# Leviathan Mine Superfund Site

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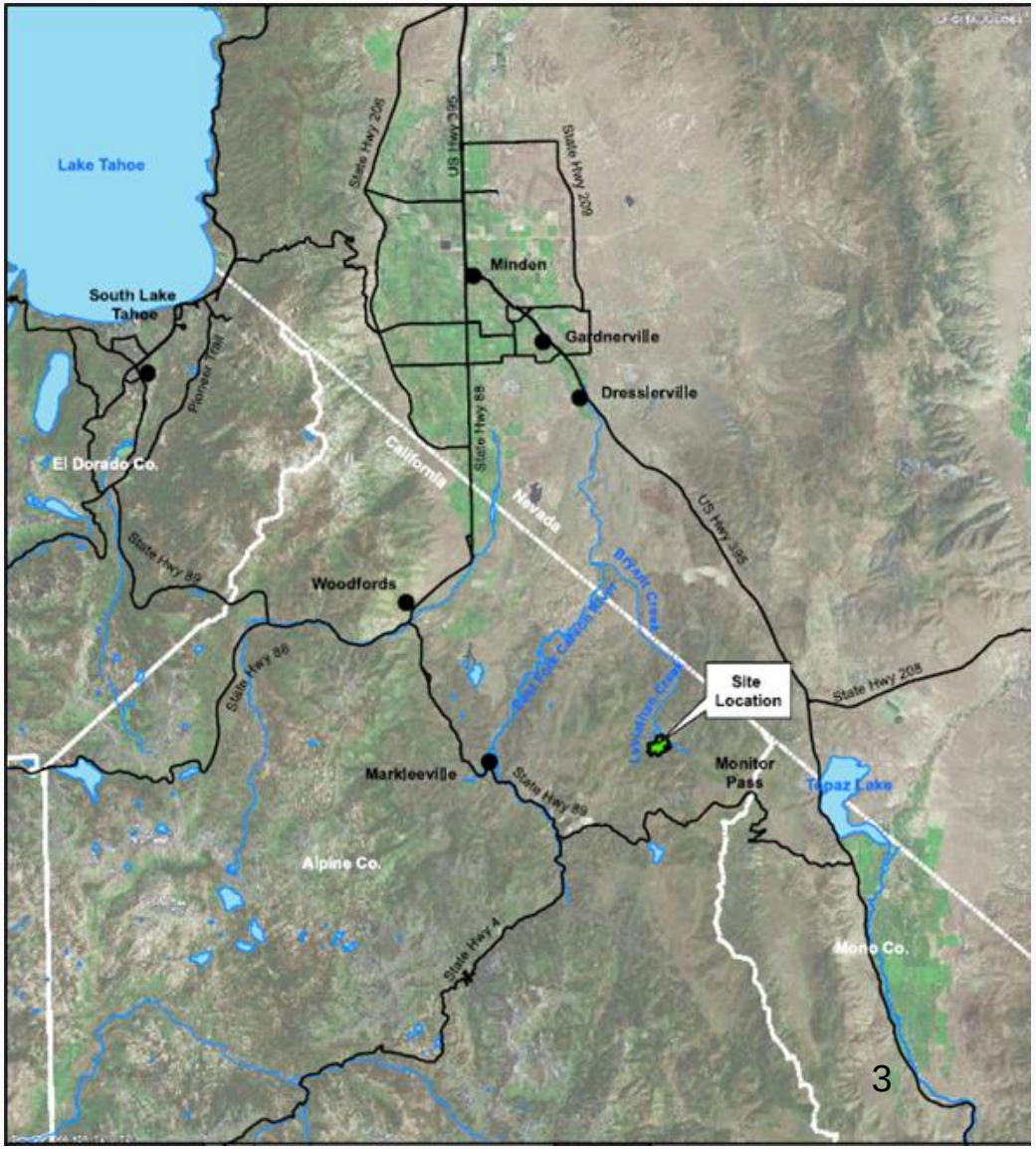
# Presentation Topics

- Introduction & Background
- Ongoing Early Response Actions
- Biomonitoring & Water Quality
- Superfund Process
- What's in progress & where are we going?
- Questions

## Leviathan Mine Site

- Mining on and off from 1860s – 1960s
- 7000 ft elevation
- ~200+ acres
- ~20+ miles southeast of Lake Tahoe

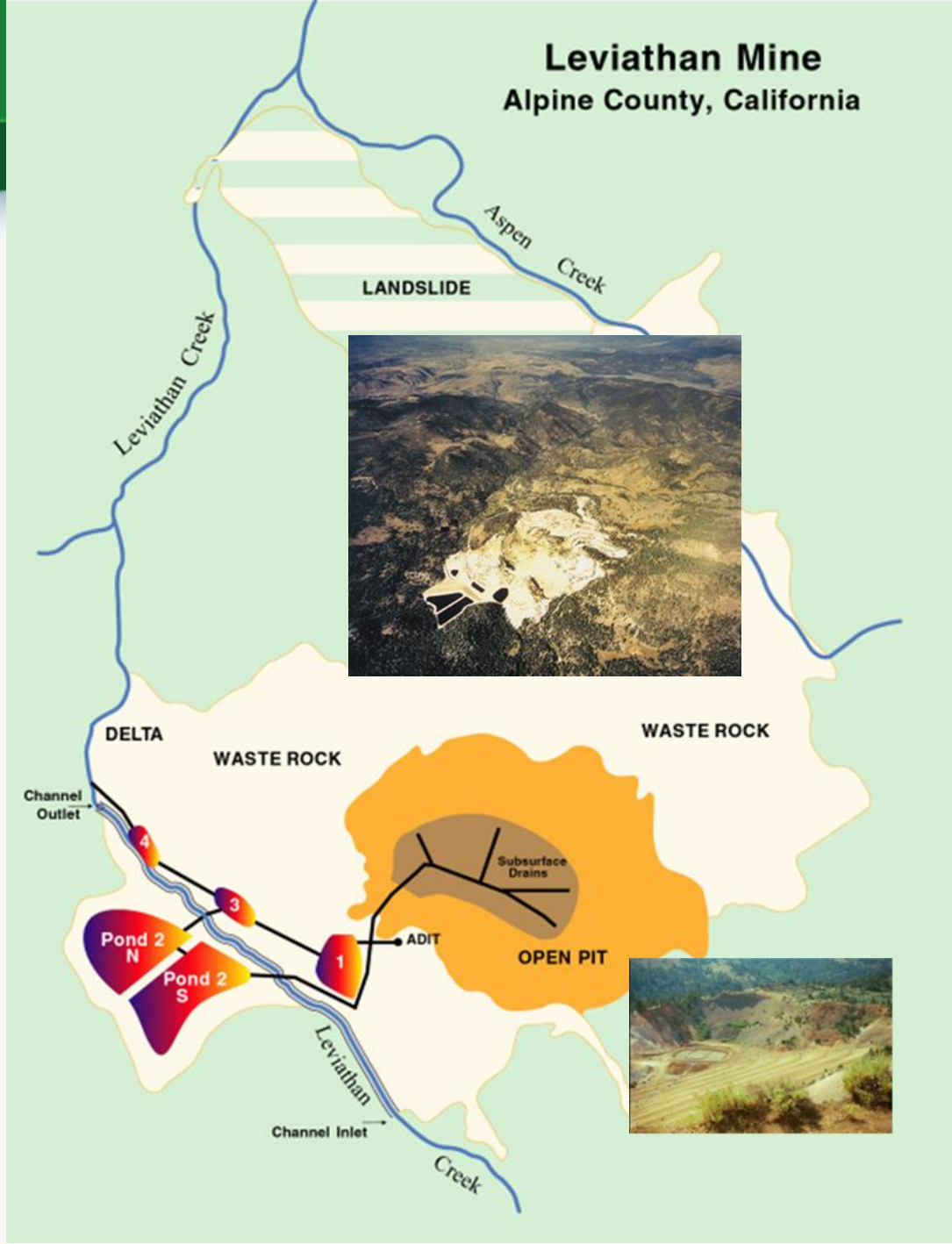


# Past & Present

# Acid Drainage Sources

- Adit
- Pit Underdrain
- Channel Underdrain
- Delta Seep
- Aspen Seep

# Early Response Actions

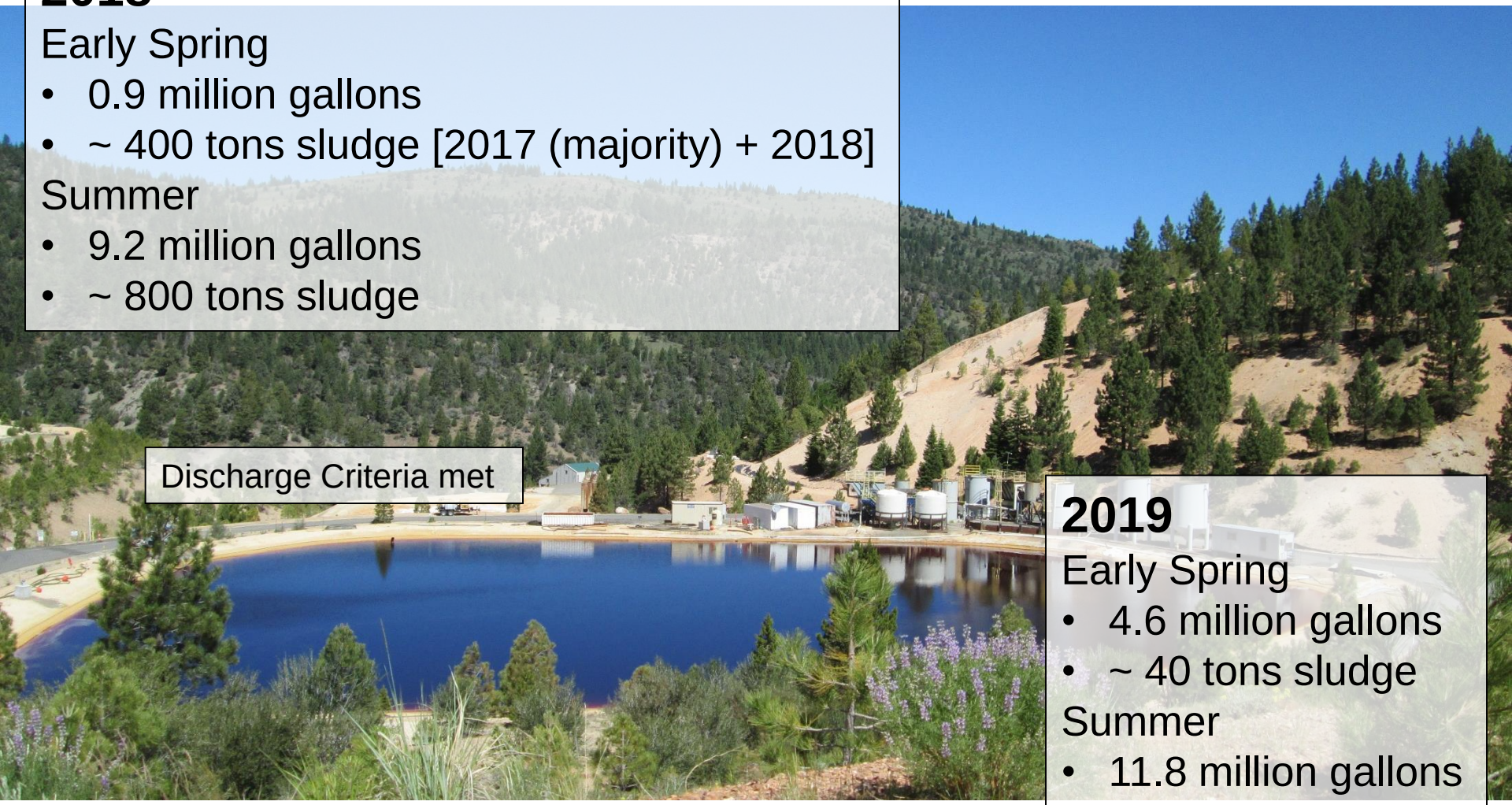


# Early Response Actions

| 1985 | 1996 - present | 1999 - present | 2001 - 2009 | 2009- present |
|---|---|---|---|---|
| Pollution Abatement Project | Aspen Seep Bioreactor | Pond water (lime) treatment system | Lime treatment system | High-density sludge (lime) treatment system |
| ***Conducted / Operated by*** | | | | |
| *Lahontan Regional Water Quality Control Board* | *Atlantic Richfield Company* | *Lahontan Regional Water Quality Control Board* | *Atlantic Richfield Company* | *Atlantic Richfield Company* |




# Lahontan Water Board Treatment 2018 – 2019



**2018**

Early Spring

- 0.9 million gallons
- ~ 400 tons sludge [2017 (majority) + 2018]

Summer

- 9.2 million gallons
- ~ 800 tons sludge

Discharge Criteria met

**2019**

Early Spring

- 4.6 million gallons
- ~ 40 tons sludge

Summer

- 11.8 million gallons
- ~ 1000 tons sludge

# Atlantic Richfield Treatment

## Aspen Seep Bioreactor

NaOH addition - neutralize pH

Sulfate Reducing Bacteria – Precipitates Metal Sulfides

## High Density Sludge

Lime – Flocculant – Recycled Solids

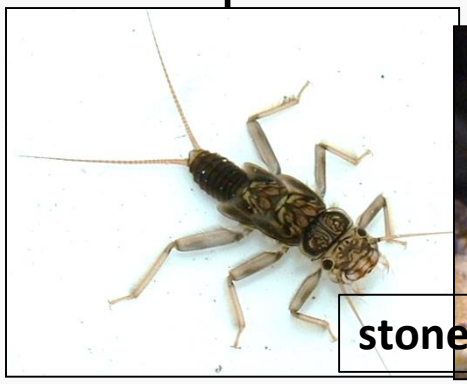
Precipitates Metal Hydroxides

| ASB Treatment Summary [5 Year Average] | | | | |
|---|---|---|---|---|
| Yearly Avg Treated (gal) | Percent Reduction | | pH | |
| | Iron (%) | Nickel (%) | Influent | Effluent |
| **4 million** | **99%** | **95%** | **2.85** | **7.39** |

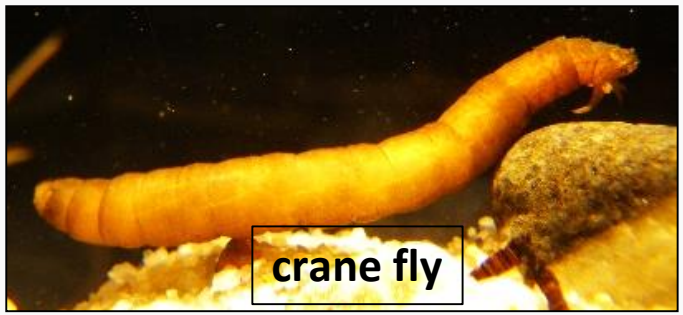
| HDS Treatment Summary [5 Year Average] | | | | |
|---|---|---|---|---|
| Yearly Avg Treated (gal) | Percent Reduction | | pH | |
| | Iron (%) | Nickel (%) | Influent | Effluent |
| **10 million** | **99.9%** | **98%** | **2.98** | **8.36** |

# Biomonitoring & water quality indicators

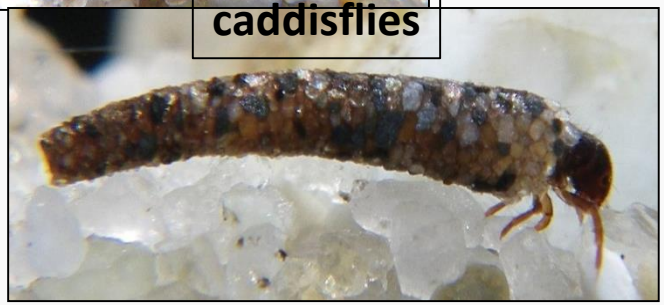
- Diversity of organisms, esp. of sensitive insects =EPT
- Tolerance to water quality impacts
- Density of organisms
- Changes (e.g. season, year, management & hydrology)
- Comparisons of impacted sites to references/controls







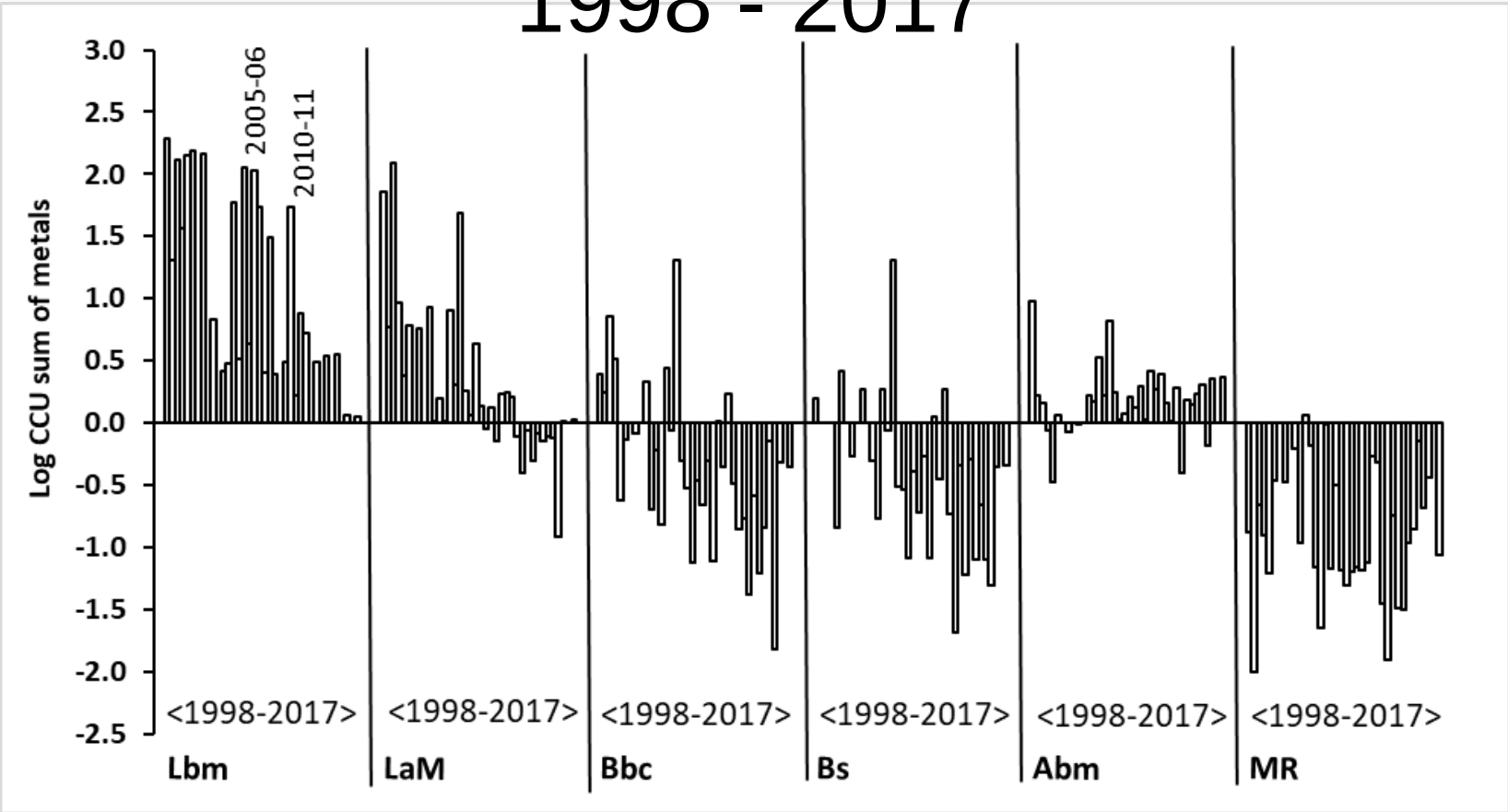


Collecting stream insects near confluence of Leviathan and Mountaineer Creeks

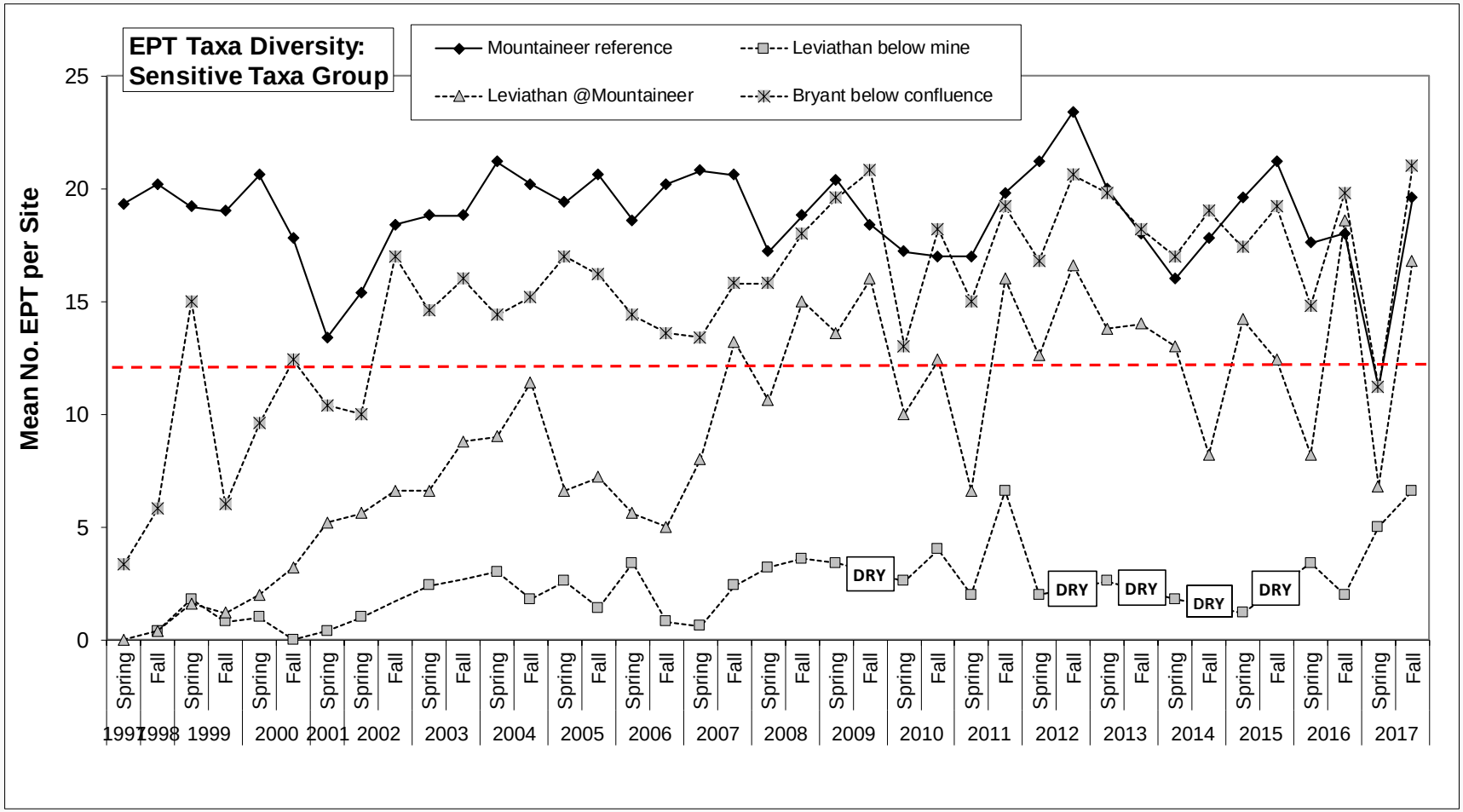
# How do insects respond to stream chemistry changes?

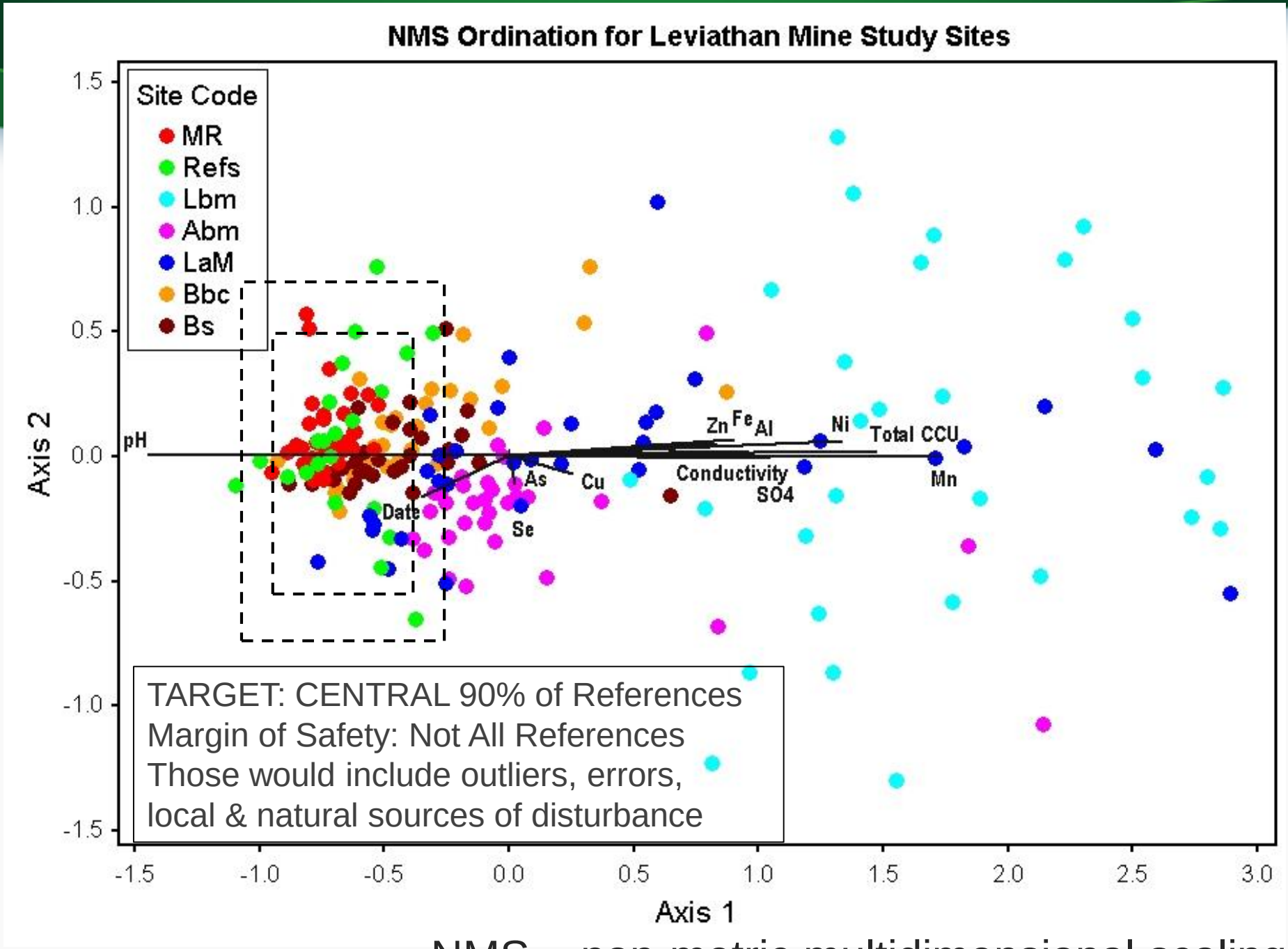
| Population Metric | Definition | Response to acids and metals |
|---|---|---|
| **Number of species** | How diverse is the insect community | **Decrease** |
| **EPT** | Number of Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies) | **Decrease** |
| **Number of intolerant insects** | Count organisms sensitive to pollution | **Decrease** |
| **% Tolerant insects** | Percent of insect community tolerant of pollution | **Increase** |

# Dissolved metals in Surface Water – 1998 - 2017



# Insect populations – 1998 - 2017






NMS = non-metric multidimensional scaling

# The Superfund Process

| Site Discovery | NPL Ranking/ Listing | Remedial Investi-gation (RI) | Feasibility Study (FS) | Public Comment Period | Record of Decision (ROD) | Remedial Design (RD) | Remedial Action (RA) | 5-Year Review | NPL De-listing |
|---|---|---|---|---|---|---|---|---|---|
| Substantial evidence of potential contamination is established | Site placed on EPA's National Priorities List (NPL), making it eligible for cleanup action under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 – "Superfund" | EPA Investigates the nature and extent of contamination | EPA identifies and analyzes alternatives for addressing site contamination | The public comments on alternatives, including EPA's preferred alternative, during formal public comment period. EPA considers these comments & prepares a responsiveness summary. | EPA documents the selected remedy in the ROD | EPA oversees development of detailed designs for the selected remedy | EPA oversees construction and operation of the remedy until cleanup goals are achieved | EPA reviews the effectiveness of the remedy every five-years after the completion of construction of the remedial system | EPA removes the site from the NPL when the cleanup goals are achieved |

# What’s in progress?

# What else are we doing?

# Remedial Investigation and Feasibility Study (RI/FS)

| Remedial Investigation (RI) | Feasibility Study (FS) |
| --- | --- |
| ○ Collect & evaluate data (historical and recent)<br>○ Determine nature and extent of contamination<br>○ Develop ecological and human health risk assessments | ○ Identify potential clean-up technologies<br>○ Evaluate clean-up options to reduce risks<br>○ Present recommendations for public comment |

# Where are we going?

- Treatability testing
- Focused Feasibility Study (FFS)
- Proposed Plan
- Early Final Remedial Action ROD

- Draft RI
- Draft FS
- Final RI/FS

# Thank you

# Questions?