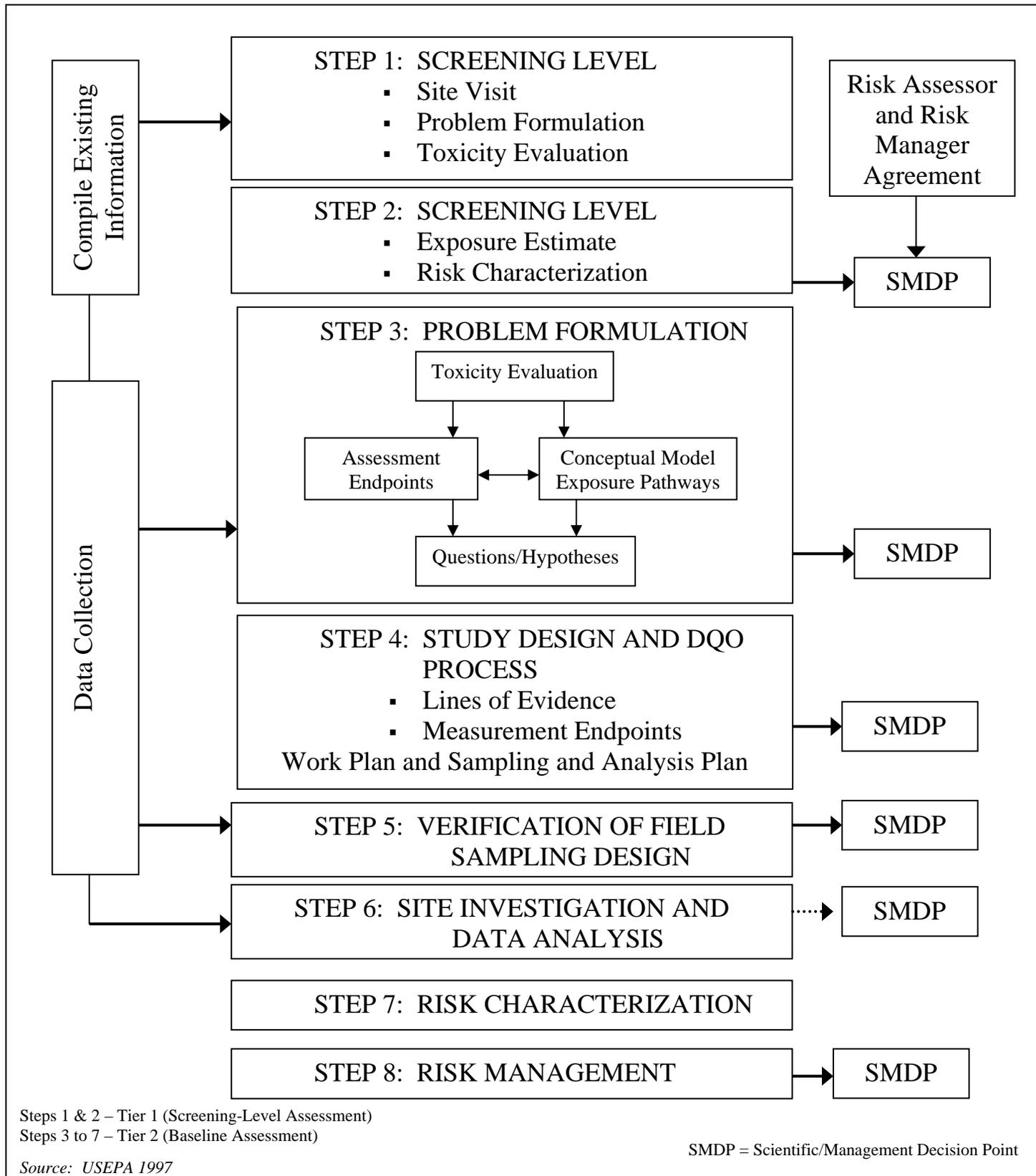
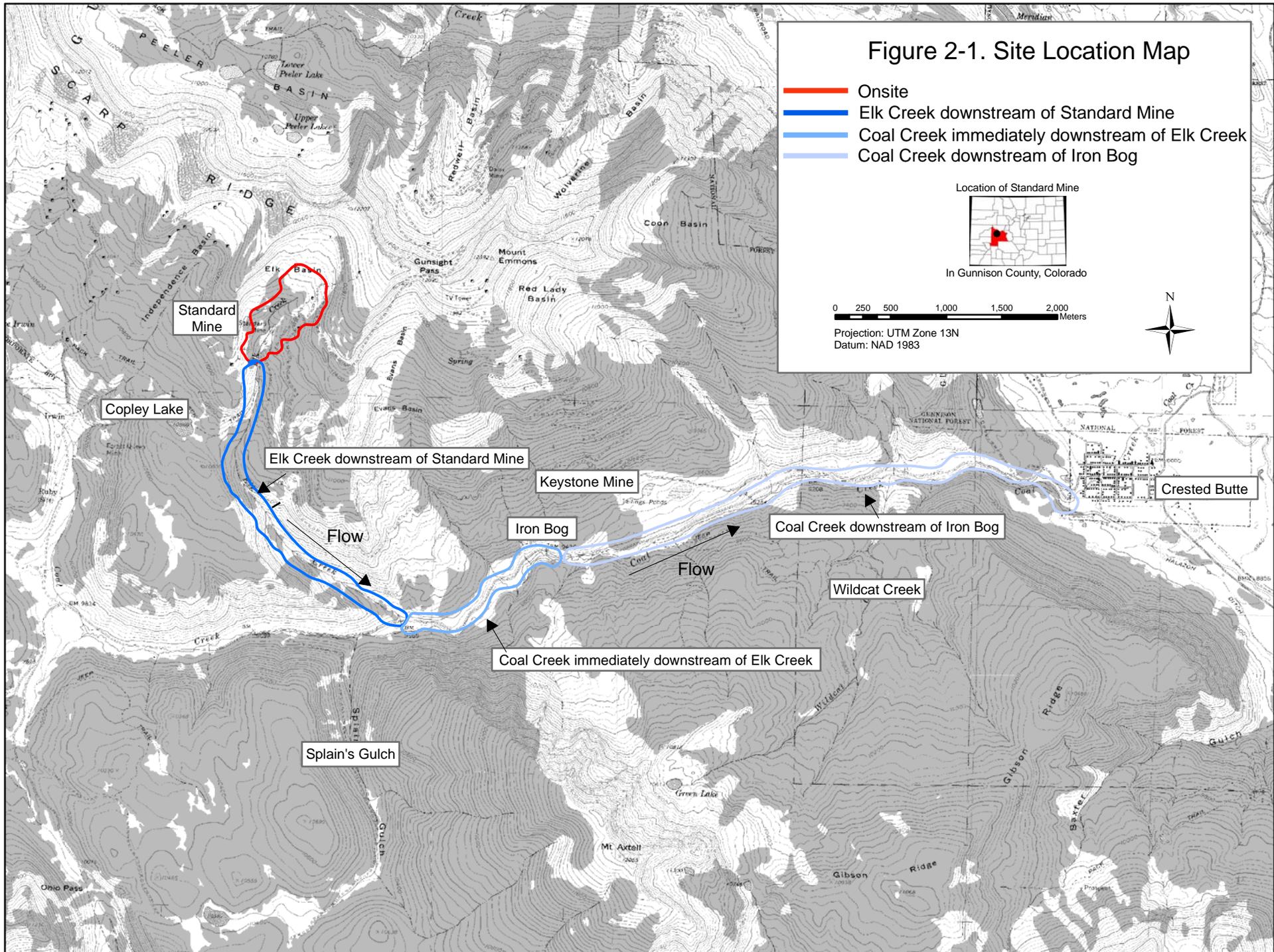


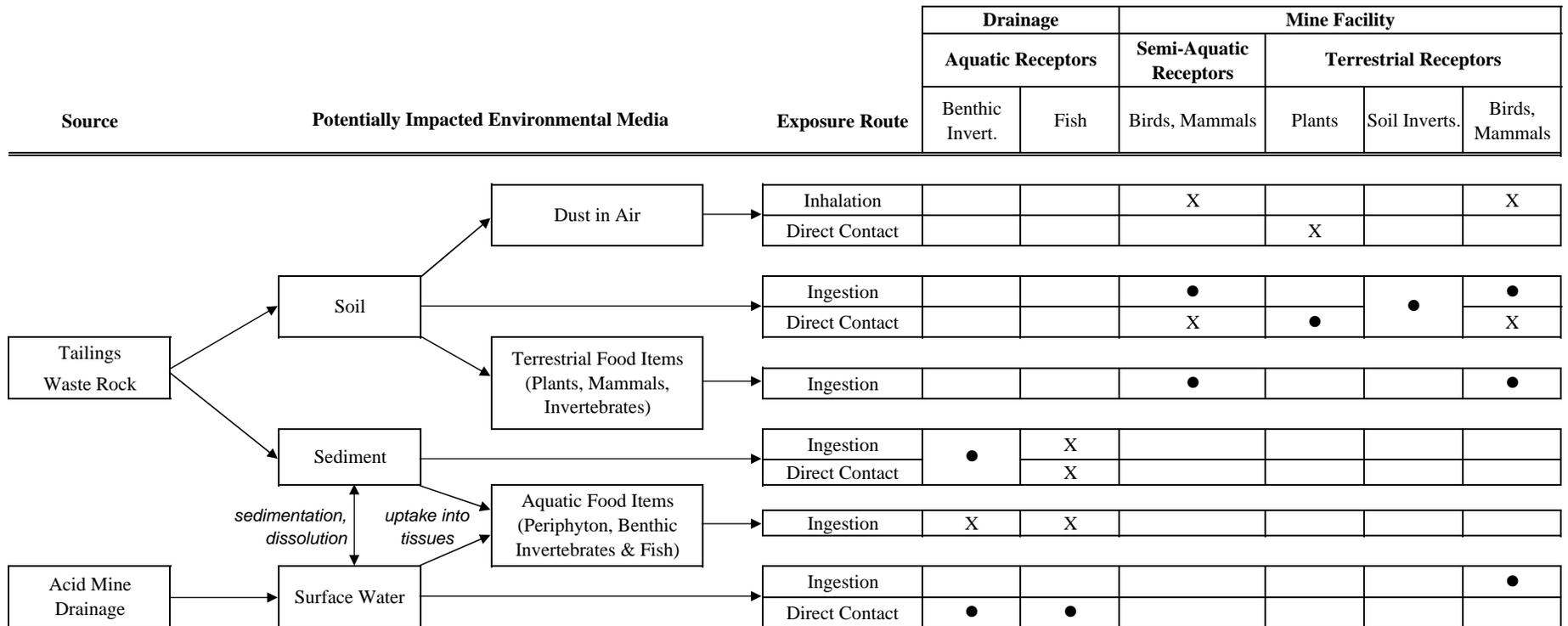
## Figure 1-1. Eight Step Process for Ecological Risk Assessment at Superfund Sites

*Baseline Ecological Risk Assessment for Standard Mine Site*





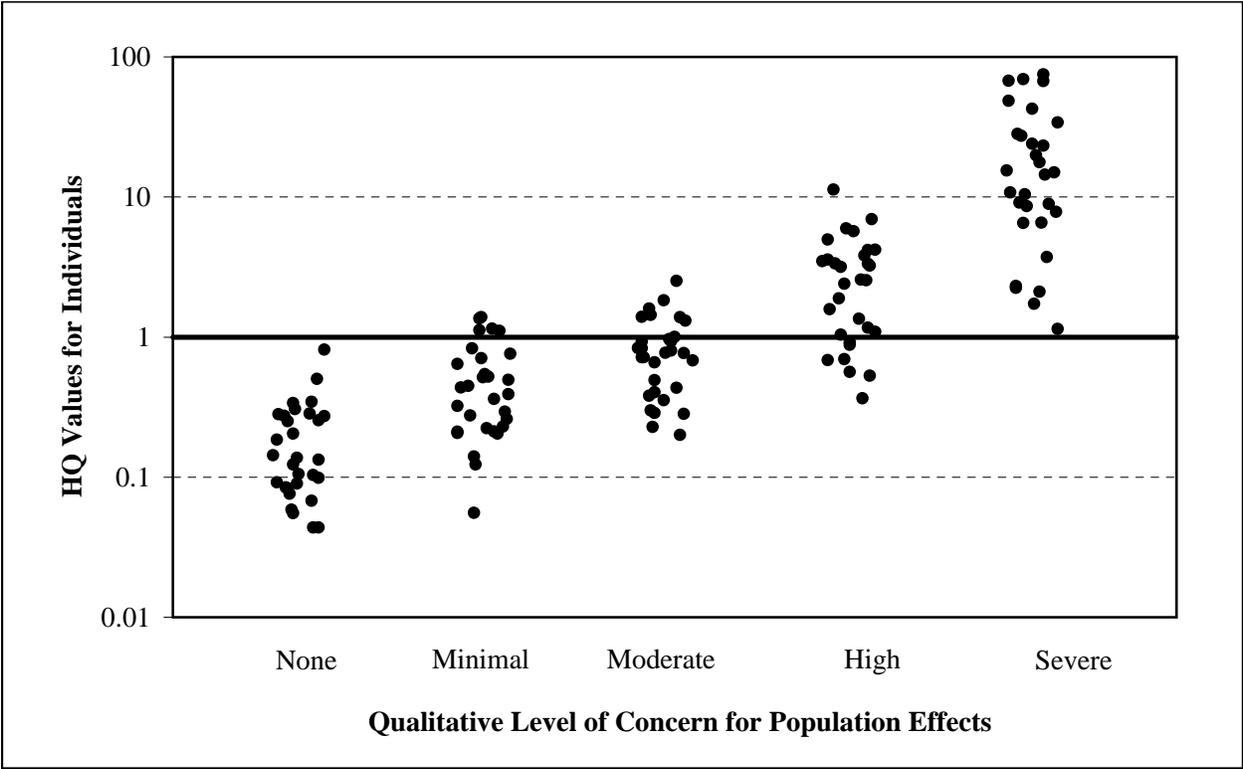
**Figure 3-1  
Initial Site Conceptual Model**

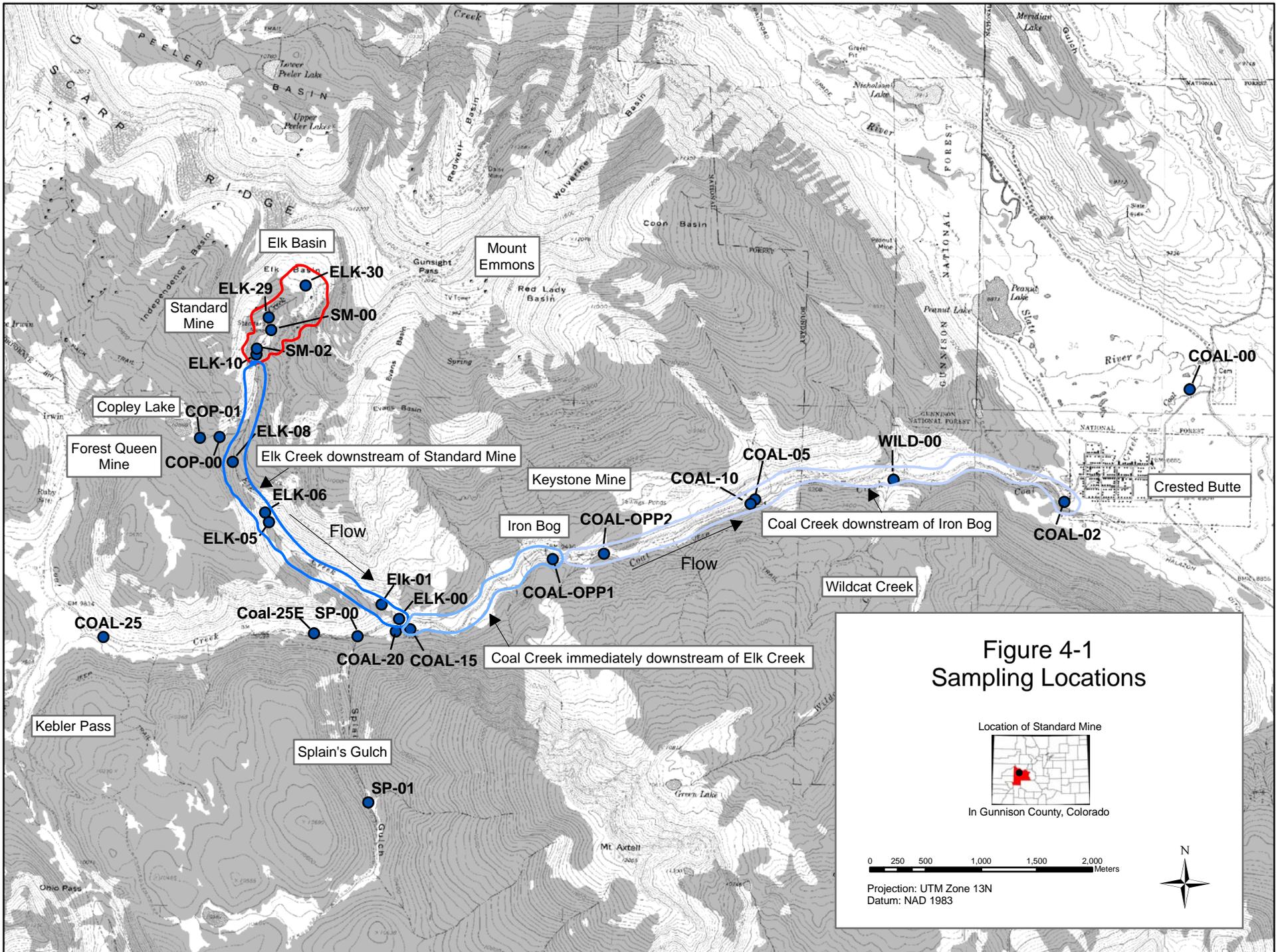


**Legend:**

●	Pathway complete and significant; quantitative evaluation
X	Pathway is complete, but is judged to be minor compared to other exposure pathways; qualitative evaluation
	Pathway not complete; no evaluation

**Figure 3-2**  
**Conceptual Approach for Characterizing Population-Level Risks**





Elk Basin

Mount Emmons

ELK-30

Standard Mine

SM-00

ELK-29

SM-02

ELK-10

Copley Lake

COP-01

ELK-08

Forest Queen Mine

COP-00

Elk Creek downstream of Standard Mine

Keystone Mine

COAL-10

WILD-00

ELK-06

Iron Bog

COAL-OPP2

COAL-05

Coal Creek downstream of Iron Bog

Crested Butte

COAL-02

ELK-05

ELK-01

COAL-OPP1

Wildcat Creek

COAL-25

Coal-25E

SP-00

ELK-00

COAL-20

COAL-15

Coal Creek immediately downstream of Elk Creek

Kebler Pass

Splain's Gulch

SP-01

Location of Standard Mine



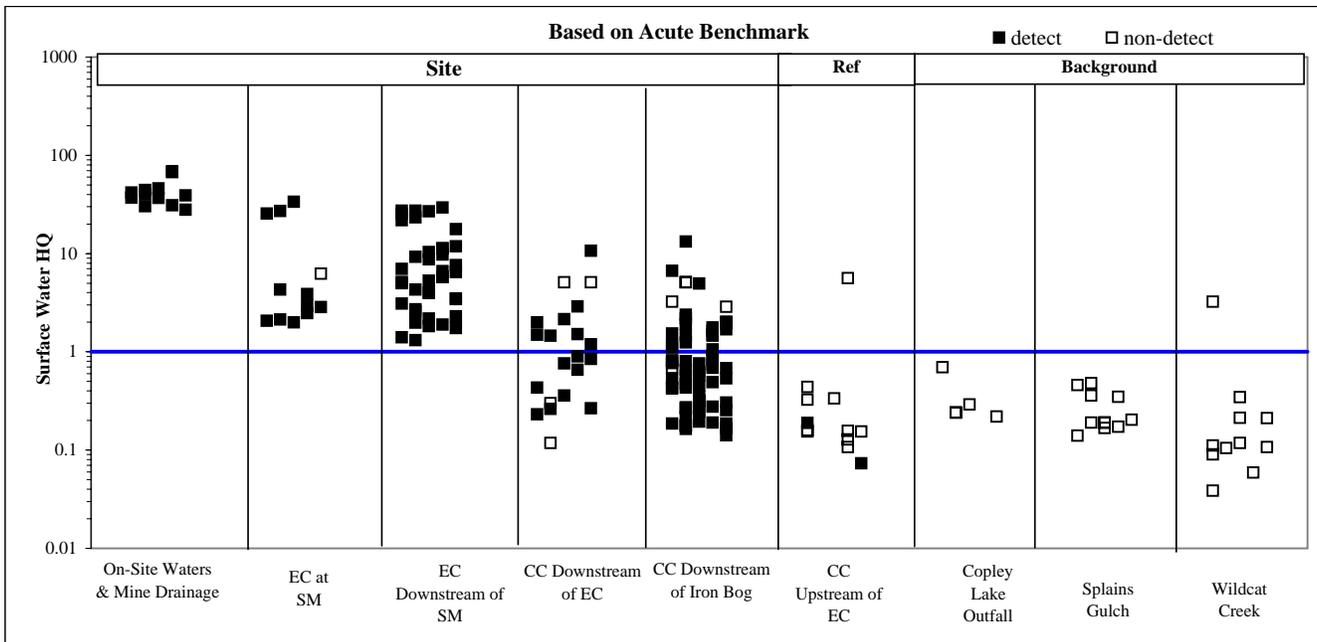
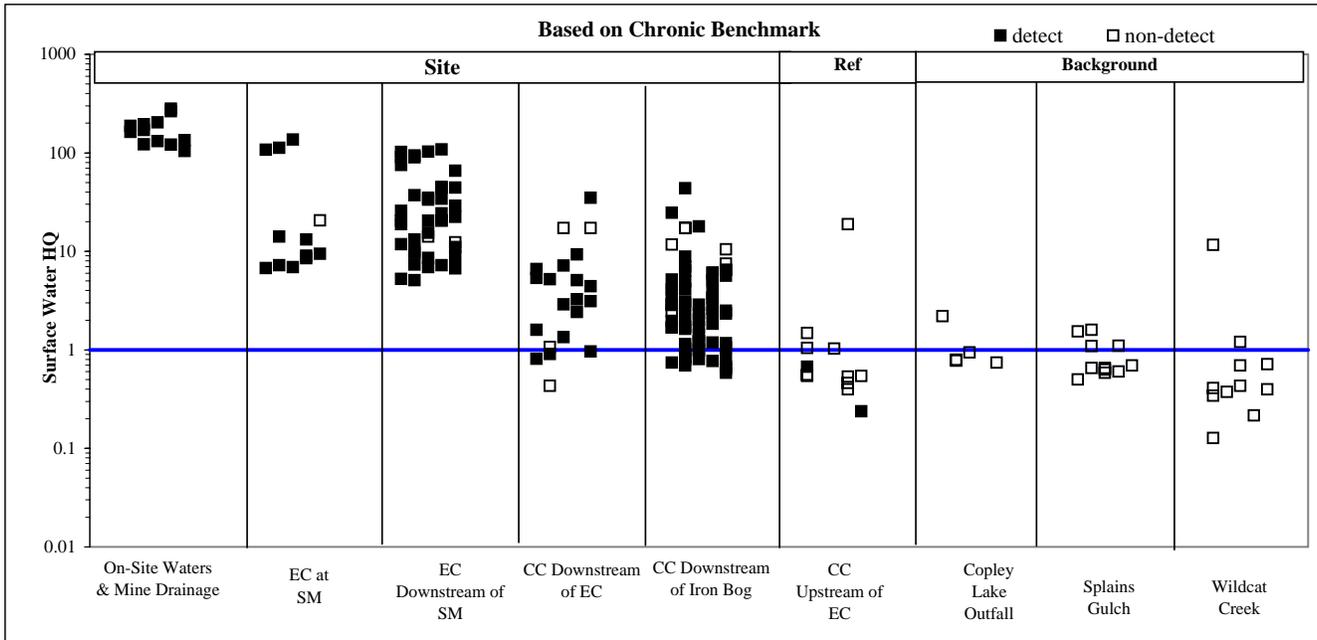
In Gunnison County, Colorado

0 250 500 1,000 1,500 2,000 Meters

Projection: UTM Zone 13N  
Datum: NAD 1983

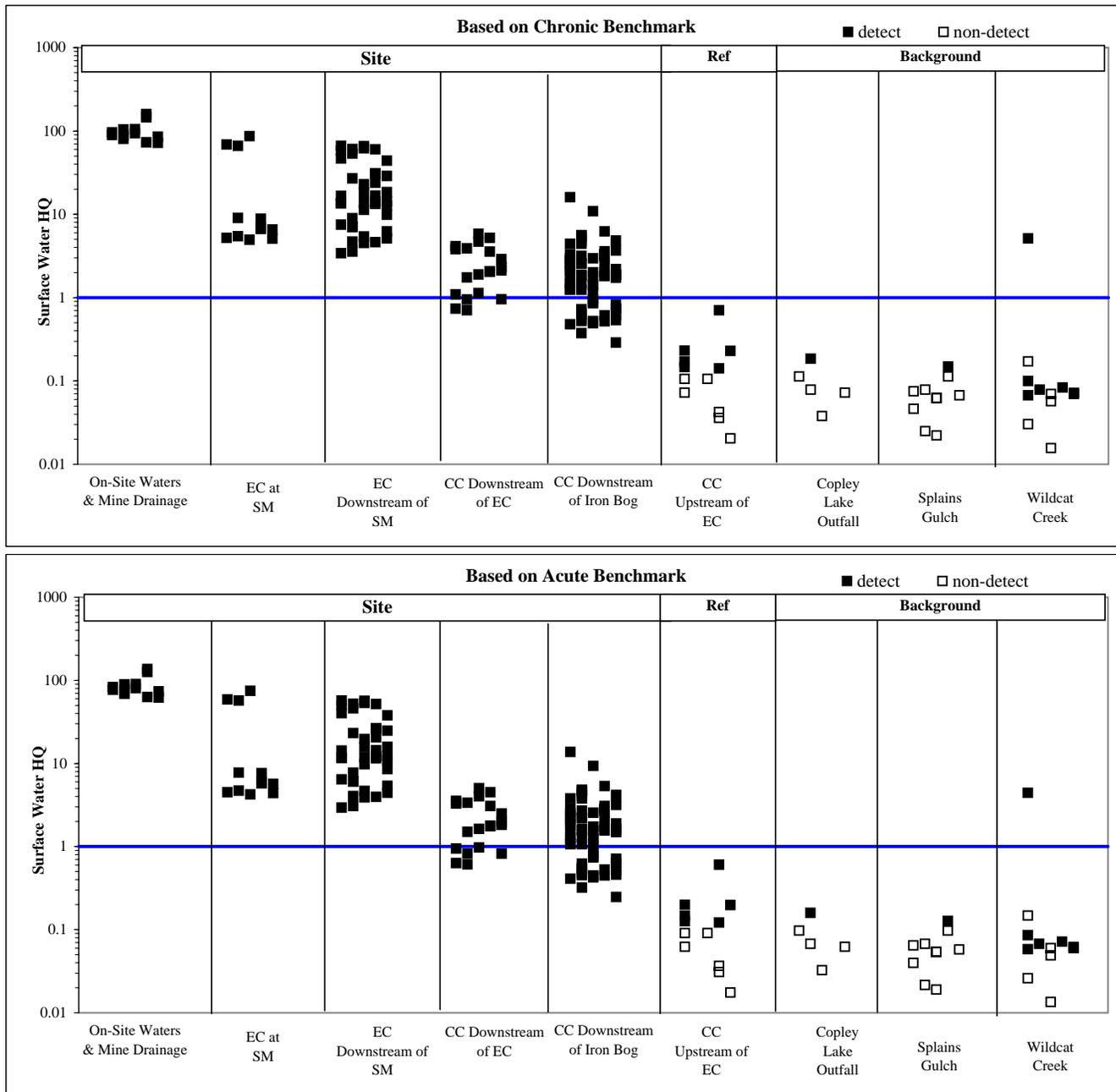


**Figure 4-2. HQ Values for Aquatic Receptors from Direct Contact with Cadmium in Surface Water**



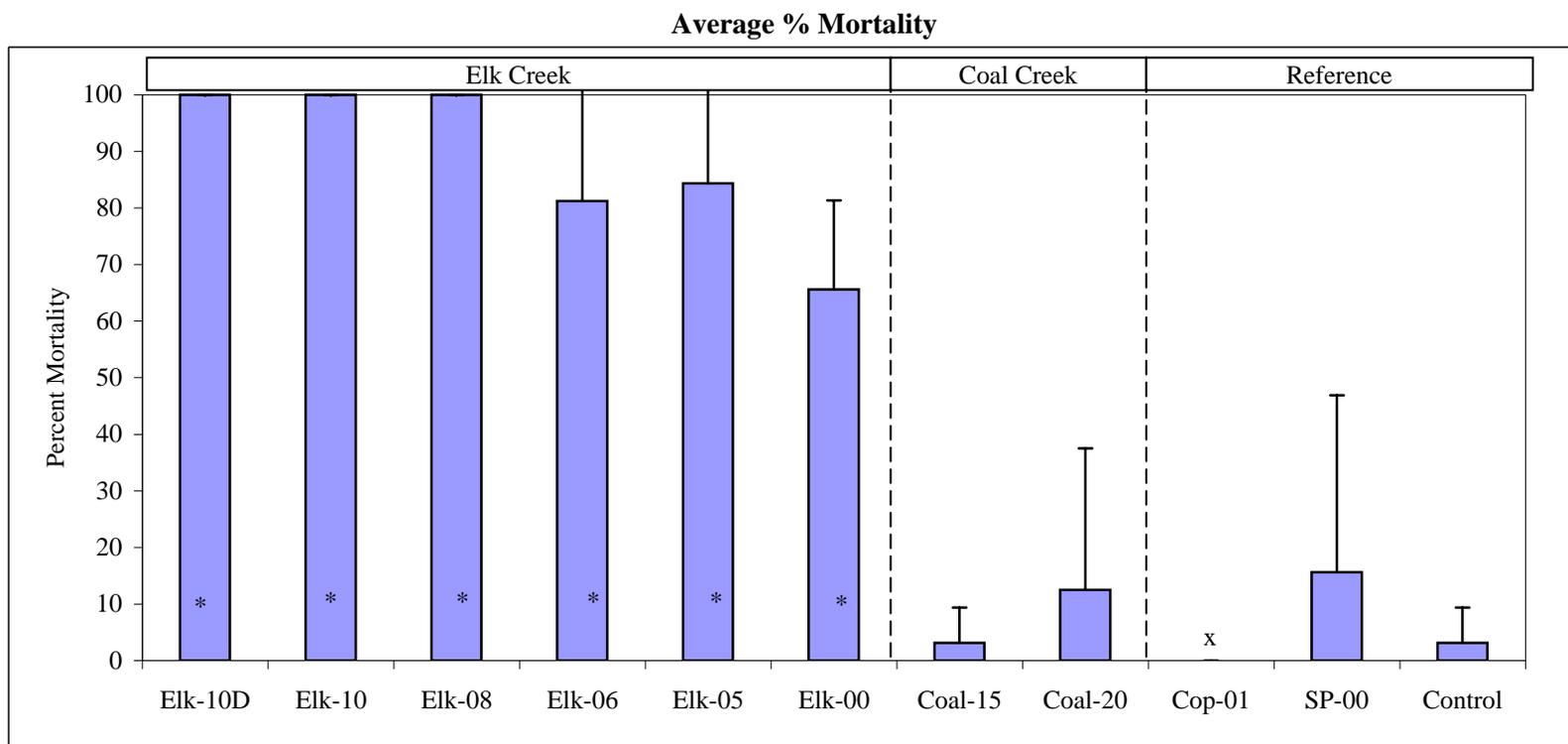
SM = Standard Mine    EC = Elk Creek  
 CC = Coal Creek      Ref = Reference

**Figure 4-3. HQ Values for Aquatic Receptors from Direct Contact with Zinc in Surface Water**



SM = Standard Mine    EC = Elk Creek  
 CC = Coal Creek      Ref = Reference

**Figure 4-4. Surface Water Toxicity Test Results**



**Station comparison for statistical significance**

Coal-15 (downstream) vs. Coal-20 (upstream)

All Elk Creek stations vs. Cop-01 and SP-00 combined (Cop-01 and SP-00 are not statistically significantly different)

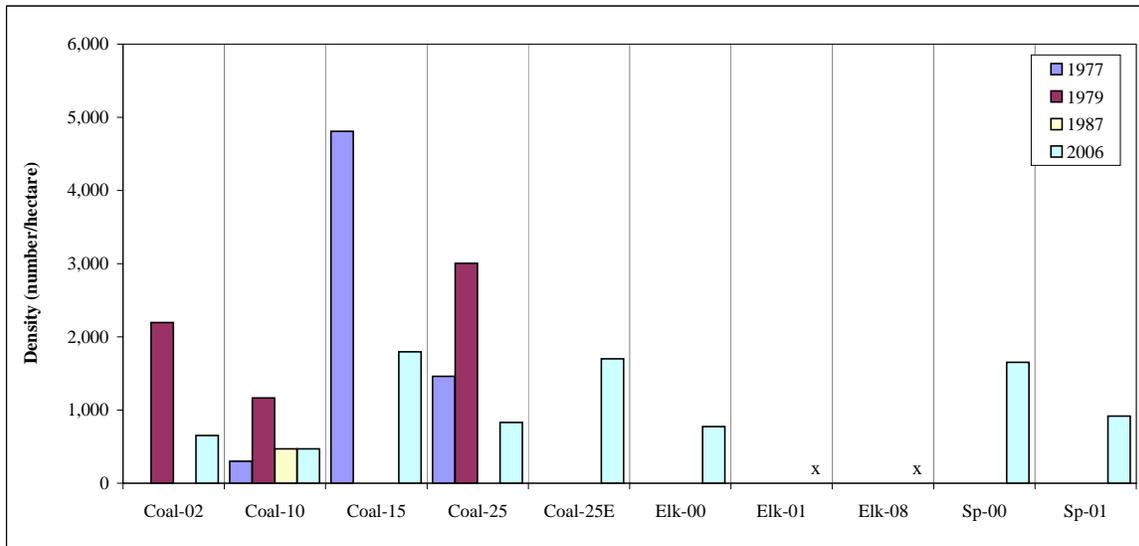
\* Statistically different from reference

x Data were collected, average % mortality is zero

Error bars are based on the standard deviation.

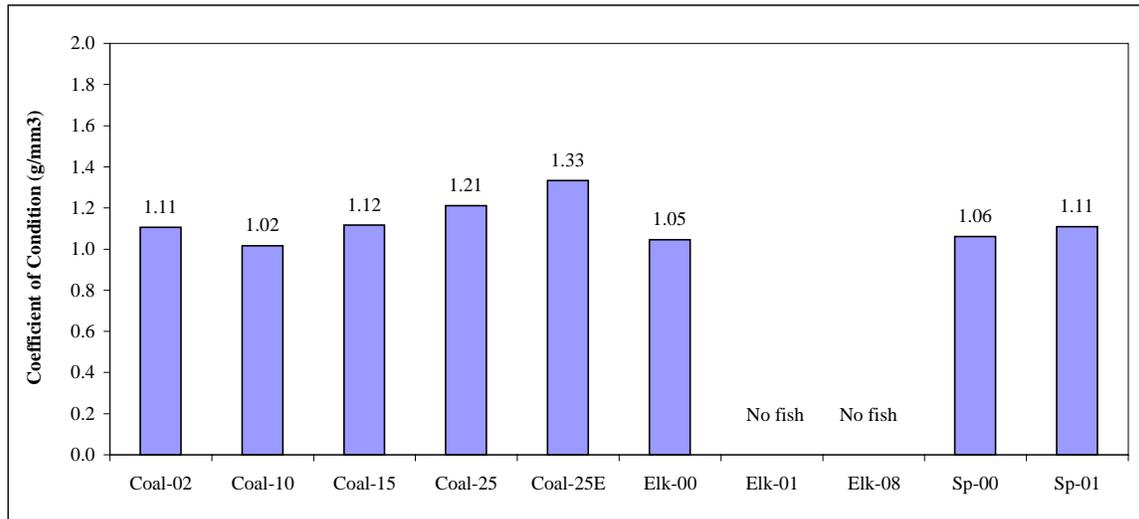
**Figure 4-5. Fish Population Survey Results**

**Panel A: Density (total number of fish / hectare)**



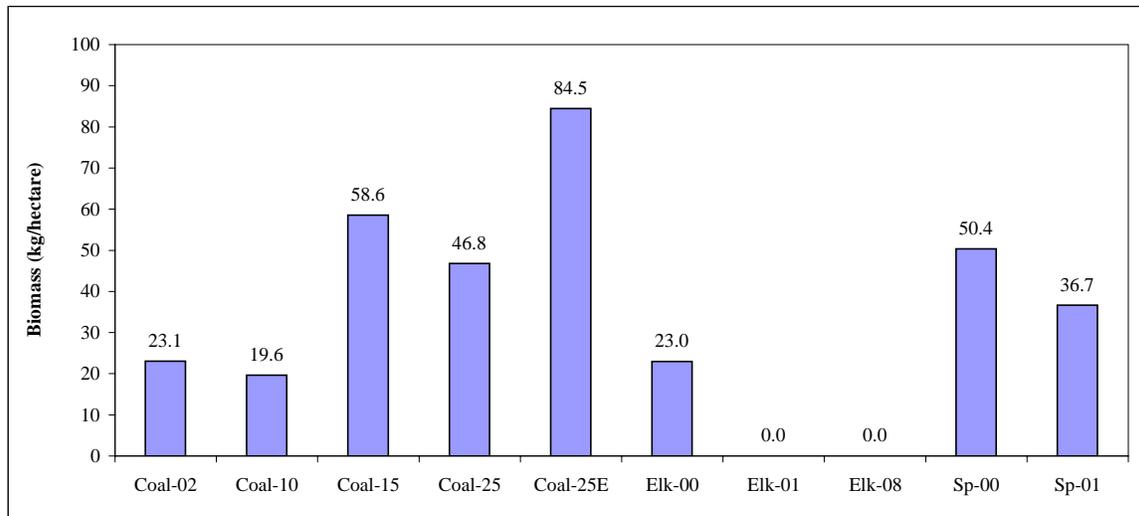
x = Sampling was performed but no fish were observed.

**Panel B: Coefficient of Condition for 2006 (g/mm<sup>3</sup>)**



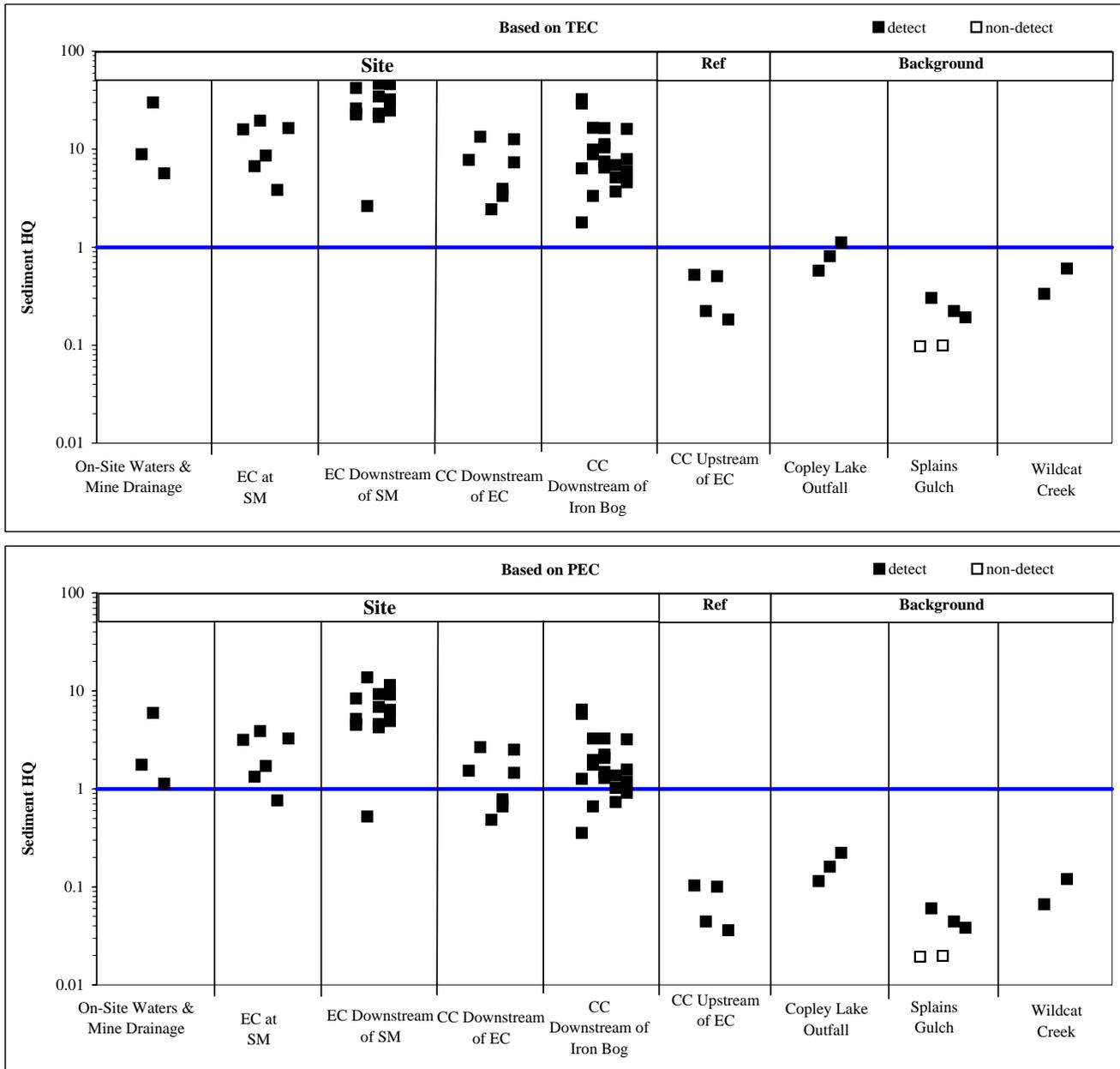
Coefficient of Condition (K, g/mm<sup>3</sup>) = 100,000 \* Weight in grams / Length<sup>3</sup> in millimeters

**Panel C: Biomass for 2006 (total weight, kg / hectare)**



Biomass (kg/hectare) = Total fish weight at station (in kg) / Station area (in hectares)

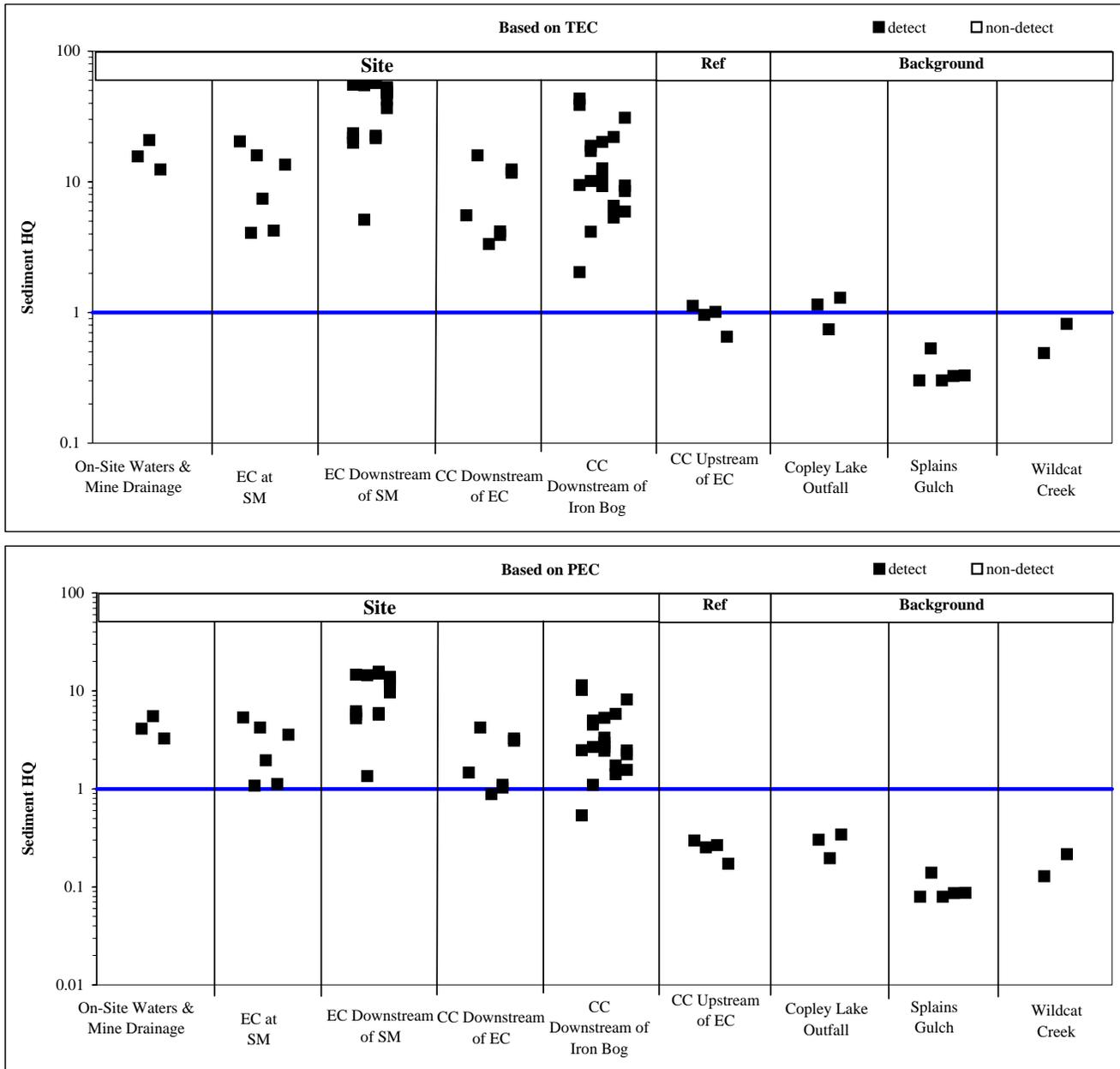
**Figure 4-6. HQ Values for Benthic Macroinvertebrates from Direct Contact with Cadmium in Bulk Sediment**



Abbreviations:

- SM = Standard Mine
- EC = Elk Creek
- CC = Coal Creek

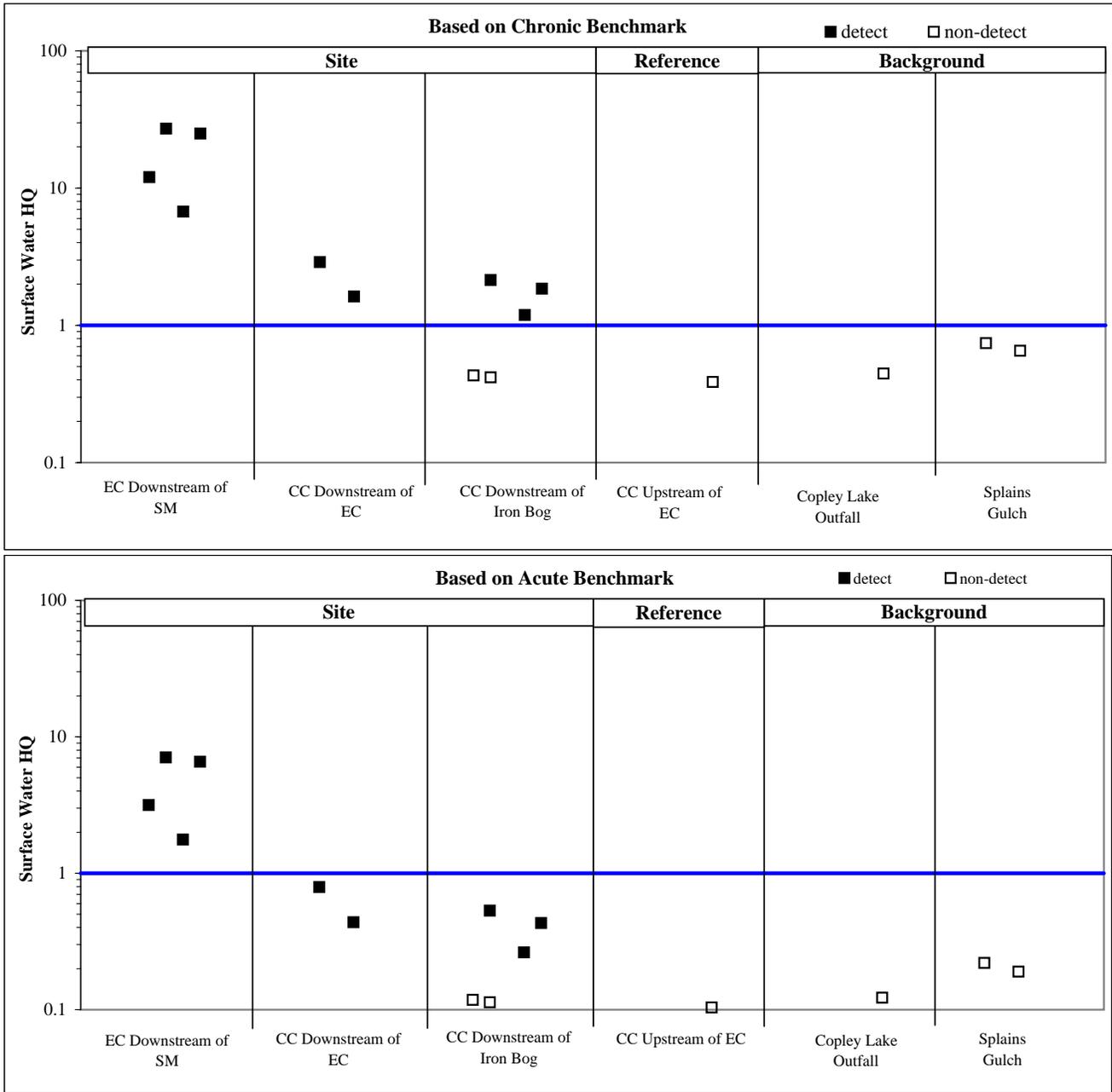
**Figure 4-7. HQ Values for Benthic Macroinvertebrates  
from Direct Contact with Zinc in Bulk Sediment**



Abbreviations:

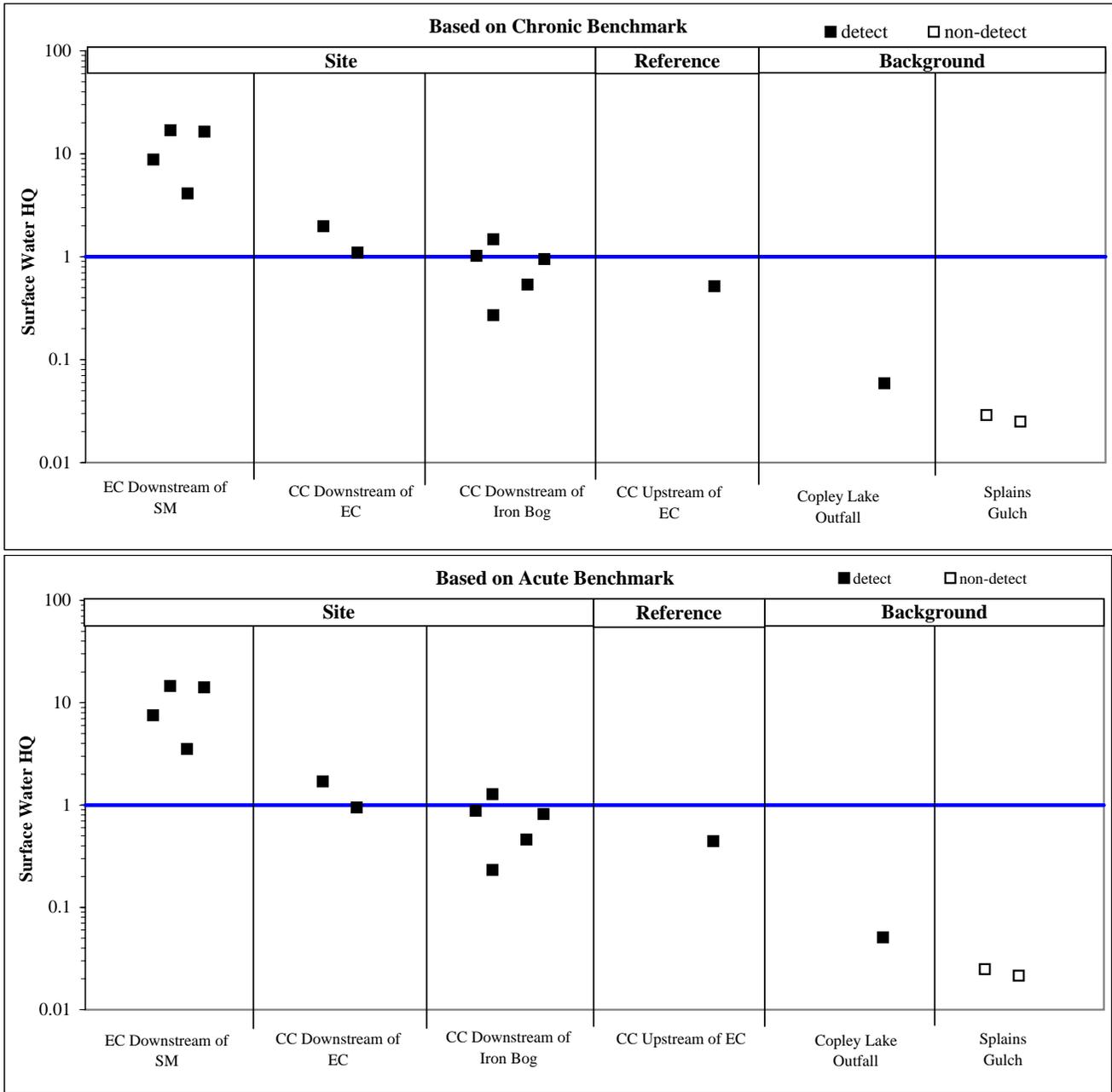
- SM = Standard Mine
- EC = Elk Creek
- CC = Coal Creek

**Figure 4-8. HQ Values for Benthic Invertebrates from Cadmium in Pore Water**



SM = Standard Mine  
 CC = Coal Creek  
 EC = Elk Creek

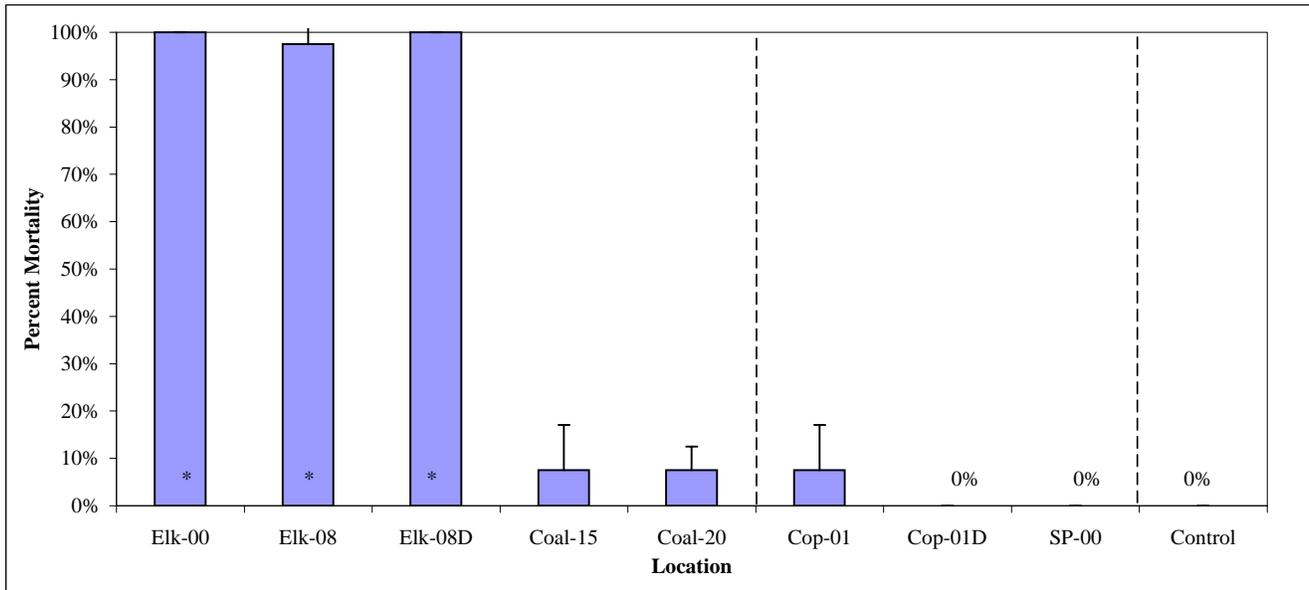
**Figure 4-9. HQ Values for Benthic Invertebrates from Zinc in Pore Water**



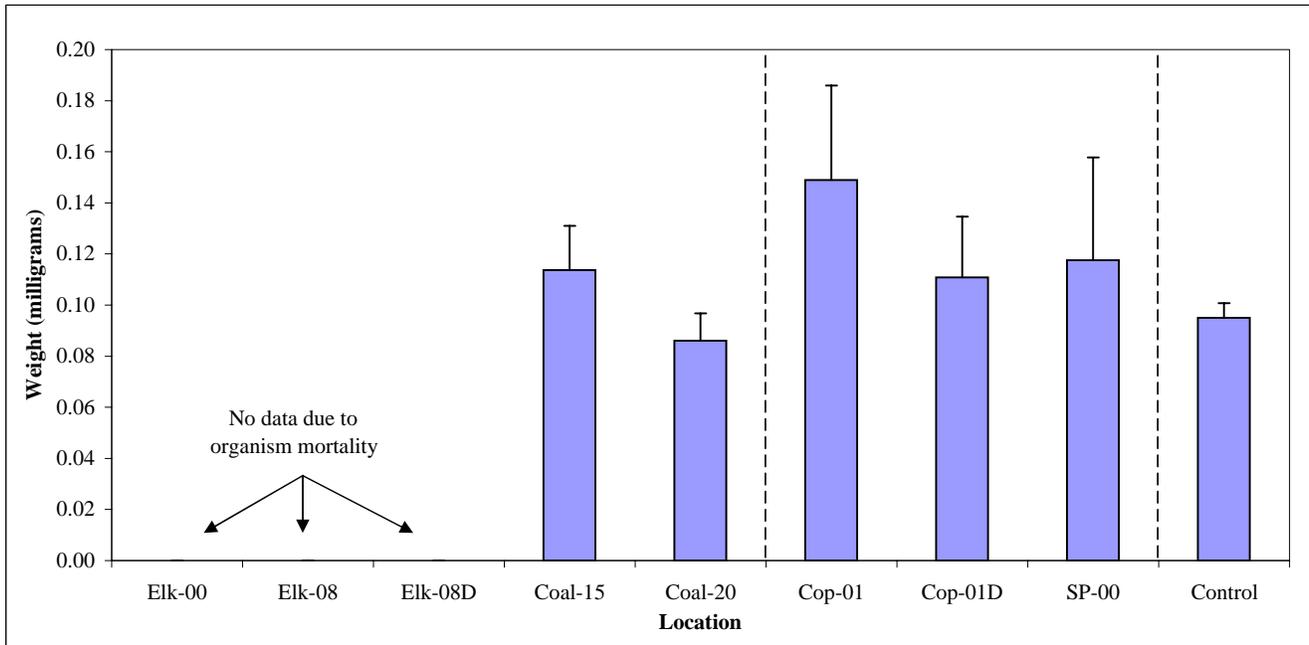
SM = Standard Mine  
 CC = Coal Creek  
 EC = Elk Creek

**Figure 4-10. Sediment Toxicity Test Results**

**Panel A. Average Percent Mortality**



**Panel B. Average Weight**



**Station comparison for statistical significance**

Coal-15 (downstream) vs. Coal-20 (upstream)

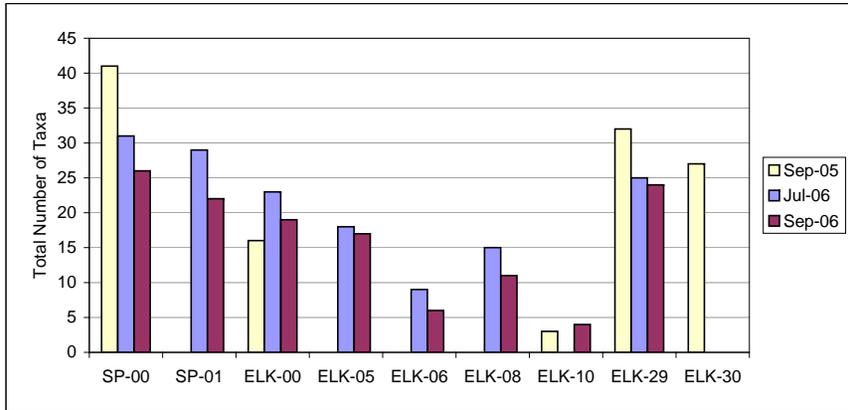
All Elk Creek stations vs. Cop-01 and SP-00 combined (Cop-01 and SP-00 are not statistically significantly different)

\* Statistically different from reference

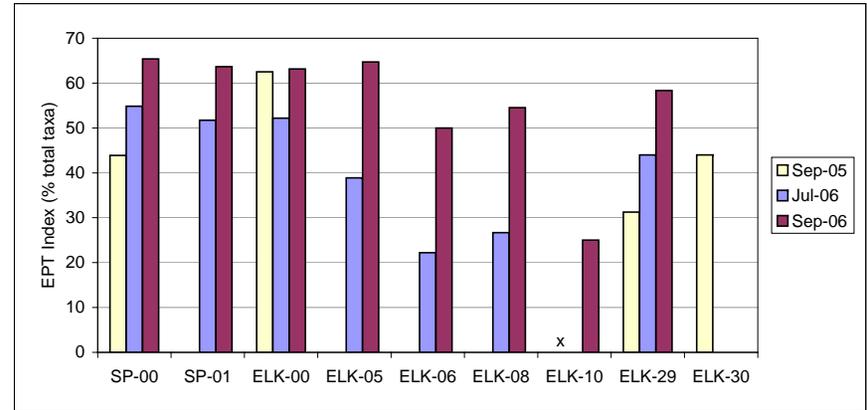
Error bars are based on the standard deviation.

**FIGURE 4-11 BENTHIC COMMUNITY METRICS FOR ELK CREEK AND REFERENCE STATIONS**

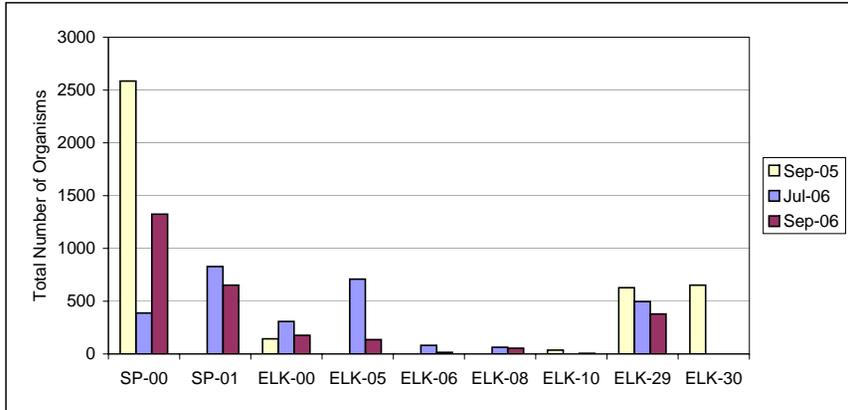
Panel A: Taxa Richness (Total number of taxa)



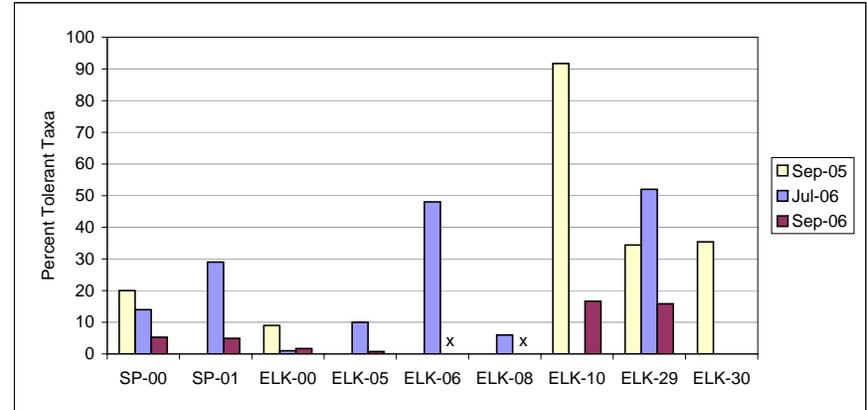
Panel D: EPT Index



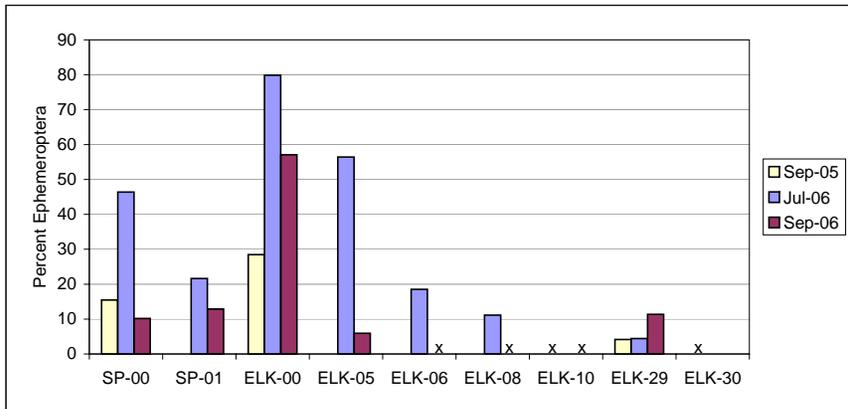
Panel B: BMI Abundance (Total number of organisms)



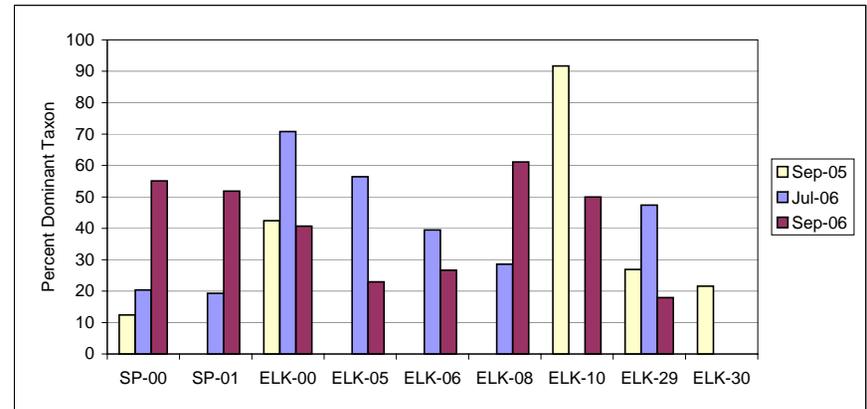
Panel E: Percent Tolerant Taxa



Panel C: Percent Ephemeroptera



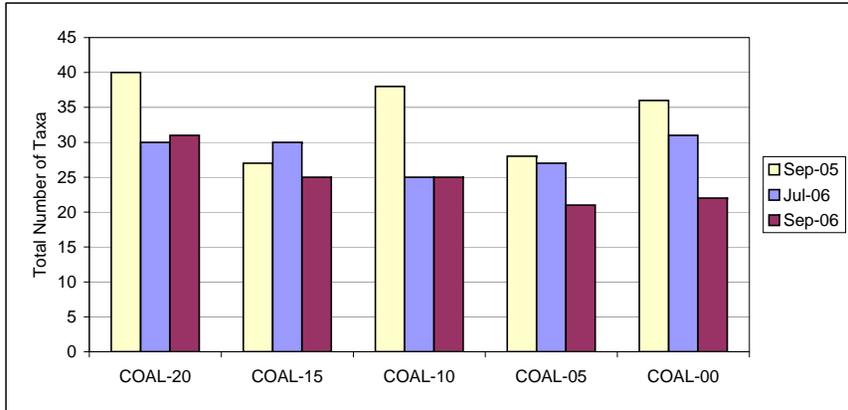
Panel F: Percent Dominant Taxon



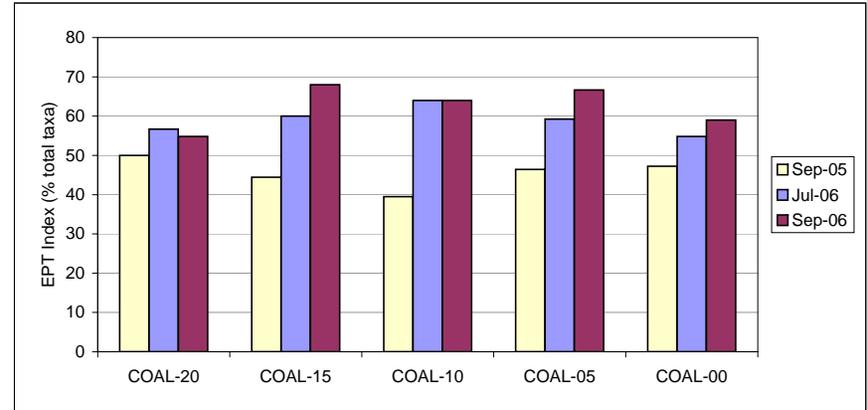
x = Samples were collected and measured metric is zero

**FIGURE 4-12 BENTHIC COMMUNITY METRICS FOR COAL CREEK AND REFERENCE STATION**

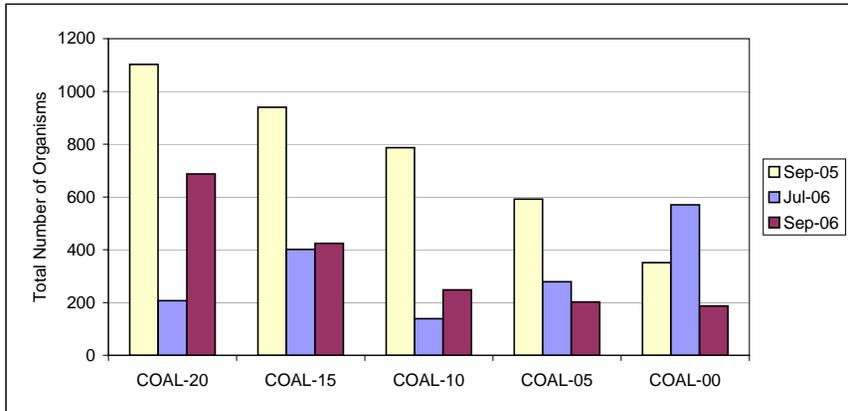
Panel A: Taxa Richness (Total number of taxa)



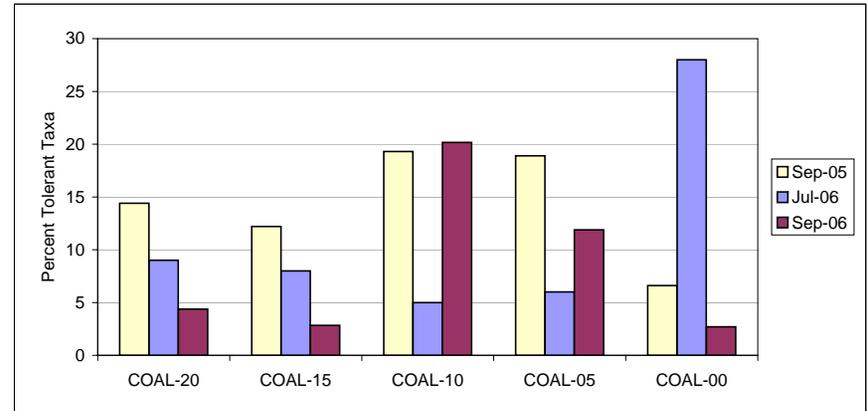
Panel D: EPT Index



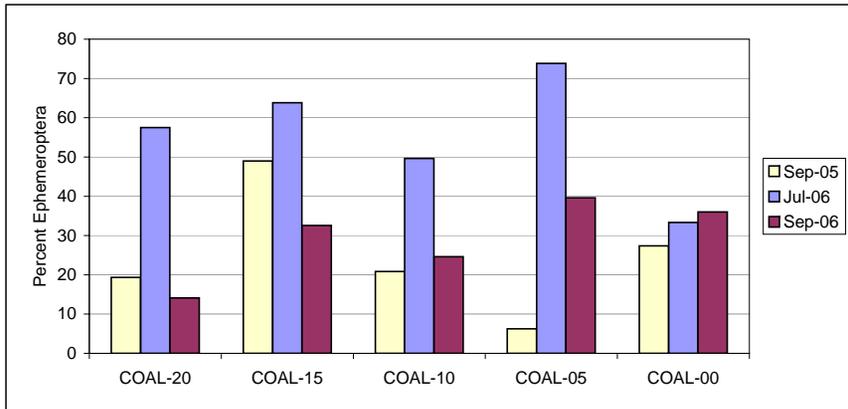
Panel B: BMI Abundance (Total number of organisms)



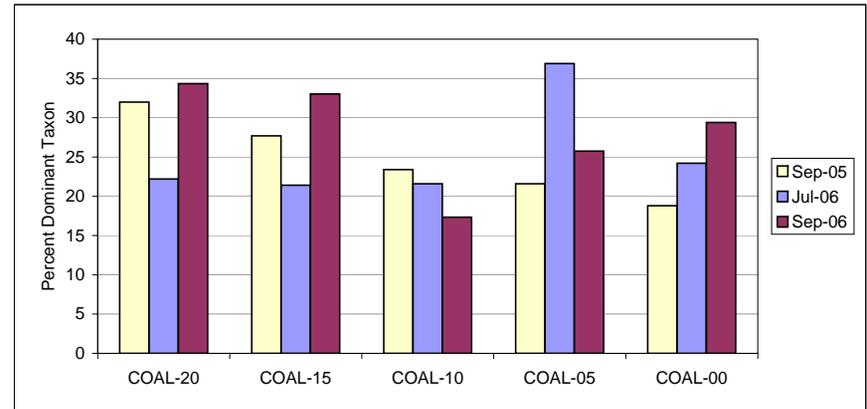
Panel E: Percent Tolerant Taxa



Panel C: Percent Ephemeroptera



Panel F: Percent Dominant Taxon



**Site-Specific Study**

**Sampling and Analysis**

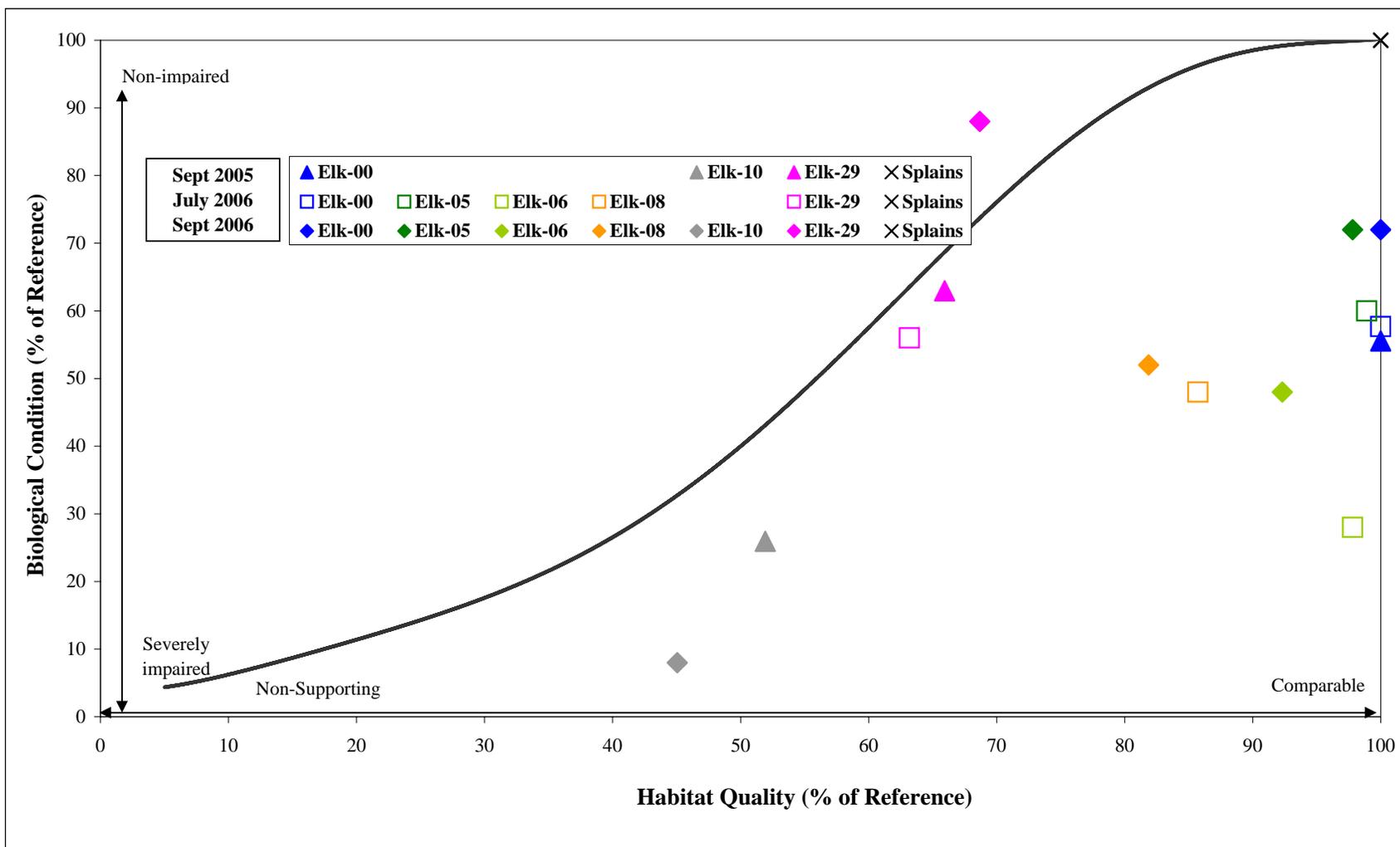
<b>Metric</b>	<b>Biological Condition Scoring Criteria</b>			
	<b>6</b>	<b>4</b>	<b>2</b>	<b>0</b>
1. Taxa Richness (site / reference)	>80%	60-80%	40-60%	<40%
2. Total Density (site / reference)	>80%	60-80%	40-60%	<40%
3. EPT Index (site / reference)	>90%	80-90%	70-80%	<70%
4. Shannon –Weaver Diversity (site / reference)	>85%	70-85%	50-70%	<50%
5. % Ephemeroptera (site / reference)	>50%	35-50%	20-35%	<20%
6. % tolerant organisms (reference / site)	>80%	60-80%	40-60%	<40%
7. % Contribution of Dominant Taxon	<20%	20-30%	30-40%	>40%
8. % scrapers (site / reference)	>50%	35-50%	20-35%	<20%
9. % clingers (site / reference)	>50%	35-50%	20-35%	<20%

<b>BIOASSESSMENT</b>		
<b>% Comp. to Ref. Score <sup>(a)</sup></b>	<b>Biological Condition Category</b>	<b>Attributes</b>
>80%	Not impaired	Balanced trophic structure. Optimum community composition and dominance for stream size and habitat quality.
50-79%	Slightly impaired	Community structure less than expected. Composition (species richness) lower than expected due to loss of some intolerant forms. Percent contribution of tolerant forms increases.
20-49%	Moderately impaired	Fewer species due to loss of most sensitive forms. Reduction in EPT index.
<20%	Severely impaired	Few Species present. If high densities of organisms, then dominated by one or two taxa.

EPT = Ephemeroptera, Plecoptera, Trichoptera  
 Source: USEPA (1989b, 1999)

**Figure 4-13**  
**Flowchart of Approach for Rapid Bioassessment Protocol (RBP) III**

**Figure 4-14. Biological Condition of Benthic Macroinvertebrate Communities and Habitat Quality for Sampling Stations in Elk Creek vs. Reference\***



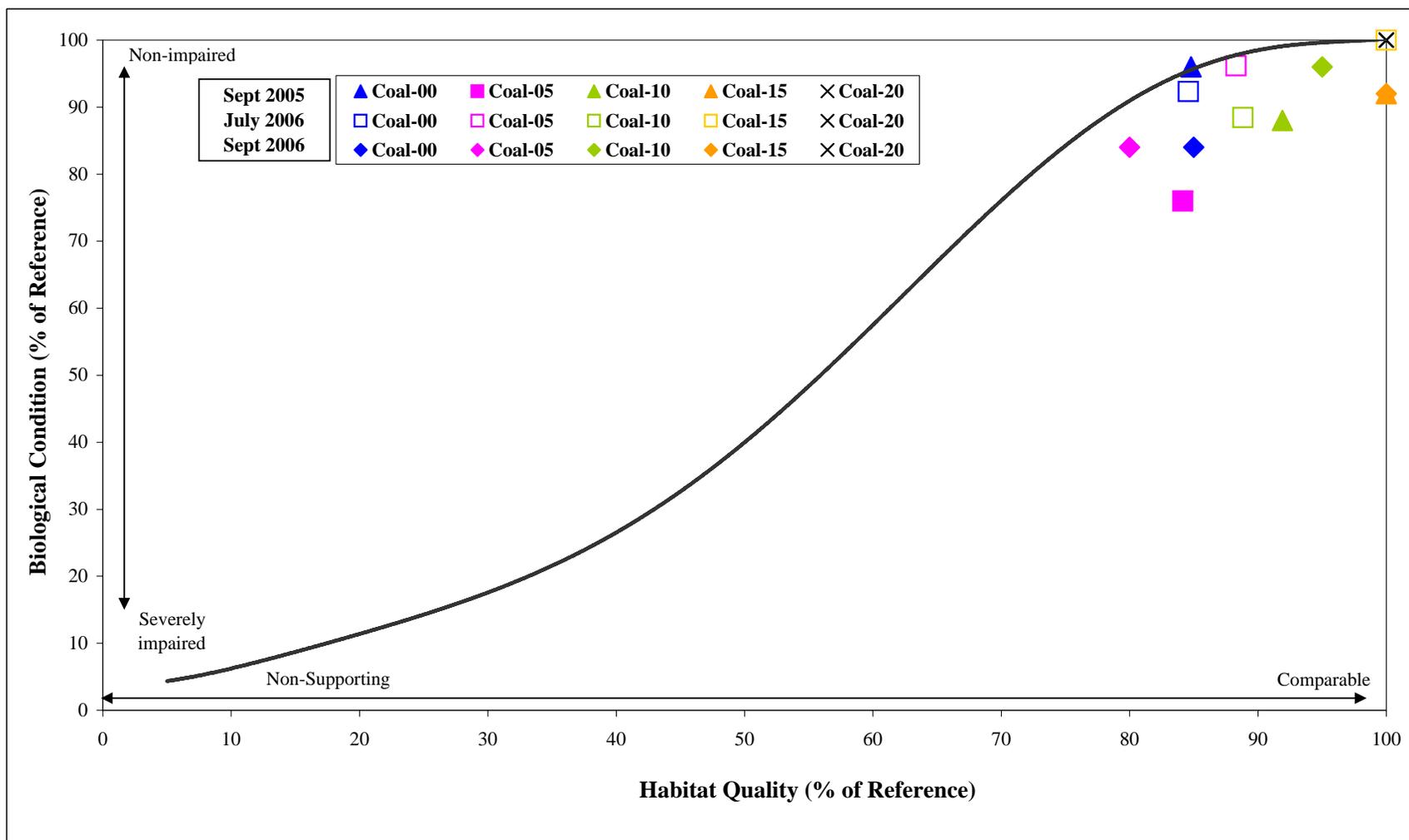
For graphing purposes, values greater than 100% of reference are shown as 100%.

In 2006, the reference for ELK-00 is SP-00; the reference for all other Elk Creek locations is SP-01.

In 2005, the reference for all Elk Creek locations is SP-00 because it is the only location on Splains Gulch that was sampled.

Habitat quality data were not collected in September 2005, so an average of the the July and September 2006 data was used for evaluation of data from 2005.

**Figure 4-15. Biological Condition of Benthic Macroinvertebrate Communities and Habitat Quality for Sampling Stations in Coal Creek Downstream of Elk Creek vs. Reference\***



For graphing purposes, values greater than 100% of reference are shown as 100%.

\*The reference for Coal Creek downstream of Elk Creek is Coal Creek Upstream of Elk Creek (COAL-20).

Habitat quality data were not collected in September 2005, so an average of the the July and September 2006 data was used for evaluation of data from 2005.

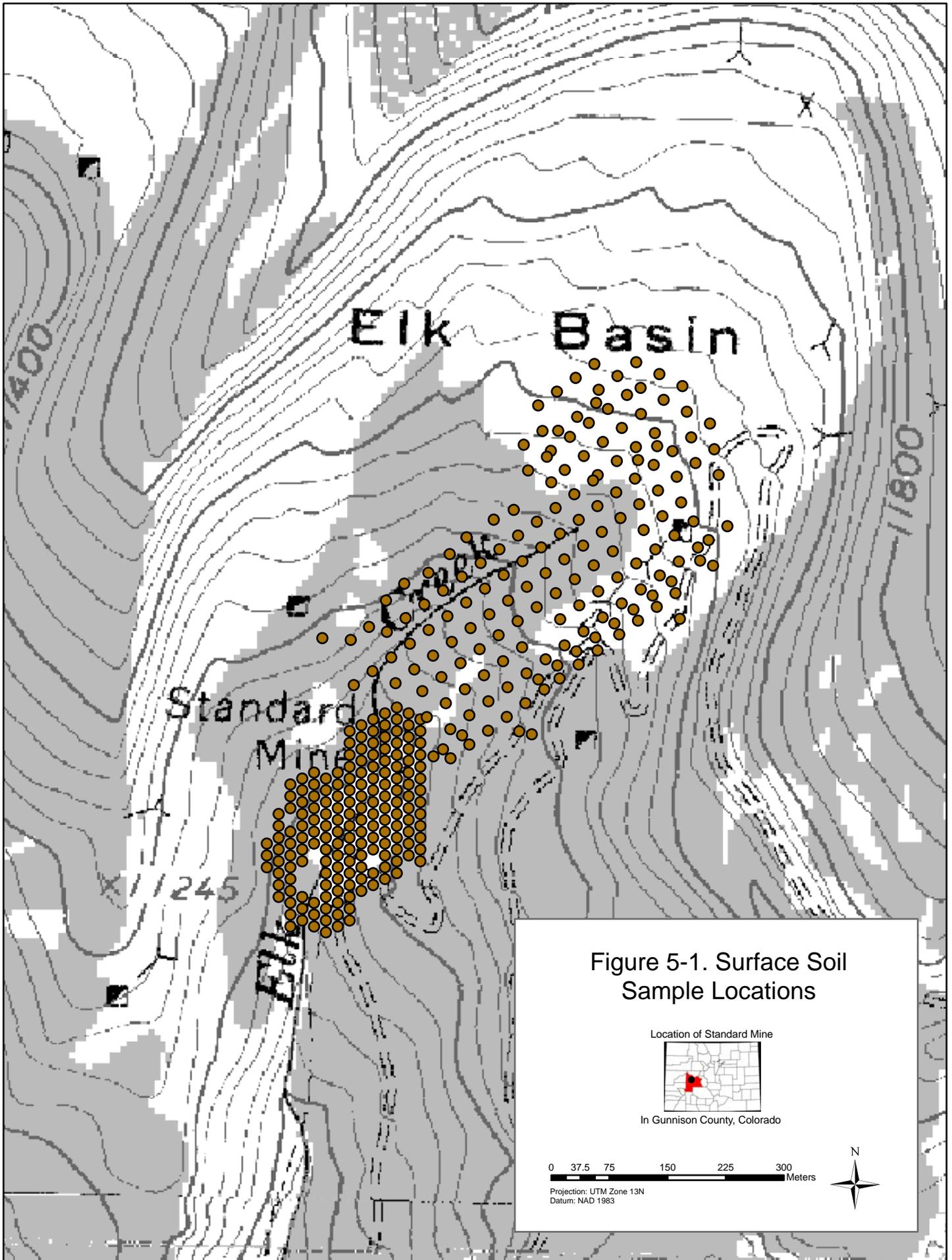


Figure 5-1. Surface Soil Sample Locations

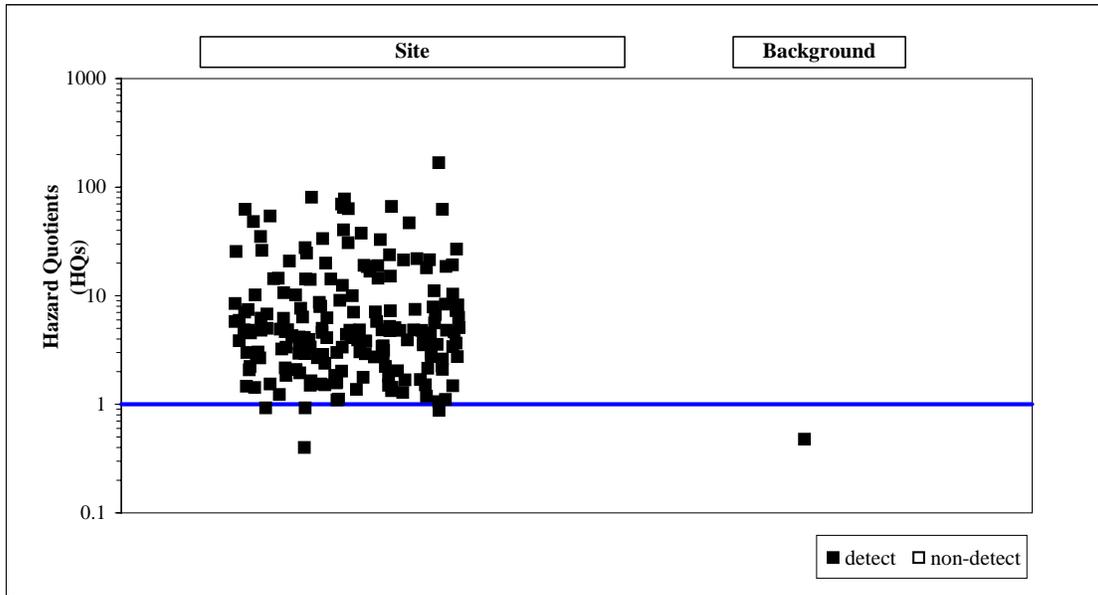
Location of Standard Mine  
In Gunnison County, Colorado

0 37.5 75 150 225 300 Meters  
Projection: UTM Zone 13N  
Datum: NAD 1983



Figure 5.2 HQ Values for Plants from Direct Contact with Site Soils

Panel A: HQ Values for Zinc



Panel B: HQ Values for Cadmium

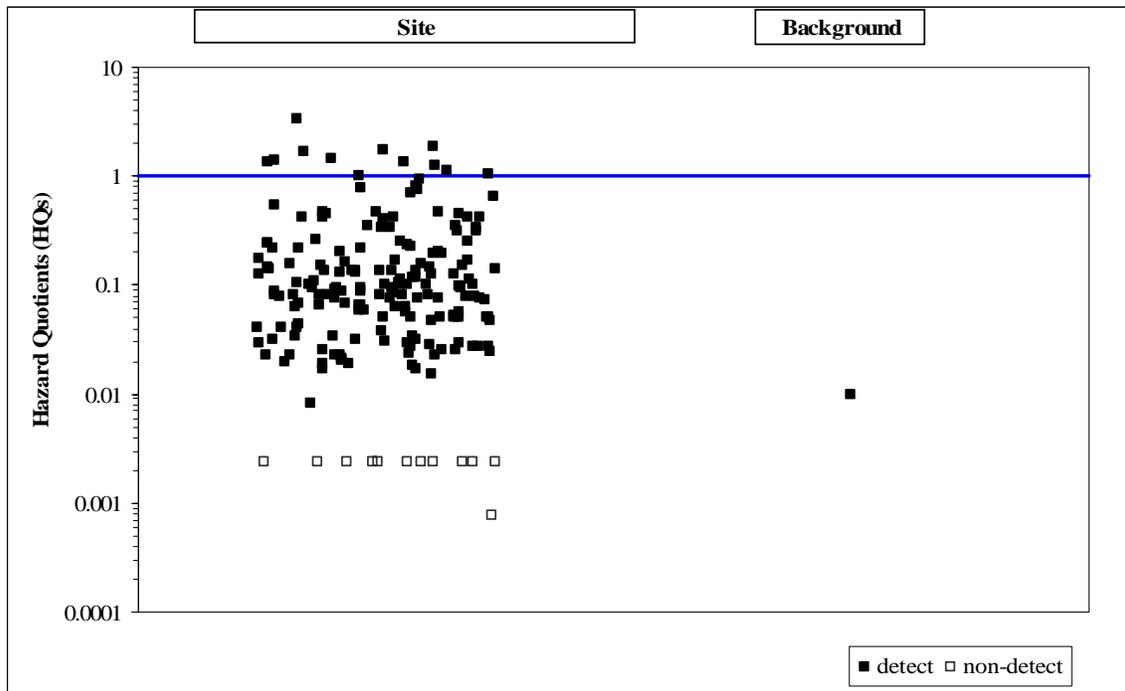
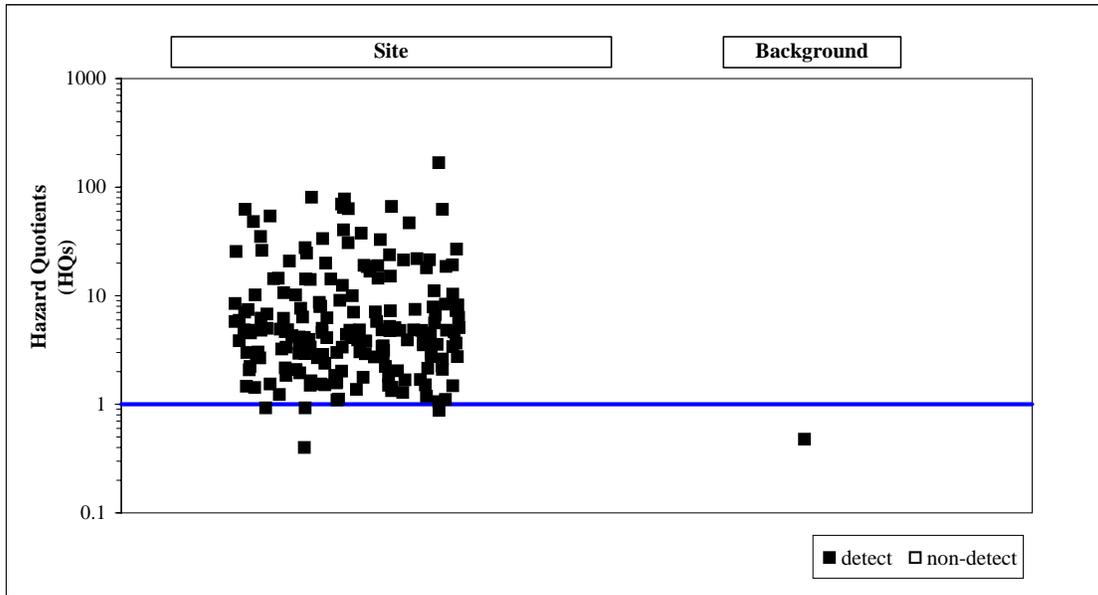


Figure 5.3 HQ Values for Soil Invertebrates from Direct Contact with Site Soils

Panel A: HQ Values for Zinc



Panel B: HQ Values for Lead

