# Animal Data Summary – Tailings Data

Technical Meeting

February 2-4, 2005

# **Animal Data**

- Animal data include:
  - Small Mammals
    - Population Data
    - Tissue Data
  - Earthworm Bioassay
    - Bioassay Results
    - Tissue Data
  - Invertebrate Community Structure

# 2002 Animal Sampling

| Location | Mammals | Earthworms | Soil Fauna |
|---|---|---|---|
| Tailings Riparian Ref – Lower Cab Ck | 3/5 | 5/5 | 5/5 |
| Tailings Riparian – Soil Area 16 | 10/10 | 10/10 | 10/10 |

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# 2003 Animal Sampling

| Location | Mammals | Waterfowl | Earthworms | Soil Fauna |
|---|---|---|---|---|
| Tailings Ponds (Soil Area 14)[1] | NA | 0/5 | NA | NA |
| Tailings Facility (Soil Area 14) | 10/10 (+3 PG) | NA | 10/10 | 10/10 |
| Tailings Reference (Cater Ranch) | 10/10 (+3 PG) | 0/5[2] | 10/10 | 10/10 |

*1 – Amphibians and ducklings collected as available (None)*

*2 – Or other reference locations, as necessary*

# Animal Data Quality Objectives

- Small mammals a risk to predators that ingest them (whole body tissue concentrations; animals for bioaccumulation test)?

- Waterfowl a risk to predators that ingest them? (no ducklings found)

- Soil invertebrates a risk to predators that ingest them (whole body tissue concentrations from earthworm bioassay)?

- Soil invertebrate community at risk (earthworm bioassay and native soil fauna data)?

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# Small Mammals

Populations

Tissue Analysis

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# Data Collection

- Small mammals were collected in Fall 2002 and Spring 2003
- Snap trap and live trap
- 10 randomly located sampling locations within each exposure area
  - 10 tailings riparian, 10 tailings
  - 5 tailings riparian ref, 10 tailings ref
- Co-located with bioassay, vegetation, and soil samples

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# **Small Mammal Populations**

- Population data are semi-quantitative
- Objective - obtain sufficient mass for tissue analysis
  - Achieved
  - Exception Lower Cab. Ck, Tailings Riparian Reference Area (3/5 successfully collected)
- Different level of trapping effort applied at different locations
- Provides:
  - general overview of species
  - suggests level of diversity and density

# 2002 Small Mammals - Results



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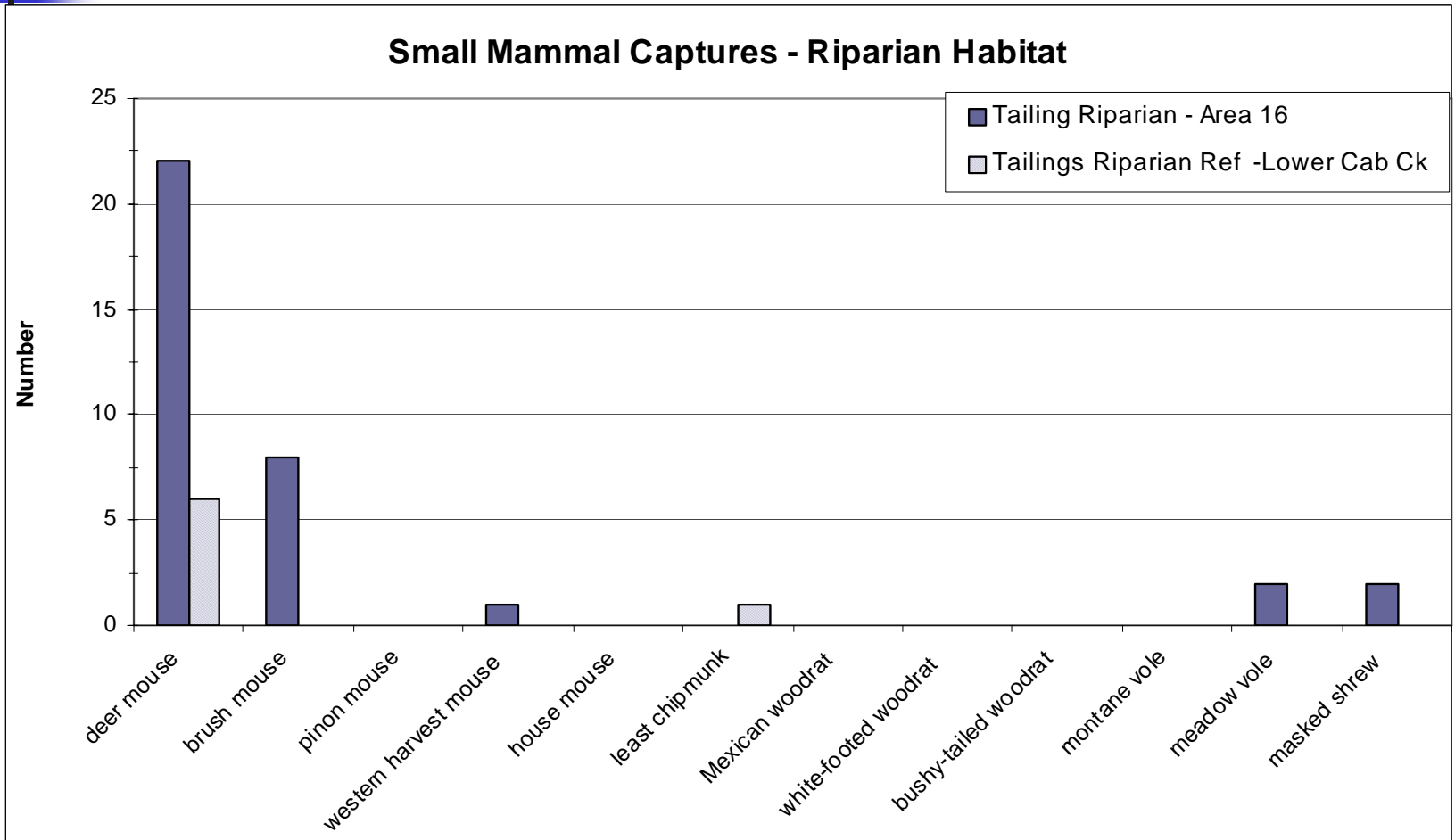
# 2003 Small Mammals - Results

**Small Mammal Capture Comparisons
from the Tailings and Reference Area**
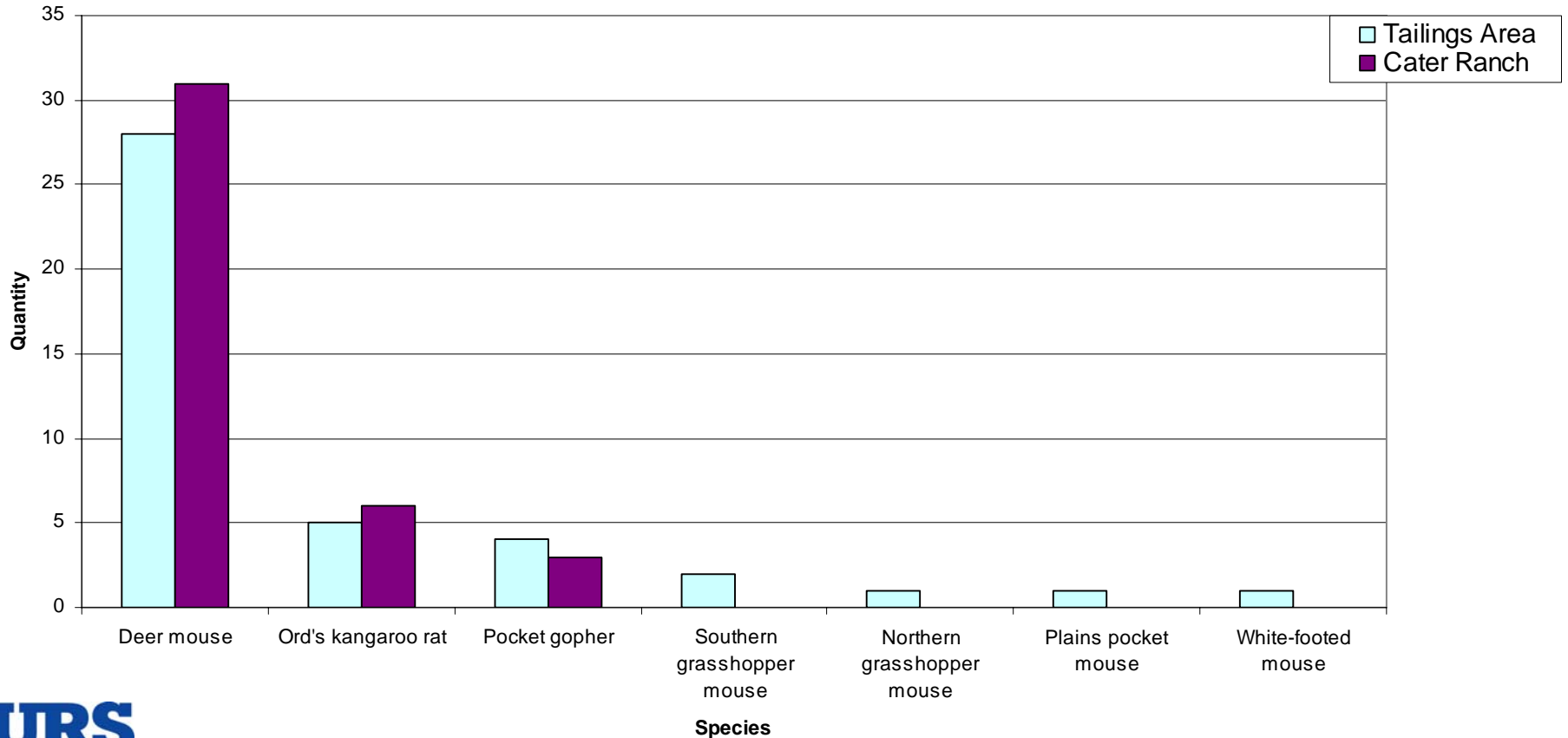
# Small Mammal Population Summary

- Semi-quantitative data
- If site-related effects, expect to see a difference between reference and onsite exposure areas
  - Mostly deer mice collected
  - About the same number of deer mice collected onsite and reference
- Study did pick up effects
  - Tailings had more diversity than Cater Ranch
- DQOs were met
  - Exception - Tailings Riparian Reference
  - Most samples successfully collected
  - Enough samples for statistical analysis

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# Small Mammal Tissue Concentrations

- Small mammals were collected, processed, shipped

- Whole body metals analysis

- Collected in 2002 and 2003

- Only 3 metals significantly elevated out of 25 total analyzed

  - Tailings-Cater Ranch

  - Pb, Mn, Mo

- All BAFs <1

# Small Mammal Tissue Summary

- 25 metals analyzed in tissue
- Three metals significantly higher in tailings animals vs. reference
  - lead
  - manganese
  - molybdenum
- All BAFs <1
- Met all DQOs

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# Earthworm Bioassay - Tailings

Bioassay Results

Tissue Metals

# Earthworm Bioassay - Tailings

- Bulk soils were collected
- 35 samples
  - 10 upland; 10 riparian
  - 10 upland reference; 5 riparian reference
- Laboratory control
- *Eisenia foetida* 28-d toxicity test
- Survival, growth, reproduction
- Surviving worms sent to lab for metals analysis

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# Earthworm Bioassay Summary

- Survival or growth did not differ significantly
- Some statistical effect on reproduction $(p<0.01)$
- Is effect biologically relevant?
- Soil fauna community structure shows no difference

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# Earthworm Tissue Metals

- Metals were measured in tissue and soil

- Data to be used in the BERA to quantify uptake in the dietary ingestion pathway

- Examine relationship between tissue and soil metals (i.e., bioaccumulation)

- 25 metals analyzed in earthworm tissue

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# Earthworm Tissue Metals Summary

- One (Mo) significantly higher at Tailings than Cater Ranch reference ($p < 0.01$)
- Four metals significantly higher in Tailings Riparian than Reference ($p < 0.01$)
- BAFs <1 for all metals except Cd
- Use measured data to predict contribution from dietary pathway for animals consuming invertebrates in ERA
  - No one best site-wide way to model metal uptake in invertebrates
  - Less uncertain than modeling from literature
- Met DQOs

# Invertebrate Community Structure
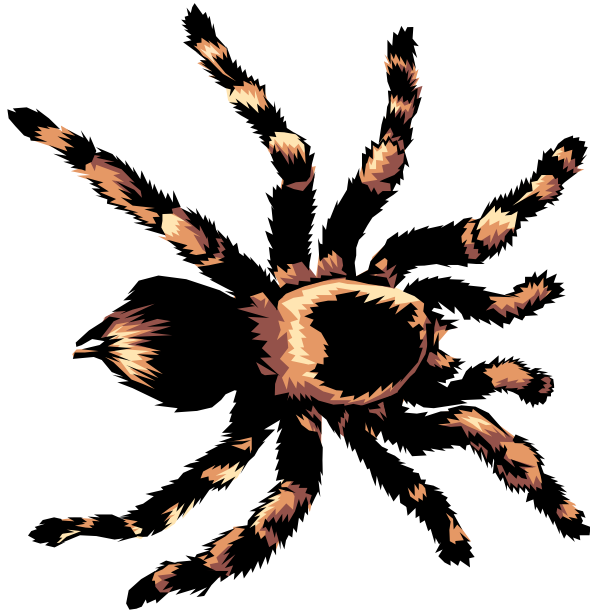
# Invertebrate Community Structure

- Soil samples collected in the field; brought to field lab

- Placed in Berlese funnel; applied light

- Bugs move downward away from light and dryness; fall into petri dish and drown

- Identified to lowest possible taxa and counted

- 2003 data soils were measured
  - Gives better snapshot in time of density and diversity

- Met all DQOs

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# **Tailings Facility Community Structure**



Terrestrial Invertebrates
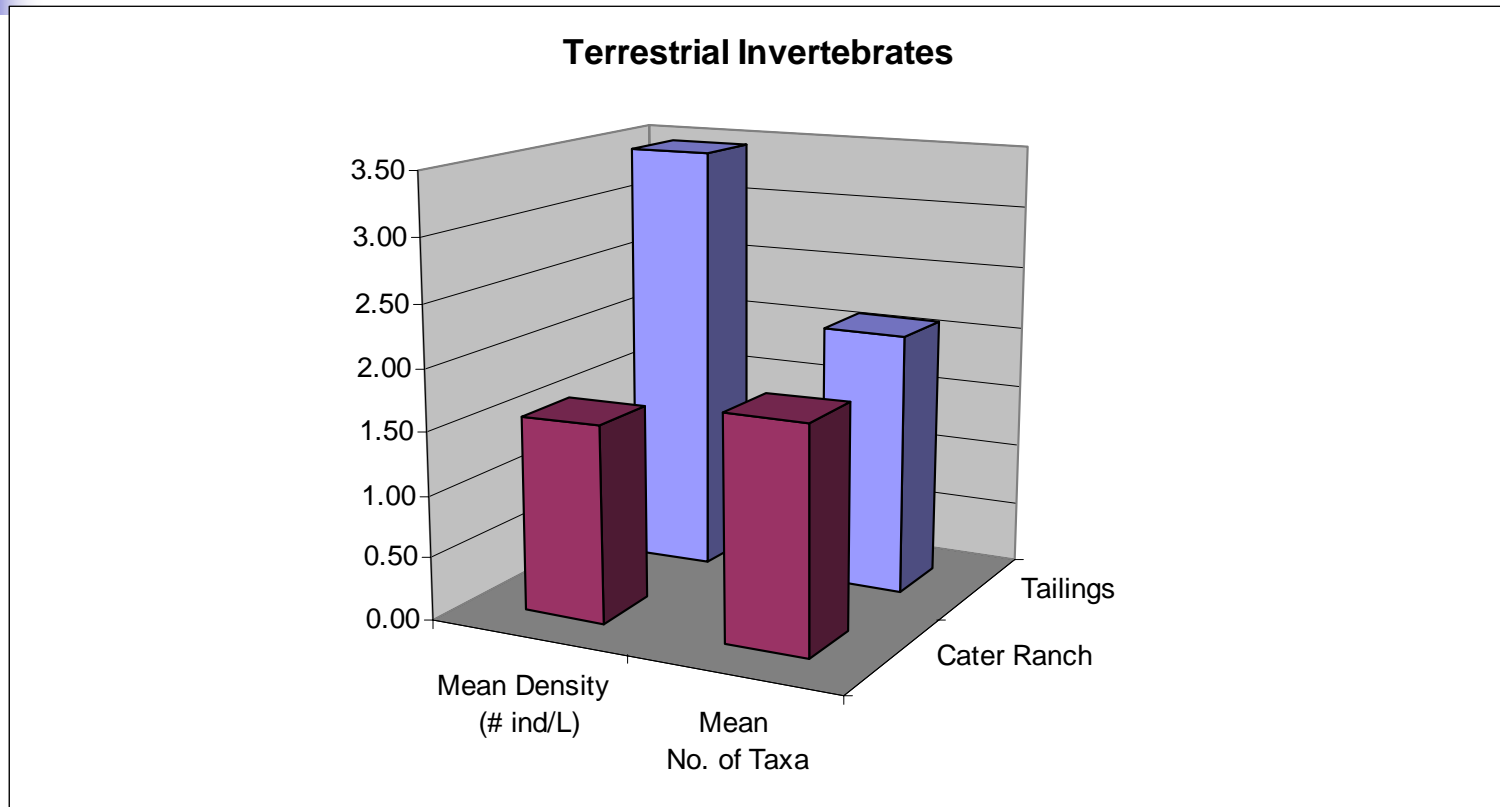
- No significant difference between site-related and reference samples at a p<0.01

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