

Expression of Metallothionein in Yellow Perch Exposed to Arsenic

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Introduction

- The American Smelting and Refining Company (ASARCO) located in Ruston, WA (1890-1985) emissions containing arsenic and lead found in sediments of freshwater lakes of the south, central Puget Sound region.
- Arsenic (As), a metalloid is a known carcinogen in humans. As in soil & lake sediment can be consumed by aquatic life and poses human health risk from contaminated areas.
- Metallothionein (MT), a gene found in aquatic species, encodes for proteins that reduce oxidative stress & provide protection of tissues from harmful contaminants such as metals & metalloids.
- *P. flavescens* (yellow perch) is a species of freshwater fish found in the lakes of the south, central Puget Sound region.
- **Objective:** Analyze MT gene expression in fish exposed to arsenic contamination.



Photo courtesy of WDFW

Results

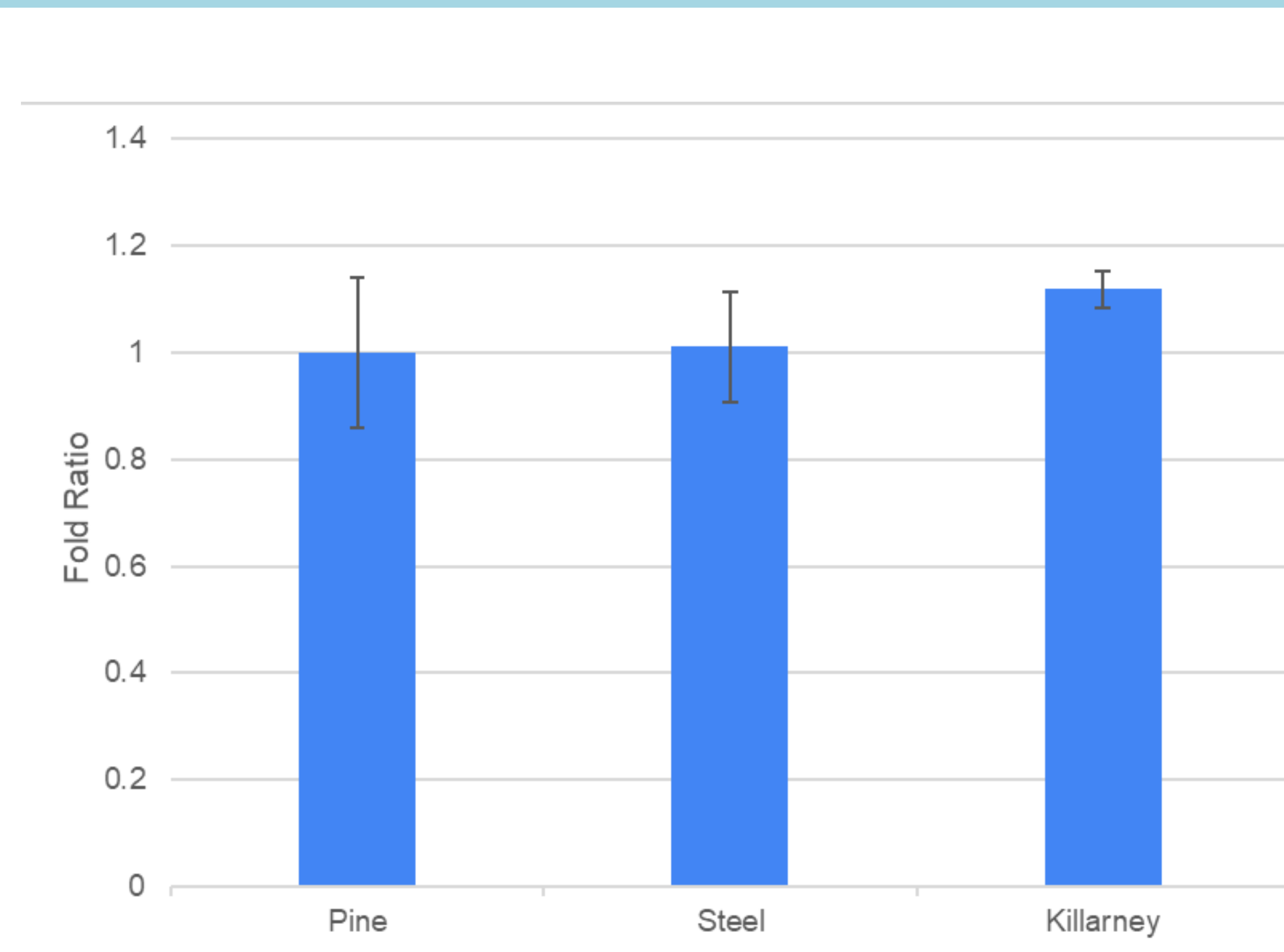


Figure 3: Fold Ratio for gene expression of MT gene in Yellow Perch from Pine Lake, Steel Lake, and Lake Killarney. Lake Killarney had a fold ratio > 1.0 showing upregulation of the MT gene in the liver of the fish from this lake.

Results

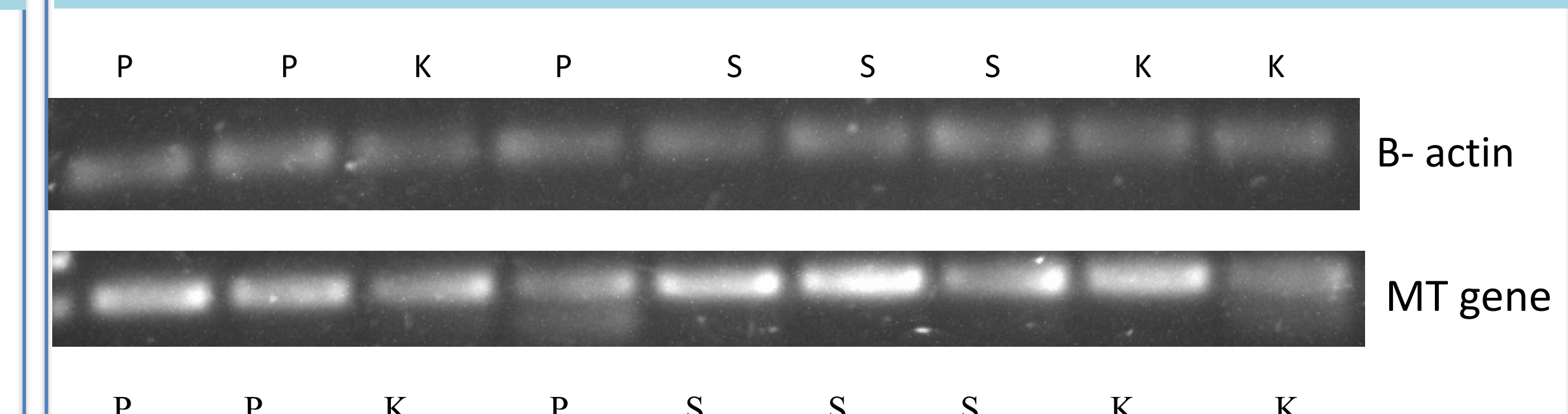


Figure 1: Bands from PCR product after gel electrophoresis. Pine lake (P), Steel lake (S) and Lake Killarney (K).

Discussion

Conclusions:

- Significance of MT gene expression between each lake with a significance threshold of $p = 0.05$.
- Results from the ANOVA produced a p -value of 0.68.
- *P. flavescens* may have adapted to presence of arsenic.

Future studies:

- Demersal fish
- Snails
- Non-resident fish

Methods & Materials

- Steel Lake (moderate), Lake Killarney (high), and Pine Lake (reference).
- *P. flavescens* (yellow Perch) were collected by Dr. Gardell & colleagues collaborating with WDFW from June- August 2021; Tissues were preserved in RNAlater.
- RNA extracted from liver tissue.
- MT and B-actin genes were amplified using endpoint PCR.
- Gel electrophoresis & densitometry for semiquantitative analysis & ANOVA to compare MT gene expression.

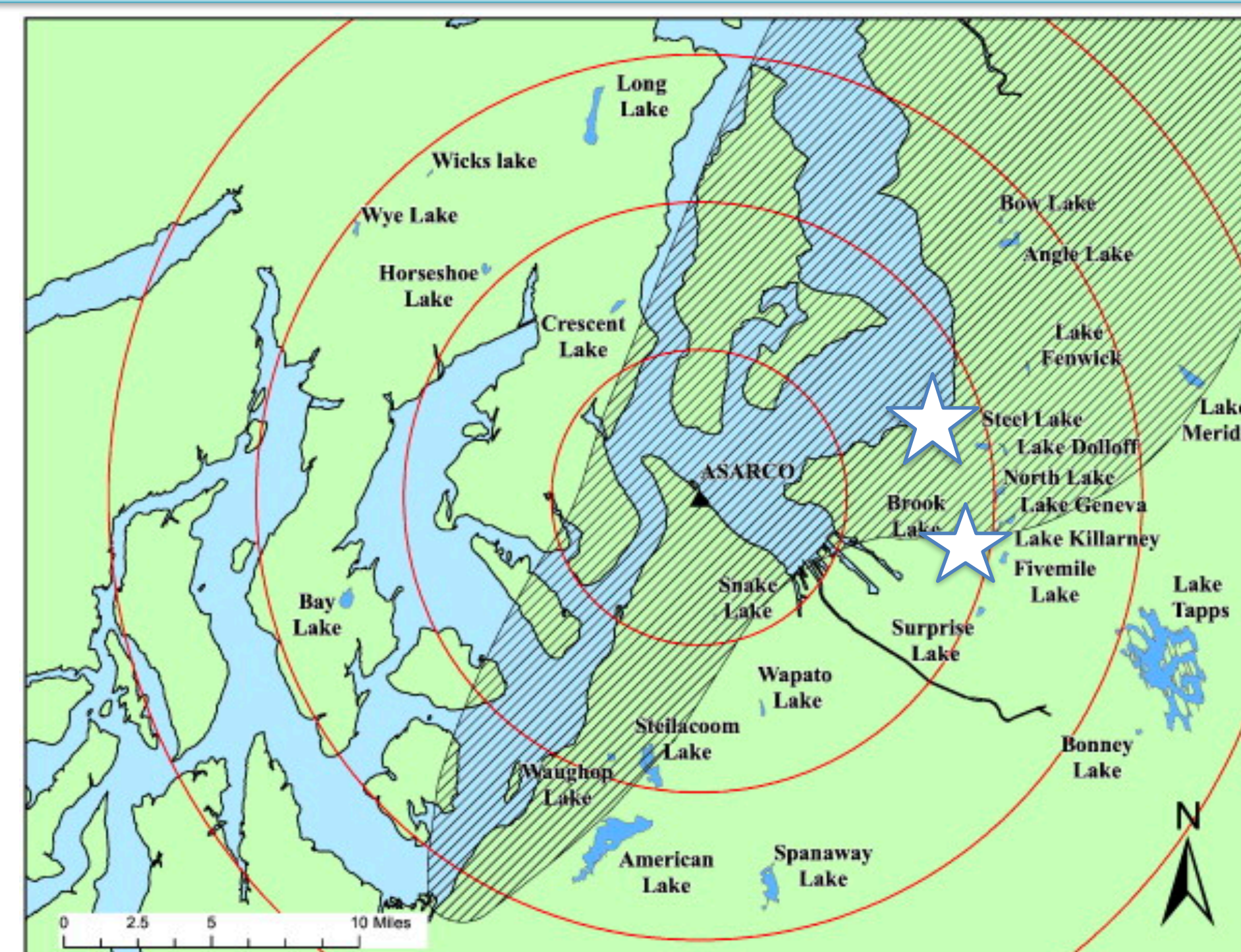


Figure 1: ASARCO smelter plume zone. Stars represent sample locations within the 20 mile plume. Map from Gawel et al, 2014.

Acknowledgments

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Works Cited

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