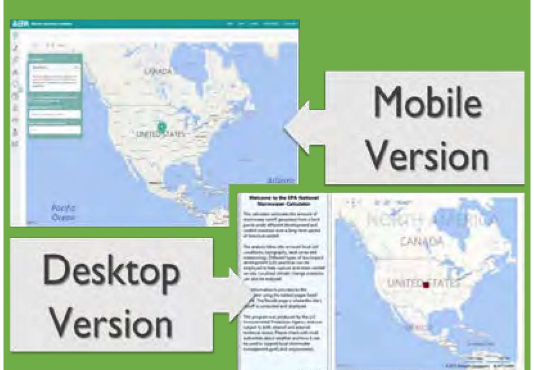
National Stormwater Calculator (SWC)

Tool that helps users control runoff to promote the natural movement of water

(1) Green Infrastructure

(2) Traditional Grey Infrastructure

The National Stormwater Calculator shows users how land use decisions and green infrastructure practices affect the amount of stormwater runoff produced. Green infrastructure, such as the street planter and porous pavers shown above (Image 1), are low impact development controls that promote the natural movement of water within an ecosystem or watershed, instead of allowing it to wash into streets and down storm drains, as it does with traditional grey infrastructure shown above (Image 2).



Mobile and Desktop Versions and Additional Material:
epa.gov/water-research/national-stormwater-calculator

Contact: SWC@EPA.gov

Stormwater discharges continue to cause impairment of our Nation's waterbodies. In order to reduce impairment, EPA has developed the National Stormwater Calculator (SWC) to help support local, state, and national stormwater management objectives and regulatory efforts to reduce runoff through infiltration and retention using green infrastructure practices as low impact development (LID) controls. The primary focus of the SWC is to inform site developers on how well they can meet a desired stormwater retention target with and without the use of green infrastructure. It can also be used by landscapers and homeowners.

Desktop and Mobile Versions. The SWC is available as a Windows-based desktop program and as a mobile web application compatible with all operating systems, which can be used on mobile devices such as smartphones and tablets. Both versions require an internet connection.

Cost Module. An LID cost estimation module within the application allows planners and managers to evaluate LID controls based on comparison of regional and national project planning level cost estimates (capital and average annual maintenance) and predicted LID control performance. Cost estimation is accomplished based on user-identified size configuration of the LID control infrastructure and other key project and site-specific variables. This includes whether the project is being applied as part of new development or redevelopment and if there are existing site constraints.

Climate Scenarios. The SWC allows users to consider how runoff may vary based both on historical weather and potential future climate conditions. To better inform decisions, it is recommended that users develop a range of SWC results with various assumptions about model inputs. Please check with local authorities about whether and how use of these tools may support local stormwater management goals.

The SWC is comprised of ten steps:

Location. This step has an address lookup feature that allows the user to easily navigate to a site selected anywhere within the United States, including Puerto Rico.

Soil Type. In this step, soil type is identified and is used to infer infiltration properties. It can be selected based on local knowledge or from the online database.

Soil Drainage. This step identifies how quickly water drains into the soil. Conductivity can be selected based on local knowledge or retrieved from the online database.

Topography. Here, the site's surface topography is characterized, as measured by the surface slope. The user can rely on the slope data display as a guide or can use local knowledge to describe the site's topography.

Precipitation/Evaporation. For this step, a National Weather Service rain gauge and a nearby weather station relevant to the site are selected. A long-term rainfall record is used to replicate storm events that might occur.

Climate Change. Users can elect to apply different future climate scenarios that modify the historical precipitation events and evaporation rates normally used.

Land Cover. For this step, impervious land cover and the different types of pervious land cover are assigned to the site for the condition the user wants to analyze.

LID Controls. Seven controls (green infrastructure practices described on page 2) can be selected for use throughout the site. LID cost estimation factors are included.

Project Cost. This step is used to estimate cost by inputting the project type, site suitability, and cost region.

Results/Runoff. An analysis of the site is run and the results are displayed for review.

Low Impact Development Controls (Green Infrastructure Practices)

The SWC allows users to apply any mix of low impact development (LID) controls by simply selecting what percentage of the impervious area is treated by each type of control. The controls are green infrastructure practices that allow stormwater to be used as a resource rather than a waste product. Having less water runoff into storm drains and roadways can help prevent contamination of waterways, infrastructure degradation, flooding, and overwhelming of treatment plants. Each LID control has been assigned a reasonable set of design parameters, but these can be modified by clicking on the name of the control. This will also allow the user to automatically size the control to capture a 24-hour design storm that is specified. The SWC includes seven different green infrastructure practices:

Rooftop (downspout) disconnection allows rooftop rainwater to discharge to rain barrels, cisterns, or landscaped areas and lawns, instead of directly into storm drains. The stormwater can then be stored or allowed to infiltrate into the soil. Downspout disconnection could be especially beneficial to cities with combined sewer systems.

Rainwater harvesting (rain barrels or cisterns) are containers that collect roof runoff during storm events and can either release or re-use the rainwater during dry periods. Cisterns may be located above or below ground and have a greater storage capacity than a rain barrel.

Rain gardens are planted depressed areas that collect rain water from a roof, driveway, or street and allows it to infiltrate into the ground. Rain gardens can also help filter out pollutants in runoff and provide food and shelter for butterflies, song birds and other wildlife. Rain gardens with drainage systems and amended soils are often referred to as bioretention cells.

Green roofs, a variation of a bioretention cell, have a soil layer laying atop a special drainage mat material that conveys excess percolated rainfall off of the roof. They contain vegetation that enables rainfall infiltration and evapotranspiration of stored water. Green roofs are particularly cost-effective in dense urban areas where land values are high and on large industrial or office buildings where stormwater management costs are likely to be high.

Street planters are a type of urban rain garden constructed with vertical walls and either open or closed bottoms. They collect and absorb runoff from sidewalks, parking lots, and streets, and are ideal for space-limited sites in dense urban areas.

Infiltration basins are narrow ditches filled with gravel that intercept runoff from upslope impervious areas. They provide storage volume and additional time for captured runoff to infiltrate the native soil below.

Porous pavements are excavated areas filled with gravel that are paved over with a porous concrete or asphalt mix. Normally, rainfall will immediately pass through the pavement into the gravel storage layer below where it can infiltrate at natural rates into the site's native soil. Block paver systems consist of impervious paver blocks placed on a sand or pea gravel bed with a gravel storage layer below. Rainfall is captured in the open spaces between the blocks and conveyed to the storage zone and native soil below.