

# Lake Austin Sediment, Preliminary Analysis

## City of Austin Watershed Protection Department

2006

DR-06-02

### Introduction

In addition to causing increased turbidity and potential filling of the river basin, sediments are an important storage compartment for many toxins released into surface waters. Because of their ability to sequester toxic compounds, sediments can reflect water quality and record the effects of anthropogenic emissions. As these toxins move through the water column and settle on the bottom, fish and other aquatic life may be exposed to them both through suspended sediments and in the benthic habitat.

As Lake Austin's watershed continues to develop, changes can be expected in sediment quality. A baseline at the current level of development is desired for comparison to future sediment concentrations.

### Sites

#### Previous Site:

**512 Lake Austin @ Fritz Hughes Park** - This site is  $\sim \frac{3}{4}$  of a mile downstream from Mansfield Dam. Sediment collection is difficult at this site. (IS THIS TRUE?)

#### Current Sites:

**559 Lake Austin @ Selma Hughes (TCEQ Site #13912)** - This site is  $\sim 3$  miles downstream from Mansfield Dam, and we found available sediment there (unlike much else upstream from that site). It is also at the upper end of the persistent hydrilla infestation.

**573 Lake Austin @ Emma Long Park (TCEQ Site #12297)** - This site is mid-lake, and downstream of the most persistent hydrilla infestation.

**562 Lake Austin @ Bull Creek (TCEQ Site #12295)** - This site will help characterize influence of Bull Creek.

**561 Lake Austin @ Tom Miller (TCEQ Site #12294)** - The most downstream site and has the most historical data (87,88 then 01-03).

## Parameters

Sediment was collected from the bottom in the center of the lake once per year. At least three sediment grabs were collected using the Ponar Dredge and composited during each sampling event.

The sediment sample was analyzed for NH<sub>3</sub>, Total Solids, TOC, TPH (by 1005), As, Cd, Cr, Cu, Fe, Pb, Zn, Hg, Ni, Ag, PAHs (by 8270C to get lower detection limits) PCBs, OC pesticides, chlorophenoxy acid herbicides, organophosphate pesticides, and texture.

Parameter	Method
Ammonia	EPA 350.1
Percent Moisture	ASTM D2216
TOC (%)	EPA 9060
TPH	Tx 1005
Arsenic	EPA 6020
Cadmium	
Chromium	
Copper	
Iron	
Lead	
Zinc	
Silver	
Nickel	
Mercury	
PAHs	EPA 8270C
PCB	EPA 8080
Organochlorine pesticides	EPA 8081
Chlorophenoxy acid herbicides	
Organophosphate pesticides	
Texture	Hydrometer

## Pesticides and Herbicides

Pesticide and herbicide sediment levels were all below the detection limits with the exception of DDE which was detected at 5.92 and 19.21 µg/kg at Tom Miller Dam in 1985. These levels are between the theoretical effects concentration (TEC) and the probable effects concentration (PEC). Silver was always less than the detection limit.

## Time Trends

**Table 1. Sediment parameters which show significant trends: 1985-2005.**

Parameter	Slope	Standard Error	Prob>  t	Direction
ARSENIC	-0.0006	0.00020	0.0048	decreasing
CADMIUM	-0.0003	0.00004	0.0000	decreasing
LEAD	-0.0036	0.00075	0.0000	decreasing
PAH	0.0690	0.02725	0.0198	<b>increasing</b>

The sediment parameters which are increasing are the PAHs. Other parameters are decreasing or remaining the same.

### Spatial Differences

**Table 2. Sediment parameters which are significantly different spatially in recent years: 2000-2005 data.**

PARAMETER		Prob > F	
Metals	ARSENIC	0.0334	Highest at Tom Miller
	CHROMIUM	0.0206	Highest at Tom Miller and Bull Creek
	COPPER	0.0135	Highest at Tom Miller and Bull Creek
	LEAD	< 0.0001	Highest at Tom Miller
	ZINC	0.0004	Highest at Tom Miller
PAHs	PAH	0.0131	Highest at Bull Creek and Tom Miller

<b>Parameter</b>	<b>Duncan Grouping</b>	<b>Mean (mg/kg metals, ug/kg PAHs)</b>	<b>N</b>	<b>Site</b>
<b>Arsenic</b>	A	6.2	1	<b>Tom Miller</b>
	B	3.2	2	Bull Creek
	B	1.2	2	Selma Hughes
	B	0.93	1	Emma Long
<b>Chromium</b>	A	12.3	3	<b>Tom Miller</b>
	AB	8.0	4	<b>Bull Creek</b>
	B	5.6	3	Selma Hughes
	B	4.4	4	Emma Long
<b>Copper</b>	A	15.2	4	<b>Tom Miller</b>
	AB	9.7	5	<b>Bull Creek</b>
	B	5.9	3	Selma Hughes
	B	4.8	4	Emma Long
<b>Lead</b>	A	20.9	4	<b>Tom Miller</b>
	B	14.5	5	Bull Creek
	C	4.5	4	Selma Hughes
	C	4.1	5	Emma Long
<b>Zinc</b>	A	65.2	4	<b>Tom Miller</b>
	B	34.7	5	Bull Creek
	B	16.8	3	Selma Hughes
	B	15.6	5	Emma Long
<b>PAH</b>	A	.79	6	<b>Bull Creek</b>
	A	.70	3	<b>Tom Miller</b>
	B	.16	4	Selma Hughes
	B	.11	3	Emma Long

The sediment concentrations typically follow the pattern: Tom Miller Dam concentrations > Bull Creek Mouth Concentrations > Selma Hughes Park Concentrations > Emma Long Park concentrations. Selma Hughes Park is upstream of Emma Long Park but has more potential for localized storm runoff. (IS THIS TRUE – WHAT IS THE REASON?) However, the concentrations at Selma Hughes Park and Emma Long Park are not significantly different. The order is slightly different for PAHs, where Bull Creek concentrations exceed those at Tom Miller Dam further downstream.

### **Sediment Toxicity**

None of the sediment parameters in recent years (2000-2005) are over the TEC. Some of our recent detection limits for each parameter are below the TEC, and most of the detection limits are below or close to the TEC.

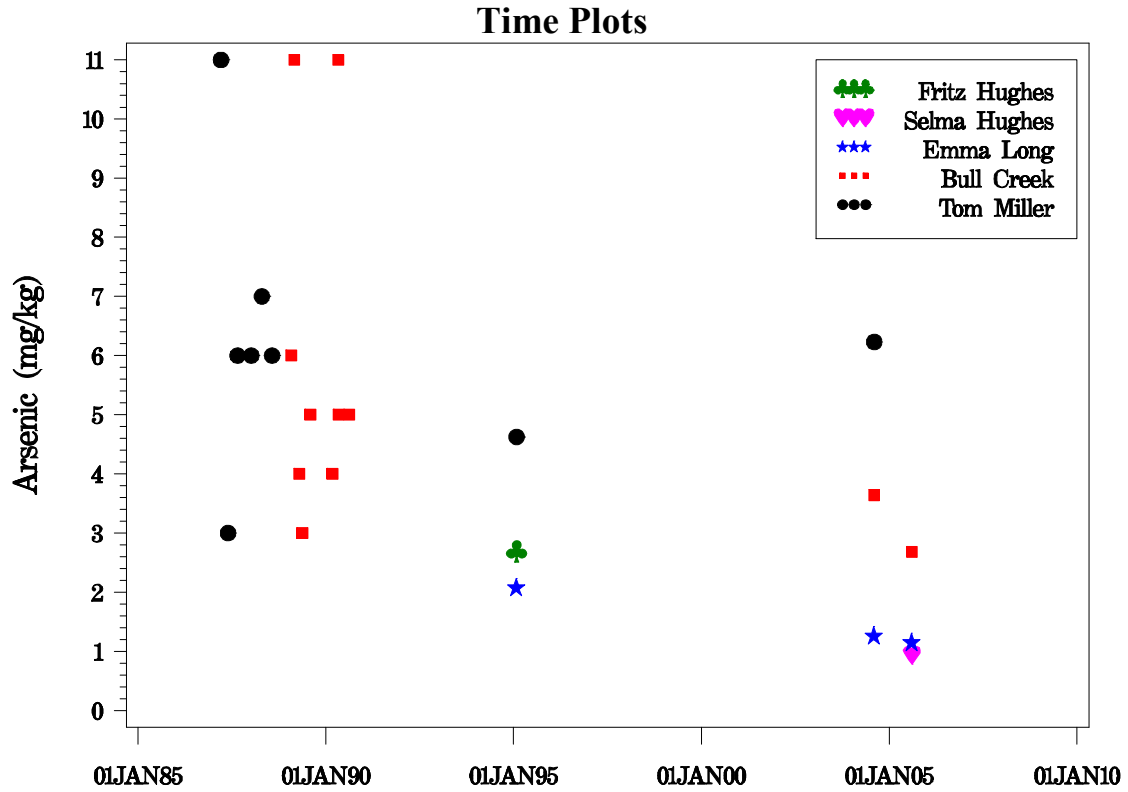


Figure 1a. Arsenic sediment concentrations in Lake Austin.

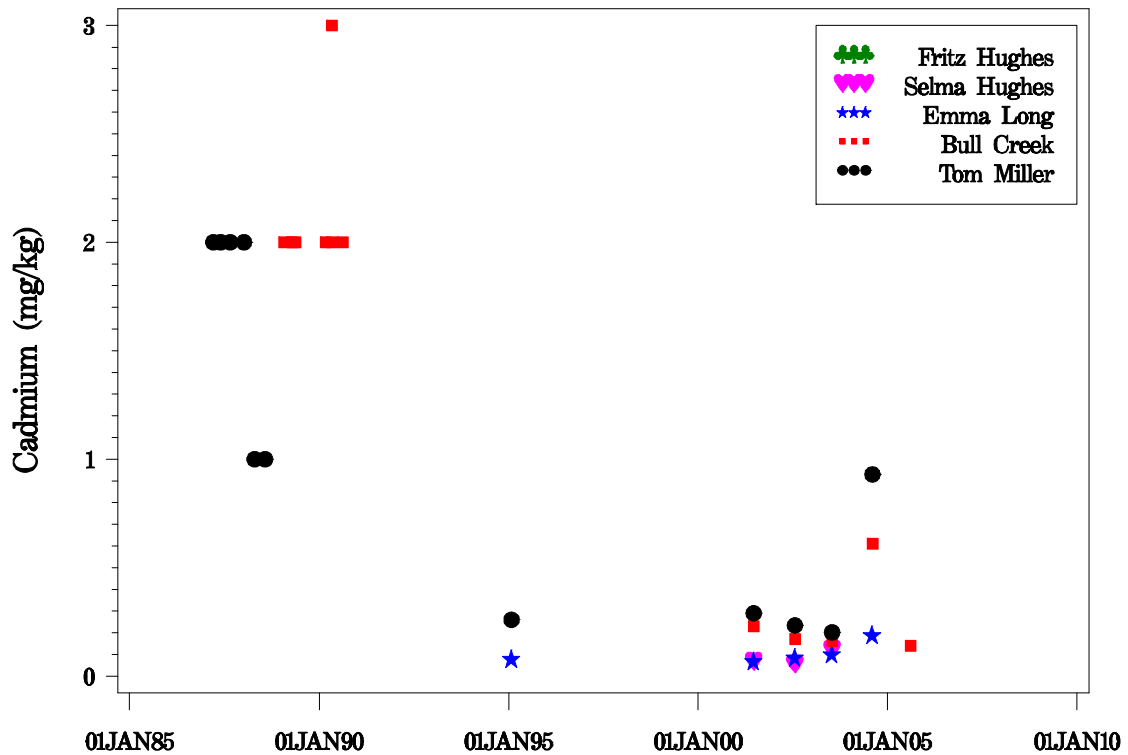


Figure 1b. Cadmium sediment concentrations in Lake Austin.

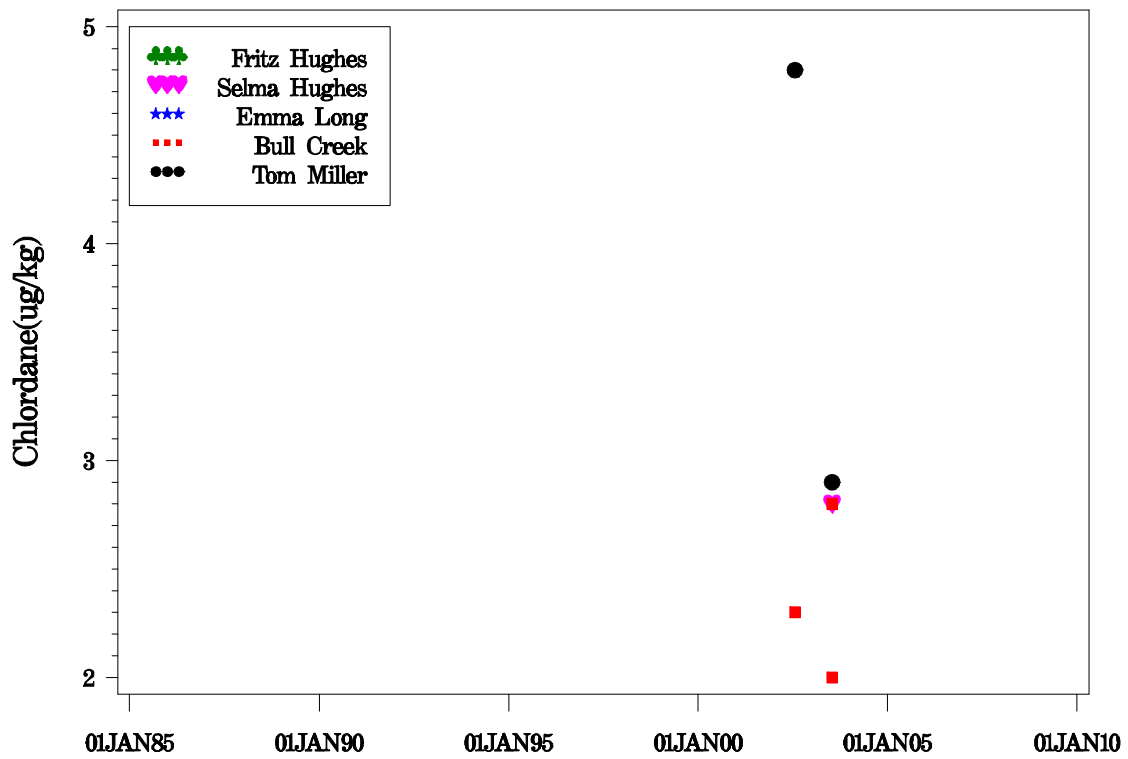


Figure 1c. Chlordane sediment concentrations in Lake Austin.

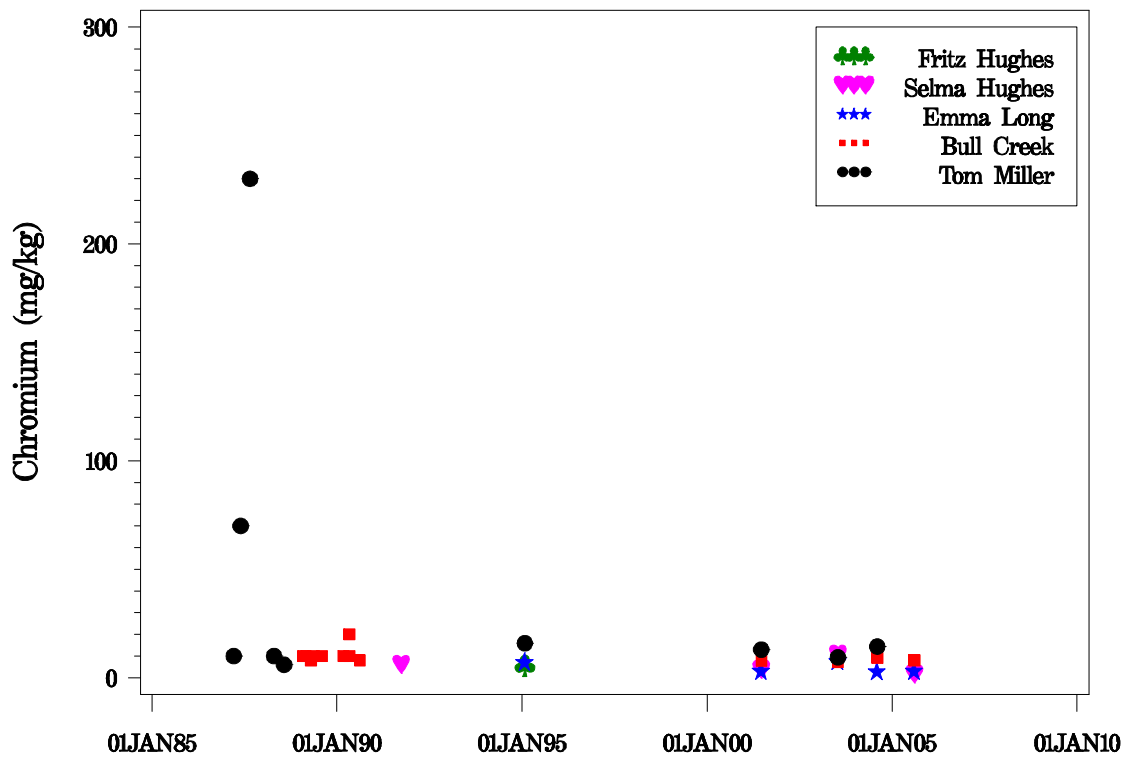


Figure 1d. Chromium sediment concentrations in Lake Austin.

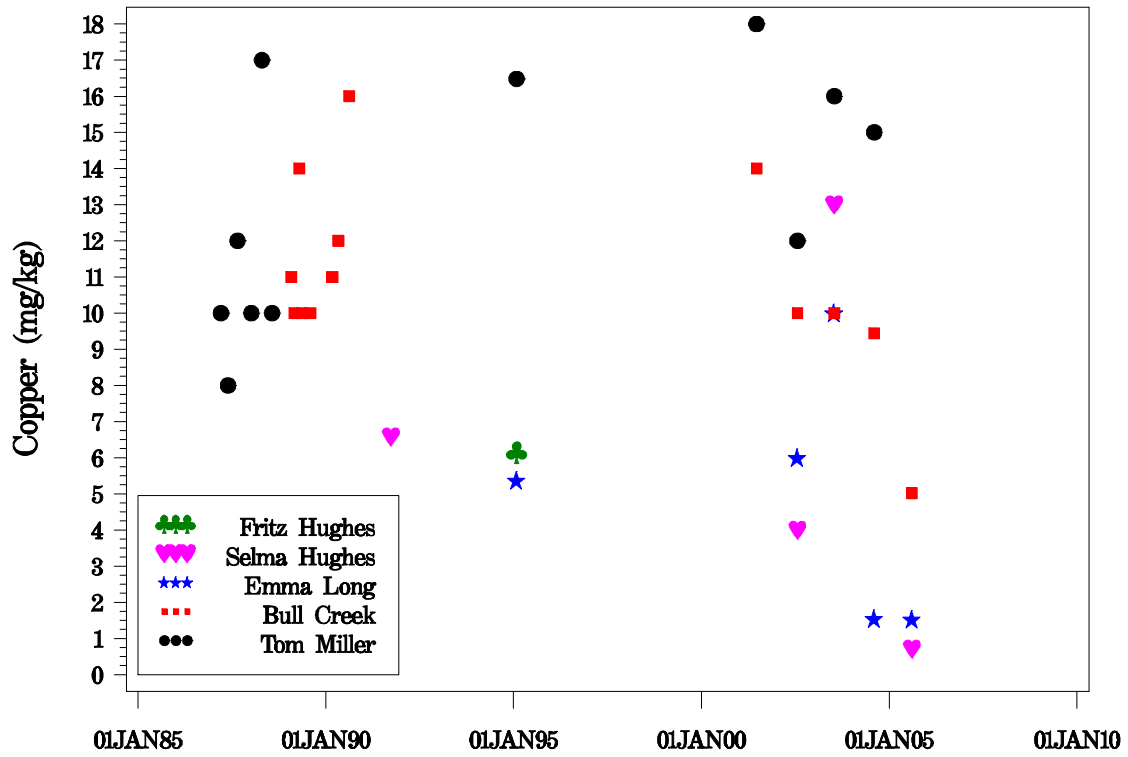


Figure 1e. Copper sediment concentrations in Lake Austin.

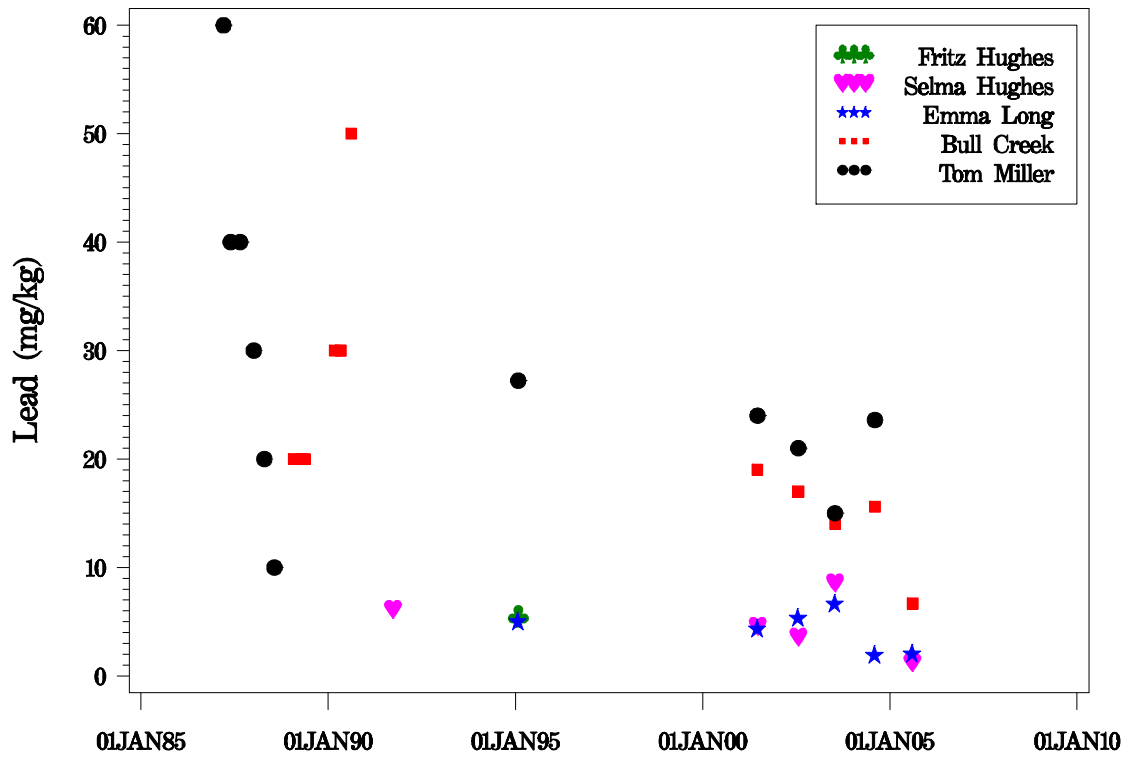


Figure 1f. Lead sediment concentrations in Lake Austin.

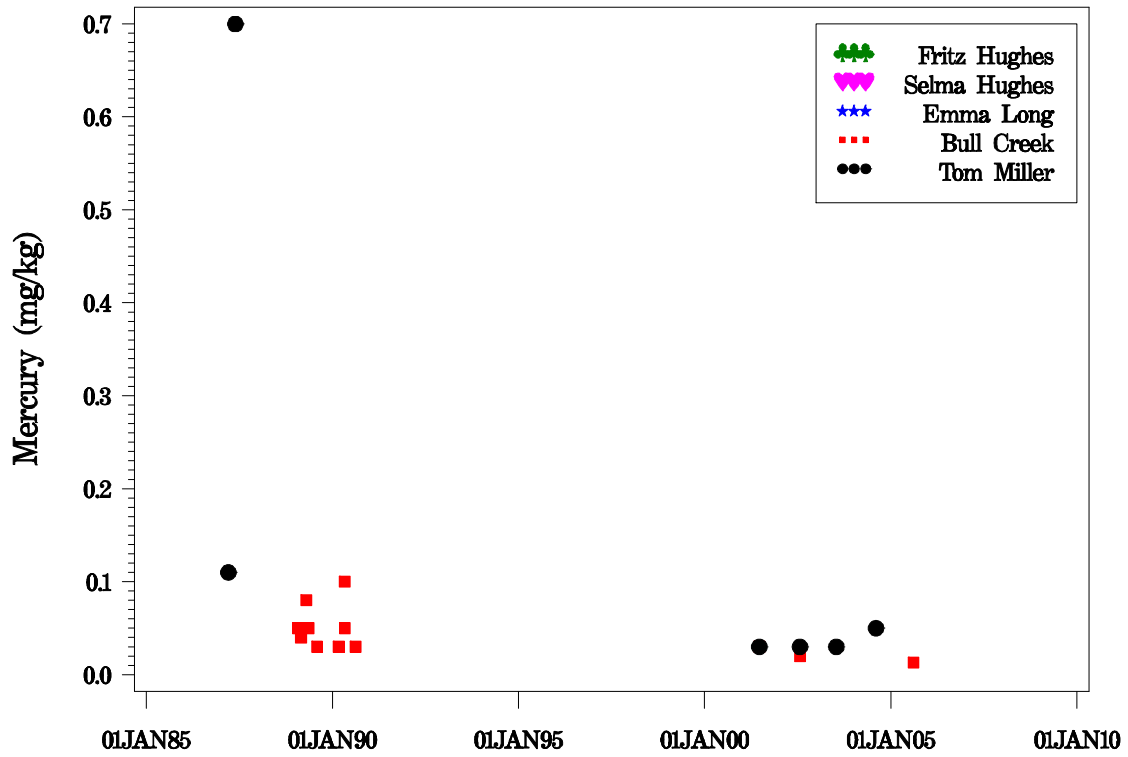


Figure 1g. Mercury sediment concentrations in Lake Austin.

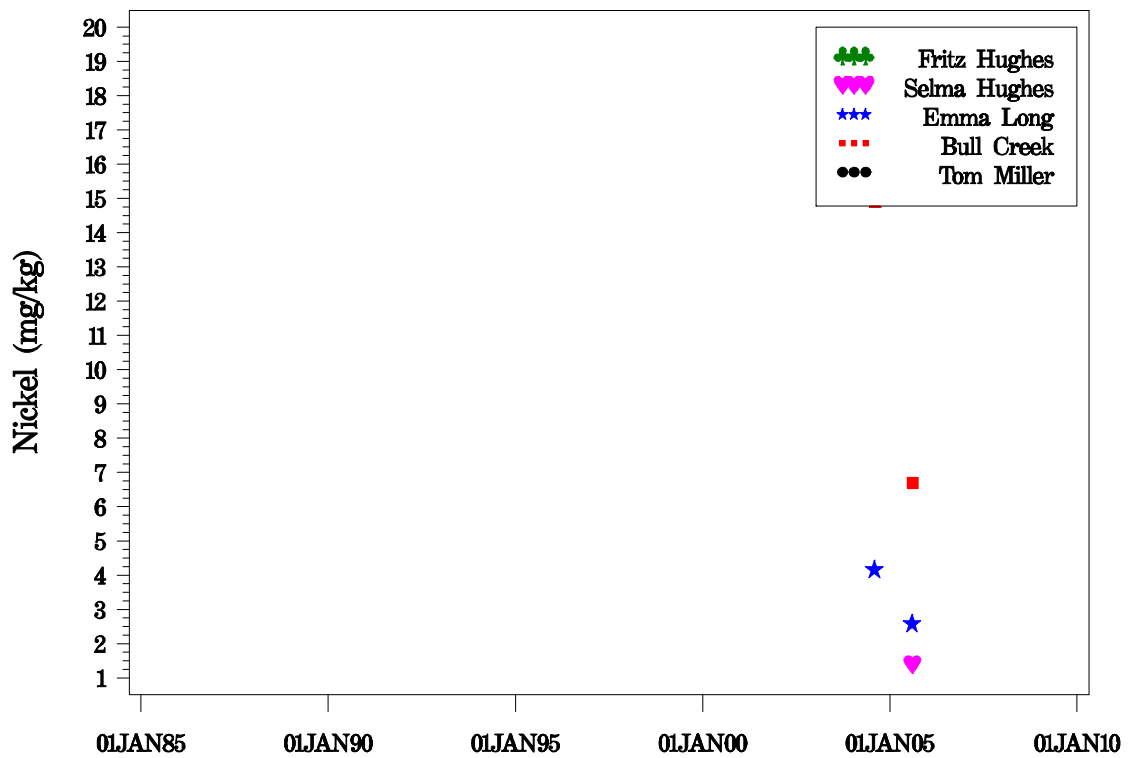


Figure 1h. Nickel sediment concentrations in Lake Austin.

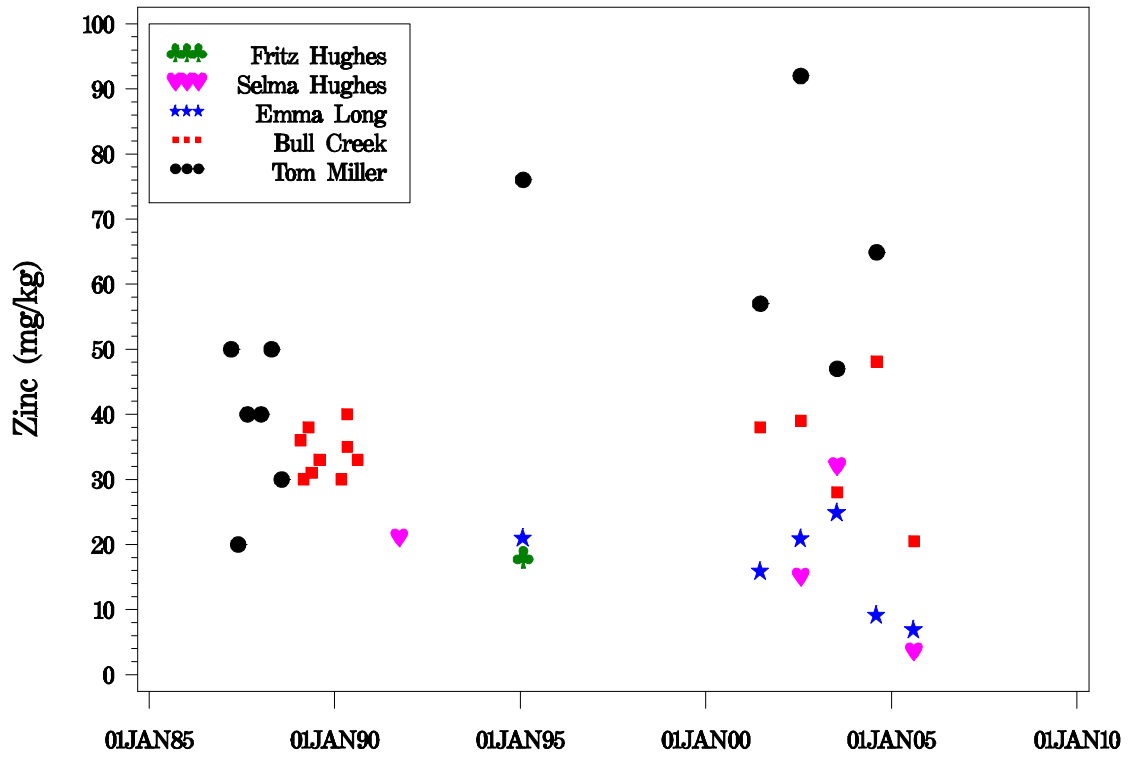


Figure 1i. Zinc sediment concentrations in Lake Austin.

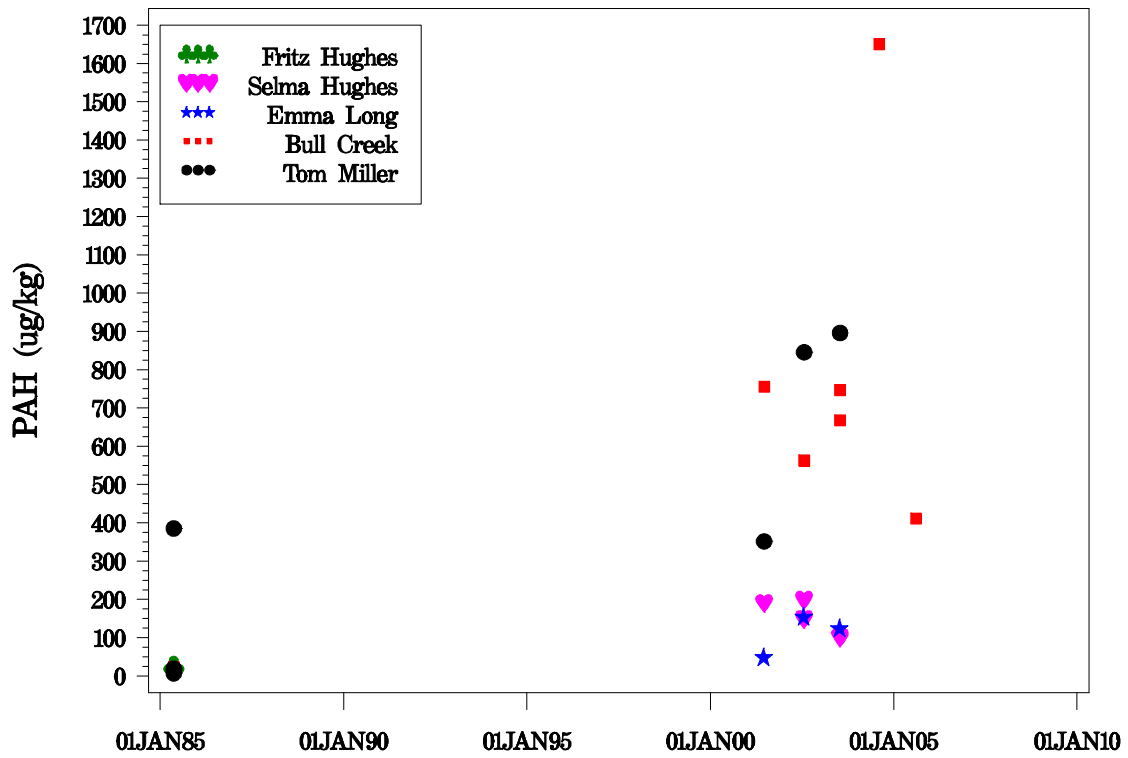


Figure 1j. Total PAH sediment concentrations in Lake Austin.

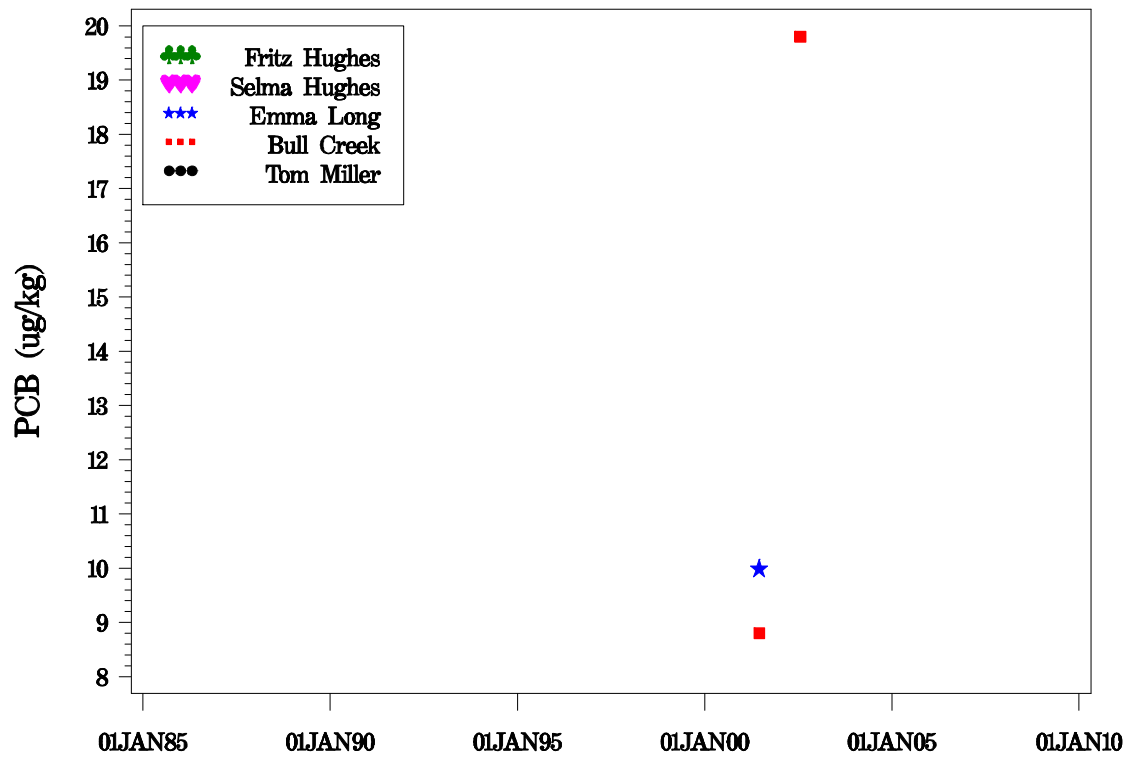


Figure 1k. PCB sediment concentrations in Lake Austin.

## Spatial Plots with Recent Data: 2000 - 2005

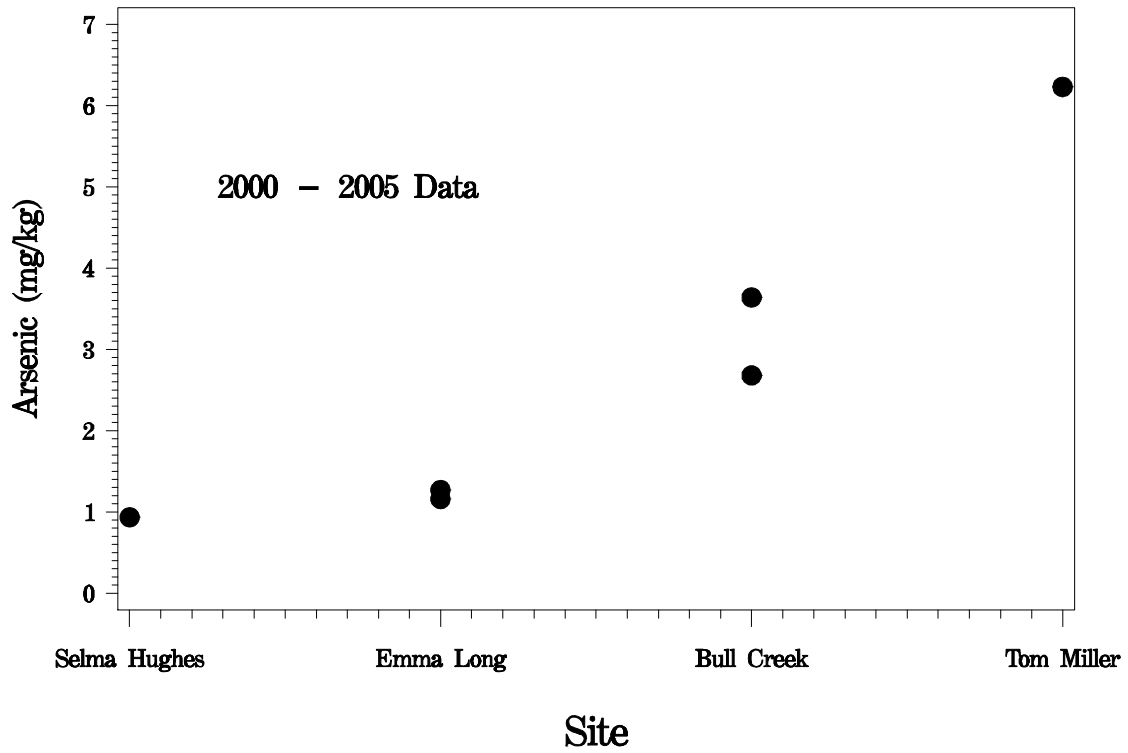


Figure 2a. Arsenic sediment concentrations at Lake Austin Sites: 2000-2005

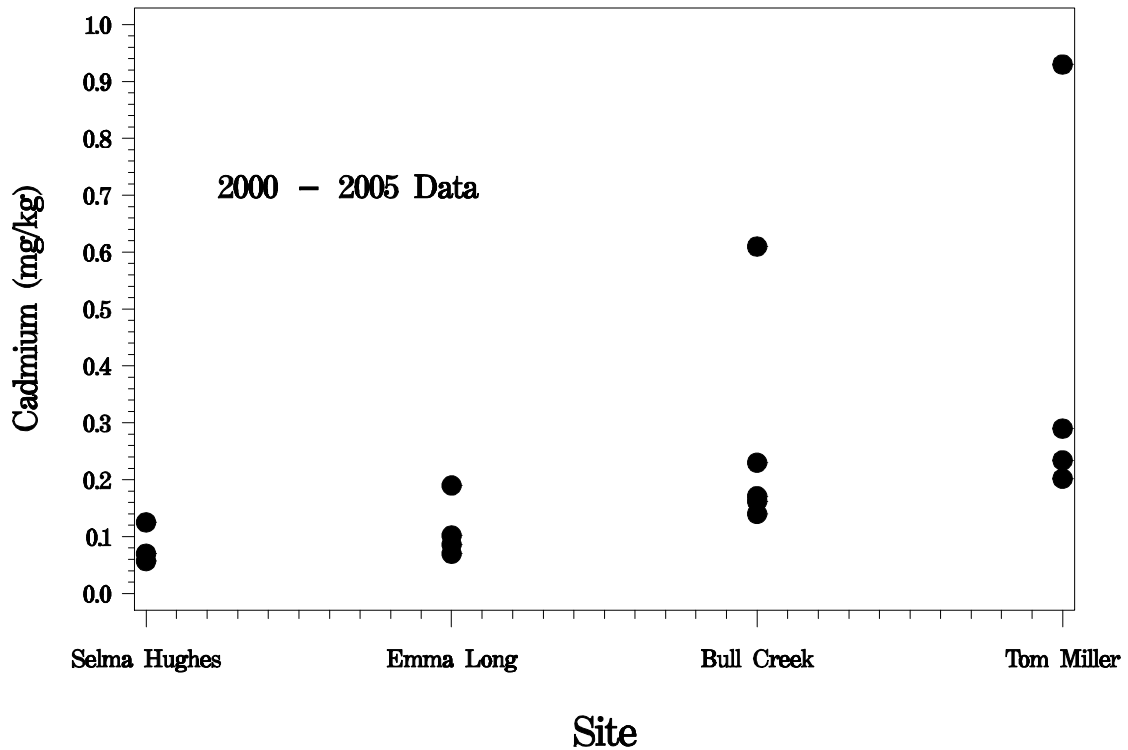


Figure 2b. Cadmium sediment concentrations at Lake Austin Sites: 2000-2005

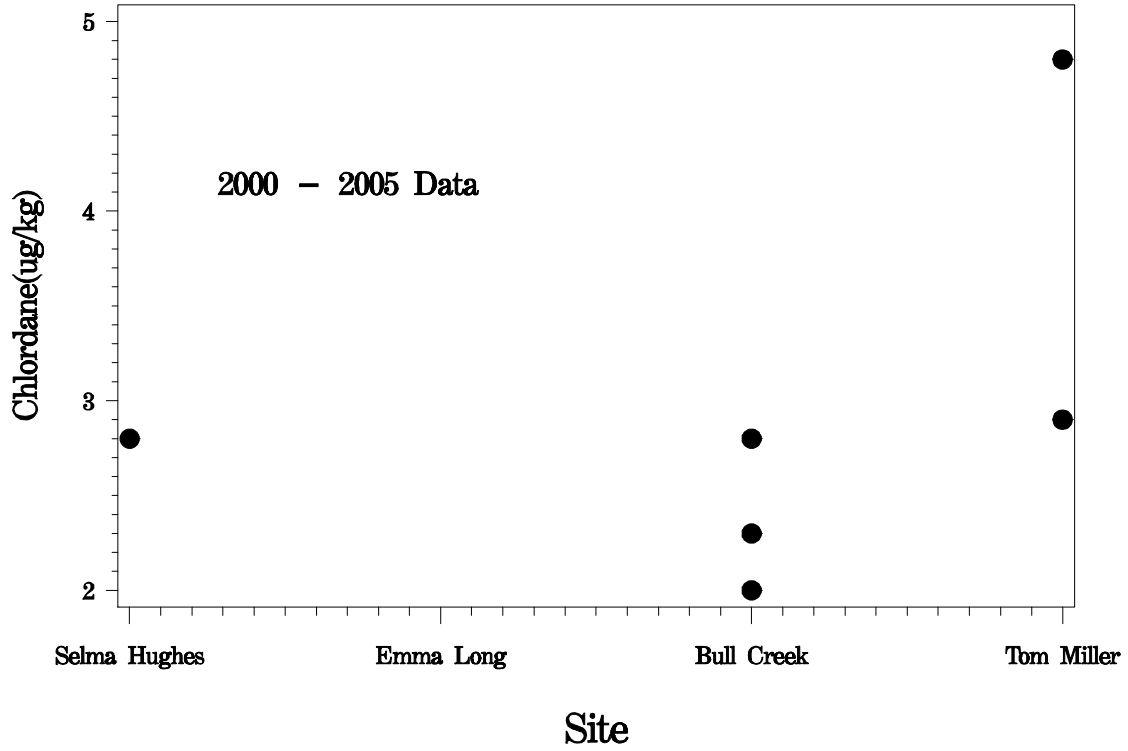


Figure 2c. Chlordane sediment concentrations at Lake Austin Sites: 2000-2005

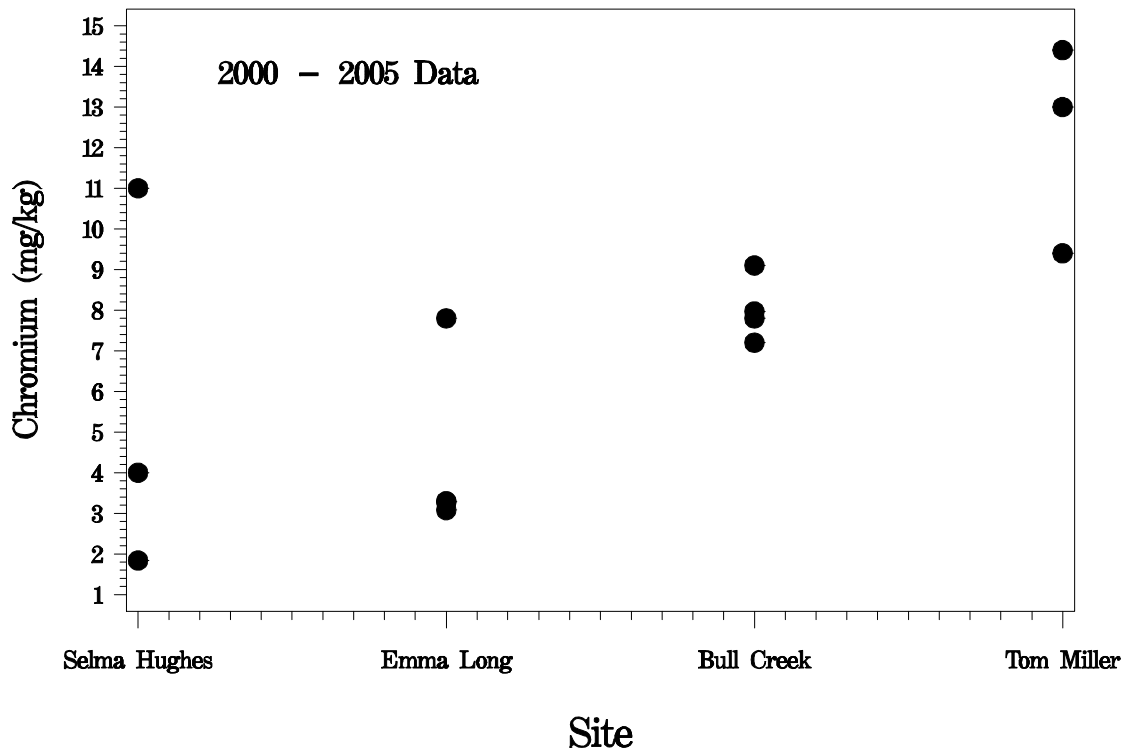


Figure 2d. Chromium sediment concentrations at Lake Austin Sites: 2000-2005

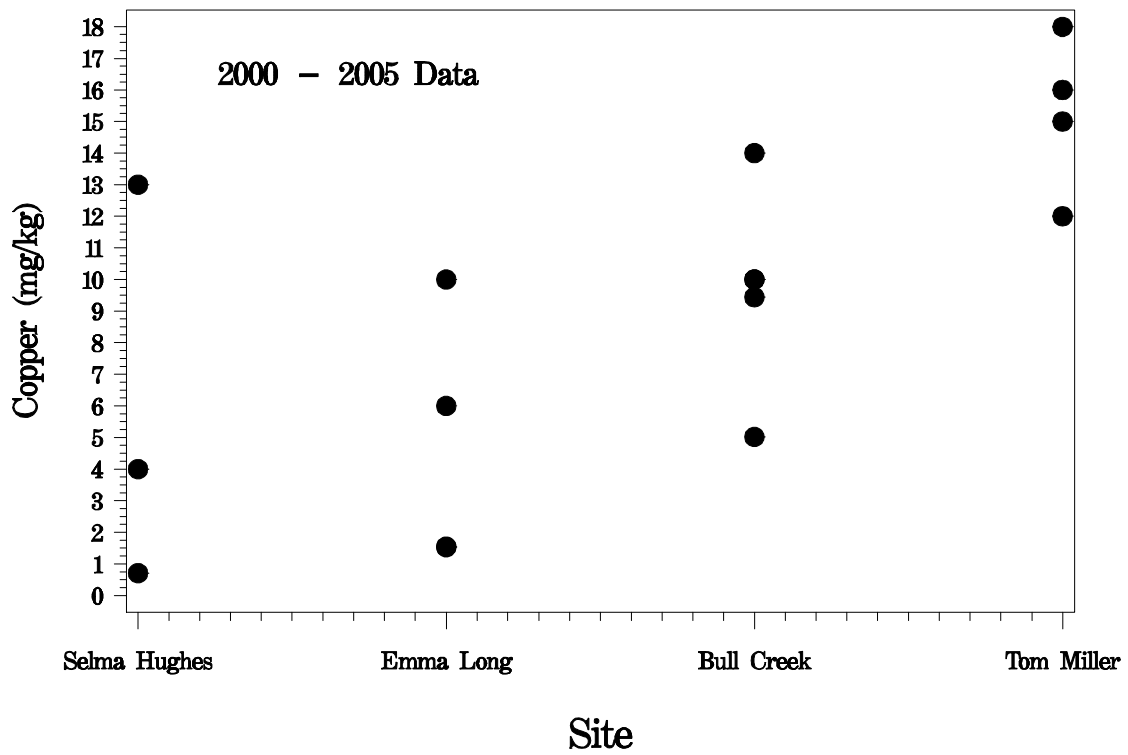


Figure 2e. Copper sediment concentrations at Lake Austin Sites: 2000-2005

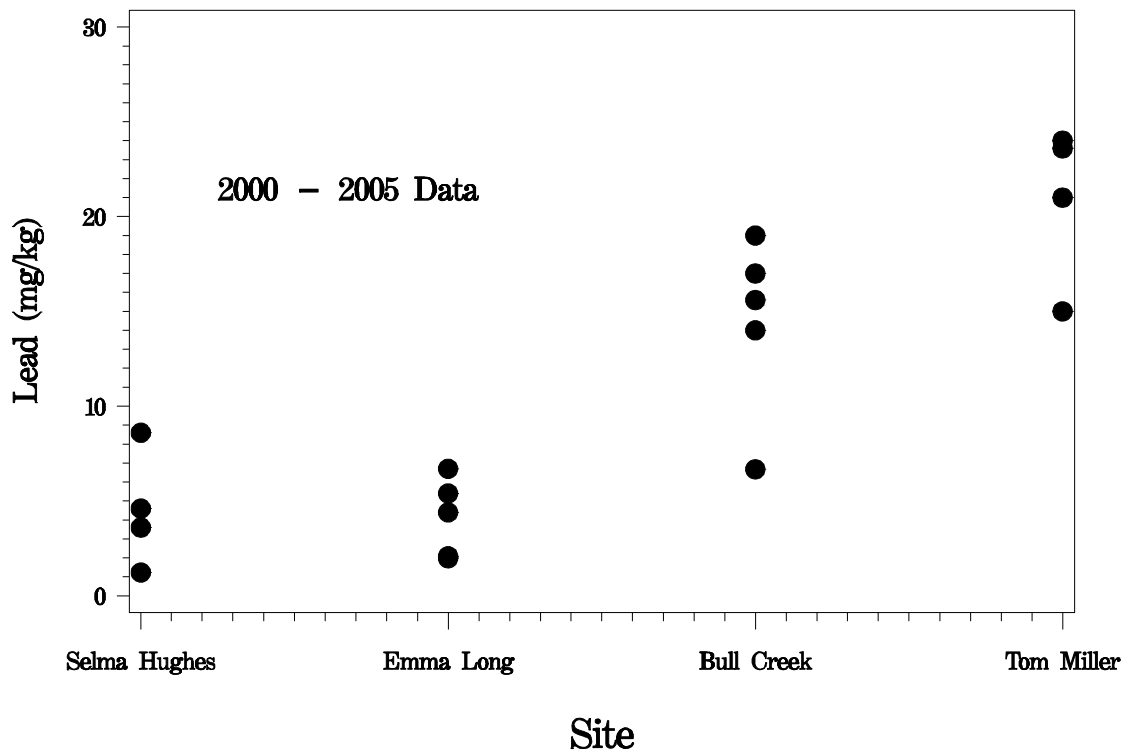


Figure 2f. Lead sediment concentrations at Lake Austin Sites: 2000-2005

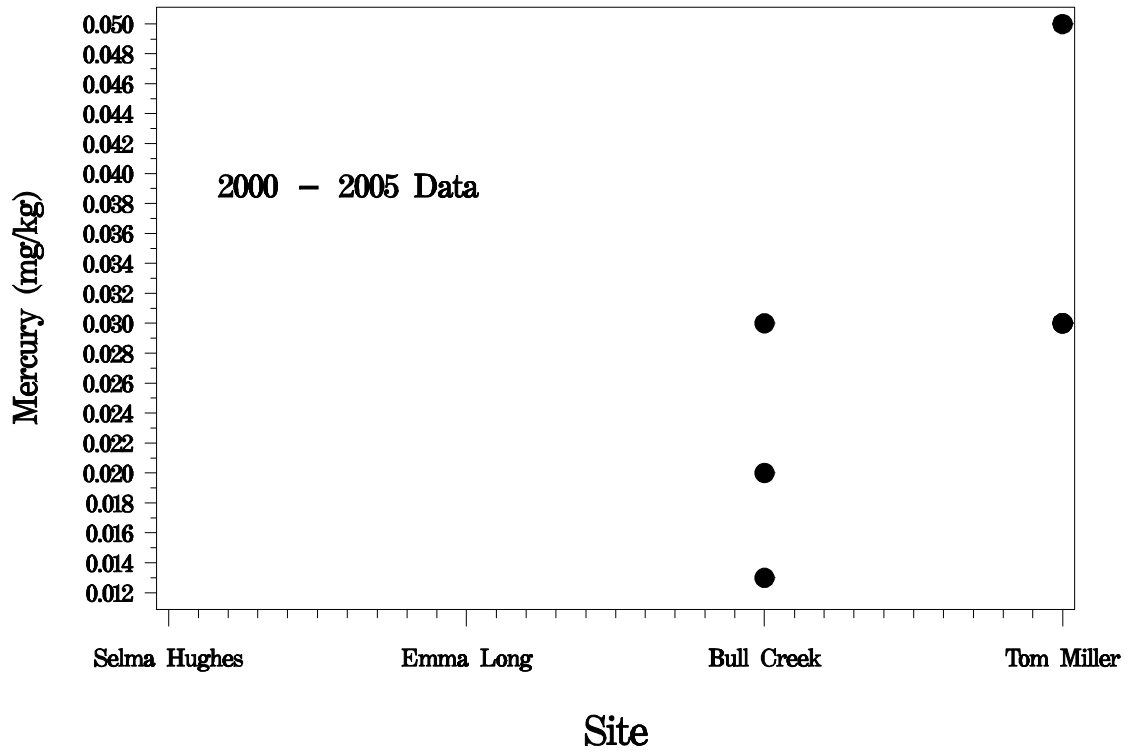


Figure 2g. Mercury sediment concentrations at Lake Austin Sites: 2000-2005

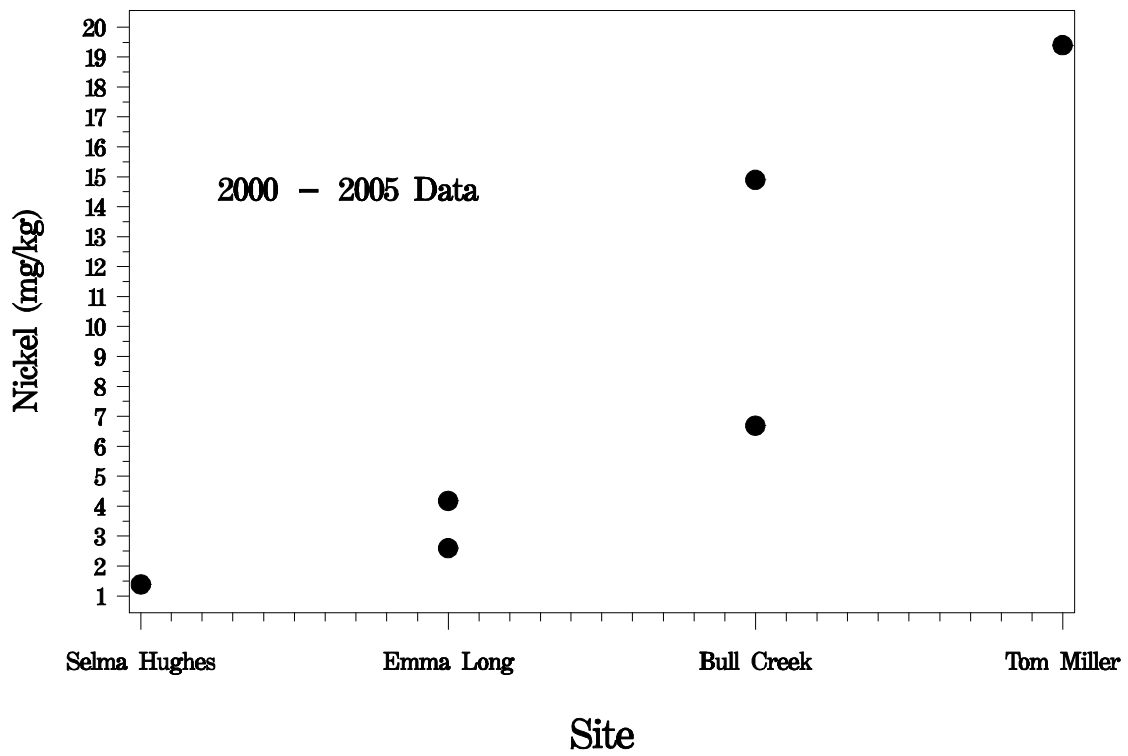


Figure 2h. Nickel sediment concentrations at Lake Austin Sites: 2000-2005

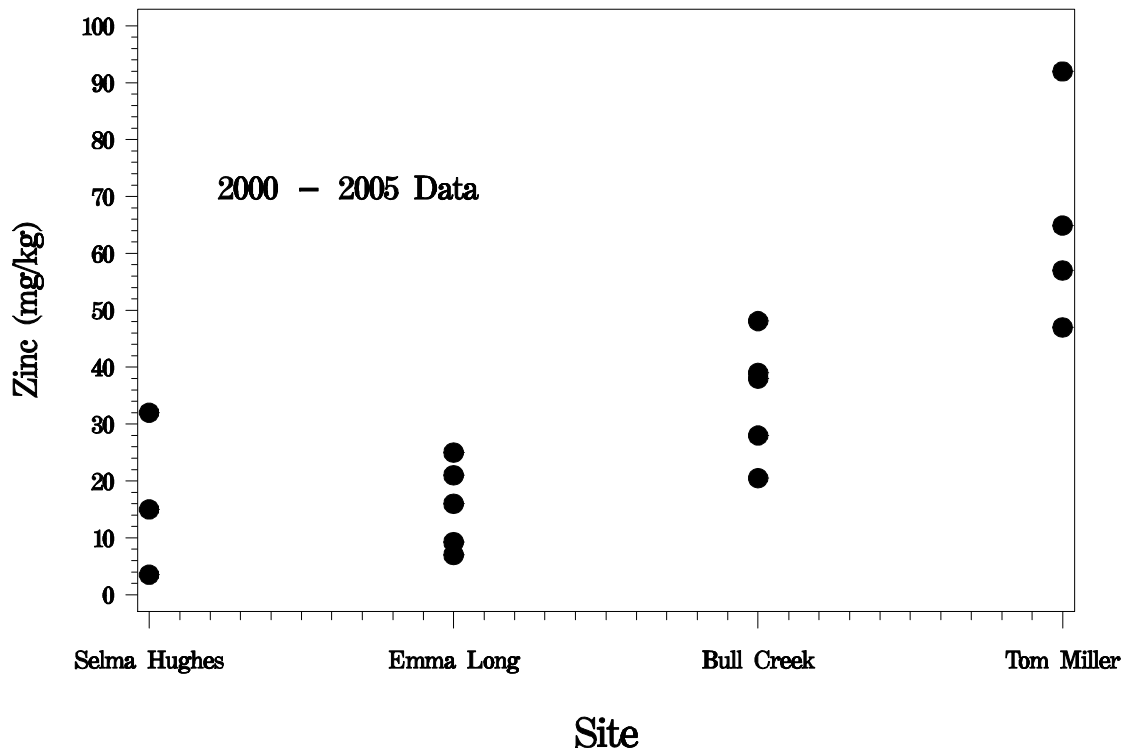


Figure 2i. Zinc sediment concentrations at Lake Austin Sites: 2000-2005

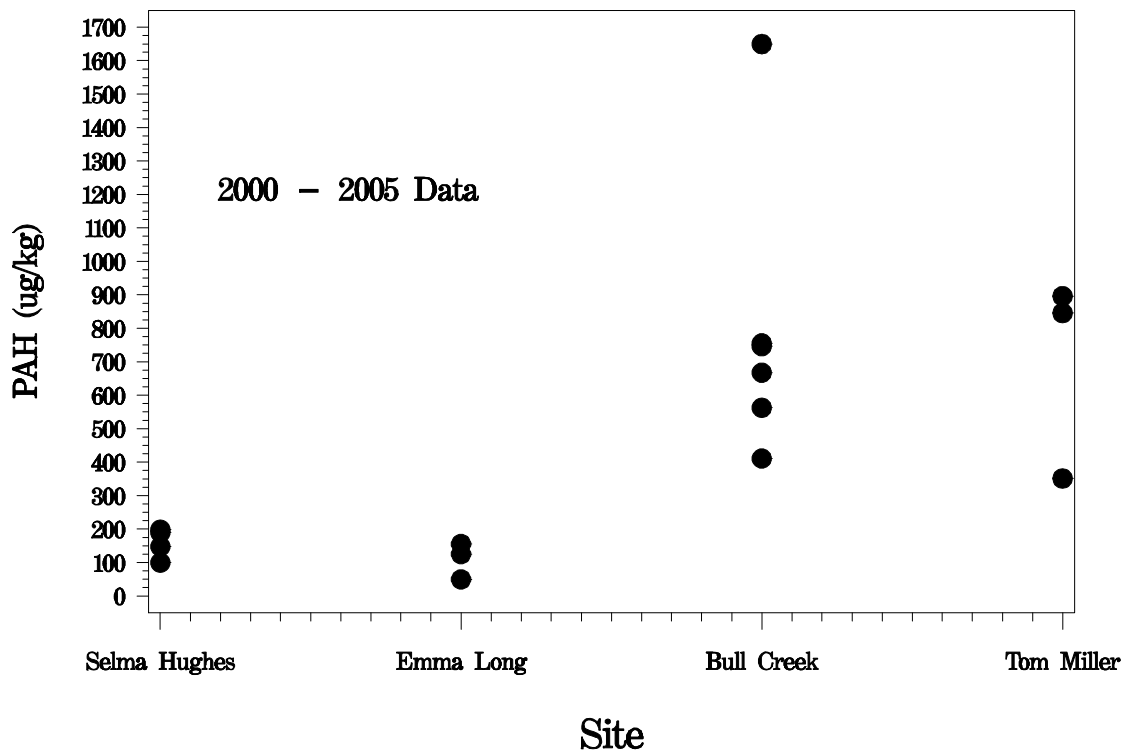


Figure 2j. Total PAH sediment concentrations at Lake Austin Sites: 2000-2005

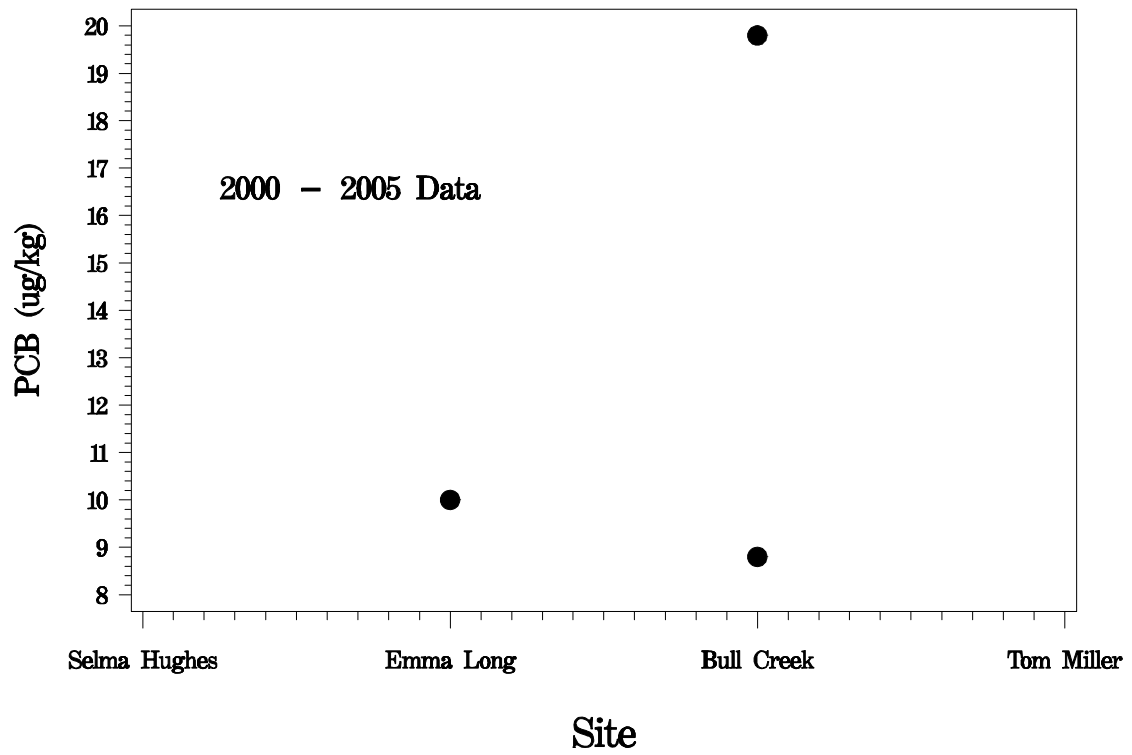


Figure 2k. PCB sediment concentrations at Lake Austin Sites: 2000-2005