

# This presentation premiered at WaterSmart Innovations

[watersmartinnovations.com](http://watersmartinnovations.com)



# State of the States – A Comparison of Approaches to Statewide Water Loss Programs



Image credit:theeventchronicle.com

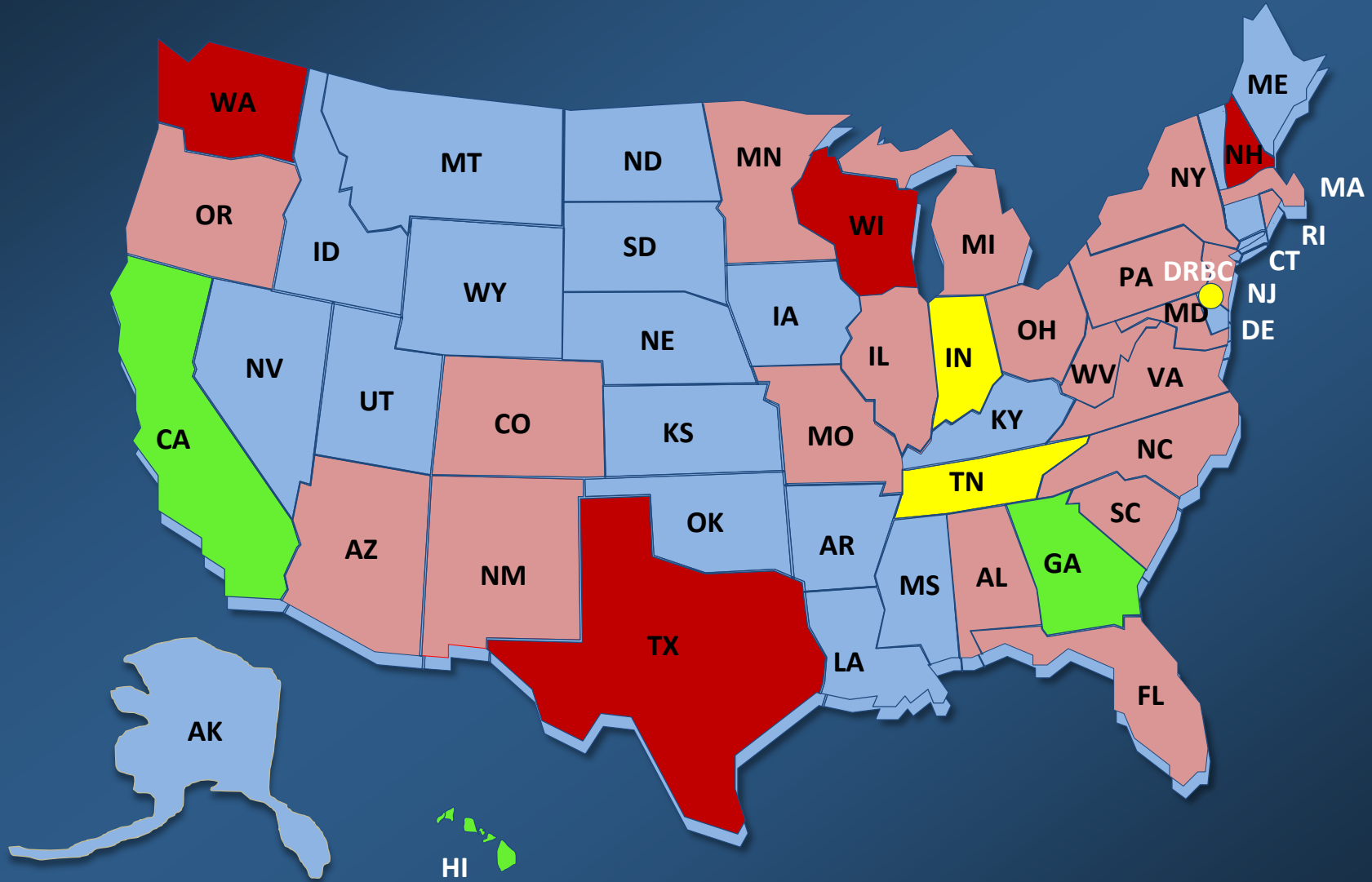
Presented by:  
**Will Jernigan, P.E.**  
[will.jernigan@cavanaugholutions.com](mailto:will.jernigan@cavanaugholutions.com)

  
**CAVANAUGH**  
*Stewardship Through Innovation*



**33 States are reviewing their Water Loss Control reporting Requirements. Most are reconsidering failed % based performance targets <sup>2</sup>**

- No water loss reporting
- Rudimentary water loss reporting
- AWWA M36 terminology & metrics
- AWWA M36 software
- AWWA M36 software with validation (Level 1)





# Statewide Water Loss Management Program – Model Implementation

## Phase 1

**Establish Annual M36 Water Auditing**

## Phase 2

**Achieve Minimum Standard of Audit Reliability**

## Phase 3

**Manage Water Loss Performance for Long-Term Reduction**

**Auditing**  
Establish annual M36 Water Auditing for all utilities

**Outreach**  
Educate Regulatory Community on M36 Method and appropriate use of performance indicators  
Establish Statewide Water Loss Control Committee

**Training & Tech Asst**  
Develop State Manual and Training Framework  
Provide extended, progressive training to utilities (funded)

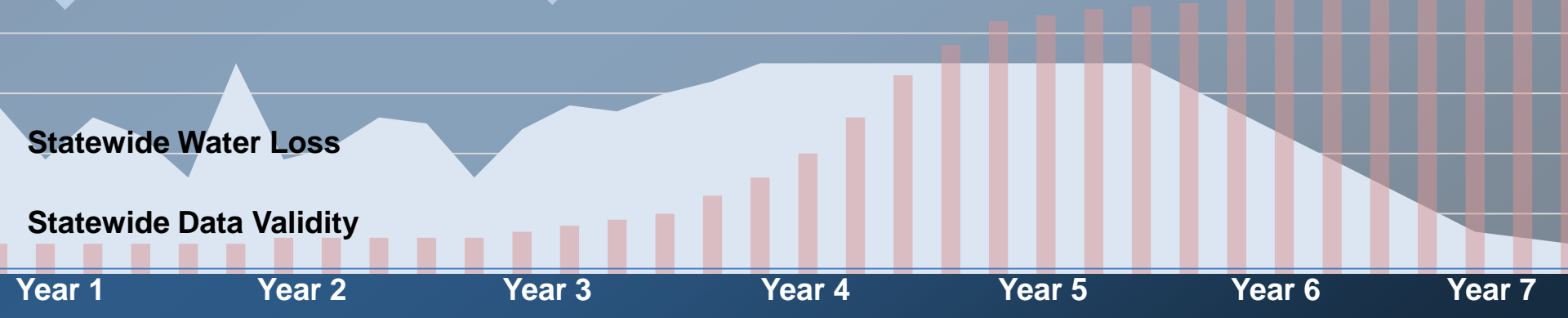
**Data Management**  
Develop and implement data management system  
Establish posting system and communication protocols

**Validation**  
Establish minimum standards of validation for quality assurance  
Determine by Agency or 3<sup>rd</sup> Party

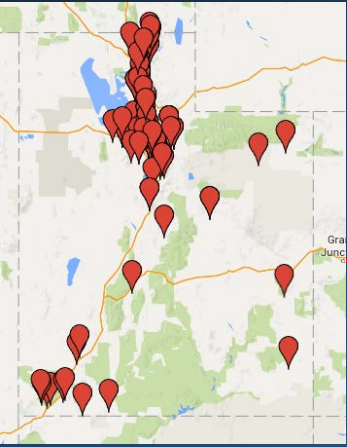
**Certification**  
Establish validation program until certification program is in place  
Design and implement a Certified Water Audit program for sustained quality control  
Statewide Water Loss Control Committee provides support

**Benchmarking**  
Suite of Performance and Process Measures  
System specific improvement over time in a cost-effective manner  
No universal targets  
Excessive thresholds established

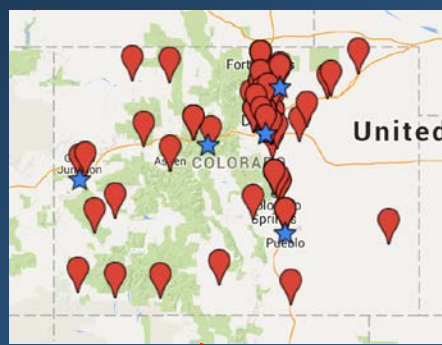
**Improvement**  
Annual audit submission threshold exceedances  
System specific progress review at designated regulatory touchpoints



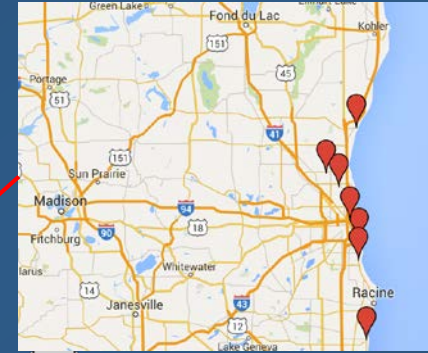
Utah Pilot:  
105 systems  
4 months



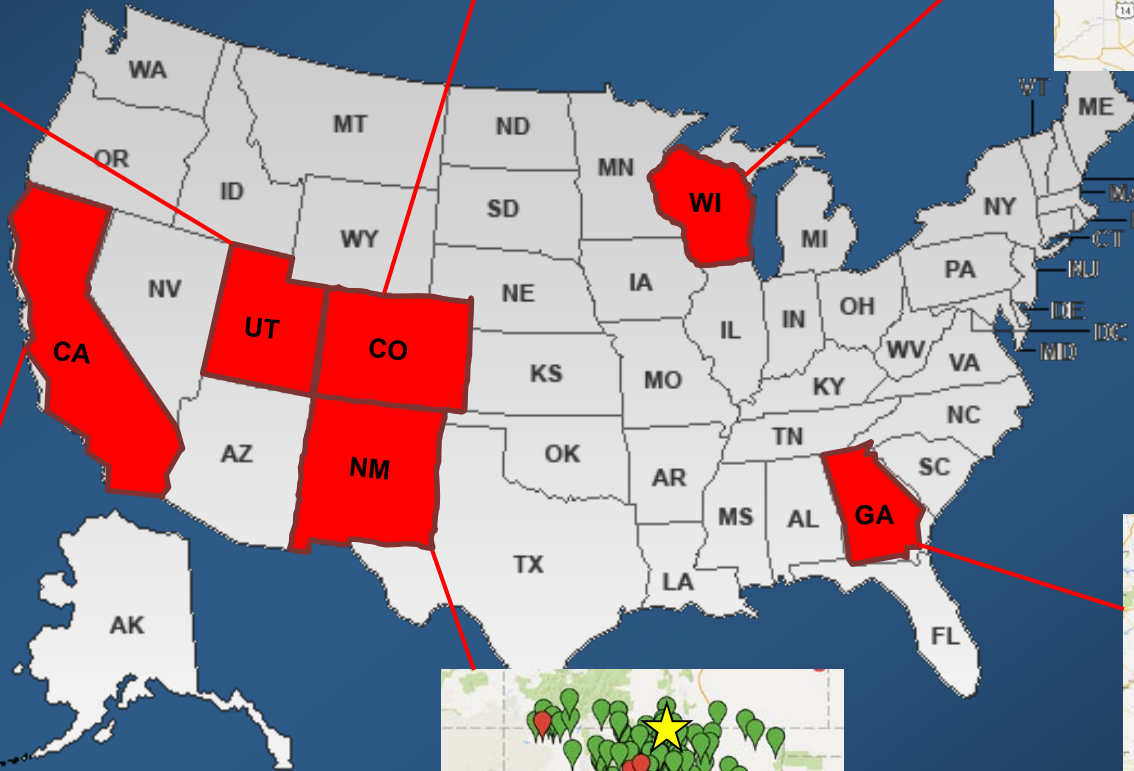
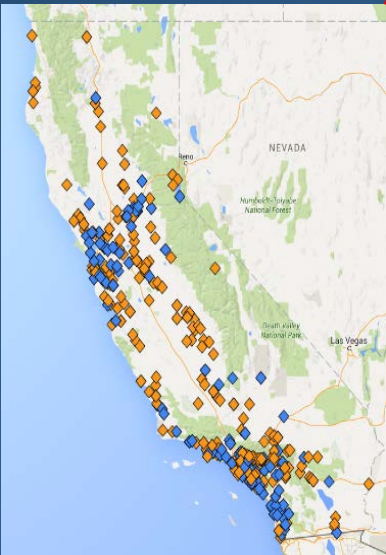
Colorado Pilot:  
50 systems  
1 month



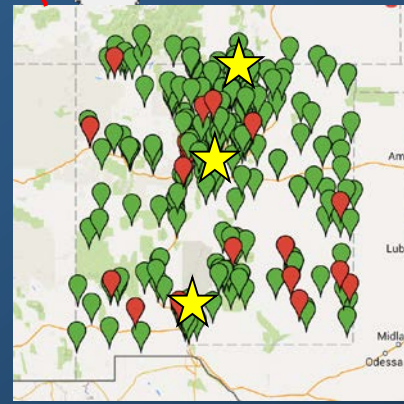
Wisconsin Pilot:  
6 systems  
6 months



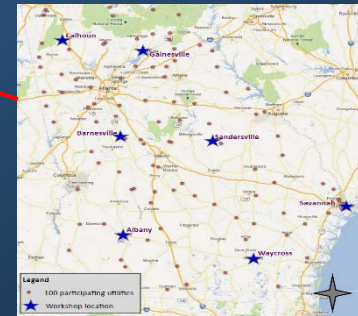
California  
Full Scale:  
460 systems  
2 years



New Mexico  
Full Scale:  
250 systems  
9 months

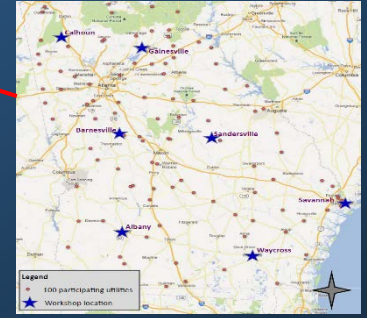
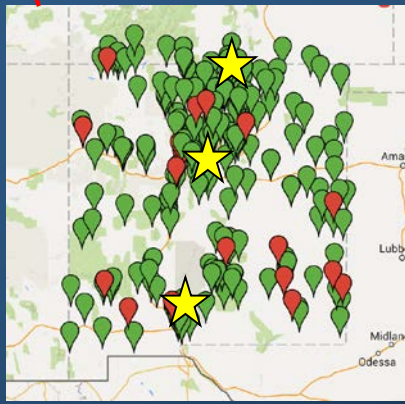
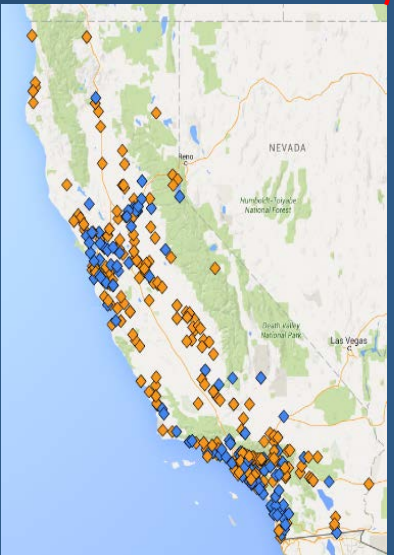


Georgia Full Scale:  
230 systems  
4 years



# Full Scale

# Water Loss Training & Technical Assistance Programs

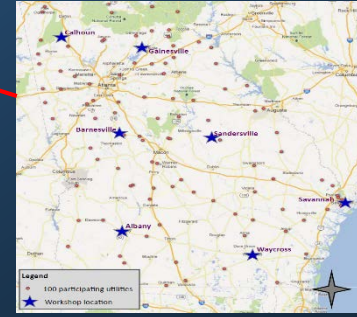
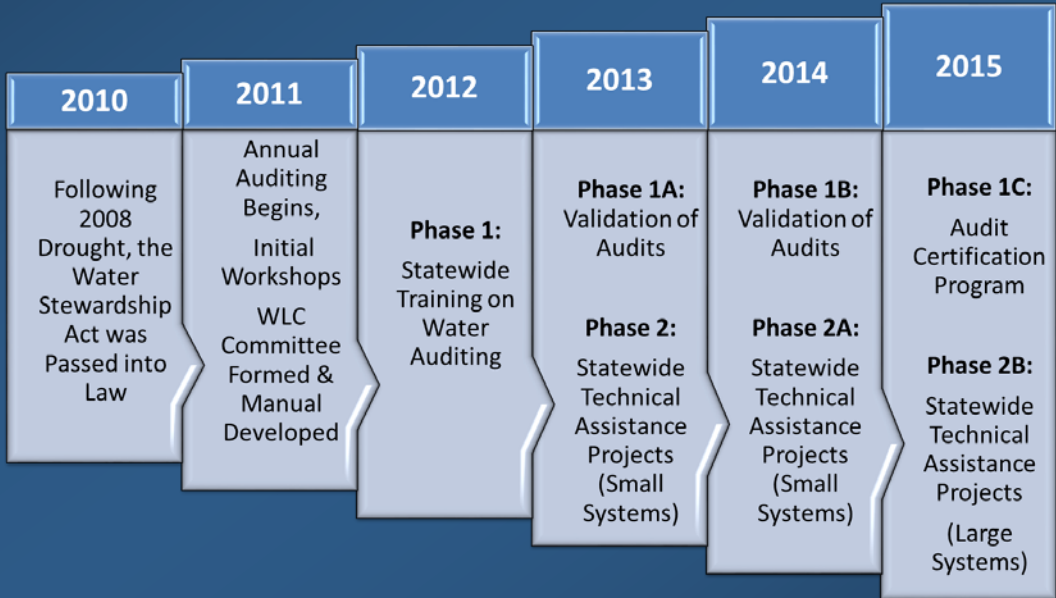
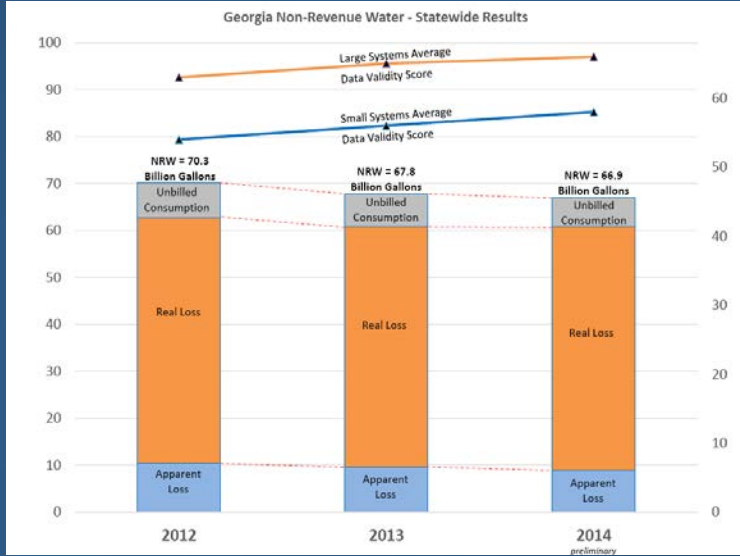




# Full Scale

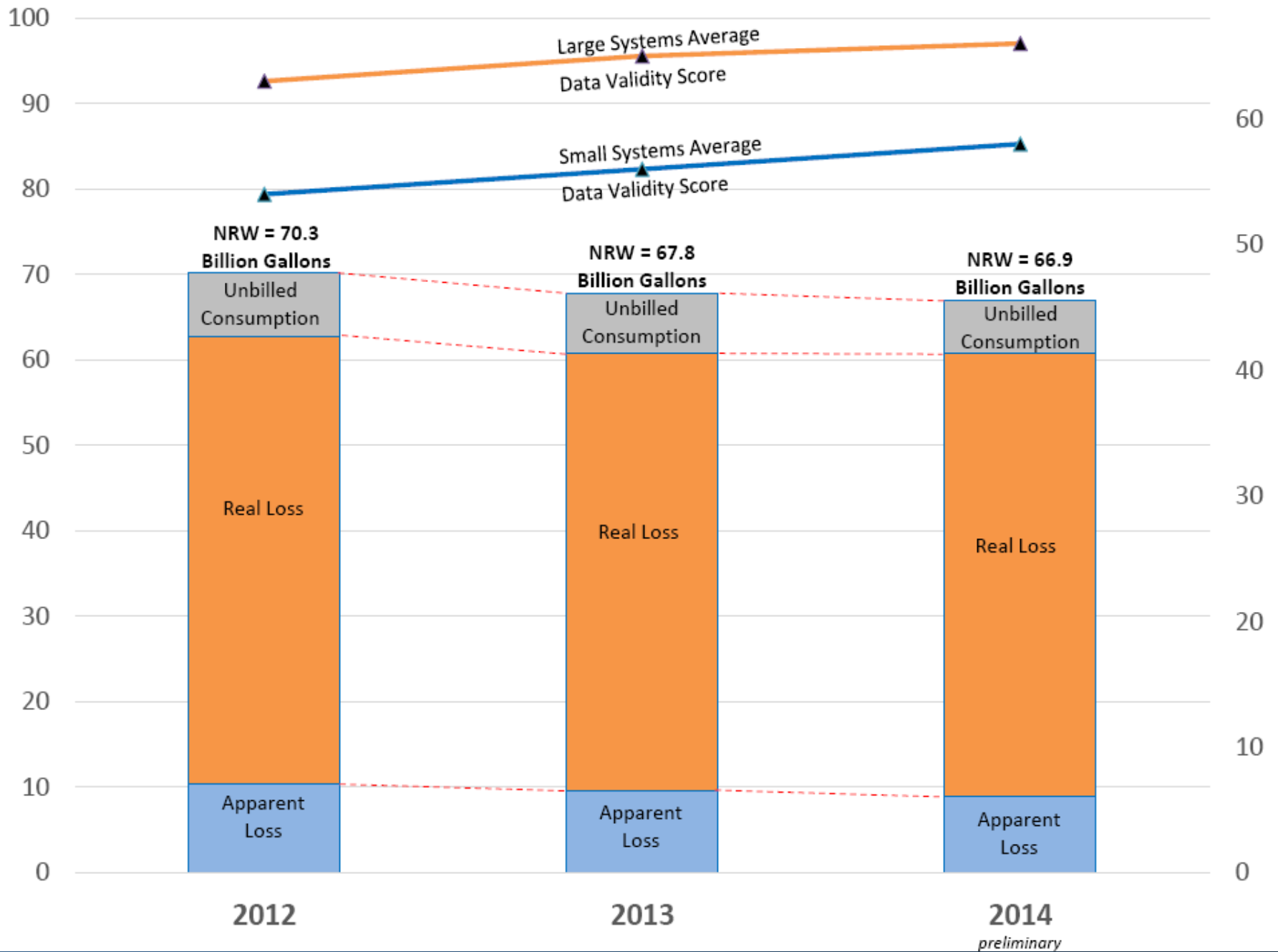
## Water Loss Training & Technical Assistance Programs

- Under regulatory framework
- Multiple Tracks
- Extended touchpoints of technical assistance
- Multiple phases over several years





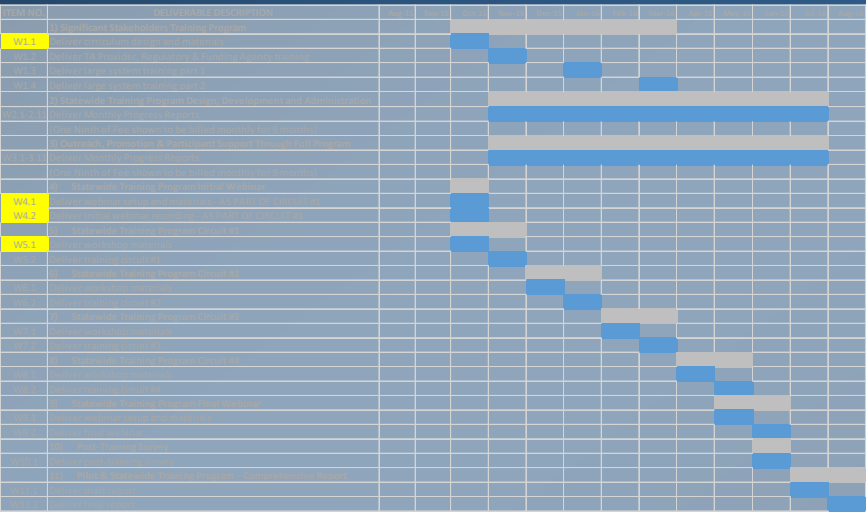
# Georgia Non-Revenue Water - Statewide Results



# Full Scale

## Water Loss Training & Technical Assistance Programs

- Under semi-regulatory framework
- Multiple Tracks
- Extended touchpoints of technical assistance



New Mexico Environment Department

**New Mexico Statewide Water Loss Control Training Program**

**NOTE:** The dates for Workshop 3 of the Small Systems Water Loss Control Training Program, and Workshop 2 of the Large Systems Water Loss Control Training Program are posted below.

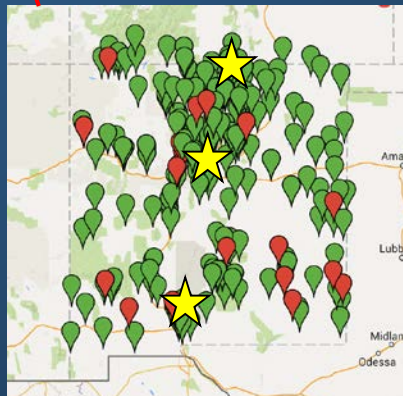
**Partners**

**Water Audits and Loss Control Programs**

The NMED Drinking Water Bureau is pleased to announce the launch of the Statewide Water Loss Control Training Program. NMED, in partnership with the Southern Environmental Finance Center and Community Water Partners, is providing free training to community public water systems across the state. The training is based on the AWWA QWS Water Auditing & Loss Control Methodology that is the standard professional course of action. This free program is available for any community public water system that:

- Does not sell its drinking water for water projects from the State
- Does not sell its drinking water to other water supply from the State
- Is seeking to improve measurement efficiency in your system
- Is seeking to cut off-body losses and/or supplies

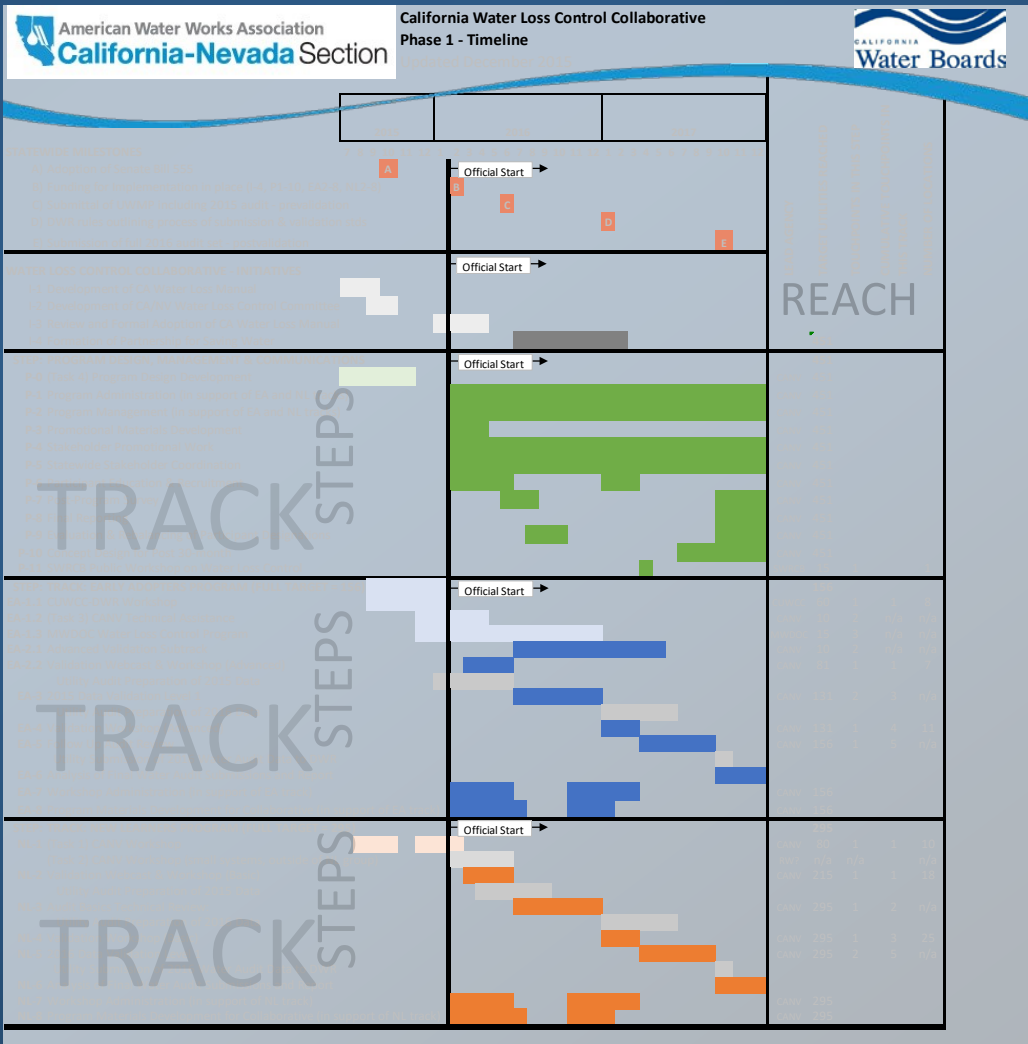
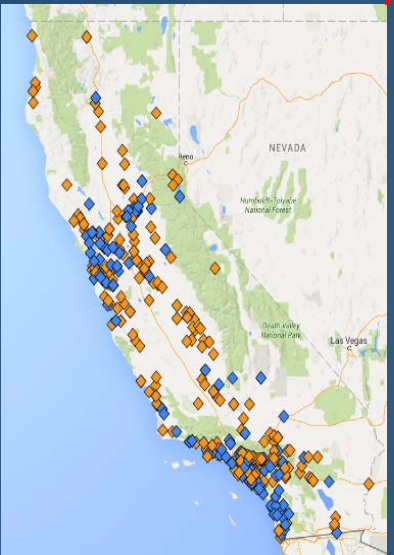
The program will be held in October and March of each year. Space is limited, so REGISTER EARLY to secure your spot and your desired location. Find out more at [www.nmedrinkingwater.com](http://www.nmedrinkingwater.com)



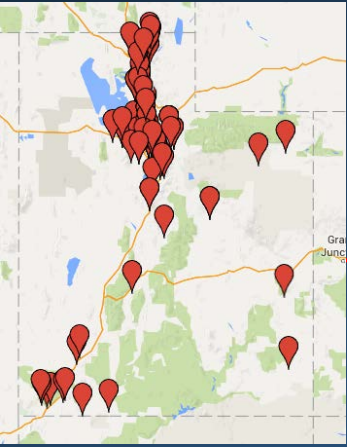
# Full Scale

## Water Loss Training & Technical Assistance Programs

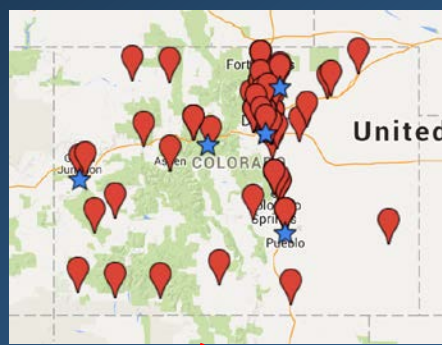
- Under regulatory framework
- Multiple Tracks
- Extended touchpoints of technical assistance



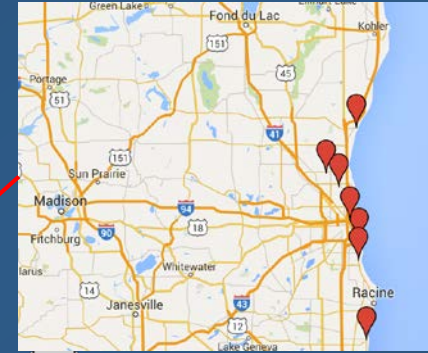
Utah Pilot:  
105 systems  
4 months



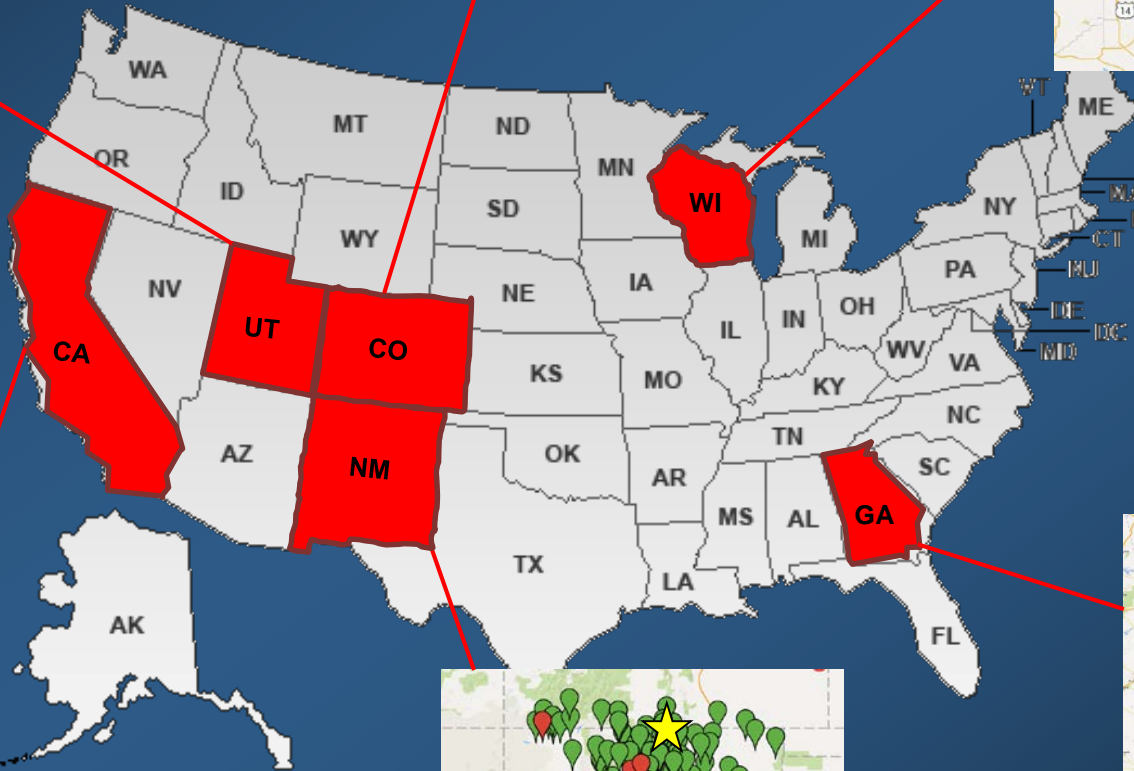
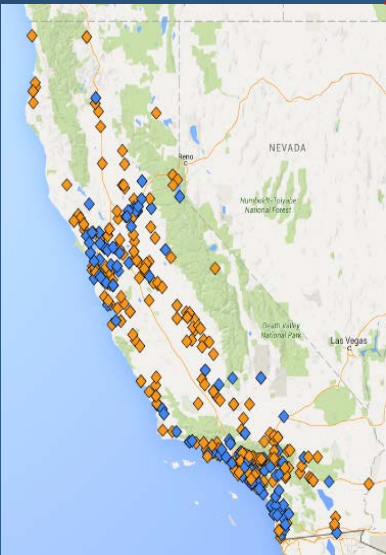
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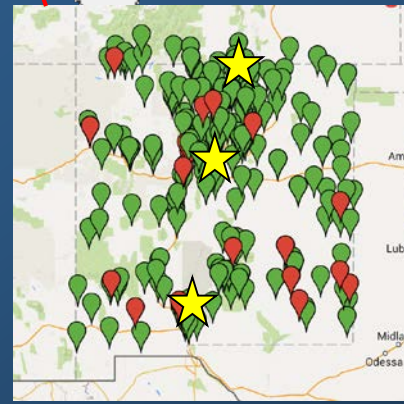
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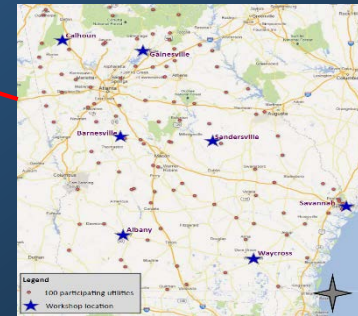
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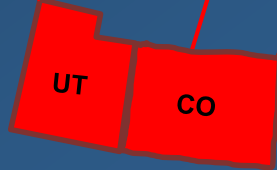
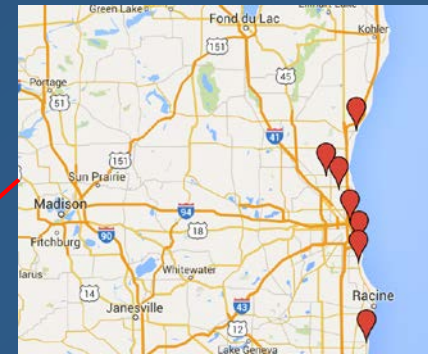
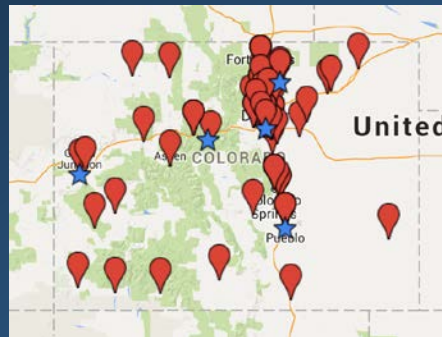
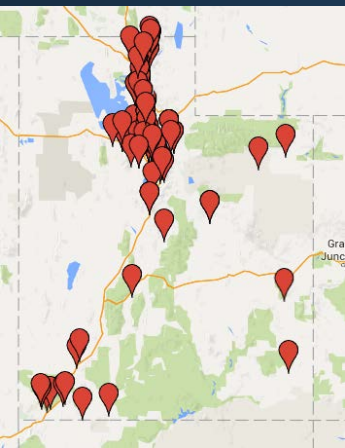
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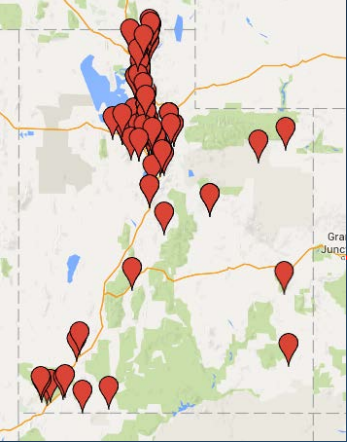




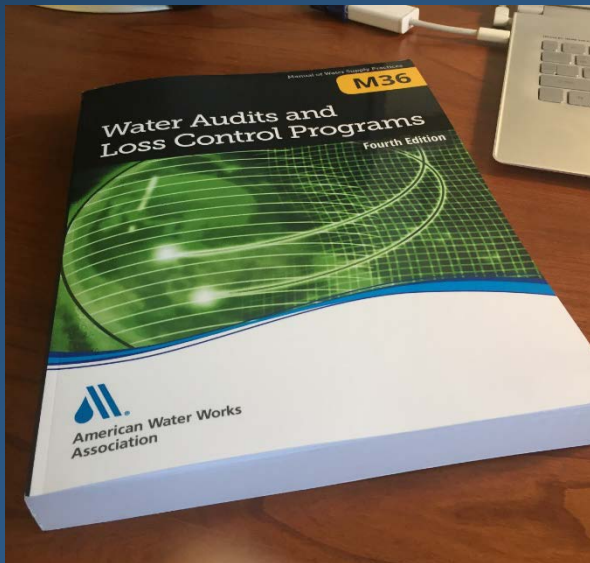


Pilot Scale

Water Loss Training & Technical Assistance Programs

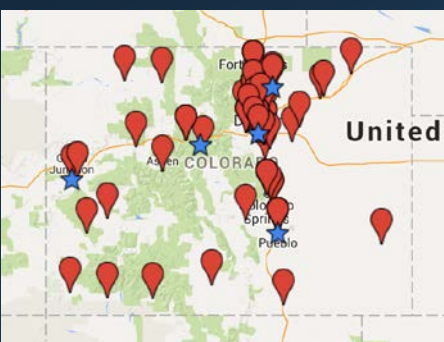


- Under NO regulatory framework
- Political context
- High level training (many utilities)
- Learning exercises with common data
- Pilot training (3 utilities)
- Learning exercises with utility specific data



Pilot Scale

Water Loss Training & Technical Assistance Programs



CO

- Under semi-regulatory framework
- High level training (50 utilities)
- Multiple locations across the state
- Learning exercises with common data



Pilot Scale

Water Loss Training & Technical Assistance Programs



Second Regular Session  
Seventieth General Assembly  
STATE OF COLORADO

INTRODUCED

LLS NO. 16-0531.02 Thomas Morris x4218

HOUSE BILL 16-1283

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A BILL FOR AN ACT

101 CONCERNING MEASURES TO DECREASE WATER LOSS BY DOMESTIC  
102 WATER SUPPLIERS.

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**Bill Summary**

*(Note: This summary applies to this bill as introduced and does not reflect any amendments that may be subsequently adopted. If this bill passes third reading in the house of introduction, a bill summary that applies to the reengrossed version of this bill will be available at <http://www.leg.state.co.us/billsummaries>.)*

**Section 2** of the bill requires that, on or before June 30, 2018, and on or before June 30 of each year thereafter, each covered entity must submit to the Colorado water conservation board (board) a completed and validated water loss audit report pursuant to guidelines that the board must adopt by January 1, 2018. A "covered entity" is a public entity that supplies at least 2,000 acre-feet of water per year to its customers. The





**DEMOGRAPHICS**

2014  
POPULATION SERVED: 865,000 (16 communities)  
SYSTEM SOURCE: Production (Lake Michigan)  
CONNECTIONS: 191,046  
MILES OF MAIN: 2,038  
SERVICE CONNECTION DENSITY: 94 conn/mile main  
AVERAGE OPERATING PRESSURE: 68.4 psi

**WATER AUDIT RESULTS**

2014  
Data Validity Score: 66/100  
Apparent Losses: 2.71 gal/serv conn/day  
Real Losses: 100.59 gal/serv conn/day  
Infrastructure Leakage Index (ILI): 5.87

# MILWAUKEE WATER WORKS

(WI2410100)

Carrie Lewis, MWW Superintendent  
Tim Ignatowski, Accountant III, Public Works—Water  
Jeff Novak, Water Business Operations Manager, Public Works—Water  
Joe Leszczynski, Office Assistant III, Neighborhood Services  
Ross Brzycki, Water Distribution Business System Supervisor

## Recommendations for Milwaukee Water Works

### Volume from Own Sources

Conduct hydraulic flow verification testing on finished water meters. As there are a large number of these meters, the volume measured by each meter in conjunction with the adequacy of upstream/downstream clearances at the meter location could be considered as a ranking criteria. Verify and document legitimacy of negative supply volumes on Low Service District – Howard.

### Volume from Own Sources: Master Meter & Supply Error Adjustments

Utilize above noted test results for derivation of this input.

### Water Exported

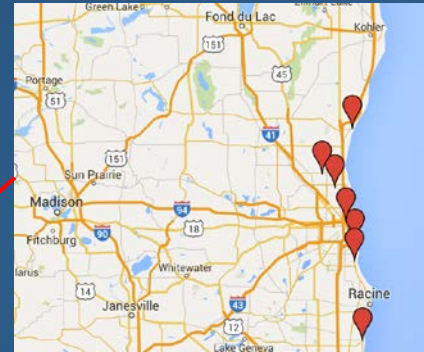
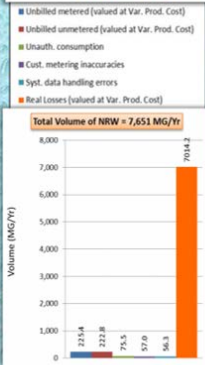
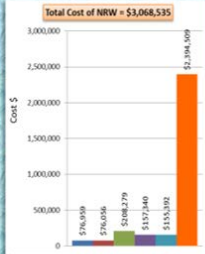
Analyze specific test results from 10 export meters for derivation of error adjustment.

### Average Length of Customer Service Line

Conduct study on available asset database for investigation of this estimate.

### Average Operating Pressure

Investigate true average pressure by pressure district, then conduct weighted average among all pressure districts using number of connections as basis for weighting.

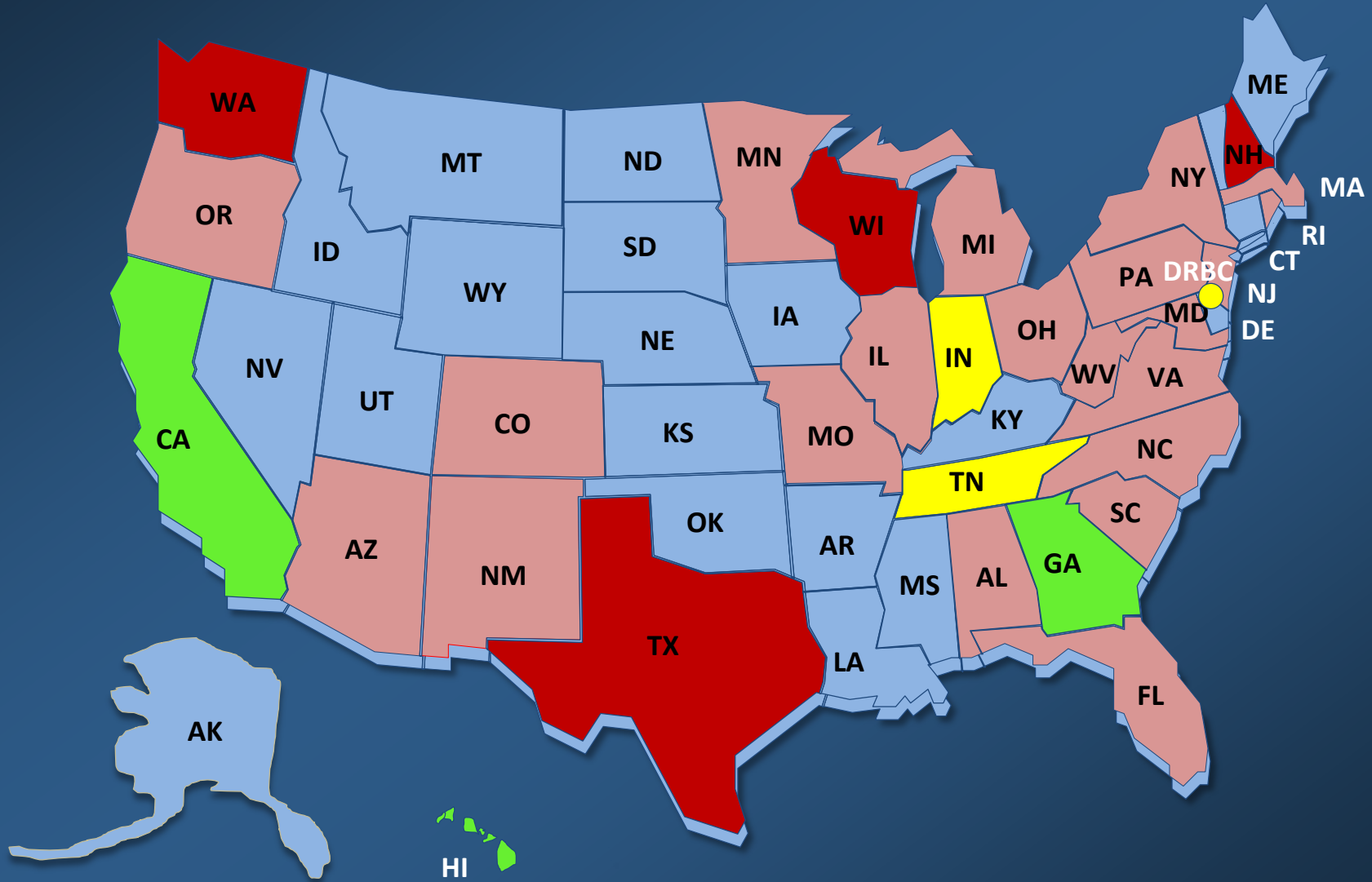


- Under regulatory framework
- Small group (6 utilities)
- Learning exercises with utility specific data

# Pilot Scale

# Water Loss Training & Technical Assistance Programs

- No water loss reporting
- Rudimentary water loss reporting
- AWWA M36 terminology & metrics
- AWWA M36 software
- AWWA M36 software with validation (Level 1)



# AWWA M36 Water Audit Validation Level Summary



**American Water Works  
Association**

*Dedicated to the World's Most Important Resource™*

Level	Descriptor	Validation Focus	Typical Activities	Level of Effort	Effort Depends on:
1	Top down review validation	Data grades, data validity score, gross errors and anomalies in the metrics	Desktop review of what is immediately available – supply reports, consumption reports, testing reports, etc. 1 to 2 hour phone call to interview utility staff, plus preparatory and documentation time. Interview questions are focused on practices to make sure the data grades have been applied correctly and consistently. Through this discussion, anomalies are discussed and either confirmed, corrected, or noted for needing further investigation.	Small	System size & complexity
2	Top down data mining validation	Supply and consumption volumes from existing data that is mined, at the component and sub-component levels	Data mining for desktop analysis of non-revenue water components. Analysis of available data, including production database and reports from SCADA system to identify gaps in the data chain. Data mining in the billing system to confirm and cleanse consumption volumes to remove redundancies from the data mining process which can come about from record duplications. Also validates exclusion of non-potable volumes in the totals. Validates that consumption volumes from low mid and high level detail extractions are corroborated. Analysis of available meter testing data for audit calculations. Applies 95% confidence limits to the AWWA water balance.	Medium	Complexity of supply setup, metering setup and billing setup. Analysis could be limited to only 1 or 2 of the 3 between supply, metering and billing.
3	Bottom up field investigation validation	Supply and consumption volumes from new data that is gathered or mined	Field investigations and extensive data mining. Supply meter testing and in-field verification of meter-transmitter-SCADA data chain. In field customer meter testing. Night flow testing & analysis for leakage. Pressure data collection & analysis.	Large	Varies widely by system, largely on how much field work is involved

THE SENATE  
TWENTY-EIGHTH LEGISLATURE, 2016  
STATE OF HAWAII

S.B. NO. 2645

# Hawaii

## A BILL FOR AN ACT

RELATING TO WATER AUDITS.

**BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF HAWAII:**

SECTION 1. Article XI, section 7 of Hawaii's Constitution obligates the State to protect, control and regulate the use of Hawaii's water resources for the benefit of its people.

Fresh water is the lifeblood of society. The quantity and quality of fresh water directly impacts the health, welfare, economy, and quality of life in Hawaii. Fresh water infrastructure has been constructed to withdraw water from available sources, to treat it to acceptable standards, and to distribute it to our various communities.

Based on the department of health's database, there are a little over fifty county-run public water systems statewide and another fifty large capacity public water systems and public water systems operating in designated ground water management areas. Many of these water distribution systems, however, may be operating with inefficiencies that result in the loss of water, increased energy costs, and lost revenue.

Water conservation is among the least expensive and most efficient ways to increase the available supply of fresh water. It requires improving the efficiency of water delivery and identifying losses to the system. A water audit helps a utility understand how much water is lost from a distribution system through the detailed analysis of data, which the utility can use to make informed decisions to reduce real or apparent losses.

There is a growing trend across the United States where states, including California, Colorado, Delaware, Georgia, New Mexico, Pennsylvania, Tennessee, Texas, Washington, and Wisconsin, and their water authorities have begun to mandate water audits by water utilities.

The purpose of this Act is to establish a program to implement standardized water audits of public water systems in accordance with the method adopted by the American Water Works Association's Water Audits and Loss Control Programs, Manual of Water Supply Practices - M36, as amended.

SECTION 2. The commission on water resource management shall establish a five-year program to conduct standardized water audits of public water systems in accordance with the method adopted by the American Water Works Association's Water Audits and Loss Control Programs, Manual of Water Supply Practices - M36, as amended.





# Indiana General Assembly

## 2016 Session

- Information
- Session
- Committees
- Legislation
- Laws
- Publications

### Senate Bill 347



#### Enrolled Senate Bill (S)

**Authored by** [Sen. Ed Charbonneau](#), [Sen. Douglas Eckerty](#), [Sen. Mark Stoops](#).  
**Co-Authored by** [Sen. Michael Delph](#), [Sen. Lonnie Randolph](#).  
**Sponsored by** [Rep. David Wolkins](#), [Rep. Greg Beumer](#), [Rep. Steven Stemler](#), [Rep. Christina Hale](#).

#### Authors / Sponsors +

#### DIGEST

Water resources. Repeals the law requiring all water utilities to annually report to the utility regulatory commission on the utilities' operations and maintenance costs in providing water service to their customers. Requires the Indiana finance authority (authority), before November 1, 2017, to prepare and submit in an electronic format to the executive director of the legislative services agency a report on non-revenue water (the difference between the volume of water entering a water distribution system and the volume of water consumption billed to customers served by the water distribution system) and water loss in Indiana. Requires the authority to perform a quality assurance review of the water resources data compiled from the reports submitted annually by owners of significant water withdrawal facilities for all calendar years since 1985, and to present the results of its quality assurance review as those results become available to the water rights and use section of the division of water of the department of natural resources. Requires the authority to study, analyze, and report to the executive director of the legislative services agency by November 1, 2016, on the infrastructure needs of Indiana's water utilities. [View less](#)



# Best Practice in Water Loss Control: Improved Concepts for 21st Century Water Management

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In 2003 the American Water Works Association (AWWA) adopted improved best practice methods for defining and measuring water loss in water distribution systems. This transition into a new era of effective water management marked a departure from previous terms and practices no longer useful to the industry. The following explains this departure from obsolete practices and articulates key points and best practices in water loss control today.

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## Improved Terminology: Non-revenue Water

In 2003 AWWA abandoned use of the term “unaccounted-for” water (UFW) because all volumes of water supplied within a distribution system go toward either beneficial consumption or wasteful loss. *All water sent into the distribution system can be accounted for.* Today, the industry term favored by AWWA and its Water Loss Control Committee when quantifying water loss is “non-revenue” water (NRW).

**NRW is specifically defined to include the sum of specific types of water loss and any authorized, unbilled consumption that occurs within water distribution systems.**

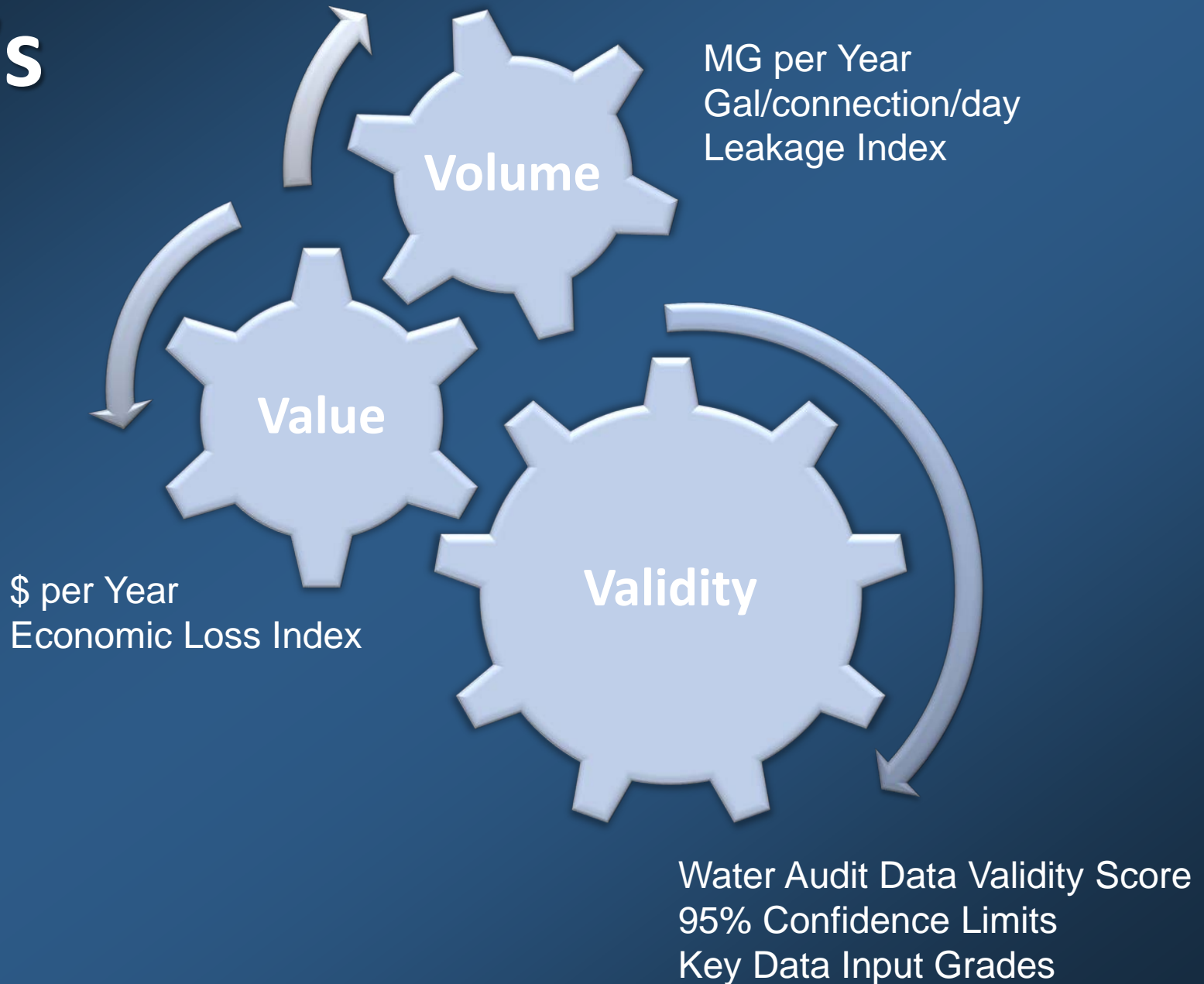
The following table provides a guide to the most up-to-date industry best practices and water loss control terminology.

### Editorial Guide for Use of Up-to-Date Water Loss Control Terminology

INCORRECT	CORRECT	WHY
Unaccounted-for water (UFW)	Non-revenue water (NRW)	All water entering a distribution system can be defined as a component of either authorized consumption or water loss
% of system input volume to measure water loss performance	Suite of key performance indicators for water loss as outlined in IWA/AWWA audit method (As an example: gal/service connection/day)	A %-based expression obscures the underlying causes of water loss and impedes realistic solutions based on system specifics

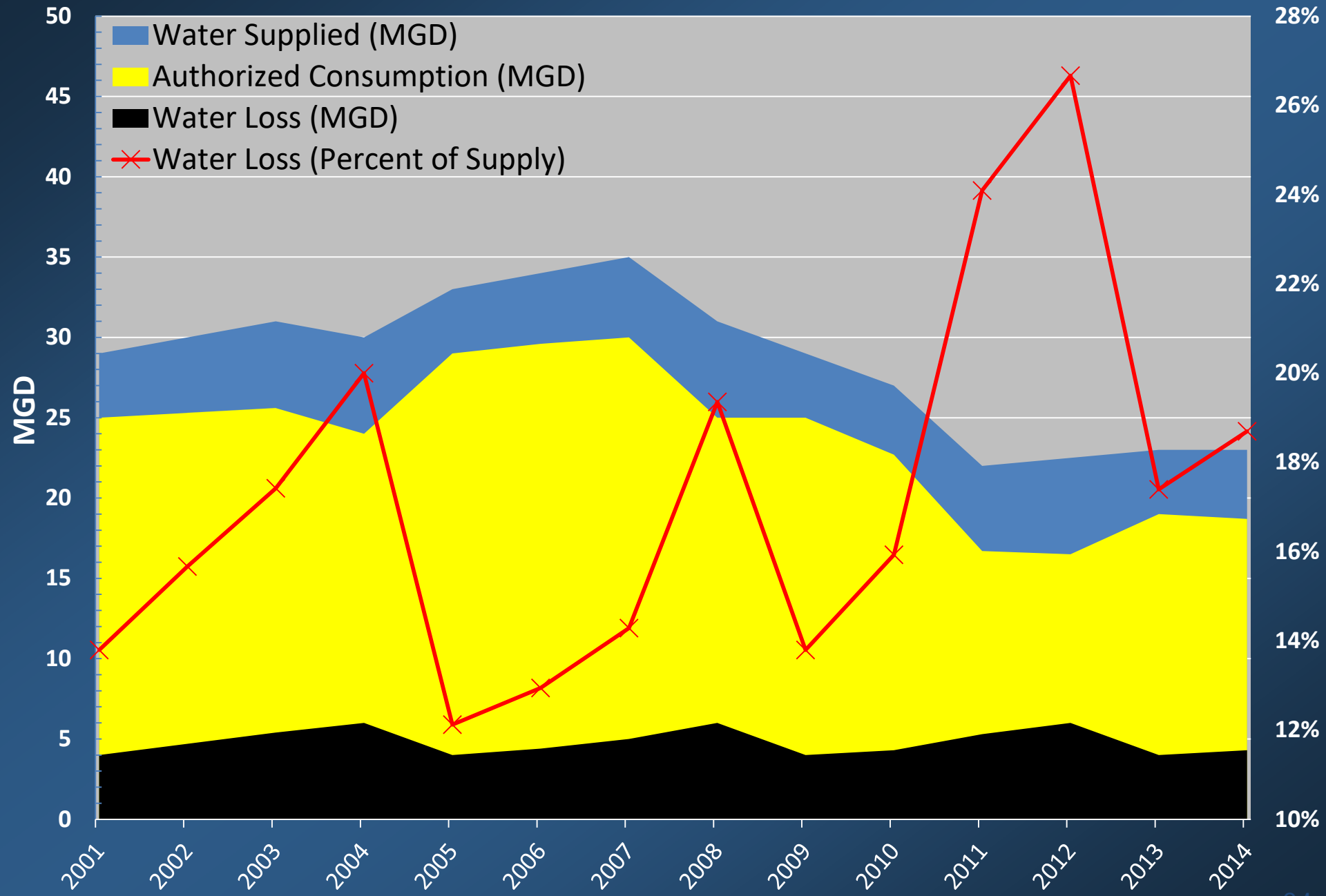
It is important to understand that all water utility distribution systems incur leakage (real losses). Similarly, all water utilities fail to recover revenue from all of the water that is (or should be) billed to customers (apparent losses). Although every system is unique, all water utilities should employ leakage control and revenue recovery programs that strive to keep losses contained to appropriate, economically justified levels. AWWA's Manual: *Water Audits and Loss Control Programs* (M36) and the [AWWA FREE Water Audit Software](#) provide a robust pathway for utilities to develop data-driven programs to cost-effectively manage all water loss components (apparent and real) in distribution systems, as shown below in the IWA/AWWA Water Balance.

# 3-V's



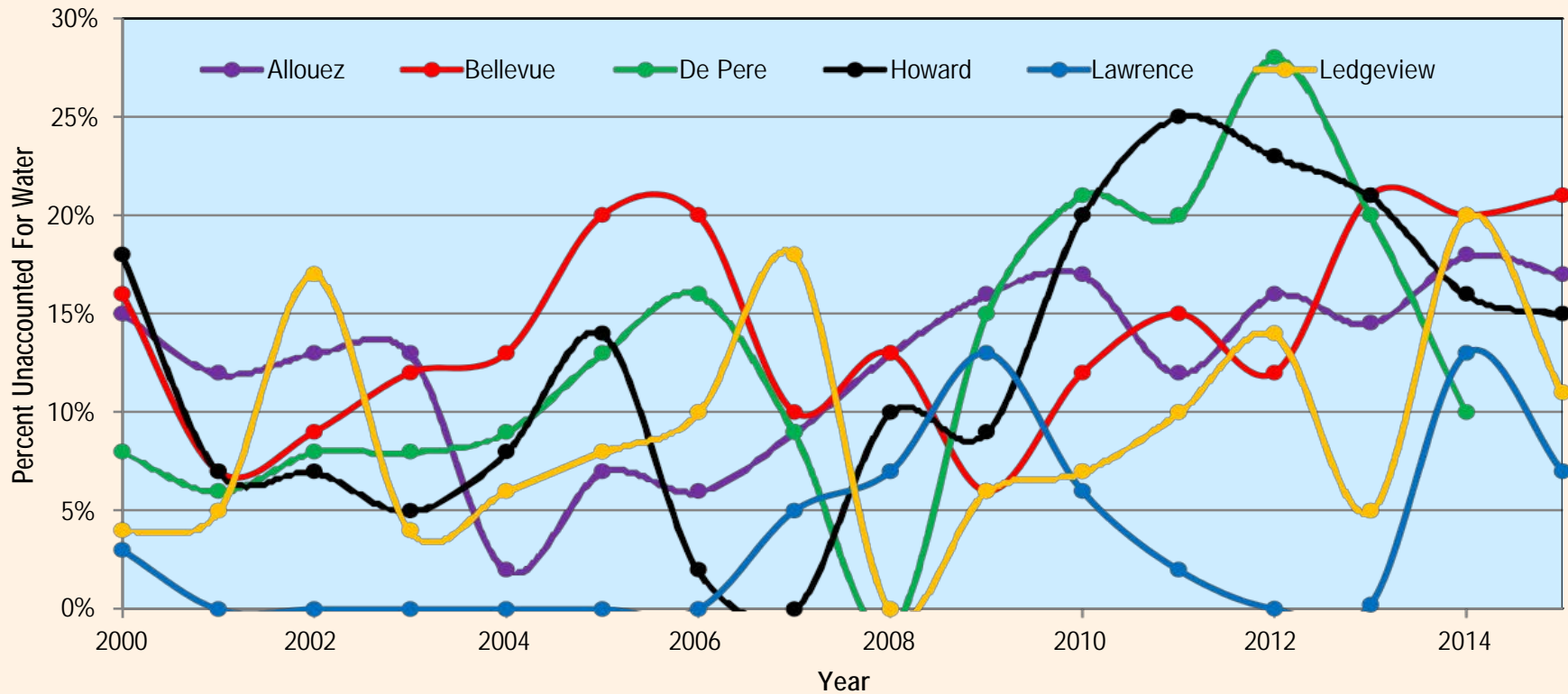


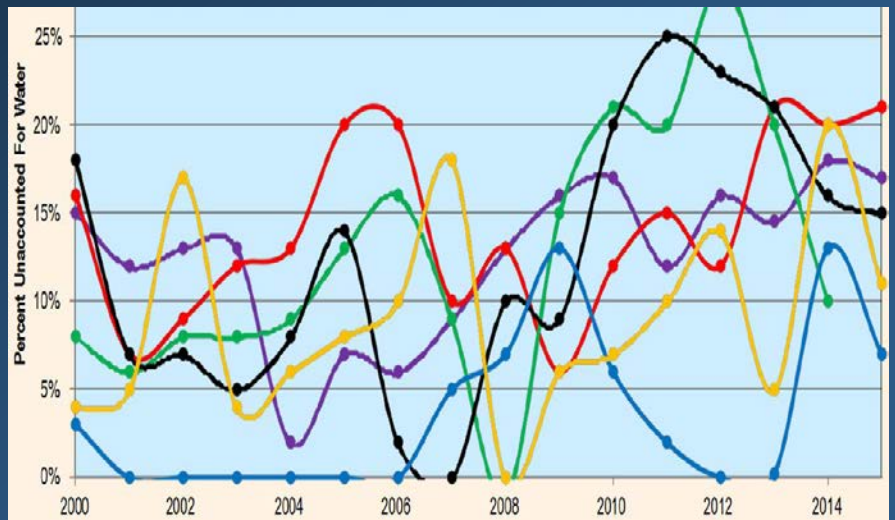
# Water Loss as a Percentage of Supply is not an Indicator of Performance



# Historical losses

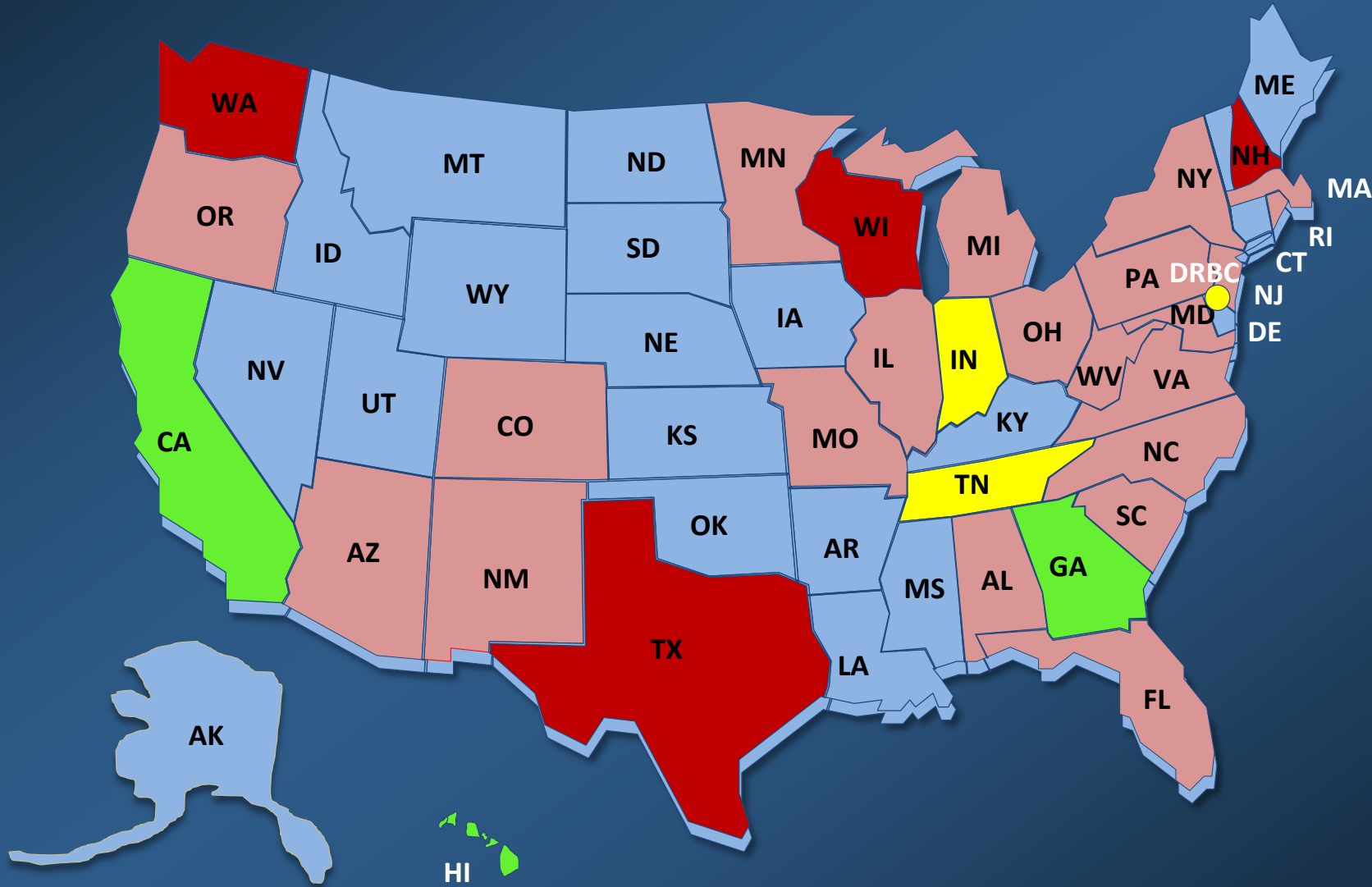
## Total Water Loss - CBCWA Members







**No water loss reporting**   **Rudimentary water loss reporting**   **AWWA M36 terminology & metrics**   **AWWA M36 software**   **AWWA M36 software with validation (Level 1)**







December 4-5, 2017