Pristine Waters and High BioDiversity and BioComplexity Threatened :

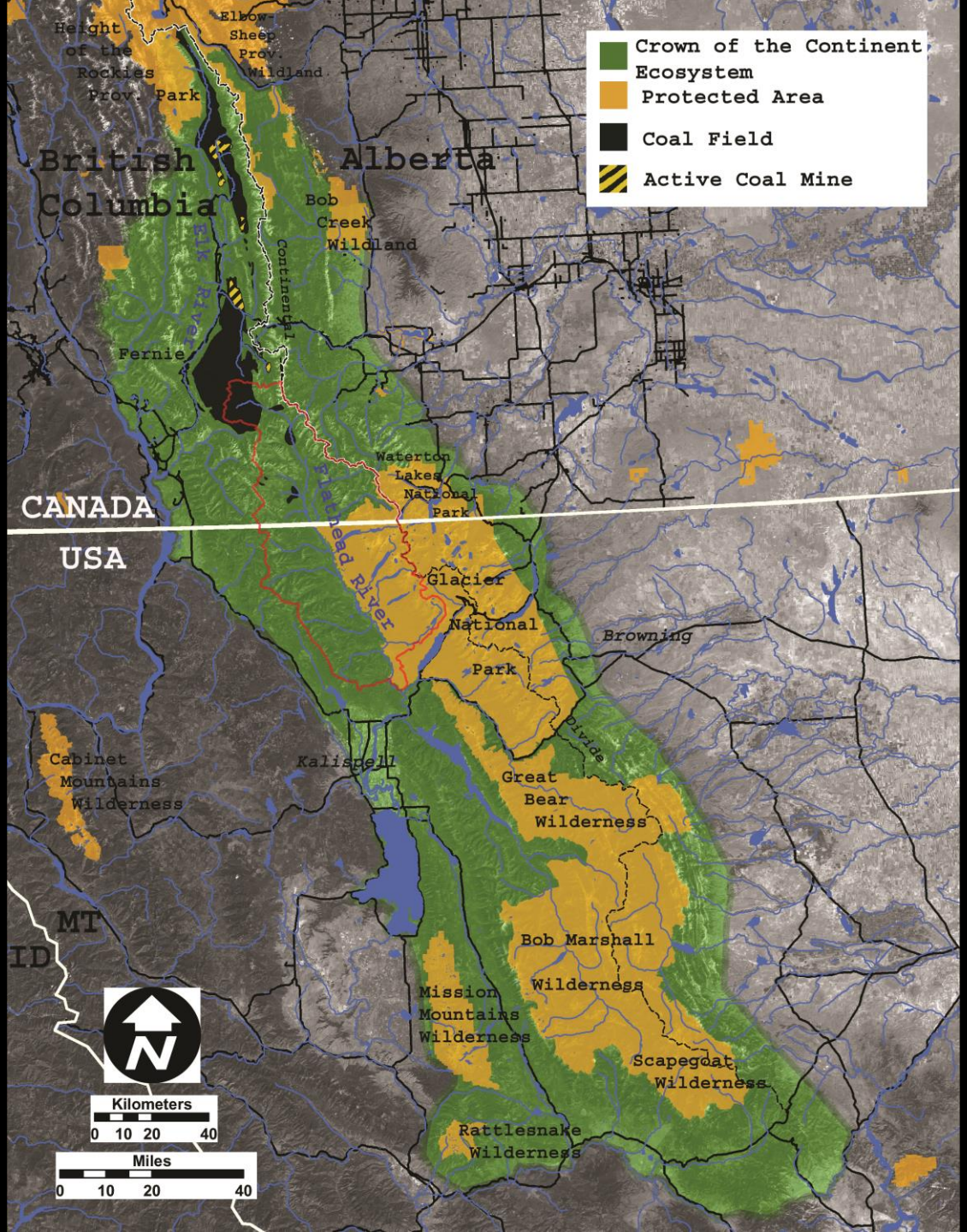
Sustainability, Vulnerability, and Resilience

Erin Sexton

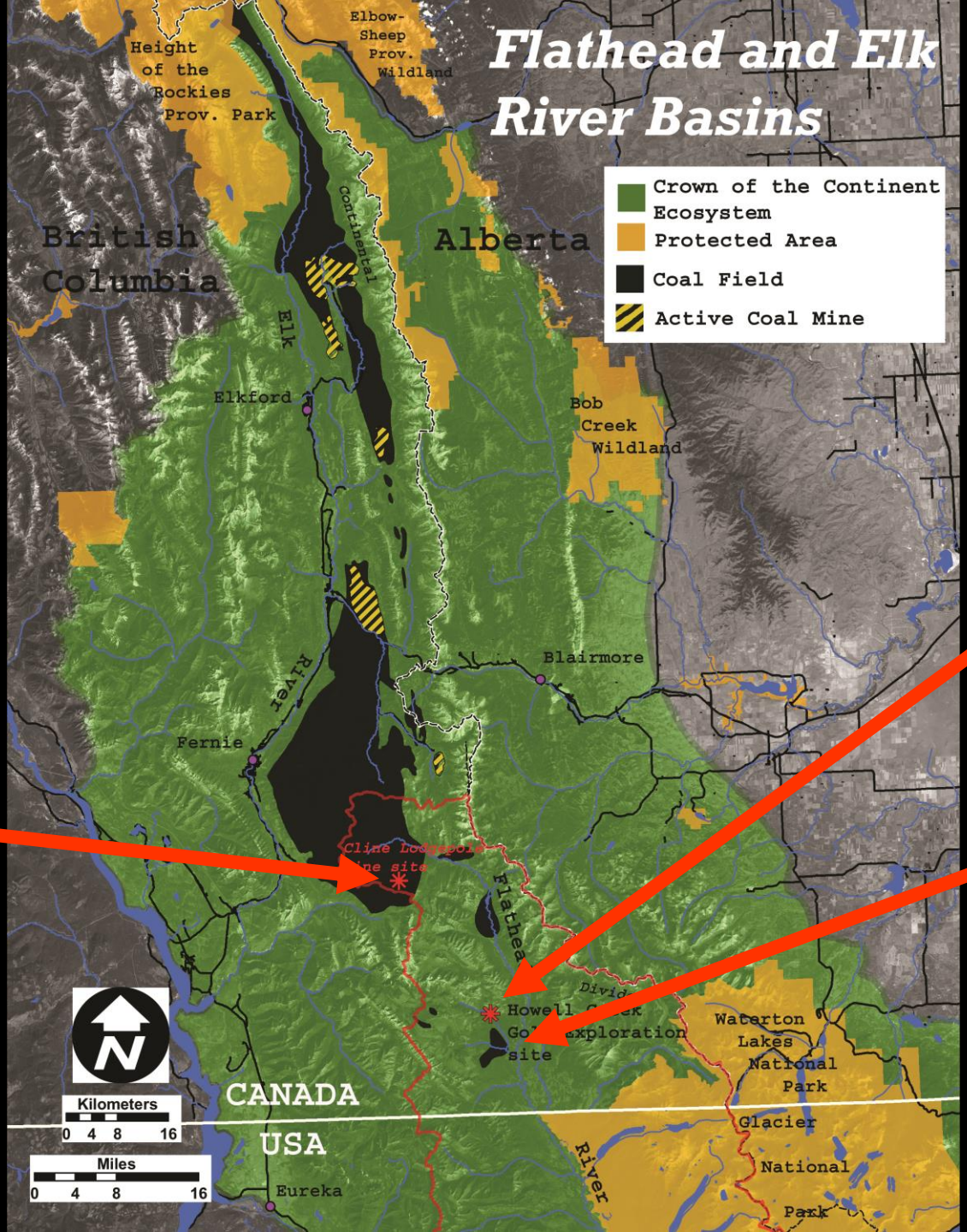
and

Richard Hauer

http://www.umt.edu/flbs/


Crown of the Continent Ecosystem
Protected Area
Coal Field
Active Coal Mine
Height of the Rockies Prov. Park
Elbow-Sheep Prov. Wildland
British Columbia
Alberta
Bob Creek Wildland
Continental Divide
Elk River
Fernie
Waterton Lakes National Park
CANADA
USA
Flathead River
Glacier National Park
Browning
Divide
Cabinet Mountains Wilderness
Kalispell
Great Bear Wilderness
MT
ID
Bob Marshall Wilderness
Mission Mountains Wilderness
Scapegoat Wilderness
Rattlesnake Wilderness
N
Kilometers
0 10 20 40
Miles
0 10 20 40

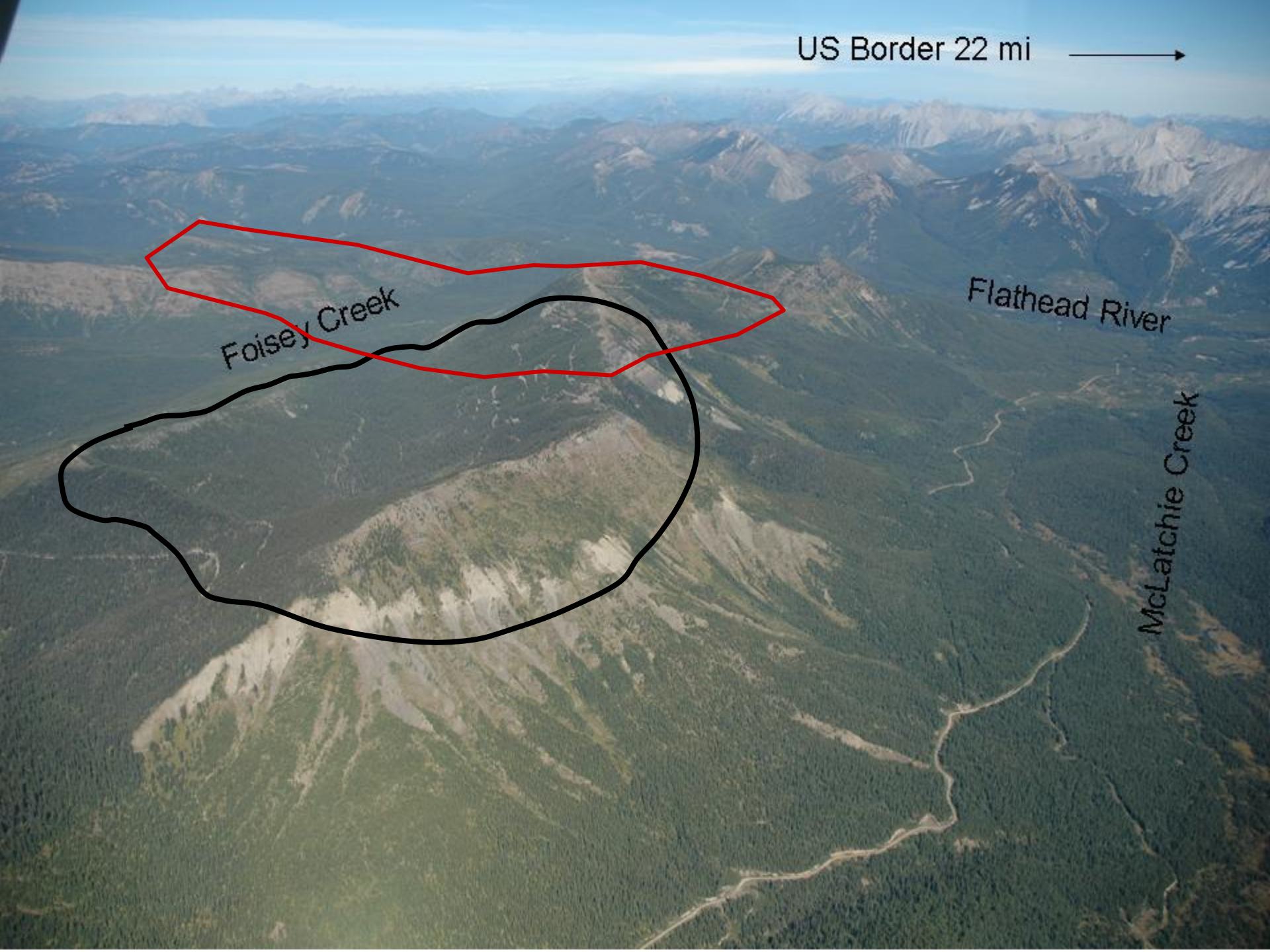
Waterton-Glacier Peace Park and surrounding landscape of the upper Flathead River Basin has among the "cleanest" waters in North America and possess the highest Aquatic BioDiversity and BioComplexity between Mexicio and the Yukon of Canada



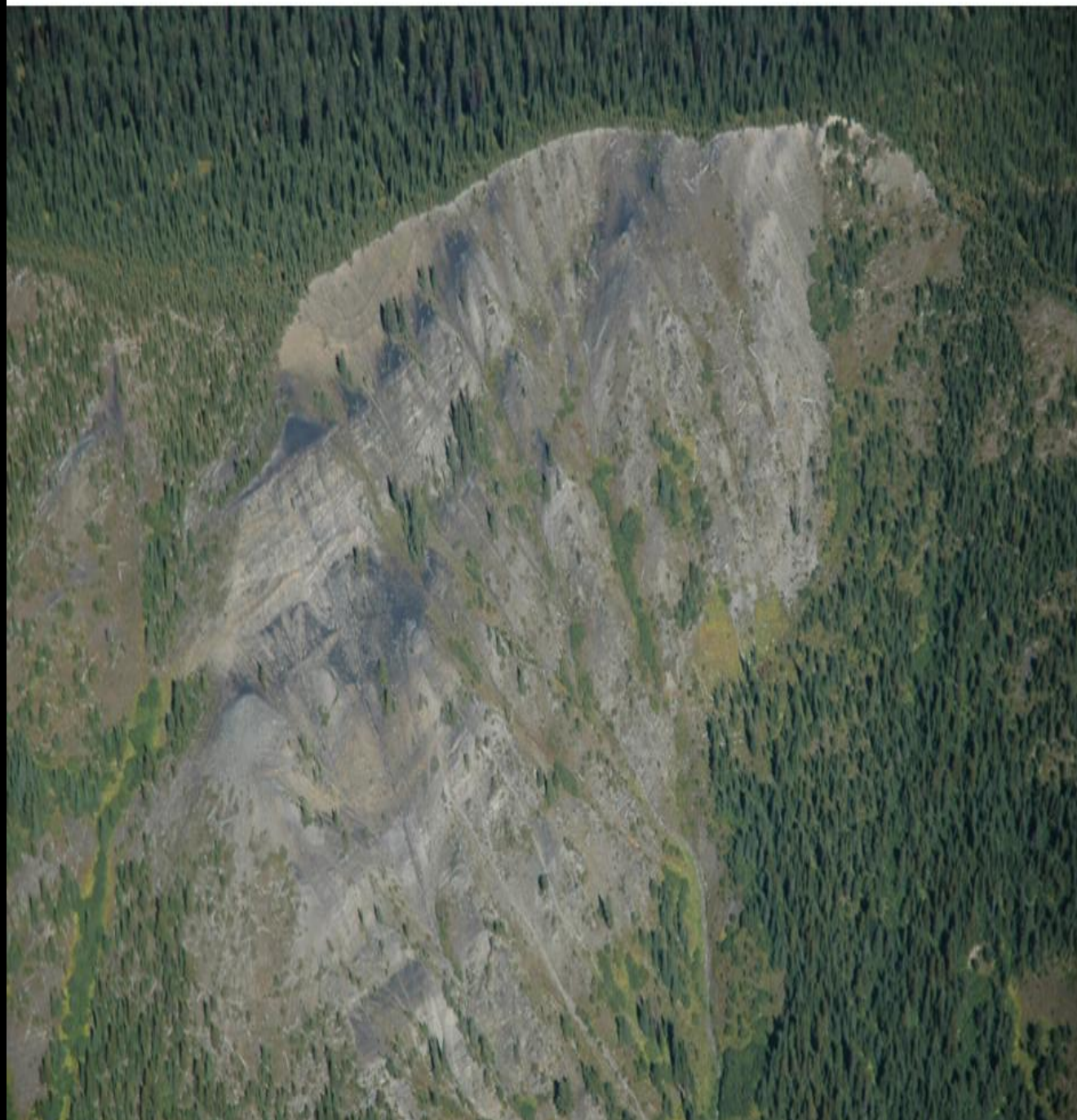
Proposed Cline Mine

Max Resources Gold Exploration

1970's Cabin Cr Mine


US Border 22 mi
Foisey Creek
Flathead River
McLatchie Creek

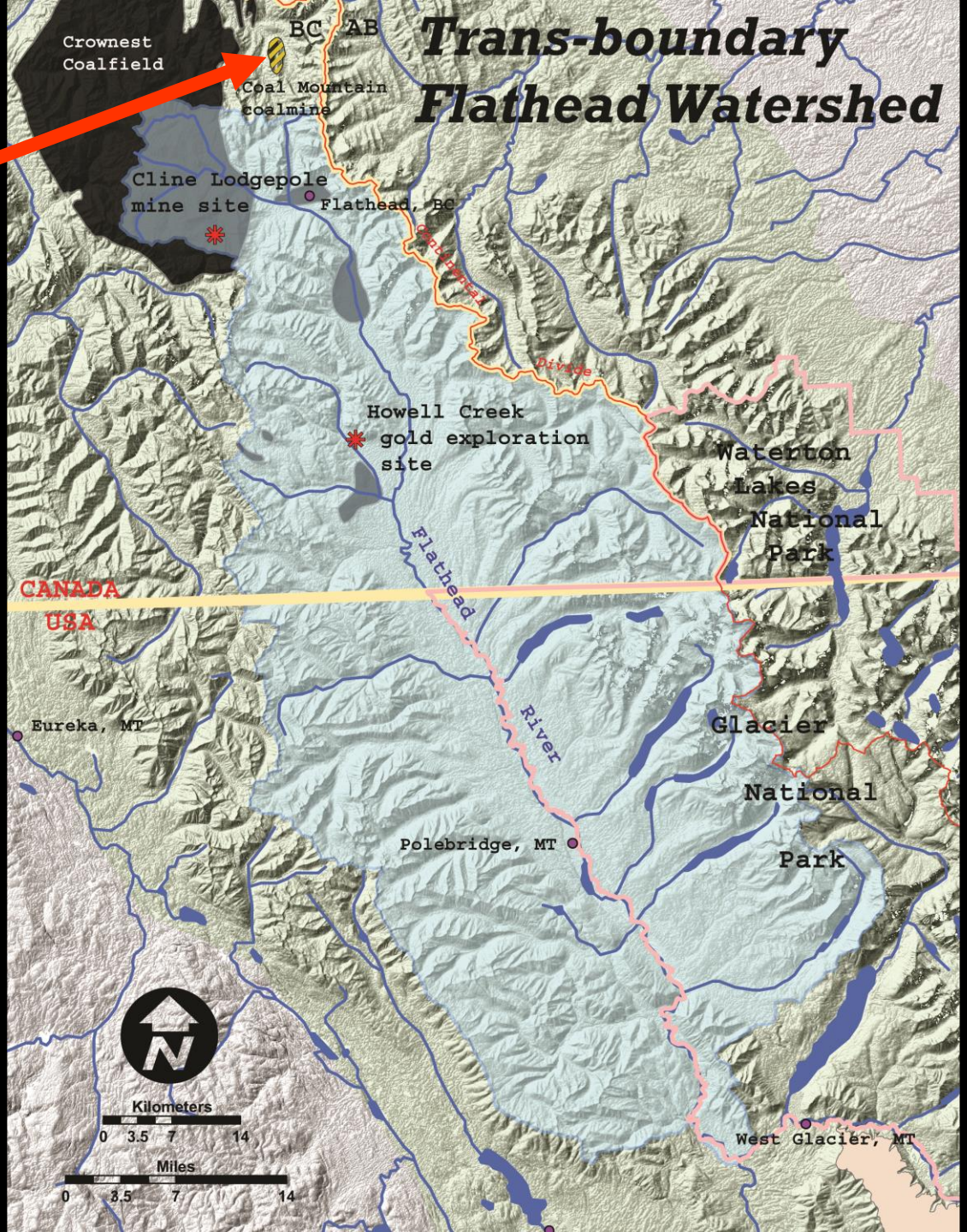
- 40 million Tons of medium-grade metallurgical coal
- 2 million Tons/yr for 20 years
- One 28 ton truck leaving the mine site every 8 minutes, 24 hours a day, 365 days a year, for 20 years
- Will produce 16 million tons/year of waste rock



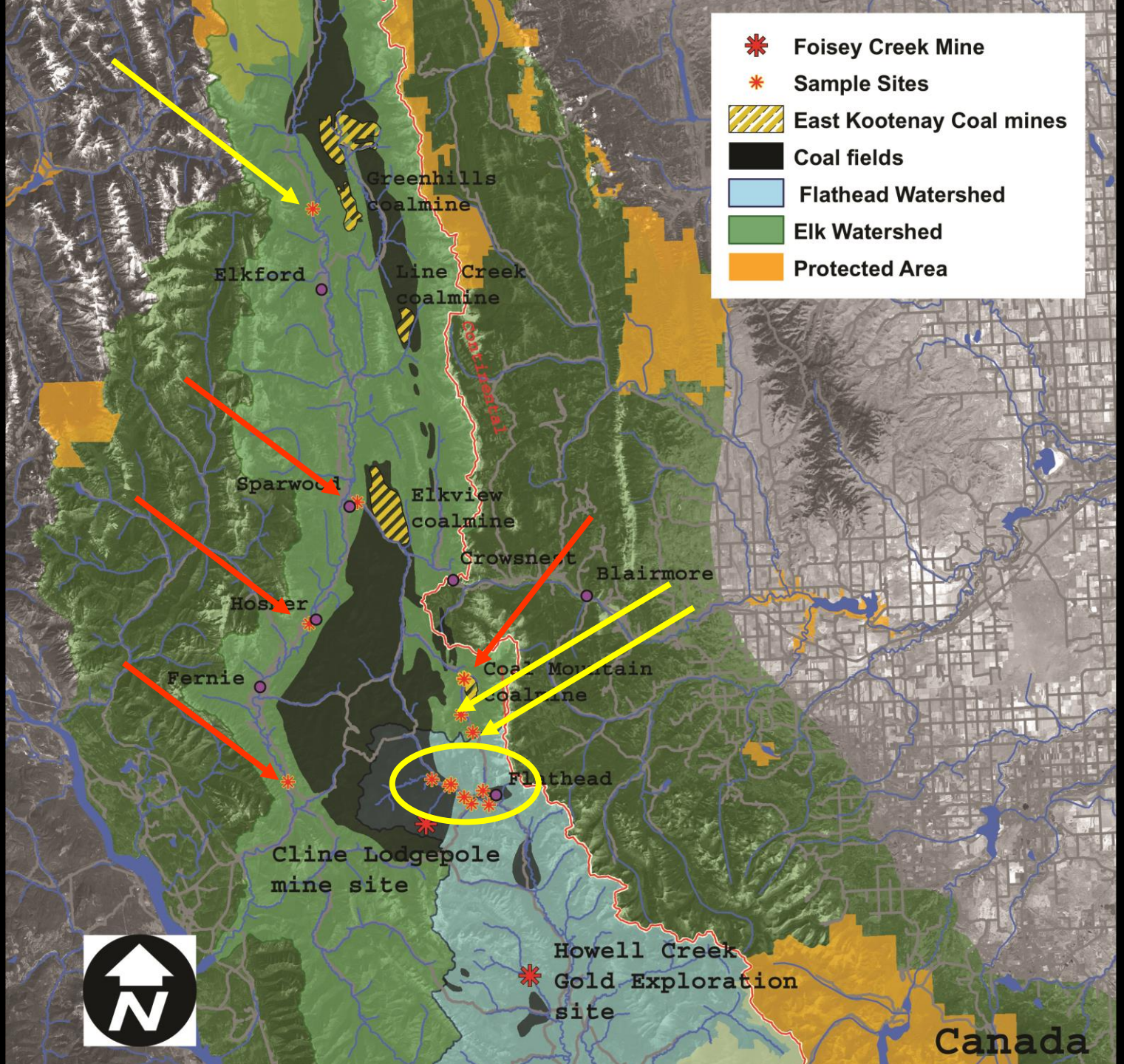
BASELINE DATA COLLECTION EFFORTS

- *Comparative analysis between the Elk and Flathead Rivers*
- *Fisheries*
- *Water quality*
- *Wildlife*
- *State & Federal Approp. MT DFWP, Grants*

Coal Mountain Mine in Elk Basin

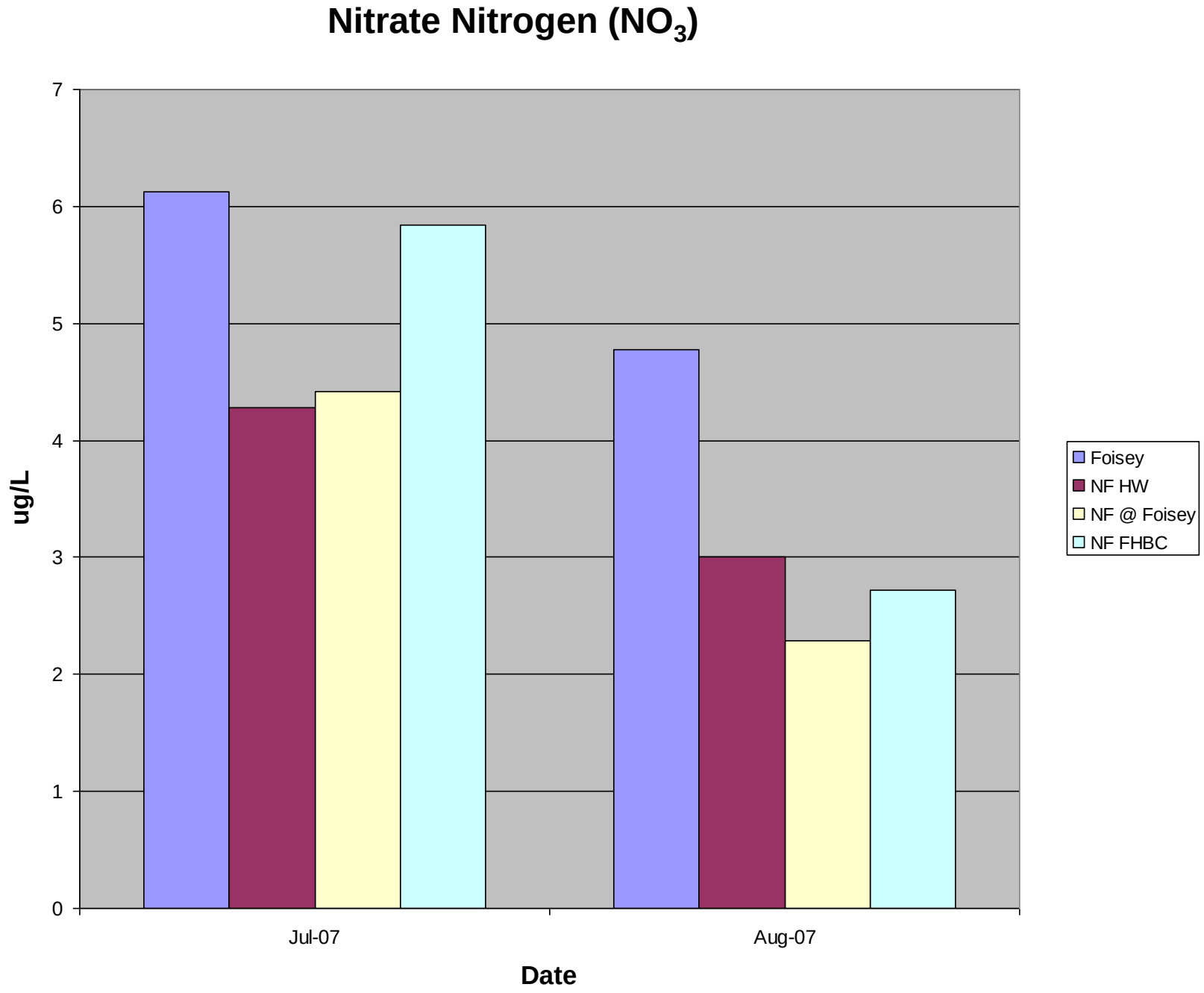


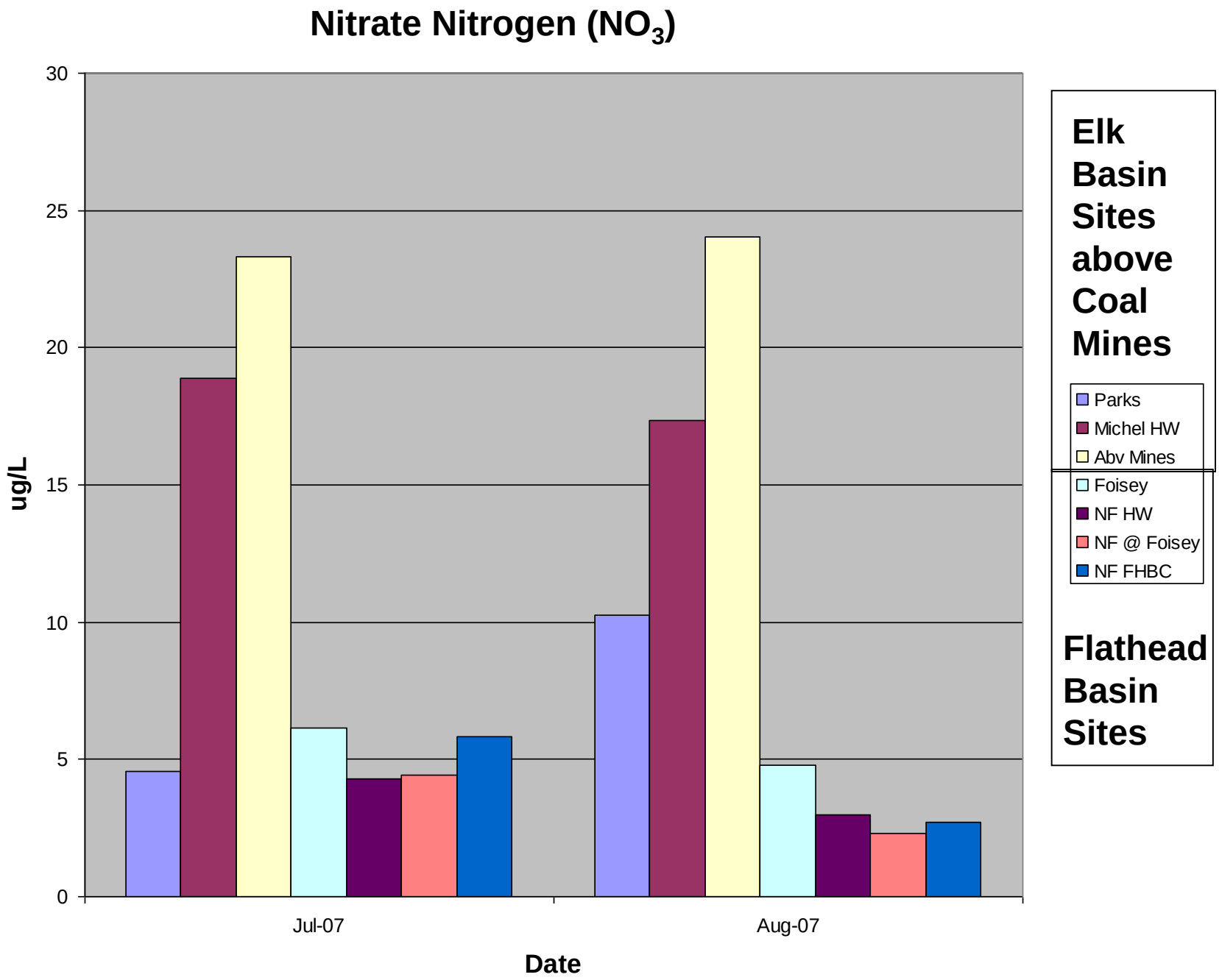
ELK VALLEY OPEN-PIT COAL MINES


Foisey Creek Mine
Sample Sites
East Kootenay Coal mines
Coal fields
Flathead Watershed
Elk Watershed
Protected Area
Greenhills coalmine
Elkford
Line Creek coalmine
Continental
Sparwood
Elkview coalmine
Crowsnest
Blairmore
Hosmer
Fernie
Coal Mountain coalmine
Flathead
Cline Lodgepole mine site
Howell Creek Gold Exploration site
Canada
N

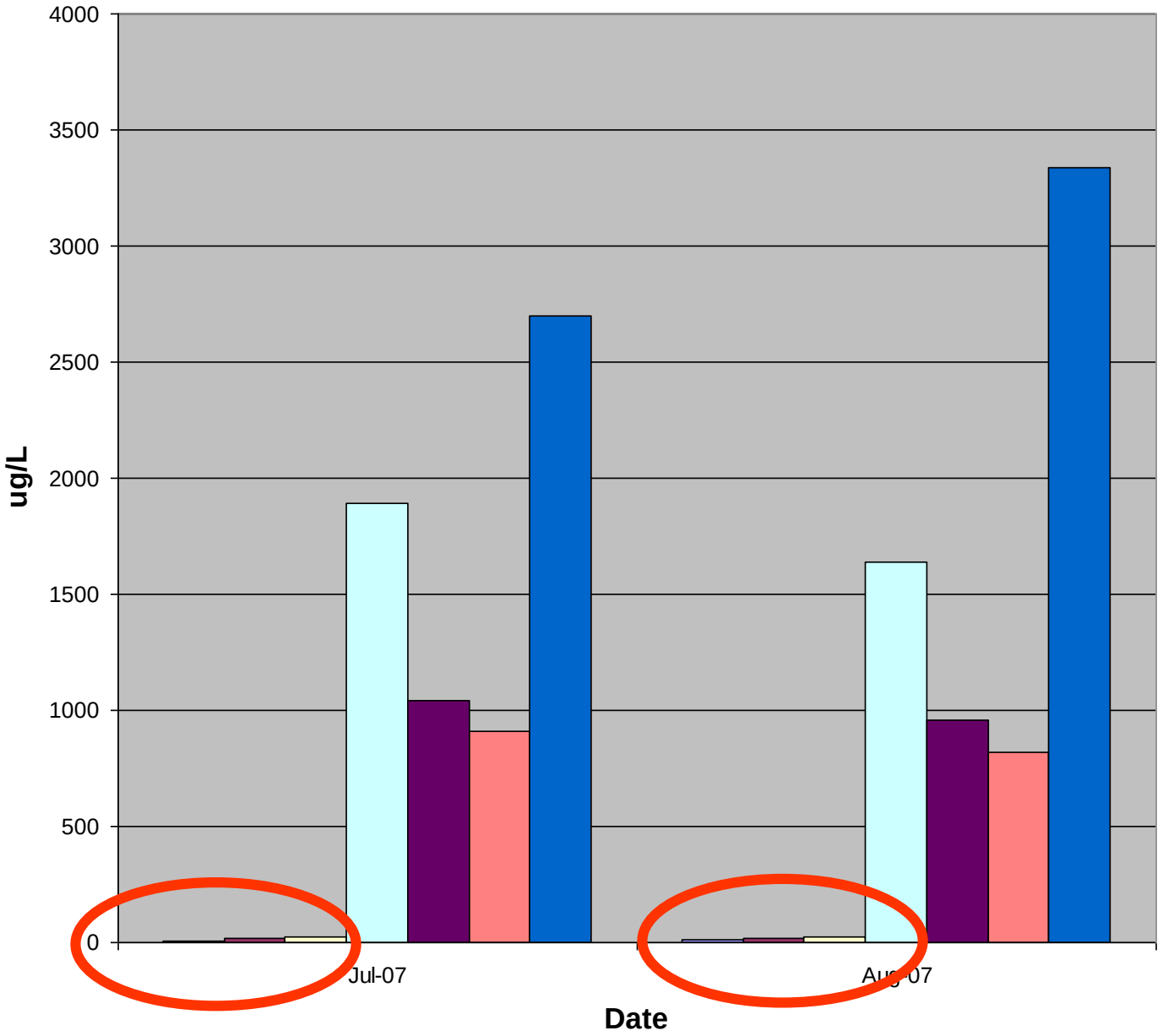
WATER QUALITY

- Nitrogen
- Sulfates
- Selenium


Nitrate Nitrogen (NO_3)
7
6
5
4
3
2
1
0
ug/L
Jul-07
Aug-07
Date
Foisey
NF HW
NF @ Foisey
NF FHBC


Nitrate Nitrogen (NO_3)
30
25
20
15
10
5
0
ug/L
Jul-07
Aug-07
Date
Elk Basin Sites above Coal Mines
Parks
Michel HW
Abv Mines
Flathead Basin Sites
Foisey
NF HW
NF @ Foisey
NF FHBC

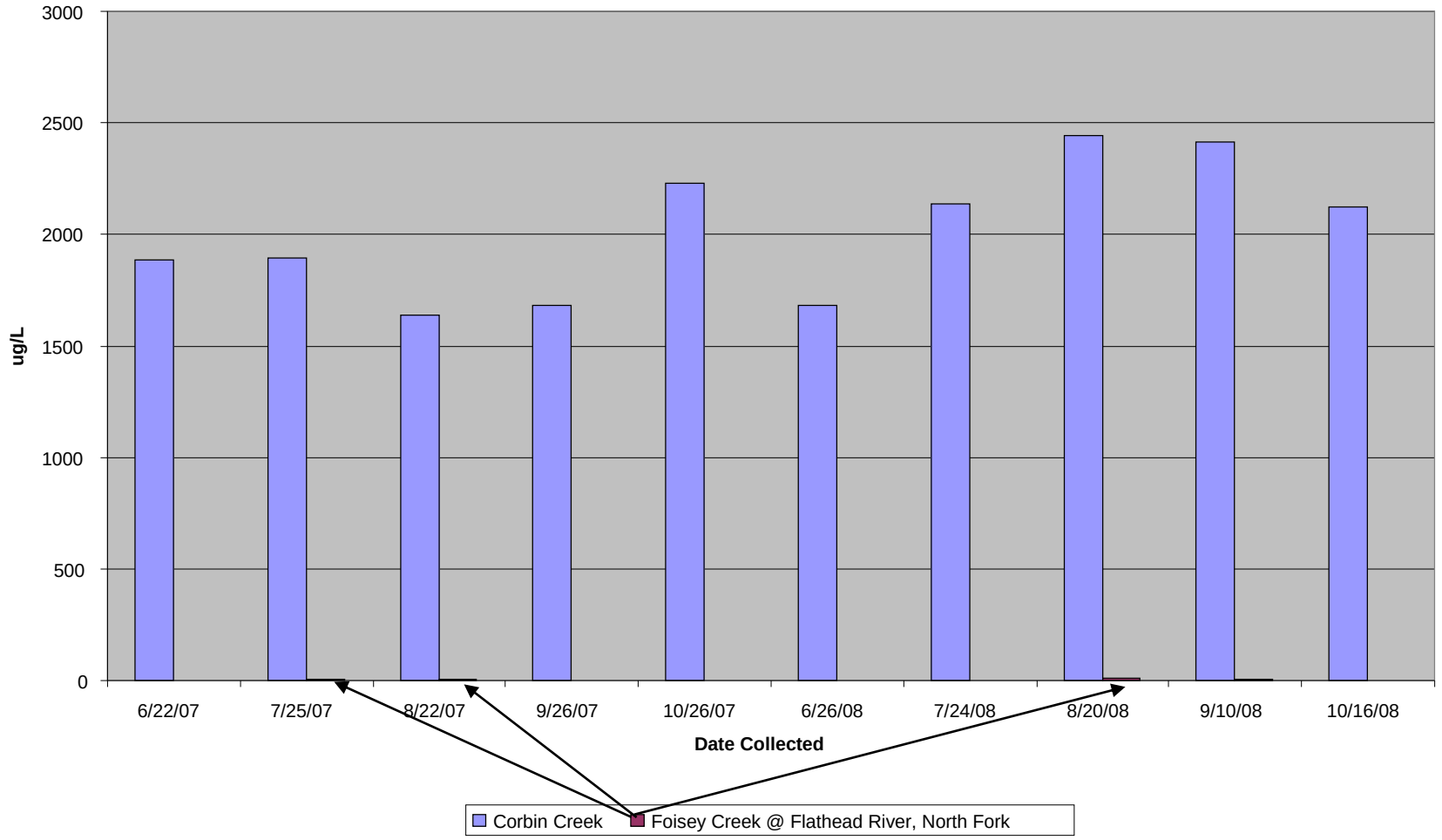
Nitrate Nitrogen (NO_3) in Elk Basin



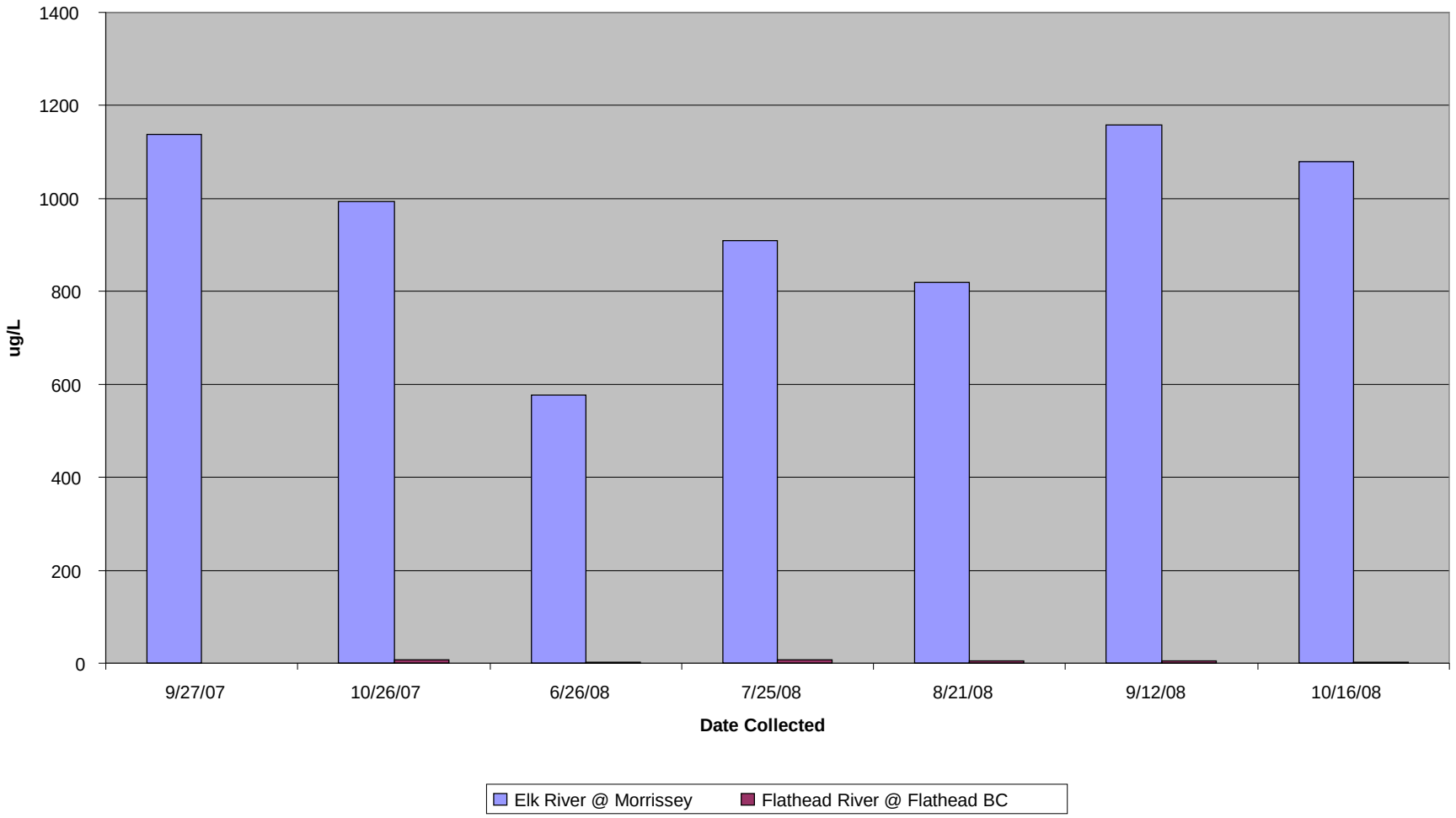
Elk Basin Sites above Coal Mines

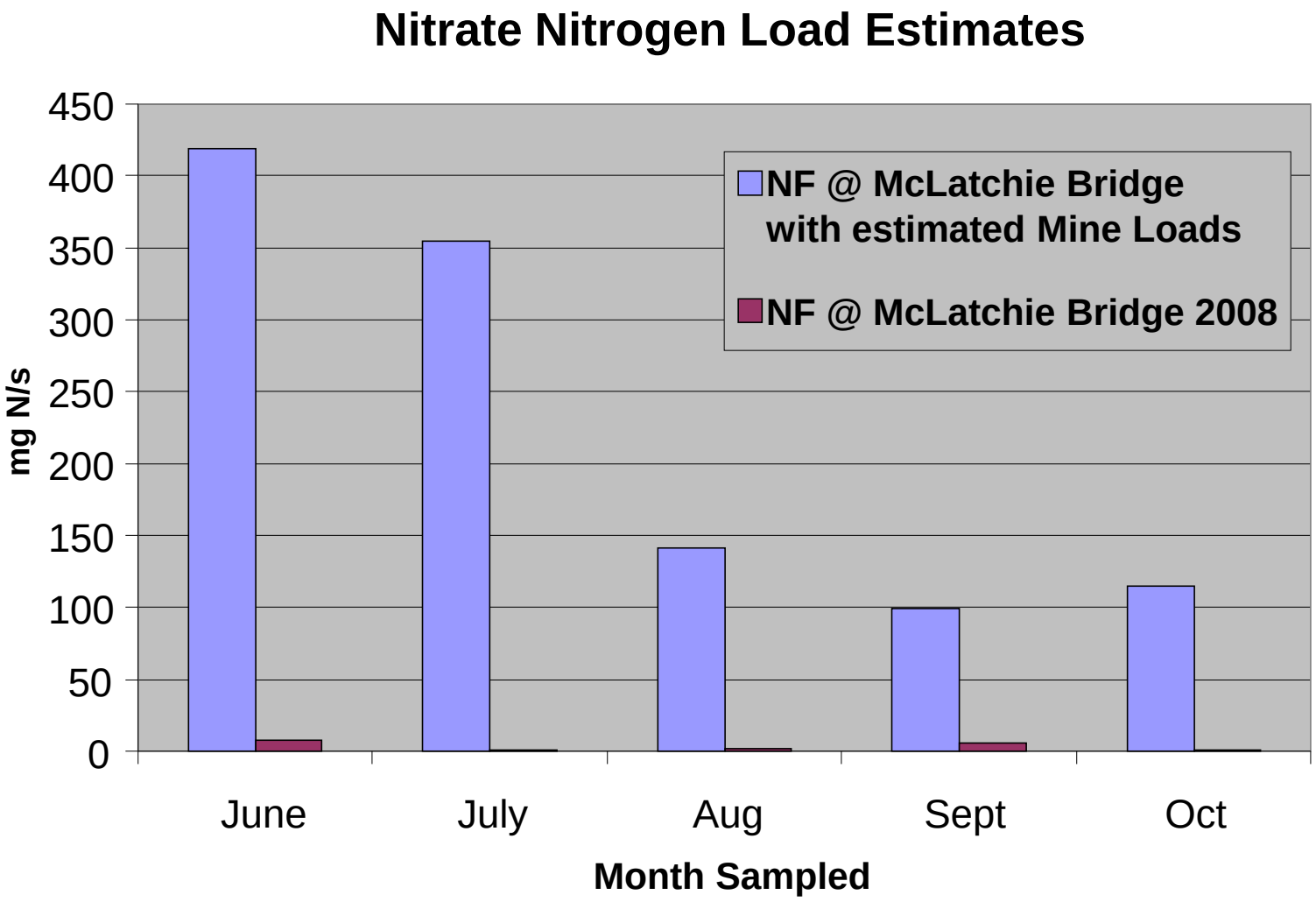
Elk Basin Sites below Coal Mines

NO2/3 in Foisey and Corbin Creeks

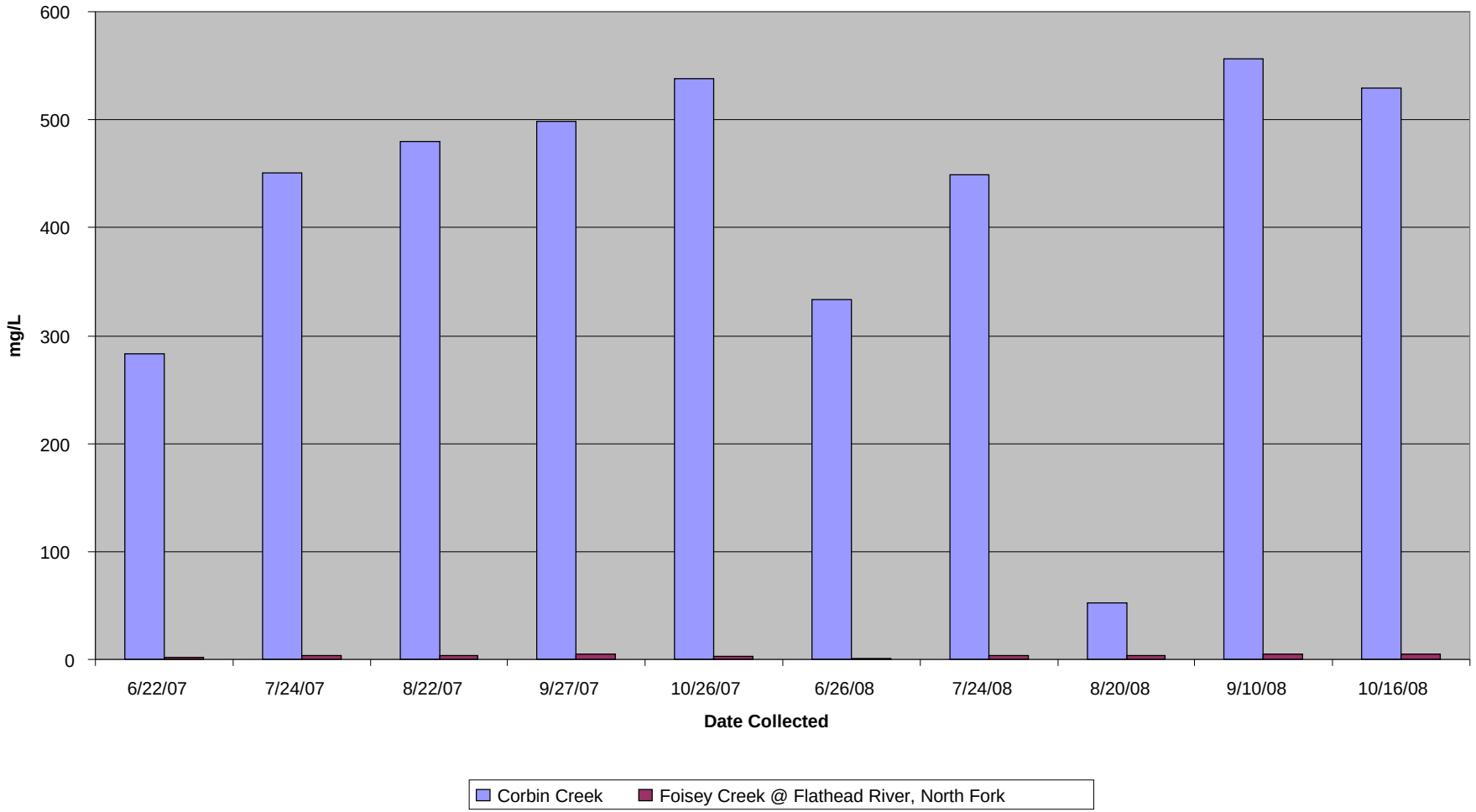


NO2/3 in Flathead and Elk Rivers

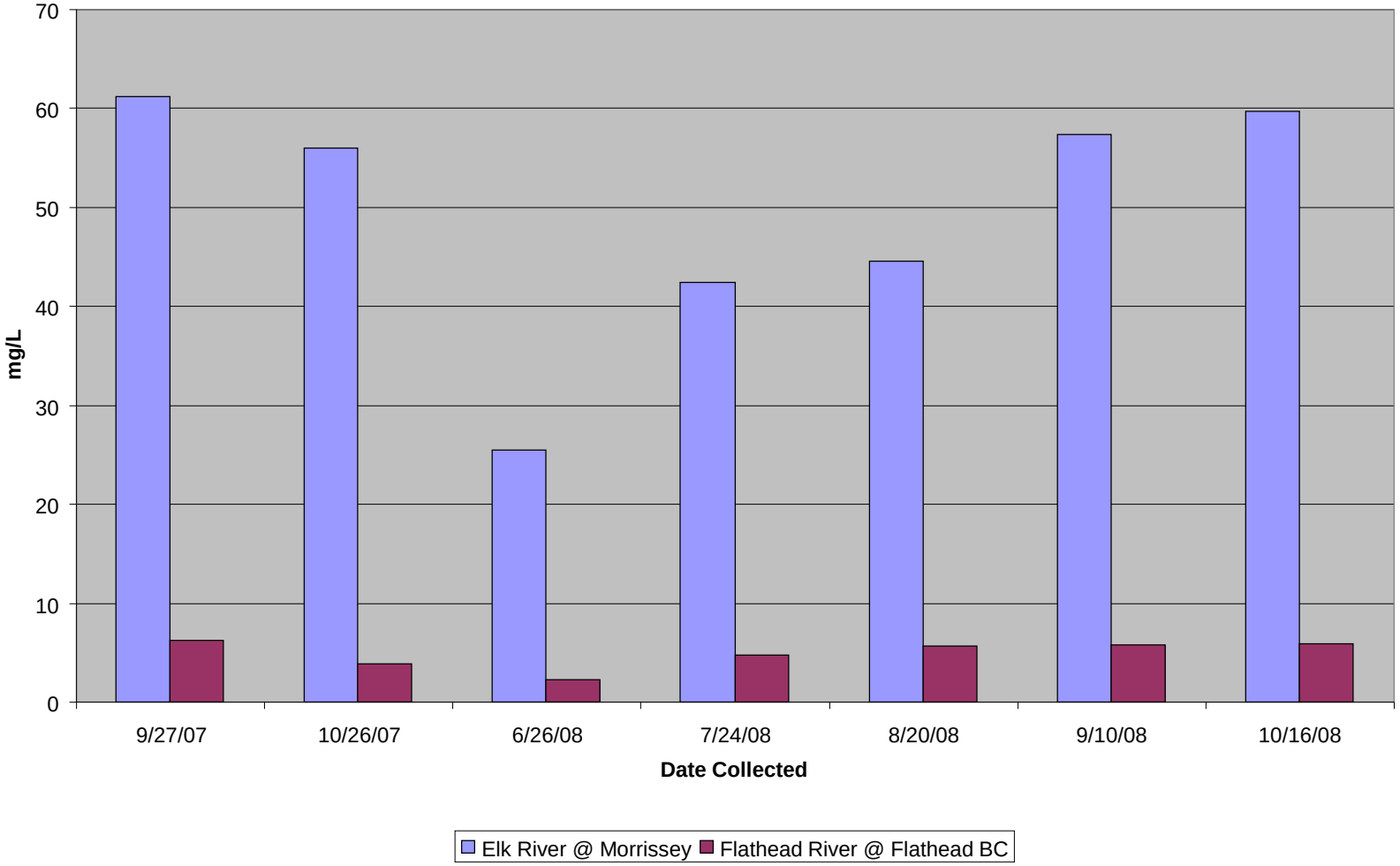



Nitrate Nitrogen Load Estimates
450
400
350
300
250
200
150
100
50
0
mg N/s
NF @ McLatchie Bridge with estimated Mine Loads
NF @ McLatchie Bridge 2008
June
July
Aug
Sept
Oct
Month Sampled

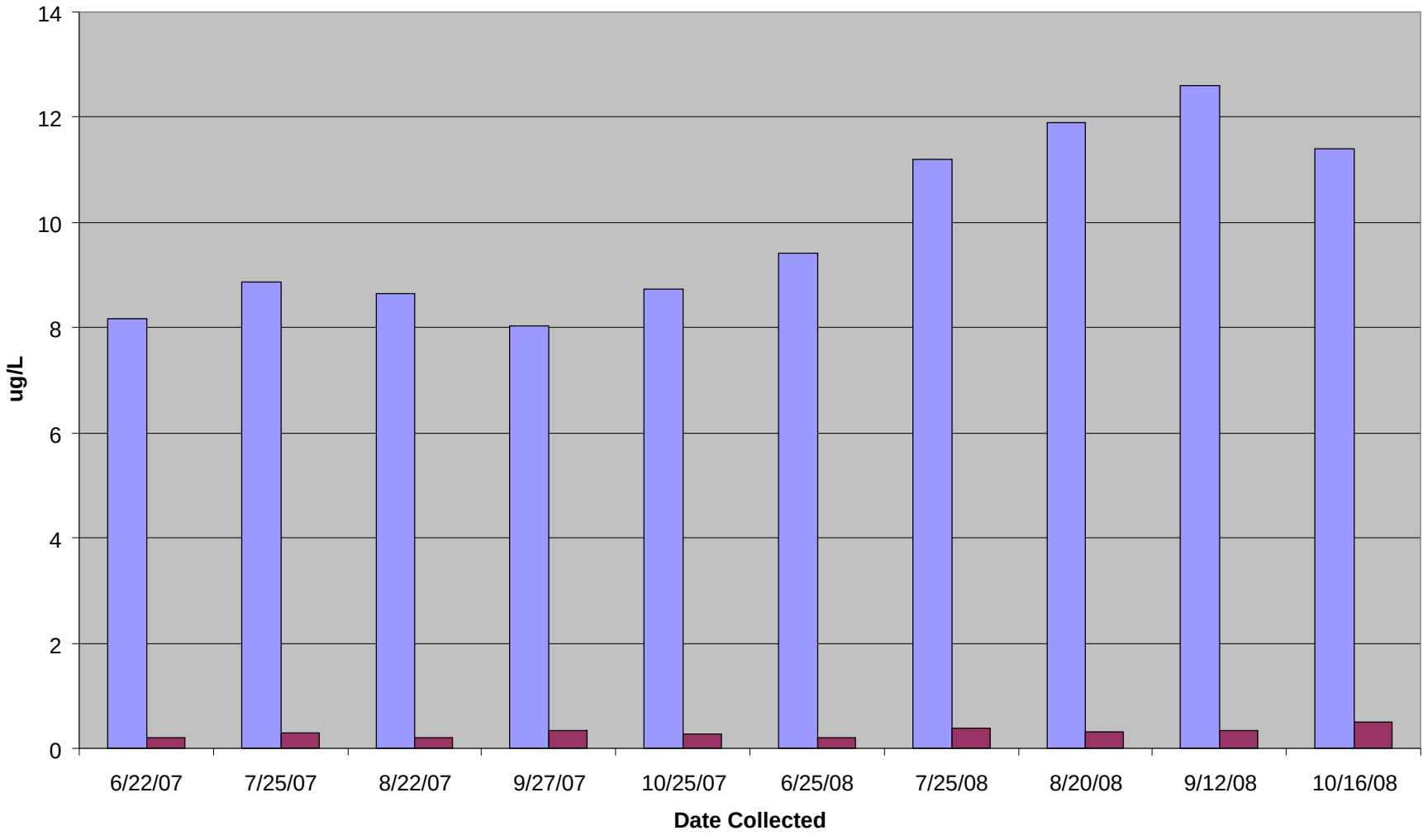
SO4 Foisey and Corbin Creeks



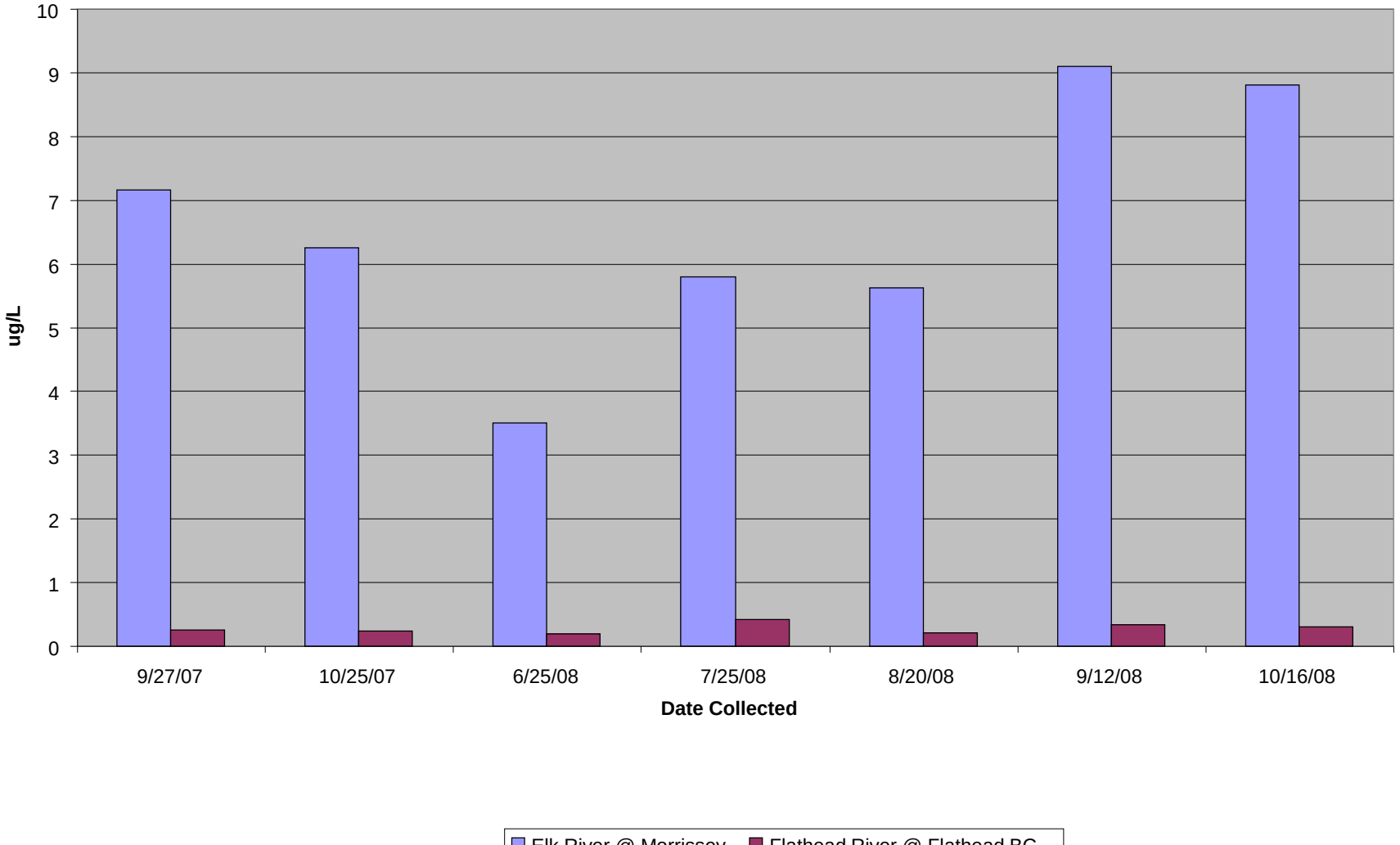
SO4 Flathead R and Elk R



Se in Foisey (FH) and Corbin (Elk) Creeks

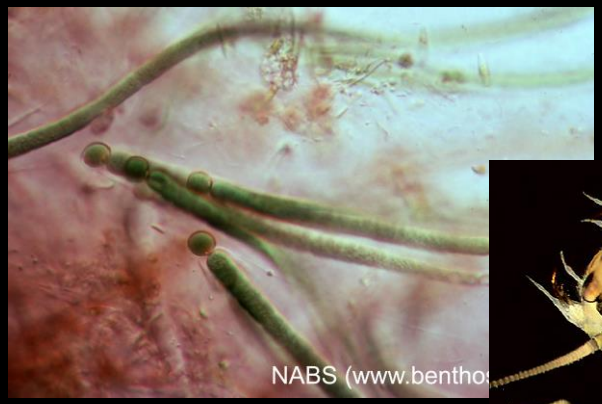


Se Flathead R and Elk R

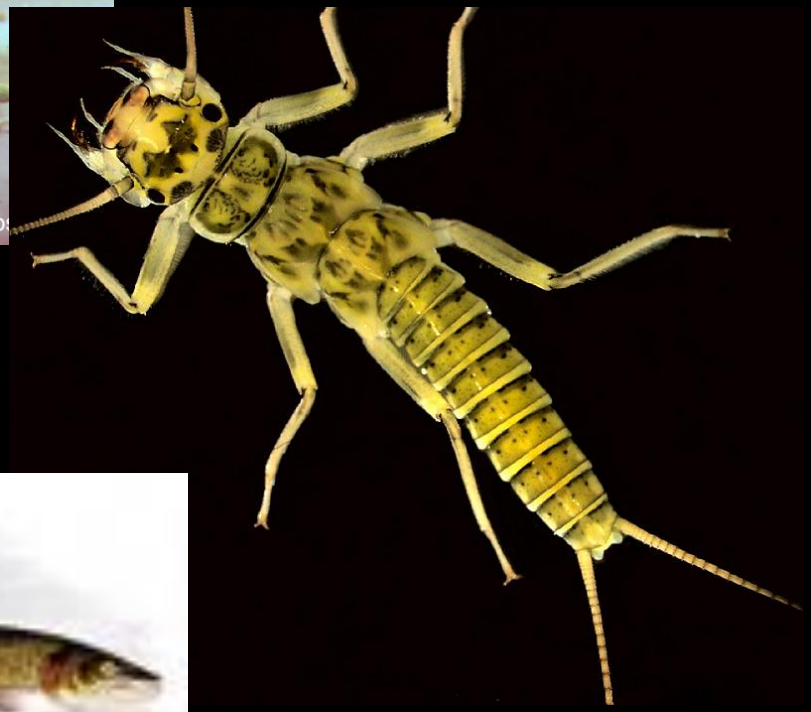


Aquatic Life

- Algae



- Macroinvertebrates



- Fish

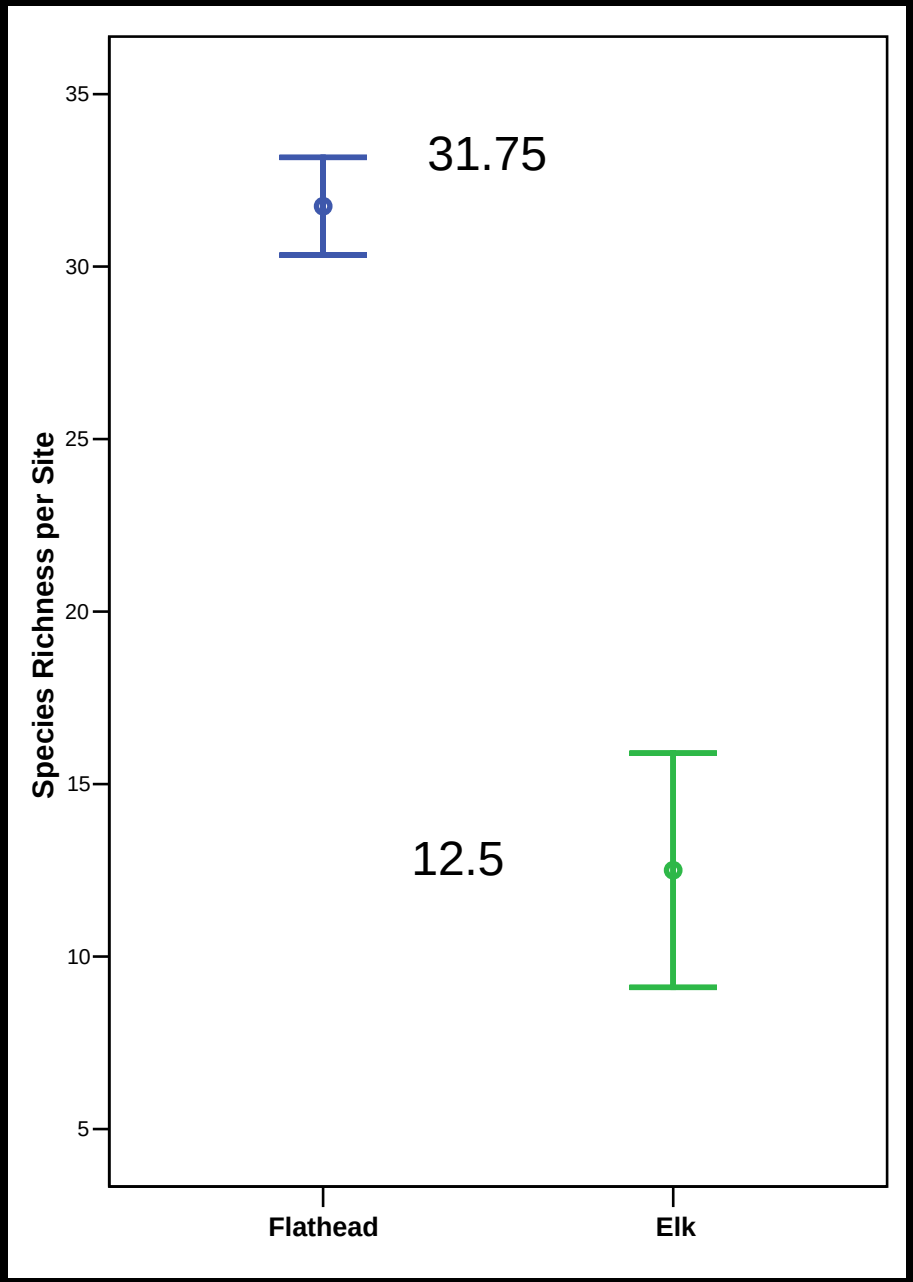
Algal Species Richness

P<0.001

Species Totals

Flathead - 74

Elk - 18

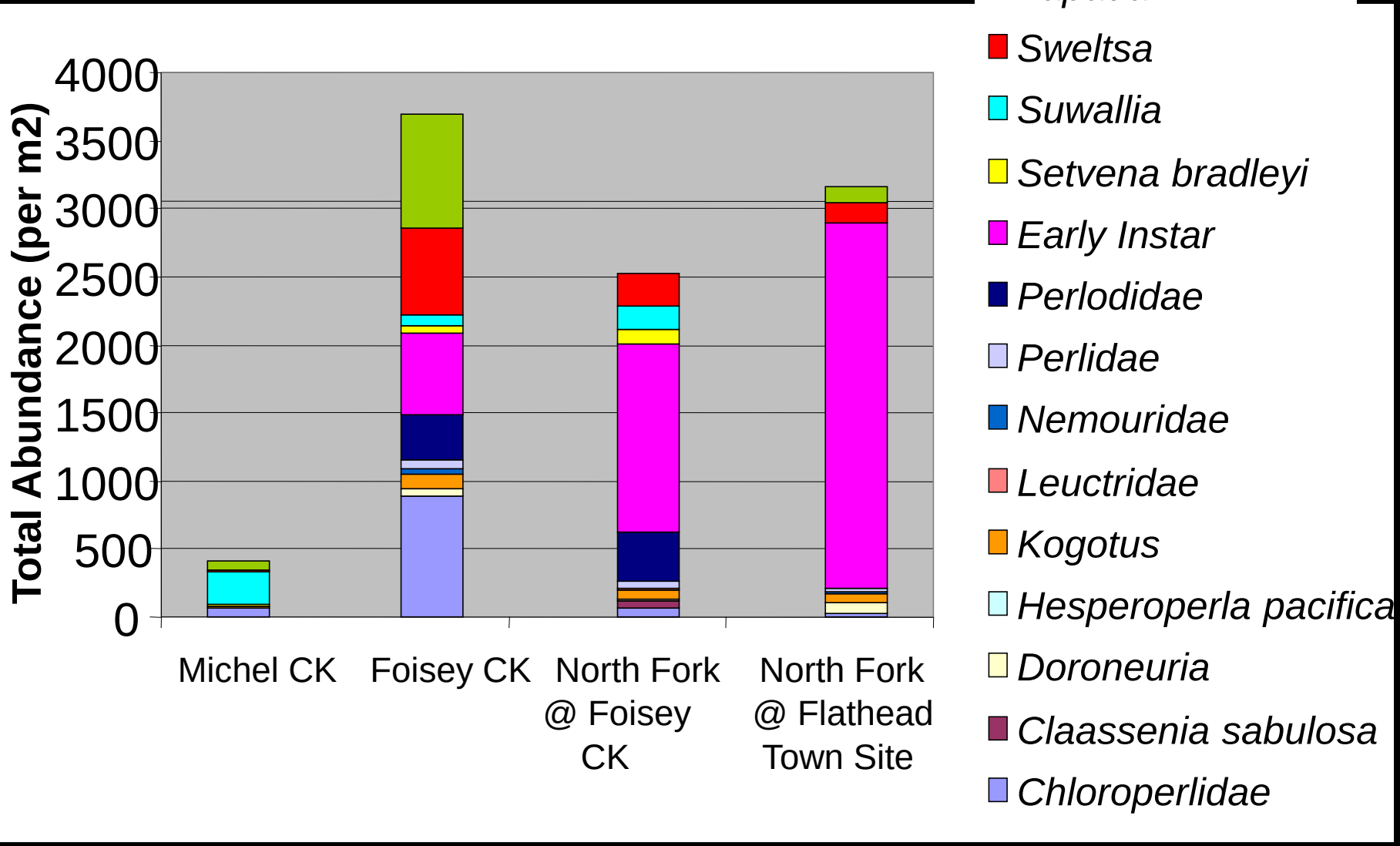


Caddisfly

Stonefly

Mayfly

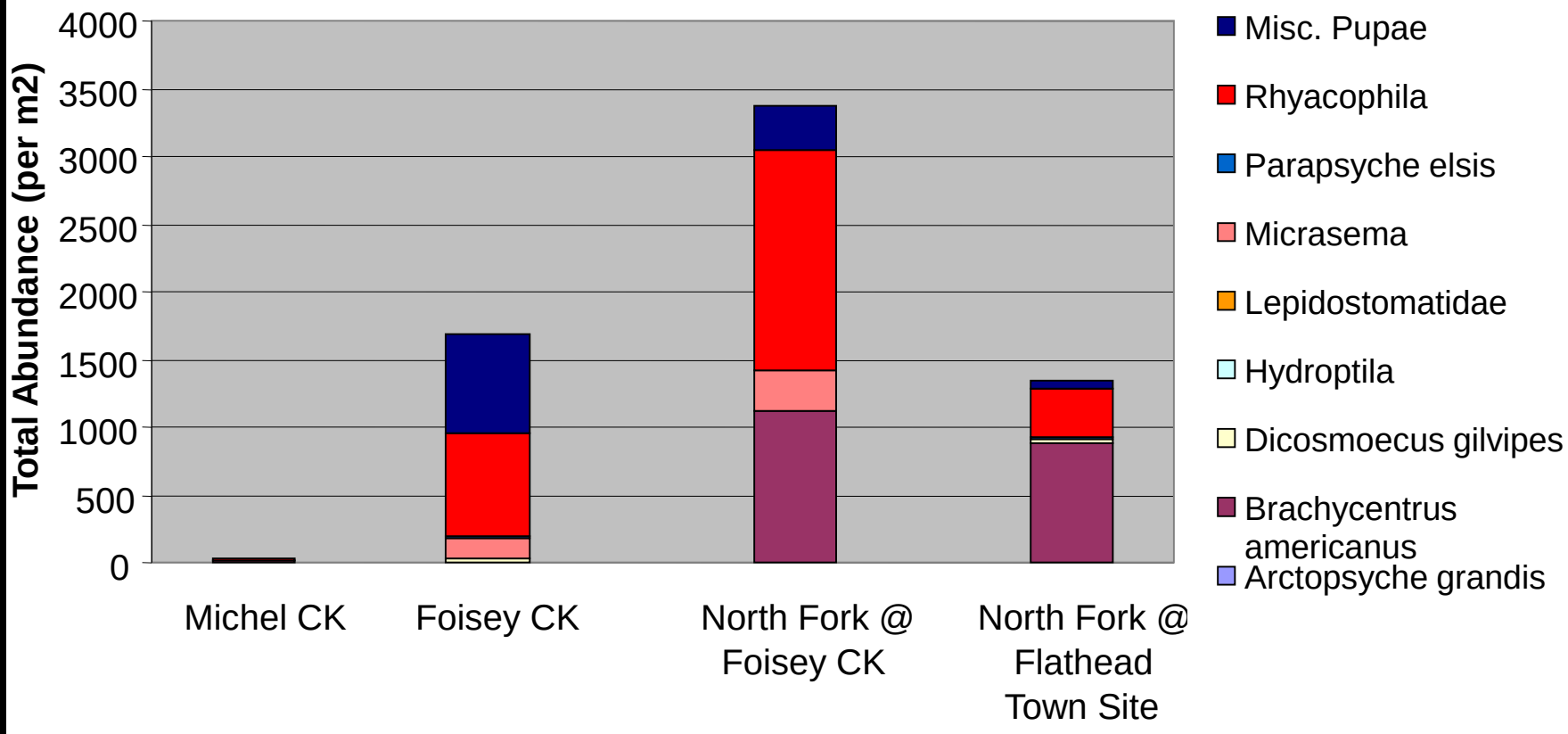
COMPOSITION of the ORDER PLECOPTERA



- **Stonefly species sensitive to pollution**

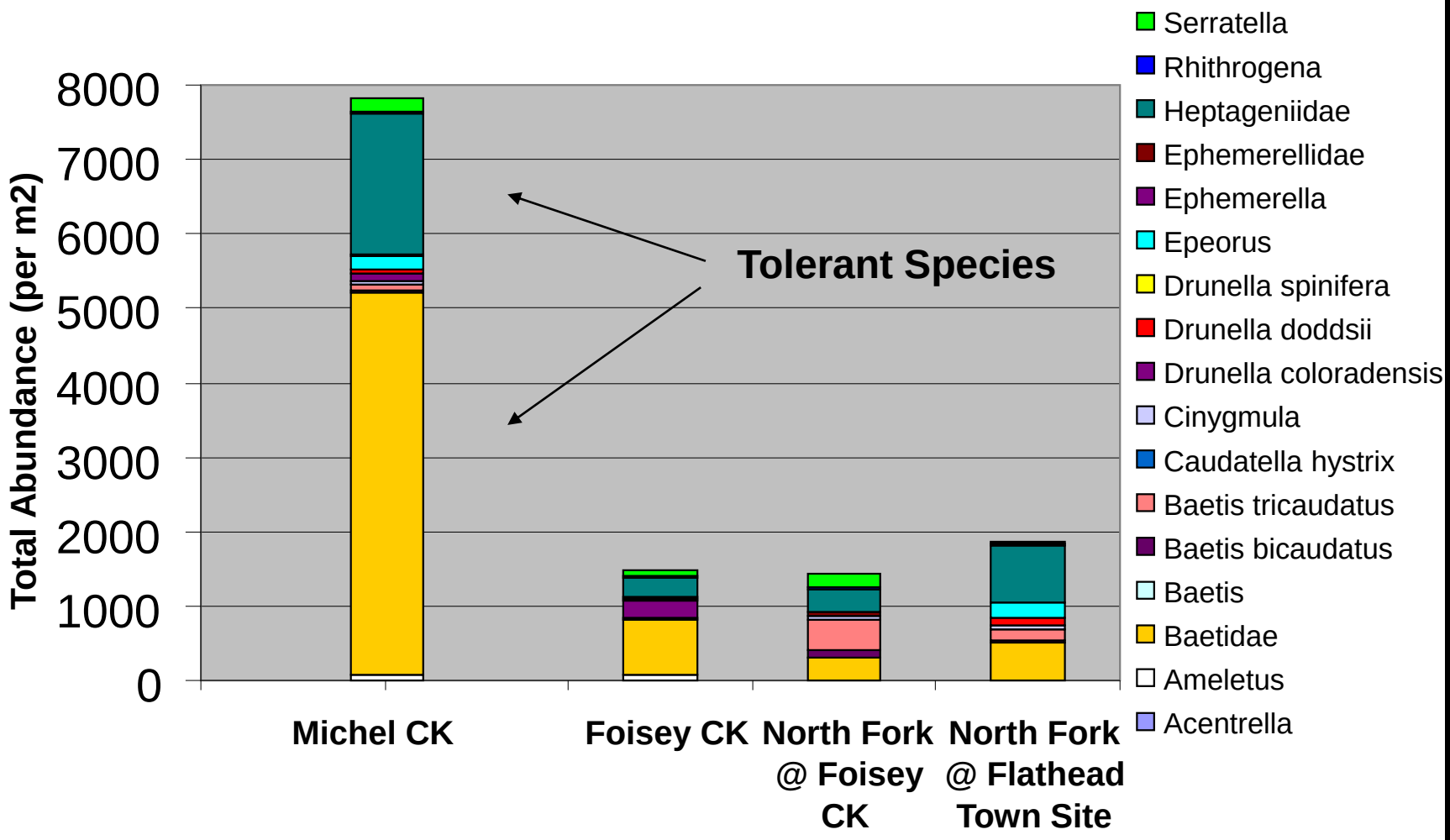
COMPOSITION of the ORDER TRICHOPTERA

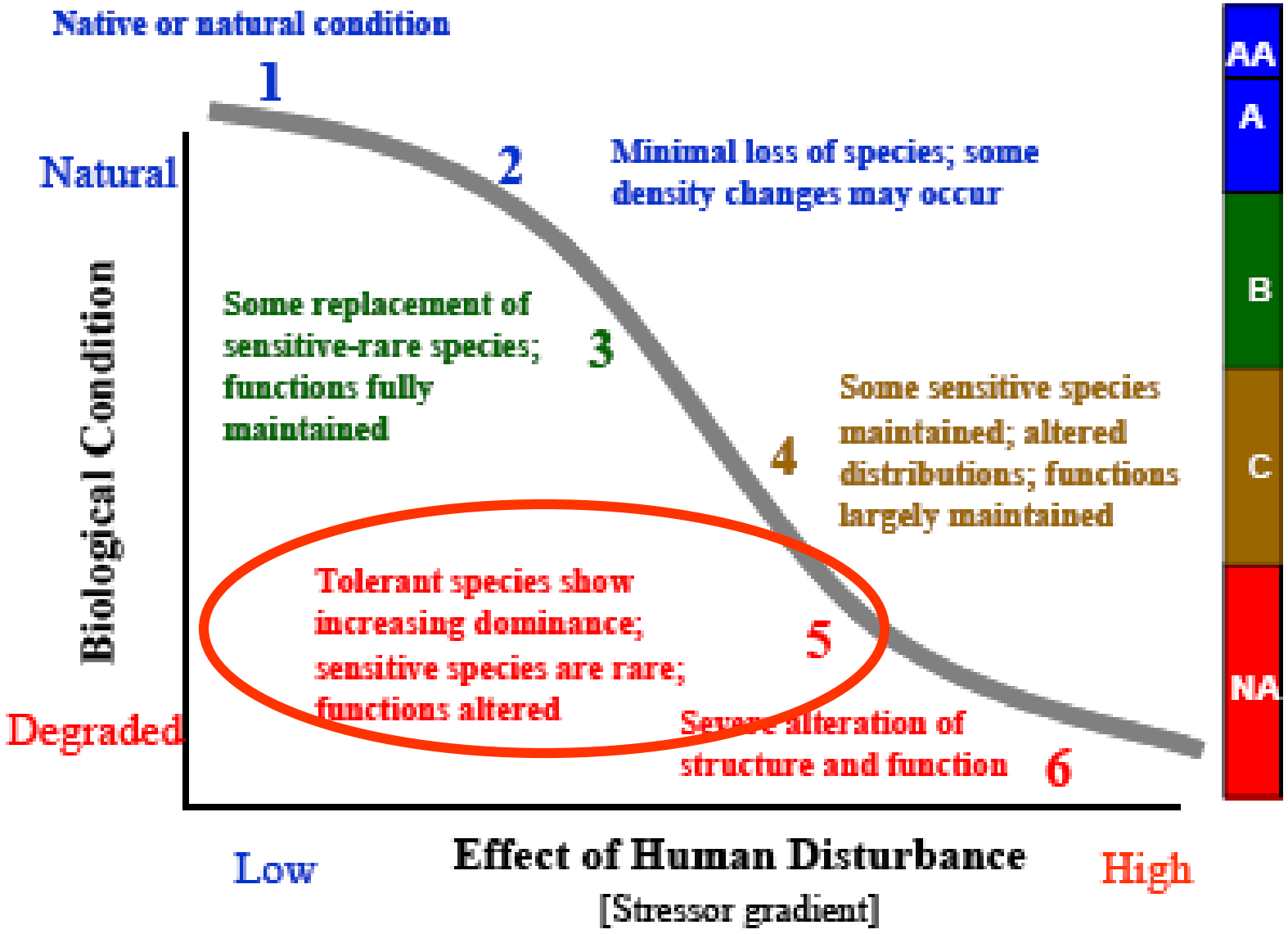
- Caddisfly species sensitive to pollution

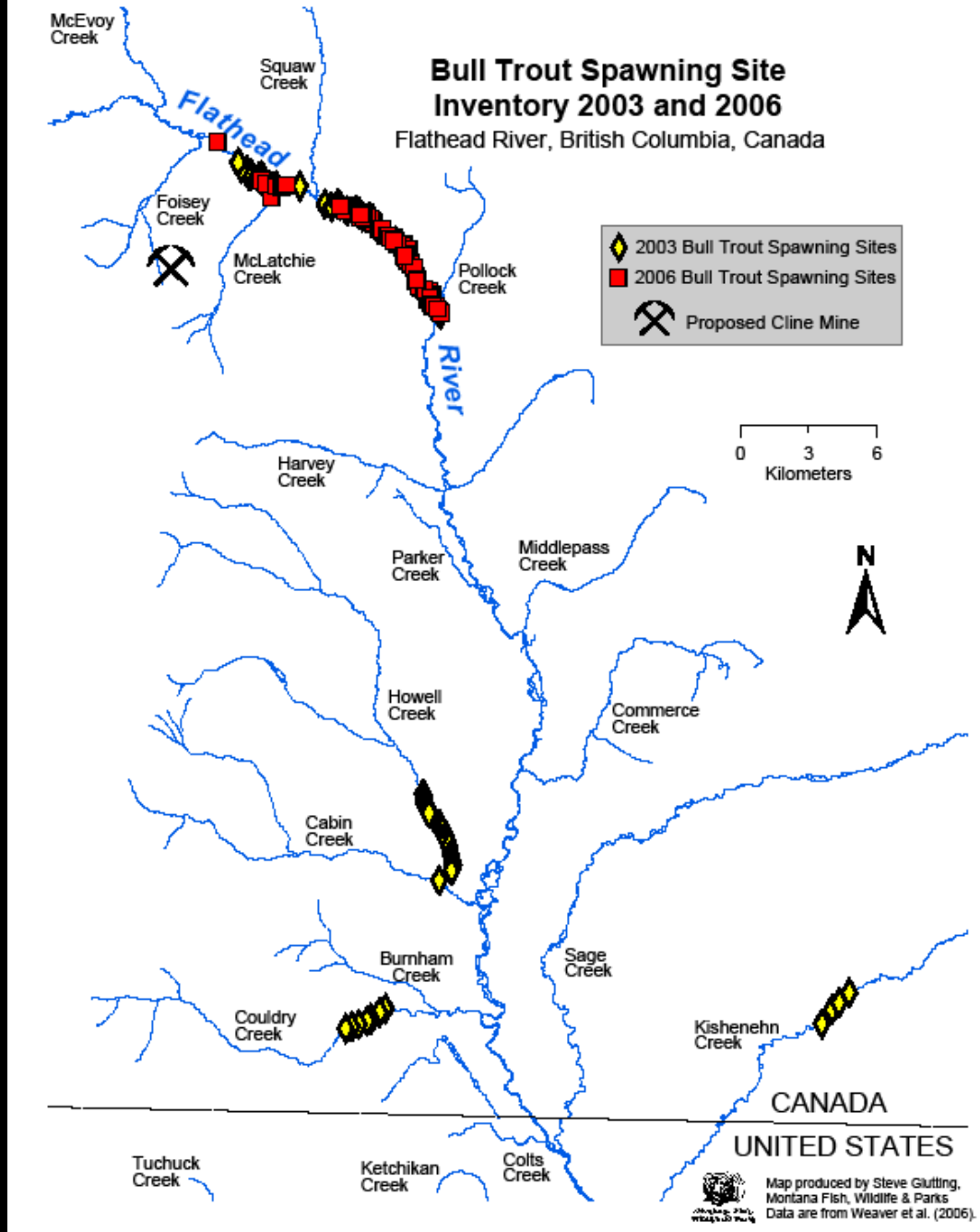


Ephemeroptera

- **Mayfly species tolerant to pollution**




Native or natural condition
1
Natural
2
Minimal loss of species; some density changes may occur
Some replacement of sensitive-rare species; functions fully maintained
3
Some sensitive species maintained; altered distributions; functions largely maintained
4
Tolerant species show increasing dominance; sensitive species are rare; functions altered
5
Severe alteration of structure and function
6
Degraded
Biological Condition
AA
A
B
C
NA
Low
Effect of Human Disturbance
[Stressor gradient]
High



- Bull trout migrate from Flathead Lake to spawn in British Columbia
- In 2003, there were 62 bull trout redds in the upper reach
- Representing 37% of spawning in the North Fork
- Representing 21% of bull trout spawning for Flathead Lake
- In 2006, there were 78 redds in the upper reach

Mining Condition

Degraded Water Quality

- Significant increase in selenium pollution

  (>50 – 100 x Se)

- Significant increase in sulfate pollution

  (>15 – 30 x SO_4)

- Highly significant increase in nitrate pollution

  (500 – 1000 x NO_3)

Mining Condition

Degraded Aquatic Life

- Significant decrease in sensitive species
- Significant increase in tolerant species
- Direct impact on Bull Trout spawning

- Classical indicators of Ecosystem Degradation

Speech from the Throne

Province of British Columbia
February 9, 2010

A new partnership with Montana will sustain the environmental values in the Flathead River Basin in a manner consistent with current forestry, recreation, guide outfitting and trapping uses.

It will identify permissible land uses and establish new collaborative approaches to trans-boundary issues.

Mining, oil and gas development and coalbed gas extraction will not be permitted in British Columbia's Flathead Valley.

The Science will continue its role in the final resolution in which Canadian and US officials work together to develop a natural resource policy that is protective of this remarkable, shared ecosystem.

A shared spirit of collaboration between US and Canada will be especially needed given the future challenges of a changing climate across this international landscape.