Proposed Sewage Effluent discharge from the City of Burnet—threats to Hamilton Creek and Lake Travis

Presentation Organization

1. Local information regarding the Burnet wastewater permit
2. Hydrologic setting of Hamilton Creek
3. Background water quality data for Lake Travis
4. General threats from wastewater effluent to the Hill Country
5. Summary of proposed effluent discharge for Burnet
6. Effluent threat to receiving waters
7. Effluent threats specific to Lake Travis

1. Local information regarding the Burnet wastewater permit

Excerpts from the Burnet Bulletin newspaper

Burnet's discharge dilemma

Nov. 4, 2009 Published in The Burnet Bulletin
By Charles Ryan Boisseau
Highland Lakes Newspapers

Asked about those who oppose the plant, Steele said "they need to get over it." He noted that the plant will discharge water that is cleaner than what is already in the lake.

Response

Below is a comparison of water quality of the effluent and Lake Travis

Comparison of effluent limitations with existing Lake Travis water quality

	Effluent interim				Effluent final phase				Lake Travis
Parameter	30-day avg		7-day avg	Daily	30-day avg		7-day avg	Daily	Daily values
	(mg/L)	lbs/day	(mg/L)	Max (mg/L)	(mg/L)	lbs/day	(mg/L)	Max (mg/L)	many sites
									mg/L
CBOD5	10	60	15	25	5	71	10	20	1
TSS	15	90	25	40	5	71	10	20	2 - 4
NH3-N	3	18	6	10	2	28	5	10	0.02
Phosphorus	N/L	N/L	N/L	N/L	0.5	7.1	1	2	0.01
DO (minimum)	5		N/L	N/L	5		N/L	N/L	8 - 10

N/L - no limit

Excerpts from the Burnet Bulletin newspaper (cont)

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putting water back into the creek and eventually into the lake is an improvement over watering "rocks" and fields to grow hay, as the city does today. The city also uses treated wastewater to irrigate its city-owned Delaware Springs golf course.

Response

Irrigation can be ineffective when done on wet soils. However, data have proven that about 85% of total rainfall in the area becomes evaporation or transpiration (water loss through plants). Most of the time, (after a drying out period following rainfall) the soil and vegetation are dry thus can absorb much more water than provided by rainfall. Additionally, soil and vegetation (which don't exist in the low part of streambeds) attenuate nitrogen, phosphorus, and other contaminants. Therefore, irrigation is an effective and generally non-threatening method for disposing of effluent.

Excerpts from the Burnet Bulletin newspaper (cont)

Burnet's discharge dilemma

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Moreover, consider the 1.7 million gallons a day Burnet might discharge. That amount is still only a drop in the proverbial bucket when you consider that Lake Travis holds about 260 billion gallons of water when it is at its "full" elevation of 681 feet above sea level. (Also, not all this amount will actually reach Lake Travis, given evaporation and seepage during its 10-mile plus journey.)

Responses

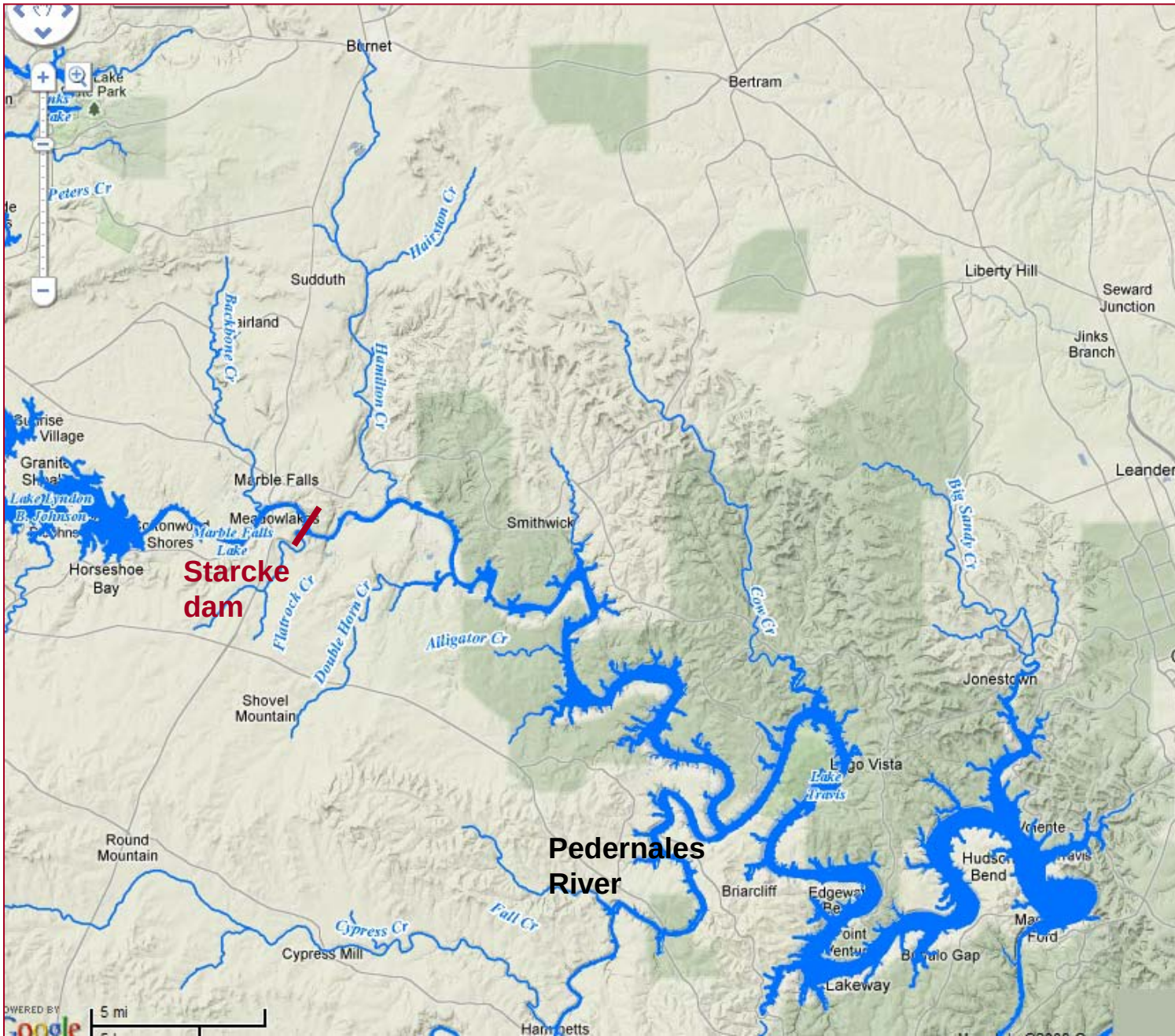
The lake is not always full and the effluent will enter the headwaters of Lake Travis where it can affect water quality there, especially if flow through Starcke dam from Lake LBJ is minimal. Also, at the headwaters, the lake is shallow and narrow thus Hamilton Creek inflow can represent a significant amount of the water there. Based on dilution with the remainder of the lake, the effluent would have a diminishing affect as it travels further down the lake and would not affect the entire lake quality.

Evaporation involves "pure" water--contamination in water is not removed by evaporation. As the "pure" water is removed, the pollutant concentration in wastewater increases—the pollutant load (in pounds) remains the same and poses the same threat as if no evaporation occurred.

2. Hydrologic setting of Hamilton Creek

Hamilton and three other major streams inflow the Lake from the north.

When little of no flow comes from Lake LBJ, Hamilton Creek represents the major inflow and water quality influence to the upper part of Lake Travis



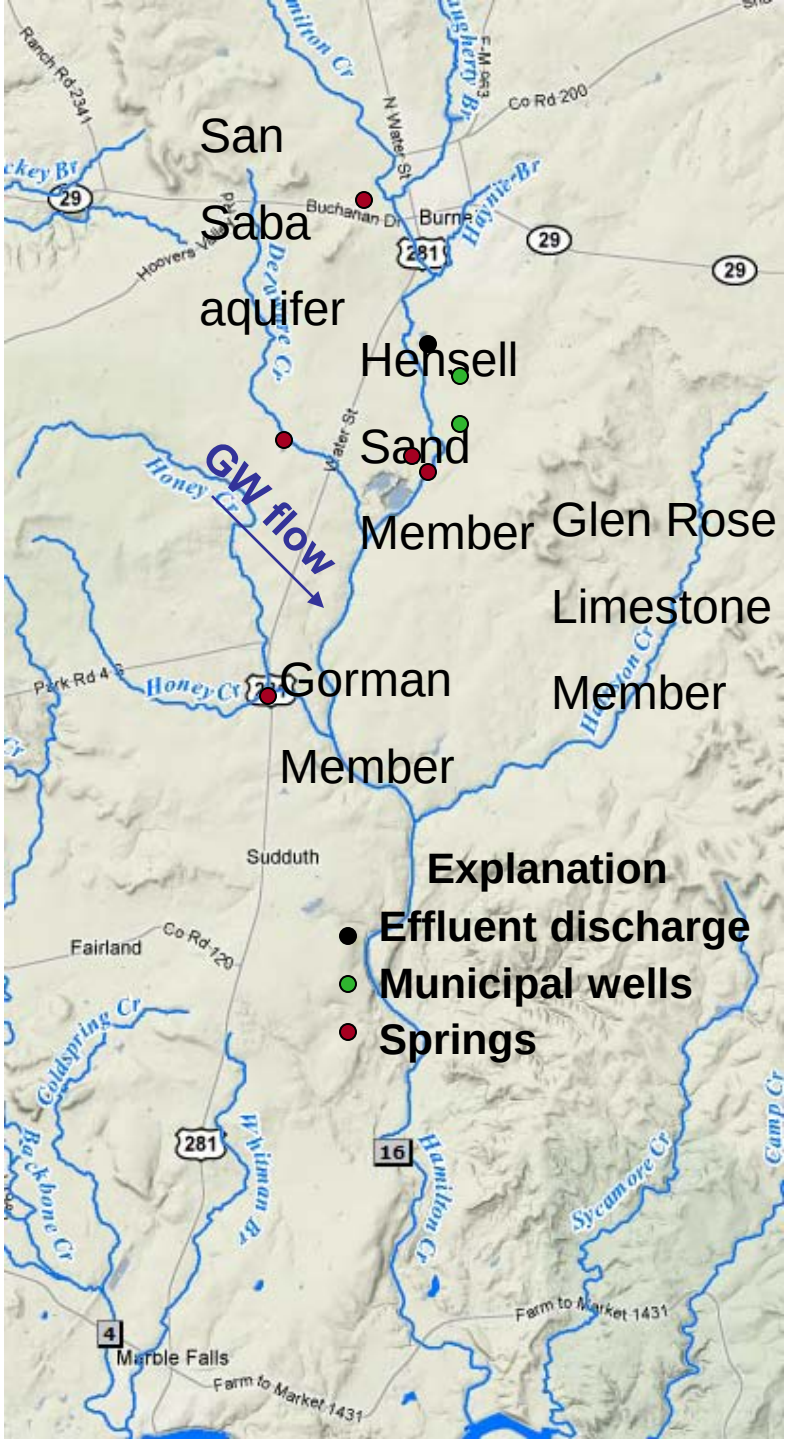
Hydrologic setting of Hamilton Creek: groundwater (cont).

Aquifers: Shown on map. Several geologic units exist throughout the area—elevations of water levels in wells indicate the formations to be hydrologically connected.

Groundwater: Shallow—less than 100 feet many areas. Approaches zero depth near creeks and readily exchanges water with streams. General direction of flow is from northwest to southeast.

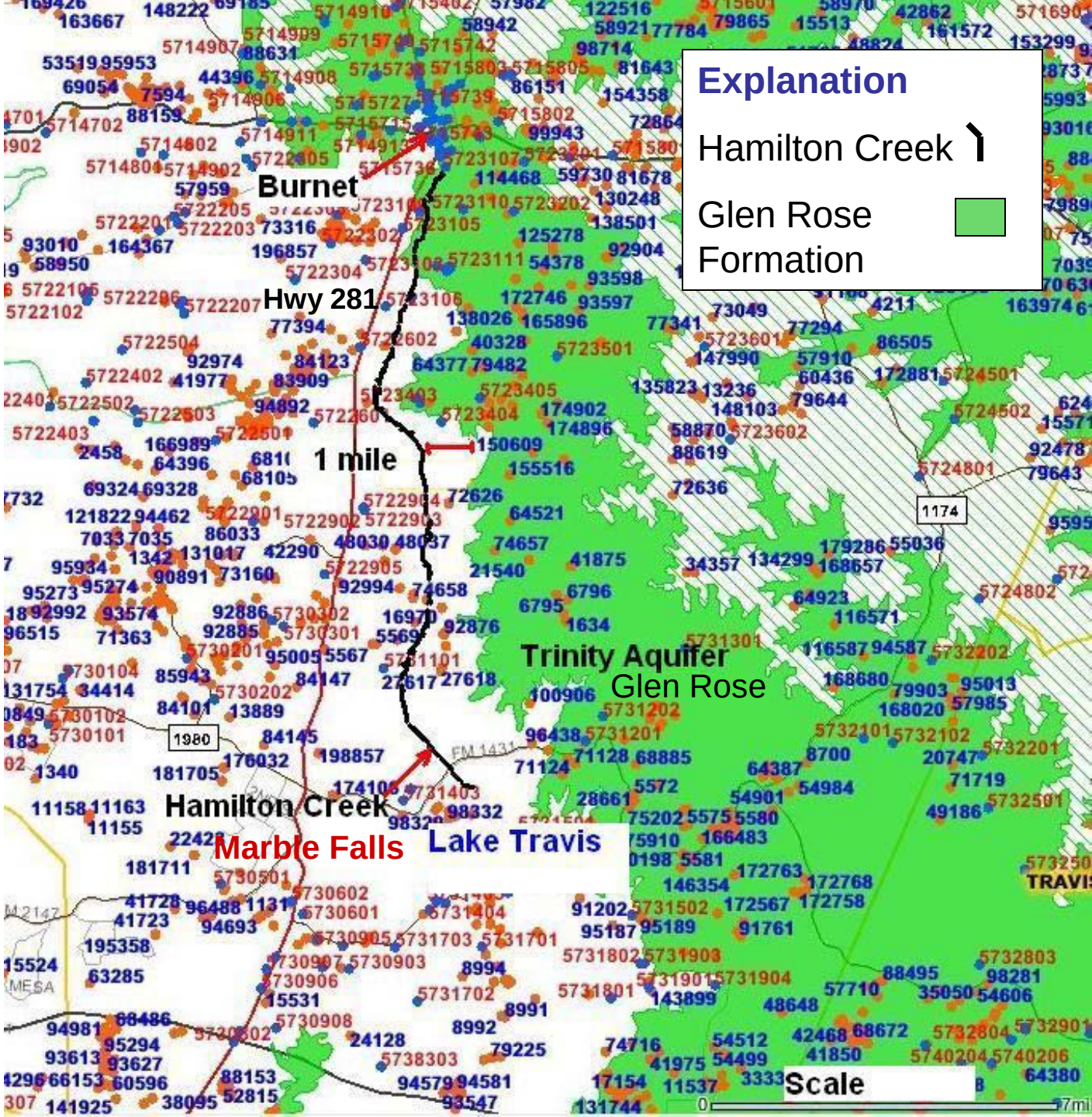
Springs: Shown in red. They exist in topographic low areas where groundwater levels exceed elevation of creek bed.

Creek flow: Creek gains flow in downstream direction due to groundwater levels exceeding streambeds. However, during dry periods when groundwater levels are low, some runoff and effluent likely would enter groundwater through streambed.



Water wells proximate to Hamilton Creek: Burnet to Lake Travis

Length of red line near map center is 1 mile. Many wells within 1-2 miles of Hamilton Creek.



Well locations from TWDB

3. Background water quality data for Lake Travis

- 1997 “Evaluation of water-quality data and monitoring program for Lake Travis, near Austin, Texas” USGS WRI report 97-4257 (W Rast and R Slade)
  Analyzed data collected from 1982-89 at 10 sites--Lake Travis “arms”
- LCRA collected data: From 1982 to date—6 times/ year at 66 Lake sites
- Texas Clean Rivers Program
  http://www.tceq.state.tx.us/compliance/monitoring/crp/
- Colorado River Watch network--began 1988, volunteers collect data
  Part of Texas Stream Team-- http://txstreamteam.rivers.txstate.edu/
- Texas Water Quality Inventory--began 1992, about every other year
  Collect data at stream sites throughout Texas including Hamilton Creek—
  http://www.tceq.state.tx.us/compliance/monitoring/water/quality/data/wqm/305_303.html . Five tributaries, including Hamilton creek sampled for water quality (information from this data presented later)

4. General threats from wastewater effluent to the Hill Country

A presentation on "General Threats to Water Quality from Domestic Wastewater Discharges in Hill Country" is presented on the home page of the Hill Country Alliance at http://www.hillcountryalliance.org/HCA/Presentations

Summary of general threats from wastewater effluent

a. **Wastewater quality limits are lax** (details in slide after next)

b. **Permits do not address many pollutants in wastewater**

* National studies of wastewater found human and veterinary drugs (including antibiotics), natural and synthetic hormones, detergent metabolites, plasticizers, insecticides, and fire retardants.

* One or more of these chemicals were found in 80 percent of the 139 streams sampled Nationwide.

c. **TCEQ management of wastewater facilities is not thorough**

* Some wastewater plants never inspected
* Most wastewater plants inspected only once per year
* Advance notice given to plant before inspection
* Even then a large percent of wastewater plants fail inspection
* Typically no penalty for failed inspection—Notice of Violation given and plant might be given 30 days or more to become compliant (details in second slide after next)

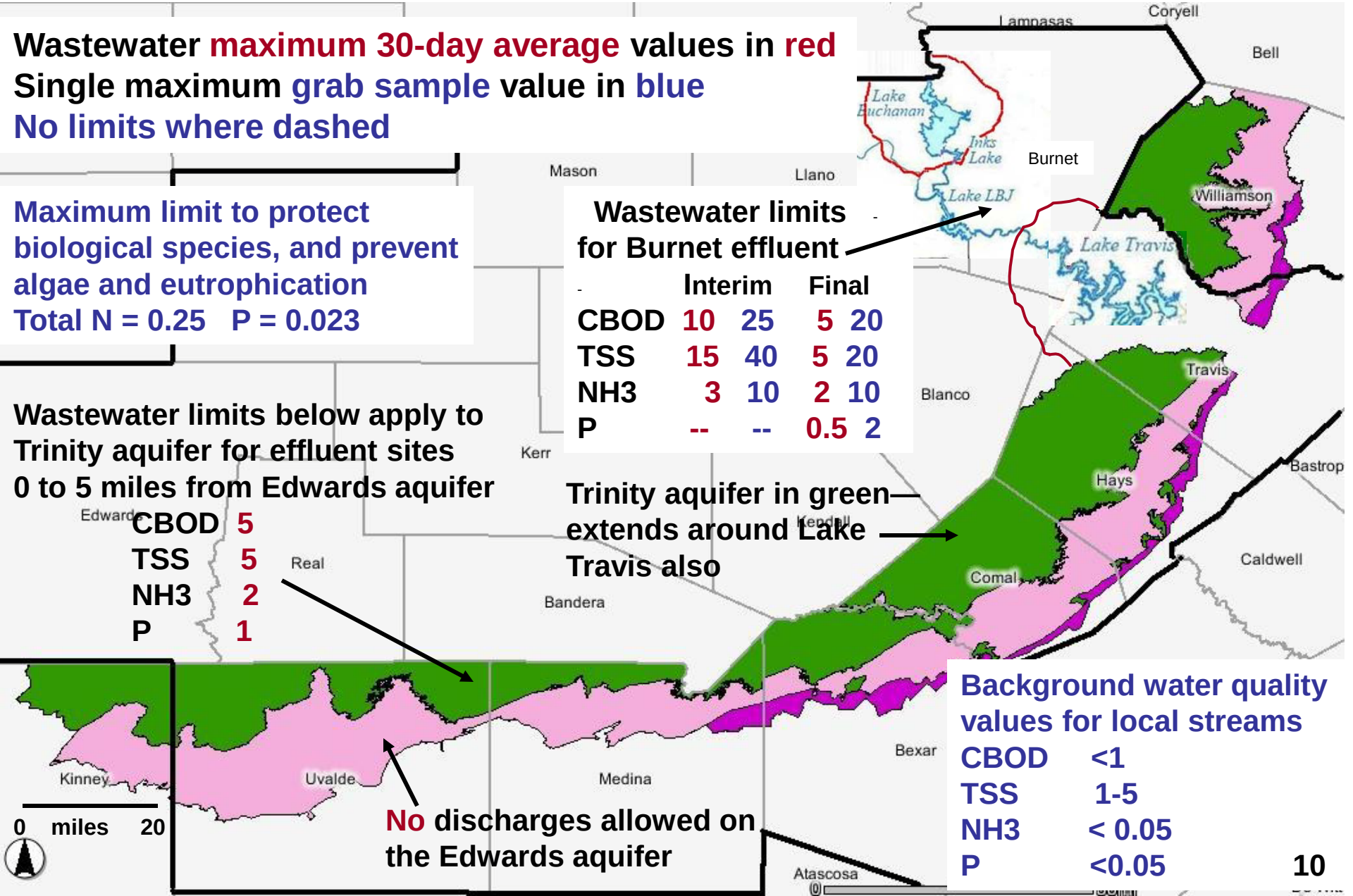
Summary of general threats from wastewater effluent (cont)

d. Lack of consideration for local physical characteristics and downstream threats

* High levels of contaminants are allowed for wastewater quality based on the expectation that wastewater nutrients (nitrogen and phosphorus) would be absorbed by vegetation in downstream channels.
* However, wastewater discharges are contained in the lowest parts of low-flow channels, typically less than a few feet wide.
* Very few Hill Country streams contain substantial vegetation in low flow channels thus reduction of wastewater nutrient levels by receiving channels is minimal.
* Additionally, TCEQ rules do not prohibit wastewater discharges into dry streams. Most Hill Country streams are dry most or much of the time, thus wastewater receiving streams often contain wastewater only.
* Wastewater permits do not require and wastewater management does not monitor receiving surface or groundwater for contamination from the wastewater.

Wastewater quality limits are lax (cont.)

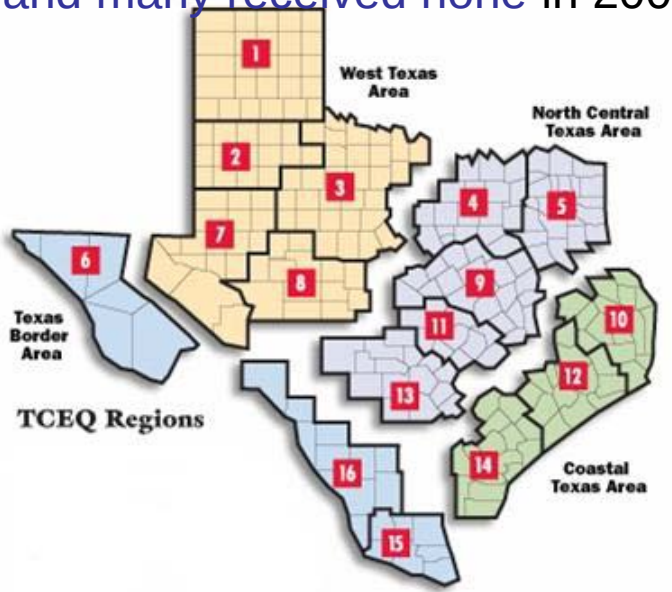
Comparison of wastewater quality limits for Burnet and elsewhere



TCEQ management of wastewater facilities is not thorough (cont.)

- When TCEQ discovers a permit violation, the responsible party typically receives a mailed “Notice of Violation (NOV)”. TCEQ claims that most offences are “corrected within a reasonable period of time, and therefore did not require further enforcement” If the violator does not become compliant, an administrative enforcement can be issued followed by civil enforcements (these are Enforcement Orders) and then criminal charges.
- TCEQ Region 13 represents the Hill Country. The 2008 Enforcement Report indicates that 240 onsite inspections were made for the Water Quality program (mostly wastewater plants) in Region 13.
- About 240 active permits for wastewater exist in the Water Quality Program database http://www4.tceq.state.tx.us/wqpaq for the Region 13, but many of the Water quality program permits are for industrial and other wastewater. Therefore some of the wastewater plants probably received one inspection and many received none in 2008.

Additionally, for this Region and Program, **107 NOVs were issued in 2008, which represents 45% of the number of on-site inspections for wastewater sites.** The Report does not reveal the number of Enforcement Orders by Region but 208 such orders for wastewater violations were issued for the State.



TCEQ database of wastewater permit complaints

In addition to TCEQ inspections, they maintain a database of complaints

http://www5.tceq.state.tx.us/oce/waci/

305 complaints against wastewater facilities in Texas from 2003 to date

Choose a Complaint Record to View Status

You searched for the following:

Regulated Entity: **wastewater**

Complaint Received Date: **Date range from 1/1/2003 to 11/21/2009**

Your search returned **305** records.
Please select a record to proceed.

Regulated Entity	Customer	Complaint Tracking #	Status	County	Complaint Received Date
AIRPORT WASTEWATER TREATMENT PLANT	CITY OF GALVESTON	128789	CLOSED	GALVESTON	08/27/09
ALLISON WASTEWATER TREATMENT FACILITIES	CITY OF CORPUS CHRISTI	73796	CLOSED	NUECES	03/31/06
ALLISON					

5. Summary of proposed effluent discharge for Burnet

INTERIM PHASE EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

The annual average flow of effluent shall not exceed 0.726 million gallons per day (MGD); nor shall the average discharge during any two-hour period (2-hour peak) exceed 1,512 gallons per minute (gpm). Note: The 2-hour max rate is 3 times higher than the max daily rate

Parameter	30-Day Average		7-Day Average	Daily Maximum
	mg/1	lbs/day	mg/1	mg/1
$CBOD_5$	10	60	15	25
TSS	15	90	25	40
NH_3-N	3	18	6	10
DO (minimum)	5.0	N/A	N/A	N/A

FINAL PHASE EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

The annual average flow of effluent shall not exceed 1.7 million gallons per day (MGD); nor shall the average discharge during any two-hour period (2-hour peak) exceed 4,722 gallons per minute (gpm). Note: The 2-hour max. rate is 4 times higher than the daily max rate.

Parameter	30-Day Average		7-Day Average	Daily Maximum
	mg/1	lbs/day	mg/1	mg/1
$CBOD_5$	5	71	10	20
TSS	5	71	10	20
NH_3-N	2	28	5	10
Total Phosphorus	0.5	7.1	1	2
DO (minimum)	5.0	N/A	N/A	N/A
E. coli, colonies/100 ml	126	N/A	N/A	394

Effluent threats to receiving waters

*** TCEQ wastewater limits greatly exceed background levels of nutrients in streams—vegetation in stream channels is expected to attenuate much of the nutrients.**

*** However, much of the streams reaches in Hamilton Creek contain minimal or no vegetation to absorb nutrients**

Channelization of a tributary to Delaware Creek in a residential area southwest of Burnet. Soil erosion and transport of sediment will occur from this area, unless temporary erosion controls are used and vegetation is reestablished.

Channelization at Delaware Springs Golf Course

Channelization not only leads to erosion as stated below the photo, but it removes vegetation that could attenuate nutrients in wastewater effluent

Some reaches of Hamilton Creek contain limited vegetation but a reconnaissance visit in November 2009 to many sites on the stream reveals that most reaches have almost no vegetation in the lowest part of the channel—the area which would convey the effluent during low flow conditions and most of the time

At the time of this photo, the stream has some algae but excellent aquatic habitat. Algae occurs when minimal levels of nutrients (nitrogen and phosphorus) exist. The extreme high levels of nutrients from wastewater effluent likely would cause loss of aquatic habitat.

It should be noted that effluent permits address ammonia (NH3) Nitrogen (N) but not other forms of N -- nitrite (NO2) or nitrate (NO3). As effluent NH3 traverses streams it readily changes to NO2 and NO3 with addition of oxygen. However, the total N is conservative unless removed by vegetation in a stream

Hamilton Creek at Burnet County Road 341. LCRA conducted a biological assessment in 1998 at this location and found that the stream has excellent aquatic habitat.

Hamilton Creek flow—natural and proposed effluent

Interim phase effluent = 726,000 gal/day (avg. for year)

LCRA streamflow gage on Hamilton Creek near Marble Falls—data from June 2002 to date (7.5 years). Based on all gaged data, no flow exists at gage 11% of time (avg. 40 days/year) and flow less than 726,000 gal/d for 23% of time (avg. 84 days/year).

- Therefore, effluent would represent all flow in creek at Marble Falls for average of 40 days/year
- Effluent would dominate flow in creek at Marble Falls (represent more than ½ of total flow) for average of 84 days per year.
- Flow in upper Hamilton Creek less than flow at Marble Falls so effluent in upper creek would represent all flow for an average exceeding 40 days per year.
- Additionally, flow in upper Hamilton Creek would be dominated by effluent for an average exceeding 84 days per year.

Note: 2-hour max. effluent flow would be 3 times greater than above value

Flow at mouth of creek less than 2-hour max effluent flow for 45% of time

Hamilton Creek flow—natural and proposed effluent (cont.)

Final phase effluent = 1.7 million gal/day (avg. for year)

Based on all gaged data, flow less than 1.7 mg/d for 27% of time (avg. 99 days/year).

- Therefore, effluent would dominate flow in creek at Marble Falls (represent more than ½ of total flow) for average of 99 days per year.
- Additionally, flow in upper Hamilton Creek would be dominated by effluent for an average exceeding 99 days per year.

Note: 2-hour max. effluent flow would be 4 times higher (avg. 6.8 mg/d)

Flow at mouth of creek less than 6.8 mg/d for **72%** of time

Comparison of effluent limits with Hamilton Creek background water quality

Parameter	Effluent interim				Effluent final phase				Hamilton Creek	
	30-day avg		7-day avg	Daily Max	30-day avg		7-day avg	Daily max	low flow 1	all data 2
	(mg/L)	lbs/day	(mg/L)	(mg/L)	(mg/L)	lbs/day	(mg/L)	(mg/L)		
CBOD5	10	60	15	25	5	71	10	20		
TSS	15	90	25	40	5	71	10	20	4	7.8
NH3-N 3	3	18	6	10	2	28	5	10	<0.05	0.07
Phosphorus 4	N/L	N/L	N/L	N/L	0.5	7.1	1	2	<0.05	0.059
DO	5		N/L	N/L	5		N/L	N/L		8

1 Avg water quality values for Hamilton Creek samples during low flow
2 Avg water quality values for all 44 samples on Hamilton Creek
3 EPA Max level of Nitrite Nitrogen (NO2) is 1.0 mg/l for public water supplies
3 EPA and Texas max level to sustain biological species and prevent algae and euthrophication is 0.025 mg/L
4 EPA and Texas max level to sustain biological species and prevent algae and euthrophication is 0.023 - 0.050 mg/L
4 Phosphorus levels for wastewater plants generally range from 1 to 4 mg/L

Threshhold levels for detecting NH3 and P are 0.05. Most values less than threshold. Value for samples probalby about 0.025 mg/L

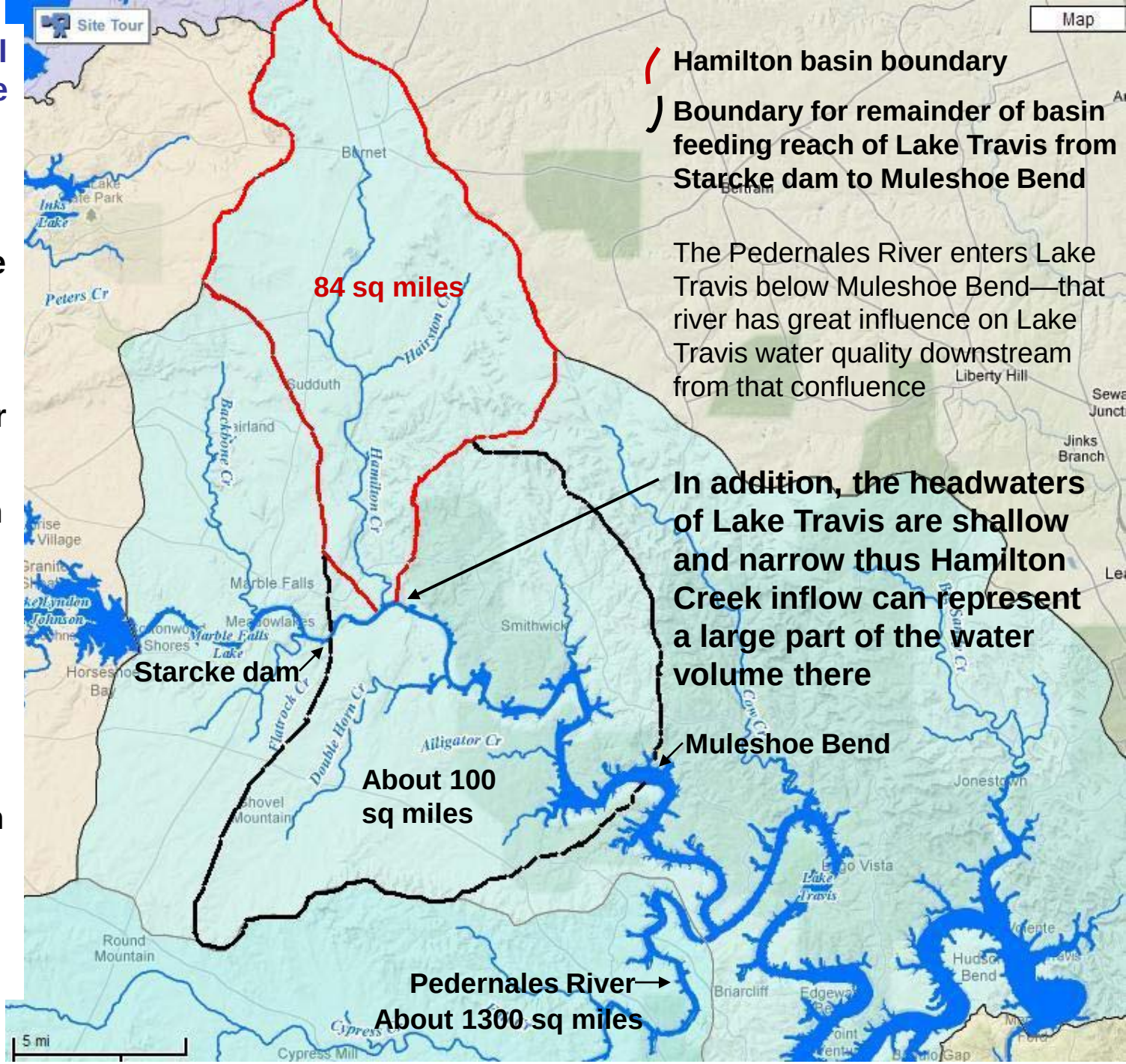
* Max. wastewater levels for TSS are up to 10 times higher than background levels
* Max wastewater levels for NH3-N are at least 40 to 200 times higher than background
* Max. wastewater phosphorus levels are at least 10 to 40 times higher than background
* Max wastewater levels for NH3 are up to 10 times higher than NO2 levels for public water supplies
* Max wastewater NH3 levels are 80 to 400 times higher than levels to protect biological species and prevent algae and eutrophication
* Max. wastewater phosphorus levels are 22 to 88 times higher than levels to protect biological species and prevent algae and eutrophication

Effluent threats specific to Lake Travis

When no or minimal flow passes Starcke dam from Marble Falls Lake:

*** Most inflow to the upper reach of Lake Travis is from Hamilton Creek which influences the water quality for that reach.**

*** For the long reach of Lake Travis from Starcke dam to Muleshoe Bend, Hamilton Creek represents about ½ of the basin area feeding that reach. Therefore, Hamilton Creek has a large influence on the water quality for that long reach.**



From TCEQ Water Quality Inventory Report

Several fish kills have been documented in Lake Travis, partly due to low dissolved oxygen.

Published studies

Publication	Date	Author
IMS 26 Lake Travis	Feb. 1975	Brazier, F.

Wastewater dischargers

Permit type	Number of outfalls
Agriculture	1
Domestic	86
Industrial	2

Historical fish kills

Start date	Location	Fish killed	Suspected cause
08/28/1995	Lake Travis near Mansfield Dam	30	Low Dissolved Oxygen
08/08/1997	Lake Travis, Anderson Bend area	3,485	Inorganic compound
04/04/1998	Hurst Creek at Lakeway Blvd. in Lakeway (Next to "The Oaks" golf course)	1,317	Organic compound

Lake Travis water quality problem

Every Water Quality inventory report since 2002 documents low levels of dissolved oxygen in Lake Travis

2002 Summary of Water Bodies with Concerns for Use Attainment

Water Body ID	Water Body Name	Concern Location	Use	Level of Concern	Parameter of Concern
1403	Lake Austin	Quinlan Park to upper end of segment	Aquatic Life Use	Use Concern	depressed dissolved oxygen
1403E	Stillhouse Hollow (unclassified water body)	Entire water body	Aquatic Life Use	Use Concern-Limited Data	impaired macrobenthos community
1403G	Tanglewood Tributary to Bull Creek (unclassified water body)	Entire water body	Contact Recreation Use	Use Concern	bacteria
1403R	Unnamed tributary to Lake Austin (unclassified water body)	Entire water body	Contact Recreation Use	Use Concern	bacteria
1404	Lake Travis	Arkansas Bend	Aquatic Life Use	Use Concern	depressed dissolved oxygen
1404	Lake Travis	Cow Creek confluence	Aquatic Life Use	Use Concern	depressed dissolved oxygen
1404	Lake Travis	Lakeway	Aquatic Life Use	Use Concern	depressed dissolved oxygen
1404	Lake Travis	Lower end of lake	Aquatic Life Use	Use Concern	depressed dissolved oxygen
1404	Lake Travis	Pace Bend	Aquatic Life Use	Use Concern	depressed dissolved oxygen
1404	Lake Travis	Spicewood	Aquatic Life Use	Use Concern	depressed dissolved oxygen

2008 Texas Water Quality Inventory - Basin Assessment Data by Segment (March 19, 2008)

2008 Supp (level of support) and Integ Supp (integrated 303(d) level of support) identifiers: FS- Fully Supporting; CN- Concern for Near non-attainment; CS- Concern for Screening level; NS- Non-Supporting; NA- Not assessed; NC- No concern; **Dataset Qualifiers:** AD- Adequate Data; ID- Inadequate Data; LD- Limited Data; TR- Not Temporally Representative; SR- Not Spatially Representative; SM- Superceded by another method; JQ- Assessor Judgement; OE- Other Information Evaluated; OS- Out-of-State; AU ID - Assessment Unit ID *Note: Carry-forward refers to impairments without sufficient information in 2008 to re-evaluate the level of support.

Segment ID: 1404A **Hamilton Creek** (unclassified water body)

Water body type: Freshwater Stream **Water body size:**

YEAR		AU ID	Assessment Area (AU)	# of Samples	# Assessed	# of Exc	Mean of Assessed	Criteria
Aquatic Life Use								
Dissolved Oxygen grab minimum								
2006	Dissolved Oxygen Grab	1404A_03	From the confluence of Haynie Branch upstream to CR 110	13	13	0		2.00
Dissolved Oxygen grab screening level								
2006	Dissolved Oxygen Grab	1404A_03	From the confluence of Haynie Branch upstream to CR 110	13	13	1		3.00
Toxic Substances in sediment								
2006	Metals	1404A_03	From the confluence of Haynie Branch upstream to CR 110	3	3	0		
General Use								
Nutrient Screening Levels								
2006	Ammonia	1404A_03	From the confluence of Haynie Branch upstream to CR 110	17	17	0		0.33
2006	Chlorophyll-a	1404A_03	From the confluence of Haynie Branch upstream to CR 110	16	16	1		14.10
2006	Nitrate	1404A_03	From the confluence of Haynie Branch upstream to CR 110	17	17	0		1.95
2006	Orthophosphorus	1404A_03	From the confluence of Haynie Branch upstream to CR 110	17	17	0		0.37
2006	Total Phosphorus	1404A_03	From the confluence of Haynie Branch upstream to CR 110	17	17	0		0.69

TCEQ criteria for Hamilton Creek is 0.33 mg/L of ammonia

TCEQ criteria for Hamilton Creek above. Wastewater permit allows 10 mg/L ammonia (which would convert to nitrate). No limit on phosphorus in effluent.