

Missouri Department of Natural Resources

## Total Maximum Daily Load Information Sheet

### Indian Creek (and Tributary) and Courtois Creek

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#### Water Body Segments at a Glance:

|                            |  |
|----------------------------|--|
| <b>County(ies):</b>        | Washington, Crawford and Iron  |
| <b>Nearby Cities:</b>      | Viburnum   |
| <b>Length of Segments:</b> | Indian Creek – 1.5 miles<br>Tributary to Indian Creek – 0.3 miles<br>Courtois Creek – 30 miles |
| <b>Pollutants:</b>         | Lead, Zinc and Metals  |
| <b>Source:</b>             | Drainage from Viburnum Division lead mine tailings piles and mining area                       |
| <b>Water Body ID:</b>      | Indian Creek – 1946<br>Tributary to Indian Creek – 3663<br>Courtois Creek - 1943               |



State map showing location of watershed

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**Scheduled for TMDL Development:** Approved by EPA on Sept. 17, 2010

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#### Description of the Problem

##### Designated beneficial uses

- Livestock and wildlife watering
- Protection of human health (fish consumption)
- Whole body contact recreation
- Secondary contact recreation (Courtois Creek)
- Protection of warm water aquatic life
- Cool-water fishery (Courtois Creek)
- Outstanding state resource water (Courtois Creek in Crawford County only)

##### Uses that are impaired

- Protection of warm water aquatic life

##### Standards that apply

Missouri water quality criteria for metals found in 10 CSR 20-7.031(4)(B)1 state:

Water contaminants shall not cause the criteria in Tables A and B to be exceeded.  
Concentrations of these substances in bottom sediments or waters shall not harm

benthic organisms and shall not accumulate through the food chain in harmful concentrations, nor shall state and federal maximum fish tissue levels for fish consumption be exceeded.

In addition, Table A of Missouri's water quality standards, expresses current lead and zinc criteria for the protection of aquatic life in dissolved form. These criteria are hardness dependent and are calculated from the formulas shown below with results expressed in micrograms per liter, or  $\mu\text{g/L}$ .

#### Dissolved Lead

$$\text{Acute} = e^{(1.273 \cdot \ln(\text{hardness}) - 1.460448)} \cdot (1.46203 - (\ln(\text{hardness}) \cdot 0.145712)) = \mu\text{g/L}$$

$$\text{Chronic} = e^{(1.273 \cdot \ln(\text{hardness}) - 4.704797)} \cdot (1.46203 - (\ln(\text{hardness}) \cdot 0.145712)) = \mu\text{g/L}$$

#### Dissolved Zinc

$$\text{Chronic} = e^{(0.8473 \cdot \ln(\text{hardness}) + 0.785)} \cdot 0.978 = \mu\text{g/L}$$

$$\text{Acute} = e^{(0.8473 \cdot \ln(\text{hardness}) + 0.8842)} \cdot 0.986 = \mu\text{g/L}$$

Where  $e$  ( $\sim 2.718$ ) is the base of the natural logarithm and "ln" is the natural logarithm.

### Background Information

Indian Creek, Tributary to Indian Creek, and Courtois Creek<sup>1</sup> are listed as impaired in Missouri's U.S. Environmental Protection Agency, or EPA, approved 2008 303(d) list of impaired waters for lead, zinc and metals. This listing is a result of water quality data from the creeks that show exceedances of the dissolved lead and dissolved zinc chronic criteria. Additionally, these streams' aquatic invertebrate communities<sup>2</sup> are exhibiting reduced species diversity and fewer individuals compared to reference streams. These reductions indicate these animals are being adversely affected by metals toxicity in their environment. It is believed lead is the primary pollutant resulting in metal toxicity for which the current metals impairment is based.

It is common to find lead and zinc contamination in soil, groundwater, surface water and sediments surrounding lead and zinc mines. In excess quantities, both lead and zinc can be highly toxic to aquatic life. In addition, human consumption of fish containing sufficient quantities of lead can result in health problems, primarily affecting the nervous system, blood cells, and processes for the metabolism of Vitamin D and calcium.

The impaired portions of Indian Creek, Tributary to Indian Creek, and Courtois Creek are located near the *New Lead Belt* region of southeast Missouri. This area is also referred to as the Viburnum Trend. Today, the only active mine in this area is the Doe Run Company-Viburnum Division, which has several outfalls that discharge into Indian Creek. Within the mining area are two large mine tailings impoundments covering a total area greater than 800 acres, which drain to these creeks.

### Water Quality Assessment Data

Following are graphic summaries of the lead and zinc data from 2001-2005 for Indian Creek, Tributary to Indian Creek, and Courtois Creek (Figures 1 – 6). The chronic criteria for both

<sup>1</sup> Courtois Creek is pronounced locally as "KOH'-tuh-way"

<sup>2</sup> Organisms without backbones that live in the stream and support the food chain

dissolved lead and dissolved zinc were calculated using the 25th percentile hardness values. These data, along with studies of the streams' aquatic invertebrate communities, were used for assessing the streams' impairment.

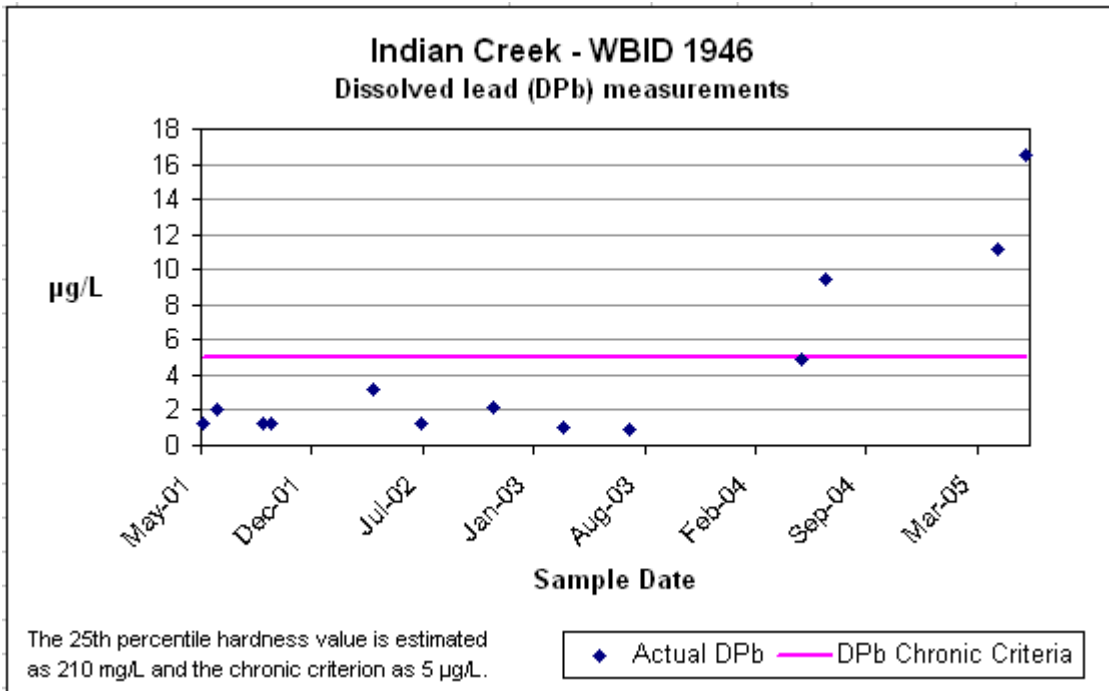


Figure 1.

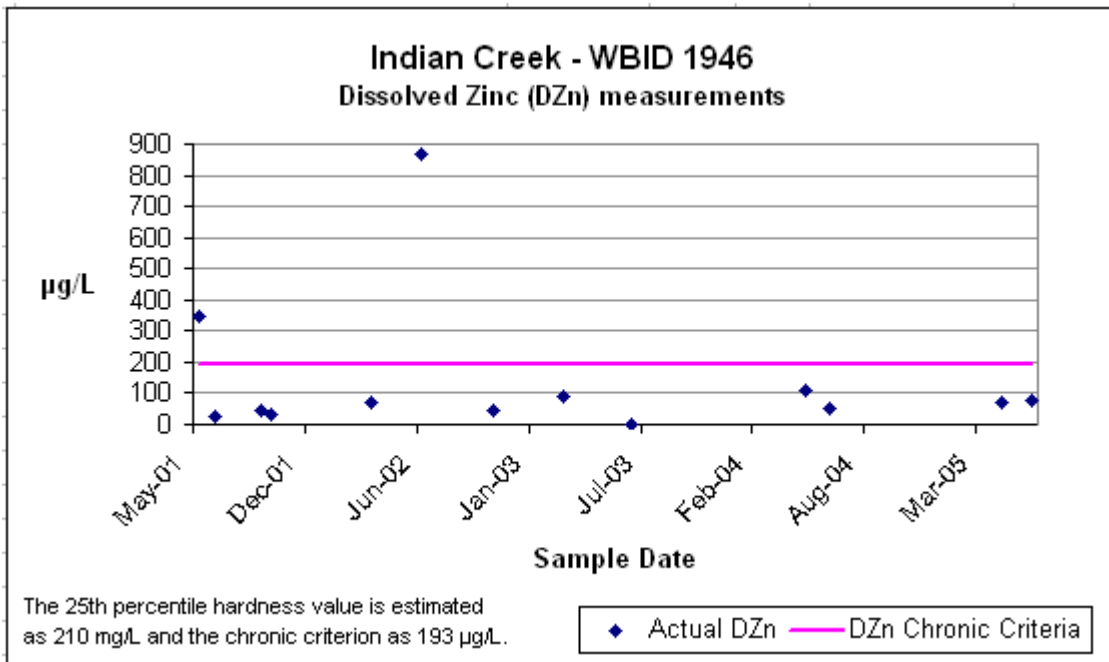
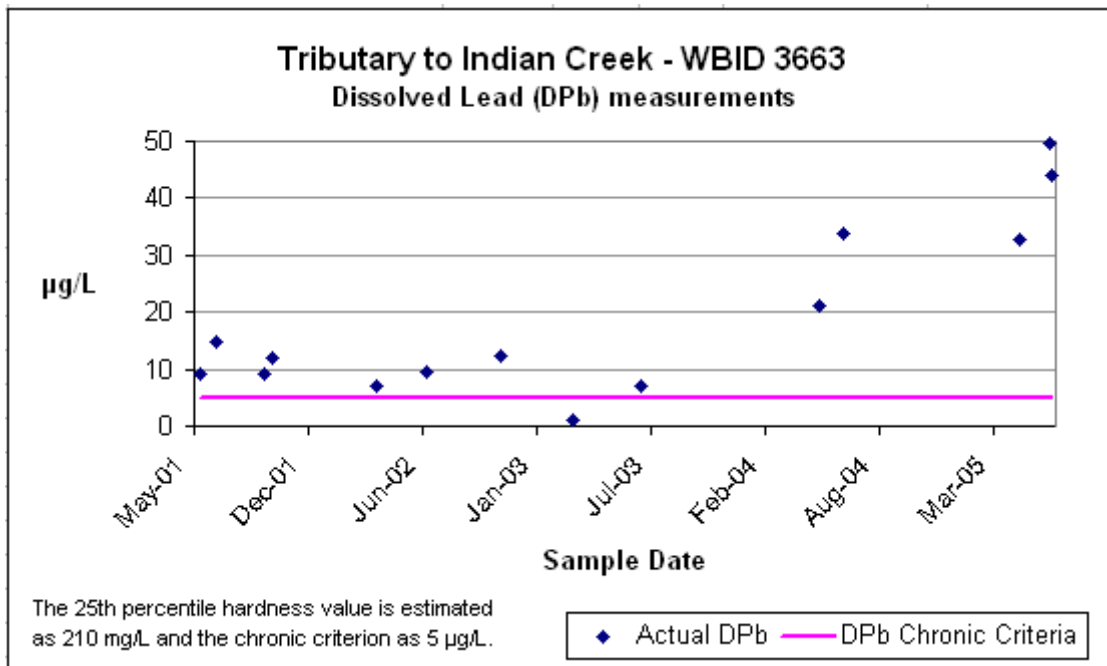
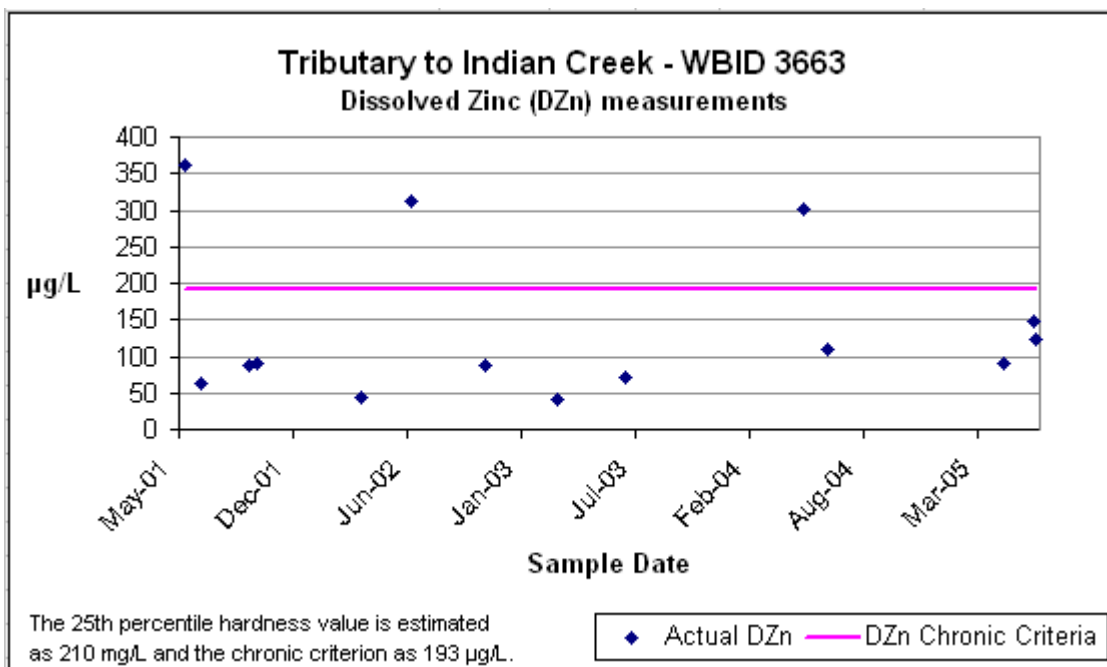


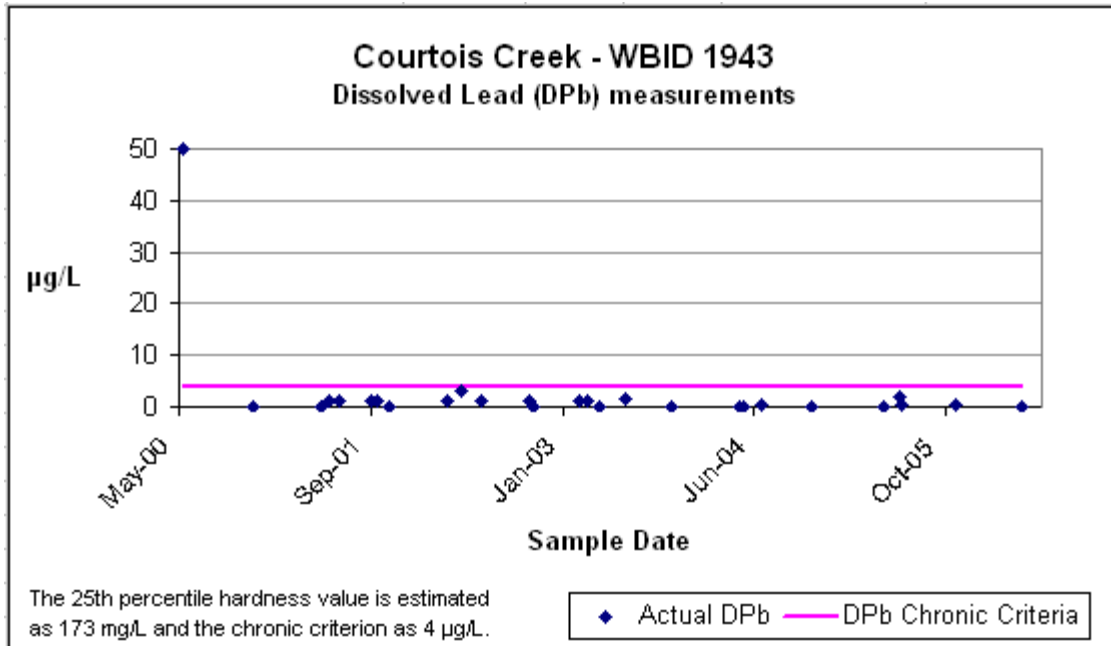
Figure 2.



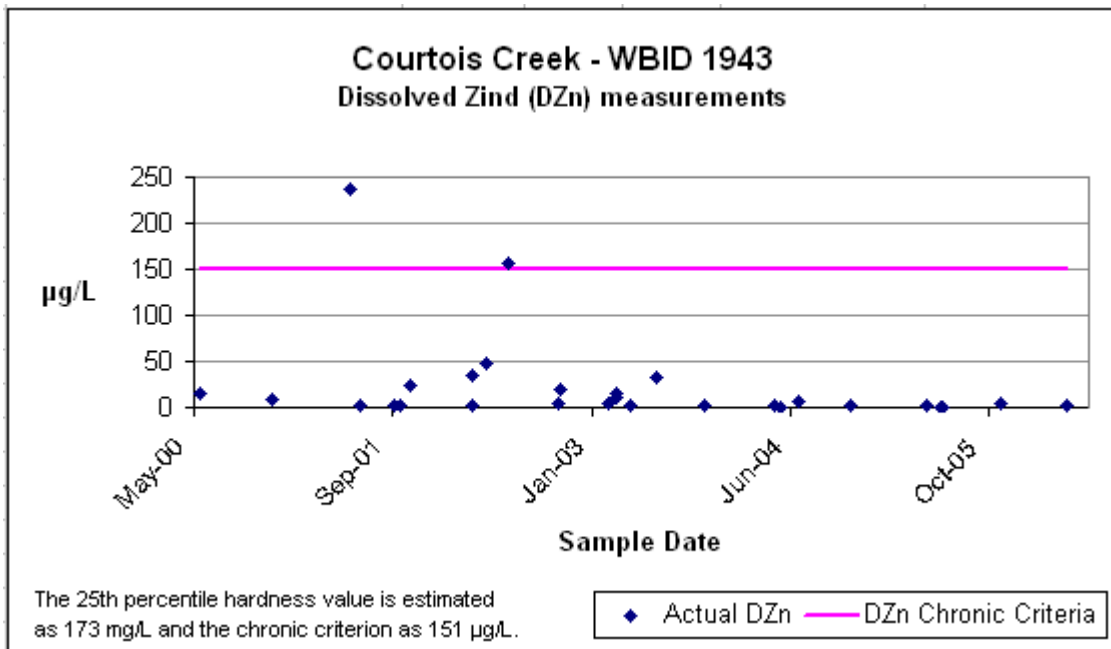
**Figure 3.**



**Figure 4.**

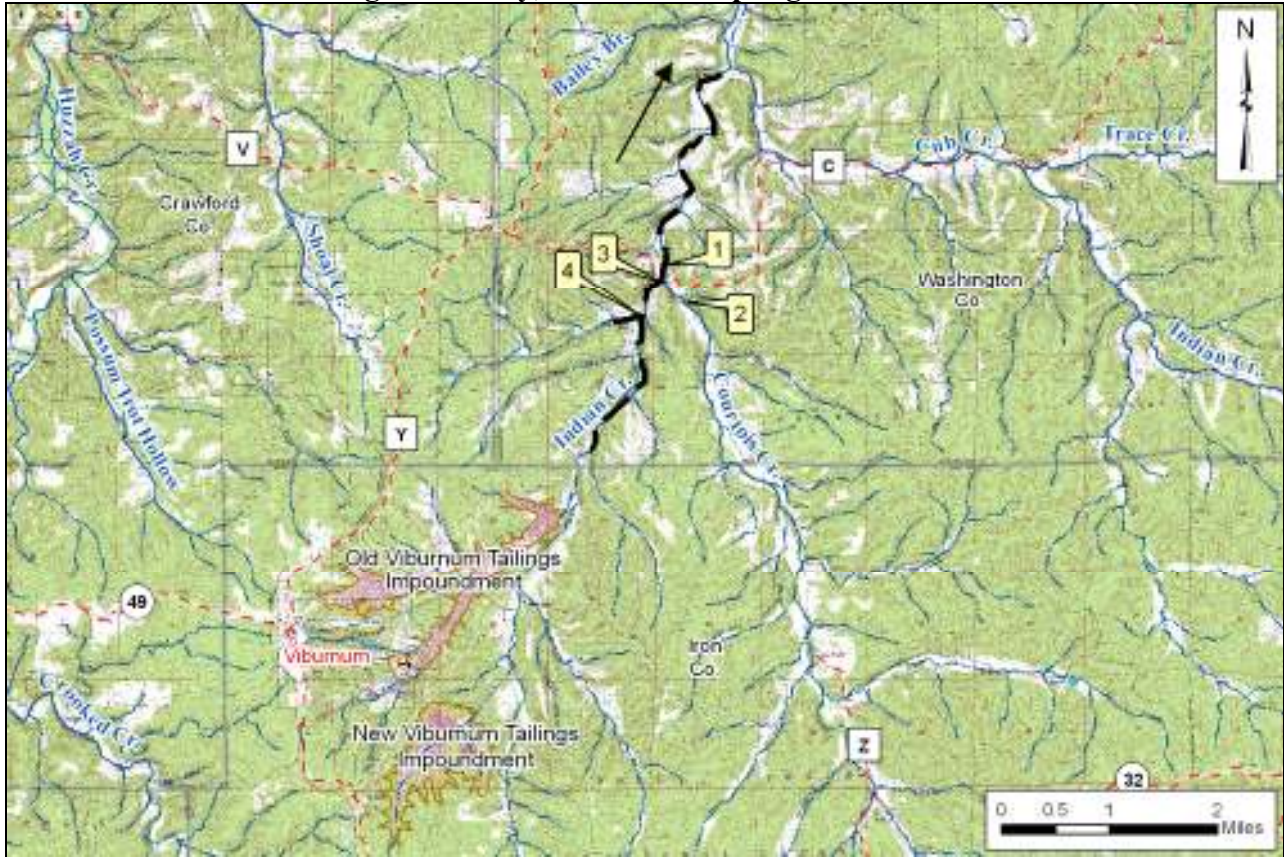


**Figure 5.**



**Figure 6.**

**Map Showing the Impaired Segments of Indian Creek, Tributary to Indian Creek and Courtois Creek in Washington County, Mo. and Sampling Sites**



--- Impaired Segment      → Direction of flow

- | <b>Sample Sites</b> |   |
|---------------------|---|
| 1                   | – Courtois Creek downstream of Indian Creek |
| 2                   | – Courtois Creek upstream of Indian Creek   |
| 3                   | – Indian Creek at old Highway C             |
| 4                   | – Tributary to Indian Creek                 |

**For more information call or write:**  
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