



Sustainability

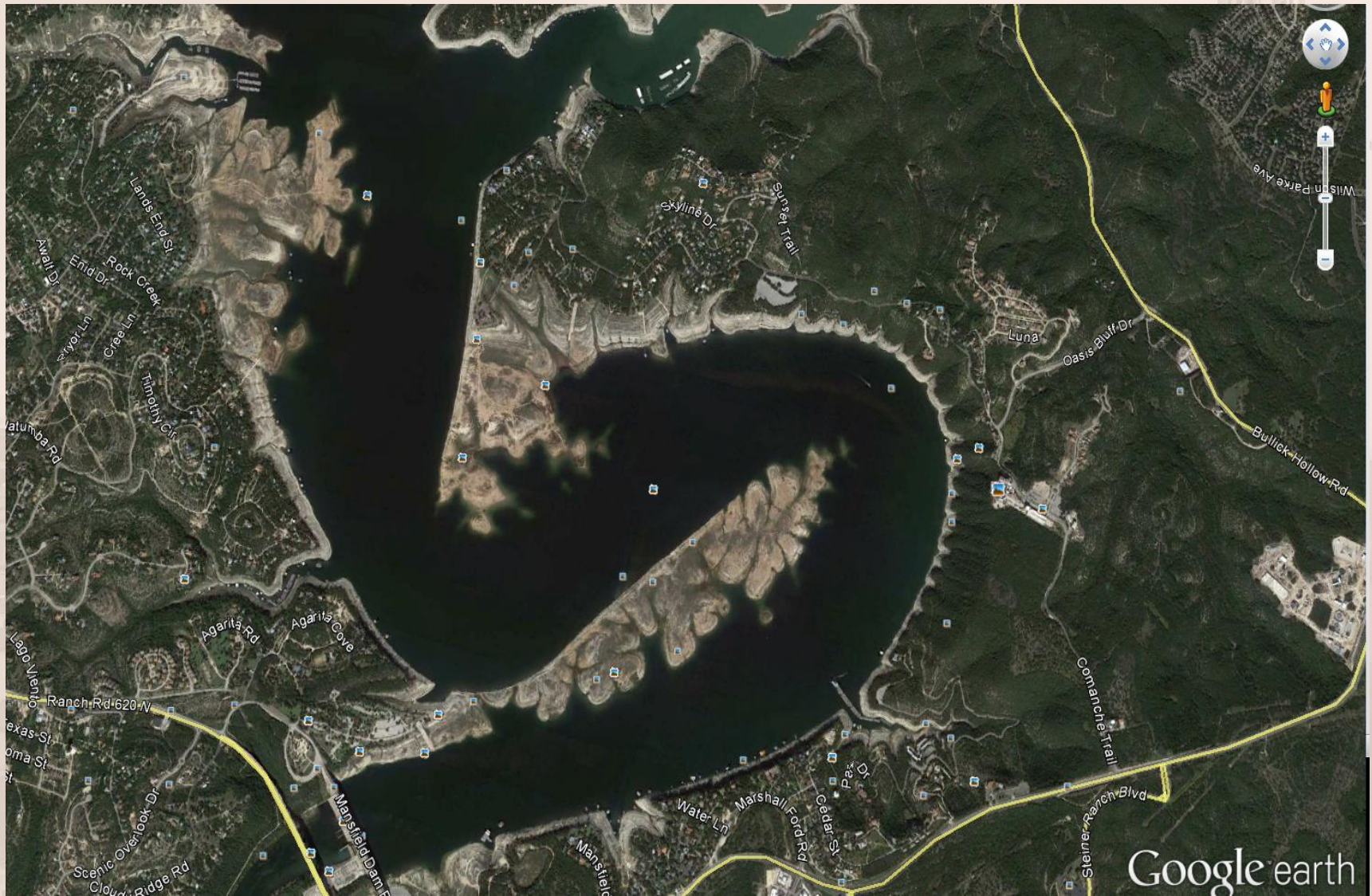
 Facilities Services

- Markus Hogue
- Program Coordinator: Irrigation & Water Conservation
- The University of Texas at Austin

Lake Travis - 2008



Lake Travis - 2013



President's Sustainability Steering Committee

- In May 2007, President William Powers established the University Task Force on Sustainability
- University adopted a policy regarding sustainability in April 2008
- By August 31, 2020, UT Austin will reduce domestic water use by 20% with at least 40% of total water use coming from reuse/reclaimed sources



U.S. Drought Monitor

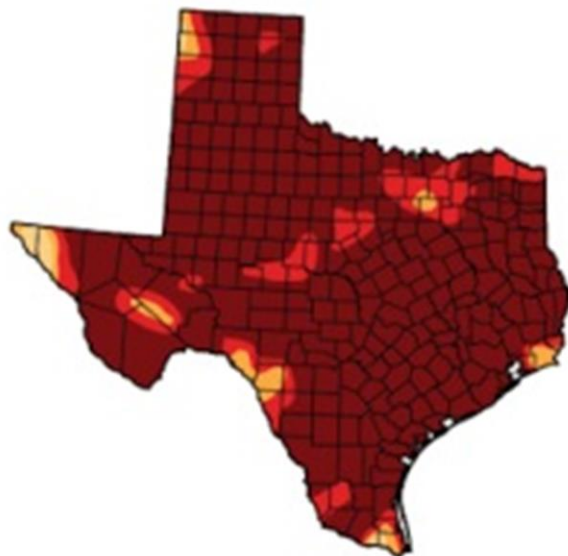
Texas

September 20, 2011
Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.00	100.00	100.00	99.03	96.10	85.43
Last Week (09/13/2011 map)	0.00	100.00	100.00	99.17	96.75	87.83
3 Months Ago (06/21/2011 map)	3.33	96.67	95.71	94.52	91.31	70.61
Start of Calendar Year (12/28/2010 map)	7.89	92.11	69.43	37.46	9.59	0.00
Start of Water Year (09/28/2010 map)	75.57	24.43	2.43	0.99	0.00	0.00
One Year Ago (09/14/2010 map)	77.93	22.07	3.37	0.97	0.00	0.00

Intensity:



The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

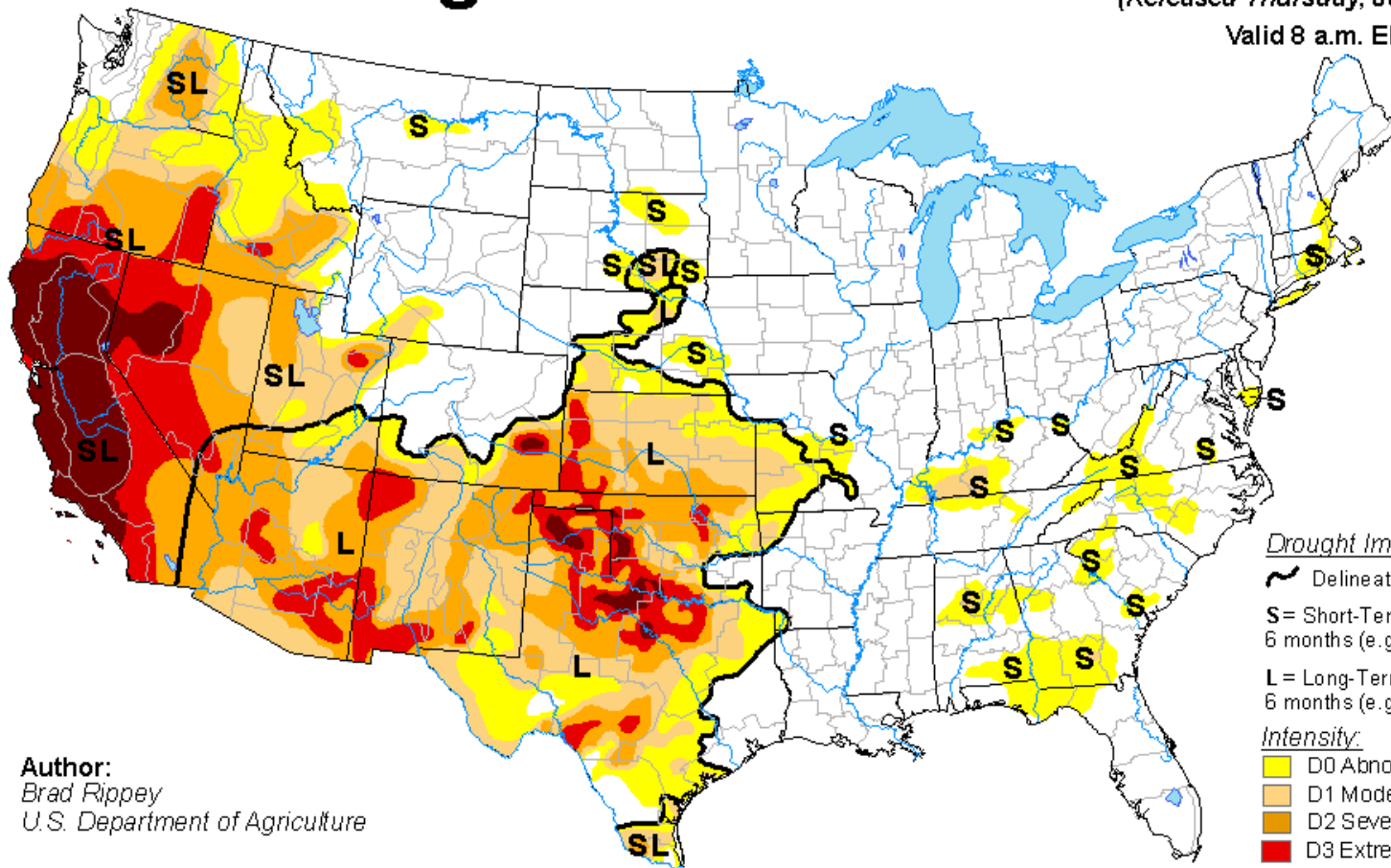
<http://drought.unl.edu/dm>



Released Thursday, September 22, 2011
Michael Brower, National Climatic Data Center/NOAA

U.S. Drought Monitor

July 29, 2014
 (Released Thursday, Jul. 31, 2014)
 Valid 8 a.m. EDT



Author:
 Brad Rippey
 U.S. Department of Agriculture

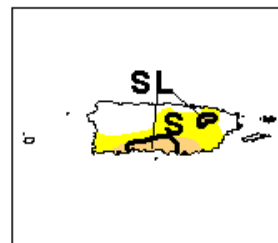
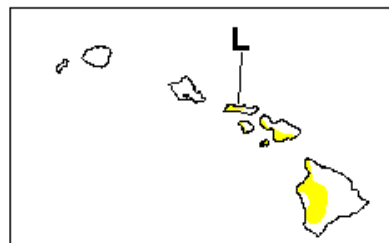
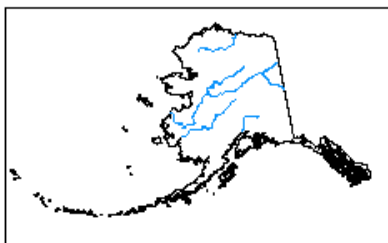
Drought Impact Types:

- ~ Delineates dominant impacts
- S= Short-Term, typically less than 6 months (e.g. agriculture, grasslands)
- L= Long-Term, typically greater than 6 months (e.g. hydrology, ecology)

Intensity:

- Yellow: D0 Abnormally Dry
- Orange: D1 Moderate Drought
- Dark Orange: D2 Severe Drought
- Red: D3 Extreme Drought
- Dark Red: D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.



<http://droughtmonitor.unl.edu/>

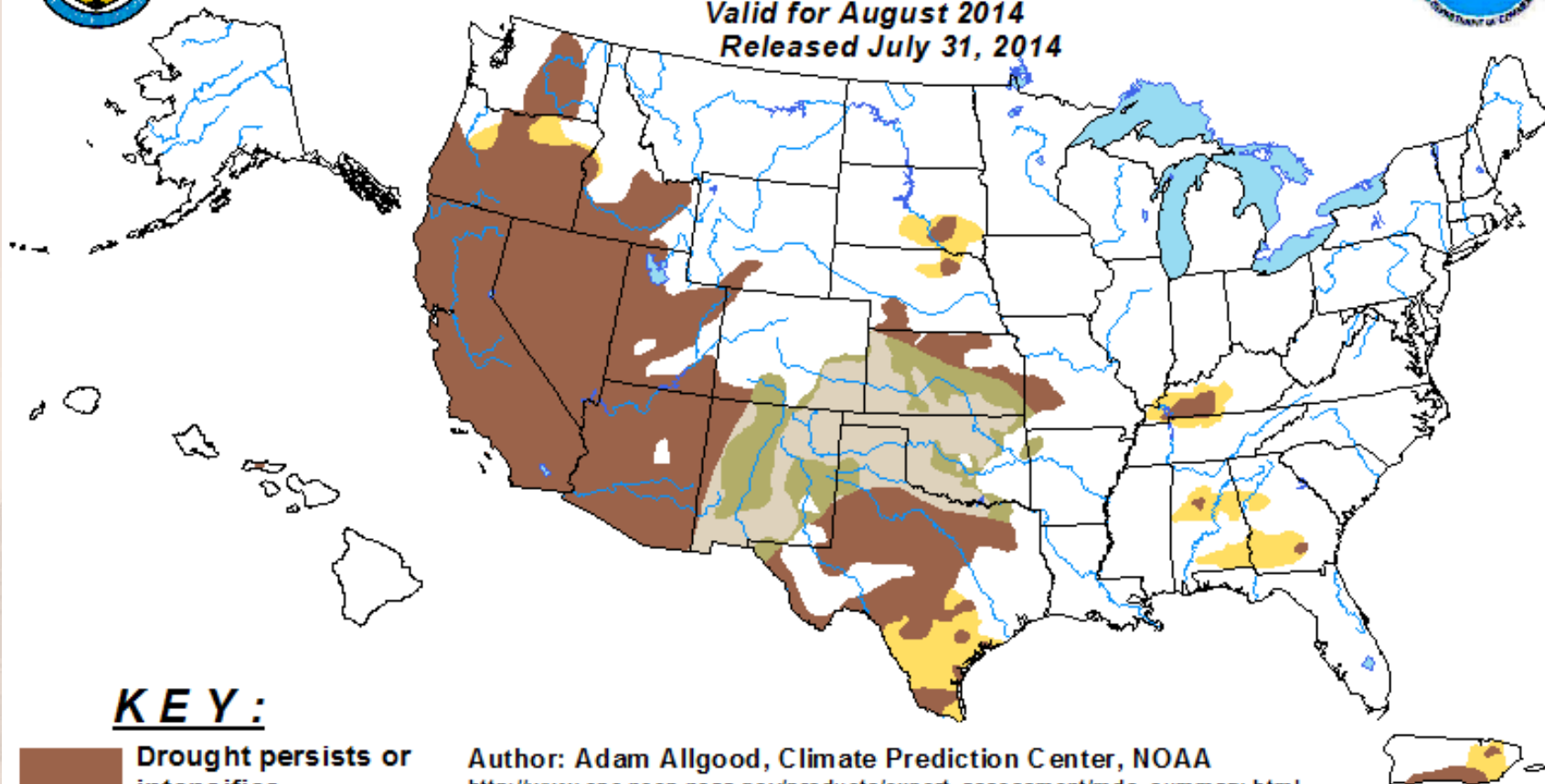


U.S. Monthly Drought Outlook





Drought Tendency During the Valid Period



Valid for August 2014
Released July 31, 2014



KEY:

-  Drought persists or intensifies
-  Drought remains but improves
-  Drought removal likely
-  Drought development likely

Author: Adam Allgood, Climate Prediction Center, NOAA

http://www.cpc.ncep.noaa.gov/products/expert_assessment/mdo_summary.html

Depicts large-scale trends based on subjectively derived probabilities guided by short- and long-range statistical and dynamical forecasts. Short-term events – such as individual storms – cannot be accurately forecast more than a few days in advance. Use caution for applications – such as crops – that can be affected by such events. "Ongoing" drought areas are approximated from the Drought Monitor (D1 to D4 intensity). For weekly drought updates, see the latest U.S. Drought Monitor.

NOTE: The tan areas imply at least a 1-category improvement in the Drought Monitor intensity levels by the end of the period although drought will remain. The green areas imply drought removal by the end of the period (D0 or none)

UT Main Campus

109 Automatic Irrigation Controllers

2,288 irrigation zones

29,744 irrigation heads

53 manual zones

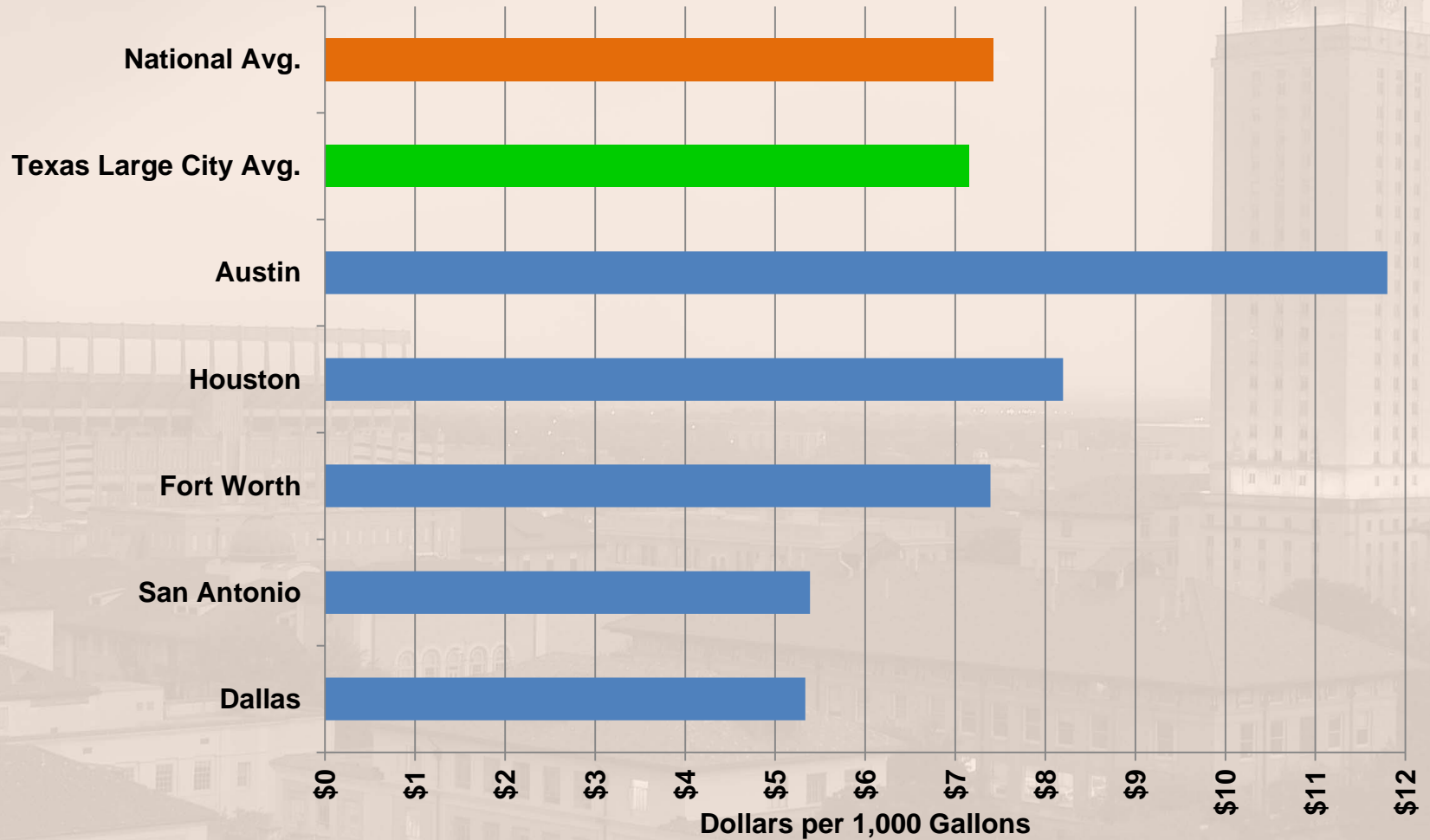
Past yearly irrigation consumption

175 million gallons of water

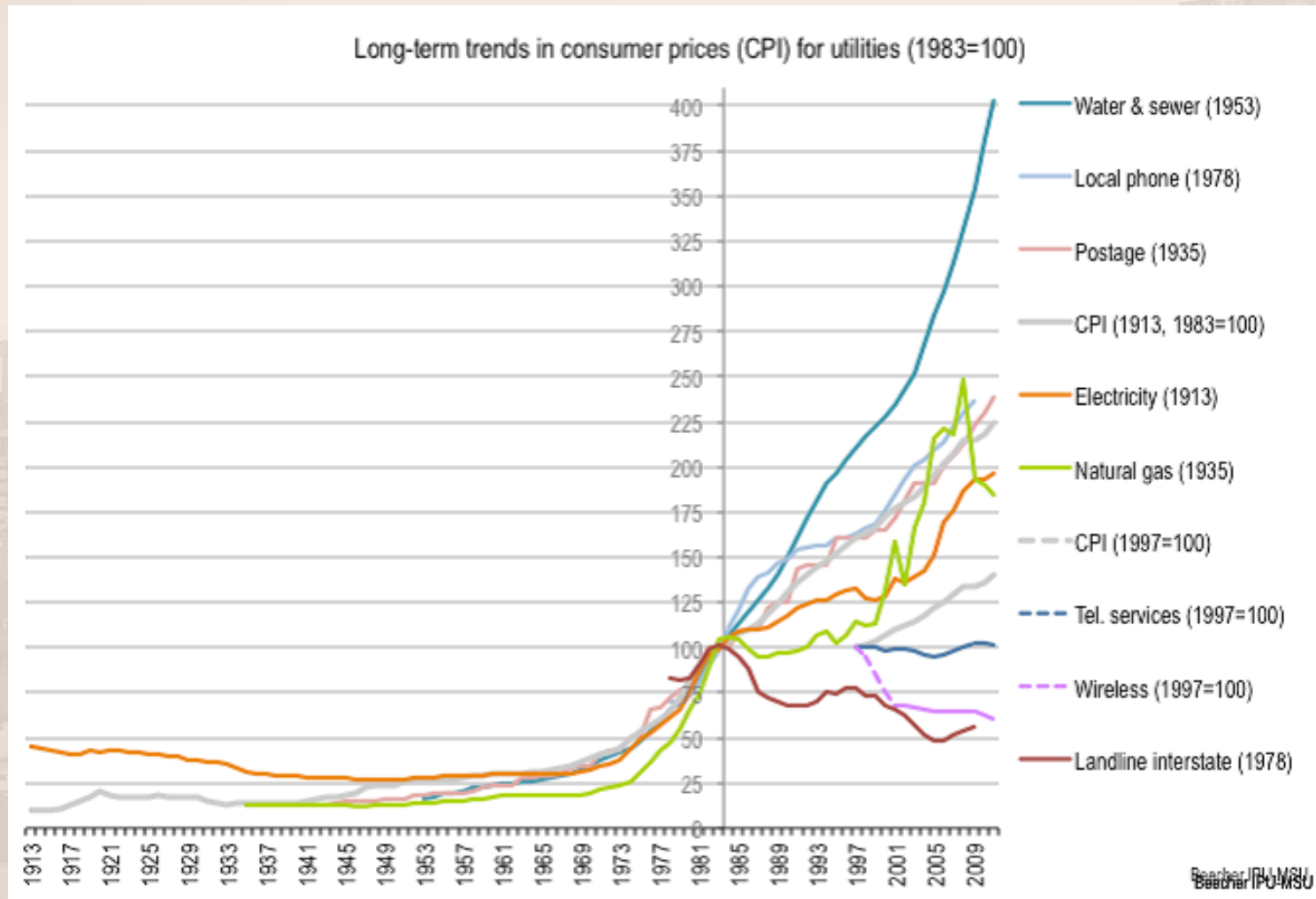
2012 consumption was 66% lower
on automated systems



2010 Combined Commercial Water & Sewer Rates



Pricing trend comparison



Irrigation and Water Management

- Distribution methods
- Central Irrigation System
- Flow Sensors
- Data analysis
- Transparency
- Xeriscaping
- Internships
- Dashboard
- Future



Replaced over
18,000 nozzles

AFTER:

No Misting

+ No Drifting

**= Minimal Water
Waste**



Nozzles



Nozzles



Drip Irrigation

- Water applied where it is needed
- Reduced water waste



Squirrel problems!





Texas Style Solution



Squirrel Solution



Irrigation and Water Management

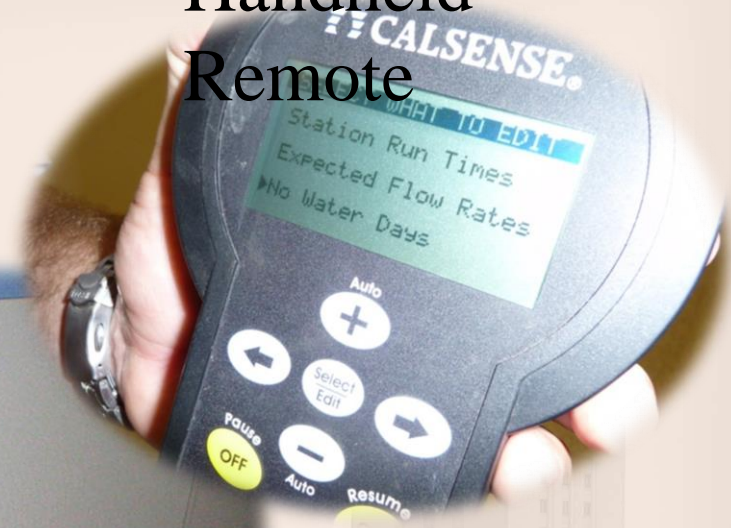
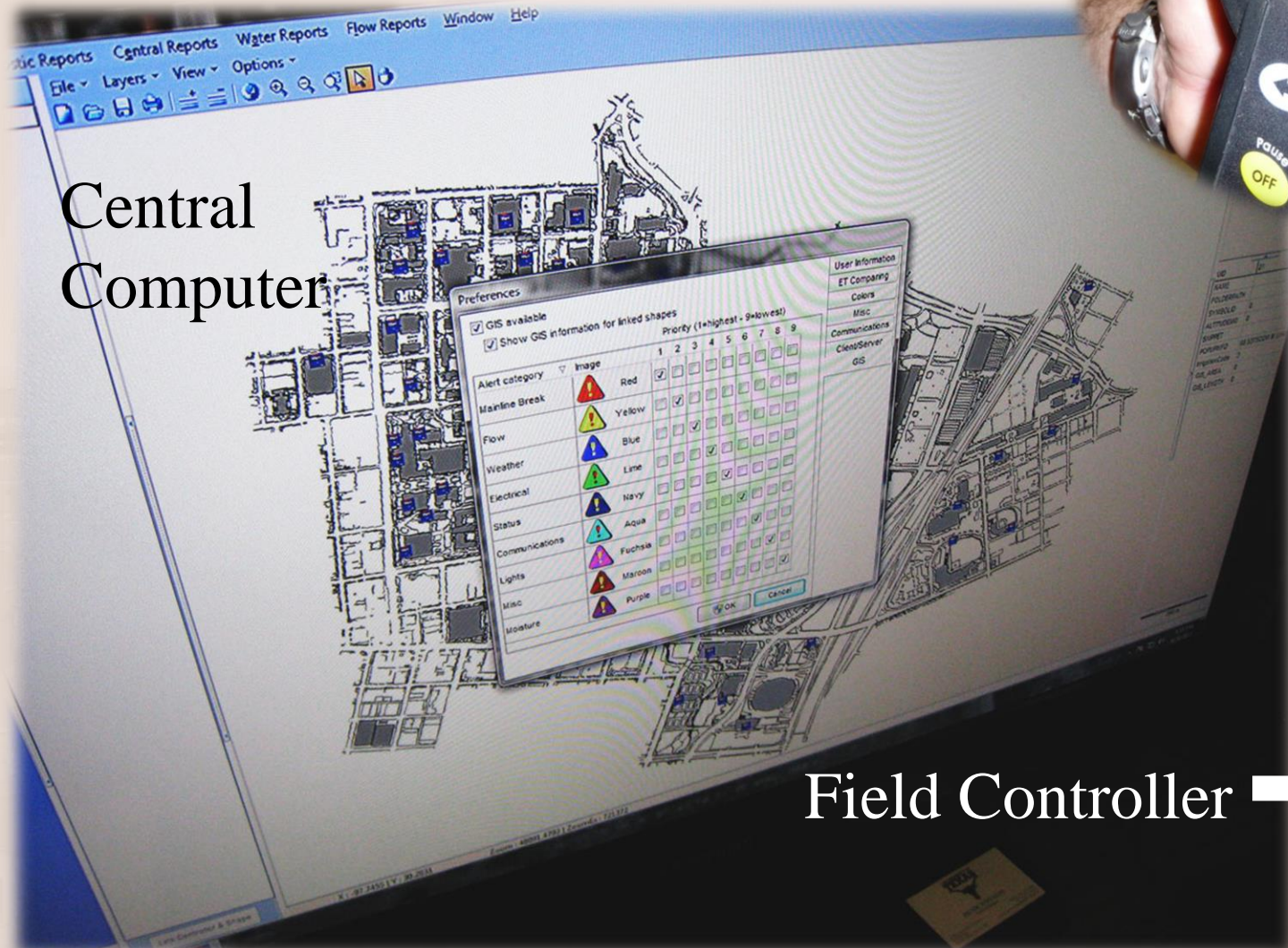
- 2.1 million dollar modernization of UT's Irrigation system
- Adhere to City Watering Regulations
- Maintenance/Repair
- High Water usage Systems



Centralized Irrigation Management

Handheld Remote

Central Computer



Field Controller →

Universal Control and Data Access

The screenshot displays the Calsense Command Center software interface. The title bar reads "Calsense Command Center {Administrator} - [Speed Communications]". The menu bar includes "File", "RR", "Setup", "Communications", "Program Data", "Diagnostic Reports", "Central Reports", "Water Reports", "Flow Reports", "Window", and "Help".

The interface is divided into several sections:

- Left Sidebar:** Contains expandable sections for "Setup" (Site/Controller, Tasks, Alert Filters & Repo..., Access Control, Controller Assignment, User Log, Rain Polling), "Communications" (Speed Communicati..., Task Scheduler, Communications Log, Winter Shutdown, Terminate Winter S...), "Program data" (Program Data), "Diagnostic repo..." (Alerts, Station History), "Central reports" (Controller List, Task List, Disabled Communic..., No Report Gathering), "Water reports" (Water Management, Water Usage, Controller Summary, Station Summary, POC Summary, Station Costing), and "Flow reports". A "Latest Alerts" section is at the bottom.
- Tree View:** Titled "Sites/Controllers", it shows a hierarchy: "<All Controllers>" (HUB, Training, Zone 1, Zone 2, Zone 3, Zone 4, Zone 5, Zone 6, Zone 7, Zone 8). Zone 1 is expanded to show sub-controllers: ADH, ARC, Belo, CMB, CPE, ETC, KIN, LFH, LLC, LTD, LTD Courtyard, SAG, SEA, SSB, SWGO, TSG.
- Main Panel:** Titled "Select controller then select option to perform:", it features a grid of 16 icons with labels: "Get Alerts", "Get Program Data", "Get Station History", "Get All Diagnostics", "Send No Water Days", "Controller ON", "Controller OFF", "Direct Access", "Get Manual Programs", "Send Access Control Codes", "Get Lights", "Clear Mainline Break", "Master Valve Override", "Clear Hold Over", "Set Time And Date", "Send Program Tag Operations", "Lights Override", and "Get Flow Recording".

Calsense Controllers



Hand Held Remote



Communication Method

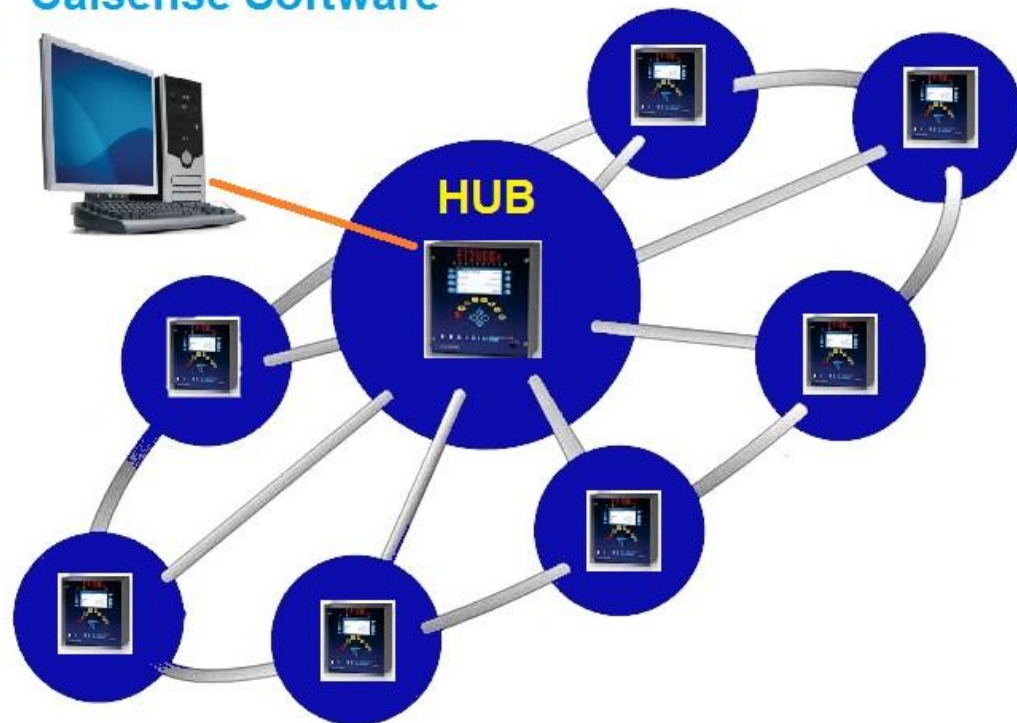
Laptop



Calsense Software



IPad or Phone



Offsite Management



GIS Map with Alert Notification

The screenshot displays the Calsense Command Center GIS Viewer interface. The main window shows a detailed GIS map of a city area with numerous blue alert icons overlaid on the map. The interface includes a menu bar (File, BRe, Setup, Communications, Program Data, Diagnostic Reports, Central Reports, Water Reports, Flow Reports, Window, Help) and a toolbar with various navigation and tool icons. On the left, there is a 'Setup' sidebar with expandable sections for Communications, Program data, Diagnostic reports, Central reports, Water reports, and Flow reports. Below this is a 'Sites/Controllers' tree view showing a hierarchy: <All Controllers>, HUB, Zone 1, Zone 2, Zone 3, Zone 4, Zone 5, Zone 6, Zone 7, and Zone 8. A 'Preferences' dialog box is open in the foreground, allowing users to configure alert categories and their visual representation.

Preferences

GIS available
 Show GIS Information for linked shapes

Priority (1=highest - 9=lowest)

Alert category	Image	Color	1	2	3	4	5	6	7	8	9
Mainline Break		Red	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Flow		Yellow	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Weather		Blue	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Electrical		Lime	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Communications		Aqua	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Status		Navy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lights		Fuchsia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Misc		Maroon	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Moisture		Purple	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

OK Cancel

User Information
ET Comparing
Colors
Misc
Communications
Client/Server
GIS

Latest Alerts
Link Controller -> Shape
X: -97.7470 | Y: 30.2901
Zoom: 49011.8378 | ZoomEx: 735177.5

Alerts

Alerts By Site

February 05, 2013 7:37 AM

Zone 1

TSG

609.c

Time Stamp	Alert Message
02/04/2013 10:02 PM	LOW FLOW: Programmed irrigation, station 1, Measured 6 gpm, Expected 13 gpm
10:05 PM	LOW FLOW: Programmed irrigation, station 2, Measured 8 gpm, Expected 14 gpm
10:07 PM	LOW FLOW: Programmed irrigation, station 3, Measured 7 gpm, Expected 18 gpm
10:09 PM	HIGH FLOW: Programmed irrigation, station 4, Measured 33 gpm, Expected 22 gpm
10:11 PM	LOW FLOW: Programmed irrigation, station 5, Measured 16 gpm, Expected 22 gpm
10:13 PM	LOW FLOW: Programmed irrigation, station 6, Measured 6 gpm, Expected 15 gpm

*Broken head west side
by entrance
2-6-13
EV*

- Location
- Time
- Savings

Above water loss

4,620 gallons

\$33 a month

Right water loss

17,820 gallons

\$128 a season

Alerts By Site

February 05, 2013 7:37 AM

Zone 1

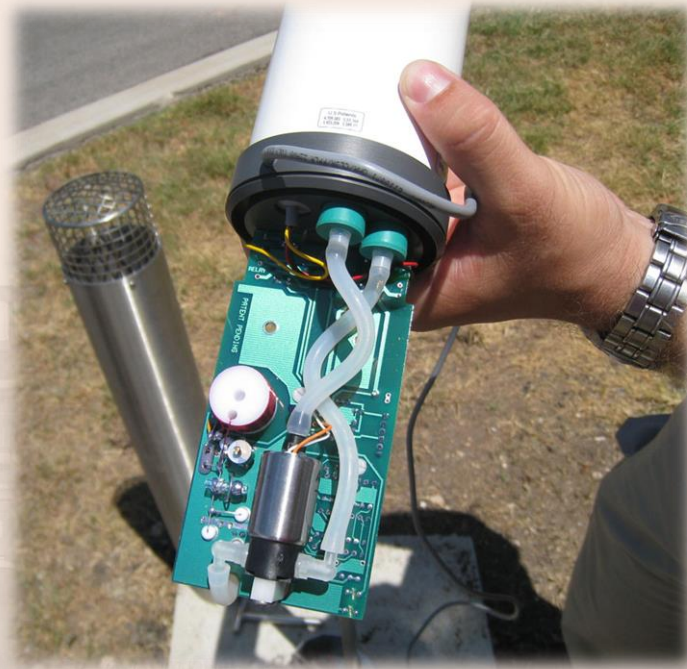
LLC

609.c

Time Stamp	Alert Message
02/04/2013 10:02 PM	NO FLOW: Programmed irrigation, station 9, Measured 0 gpm, Expected 5 gpm
11:51 PM	LOW FLOW: Programmed irrigation, station 3, Measured 5 gpm, Expected 8 gpm
11:53 PM	LOW FLOW: Programmed irrigation, station 10, Measured 8 gpm, Expected 11 gpm
11:59 PM	LOW FLOW: Programmed irrigation, station 11, Measured 13 gpm, Expected 16 gpm
02/05/2013 12:01 AM	HIGH FLOW: Programmed irrigation, station 2, Measured 17 gpm, Expected 7 gpm
12:03 AM	HIGH FLOW: Programmed irrigation, station 6, Measured 21 gpm, Expected 10 gpm
12:05 AM	HIGH FLOW: Programmed irrigation, station 12, Measured 21 gpm, Expected 10 gpm
12:07 AM	HIGH FLOW: Programmed irrigation, station 1, Measured 25 gpm, Expected 14 gpm
12:09 AM	HIGH FLOW: Programmed irrigation, station 4, Measured 19 gpm, Expected 11 gpm
12:12 AM	HIGH FLOW: Programmed irrigation, station 5, Measured 19 gpm, Expected 9 gpm
12:14 AM	HIGH FLOW: Programmed irrigation, station 7, Measured 19 gpm, Expected 10 gpm
12:16 AM	HIGH FLOW: Programmed irrigation, station 8, Measured 22 gpm, Expected 11 gpm

*Valve # 11 stuck and
2-6-13
EV
Repaired
2-11-13
EV*

Adjusting for Climate by Gauging Evapotranspiration



Evapotranspiration ET definition: is a term used to describe the sum of evaporation and plant transpiration from the Earth's land surface to atmosphere.

Rain Buckets

Locations : MAI

JON

Facilities Services

Turns off irrigation due to rain

**Uses rain amount to modify
program operating times**

**Shares data with controllers that are
near the Rain Bucket's location**

**Rain Buckets at MAI and Facilities
Services have had different
amounts of up to half an inch**



Measurement & Automatic Shut-Off

Installed flow sensors & master control valves



Old irrigation control box

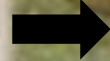
New irrigation controls



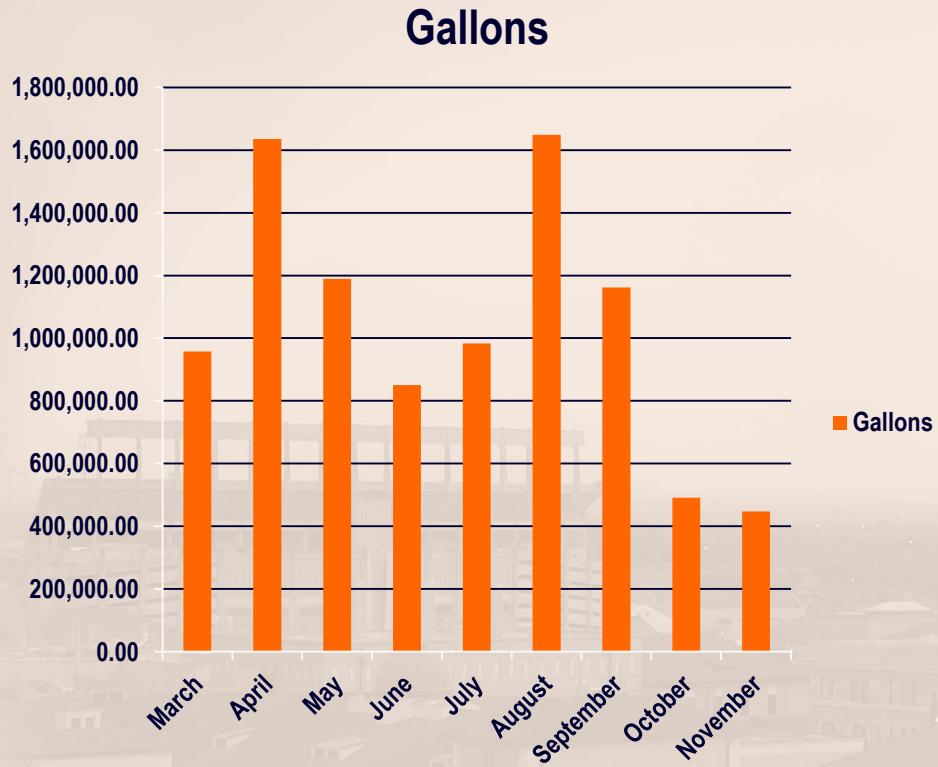
Flow sensor



Master control valve



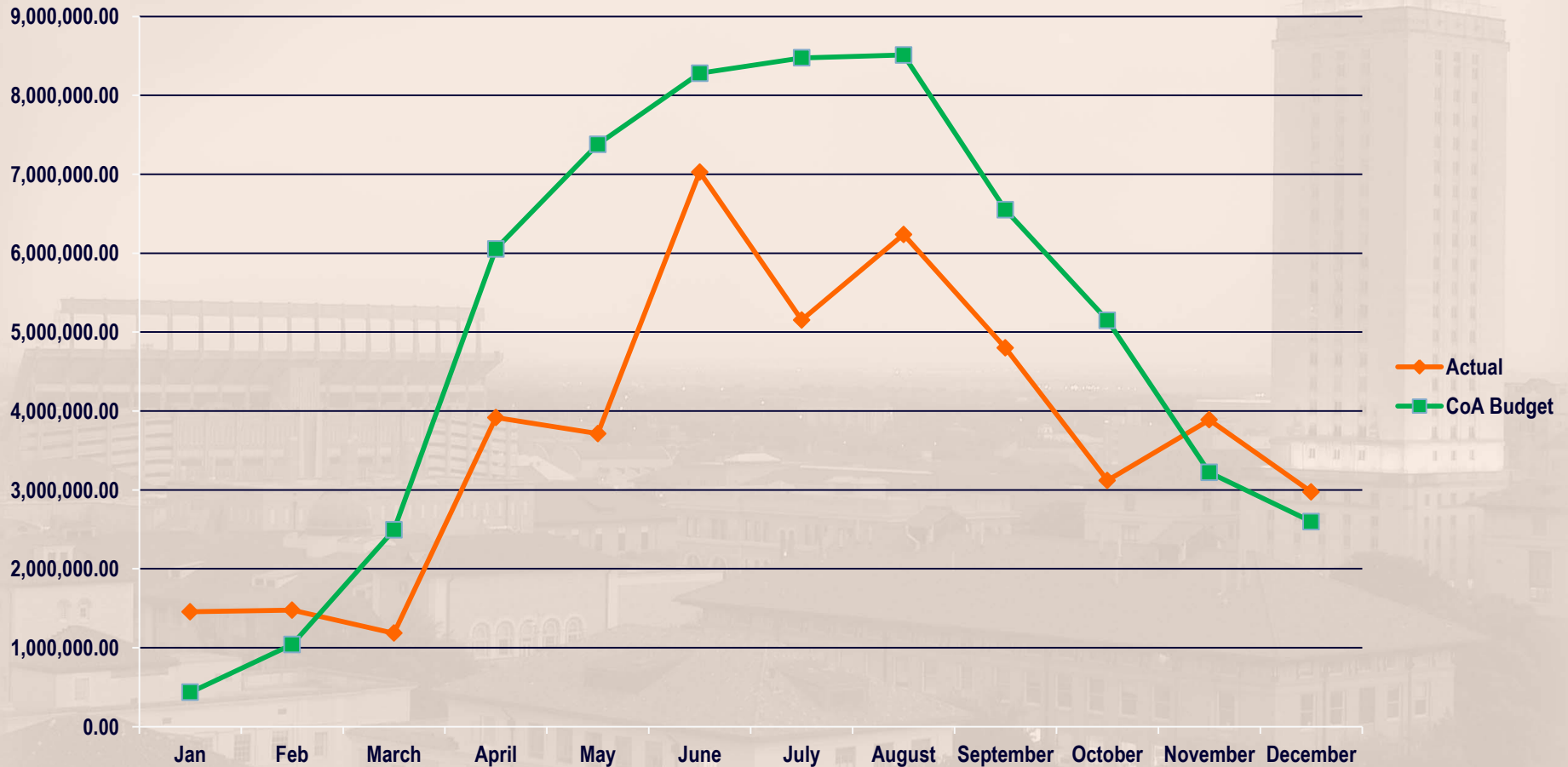
Water Savings from Flow Sensor



- Over 9.3 Million gallons in 2012!!!!

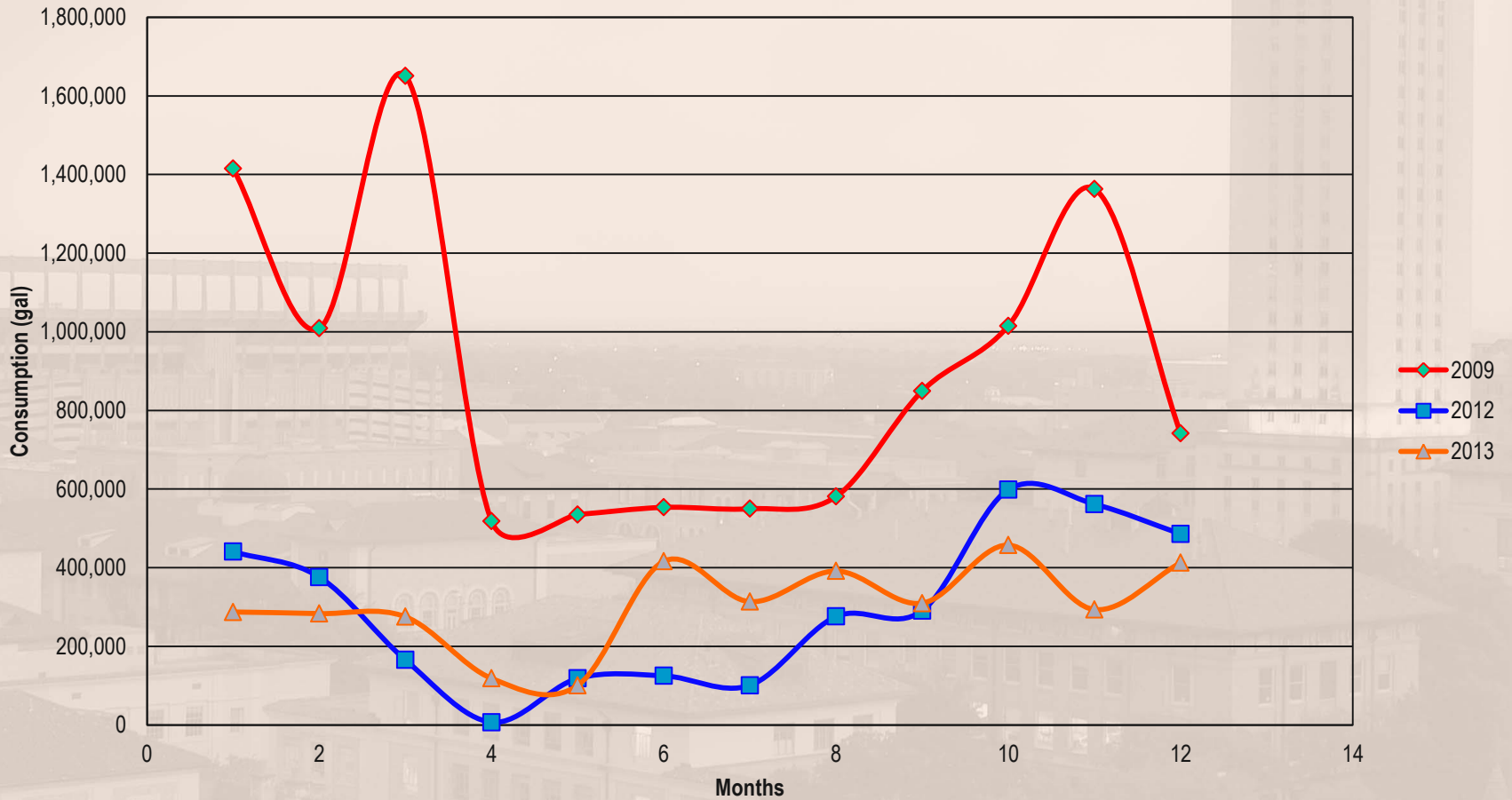


UT vs. City of Austin Budget



Water meter data

All Automated



Past Irrigation Information

Water Meter Data from Irrigation Meters

- 285 million gallons average for past 3 years

Calculation based on nozzle precipitation

- 182 million gallons per year

WMI Irrigation Audit in 2007-2008

- 176 million gallons per year

Present Data Collection

<u>Water Usage</u>	July 27, 2012 10:04:09 AM	Jun/01/2012 - Jun/30/2012	
	Usage (Gallons)	ET Table (Inches)	Rain Table (Inches)
Zone 1			
LFH			
Jun-2012	61,043	7.93	0.00
Total	61,043	7.93	0.00
LLC			
Jun-2012	53,175	8.28	0.00
Total	53,175	8.28	0.00
LTD			
Jun-2012	352	8.28	0.00
Total	352	8.28	0.00
LTD Courtyard			
Jun-2012	4,716	7.93	0.00
Total	4,716	7.93	0.00
SAG			
Jun-2012	3,788	8.28	0.00
Total	3,788	8.28	0.00
SEA			
Jun-2012	138,540	8.28	0.00
Total	138,540	8.28	0.00
SSB			
Jun-2012	51,392	8.28	0.00
Total	51,392	8.28	0.00
SMC			

Water Usage Data



Calsense
2075 Corte del Nogal
Carlsbad, CA 92011
(800) 572-8608
July 17, 2012 6:43 AM

Controller Summary
Zone 7
MMS

Jun/01/2012 - Jun/30/2012

Date	Hist.	ET	Total	Rain	Budget	Irrigation	Irrigation	Manual	Manual	Test	Test	Remote	Remote	Non-Controller	Non-Controller
06/01/2012	0.28	0.28h	0.00	0.00o	317,529	0	0.0	0	0.0	0	0.0	0	0.0	2	0.1
06/02/2012	0.28	0.28h	0.00	0.00o	317,529	0	0.0	0	0.0	0	0.0	0	0.0	12,922	260.3
06/03/2012	0.28	0.28h	0.00	0.00o	317,529	13,235	248.5	0	0.0	0	0.0	0	0.0	396	85.3
06/04/2012	0.28	0.28h	0.00	0.00o	317,529	0	0.0	0	0.0	0	0.0	0	0.0	12,804	260.3
06/05/2012	0.28	0.28h	0.00	0.00o	317,529	9,555	180.3	0	0.0	0	0.0	0	0.0	12,723	259.1
06/06/2012	0.28	0.28h	0.00	0.00o	317,529	0	0.0	0	0.0	0	0.0	0	0.0	12,871	260.3
06/07/2012	0.28	0.28h	0.00	0.00o	317,529	14,094	265.8	0	0.0	0	0.0	0	0.0	2	0.1
06/08/2012	0.28	0.28h	0.00	0.00o	317,529	0	0.0	0	0.0	0	0.0	0	0.0	2	0.1
06/09/2012	0.28	0.28h	0.00	0.00o	317,529	0	0.0	0	0.0	0	0.0	0	0.0	19,015	385.3
06/10/2012	0.28	0.28h	0.00	0.00o	317,529	14,144	268.6	0	0.0	0	0.0	0	0.0	597	73.9
06/11/2012	0.28	0.28h	0.00	0.00o	317,529	0	0.0	0	0.0	0	0.0	0	0.0	19,499	401.3
06/12/2012	0.28	0.28h	0.00	0.00o	317,529	9,750	248.1	0	0.0	0	0.0	0	0.0	0	0.1
06/13/2012	0.28	0.28h	0.00	0.00o	317,529	0	0.0	0	0.0	0	0.0	0	0.0	11,096	401.1
06/14/2012	0.28	0.28h	0.00	0.00o	317,529	10,126	258.3	0	0.0	0	0.0	0	0.0	1	0.1
06/15/2012	0.28	0.28h	0.00	0.00o	317,529	0	0.0	0	0.0	0	0.0	0	0.0	1	0.1
06/16/2012	0.28	0.28h	0.00	0.00o	317,529	0	0.0	0	0.0	0	0.0	0	0.0	11,059	401.1
06/17/2012	0.28	0.28h	0.00	0.00o	317,529	9,922	259.8	0	0.0	0	0.0	317	8.6	342	77.4
06/18/2012	0.28	0.28h	0.00	0.00o	317,529	0	0.0	0	0.0	139	4.3	0	0.0	10,847	401.1
06/19/2012	0.28	0.28h	0.00	0.00o	317,529	10,130	252.4	980	45.0	0	0.0	0	0.0	7,243	348.2
06/20/2012	0.28	0.28h	0.00	0.00o	317,529	0	0.0	1,014	45.1	0	0.0	0	0.0	15,241	497.0
06/21/2012	0.28	0.28h	0.00	0.00o	317,529	13,935	268.1	1,576	45.0	0	0.0	0	0.0	2	0.1
06/22/2012	0.28	0.28h	0.00	0.00o	317,529	0	0.0	1,646	45.3	0	0.0	0	0.0	2	0.1
06/23/2012	0.28	0.28h	0.00	0.00o	317,529	0	0.0	0	0.0	0	0.0	0	0.0	19,779	401.3
06/24/2012	0.28	0.28h	0.00	0.00o	317,529	14,123	268.5	0	0.0	0	0.0	0	0.0	4,032	148.3
06/25/2012	0.28	0.28h	0.00	0.00o	317,529	9,815	180.7	0	0.0	0	0.0	0	0.0	19,503	398.3
06/26/2012	0.28	0.28h	0.00	0.00o	317,529	0	0.0	0	0.0	0	0.0	0	0.0	2,772	60.1
06/27/2012	0.28	0.28h	0.00	0.00o	317,529	9,973	180.7	0	0.0	0	0.0	0	0.0	18,542	368.3
06/28/2012	0.28	0.28h	0.00	0.00o	317,529	13,952	262.1	0	0.0	0	0.0	0	0.0	2	0.1
06/29/2012	0.28	0.28h	0.00	0.00o	317,529	0	0.0	0	0.0	0	0.0	0	0.0	3	0.1
06/30/2012	0.28	0.28h	0.00	0.00o	317,529	0	0.0	0	0.0	0	0.0	0	0.0	18,878	371.3
Jun-2012	8.28	8.28	0.00	0.00	317,529	152,754	3,141.9	5,216	180.4	139	4.3	317	8.6	230,178	5,860.0
Totals:	8.28	8.28	0.00	0.00	317,529	152,754	3,141.9	5,216	180.4	139	4.3	317	8.6	230,178	5,860.0
Site Totals:					317,529	152,754	3,141.9	5,216	180.4	139	4.3	317	8.6	230,178	5,860.0
Grand Totals:					317,529	152,754	3,141.9	5,216	180.4	139	4.3	317	8.6	230,178	5,860.0

Intelligent Operations

Collecting and analyzing data, while automating a collaborative response



Data

Insight

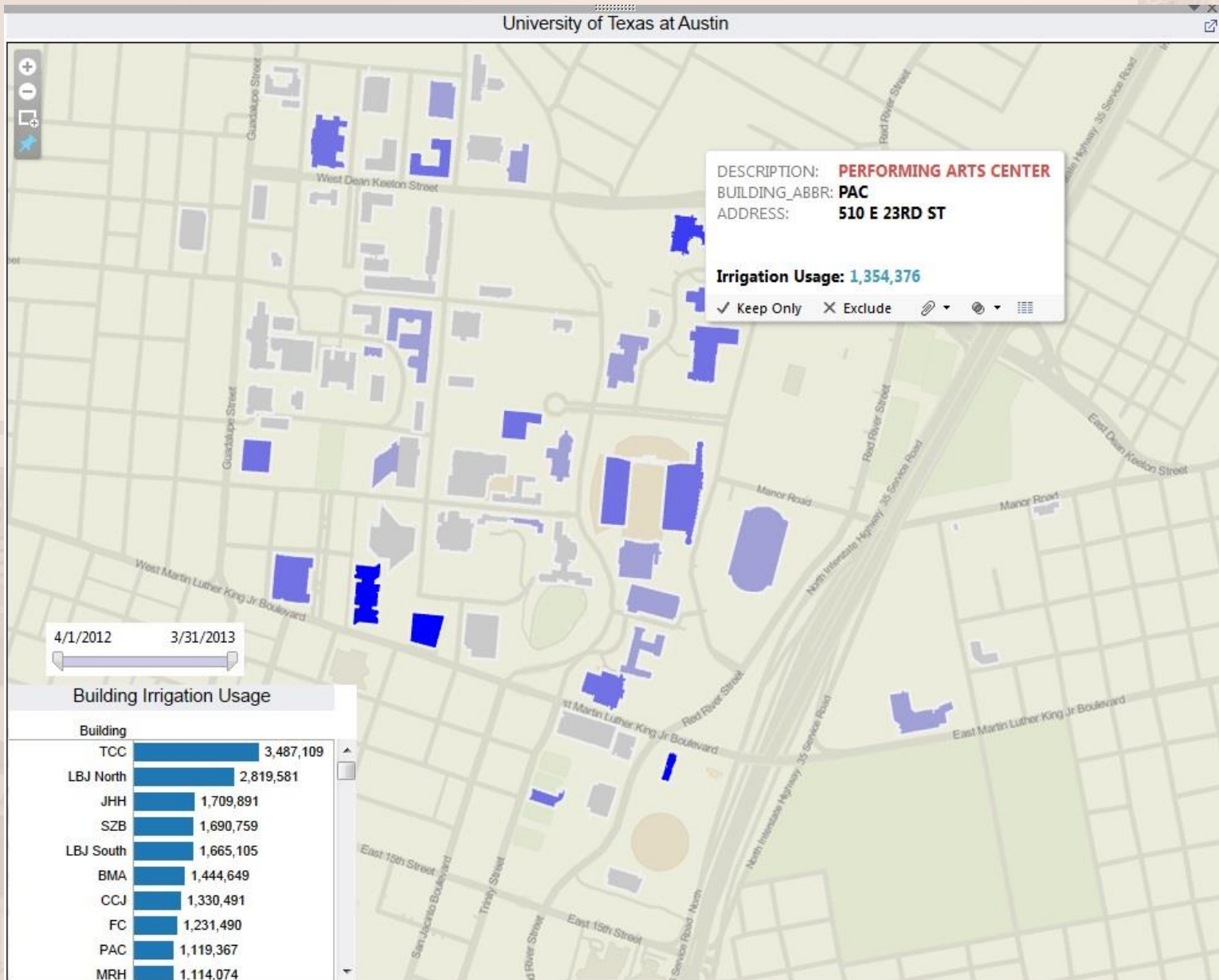
Focused Response

Leverage
Information

Anticipate problems
through analytics

Coordinate resources
and response using
actionable intelligence

Transparency



Sustainable Landscaping

Lower Maintenance

Requires less water

Can be very colorful

Local plant material



Xeriscaping



Utilizing Interns

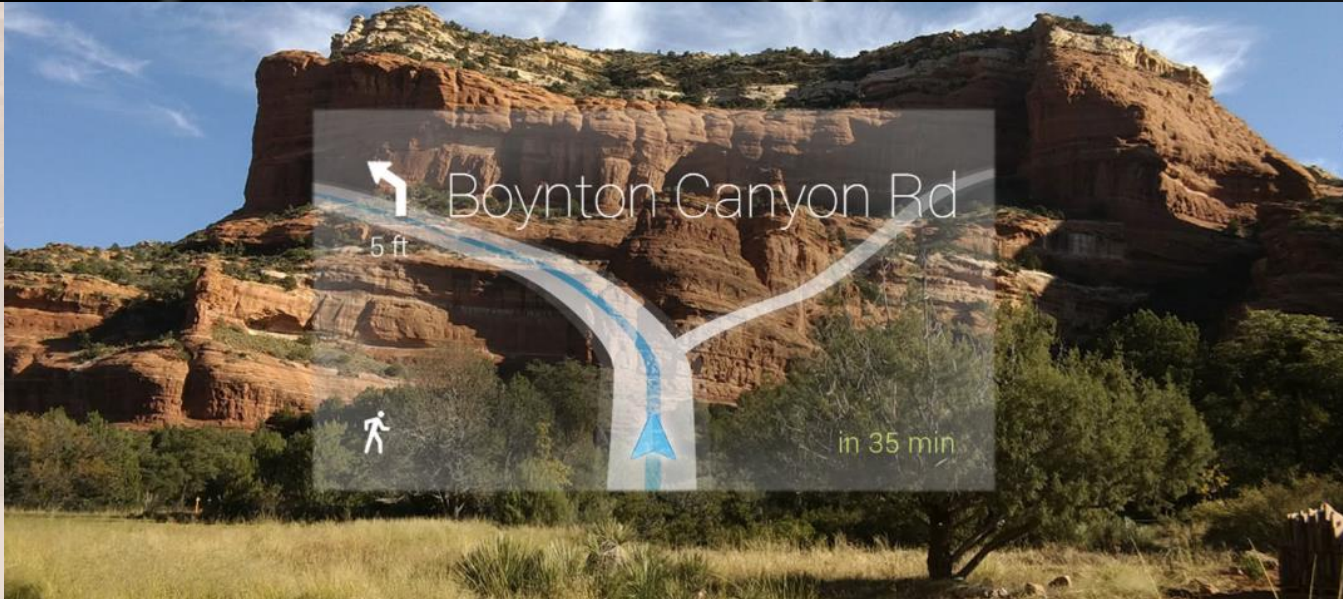
Hands on experience!!!

**Combining class lessons with
real life applications**



Google Glass





Future

Control Irrigation
from anywhere
in the world

See piping in the ground

Access irrigation plans from
anywhere



What Starts Here Changes the World

Contact Information

Markus Hogue

Markus.hogue@austin.utexas.edu

512-475-7750 – Office

512-796-9549 – Cell

