

Fish studies of the Eagle River at the Eagle Mine Site.

Results of restoration activities from
1990 to present.

Part 1. 1990-2007.

Presented by ERWC Eagle Mine Limited.

In 1984 the Eagle River from Belden to Minturn was contaminated by mine wastes emanating from various sources – including mine workings in Belden,



Eagle River flowing by mine workings in Belden

roaster piles in Belden dumped along the river,



Roaster Pile on south side of Eagle River in Belden. A roaster pile is the waste from an old-time inefficient ore refining operation that left a lot of metals including zinc in the processed ore.

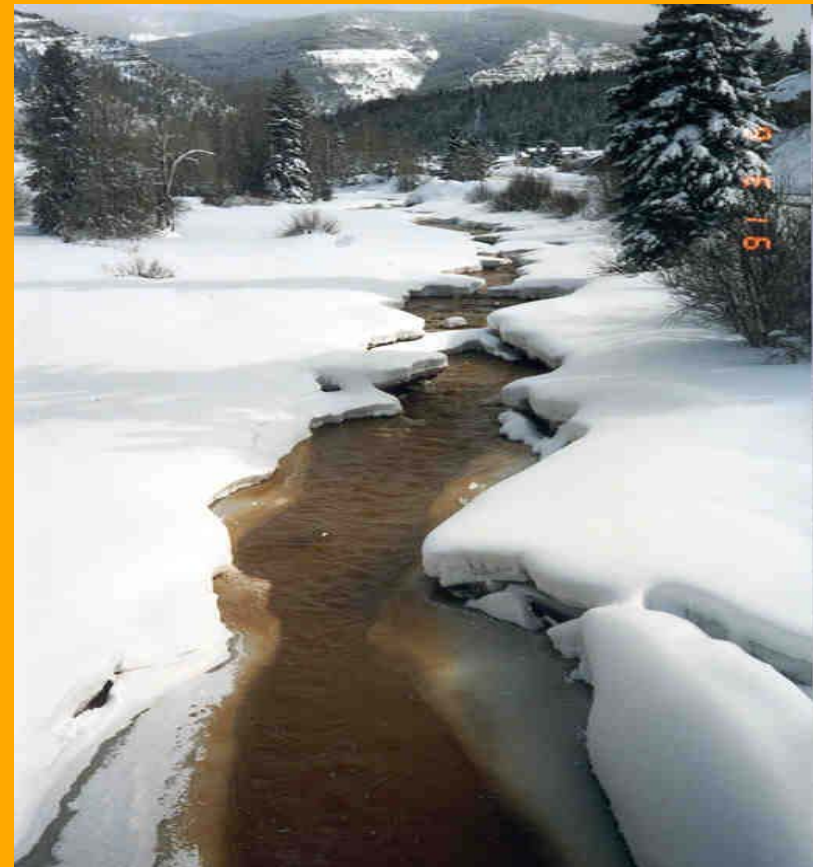
and tailings piles in many locations that introduced metals into the Eagle River,



Tailings pile south of Minturn before restoration

that all introduced a toxic stew of metals into the Eagle River. The Eagle River from Minturn upstream to Belden was a biological desert.

- In the spring of 1990 the Colorado Division of Wildlife and Colorado Division of Hazardous Materials and Waste Management found no fish in the Eagle River in Belden (300 feet of stream), one brown trout in the Eagle River south of Minturn (350 feet of stream above Two Elk Creek) and one brown trout and two brook trout south of Minturn (350 feet of stream).
- The Eagle River was as dead and quiet as the photo indicates from Belden to Minturn.



Eagle River north of Minturn, 1991, red water from mine wastes

In 1984 the State of Colorado filed a CERCLA (Comprehensive Environmental Response Compensation and Liability Act) lawsuit against the owner of the Eagle Mine Site. The lawsuit resulted in a massive multiyear recovery program.

- The roaster piles were removed, tailings moved or capped, water diverted from contaminant sources, a treatment plant installed, as well as other projects
- These major restoration projects began in 1988 and continued through 1996, minor projects until 2006.
- Additional restorations are being planned.



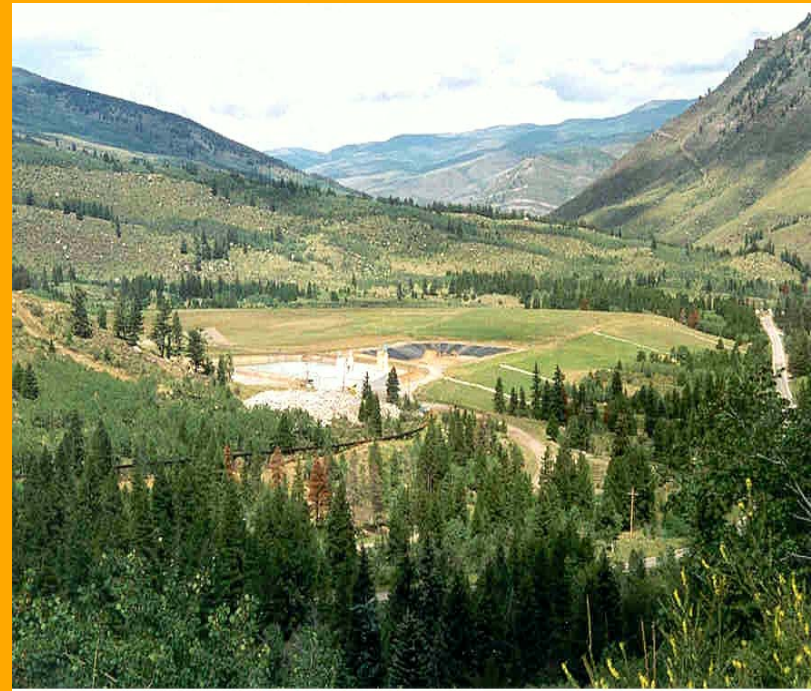
Roaster pile at Belden

The roaster pile on the south side of the Eagle River at Belden was removed in 1994. This material contained a lot of zinc



No fish were found in Belden downstream of this pile prior to restoration. Now the brown trout at this site are often more abundant than at any other sampling site, including reference locations

Consolidated tailings pile



Consolidated tailings pile before and after. Treatment plant located in photo on the right indicated by arrow.

The Eagle River began to change as restoration projects were completed

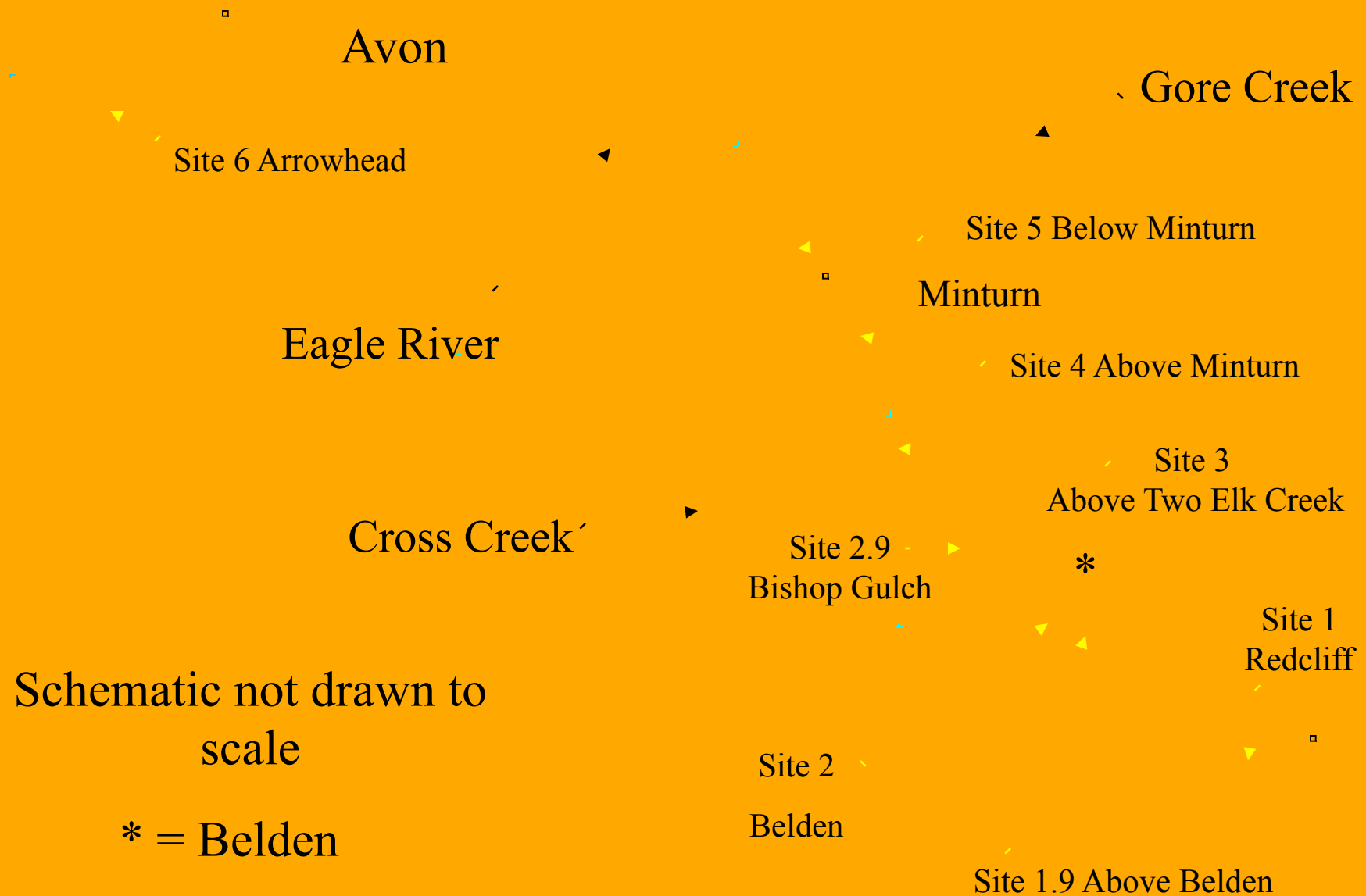
- About 90% of the metal contamination has been removed since 1984.
- The fisheries improved in the Eagle River through the mine site. Brown trout are now abundant with multiple age classes present through the entire mine site.
- “No man ever steps in the same river twice, for it's not the same river and he's not the same man.” (Heraclitus a Greek philosopher).

The Colorado Division of Wildlife and the Colorado Hazardous Materials and Waste Management Division began monitoring the Eagle River as the mine owners designed and completed various restoration projects.

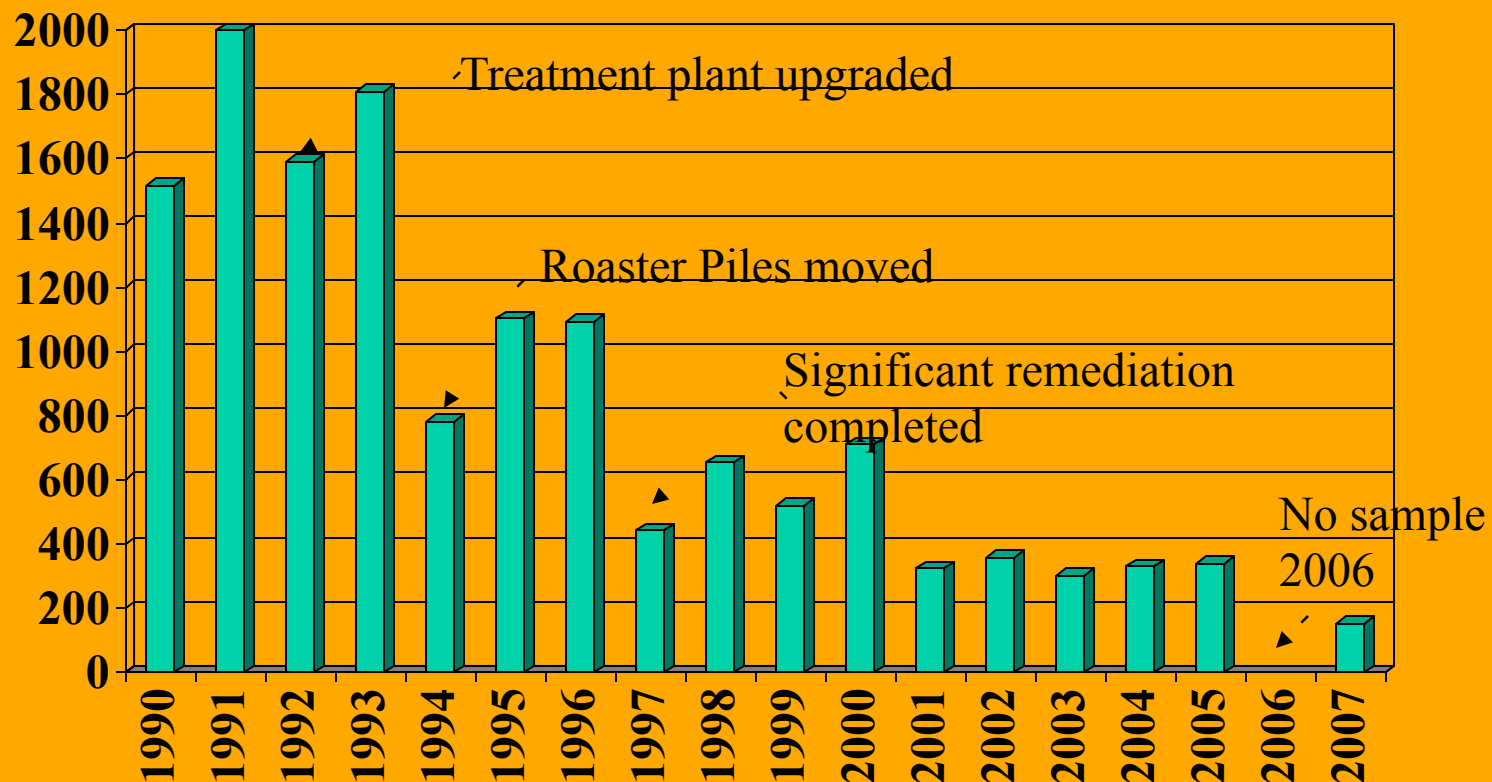
- In time eight sampling points were established
- Site 1 – The Eagle River at Redcliff just upstream of Homestake Creek = C
- Site 1.9 _ The Eagle River just upstream of the Eagle Mine Site = C
- Site 2 – The Eagle River in Belden
- Site 2.9 The Eagle River at Bishop Gulch
- Site 3 – The Eagle River just upstream of Two Elk Creek
- Site 4. – The Eagle River on south side of Minturn
- Site 5 – The Eagle River downstream of Minturn
- Site 6 – The Eagle River at Arrowhead = C

- C = comparison site, assumed to be uncontaminated by mine releases.

Schematic map Eagle River sampling sites

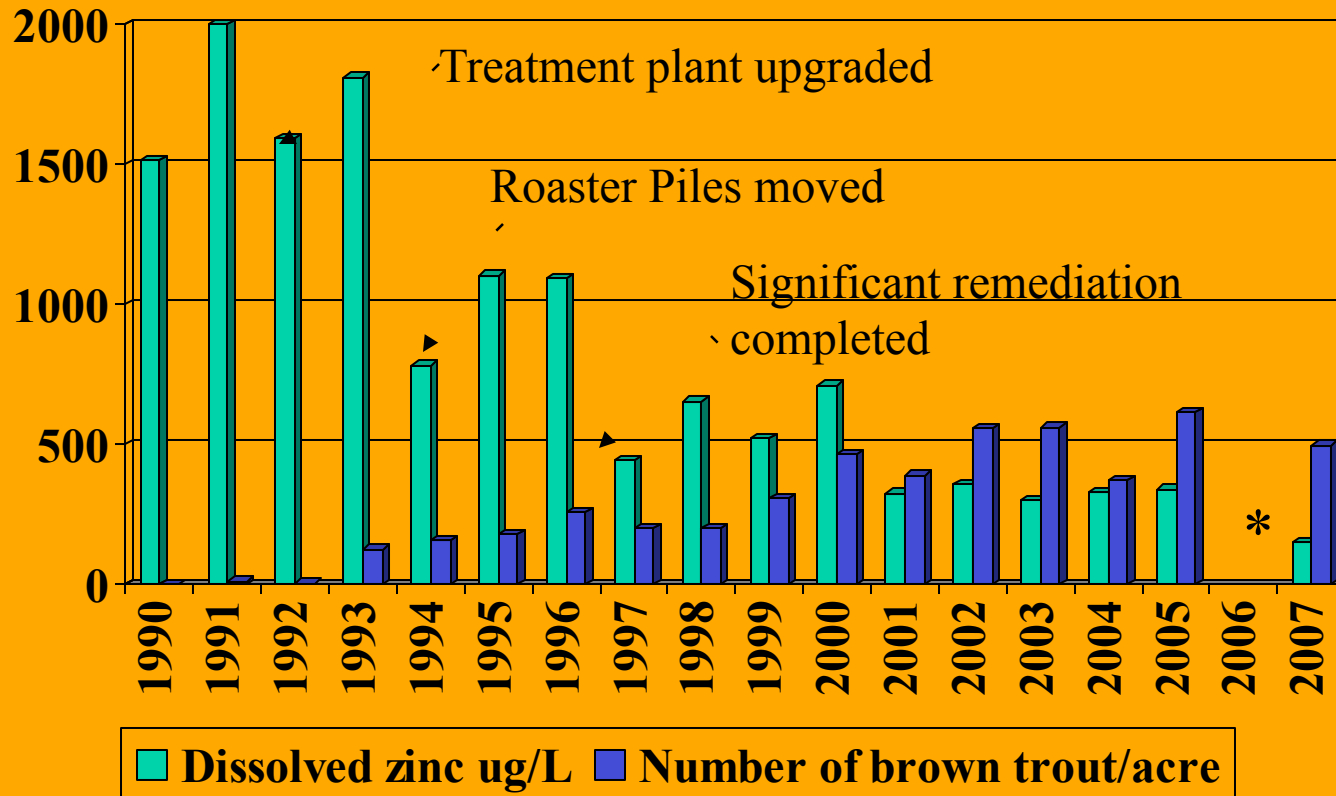


Dissolved zinc ug/L at Eagle River Site 3, downstream of treatment plant effluent and upstream of Two Elk Creek



Dissolved zinc concentrations tended down for years after major treatment Project completed. In 1996 refined zinc product removed from building in Belden. In 2006 a waste pile was removed from a site adjacent to the river in Belden.

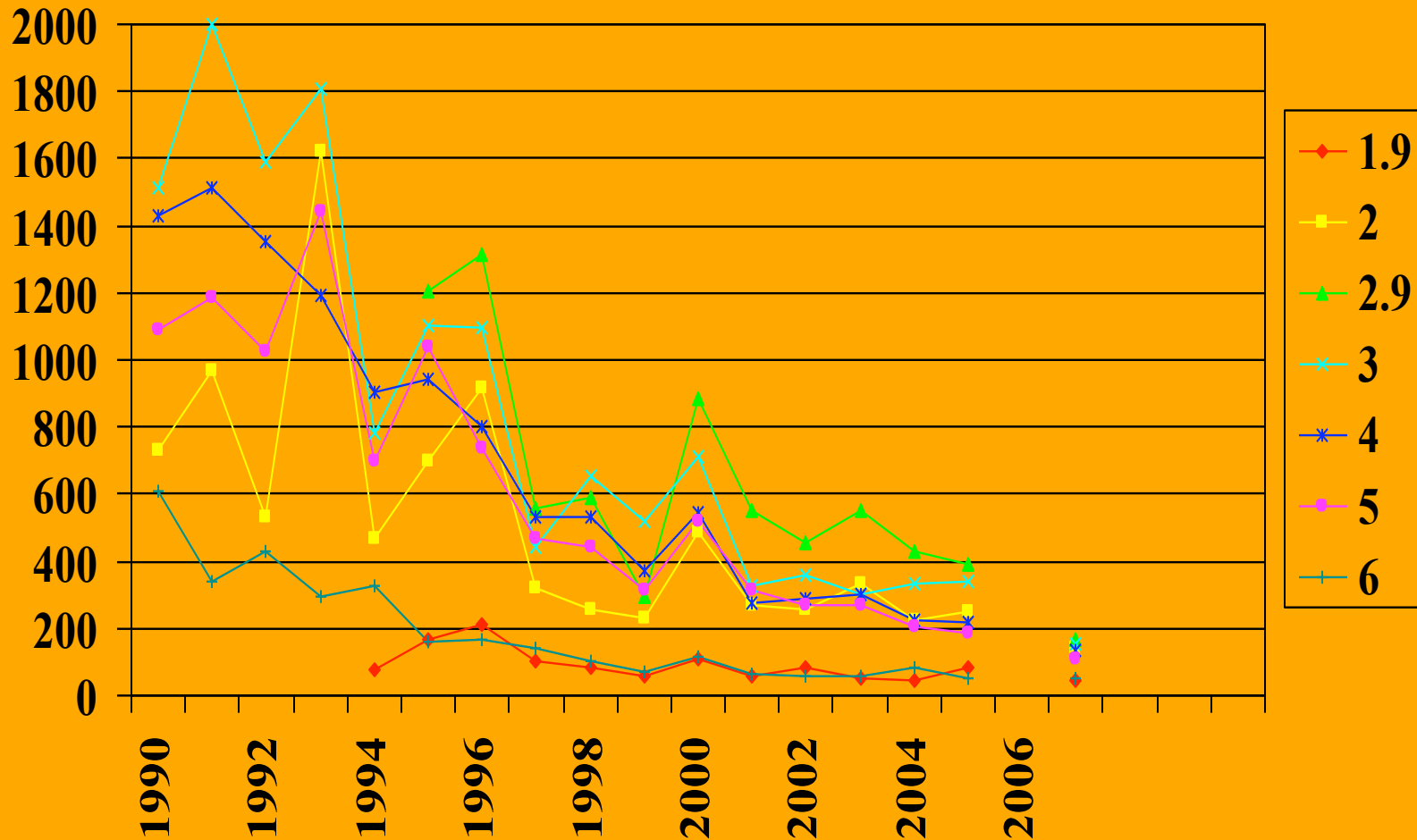
Dissolved zinc ug/L at Eagle River Site 3, downstream of treatment plant effluent and upstream of Two Elk Creek



Dissolved zinc concentrations tended down for years after major treatment projects completed. Brown trout, always present at Site 3 increased in numbers in same time period. * = No samples collected in 2006

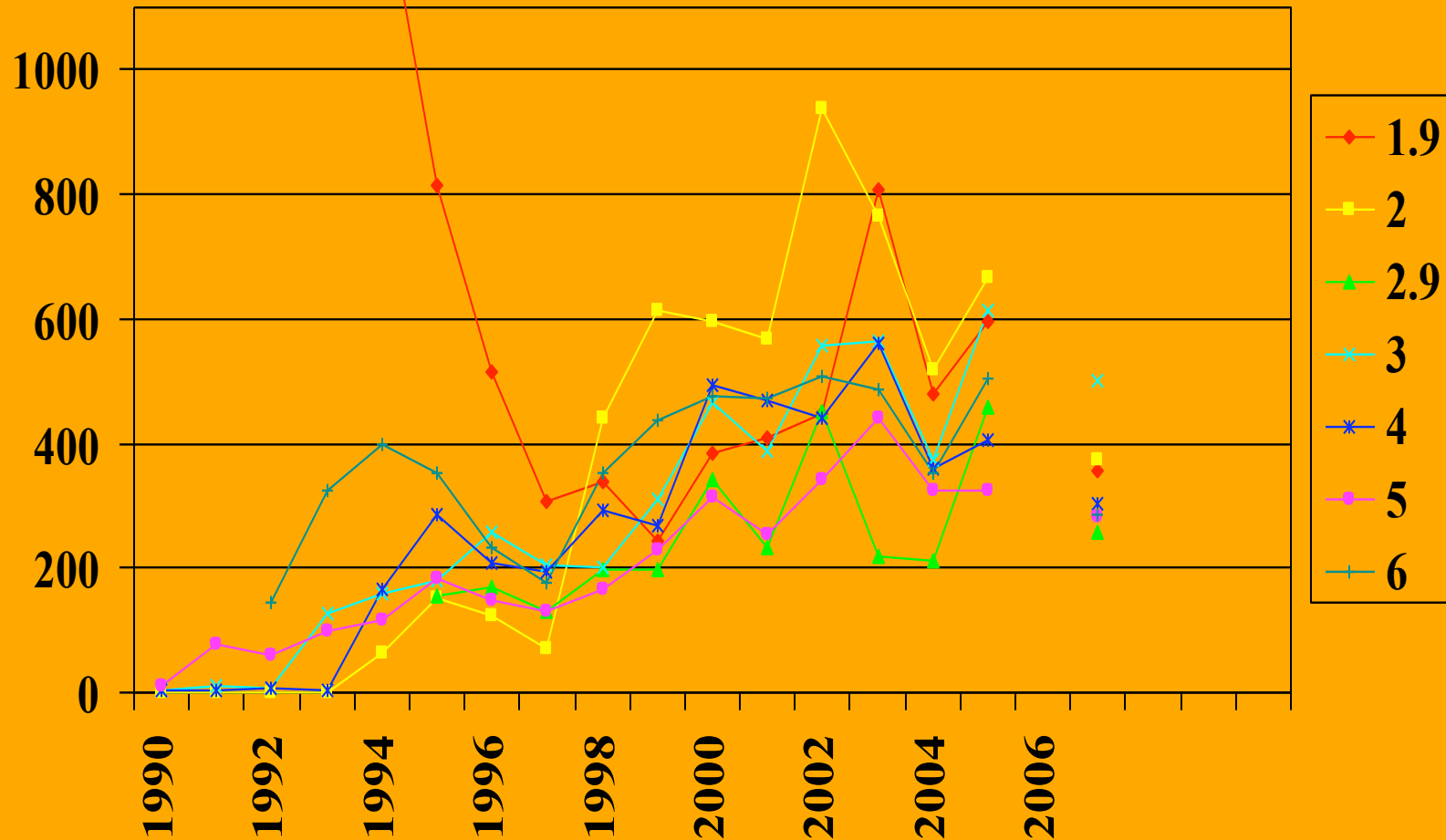
- The same trend held true at all the sampling sites downstream of the Eagle Mine Site from 1990 through 2007. The numbers of brown trout increased while the zinc concentrations (and other metals such as cadmium and copper) decreased. Brown trout numbers at the three comparison sites varied in response to other environmental variable such as the water level in spring associated with snow melt or drought cycles.

Dissolved zinc (ug/L) Eagle River sampling sites 1990-2007.



Sites 1.9 and 6 are reference sites, above and below Eagle Mine Site, respectively, where zinc was lowest. Note that zinc concentrations are often highest at Site 2.9.

Brown trout (number/acre) Eagle River sampling sites 1990-2007.



Sites 1.9 and 6 are reference sites, above and below Eagle Mine Site, respectively

- Not much change in dissolved zinc levels has occurred since 1999. The highest zinc measurements were often measured at Site 2.9 (6 of 8 sampling events since 1999) while the lowest number of brown trout per acre were present (5 of 8 sampling events since 1999) at Site 2.9.
- In contrast, the highest number of brown trout per acre at all sites including reference locations were measured at Site 2 (7 of 9 events since 1998) downstream of where the roaster piles were removed in '94 and the zinc product in '96.
- Much of the restoration has been a success while some problems seem to remain.

- The mine owner (CBS the television company) and the State of Colorado petitioned the Colorado Water Quality Control Commission in 2008 and successfully relaxed the stream standards for zinc, cadmium and copper that apply to the Eagle River within the Eagle Mine Site.
- CBS is currently designing a reclamation program that will result in decreasing zinc to levels that will meet the new stream standards.
- Data (fish and water quality) collected since 2007 provides an indication of what the new standards mean for the river and indicates how close CBS is to attaining the new standards.
- Annual fish sampling of all sites was not conducted in 2006 and severe snow accumulations in '08 and '09 precluded sampling at some sites in those years. All sites were sampled in the spring of 2010.