United States Department of the Interior

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August 13, 2001

Mr. Holland Shepherd
New Mexico Energy, Minerals,
and Natural Resources Department
Mining and Minerals Division
2040 South Pacheco Street
Santa Fe, New Mexico 87505

Dear Mr. Shepherd:

Thank you for the opportunity to participate in the technical review of the Molycorp Mine Closeout/Closure Plan. The following comments are in response to issues raised in the June 19, 2001, Molycorp conference call hosted by the U.S. Environmental Protection Agency regarding fish and benthic invertebrate populations in the Red River. Comments are based primarily on information provided in the report titled "Red River Biological Monitoring 2000" (Chadwick 2001). While Chadwick (2001) discusses some very important points regarding the ecological health of the Red River, there are several additional issues that were not addressed.

Fish Population Surveys

Although trout populations (density) progressively decrease between the town of Red River and Hansen Creek (upstream of Molycorp), trout biomass does not. Chadwick (2001) mentions biomass, but discussions throughout the document focus on total trout populations (rather than biomass and individual species trends). The relative steady biomass concurrent with a decrease in density indicates a shift from smaller fish (e.g., brook trout, other native trout) to larger fish (e.g., stocked rainbow trout). There is a slight decrease in biomass at the June Bug campground, which may be related to a switch in competitive advantage between brown trout (which prefer bigger, slightly warmer waters) versus previously abundant brook trout (which prefer smaller, cooler headwaters). But brook trout and brown trout mean weight (biomass) and condition factor (ratio of fish weight to length) actually increase at the June Bug site (bigger, fatter fish compared to sites further upstream). Thus, adverse effects to the fish community due to natural metal loading above the Molycorp mine appear less severe once biomass and species distributions are considered.

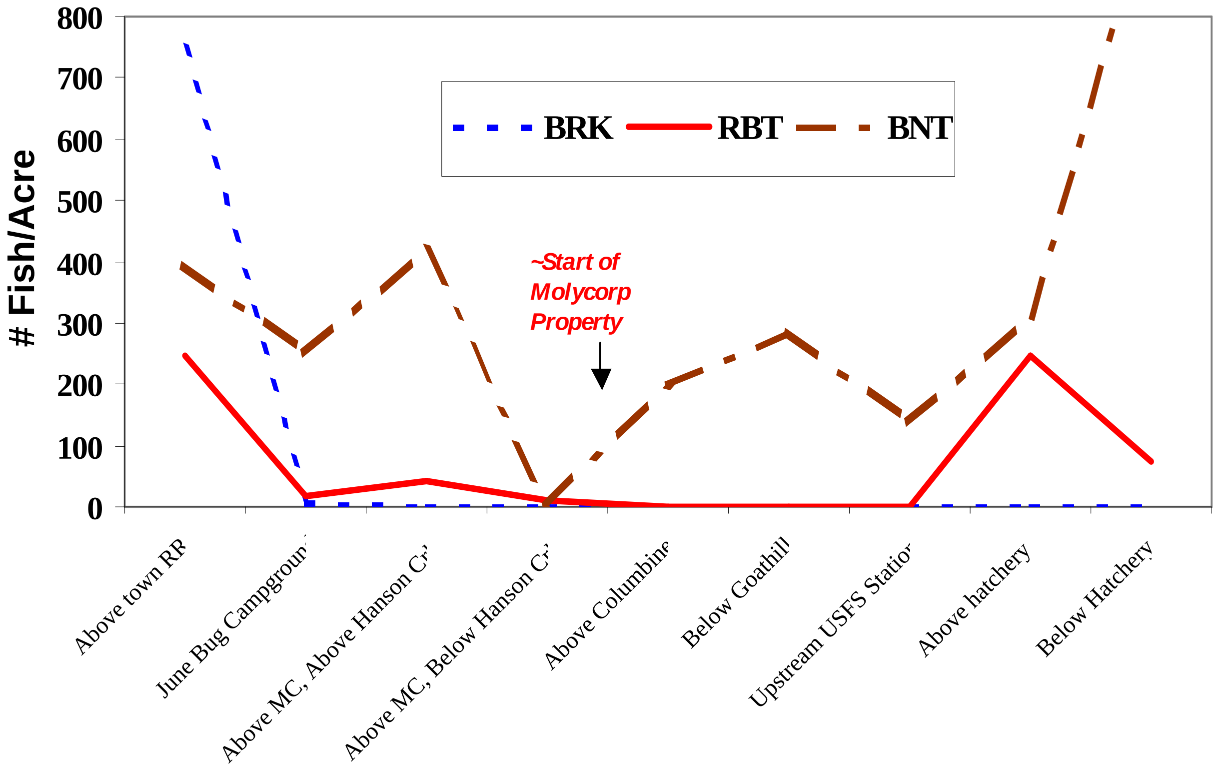

Figure 1. Individual fish species population trends in the Red River during September 2000 (data re-plotted from Chadwick 2001). BRK = brook trout; RBT = rainbow trout; BNT = brown trout; MC = Molycorp.

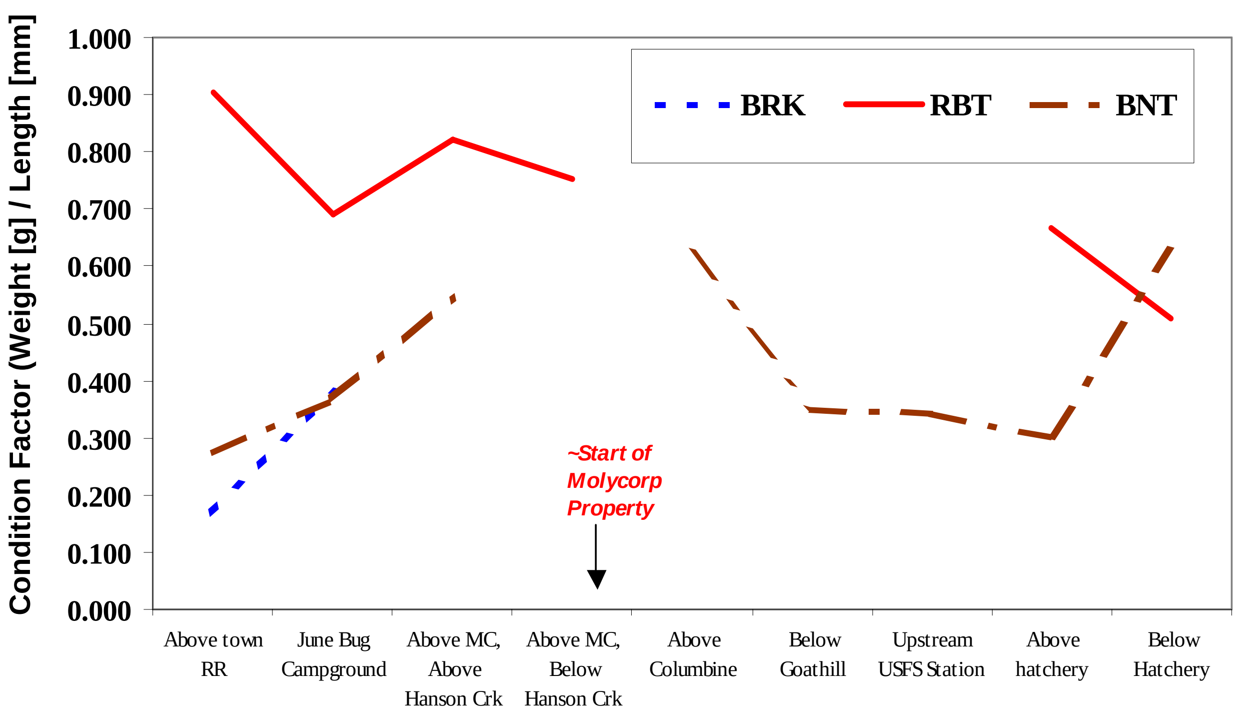

Figure 2. Fish condition factor, which is the ratio of fish weight to length, for three trout species in the Red River sampled in September 2000 (data derived from Chadwick 2001). BRK = brook trout; RBT = rainbow trout; BNT = brown trout; MC = Molycorp.

Moving farther downstream, even though trout populations approach zero below Hansen Creek (above Molycorp operations), some rainbow trout persist. Nonetheless, there is clearly a negative impact on fish populations below Hansen Creek. The cause(s) of this decline may include: natural metals loading from the Hansen Creek hydrothermal scar, increased fishing pressure, decreased habitat quality or quantity, and decreased invertebrate food availability.

Below Molycorp property, rainbow trout are completely absent even though they are stocked upstream. The only trout species present at and below Molycorp operations are brown trout. Studies of fish populations and species distributions in the metal-contaminated Clark Fork River in Montana, noted this same trend. Rainbow trout were absent from many contaminated stretches of the Clark Fork River, whereas brown trout remained. Laboratory studies determined that rainbow trout were more sensitive to metals than brown trout (Phillips and Lipton 1995). Concurrent studies concluded that pulses of metals (i.e., storm events), prior acclimation to metals, behavioral avoidance, and consumption of metals-contaminated invertebrates, could adversely affect fish health, survival, and/or species distributions[1].

Despite gradual increases in brown trout numbers through much of Molycorp's property, mean brown trout weight and condition factor decrease, suggesting impaired health. Impaired health could be related to a parallel decrease in benthic invertebrate density (food) and/or sub-lethal contaminant stressors. Brown trout density also decreases farther downstream at the Questa Ranger Station site. This could be related to the cumulative impacts of several low-pH, metal-rich seeps (such as from Capulin Canyon) on water quality beyond the downstream border of Molycorp’s property. More contaminant-sensitive rainbow trout do not return until just upstream of the hatchery.

While other factors, such as poor habitat quality and discharge, could explain the trends in fish and invertebrate density and species diversity, contaminants can not be discounted as a causative factor. Even if surface-water grab-samples do not indicate an exceedance of a water quality criterion, high-concentration pulses of contaminants can be toxic, may cause fish to avoid metal enriched water, and result in the temporary collapse of benthic invertebrate populations. It is possible that the Red River is markedly "biologically impoverished" or "devoid of aquatic life" during these events.

Although aquatic ecosystems will recover from chemical and physical perturbations, this does not mean that the ecosystem is without long-term adverse impacts. The presence of life does not mean an ecosystem is healthy and self-supporting (the Mining Act requires that Molycorp return mine-impacted areas to a "self-sustaining ecosystem").

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[1] There are numerous peer-reviewed, published papers that discuss sensitivity of various trout species, especially those produced as part of investigations at the Clark Fork River in Montana. These studies are published as a special section in the Canadian Journal of Fisheries and Aquatic Sciences, Volume 52 (1995).

Invertebrate Community Surveys

The invertebrate community data are equivocal. Community metrics vary widely between different sites along the Red River, and between replicate samples collected at individual sites. Because habitat, sediment embededness, sediment and water metal concentrations, invertebrate tissue metal concentrations, flows, seasonal variation, and storm events, will all affect invertebrate community metrics, it is difficult to draw any definitive conclusions from Chadwick (2001) regarding the potential impacts of Molycorp operations on the biological health of the Red River.

There is, however, a steep decline in percent ephemeroptera, plecoptera, and trichoptera (percent EPT) taxa and percent ephemeroptera downstream of Molycorp operations. There is also a decline in overall invertebrate density, number of taxa, and number of EPT taxa below Molycorp operations. But these declines follow an initial sharp increase in percent EPT, and even the lowest percent EPT measured below the mine is not significantly different than upstream reference sites. Nonetheless, decreases in some metrics, a significant negative correlation between copper and zinc concentrations and numbers of total and EPT taxa, and the increase in sediment copper and zinc concentrations below Molycorp operations, suggest that further studies are needed to assess if Molycorp operations are having an adverse effect on invertebrate communities.

Studies by Failing (1993) and Lynch et al. (1988) also noted that invertebrate tissue metal concentrations were greater below Molycorp operations. Concentrations of copper, manganese, and molybdenum were approximately 2 times, 15 times, and 6 times, respectively, greater in invertebrates collected below Molycorp operations. Concentrations of copper and zinc in invertebrates exceed Lowest Observable Adverse Effect Level (LOAEL) based benchmarks for food items of insectivorous birds (Sample et al. 1996).

Sediment Sampling

The “freeze-core” sampling technique, in which an eight-inch core of sediment is extracted, may not be representative of the surface sediments that biota contact. Moreover, the lack of a clear trend in percentage fine sediment along the length of the Red River is not surprising given the sampling technique. Finer sediments will preferentially accumulate near the surface, in pool habitat, and along banks and backwaters. Fine sediment content will also vary greatly according to season, time since the last storm runoff, etc. Future analyses of fines should focus on surface sampling. Also, rather than comparing invertebrate populations to fine sediment content, comparisons should be made to percent sediment embededness.

Freeze-core sediment metal concentrations may not reflect the biota exposure concentration. As is evident in Table 1, sediment metal concentrations determined in Chadwick (2001) are the lowest among four different studies. This may be due to "dilution" of sediment metals by coarser sands from deeper in the sediment core. Comparison of these metal concentrations to the most recently published sediment effects thresholds (MacDonald et al. 2000) indicates that copper and zinc exceed "probable effects concentrations." The thresholds determined by MacDonald et al. (2000) are "consensus-based" thresholds. They are derived by calculating the geometric mean of the thresholds derived by up to six different research groups, including the Ontario "Severe Effect Level" criteria (Persaud et al. 1993) used by Chadwick (2001).

Table 1. Metals concentrations in sediment at or near Goathill Campground determined in various studies.

Study	**Aluminum**	**Cadmium**	**Copper**	**Lead**	**Zinc**
Chadwick 2001	1,890	0.4	31	24	136
Taylor 2000	40,800	BD	390	BD	1,630
Allen *et al.* 1999	103,000	BD	250	BD	330
Kent 1995	10,900	BD	104	91	182
Threshold Effects Concentration	***NA***	***1.0***	***32***	***36***	***121***
Probable Effects Concentration	***NA***	***5.0***	***149***	***128***	***459***

Samples collected by Taylor (2000) focused on depositional areas were biota would likely be exposed. Values are in mg/kg dry weight. BD = Below Detection limit; NA = Not Available.

Nonetheless, even though concentrations are lower as documented in Chadwick (2001), there is a clear trend of increasing zinc concentrations below Molycorp's operations. Other studies (e.g., Table 1) also indicate an increasing trend in aluminum, cobalt, copper, manganese, molybdenum, and nickle concentrations.

Toxicity testing

Results of the water and sediment toxicity tests suggest that there may be adverse effects due to both natural metals sources and Molycorp operations; however, there are no clear trends. Concentrations of metals in water and sediments may vary widely, so a single grab sample is only a snapshot in time and may not reflect "typical" conditions, or complex, changing conditions. More advanced laboratory testing is required to simulate the dynamic conditions of the Red River.

In conclusion, there appears to be an impact to fish populations, species distributions, weight, and health due to Molycorp operations, although upstream contaminant loading and habitat alterations due to various natural and anthropogenic activities will also affect fish and invertebrate populations, density, and species distributions.

Every effort should be made to remediate and restore as much of the Red River as possible to a "self-sustaining ecosystem" with a "Post Mining Land Use" of "Wildlife habitat" as specified in the New Mexico Mining Act, §507.A and §107.MM. Please contact Russ MacRae of my staff at (505) 346-2525, ext. 124 if you have questions or require further information.

Sincerely,

Joy E. Nicholopoulos
Field Supervisor

cc:
Environmental Coordinator, Molycorp, Inc., Questa, New Mexico
Director, New Mexico Department of Game and Fish, Santa Fe, New Mexico
Director, New Mexico Environment Department, Groundwater Quality Bureau, Santa Fe, New Mexico
Director, New Mexico Environment Department, Surface Water Quality Bureau, Santa Fe, New Mexico
Director, Superfund Program, U.S. Environmental Protection Agency, Dallas, Texas

References Cited

Allen, B.D., A.R. Groffman, M.C. Molles Jr., R.Y. Anderson, and L.J. Crossey. 1999. Geochemistry of the Red River stream system before and after open-pit mining, Questa area, Taos County, New Mexico. Final Report prepared for the New Mexico Office of the Natural Resource Trustee, Santa Fe, NM.

Chadwick Ecological Consultants, Inc. 2001. Red River Aquatic Biological Monitoring, 2000. Report prepared for Molycorp, Inc.

Failing, L.F. 1993. Aquatic insects as indicators of heavy metal contamination in selected New Mexico streams. Masters Thesis, New Mexico Highlands University, School of Science and Engineering. 85 pp.

Kent, S. 1995. Expanded site inspection report on Molycorp Inc., Questa Division, Taos County New Mexico (CERCLIS ID# NMD0022899094). New Mexico Environment Department, Groundwater Protection and Remediation Bureau, Superfund Program, Santa Fe, New Mexico.

Lynch, T.R., C.J. Popp, and G.Z. Jacobi. 1988. Aquatic insects as environmental monitors of trace metal contamination: Red River, New Mexico. Water, Air, Soil Pollu. 42:19-31.

Phillips, G. and J. Lipton. 1995. Injury to aquatic resources caused by metals in Montana's Clark Fork River basin: historic perspective and overview. Can. J. Fish. Aquat. Sci. 52:1990-1993.

Sample, B.E., D.M. Opresko, and G.W. Suter II.. 1996. Toxicological Benchmarks for Wildlife: 1996 Revision. ES/ER/TM-86/R3. Oak Ridge National Laboratory, Oak Ridge, Tennessee. 33 pp.

Taylor, R. 2000. Red River water and sediment sampling results. U.S. Geological Survey unpublished data.