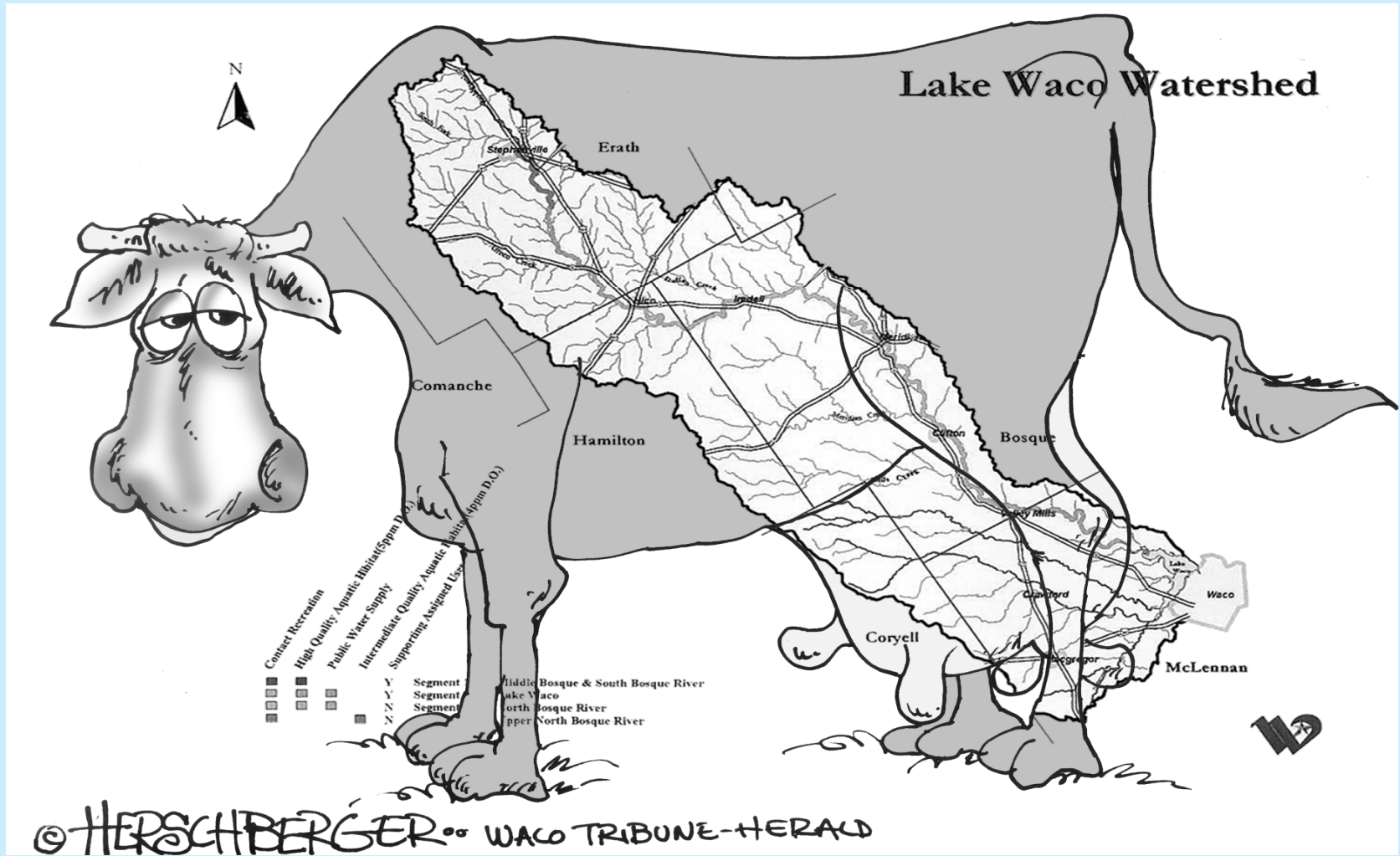




# Surface Water Sources and Their Watersheds

Options when you have to  
***“Drink Downstream From the Herd”***

Thomas Conry, Program Manager  
City of Waco Water Utilities Services



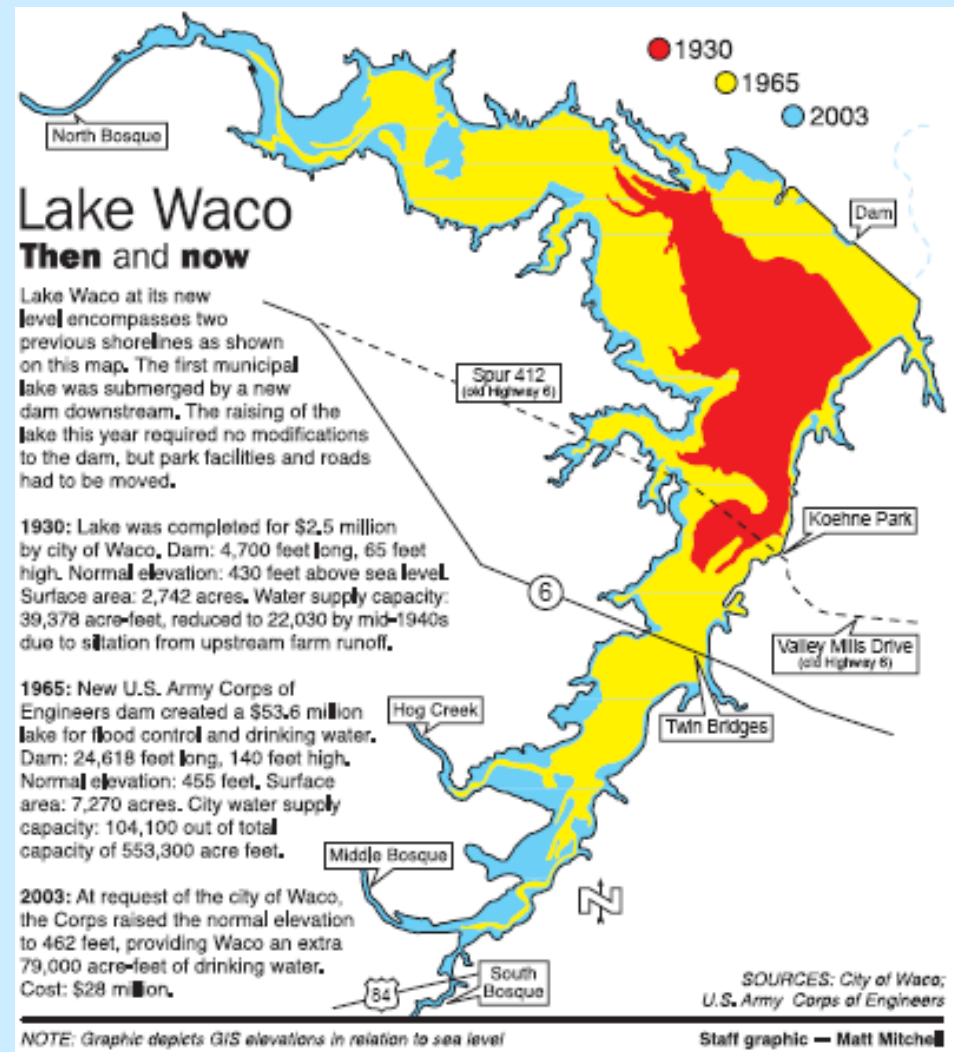
*Everyone has problems – what's yours?*

# Waco Water Woes



# Historical Perspective

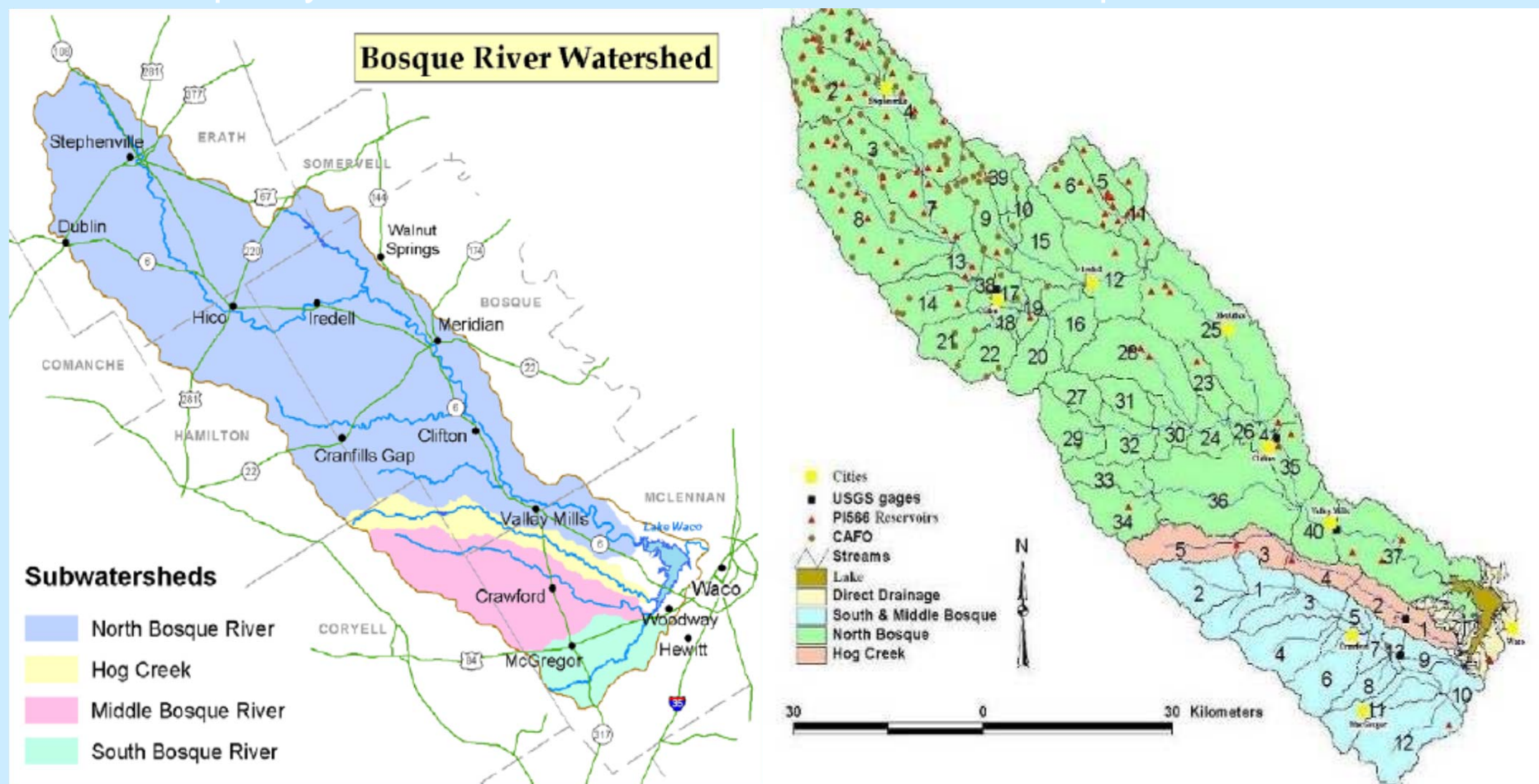
- 1929 - Lake Waco created, infilling severe by 1960s
- 1966 - New dam built, larger lake, many watershed PL566 detention areas built
- 2003 - Seven foot pool rise
  - 8900 surface acres
  - mean depth of 22 ft
  - maximum depth of 86 ft
  - volume 196,000 acre-feet





# Historical Perspective

Lake Waco is a product of its watershed: large size, dairies, croplands, urban areas, erodible calcareous soils, and PL566 reservoirs; declining water quality observed since 1980s, reached critical point in late 1990s.



## Waco Actions

- Fortunately, Lake Waco has been monitored at least monthly since 1968
- Involvement in watershed issues since 1995
- TOC Levels increase 33% (4.5 to 6.0 ppm) in 5 years **this increases costs and customer' bills**
- Conservation pool raised 7 feet (2004)
- Increased treatment costs documented (up to 50% for T&O episodes)

# THE PROBLEM -



**Geosmin scum – with carbon absorption added**



# Watershed Timeline

- 1988 – North Bosque River (Segment 1226) listed on 303d**
- 1991 – 1226 divided into 1226 and 1255**
- 1992 – 1255 listed for nutrients and bacteria impacts**
- 1996 – 1226 identified as needing TMDL**
- 2000 – stakeholders’ fail to reach consensus, TNRCC does TMDL**
- 2001 – Ag interests sue TNRCC over TMDL**
- 2002 – EPA approves TMDL, TNRCC develops Implementation Plan**
- 2005 – Waco files 14 lawsuits against CAFOs, based on TCEQ records**
- 2006 – Mediation reduces suits to six, bacteria TMDL task force formed but no action results**
- 2008 – Four-year comprehensive study of Lake Waco report issued**
- 2010 - \$50 million DAF comes on-line, drinking water improvement**



# The TMDL Conundrum

- Point source vs. Nonpoint source
- “Manmade” vs. “Natural” Pollution
- Base flows vs. Storm flows

# Cost of Algal Toxins, T&O

- \$85 million bond – filters and DAF
- \$10.5 million in lost revenue (Yucky)
- Public faith – “What Waco Water Is”
- Department culture - defeatist

# Lake Study Management Options Summary for In-Lake

Interim and potential longer term improvement may be achieved by:

- ✘ Continuous mixing of at least 1000 acres of lake near the intake to disrupt algal growth**
  - Calcium additions during storms to NBR near inlet to Lake Waco**
- ✘ Increasing predatory fish populations (striped bass) to reduce fish predation on zooplankton (increase grazing on algae)**

# Lake Study Management Options Summary-Watershed

Long-term improvement will be achieved by watershed management that includes:

- Dairy manure management
- PL566 reservoir maintenance for detention
- Additional detention wherever possible
- Urban runoff controls
- Wastewater treatment upgrades (in progress)



# Dissolved Air Flotation Plant Update

City of Waco Water Utilities Department



# City of Waco Dissolved Air Flotation Water Treatment Plant



# City of Waco Dissolved Air Flotation Water Treatment Plan

- DAF process used in over 300 treatment plants in Europe
- Only one in Texas used for Water Treatment
- 90 million gallon per day treatment capacity
- Plant has two treatment components: DAF and Ozone
- 80% of plant is underground - smaller footprint
- DAF is operated by SCADA (**supervisory control and data acquisition**)



# The Bottom Line

Waco Tribune-Herald

118 years serving the Heart of Texas

Sunday, Aug. 15, 2010 In God we trust Single copy \$1.60

## Testing Waco's waters

Panel tastes samples from city's new treatment process

**“Forget bottled water; fill your canteen or cup with good-tasting Lake Waco water.”**

**Editorial**  
Waco Tribune-Herald editorial board



Staff photo — Duane A. Laverty

Woodway City Councilwoman and local architect Jane Kittner (left) takes a blind taste test of local water along with Tribune-Herald owners Clifton Robinson (center) and Gordon Robinson.

### From the tap

Forget bottled water; fill your canteen or cup with good-tasting Lake Waco water

If you're buying bottled water by the case during a recession, contributing to the multitude of plastic at our landfill and carelessly feeding a culture of litter at our parks and rivers, all because you believe Lake Waco water tastes awful, here's a news flash: Change your ways because the water's fine.

We never guessed we'd be saying that. For years, Wacoans and those towns that contract to buy Lake Waco water had to endure musty-tasting water that definitely had a "nose" to it, the result of blue-green algae blooms fragmenting in Lake Waco, leaving a pungent if harmless chemical called geosmin in the water. It's actually more complicated than that, but suffice it to say that this annoying problem proved especially discouraging earlier this decade.

But a blind taste test by area leaders, overseen by Tribune-Herald staff writer J.B. Smith, signals things have changed for the better and may improve further. Smith conducted his test after a new \$50 million treatment plant went online this month. Among other things, it will purify our lake water through "dissolved air flotation" technology.

Surprise: Not only did most of the folks doing the taste test — including three members of the Tribune-Herald editorial board — highly rate that water purified through the new plant but also lake water processed through earlier, activated-carbon technology. Other water for the test came from a bottled water company and a Woodway water well.

Results were mixed, but Lake Waco water treated through the new technology consistently scored at or near the top with close to the same results for our lake water treated through previous technology. The bottled water scored well but not so often as our lake water. The Woodway water scored so-so, with some noting its "funky" smell.

All of this reflects what we've quietly noticed in recent years. Even before the new plant went online, the city of Waco made significant strides in improving the taste of local water, something worth toasting. Water quality official Tom Conry tells us this is due to several things, ranging from the drought of 2005-2006, to the flooding that dominated much of 2007, to the fact that city officials are simply becoming more adept at battling taste and odor problems. He says our water will taste even better once the new plant begins using ozone to disinfect pre-treated water this fall, giving it a "crisper and sweeter taste."

So for all of you who take bottled water when hiking or biking or on any other recreational endeavor or jaunt, it's time you change your wasteful ways. Begin by more readily using local tap water instead of bottled water. If need be, buy a canteen. There's no longer any good excuse not to.



# Take Home points

- The effectiveness of DAF in addressing t&o is dependent on the distance between the source water and the DAF
- Removing organics prior to chlorination removes byproduct precursors
- As clarification step, DAF is superior to sedimentation in performance, footprint, and flowrate

# I. Project Objectives – and results!

## A. Treatment Process Improvement {Quality}

1. Trihalomethane concentrations below 40 parts per billion (ppb)  
[Pre-DAF about 85 ppb] TTTHM level at DAF has been 9.6 ppb
2. Total Haloacetic Acids concentration below 20ppb [Pre-DAF about 40ppb]  
Post DAF, THAA level has been 20.5 ppb
3. Geosmin- less than 9 parts per trillion (ppt) on finished water  
[Intake as high as 150ppt on treated and 1,000ppt on raw water]
4. 5 log removal or 99.999% removal of viruses and microbial contaminants
5. Finished water is non-corrosive and meet all aspects of current and pending state and federal rules

## B. Increased Capacity {Quantity}

Meet 2050 capacity requirements as per water demand projections from 2003 Master Plan or 131 million gallons per day.

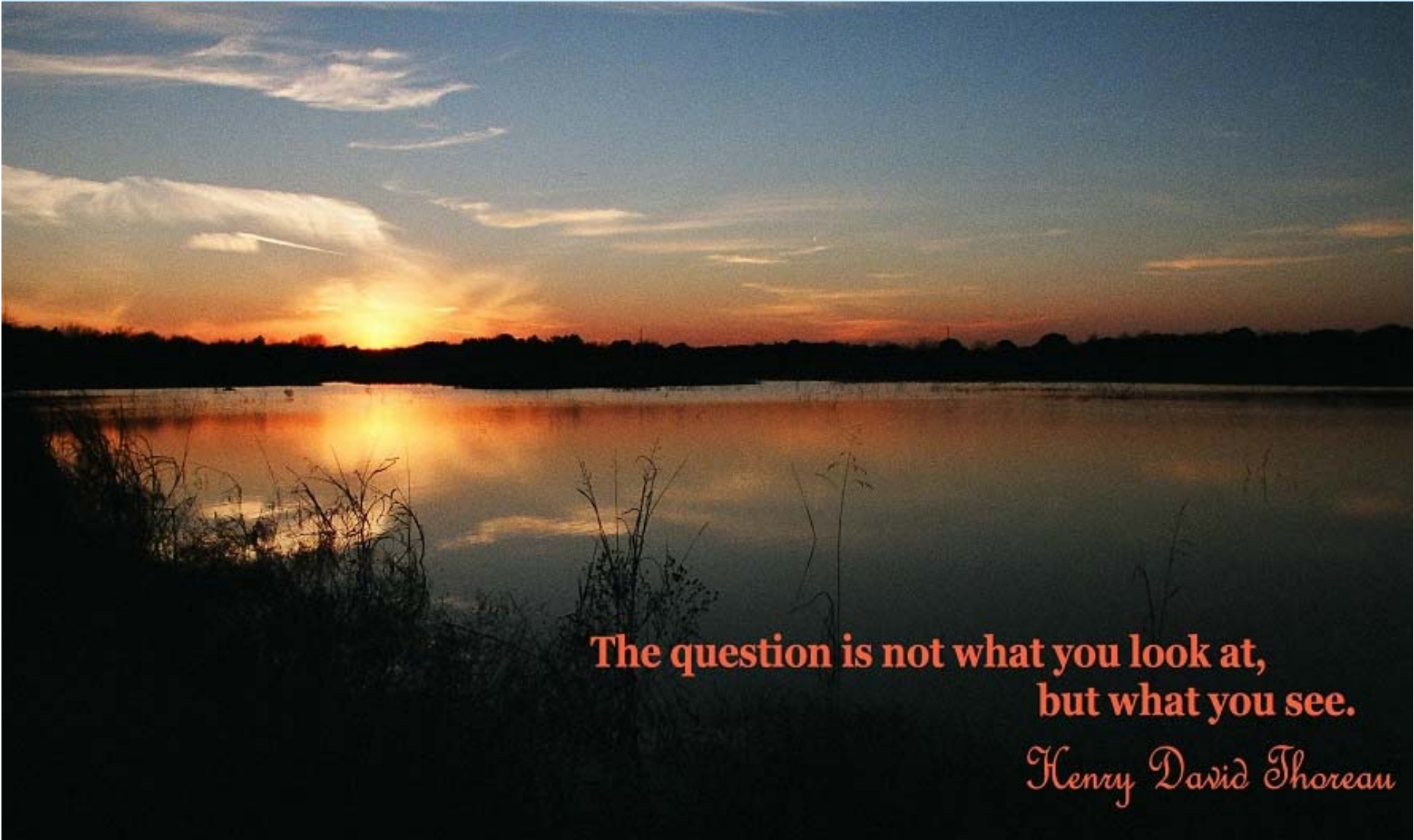
# Good and Bad

- Water Sales Up
- Complaints Down
- Less chemicals
- Preparing for the future
- Filter runs 100 hours+  
(0.7 NTU from DAF)
- THM, HAA very low
- No Cyanotoxins detected
- \$85 million debt  
(pumping \$ up)
- Different chemicals
- Have to “Prove”  
everything
- Somewhat steep learning  
curve

# Half the Battle

- T&O improvements enabled other actions
  - Staff taking initiative
  - Biological filtration pilot project
- **STILL HAVE CYANOTOXINS (in lake) –**  
increased monitoring, public health concerns



A photograph of a sunset over a body of water. The sun is low on the horizon, creating a bright orange and yellow glow that reflects on the water's surface. The sky is a mix of dark blue and orange, with some wispy clouds. The foreground shows dark silhouettes of reeds or grasses. The quote is overlaid in the bottom right corner of the image.

**The question is not what you look at,  
but what you see.**

*Henry David Thoreau*



Tom Conry

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