

WATER UTILITIES

Customer

Aurora Water Conservation

Challenge

Aurora needed to modernize its manual processes to be more efficient and support the growth of the recommended water use program.

Solution

ArcGIS® Pro; automation using ArcPy™, R, and VBA

Result

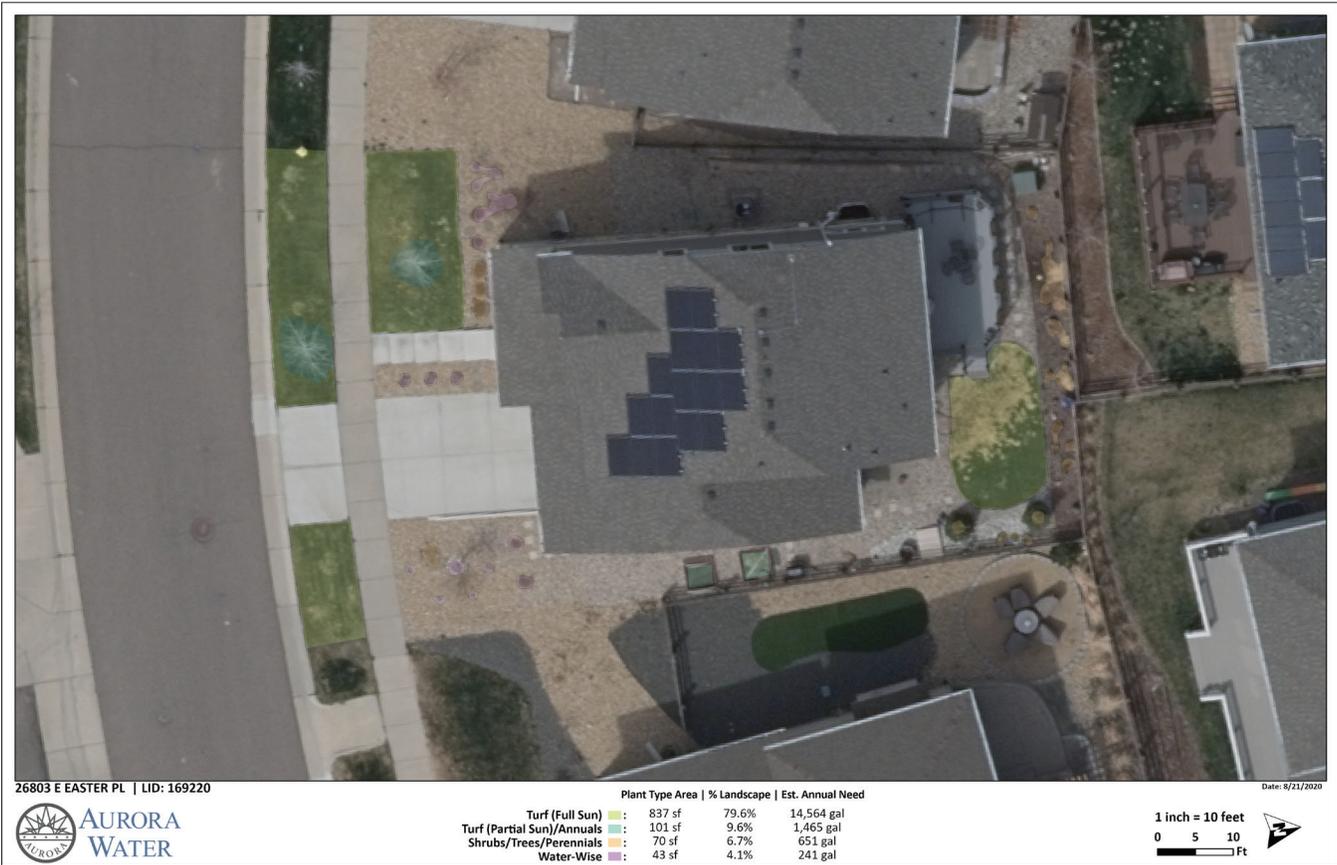
Conservation program participants saved over 12 million gallons of water.

Aurora Water Provides Personalized Water Use Recommendations to Customers

Aurora is the third-largest city in Colorado, home to approximately 374,000 people and growing rapidly. Receiving only 15 inches of precipitation per year, its semiarid climate makes water conservation a key issue for both the city and the region. The city has a permanent water efficiency management plan in place and a robust water conservation office with eight full-time staff members and more than 15 programs. Customers are encouraged to reduce their water usage via rebates and assessments, outreach and education, and enforcement of watering restrictions. The Know Your Flow recommended water use program ties together several of these strains of conservation by allowing customers to monitor their water usage and track their efficiency compared to a customized, data-driven benchmark.

Challenge

Know Your Flow began as part of a budget-based rate study in January 2017. The program started with 275 voluntary participants and has since grown to over 1,500 participants. Customers receive monthly emails comparing their household's actual water usage to data-driven recommended usage customized for their property. The



recommended usage calculation is based on the number of residents, weather data corresponding to the billing period, and the square footage of turf and water-wise vegetation.

Know Your Flow calculations are performed for both outdoor and indoor recommended use. An efficient baseline of 41 gallons per person per day (1,250 gallons per person, per month) generates the indoor recommended use, while the outdoor recommended use is calculated based on the square footage of the two different landscape types. The square footage is captured using aerial photos in ArcGIS Pro and multiplied by the plant water requirements, which are based on the watering coefficient for each vegetation type and the weather conditions during the customer’s billing period. Customers also receive weekly watering recommendations and tips during the irrigation season, based on weather data from the station closest to the customer’s address.

Due to the complexities of the recommended water use calculation and the rapid growth of the program, Aurora Water Conservation staff have found a need to automate and streamline many program elements. Previously, property site maps were created and exported manually, and all data preparation and recommended water use calculations were handled through a series of Excel operations that required significant manual work. Staff needed a more efficient way to manage the program.

Solution

The Know Your Flow program is multifaceted, with GIS as a key component. ArcGIS Pro, ArcPy scripts, and map series support the collection of vegetation cover measurements and the creation of site maps.

To streamline the creation of customer site maps, a custom ArcPy script is used to generate site map PDFs by using



AURORA WATER

conservation

Dear _____,

Your residence's monthly water use information is summarized below. Your water usage for **May** was **32%** of your recommended water usage.

Click the tabs below for a breakdown of your water use (in gallons X 1,000), alongside the data used in the calculations.

Use Chart
Use Table
Customer Data

The information below is used to calculate your household's recommended water use. Visit this [website](#) for more information on the calculation methods, and please call (720.859.4375) or e-mail us if any information below has changed.

- Address: **3100 N ABILENE ST**
- Billing Period: **04/20/20 to 05/19/20**
- Number of Days: **29**
- Number of people: **5**
- Square feet of turf grass: **4773**
- Square feet of water-wise landscape: **201**

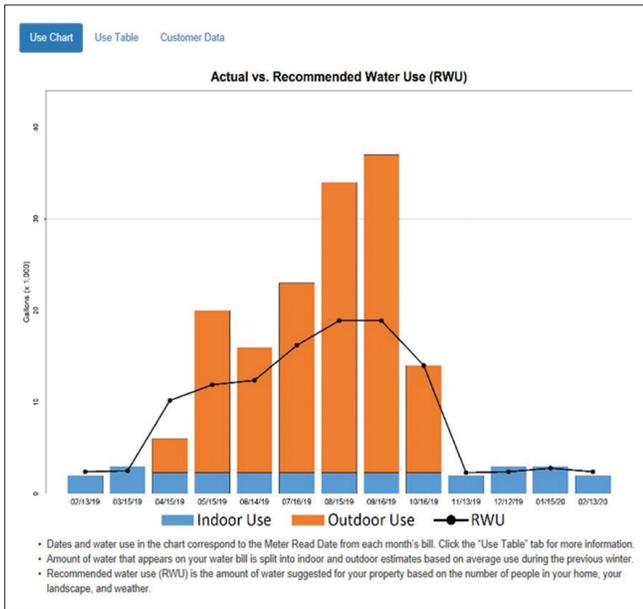
KNOW YOUR FLOW



Use Chart **Use Table** Customer Data

Read Period	Total Use*	Total RWU**	Indoor Use*	Indoor RWU**	Outdoor Use*	Outdoor RWU**
01/15/19 - 02/13/19	2	2.4	2	2.4	0	0
02/13/19 - 03/15/19	3	2.5	3	2.5	0	0
03/15/19 - 04/15/19	6	10.2	2.3	2.5	3.7	7.7
04/15/19 - 05/15/19	20	11.9	2.3	2.5	17.7	9.4
05/15/19 - 06/14/19	16	12.4	2.3	2.5	13.7	9.9
06/14/19 - 07/16/19	23	16.2	2.3	2.6	20.7	13.6
07/16/19 - 08/15/19	34	18.9	2.3	2.5	31.7	16.4
08/15/19 - 09/16/19	37	18.9	2.3	2.6	34.7	16.3
09/16/19 - 10/16/19	14	14	2.3	2.5	11.7	11.5
10/16/19 - 11/13/19	2	2.3	2	2.3	0	0
11/13/19 - 12/12/19	3	2.4	3	2.4	0	0
12/12/19 - 01/15/20	3	2.8	3	2.8	0	0
01/15/20 - 02/13/20	2	2.4	2	2.4	0	0
Total (last 12 mo.)	163	114.9	29.1	30.1	133.9	84.8

*Amount of water that appears on your water bill is split into indoor and outdoor estimates based on average use during the previous winter.
 **Recommended water use (RWU) is the amount of water suggested for your property based on the number of people in your home, your landscape, and weather.



The Know Your Flow program has created a new channel of customer engagement that has delivered quantifiable results. ArcGIS has helped us automate data-driven water use recommendations for our customers."

Tim York
Supervisor, Aurora Water Conservation

a series of geoprocessing operations, field calculations, and map series exports. The script logic allows for multiple digitizers to be working on different properties simultaneously by checking individual digitizer files against the main dataset before combining. The script also calculates a rotation angle and scale to match a standard layout before exporting. Site maps are exported via map series to a central repository that is searchable by customer name, account ID, or property address.

The monthly recommended water use calculations have been automated using an R script. R is also used to generate HTML attachments displaying a usage trend chart, historical consumption table, and customer details. Once the calculations and charts are complete, a VBA macro in Excel loops through the output table and sends customized emails to each Know Your Flow participant. Each email includes introductory messaging that is consistent across customers, as well as a customer-specific overview of their performance relative to recommended water use over the past month. The HTML attachment provides a much greater level of detail, including recommended use performance over the past 13 months. During the irrigation season, customers also receive weekly emails (sent using a VBA macro in Excel) with conservation messaging alongside the recommended number of watering days per week and the number of minutes per zone for specific sprinkler head types.

Result

Know Your Flow has been successful by several metrics. In terms of educating customers, 96 percent of survey respondents reported that they were more knowledgeable about their water use after participating in the program. A large majority of respondents (86%) reported that the monthly email reports were either somewhat or very helpful. Many respondents also reported that they changed their behaviors, replaced fixtures or irrigation equipment, or participated in other conservation programs. Finally, based on change analysis of customer water usage before and after Know Your Flow participation, customers have saved more than 12 million gallons, or 37 acre-feet of water, over the lifetime of the program. This equates to approximately \$650,000 saved when comparing the cost of acquiring new water rights versus the cost of operating the Know Your Flow program.

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