methods to manage or reduce storm water runoff and mitigate events leading to a Combined Sewer Overflow (CSO). A CSO occurs in cities with Combined Sewer Systems (CSS) where wastewater (e.g. sanitary sewage), storm water, and urban runoff water are collected in the same pipe network and routed to a treatment plant. If the capacity of the downstream treatment plant cannot handle the amount of water collected, the excess, including sanitary sewage, is often routed directly to the nearest body of water. Green infrastructure storm water management projects that provides flood risk reduction may also alleviate a CSO by capturing the storm water, and reducing and/or slowing the volume and rate of water entering the storm drain to avoid overwhelming the storm water system.

Projects implemented using green infrastructure methods will need to meet all HMA eligibility criteria including demonstrating the project is cost effective and provides risk reduction benefits. The project applications must include the necessary data and information for FEMA to conduct the appropriate EHP review and ensure the activity is compliant with all applicable environmental and historic preservation (EHP) requirements. More detailed information on the project eligibility and the EHP review process and requirements can be found in the HMA Guidance in the FEMA Library.

## Benefits of Green Infrastructure

Green infrastructure emphasizes local, decentralized solutions that leverage the beneficial services that natural ecosystem functions can provide. Green infrastructure projects can be scaled to address site specific needs and conditions. Green infrastructure principles can be used in projects to mitigate flood risk to homes and property, filter pollutants from water, and capture and store water for use at a later time. The diversion, storage, and infiltration of the storm or flood water can replenish ground water supply and increase or enhance usable water supply to mitigate the effects of drought.

Since green infrastructure projects focus on smaller scale, localized water storage, they tend to be most effective for higher frequency, lower impact events. Green infrastructure projects can be considered for implementation in a connected system to scale the overall system capacity (e.g. a series of bio-detention sites along the natural water body or storm water flow path). A benefit of the green infrastructure approach for urban settings is that the project design may include dual-use as green space or recreation areas when not submerged or locate the project between roadways or underneath existing sidewalks so it does not reduce the area used for vehicle or pedestrian traffic.

Green infrastructure projects can also provide additional ecosystem services to address climate change resilience by improving air and water quality, reducing urban heat island effects, and providing or restoring native plant and wildlife conservation and habitat.

## Climate Data, Drought Information, and HMA Resources

The National Integrated Drought Information System (NIDIS) website, the U.S. Drought Portal
http://www.drought.gov/drought

The U.S. Drought Monitor weekly map delineates drought conditions throughout the Nation
http://droughtmonitor.unl.edu/

NASA Gravity Recovery and Climate Experiment (GRACE) provides satellite data on aquifer water levels

http://www.nasa.gov/mission_pages/Grace

U.S. Department of Agriculture Disaster and Drought Information
http://www.usda.gov/wps/portal/usda/usdahome?navid=DISASTER_ASSISTANCE

Hazard Mitigation Assistance Guidance and Addendum (February 27, 2015)
https://www.fema.gov/media-library/assets/documents/103279

U.S. Global Change Research Program conducts a National Climate Assessment every four years
http://www.globalchange.gov

NOAA Climate.gov provides science and information for a climate-smart Nation
https://www.climate.gov

## Information Requests and Questions

FEMA encourages communities to work with their State or Tribal Hazard Mitigation Office in identifying and developing flood and drought mitigation projects. States and federally-recognized tribes should contact their FEMA Region Office with questions. Questions can also be submitted by email to FEMA-HMA-Grants-Policy@fema.dhs.gov.