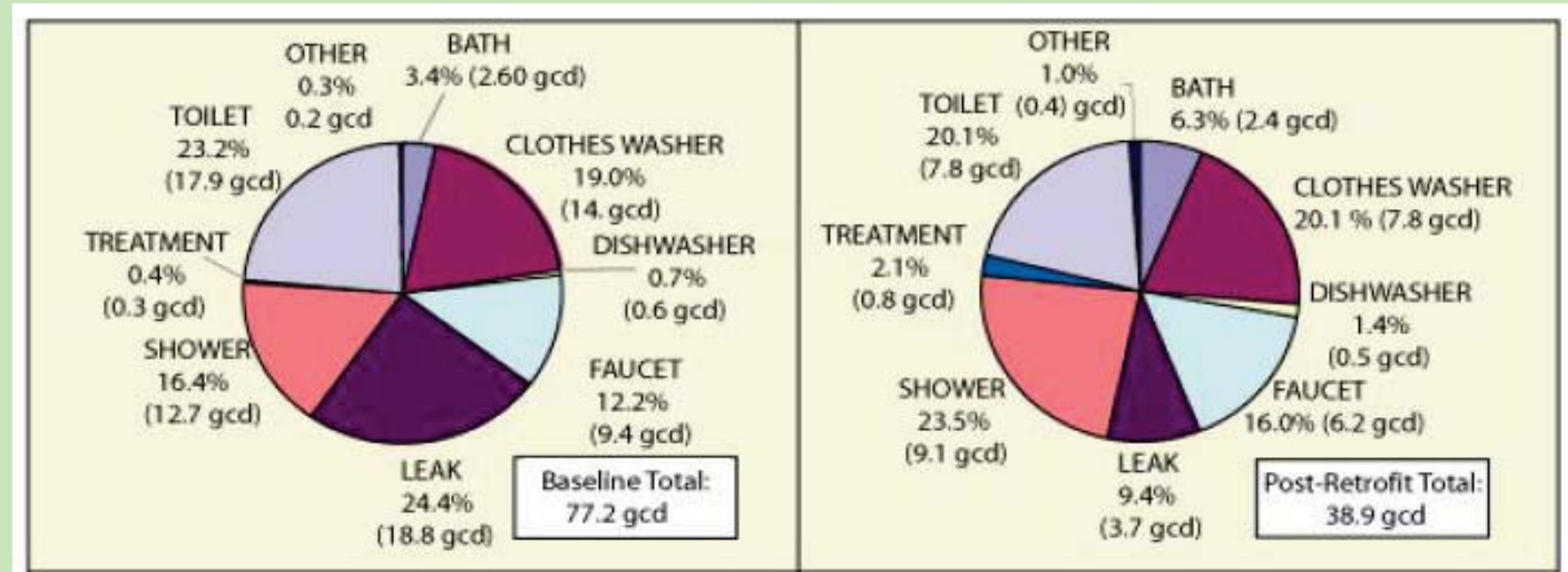


## Why focus on water audits in Florida?

- Several water stressed areas in Florida are considering alternative water supplies, including reuse water, and water conservation to ensure that ample future water is provided.
- Water loss could account for 15-20% of water supplies.
- System water loss is typically analyzed separately from water conservation analysis addressing post customer meter demand management.
- However, system loss can be evaluated in conjunction with typical conservation analysis since both involve an end use accounting of water uses.
- Figure 1 shows how end use analysis can be used to evaluate single family residential usage.
- In this example, all end uses are directly measured and residual usage is considered leakage or water loss.
- System losses can be evaluated similarly by measuring all uses within a distribution system where any residual usage is leakage or water loss.
- Several water audit methodologies exist in Florida to evaluate system water loss.
- However, the audits are inconsistent both in how water loss is defined and how loss is calculated.
- Furthermore, the validity of data input into water audits is handled differently in each audit.
- Water audits in Florida need to be consistent and accurate in order to evaluate water loss control as a demand management option.
- A water conservation tool (EZ Guide 2.0) has been developed to evaluate water conservation potential including water loss for utilities.

Figure 1. Pre- and post-retrofit indoor per capita water use percentage including leakage for Tampa (Mayer et al. 2004).



## IWA/AWWA Audit

- The IWA/AWWA audit was developed by international water loss experts.
- Most extensive audit available.
- Free download of spreadsheet-Version 4.0 (Figure 2) released in May 2009 (AWWA 2009b).
- Associated 2009 AWWA technical manual (M36) contains detailed procedures (AWWA 2009a).
- Based on one year of historical data (AWWA 2009a).
- Simple to use. About 18 inputs with manual input of reliability score for each input (1-10) (Figure 2 and 3).
- High validity scores for metered data, low for estimates/guesses.
- Calculates various performance indicators (not %).
- Aggregate data reliability score based on pre-defined weighting of input importance.

Figure 2. AWWA version 4.0 water audit spreadsheet

Figure 3. Inputs for 2009 AWWA version 4.0 audit

Number	Category	Item
1	Water Supplied	Volume from own sources
2	Water Supplied	Master meter error adjustment
3	Water Supplied	Water imported
4	Water Supplied	Water exported
5	Authorized Consumption	Billed metered
6	Authorized Consumption	Billed unmetered
7	Authorized Consumption	Unbilled metered
8	Authorized Consumption	Unbilled unmetered
9	Apparent Losses	Unauthorized consumption
10	Apparent Losses	Customer metering inaccuracies
11	Apparent Losses	Systematic data handling errors
12	System Data	Length of mains
13	System Data	Number of active and inactive service connections
14	System Data	Average length of customer service line
15	System Data	Average operating pressure
16	Cost Data	Total annual cost of operating water system
17	Cost Data	Customer retail unit cost (Applied to Apparent Losses)
18	Cost Data	Variable production cost

## What is the best option for Florida?

- The current water audits in Florida including the IWA/AWWA audit were reviewed for their applicability toward water conservation evaluations in Friedman and Heaney 2009b.
- Florida (EZ Guide 2.0) should use M36 audit procedures complemented by free software.
- Express water loss as gpcd and % by volume for conservation analysis (Figure 4).
- Errors in metered supply and billing data needed.
- Quantitative meter testing according to accepted procedures.
- The validity scoring system in the IWA/AWWA audit was reviewed for its applicability toward water conservation evaluations in Friedman and Heaney 2009a.
- Only 7 of the 18 inputs were necessary for conservation analysis.
- Composite score of weighted average of manual scores and weights can be utilized.
- However, a flow weighted average in which all unmeasured usage is considered loss was suggested as an appropriate validity score (Figure 4)
- Current EZ Guide 2.0 uses manual entry of percent water loss from any audit chosen (Figure 5).
- Feedback needed on proposed audit methodology for Florida.

Figure 4. Comparison of water audit validity methods

Number	Item	Score	Assumed Weight	Populaton = 15,000	Mil. Gal/yr	Gpcd	Weight		
<b>WATER SUPPLIED</b>									
1	Volume from own sources	10	20	200	800	146.1	87.9%		
2	Master meter error adjustment	3	8	24	50	9.1	5.5%		
3	Water imported	10	8	80	60	11.0	6.6%		
4	Water exported								
Sub-total, Water Supplied				23	36	304	910	166.2	100.0%
<b>WATER DELIVERED</b>									
5	Billed metered	8	15	120	650	118.7	71.4%		
7	Unbilled metered	8	4	32	50	9.1	5.5%		
10	Customer metering inaccuracies	5	8	40	50	9.1	5.5%		
Sub-total, Water Delivered				21	27	192	750	137.0	82.4%
Totals				44	63	496		16.0	
Maximum Value				60	630			18.2	
Relative Score				73.3%	78.7%			82.4%	88.0%
% Metered Water								82.4%	
Unmetered gpcd								29.2	

A flow based validity weighting results in a score of 88 as opposed to a score of 78.7 based on assumed pre-defined weights.

Figure 5. EZ Guide 2.0 water audit interface

Water Audit	As Needed	Y/N
How often will your utility perform a system audit?		
What water audit method will you use?		
What is your water loss percentage (GL or % water loss = [(water lost (WL)/water supplied (WS))*100]	15%	
Accept default water loss percentage		

## Conclusions

- Water audits in Florida need to be consistent and accurate in order to evaluate water loss control as a demand management option.
- The IWA/AWWA audit should be utilized in Florida.
- For conservation analysis, water loss should be expressed as gpcd and % by volume.
- A flow weighted average can be used to determine water audit validity.
- With this methodology, water loss can be compared to usage in other sectors for conservation analysis (Figure 6).

Figure 6. Comparison of water loss with other usage sectors in EZ Guide 2.0

Sector	% of Total Water Use	Breakdown of Gross gpcd
Single Family	41.0%	58
Single Family Indoor	25.9%	36
Single Family Outdoor	15.2%	21
Multi-Family Commercial	20.8%	29
Industrial	13.3%	19
Institutional	0.8%	1
Water Loss	9.1%	13
<b>TOTAL</b>	<b>100.0%</b>	<b>141</b>

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- Mayer, P., DeOreo, W., Towler, E., Martien, L., and D. Lewis. (2004). "Tampa Water Department Residential Water Conservation Study". US EPA.

## More Information

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## Comparison of water audits in Florida

- St. Johns River Water Management District (SJRWMD)
  - Includes treatment losses
  - % loss by volume including treatment losses
- South West Florida Water Management District (SWFWMD)
  - Required for water use cautionary areas
  - 12% loss by volume rule requiring meter testing
- Florida Rural Water Association (FRWA)
  - Asks for monthly data, but uses annual data
  - Detailed unmetered use section
- Online Water Conservation Guide
  - Simple, does not incorporate unbilled uses
  - None of these methodologies analyze data validity.