

EVOLUTION OF THE GUIDE AS A TOOL TO DEVELOP GOAL-BASED WATER CONSERVATION PLANS IN FLORIDA

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INTRODUCTION

As the need to implement water conservation practices in Florida becomes more important, more streamlined and accountable water conservation practices must be developed. In the State of Florida, the five water management districts (WMDs) have committed to varying extents to the implementation of conservation practices by their water utilities. Each WMD has a number of rules which its utilities have to follow in order to obtain a Consumptive Use Permit (CUP). Incorporated in these rules are conservation practices that water utilities and other major water users must follow in order to obtain a CUP. The CUP permitting process provides a regulatory framework within which conservation plans can be implemented. Also, water conservation plans are required as part of water supply planning and utilities may be required to track the performance of their conservation practices. The original online *Guide* software was developed to assist small, medium and large scale water utilities in implementing water conservation practices throughout Florida (Malcolm Pirnie 2006a and 2006b). The Conserve Florida Water Clearinghouse team's initial thrust was to interact with utilities and facilitate their use of the *Guide*. An overview of the *Guide* and its application to three utilities in Florida is presented in Indeglia et al. (2007). Users have experienced some issues in working with the *Guide* software. Procedures are in place to fix bugs and refine the software as needed. Most of the issues relate to the need for very detailed information that in some cases had no relevance in the water conservation plan. Lack of billing data also affected the functionality of all the options available in the original *Guide*. Hence, the number of utilities who have used the original *Guide* is smaller than originally anticipated for several reasons including:

1. The *Guide* software had bugs and was not easy to use.
2. Considerable effort was needed to fill in the required data for the utility Profile section of the *Guide*.
3. Users were not sure how the Profile information was used by the *Guide* software.
4. The *Guide* required that some BMPs and Measures be implemented as part of the Conservation Plan. Users may not agree with these requirements.
5. Users are unclear how the *Guide* was to be used by water management districts (WMDs) as part of their regulatory process, including the Consumptive Use Permit (CUP) review process.

6. The *Guide* software used evaluation methods that differ than those required by the WMDs as part of the CUP review process, e.g., different methods for estimating percentage water loss; different sets of required BMPs and Measures.

The University of Florida and Conserve Florida Water Clearinghouse (CFWC) developed the EZ Guide Version 1.0 to help users perform the water conservation calculations from the original *Guide* (http://conservefloridawater.org/ez_guide.asp). It is a spreadsheet based tool that can assist water utilities and water management districts in performing analyses and developing water conservation plans. The purposes of these plans include consumptive use permitting, water supply planning, tracking the effectiveness of a conservation program, and inclusion in a comprehensive urban infrastructure plan. This spreadsheet-based tool was developed to better address the needs of utilities to have a less-data intensive method than the original *Guide* that was developed by Malcolm Pirnie (2006a and b). The element of simplicity that the EZ Guide offers does not pertain to the complexity of its calculations but rather to the types of inputs and a simple interface that allows transparency in terms of how inputs and equations are used. All inputs are user defined and there are no requirements for further explanation. EZ Guide Version 1.0 helps users understand the linkage between input data, the spreadsheet calculations, and the resultant output that is contained in the original *Guide*. No major changes were made in EZ Guide Version 1.0. Rather, it replicates the analysis methods that were contained in the original *Guide* with one notable exception. The regulatory components embedded in the original *Guide* were deleted because the regulatory requirements for conservation evaluations vary across the State of Florida. Thus, EZ Guide is primarily a calculator that can be used in a variety of regulatory contexts. EZ Guide Version 2.0 will have significant refinements that incorporate improved conservation analysis tools. This paper discusses the evolution and content of EZ Guide Version 1.0.

EZ GUIDE VERSION 1.0

EZ Guide Version 1.0 is a water savings calculator designed to provide decision support information to utilities. The element of simplicity that the EZ Guide offers does not pertain to the complexity of its calculations but rather to the number of inputs, the way inputs are used and the types of inputs. Users enter aggregate data in order to perform analyses. All inputs are user defined and there are no requirements for explanation of inputs. Additionally, input information not used in calculations is condensed and displayed in tabular formats.

In the EZ Guide, reliance is placed on aggregate data for the utility. The aggregate data are based on what is now required by the original *Guide*. For example, the *Guide* only requires the user to input a year or two of customer usage data. Thus, the forecasts of future water use patterns are very simple. This capability can be greatly enhanced by analyzing a longer period of historical data in more detail. Also, the behavior of individual customers is not evaluated except for larger users. Currently, the EZ Guide only takes inputs of aggregate data; however, future development will enable it to handle disaggregated data inputs.

EZ Guide is supported by information contained in databases, technical documents, and GIS as shown in Figure 1. A key question in using EZ Guide is the validity of the underlying data. For example, the user can input an estimate of unaccounted for water without providing any evidence

of which input data are actually metered. The modules shown in Figure 1 provide this supporting information. Thus, the EZ Guide calculations are a summary spreadsheet that can be linked to supporting modules as required, depending on the purpose of the calculations. This structure is analogous to IRS forms that provide supporting evidence for entries into the primary tax calculation. These modules are being developed by the CFWC and will be available online as they are released for public use. The objective of this system is to provide high quality data in a centralized location, to develop coefficients that are relevant to Florida, and to facilitate the development of conservation plans by utilities.

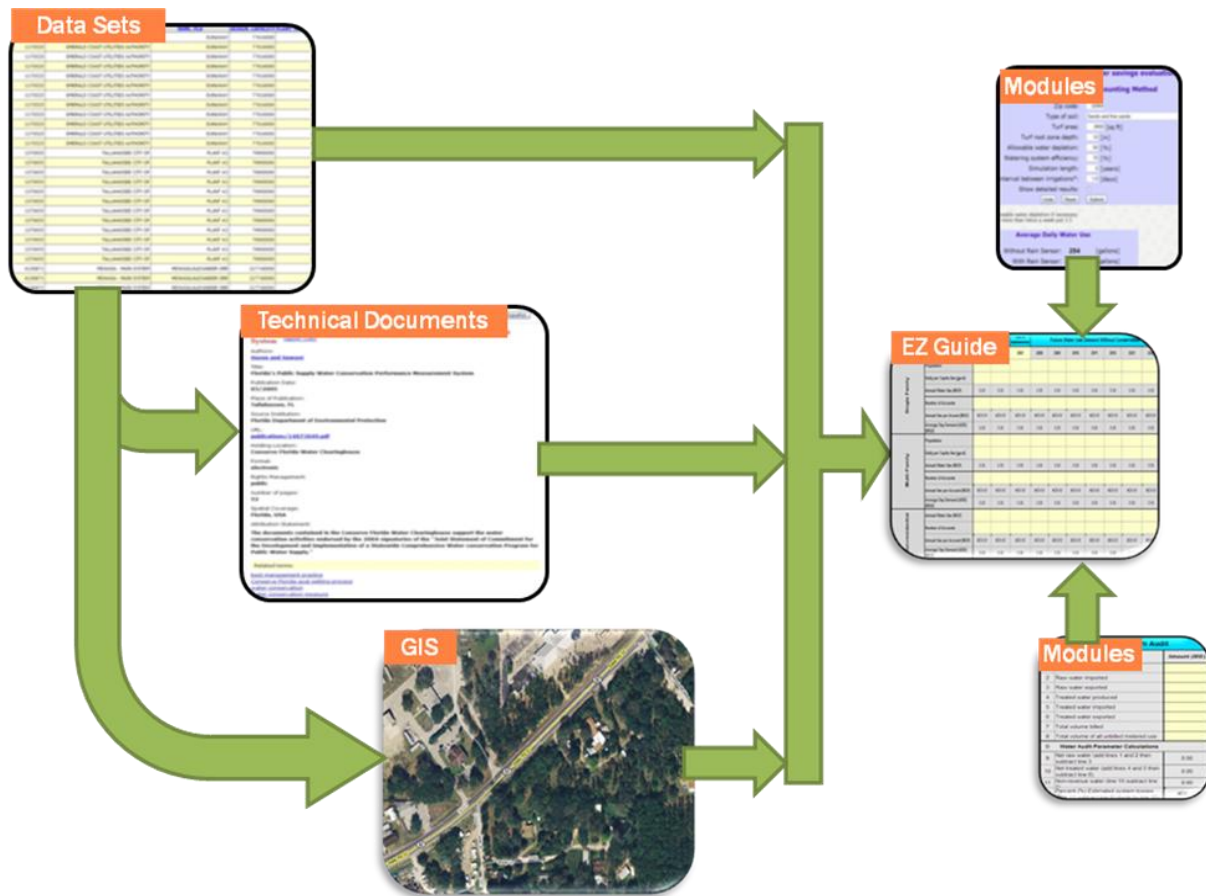


Figure 1. Data infrastructure support for the EZ Guide

EZ Guide uses the minimum number of inputs necessary to develop a basic water conservation plan. These inputs include: customer billing data with customer sector information from utility's records; monthly treated water produced; and demographic data such as population served. Some of the required input data can be obtained online, e.g., the monthly water supplied can be obtained directly from the web site of the Florida Department of Environmental Protection. The CFWC group has combined the annual reports from FDEP and the database is available on the CFWC (2009b) website.

EZ Guide is organized into the seven sections shown in Figure 2. Each section is organized in a logical way, starting with the profile that contains basic information describing the utility and its

service area. The next step is a water budget that identifies the water used on each sector (e.g. residential, non-residential). Measures are water conservation practices that are not quantifiable. BMP (Best Management Practices) are practices for which their water savings can be measured. Analysis provides charts and tables that summarize the results of the water conservation plan. Reports can be produced and submitted to the water management districts or for internal use by the utility. Finally, BMP tracking allows the utility to keep track of the number of BMPs that are implemented and to quantify water savings. Each of these sections is described briefly.



Figure 2. EZ Guide main menu

PROFILE

The Profile section in the original *Guide* requires quite a few inputs such as: utility name, address, primary contact, description of service area, information on system design, capacity, etc. It's the most input intensive section on the *Guide* and the main obstacle for utilities to complete it. The EZ Guide simplified this section to only require profile data that are actually used in the analysis as illustrated in Figure 3. This information can be collected from CUP reports or from the Florida Department of Environmental Protection (FDEP) drinking water database (<http://www.dep.state.fl.us/water/drinkingwater/flow.htm>). The type of utility site information that is available on the FDEP site is shown in Table 1. Monthly water supplied data are available from January 1999. Many CUP reports are available in electronic form from the e-permitting systems that are being set up by the WMDs (<http://flwaterpermits.com/>). The e-permitting system of the SJRWMD is a good example of the type of information that is available.

Utility Profile	
Name of Utility	ABC
Type of Water Supplier	Retail
Address	1000 Location Blvd. City, FL
Description of Service Area	Primary single family residential retail with one school and shopping center.
Permitting Agency	WMD
Permit Number	1,2
Permit Expiration Date	1/1/2013 0:00

Gross Per Capita	Historical Water Use		Current Year	Future Water Use Demand Without Conservation							
	2006	2007	2008	2009	2010	2011	2012	2017	2022	2027	
Utility Service Area Finished Water Use (MGY)	48.14	55.98	52.06	52.06	52.06	52.06	52.06	52.06	52.06	52.06	52.06
Total Number of Residential Units	192	192	192	192	192	192	192	192	192	192	192
Estimate of Persons per Household	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40
Utility Service Area Residential Population											
Gross Per Capita (gpcd)	202.04	234.34	210.49	210.49	210.49	210.49	210.49	210.49	210.49	210.49	210.49

Figure 3. Description of utility and service area information for the Profile.

Table 1. Utility profile information obtained from the FDEP Drinking Water database.

Entity	VALUE
District	3
E_mail	city@email.gov
Pws id	*****
Type	COMMUNITY
Source	GROUND
Mailing name	***** CITY OF (2 WPS)
Address1	CLUB RD & ORLANDO DR
Address2	
City	City
State	FL
Zip	32611
Zip4	1788
Phone	000-000-0000
Phone ext	
Contact	CHARLES
Contact phone	000-000-0000
Contact phone ext	
Owner	CITY OF *****
Owner address1	P O BOX

Owner address2	
Owner city	*****
Owner state	FL
Owner zip	32611
Owner zip4	1788
Owner phone	000-000-0000
Owner phone ext	
Owner type	MUNICIPALITY
Pop served	62052
Sells to pop	4752
Design cap	14688000
Srvc connect	17729
# Plants	2
# Sources	16
Last inspect	08/2007

Reusing information readily available to the utility greatly simplifies the data gathering process, reducing the time needed to complete the profile section. Much of the *Guide* input data is available from CUP files as shown in Table 2.

Table 2. Evaluation of Guide input requirements contained in CUP reports.

Guide Requirements	CUP	Comments
Utility name	yes	FDEP drinking water database
Type of water supplier	yes	FDEP drinking water database
Address	yes	FDEP drinking water database
Primary Contact	yes	FDEP drinking water database
Description of Service Area	yes	Public water supplier report - GIS map and data
Other Users	no	
Plan Horizon	yes	Public water supplier report
Water and/or CUPs	yes	Public water supplier report
Sectors and Meters	yes	
Historical water use	yes	
High use customers	no	
Population and potable water use projections	yes	Public water supplier report
Water Audit	yes	SJRWMD E-Permitting webpage
Cost of Water	no	

Utility rate structure	no	
Utility rate structure by sector	no	
Socio-Economic Data	no	
Measures and BMPs	yes	Public water supplier report & E-Permitting

From the evaluations of selected CUP reports (Table 2), it is evident that the majority of the required user input data is already available as part of the WMD CUP process. However, the consistency of the input information as well as its compatibility with the Guide’s methods is something that has to be addressed. Also, even with the e-permitting system, a significant effort may be required to retrieve the relevant files since the e-permitting files must be inspected individually to find the necessary information.

Referring to the actual calculations on the profile section, the original *Guide* allowed users to enter gallons per capita per day (gpcd) without an explanation of the method used in the calculations. The EZ Guide introduced the gross per capita calculation that is based on the FDEP (2008) guidance on per capita water use which has been agreed on by all the water management districts. The use of this method to calculate gpcd provides result that can be compared across districts to determine water use and to estimate water conservation plan effectiveness.

Uniform Gross Per Capita is defined as (FDEP 2008):

$$\frac{\text{Utility Service Area Finished Water Use}}{\text{Utility Service Area Residential Population}}$$

Where

- Utility Service Area Finished Water Use is the sum of finished water (Withdrawals + Imports – Exports – Treatment Losses) used by all sectors (residential, industrial, commercial, etc.) served by a utility, and
- Utility Service Area Residential Population is the number of dwelling units served, multiplied by an estimate of persons per household.

WATER BUDGET

A water audit is a water use analysis technique where the water supplier performs accounting of water throughout the production, transmission and distribution facilities of their water supply system. EZ Guide 1.0 reproduces the water budget tool available in the *Guide*. It does not make any changes in the calculation or input required to complete it. The main change is that the user is not required to enter the information twice but it uses the inputs from the utility Profile section (Figure 4). Additionally, EZ Guide Version 1.0 provides a list of some standard water audit methods used throughout Florida. These links direct users to resources for the respective methods (Figure 5). The results obtained from the selected method may be used in lieu of the provided *Guide* audit.

Line	Guide System Audit	
A	Water Audit Input Data	Amount (MG)
1	Raw water withdrawn	55.98
2	Raw water imported	0.00
3	Raw water exported	0.00
4	Treated water produced	57.26
5	Treated water imported	0.00
6	Treated water exported	0.00
7	Total volume billed	49.85
8	Total volume of all unbilled metered use	0.00
B	Water Audit Parameter Calculations	
9	Net raw water (add lines 1 and 2 then subtract line 3)	55.98
10	Net treated water (add lines 4 and 5 then subtract line 6)	57.26
11	Non-revenue water (line 10 subtract line 7)	7.41
12	Percent (%) Estimated system losses ((line 11 subtract line 8) divide by line 10)	12.94

Figure 4. Water audit calculator in EZ Guide.

2.1. System Audits Clear All Entries Save

Southwest Florida Water Management District	<input type="checkbox"/>
St. John's River Water Management District	<input type="checkbox"/>
AWWA/IWA	<input type="checkbox"/>
Guide Audit	<input checked="" type="checkbox"/>
FRWA Water Audit	<input type="checkbox"/>

Figure 5. Links to external water audit tools in EZ Guide.

MEASURES

The EZ Guide 1.0 approach to identifying and describing implemented and planned conservation measures has been significantly modified from the original *Guide*. A frequent comment regarding the original *Guide* was that data input in this section was time consuming. A review of the original *Guide* showed that many of the pages for Measure data input required extensive time to complete and mostly were simply added to the Profile and Planning reports, with no additional analysis. To reduce the effort required for entering conservation measures, the data entry format has been altered to the more free-form format shown in Figure 6. All conservation measures are now listed on a single table, with the following four data fields for each measure:

- Whether a measure is currently implemented
- Description of the current measure implementation (if applicable)

- Whether the measure is planned to be implemented
- Description of the measure implementation plan (if applicable)

3.1 Conservation Measures Clear All Entries Save Create Report

Line	Measures	Select and Describe Implemented Measures	Modify Existing Measure, or Select and Describe Planned Measures
Operational Measures			
1	Source-water metering	<input checked="" type="checkbox"/> sfgsgfsg	<input type="checkbox"/>
2	Service-connection metering	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3	Fixed-interval meter (reading, testing, calibrating, repairing & replacing)	<input checked="" type="checkbox"/> Monthly; testing every five yrs.	<input type="checkbox"/>
4	System audit	<input checked="" type="checkbox"/> Monthly; Guide method	<input type="checkbox"/>
5	Leak detection and repair	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Figure 6. Simplified measure input format in EZ Guide.

BEST MANAGEMENT PRACTICES (BMP)

In the *Guide*, users had to enter data in separate pages for each BMP. This added repetitive information and was time consuming and the format was not user friendly, especially to make comparisons among BMPs. In EZ Guide 1.0, data inputs are separated by best management practice (BMP) and by sector. However, they are integrated into a single table. The left side of the table (yellow cells) is for data input, and the right side (gray cells) provides the output for each calculation as shown in Figure 7. The EZ Guide BMP data input section consists of two main types of data input pages: an aggregate data page, and detailed pages. Detailed pages are optionally filled out for those BMPs where it is desirable to specify a detailed implementation plan of a BMP. The aggregate data for all of the conservation BMPs are entered onto a single data input page. The detailed implementation pages allow the user to specify year by year the number of accounts, units, or measures implemented for a given BMP.

BMP	Sector	ID	Cost of Water (\$/1000 Gal)	Start year of Implementation	BMP life span (year)	Passive annual replacement rate (%)	Water Savings Horizon (year)	Number of Implementations per Year	Service Life Savings (unit cost \$/1000)	Total BMP Cost (\$)	Total BMP Water Savings (1000 Gal)
Reuse Projects	Single Family	RP_SF						Add Data	#DIV/0!	0	0
	Multi-Family	RP_MF						Add Data	#DIV/0!	0	0
	Non-Residential	RP_NR						Add Data	#DIV/0!	0	0
Non-potable Irrigation Source Rebates	Single Family	NPL_SF						Add Data	#DIV/0!	0	0
	Multi-Family	NPL_MF						Add Data	#DIV/0!	0	0
	Non-Residential	NPL_NR						Add Data	#DIV/0!	0	0
Water-Efficient Landscape and Irrigation Evaluations and	Single Family	WEL_SF						Add Data	#DIV/0!	0	0
	Multi-Family	WEL_MF						Add Data	#DIV/0!	0	0
	Non-Residential	WEL_NR						Add Data	#DIV/0!	0	0
High-Efficiency Clothes Washer Rebates	Single Family	HECW_SF						Add Data	#DIV/0!	0	0
	Multi-Family(common)	HECW_MFc						Add Data	#DIV/0!	0	0
	Multi-Family(inside)	HECW_MFi						Add Data	#DIV/0!	0	0
Toilet Rebates	Single Family	ULFT_SF						Add Data	#DIV/0!	0	0
	Multi-Family	ULFT_MF						Add Data	#DIV/0!	0	0
	Non-Residential	ULFT_NR						Add Data	#DIV/0!	0	0

Figure 7. BMP data input and outputs aggregated table in EZ Guide.

ANALYSIS

This section of EZ Guide provides graphics that allow an easy interpretation of the outputs from the BMP section. The first chart (Figure 8) allows the selection of BMP's that have a cost of implementation below a threshold set by the user.

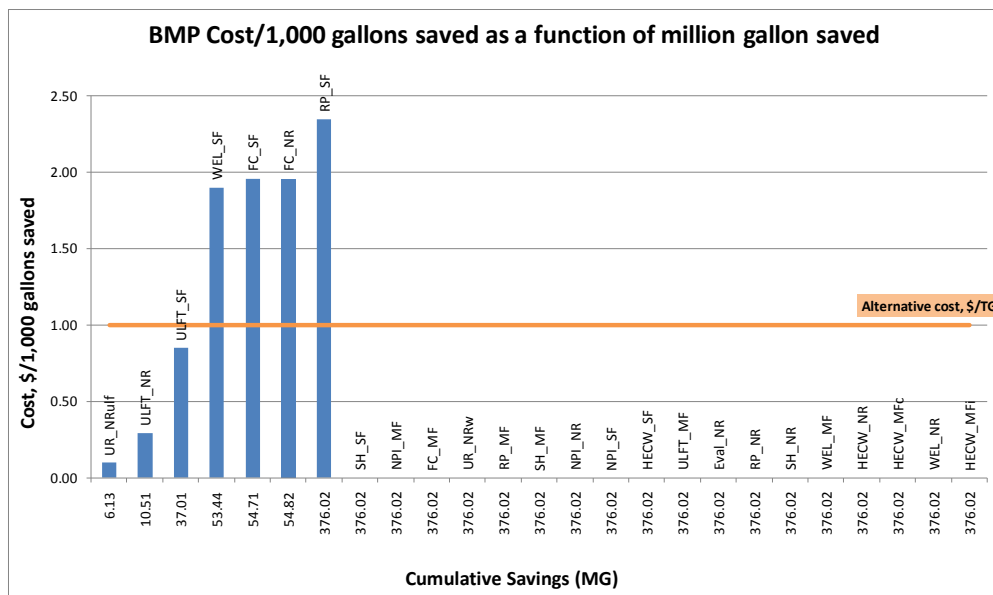


Figure 8. BMP selection based on cost of implementation per volume saved in EZ Guide.

The rest of the figures allow the users to see the effect that a certain number of implementations for a given BMP will have during the duration of their water conservation plan (Figure 9). The figures are separated by sector (i.e., single-, multi- family and CII or non-residential).

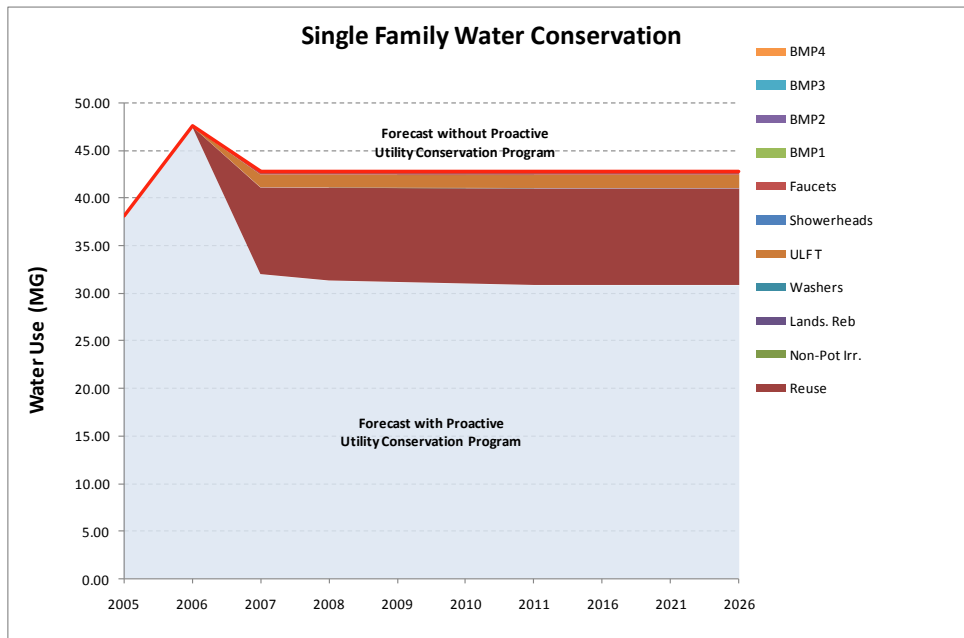


Figure 9. Savings by BMP during the duration of the water conservation plan in EZ Guide

REPORTING

EZ Guide 1.0 provides basic reporting capabilities in contrast to the extensive reports created by the *Guide*. The main reports are for the measures and BMP sections. In the BMP section, the user can create up to five scenarios with a combination of different BMPs. While the detail of the reports has been reduced, redundancy was also eliminated only providing data that is relevant to the water conservation plan. The reports try to accommodate the requirements of the different agencies as explained in the tracking section below.

TRACKING

The *Guide* provided limited options to track BMP's implementation data. To simplify the application, that feature was removed in EZ Guide 1.0. The new version will reintroduce this feature. It was developed taking into consideration utilities reporting needs like the Water Savings Incentive Program (WaterSIP) developed by the South Florida Water Management District (SFWMD). By incorporating existing reporting we avoid duplicating efforts on the utility side, and provide an added advantage to use the EZ Guide as a tool to track BMP implementations. This feature could also be useful to evaluate the performance of BMP implementation grants offered by water management districts and other agencies.

SUMMARY

The EZ Guide 1.0 provides most of the functionality available in the *Guide*. At the same time, it reduces the some of the issues regarding the amount of data required, and especially only requires data that will be used to develop the water conservation plan. The spreadsheet interface is more familiar for most users and it greatly reduces the number of screens for data input. It provides tools like tracking and reporting that are necessary to comply with water management districts' requirements. The EZ Guide 1.0 offers a beneficial way to regularize the implementation of conservation practices. The use of standard methodologies like the gross gpcd allows for a better analysis and comparison between water conservation plans.

ACKNOWLEDGEMENTS

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