NATIONAL STORMWATER CALCULATOR

With Climate Change Assessment

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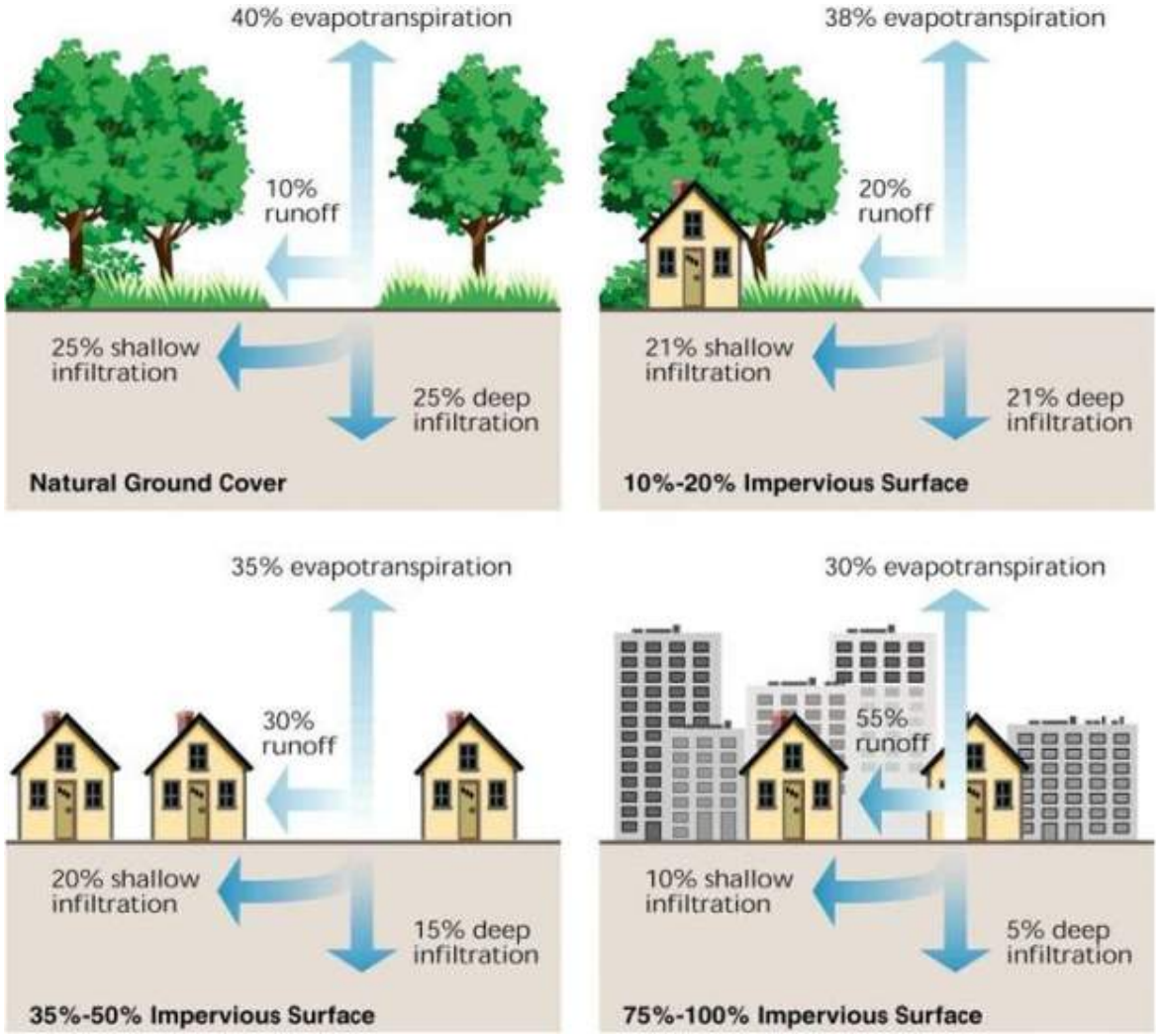
Managing Urban Stormwater - An Environmental Challenge

- Urban stormwater is listed as the “primary” source of impairment for 13% of all rivers, 18% of all lakes, and 32% of all estuaries. (NRC 2008)
- In 2010, stormwater caused more than 8,700 beach closing and advisory days; sewage spills and overflows caused more than 1,800. (NRDC 2011)
- In general, high runoff volumes and flow rates lead to:
  - Flooding and combined sewer overflows
  - Stream erosion and channel degradation
  - Increased property damage
  - Loss of habitat and aquatic life

Urbanization Changes the Hydrologic Cycle



- Soils and vegetation are replaced with impervious surfaces
- Impervious surfaces are connected to dense drainage networks
- Runoff drains directly into streams, lakes, wetlands, and coastal waters
- Even small storms generate significant runoff

A New Approach - Volume Based Source Control

- Recommended by the NRC's 2008 review of EPA's stormwater program.
- Already adopted by several states, local communities, and federal facilities.
- Forms the cornerstone of EPA's proposed National Stormwater Rule.
- Returns areas to a more natural balance between interception, infiltration, evapotranspiration, and runoff.
- Promotes the use of low cost Green Infrastructure practices (green roofs, rain gardens, rain barrels, street planters, swales, permeable pavement).

Our Challenge (per OW's Request)

Build a Stormwater Calculator, to assist government agencies and property owners to implement volume based controls, that would:

- Predict runoff from any site in the US for different development scenarios and GI controls.
- Analyze site hydrology over a continuous, long-term meteorological record.
- Be intelligible to users without prior modeling experience or hydrology expertise.
- Require only a minimum amount of readily available site information (such as from web sources).
- Produce technically sound and defensible results for screening level analysis.

The Result: The National Stormwater Calculator

Released July 2013 (http://www.epa.gov/nrmrl/wswrd/wq/models/swc/)

EPA United States Environmental Protection Agency

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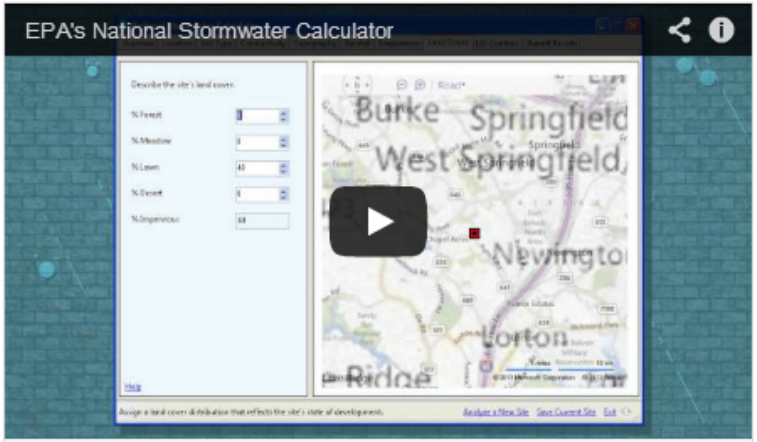
National Stormwater Calculator

EPA's National Stormwater Calculator is a desktop application that estimates the annual amount of rainwater and frequency of runoff from a specific site anywhere in the United States (including Puerto Rico). Estimates are based on local soil conditions, land cover, and historic rainfall records.

It is designed to be used by anyone interested in reducing runoff from a property, including

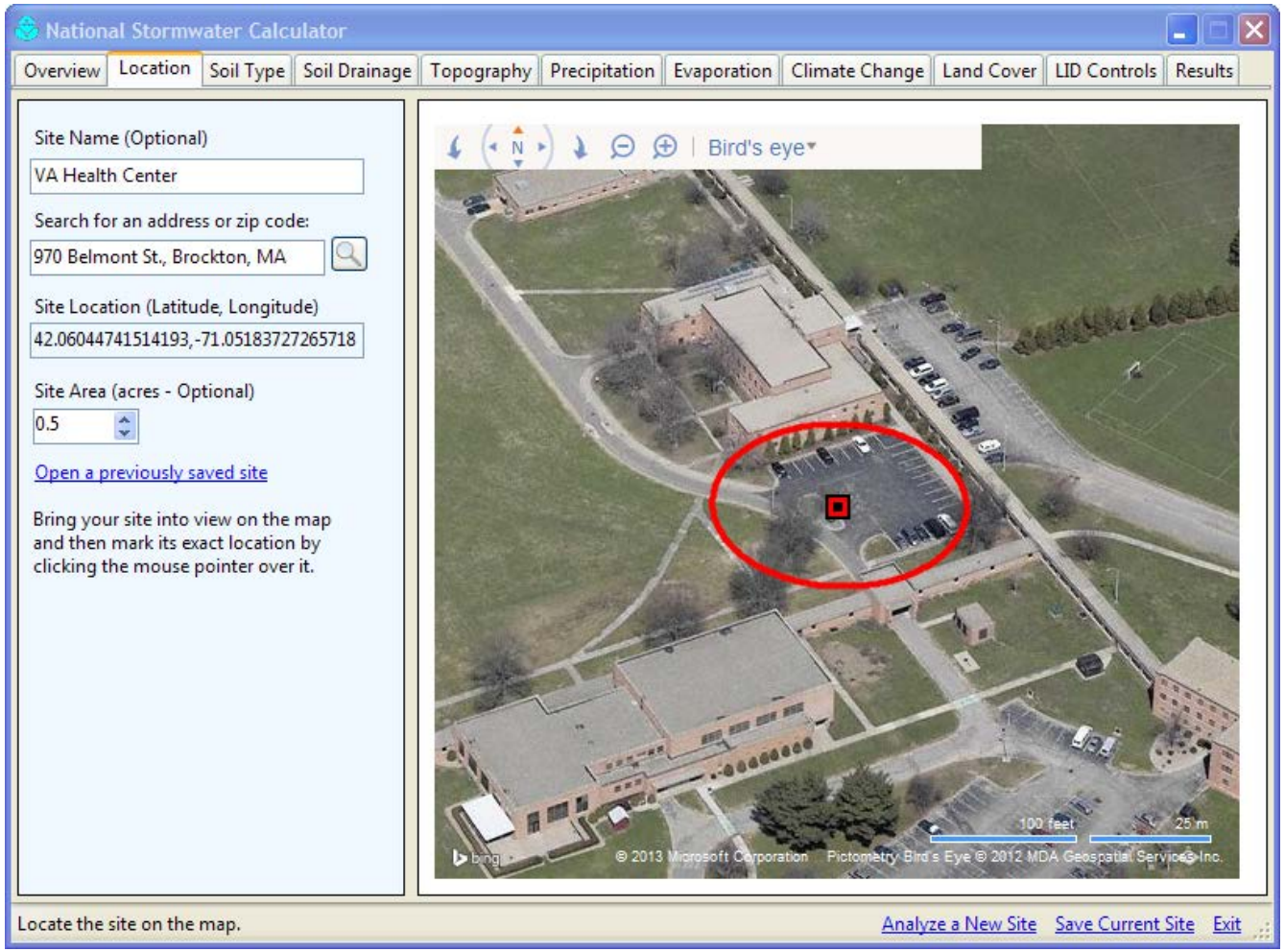
- site developers,
- landscape architects,
- urban planners, and
- homeowners.

The Calculator accesses several national databases that provide soil, topography, rainfall, and

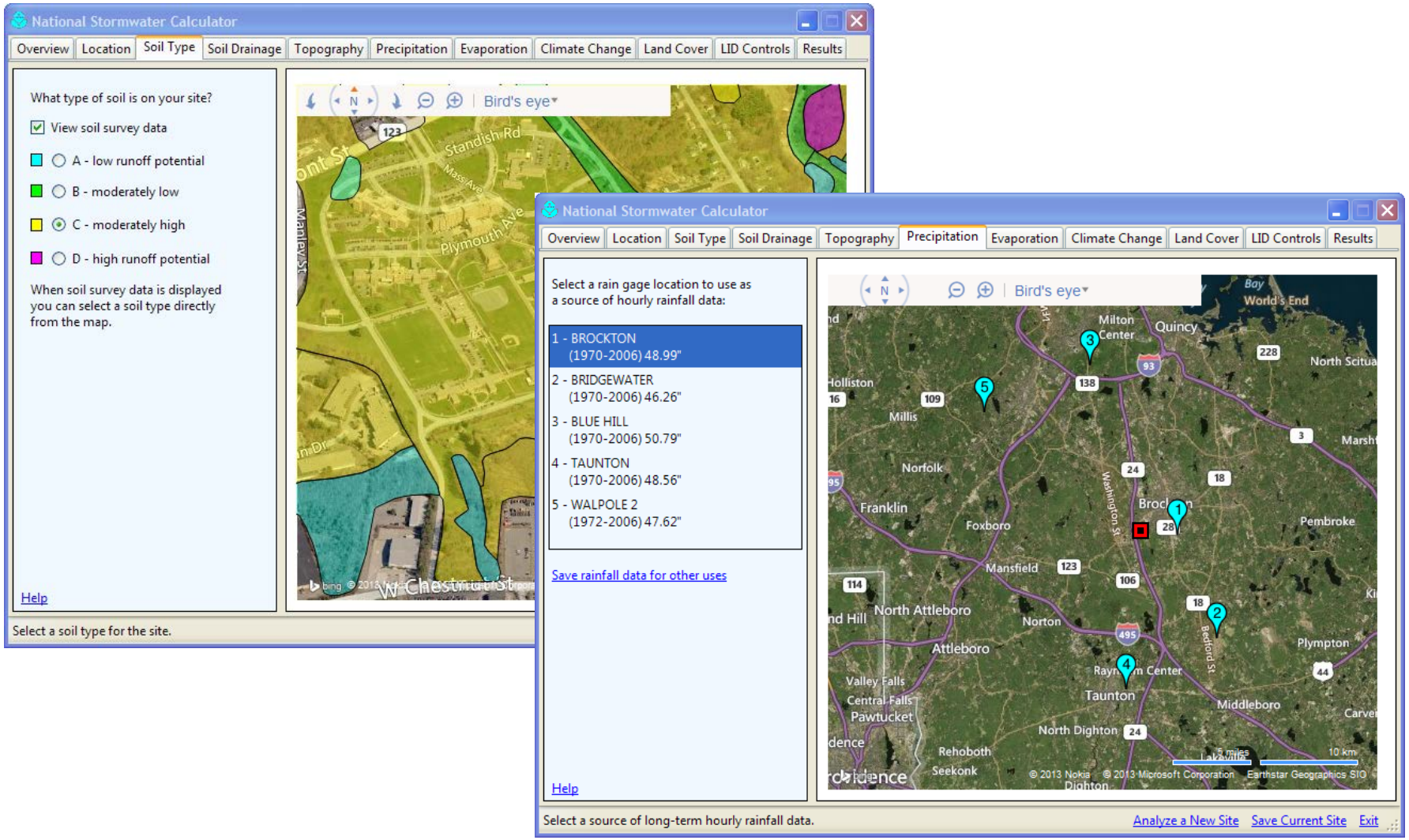


The National Stormwater Calculator can be used with all versions of Microsoft Windows with .Net Framework 4 and requires an Internet connection to run. Watch this video on YouTube!

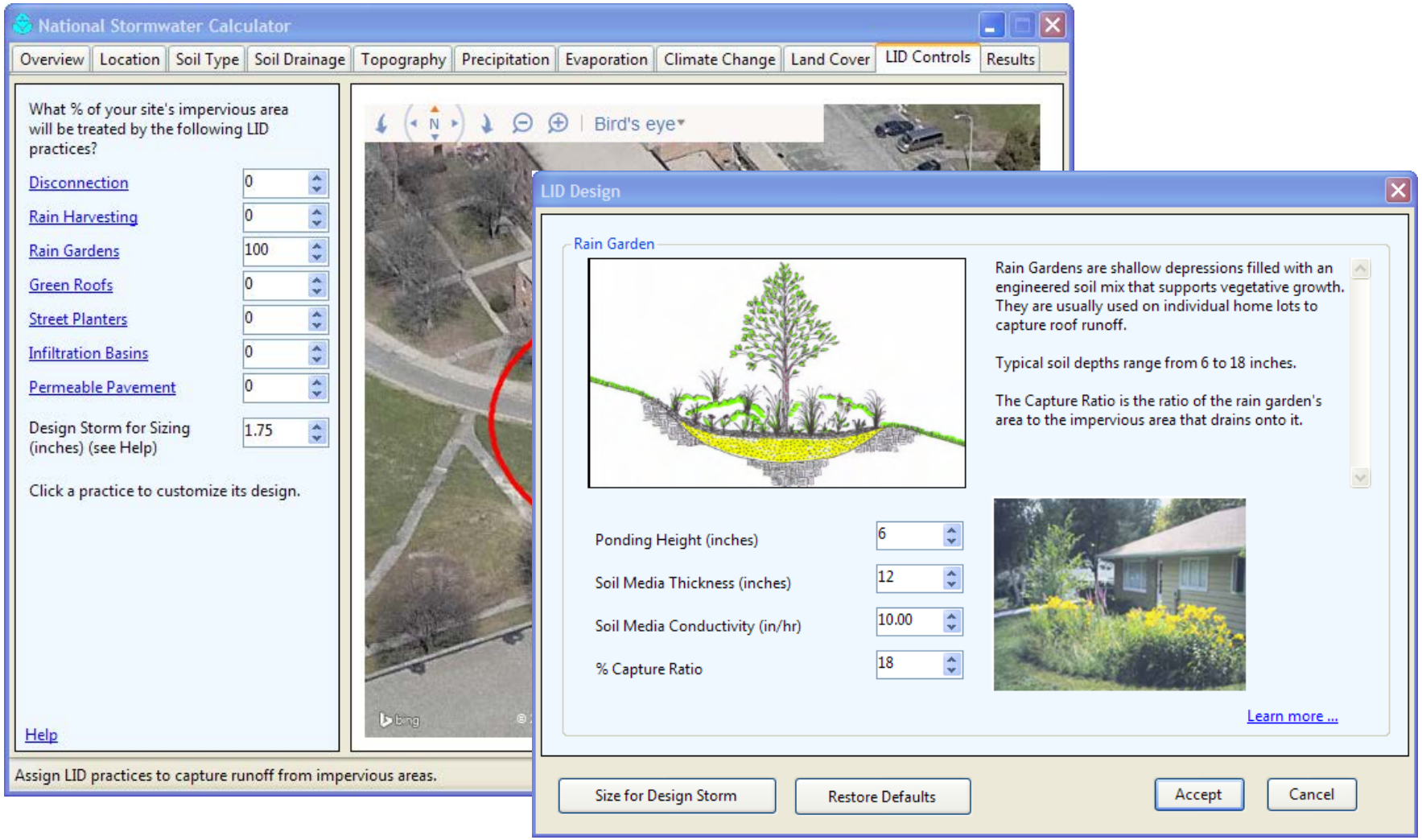
VA Health Center Example: Locating the Site



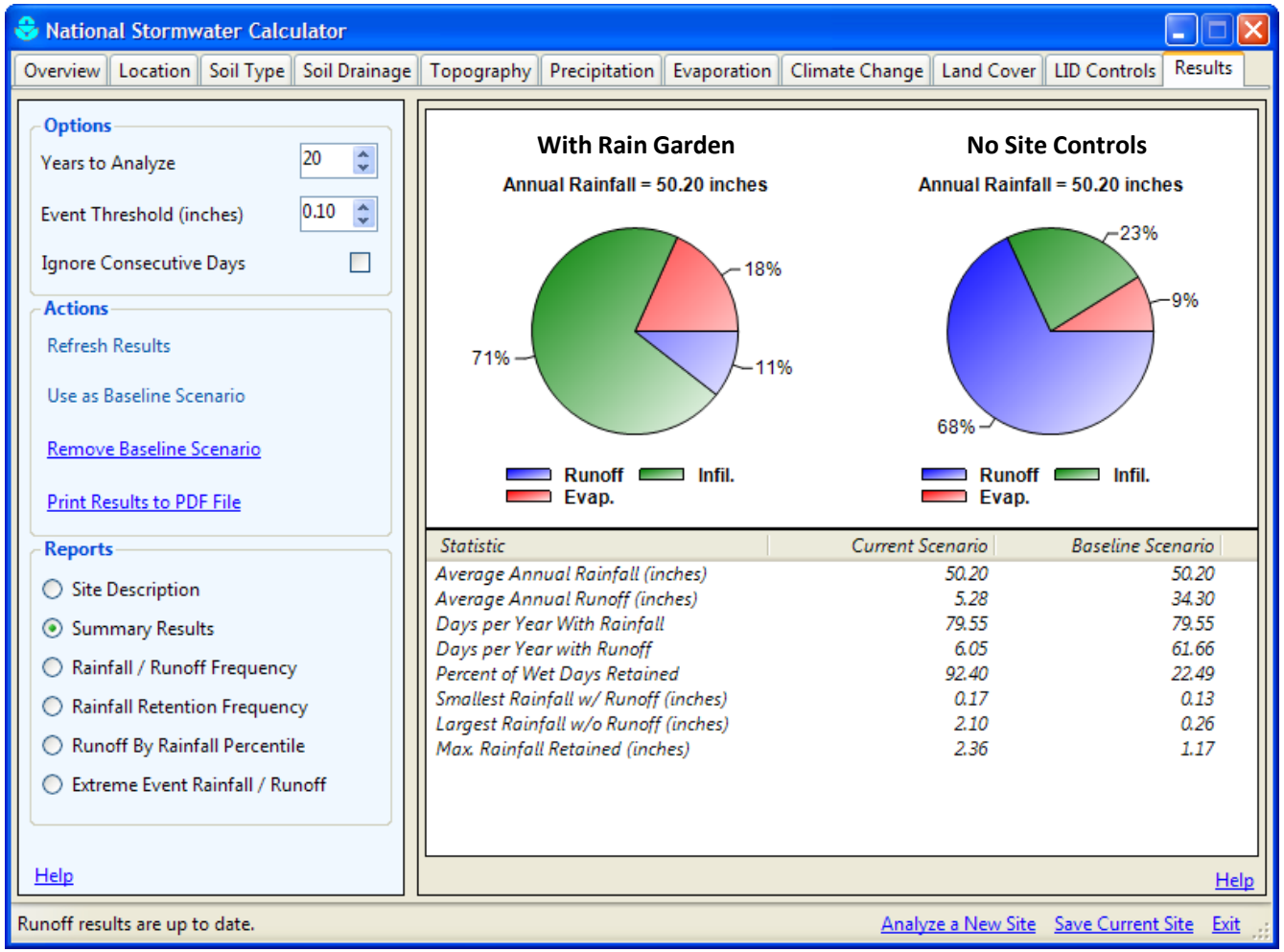
VA Health Center Example: Acquiring Site Data



VA Health Center Example: Adding LID Controls



VA Health Center Example: Viewing Results



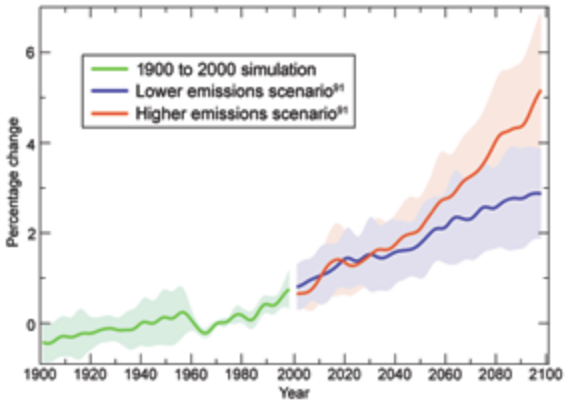
Climate Change Impacts on Urban Runoff

- The Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) states that the earth's climate is is unequivocally changing.

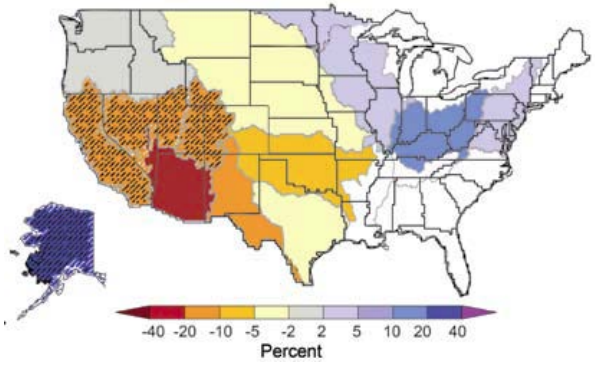
- The resulting impacts on small scale hydrology include:
  - changes in seasonal precipitation patterns
  - more frequent occurrence of high intensity storm events
  - changes in evaporation rates

- A climate change component has been added to the calculator to help assess how resilient source controls will be to future meteorological conditions.

Global Increase in Heavy Ppt. Events

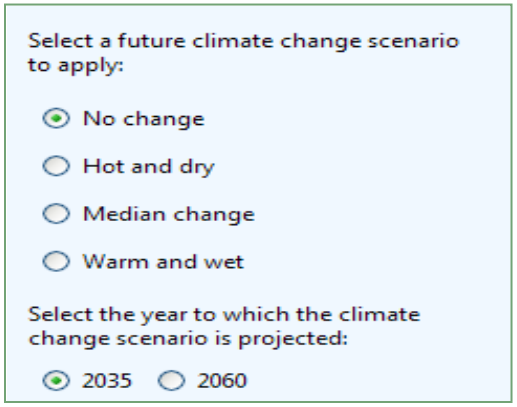


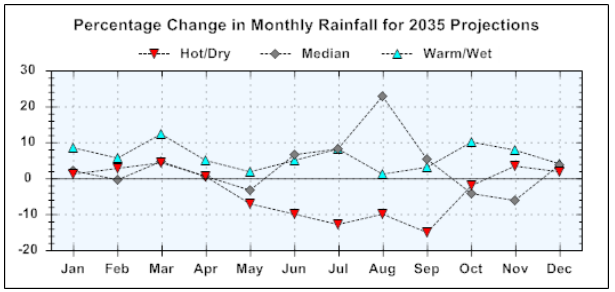
Projected Changes in Annual Runoff

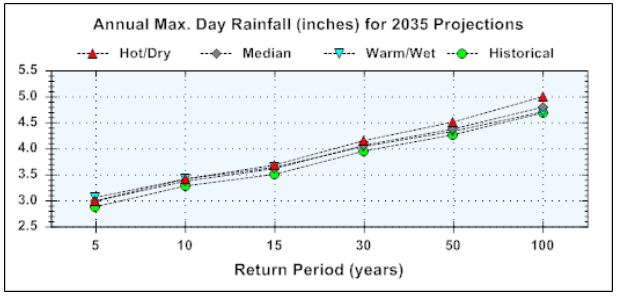


The Calculator's Climate Change Extension

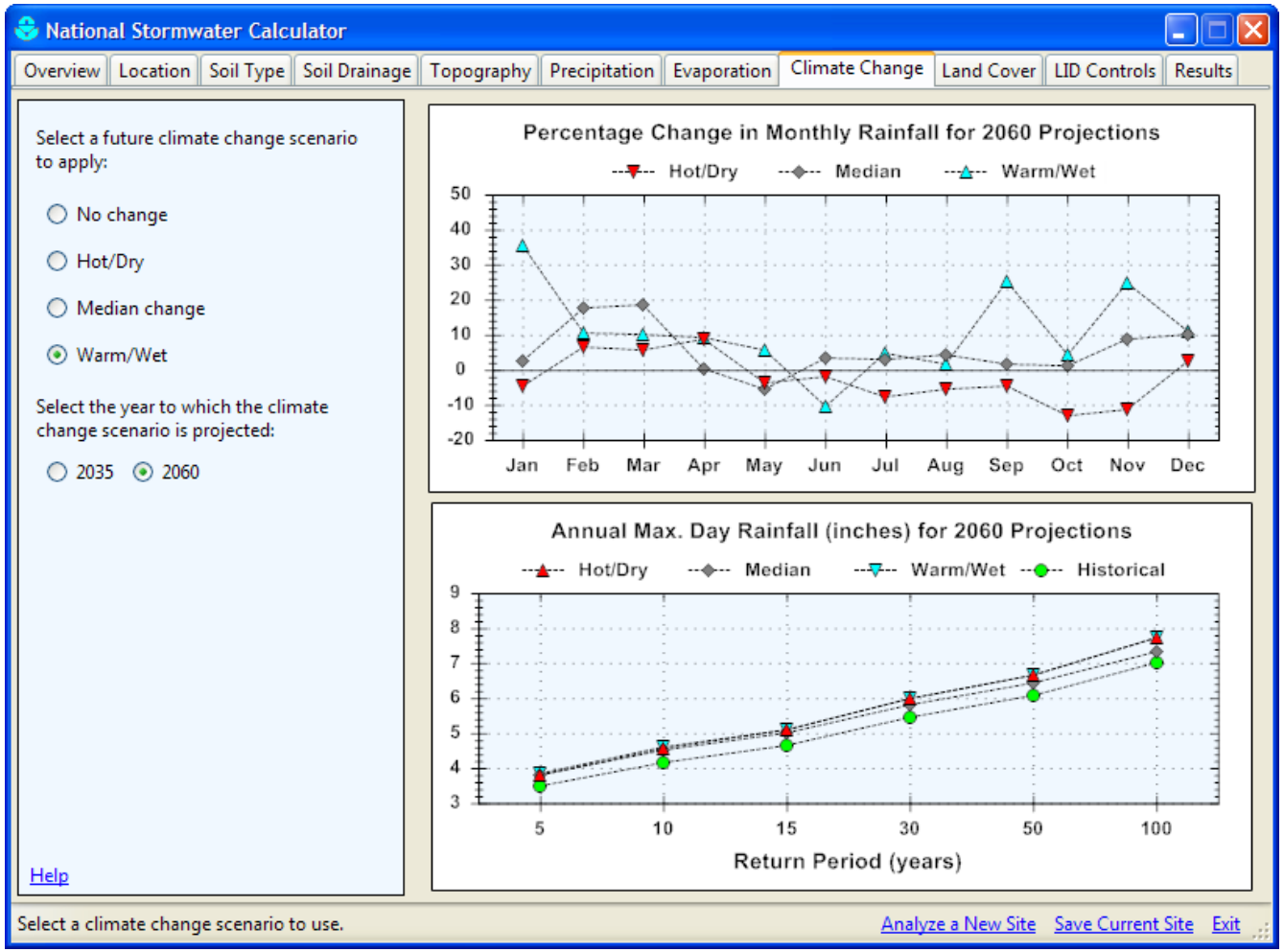
- Climate change scenarios are taken from EPA's CREAT tool and are based on downscaled CMIP3 GCM results used in the IPCC AR4.
- Calculates the long-term hydrologic response of the site to a rainfall record modified by the monthly mean changes.
- Also calculates the response of the site to the climate-induced max. 24-hour rainfall at different return periods.
- Will be part of the Climate Resilience Toolkit being developed as part of the President's Climate Action Plan.



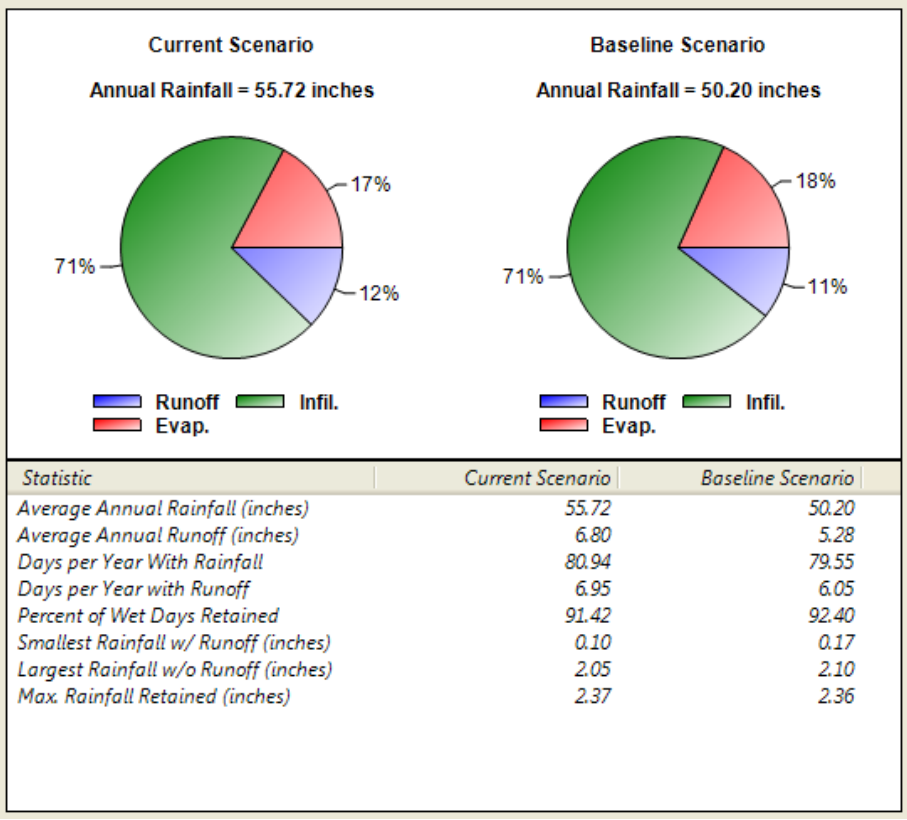




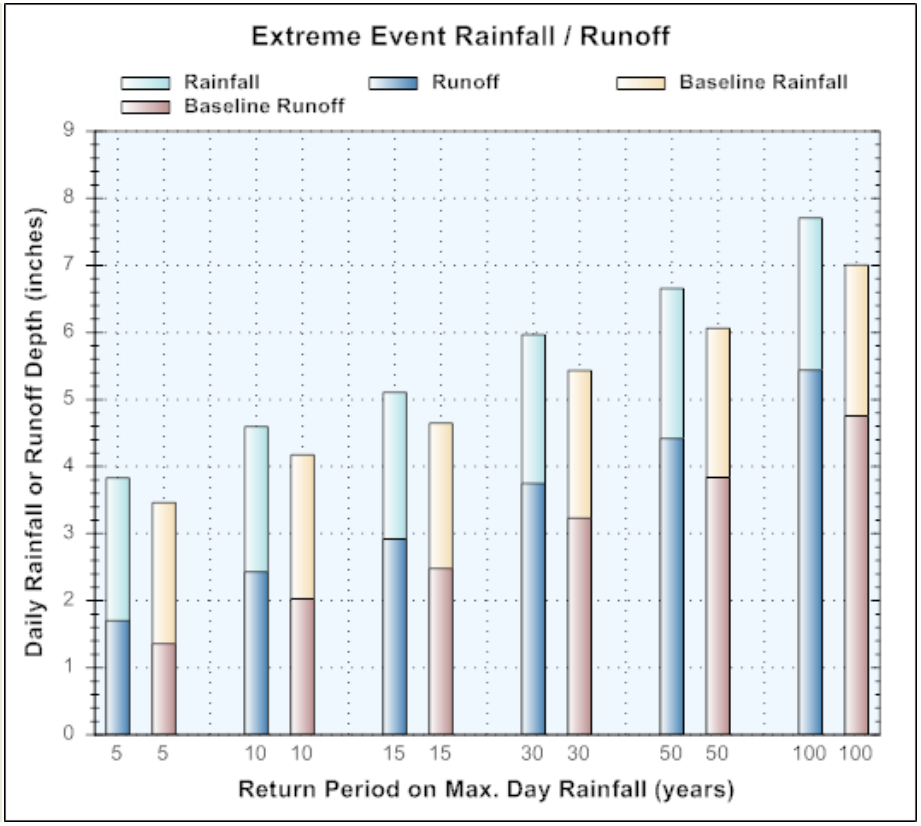
VA Health Center Example: Climate Change Scenarios



VA Health Center Example: Climate Change Impact



Statistic	Current Scenario	Baseline Scenario
Average Annual Rainfall (inches)	55.72	50.20
Average Annual Runoff (inches)	6.80	5.28
Days per Year With Rainfall	80.94	79.55
Days per Year with Runoff	6.95	6.05
Percent of Wet Days Retained	91.42	92.40
Smallest Rainfall w/ Runoff (inches)	0.10	0.17
Largest Rainfall w/o Runoff (inches)	2.05	2.10
Max. Rainfall Retained (inches)	2.37	2.36



Baseline = Historical Rainfall Scenario

Current = Future Rainfall Scenario

Future annual rainfall is 10% greater but results in only 1 more day per year with runoff. This rain garden was not sized to capture either historical or future extreme event storms.

Additional Items of Note About the Calculator

- Almost 10,000 downloads since the July release.
- Most interested parties appear to be local planning agencies, watershed groups, and consultants.
- Linked to on several state stormwater web sites.
- Featured in Region 1's Federal Facilities webinar and OW's Watershed Academy webinar (with almost 900 participants).
- Climate change extension scheduled for a January release.
- For additional information contact Lew Rossman (rossman.lewis@epa.gov).