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# Using Alternate Water Sources as Offsets in Water Neutral Development

**Mary Ann Dickinson**
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**Alliance for Water Efficiency**

Alliance for Water Efficiency

river NETWORK
connecting people · saving rivers

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# The Problem

- Many cities in North America are already challenged to meet their customer demands for water
- Growing population and economic growth will place even more pressure in arid and water-short areas
- As drought and water shortages occur, residents raise the issue about available water for new development when they are being restricted
- Some communities cannot accommodate growth with current water supplies

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## Some home building halted as counties react to water-rights case

Originally published December 10, 2016 at 1:52 pm | *Updated December 10, 2016 at 3:05 pm*

**As counties across Washington respond to a far-reaching state Supreme Court decision involving water rights, angry and frustrated property owners are finding they cannot depend on groundwater wells to build new homes as they have in the past.**

By PHUONG LE
*The Associated Press*

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As counties across Washington respond to a far-reaching state Supreme Court decision involving water rights, angry and frustrated property owners are finding they cannot depend on groundwater wells to build new homes as they have in the past.

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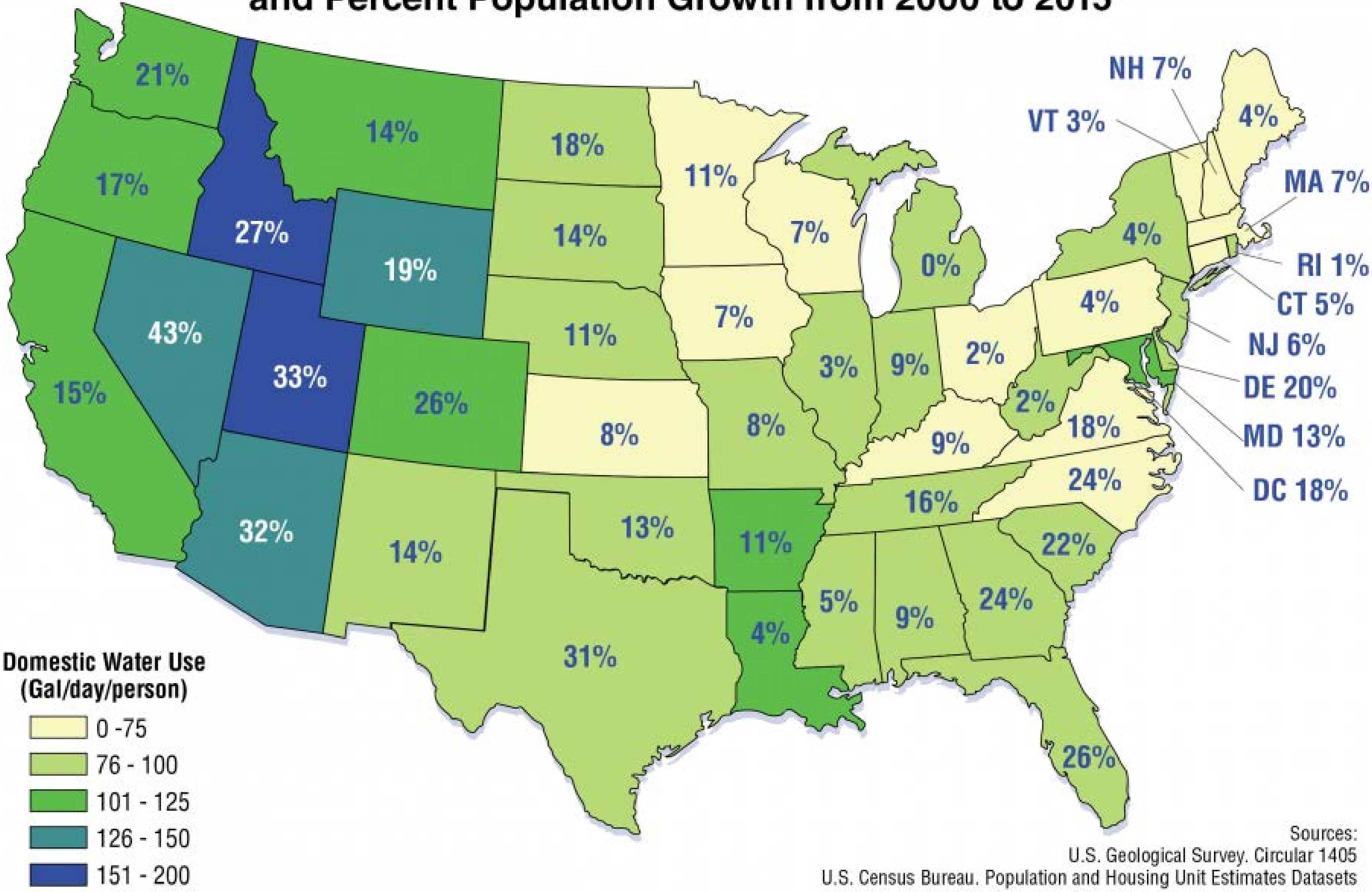
# Domestic Water Use in Gallons per Day per Person and Percent Population Growth from 2000 to 2015




Sources:
U.S. Geological Survey. Circular 1405
U.S. Census Bureau. Population and Housing Unit Estimates Datasets

# The Answer: Water Offsets

- Can allow growth without increasing system-wide water consumption across a community or a water supply service area
- Can be a combination of on-site water efficiency and off-site water efficiency
- Can reduce or completely eliminate impact of new development on water supply
- Can help avoid building moratoriums in resource-constrained communities

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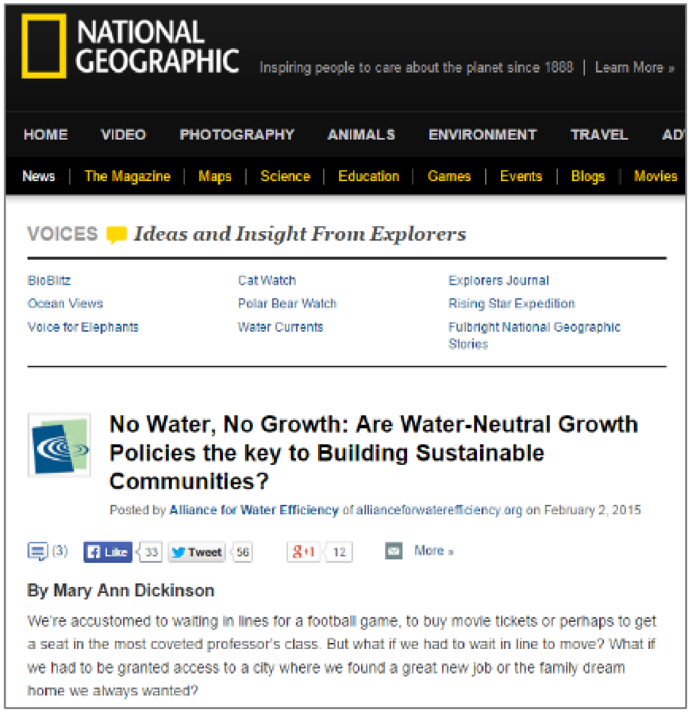
# Net Blue: Water-Neutral Growth

- 3-year project to create a national ordinance development tool that can be tailored to create a customized water demand offset approach
- Partners: AWE, Environmental Law Institute, and River Network
- Funders: Scherman Foundation, Paul Johanson Foundation, and the Metropolitan Water District of Southern California
- Worked with 7 partner cities to vet the approach



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**No Water, No Growth: Are Water-Neutral Growth Policies the key to Building Sustainable Communities?**

Posted by Alliance for Water Efficiency of allianceforwaterefficiency.org on February 2, 2015

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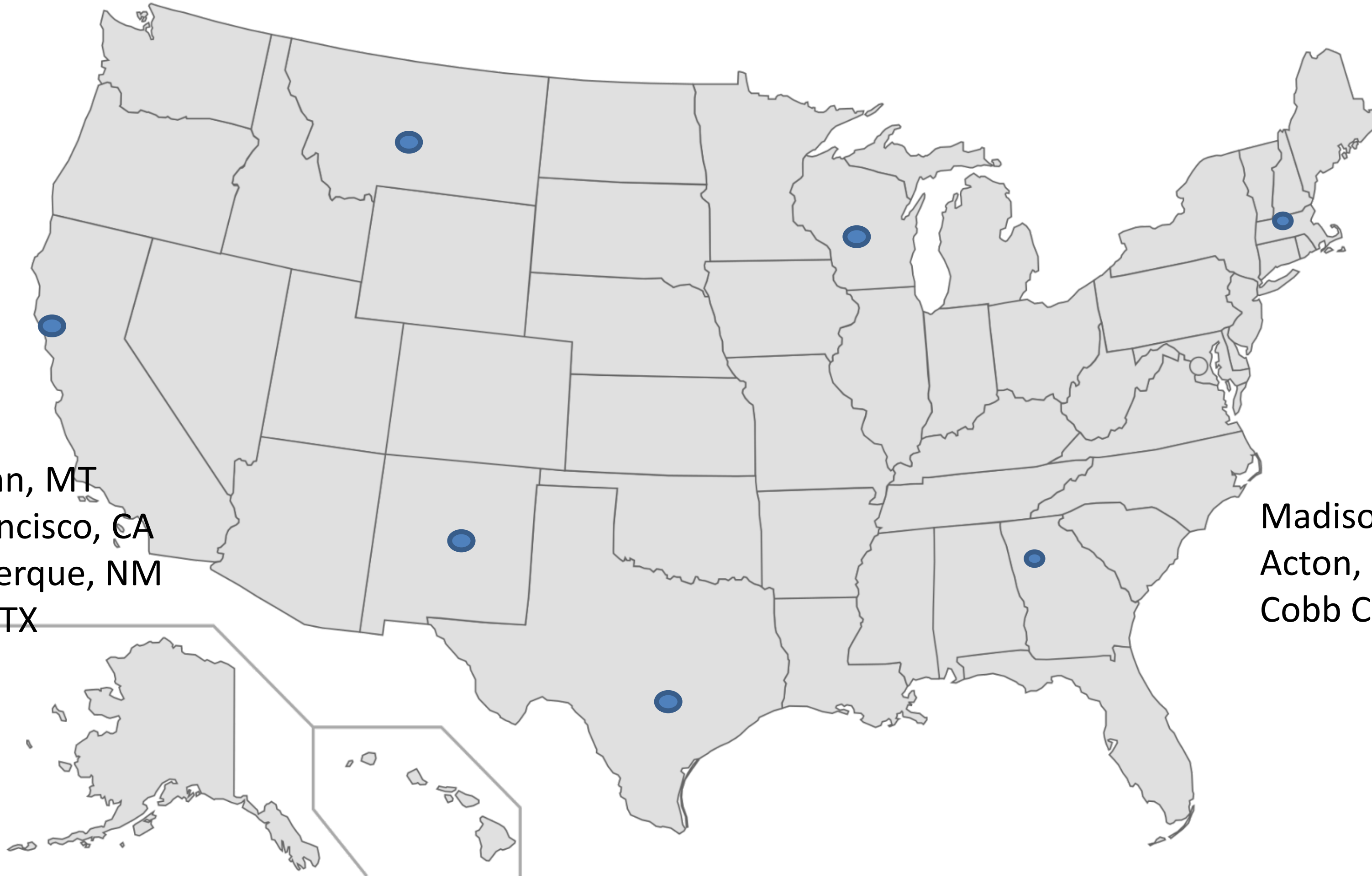
**By Mary Ann Dickinson**

We're accustomed to waiting in lines for a football game, to buy movie tickets or perhaps to get a seat in the most coveted professor's class. But what if we had to wait in line to move? What if we had to be granted access to a city where we found a great new job or the family dream home we always wanted?

# Net Blue Partner Communities



Bozeman, MT
San Francisco, CA
Albuquerque, NM
Austin, TX

Madison, WI
Acton, MA
Cobb County, GA

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# Net Blue Project Advisory Committee

1. Dave Anderson (Planning & Zoning)
2. Jacob Atalla (Builder)
3. Sarah Bates (Water law)
4. Bill Cesanek (APA Water Task Force)
5. Doug Farr (Sustainability architect)
6. Kyle Harwood (Offset ordinance attorney)
7. Paula Kehoe (City)
8. Cooper Martin (League of Cities)
9. Dwight Merriam (Developer attorney)
10. Brian Richter (Environmental expert)

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# Launched Toolkit 2017

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## Net Blue: Supporting Water-Neutral Growth

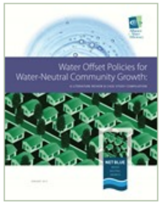
**Section:** Water and Land Use Planning


Net Blue is a collaborative initiative of the Alliance for Water Efficiency (AWE), the Environmental Law Institute (ELI), and River Network to support sustainable community growth. The project team members developed a model ordinance that communities can tailor and customize to create a water demand offset approach meeting local needs. Communities in different regions throughout the United States were consulted to help develop the model ordinance and the offset components, and to ensure that the program is adaptable to many different political climates, legal frameworks, and environmental challenges.

The Net Blue Project is divided into four parts:

**1. Initial Offset Research**

Report entitled, *Water Offset Policies for Water-Neutral Community Growth*, which reviewed 13 communities throughout the United States that currently have a water demand offset policy or water neutral growth policy in place. These policies require offsetting the projected water demand of new development with water efficiency measures to create a "Net Zero" or neutral impact on overall service area demands and water use. The report found that the most common scenario where this has been applied entails issuing building permits for development that requires offset of the new water use through both on-site water efficiency measures and replacement of inefficient fixtures in pre-existing facilities. In numerous California communities and in cities ranging from Santa Fe, New Mexico to Sharon, Massachusetts, water demand offset programs have been utilized to help enable new construction that likely would have been prohibited due to supply constraints. The report also contains a literature review related to this topic, and information on communities that had a water demand offset policy in the past.




**2. Model Ordinance**

A template for a model ordinance that requires or incentivizes offsetting the impact of new development's water use via water efficiency measures. ELI led the work on developing the model ordinance. Building on AWE's initial offset research report, ELI did the following: (1) Analyzed the legal language used in existing water offset ordinances; (2) Identified potentially useful supplemental language in other ordinances; (3) Assessed a variety of institutional configurations that may influence the adoption and implementation of a water offset ordinance; and (4) Examined legal opportunities for and constraints on expanding the concept to new places. The final work product resulted in a model ordinance worksheet, a user's guide, and three examples of customized ordinances. Due to the variety of circumstances that occur in a county, municipality, or utility, and the diversity of legal constraints and authorities that can dictate the form of such an ordinance, a "one size fits all" approach does not work in this context. Thus, the model ordinance is in the form of a

# Net Blue Toolkit

1. Model Ordinance Worksheet
2. Model Ordinance User Guide
3. Three Ordinance Examples
4. Offset Methodology Workbook
5. Offset Methodology User Guide
6. Three Offset Examples matching the ordinance examples
7. Outreach Materials

# Methodology Workbook

- Designed to help communities evaluate and select off-site offsets for development projects

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Offset Strategies

Selected Offsets

Res-Toilet Stock Estimate

Rainwater Harvesting

StormWater Calculator

**Net Blue** is a collaborative initiative of the Alliance for Water Efficiency, the Environmental Law Institute, and River Network to support sustainable community growth.

This tool accompanies the model ordinance template and is intended to help communities evaluate and select strategies to offset the projected potable water use of new development or expanded use of existing connections. This workbook is related to offsite offsets and does not include calculations to determine the demand of new development, including onsite demand reduction measures.

This workbook contains the following worksheets:

**Offset Strategies** – The *Offset Strategies* worksheet can be used to evaluate and select a suite of measures to offset the demand of new or expanded water use. It contains example offset strategies related to indoor water fixture and appliance replacements and retrofits. Custom offset strategies can also be entered by the user.

**Selected Offsets** – This worksheet contains table that can be used to compile selected offset strategies for a new or expanded water use project. It can also be used to tally offset implementation. It is populated based on selections made on the *Offset Strategies Worksheet*.

**Res-Toilet Stock Estimate** – This worksheet can be used to create a general estimate of the stock of inefficient toilets in a given service area if such an estimate does not already exist. This can be helpful to determine the potential for inefficient toilet replacements which is typically a cost-effective and reliable strategy that provides theoretically permanent water savings.

**Rainwater Harvesting** – This worksheet contains a calculator for estimating the yield of rainwater harvesting (RWH is assumed to be the rain that falls on building roofs; rain not on roofs is considered stormwater.) It carefully addresses how much of the harvested rainwater is used on-site (and thus reducing on-site potable water demand) and how much rainwater is used off-site to offset potable water demand offsite.

**Stormwater Calculator** – This worksheet contains information and links to the USEPA Stormwater Calculator. If stormwater is captured and can be distributed off-site use, then this volume of water would qualify as a potable water demand offsite.

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# Workbook Components

- New demand information
- Offset strategy evaluation
  - Water conservation strategies
  - Custom offsets
  - **Rainwater harvesting**
  - **Stormwater capture**
- Selected offsets worksheet
- Supplemental sheets
  - Inefficient toilet stock estimator
    - *Baths and Half Baths Housing Data*

# Offset Strategy Worksheet

## Offset Strategies Worksheet

This worksheet can be used to evaluate and select a suite of measures to offset the demand of new or expanded water use. It contains example offset strategies related to indoor water fixture and appliance replacements and retrofits. Cooling tower retrofits are also included. Additionally, the user can enter custom measures. Example savings estimates are provided for the included offsets, but the user is encouraged to evaluate savings of offset strategies in relation to their service area.

User inputs and selections are required in cells with a white background. Green cells do not require any input or selection.

Selecting "Yes" in 'Column J' will include the offset measure in the *Selected Offsets* worksheet as long a 'Column D' is populated with a savings estimate value.

**Step 1: Enter Information about New or Expanded Water Use**

| | | | |
|---|---|---|---|
| Project Name/Description | Example Development | | |
| Projected New Potable Water Demand of New or Expanded Use | 500,000.00 | Gallons per Year | *Select Gallons, Million Gallons, Acre-Feet, Litres or Megalitres per Year* |
| Does above estimate include adjustment for on-site rainwater harvesting? | No | | |
| Do you want to adjust potable demand for rainwater harvesting using RWH Calculator? | Yes | *Use the RWH Calculator to calculate the demand adjustment and export the result to cell below.* | |
| Estimated demand adjustment for on-site rainwater harvesting | 10,898.89 | *Gallons per Year* | |
| Are USEPA Stormwater calculator results used in this model? | Yes | | |
| Percent of New or Expanded Use that Must be Offset | 110% | | |
| Total Offset Requirement for New or Expanded Water Use | 538,011.23 | *Gallons per Year* | |

**Step 2: Enter Persons Per Household for the Service Area** (used to generate savings for toilet replacements)

| | |
|---|---|
| Service Area Average Persons Per Household Single-Family | 2.50 |
| Service Area Average Persons Per Household Multifamily | 2.00 |

**Step 3: Define and Select Water Demand Offset Strategies**

| Offset Strategy | Example Savings Estimate Per Replacement/Retrofit in Gallons per Year* | User Specified Savings Estimate Per Replacement/Retrofit in Gallons per Year | Approximate Number of Replacements/Retrofits to Meet Offset if Sole Strategy? | Related Plumbing Code? | Useful Life | Seasonality of Water Savings | Percent of Total Offset Requirement per Replacement/Retrofit | Include in Selected Offset Table? |
|---|---|---|---|---|---|---|---|---|
| Single-Family High-Efficiency Toilet Replacements | 9,541 | 9,500 | 57 | Yes | Theoretically Permanent | Even throughout year | 2% | No |
| Multifamily High-Efficiency Toilet Replacements | 16,472 | 15,000 | 36 | Yes | Theoretically Permanent | Even throughout year | 3% | No |
| Showerhead Replacement Single-Family | 2,062 | 2,050 | 262 | Yes | Theoretically Permanent | Even throughout year | 0% | No |
| Showerhead Replacement Multifamily | 1,898 | 1,800 | 299 | Yes | Theoretically Permanent | Even throughout year | 0% | No |
| Single-Family Clothes Washer Replacement | 7,043 | 7,000 | 77 | Yes | Theoretically Permanent | Even throughout year | 1% | No |
| Multifamily Clothes Washer Replacement | 25,310 | 25,000 | 22 | Yes | Theoretically Permanent | Even throughout year | 5% | No |
| CII Urinal Replacements or Retrofits | 6,206 | 6,000 | 90 | Yes | Theoretically Permanent | Even throughout year | 1% | No |
| CII High-Efficiency Toilet Replacements | 13,020 | 13,000 | 41 | Yes | Theoretically Permanent | Even throughout year | 2% | No |
| Laundromat Clothes Washer Replacements | 31,435 | 31,000 | 17 | Yes | Theoretically Permanent | Even throughout year | 6% | No |
| Commercial Dishwasher Replacements | 57,757 | 55,000 | 10 | No | 20 Years | Even throughout year | 10% | No |
| Pre-Rinse Spray Valve Replacements | 28,285 | 28,285 | 19 | Yes | Theoretically Permanent | Even throughout year | 5% | No |
| Commercial Food Steamer Installation | 81,500 | 81,500 | 7 | No | 10 Years | Even throughout year | 15% | No |

Intro | Offset_Strategies | Selected_Offsets | Res_Toilet_Stock | RWH_Calculator | Stormwater_Calculator | RWH 1C ...

# Offset Strategy Worksheet

## Offset Strategies Worksheet

This worksheet can be used to evaluate and select a suite of measures to offset the demand of new or expanded water use. It contains example offset strategies related to i retrofits. Cooling tower retrofits are also included. Additionally, the user can enter custom measures. Example savings estimates are provided for the included offsets, but t strategies in relation to their service area.

User inputs and selections are required in cells with a white background. Green cells do not require any input or selection.

Selecting "Yes" in 'Column J' will include the offset measure in the *Selected Offsets* worksheet as long a 'Column D' is populated with a savings estimate value.

### Step 1: Enter Information about New or Expanded Water Use

| | | | |
|---|---|---|---|
| Project Name/Description | Example Development | | |
| Projected New Potable Water Demand of New or Expanded Use | 500,000.00 | Gallons per Year | *Sel* |
| Does above estimate include adjustment for on-site rainwater harvesting? | No | | |
| Do you want to adjust potable demand for rainwater harvesting using RWH Calculator? | Yes | ***Use the RWH Calculator to calculate the demand adjust*** | |
| Estimated demand adjustment for on-site rainwater harvesting | 10,898.89 | ***Gallons per Year*** | |
| Are USEPA Stormwater calculator results used in this model? | Yes | | |
| Percent of New or Expanded Use that Must be Offset | 110% | | |
| Total Offset Requirement for New or Expanded Water Use | 538,011.23 | ***Gallons per Year*** | |

# Offset Strategy Worksheet

**Step 3: Define and Select Water Demand Offset Strategies**

| Offset Strategy | Example Savings Estimate Per Replacement/Retrofit in Gallons per Year* | User Specified Savings Estimate Per Replacement/Retrofit in Gallons per Year | Approximate Number of Replacements/Retrofits to Meet Offset if Sole Strategy? | Related Plumbing Code? |
|---|---|---|---|---|
| Single-Family High-Efficiency Toilet Replacements | 9,541 | 9,500 | 57 | Yes |
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| CII High-Efficiency Toilet Replacements | 13,020 | 13,000 | 41 | Yes |
| Laundromat Clothes Washer Replacements | 31,435 | 31,000 | 17 | Yes |
| Commercial Dishwasher Replacements | 57,757 | 55,000 | 10 | No |
| Pre-Rinse Spray Valve Replacements | 28,285 | 28,285 | 19 | Yes |
| Commercial Food Steamer Installation | 81,500 | 81,500 | 7 | No |
| Cooling Tower Retrofits | 209,880 | 180,000 | 3 | No |
| Harvested rainwater on sites **other** than the development property | NA | | NA | No |
| Surplus harvested rainwater from sites **other** than the development property | NA | | | No |
| Surplus harvested rainwater from the development property | NA | 15,572 | | No |
| Stormwater Capture and Use (Off-site) | 30,120 | | - | No |
| Custom Offset (to be entered by user) | - | - | - | |
| Custom Offset (to be entered by user) | - | - | - | |
| Custom Offset (to be entered by user) | - | - | - | |
| Custom Offset (to be entered by user) | - | - | - | |
| Custom Offset (to be entered by user) | - | - | - | |
| Custom Offset (to be entered by user) | - | - | - | |
| Custom Offset (to be entered by user) | - | - | - | |
| Custom Offset (to be entered by user) | - | - | - | |

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# Selected Offset Table

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## Selected Offsets

Update Selected Offsets Table

This worksheet contains an auto-populating table based on user selections made in the *Offset Strategies* worksheet. The table can be populated using the "Update Selected Offsets Table" button to the right of the Net Blue logo. The user manually enters the implementation value (e.g., number of toilet replacements) in 'Column D.' The 'Percent of Total Offset Requirement' column is automatically calculated after the user specifies implementation. If changes are made in the *Offset Strategies* worksheet, the user must update the selected offsets table using the "Update Selected Offsets Table" button.

| Offset Strategy | Savings Per Unit in Gallons per Year | Number to be Implemented | Percent of Total Offset Requirement |
|---|---|---|---|
| Single-Family High-Efficiency Toilet Replacements | 9,500 | 15 | 13% |
| Multifamily High-Efficiency Toilet Replacements | 15,000 | 10 | 13% |
| Single-Family Clothes Washer Replacement | 7,000 | 10 | 6% |
| Multifamily Clothes Washer Replacement | 25,000 | 5 | 11% |
| CII Urinal Replacements or Retrofits | 6,000 | 10 | 5% |
| CII High-Efficiency Toilet Replacements | 13,000 | 10 | 12% |
| Pre-Rinse Spray Valve Replacements | 28,000 | 10 | 25% |
| Rainwater Harvesting (Off-site) | 155,722 | 1 | 14% |
| **Total** | | | **100%** |

Intro | Offset_Strategies | Selected_Offsets | Res_Toilet_Stock | RWH_Calculator | Stormwater_Calculator | RWH 10 ...

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# Rainwater Harvesting Calculator

- Calculates the amount of harvested rainwater available for on-site and off-site use
- Simulates daily cistern performance over 10-year period using weather data you import into the model
- Estimates potential on-site uses for landscape irrigation and indoor plumbing
- Calculates surplus harvested rainwater available for off-site uses
- Four steps to setup and use the calculator

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# Rainwater Harvesting Calculator

## Rainwater Harvest Calculator

This calculator can be used to estimate potential demand offsets from rainwater harvesting and use by a residential or non-residential development fitted with a rainwater collection and storage system (or multiple systems). Three potential demand offsets are estimated: (1) onsite irrigation demand, (2) onsite indoor plumbing demand, and (3) unspecified offsite demand. The calculator simulates daily rainwater collection, storage, and use over a 10-year period using weather data you import into the workbook. There are four steps to setup and use the calculator. The instructions on this worksheet will guide you through each step. Additional information about the calculator is available in the User Guide. The four steps are:

1. Import the weather data.
2. Enter information about onsite landscaping that would potentially use water from the rainwater collection and storage system for irrigation.
3. Enter information about indoor plumbing fixtures that would potentially use water from the rainwater collection and storage system for their operation.
4. Enter information on the design of the rainwater collection and storage system.

**Step 1: Import the weather data**

*Note: to complete this step your computer must be connected to the internet.*

In this step you will download the weather data used by the calculator to simulate rainwater collection and storage system performance. To download the data you will need to know the latitude, longitude, and elevation of the location where the rainwater collection and storage system would be installed. Enter these values in the indicated cells below. If you do not know these values, click on this link: Get Latitude, Longitude, and Elevation. Use the navigation features on the map on the webpage to locate your site. Once you have located your site on the map, use your mouse's pointer and click the location. Copy the latitude and longitude coordinates and the elevation.

| | | |
|---|---|---|
| Latitude | 38.600 | |
| Longitude | -121.500 | |
| Elevation | 20 | Feet |

Now you are ready to download the weather data. Click this link to go to the website with the data you will download: Get weather data. On this webpage you complete five steps to download the weather data for your site. Screen shots of each step are shown to the right of this text box. Follow these steps exactly. The calculator will not import the data unless it is formatted correctly.

STEP ONE: Set 'Select Frequency of Desired Data:' to **daily data**; set 'Select Scenario:' to **historical (1950-2005)**; set 'Min Year:' on the left to **1996** and the one on the right to **2005**.
STEP TWO: Enter your latitude (N) and longitude (E) values in the indicated fields. You can use the map on the webpage to confirm the coordinates correspond to your site location.
STEP THREE: Set the number of variables for CSV columns to **7**.
STEP FOUR: Set the first row of columns 2-7 to **MACAv2-METDATA (Climate)**. Set the first row of column 8 to **MACAv2-LIVNEH (Climate)**. See the example to the right.
Set the second row of all the columns to **GFDL-ESM2M (USA)**
Set the third row of the columns as follows: **col 2** pr(Precipitation), **col 3** rsds(Downwelling Solar Radiation), **col 4** tasmax(Max Temperature), **col 5** tasmin(MinTemperature), **col 6** rhsmax(Max Rel Humidity), **col 7** rhsmin(Min Rel Humidity), **col 8** was(Wind Speed).
*Warning: The columns must be specified exactly as described above or the calculator will not import the data.*
STEP FIVE: Click the button **DOWNLOAD CSV**. A csv formatted file with the data will download to your default download folder. The default file name is 'data.csv.' However, if there is already a file in your default download folder with this name, a number in parentheses will be appended to the file name, like 'data (1).csv."

Now you can import the weather data into the workbook. Click the 'Import Weather Data' button to the right and use the File Explorer to navigate to the data file you downloaded. It will be located in your default download folder, which is probably a folder named 'Downloads.' Once you have navigated to the folder with the file, highlight the file and click the Open button. If the data is imported successfully, you will receive a message telling you this. Otherwise you will receive a message telling you the data could not be imported and to try downloading and importing the data again.

Import Weather Data

# Rainwater Harvesting Calculator Step 2

**Step 2: Enter information about site landscaping that would potentially be irrigated with harvested rainwater**

In this step you will enter information on the area and type of landscaping that would potentially be irrigated with harvested rainwater on the site of the rainwater collection and storage system. The calculator will combine this information with the weather data you imported in Step 1 to calculate daily landscape irrigation requirement over the 10-year simulation period.

First enter the months that define the irrigation season. If irrigation occurs year round, enter Jan as the starting month and Dec as the ending month. Next enter the total landscaped area that would potentially be irrigated with harvested rainwater in the specified units (sq. ft. or sq. meters). Now use the Plant Type table to enter the percentage of total landscaped area that will be planted to each type of landscaping. Irrigation water demand depends on the distribution uniformity (DU) of the irrigation system. The calculator uses a default distribution uniformity of 75%. You can adjust this value to between 60% and 90%. Irrigation water demand is inversely related to DU -- the higher the DU, the lower the water requirement. Values below 70% indicate problems with the irrigation system. Values between 70% and 90% indicate acceptable performance. Values above 90% indicate exceptional performance. It is virtually impossible to attain 100% DU in practice. Irrigation water demands are calculated using the SLIDE method. Click this link for more information on the SLIDE method for estimating irrigation water demand: Take me to the SLIDE webpage.

**Irrigation Water Demand Parameters**

| | Starting Month | Ending Month | |
|---|---|---|---|
| Irrigation Season | Mar | Oct | Month Range Okay |
| Total area irrigated | 3,000 | Sq.Ft. | |

| Plant Type | % of Area | Distrib. Uniformity | Plant Factor |
|---|---|---|---|
| General Turfgrass Lawns, cool-season (tall fescue, Ky. bluegrass, rye, bent) | 50% | 75% | 0.8 |
| General Turfgrass Lawns, warm-season (bermuda, zoysia, St, Augustine, buffalo) | 0% | 75% | 0.6 |
| Trees, Shrubs, Vines, Groundcovers | 25% | 75% | 0.5 |
| Herbaceous Perennials | 10% | 75% | 0.5 |
| Annual Flowers & Bedding Plants | 5% | 75% | 0.8 |
| Home Fruit and Vegetable Crops | 0% | 75% | 1.0 |
| Desert Adapted Plants | 10% | 75% | 0.3 |
| Total/Avg | 100% | 75% | 0.645 |

Sum Check Okay

# Rainwater Harvesting Calculator Step 3

**Step 3: Enter information about plumbing fixtures that would potentially use water from the rainwater collection and storage system for their operation**

In this step you will enter information about onsite plumbing fixtures that would potentially be operated with water from the rainwater collection and storage system. You specify the plumbing fixture uses for a residential or non-residential site. If no such uses are contemplated, select 'None' for type of site. If you are modeling a non-residential site, you can choose from three types: (1) commercial/industrial facility, (2) school/museum/etc., or (3) retail store(s). After selecting the type of site, enter the average number of residents, employees, students/visitors, or customers for the site. Next, use the check boxes to select the plumbing fixtures that would potentially be operated with water from the rainwater collection and storage system and then enter the daily fixture utilization and water use values. You can copy the recommended values or enter your own. Lastly, enter the daily water use for any other potable water demands that would potentially be served with water from the rainwater collection and storage system. If none, enter zero or leave blank.

**Select type of site**

Residential

| | |
|---|---|
| Avg persons per household | 2.50 |

**Select plumbing fixtures that would potentially be operated with water from the rainwater collection and storage system**

☑ Toilets ☑ Clothes Washer

**Enter daily plumbing fixture utilization**

| | User Value | Recommended Value |
|---|---|---|
| Toilet flushes/person/day | 4.75 | 4.75 |
| Clothes washer loads/person/day | 0.3 | 0.3 |

**Enter fixture water use**

| | User Value | Recommended Value | |
|---|---|---|---|
| Toilet water use per flush | 1.28 | 1.28 | gallons/flush |
| Clothes washer water use per load | 31 | 31 | gallons/load |

**Daily calculated water use**

| | User Estimate | Recommended Estimate | |
|---|---|---|---|
| Toilets | 15 | 15 | gallons/day |
| Clothes washer | 23 | 23 | gallons/day |
| Other potential water use | 0 | 0 | gallons/day |
| **Total** | **38** | **38** | gallons/day |

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# Rainwater Harvesting Calculator
# Step 4

**Step 4: Enter design information for the rainwater collection and storage system**

In this step you enter design information for the rainwater collection and storage system. Two types of information are needed: (1) the drainage area that will harvest rainwater and (2) the cistern design for storing harvested rainwater. The drainage area consists of roof and other impervious areas that will drain to the cistern. You can specify either a cylindrical or rectangular cistern. If you specify a rectangular cistern, you will enter its length, width, and depth. If you specify a cylindrical cistern, you will enter its diameter and depth. If your cistern design is oddly shaped, simply choose either rectangular or cylindrical and parameterize it so that the resulting volume matches the volume of your cistern design. The proposed cistern size should be sufficient to store a minimum of 0.25 inches of rainfall per square foot (0.635 cm of rainfall per square meter) of drainage area. You will be alerted if this is not the case.

| | User Value | Recommended Value | |
|---|---|---|---|
| Average runoff coefficient | 0.85 | 0.85 | *Recommend 0.85 for roofs.* |

| | | |
|---|---|---|
| Cistern drainage area | 2,500 | square feet |
| Cistern shape | Cylindrical | |
| Cistern diameter | 5 | feet |
| Cistern depth | 9 | feet |
| N/A. Does not apply to cylindrical shapes | | |

Cistern volume check okay

| | | |
|---|---|---|
| Cistern footprint area | 20 | square feet |
| Cistern volume | 177 | cubic feet |
| Cistern volume | 1,322 | gallons |

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# Rainwater Harvesting Calculator Results

**Simulation Results**

Enter the number of sites that will have the rainwater collection and storage system installed. The results of the rainwater harvesting simulation are summarized below. The first table shows the average annual onsite demand that would potentially be supplied by harvested rainwater. The second table shows the average annual harvested rainwater used onsite and the percent of onsite demand served. The third table shows the average annual amount of harvested rainwater overflow that could potentially be used offsite. The fourth table shows the monthly averages for rainfall, captured runoff, onsite demand, onsite use, and overflow for offsite use. You can also review the daily simulation for the entire 10-year period on the RWH 10-yr Simulation worksheet.

To use the simulation results on the Offset_Strategies worksheet, enter the number of systems that will be installed, use the drop-down to indicate if these systems will be installed on the development property or a different property, and click the 'Export Results to Offset_Strategies Worksheet' button.

| | |
|---|---|
| Enter the number of structures that will have this rainwater collection and storage system | 20 |

**Use drop-down to select where system(s) will be installed**

On the development property

**Average annual onsite demand potentially supplied by harvested rainwater**

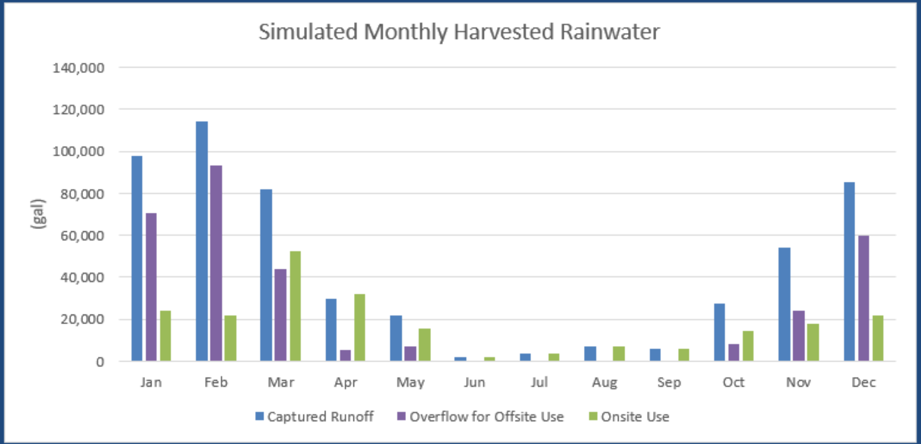
| | | |
|---|---|---|
| Landscape irrigation | 2,149,666 | gallons |
| Indoor plumbing | 280,839 | gallons |
| **Total** | **2,430,505** | gallons |

**Average annual harvested rainwater used onsite**

| | | |
|---|---|---|
| Site demand met with harvested rainwater | 217,978 | gallons |
| % of site demand met with harvested rainwater | 9.0% | |

**Average annual harvested rainwater overflow available for offsite use**

| | | |
|---|---|---|
| Harvested rainwater overflow available for off-site use | 311,444 | gallons |




Simulated Monthly Onsite Demand Met with Harvested Rainwater

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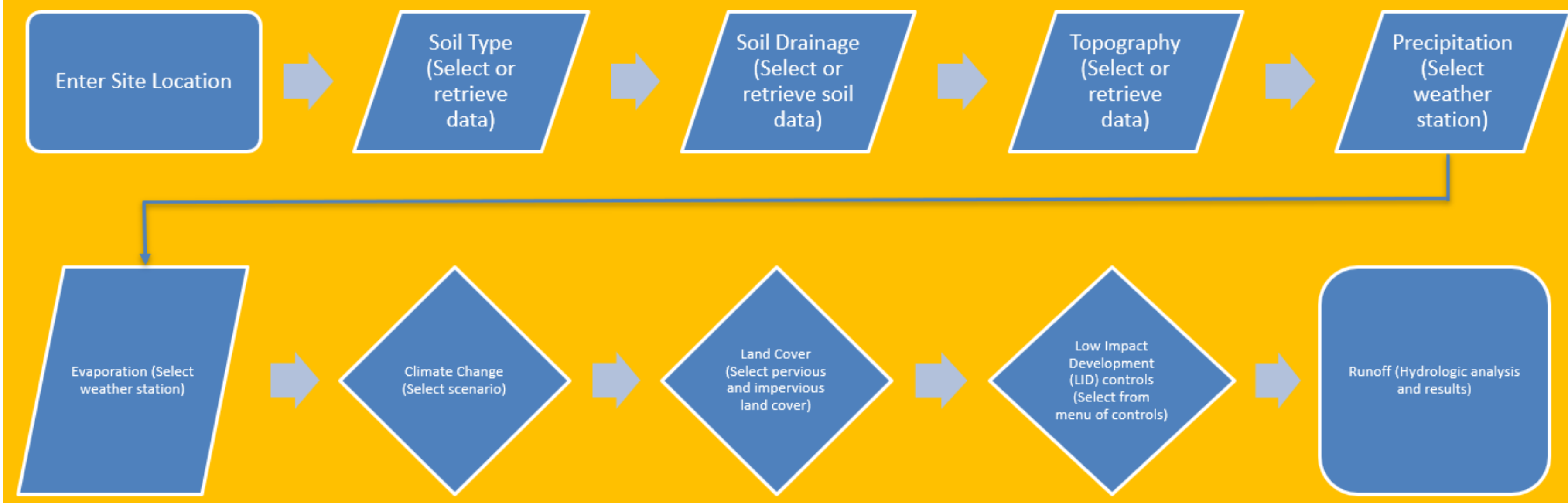
# Stormwater Calculator

[Click for link to EPA: National Stormwater Calculator]

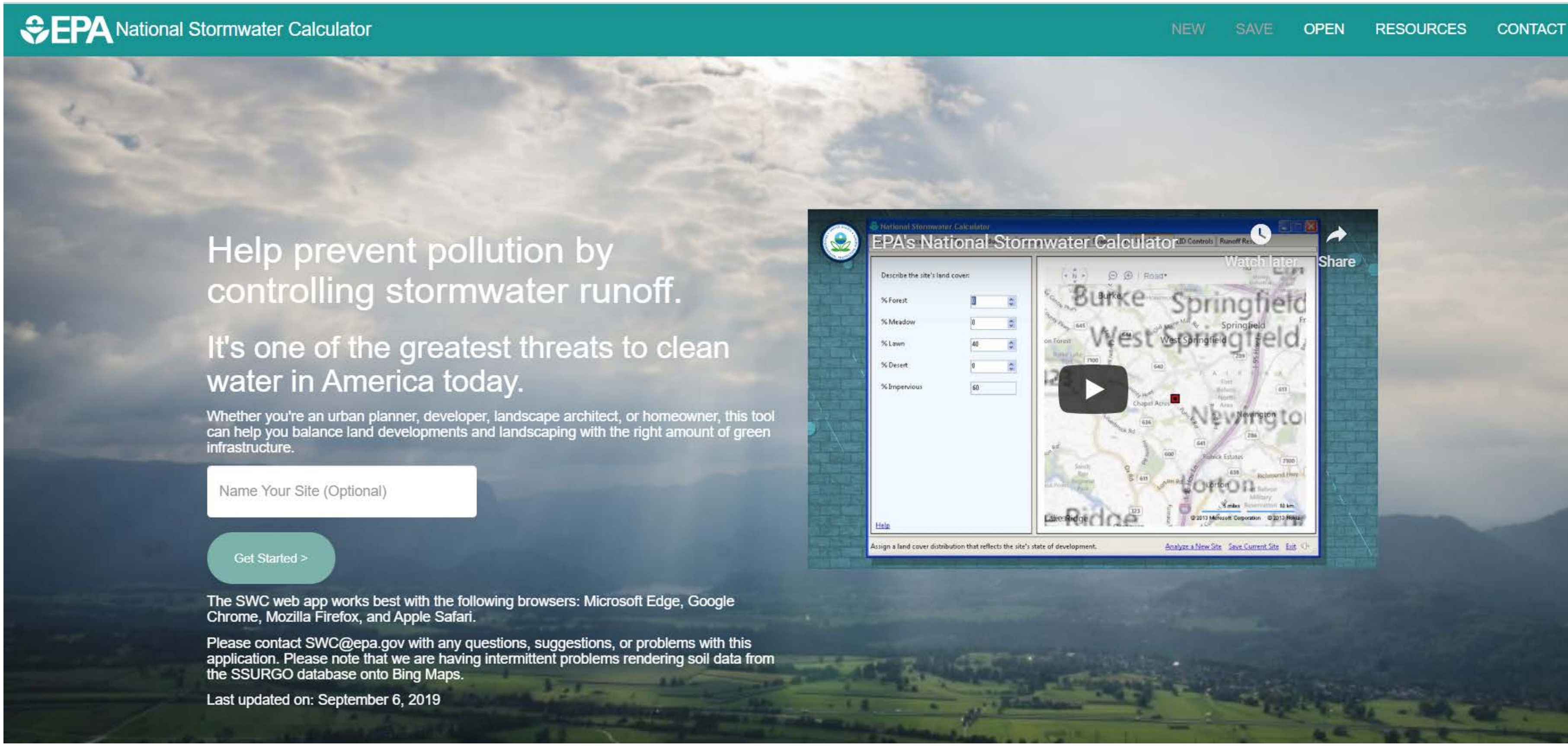
Conceptual Model of EPA National Stormwater Calculator




| | | |
|---|---|---|
| Are USEPA Stormwater calculator results used in this model? | Yes | Values below linked to Offset_Strategies |

| | | | |
|---|---|---|---|
| Enter output from National Stormwater Calculator: | Area: | 2.00 | acres |
| | Runoff (inches) Current Scenario: | 6.13 | inches annual runoff |
| | Proportion of Runoff the will be used off-site | 50% | |

# EPA Stormwater  Calculator

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# Example #3: Parker County Council

- County government with anticipated surface water shortage
- Offsets required of all site plan approval requests
- Compliance required 90 days after application approval
- Monitoring required
- Offset amount 100%
- No in-lieu fee option

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# Example #3:  Offset

- New Beer Brewery
- Projected annual water demand:  1.75 million gallons
- Required Offset amount:  100%
- Offset strategy: On-site rainwater harvesting project to flush toilets and single-family toilet replacements
- Offset amount: 100% of toilet flushing with rainwater; 330,150 excess gallons per year to be used as off-site credit;  129 single family toilet replacements

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# Outreach Materials

- Fact Sheet
- Frequently Asked Questions
- All outreach items online
- Requests for toolkit online

NET BLUE Frequently Asked Questions

A collaborative initiative of the Alliance for Water Efficiency, the Environmental Law Institute, and River Network
www.net-blue.org

1. What is Net Blue?

"Net Blue" is an approach to keep water use at the same or reduced levels as a community continues to develop. This concept of "water neutral" growth is achieved by integrating land use planning and water management to require or incentivize water use offsets (e.g., water efficiency retrofits) that will equal or exceed the additional demand of new development or redevelopment (residential and commercial). By choosing to adopt an ordinance or incentive that requires or encourages this approach, communities can stretch their water supplies, decrease the need for new infrastructure, and help ensure more water for fish, wildlife and recreation as well as provide other benefits. The Net Blue team has created a model ordinance toolkit to assist communities interested in tailoring this approach for their specific needs and context at www.net-blue.org.

2. Why might my community be interested in adopting Net Blue?

There are many benefits to Net Blue. Communities with high growth and stressed water supplies are finding that water scarcity is affecting their economic development potential. Water demand offset policies thus offer communities a meaningful and sustainable way to enable population and economic growth without increasing overall water demands in a utility service area. Making sure that additional development does not further increase demand for highly treated water will reduce the need to pump and treat additional water and the need for new withdrawals from local water sources, and thus reduce expenses for the community. Another benefit of Net Blue is to defer new and costly infrastructure investment. Water efficiency is often the least expensive form of new supply, especially when compared to developing new reservoirs, diversions or other infrastructure. Even in communities that are not immediately water-stressed, reducing water use helps to build in additional resilience for the future by stretching existing supplies. Net Blue also can benefit recreation and fish and wildlife by keeping more water flowing in streams and rivers.

3. How can Net Blue benefit local streams and rivers and other freshwater resources?

In many places, rivers, streams, groundwater and other waterbodies are suffering from depletion when the amount of water withdrawn is greater than the amount returned. When this happens, fish, wildlife, recreation and downstream communities all suffer. Using a Net Blue approach can help to prevent further depletion of our rivers, streams and aquifers by reducing the current amount of water withdrawn or preventing the need for increased withdrawals. Although this approach may not automatically translate into more water for our rivers, it is one important tool in the toolbox to reduce demand for highly treated water, taking some pressure off of our waterways and groundwater resources.

www.net-blue.org

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# For More Information and to order the Net Blue Toolkit, visit: www.net-blue.org

Alliance for Water Efficiency

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**http://www.allianceforwaterefficiency.org/net-blue.aspx**