Idaho Mining and Exploration, 2012

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INTRODUCTION

The multi-year rise in value of Idaho’s annual non-fuel mineral production ended decisively in 2012 as many commodity prices continued a decline started late in 2011, and one of the state’s major metal mines was shut down for maintenance most of the year. Exploration projects abounded, though the effect of tightened financing hurt companies and projects. Figure 1 shows the locations of Idaho’s major mining areas. The Silver Valley in northern Idaho and the Phosphate District in southeastern Idaho continued to be the most active in mineral production, but there was significant exploration activity in Valley County and across the center of the state, principally seeking precious metals. Metal prices for silver and gold remained quite high throughout 2012 though they were below the peaks of 2011, with gold spot prices trading in a range of $1600 to $1800 per troy ounce and silver around $30 per troy ounce, fueling the increase in exploration activity in the state. Industrial minerals associated with the construction industry were rebounding somewhat as markets stabilized after the 2009 recession. Employment and budget woes were still present in other sectors of Idaho’s economy, including government and education, as well as the construction industry.
Figure 1. Location of 2012 mining areas in Idaho. Closed mines indicated by an “X.”
According to the Idaho Division of Financial Management (DFM), direct mining employment increased from 2,702 jobs in the last quarter of 2011 to 2,824 jobs by the last quarter of 2012, not including the mineral-related chemical processing plants. New mines and expansions are anticipated to add additional jobs through 2015 (DFM, Idaho Economic Forecast, January, 2013), although the text reports layoffs at a couple of operations.

Idaho mineral production value for 2012 and prior years, as compiled by the U.S. Geological Survey, is shown in Figure 2. According to the U.S. Geological Survey’s statistics, Idaho’s 2011 mineral value (not including processing) was a new record in 2011 with a value of $1.324 billion (Figures 2 and 3). The much lower 2012 value of $813.2 million reflected the MSHA-mandated closure for safety maintenance of the Lucky Friday mine (Figure 4).

![Idaho Non-fuel Mineral Production (USGS)](image)

Figure 2. Idaho non-fuel mineral production total value.
Figure 3. Idaho’s record 2011 mineral production by commodity.

Figure 4. Idaho’s mineral commodity production for 2012.
In 2012, as in other recent years, the highest value commodity produced in Idaho was molybdenum from the Thompson Creek mine in Custer County, followed by phosphate and silver. However, the % of value due to silver and base metals was negatively affected by the 1-year closure of Hecla’s Lucky Friday mine, as described below.

METAL MINING

COEUR D’ALENE AREA

The Coeur d’Alene District, also known as the Silver Valley, is one of the world’s largest silver producing districts, with a cumulative production of over 1.23 billion troy ounces (38.26 million kg) of silver and substantial associated lead, zinc, copper, and antimony since mining started in 1884. In recent years, two deep, underground mines have extracted ore from the high grade quartz-siderite-sulfide veins hosted by the Belt Supergroup metasedimentary rocks. They are Hecla Mining Company’s Lucky Friday mine at Mullan and U.S. Silver’s Galena mine complex (Figure 5). Workings at both extend over a mile deep. The 2011 silver production from the Lucky Friday was almost 3 million troy ounces, but none was produced in 2012, a unique year. Concentrates in 2011 were all shipped to Cominco’s smelter in Trail, BC.

Figure 5. Location map of mines (squares) and towns in Coeur d’Alene District.
The Lucky Friday mine was shut down in early January, 2012, for the year by MSHA order, as a consequence of two fatal accidents in 2011 and a December rock burst injury. MSHA ordered a halt in operations until loose material was cleaned out from the Silver Shaft, the main production shaft in the mine. Hecla workers and contractors spent the year power washing the shaft to remove loose cement which had leaked out from the paste fill system. They also constructed a water ring and metal brattice in the shaft, installed a new power cable in the shaft, constructed a bypass tunnel around the unstable ground on the 5900 haulage level, and completed a number of other maintenance and training projects at the mine and mill. However, approximately 110 miners were laid off as a consequence of the closure. By the time the mine re-opened in 2013, it was like a “new mine.”

Exploration and development underground at the Lucky Friday were also suspended as a consequence of the shutdown of the Silver Shaft. However, geologic modelling and optimization of the #4 Shaft project, which was approximately 45% complete, continued. Mining and development work was scheduled to resume in the first quarter of 2013.

The second operating mine in the district was the Galena mine complex, which includes the nearby Coeur mine and Caladay shaft. U.S. Silver Corporation operated the Galena, but in August, the company announced a merger with RX Gold & Silver, Inc., with the new company to be named U.S. Silver & Gold. RX owned the Drumlummon mine, an epithermal Ag-Au mine in Montana, and it was added to the assets of U.S. Silver & Gold.

Mining in 2012 at the Galena produced 2,152,363 troy ounces of silver, a slight decrease from the prior year. The mine had an aggressive $ 5 million in-mine exploration program, focused on evaluating the Lead Zone, a large area of lower grade argentiferous galena mineralization that extends from the 2400 to 5200 levels and could potentially be bulk mined. They were also exploring along the Silver vein, the 370 vein, and reviewing the Coeur mine options.

Other district mines, including the Sunshine mine, owned by Sunshine Silver Mines Corp., part of Silver Opportunity Partners, remained closed. There was a small fire in February at the Sunshine, and the exploration and refurbishing work was halted for three months.

New Jersey Mining Company owns the only independent mill in the area and it was working on an expansion to 350 tpd capacity. The expansion was finished in June. They installed a new paste thickener which captures and recycles process water.
OTHER METAL MINING

Thompson Creek Metals had a good year of mining Phase 7 ore at their large open pit molybdenum mine near Challis in Custer County. The company reported that the mine produced at high volume and low cost, partly due to corporate’s decision to cease Phase 8 stripping at the operation in October. That resulted in layoffs of 110 employees. The company was focused on development of their new Mt. Milligan copper-gold mine in British Columbia and was also concerned about the sagging price of molybdenum, which dropped to $11 to $12 per pound molybdenum oxide in the last quarter of the year. Mine personnel continued to work on permitting the Phase 8 mine expansion and a related 5,000 acre land exchange with federal agencies, as well as to continue reclamation and environmental projects. A large perimeter wind fence, over 60 feet high, was completed at a cost of $2.4 million to reduce air emissions at the coarse ore stockpile (Figure 6).

Figure 6. New wind fence at Thompson Creek mine, August 2012.

Production in 2012 was 16,238,000 pounds of molybdenum at Thompson Creek, a decrease from the 21,368,000 pounds in 2011. Cash costs for 2012 were $8.06/lb., up from the prior year. Concentrates were sent to the company’s Langeloth roaster facility in Pennsylvania.
Southeastern Idaho hosts the Idaho Phosphate District, which makes Idaho the third largest phosphate producer in the nation (Figure 7). The raw ore value is over $200 million, but the ore is processed at three large chemical plants into higher-value products. Three open pit mines were in production with a fourth under construction in 2012, and exploration and permitting work continued as well. The mines are located on a mix of federal, state and private land, but administered principally by the BLM and State.

Ore is derived from the Permian-age Meade Peak Member of the Phosphoria Formation, an organic-rich, phosphatic black shale. The strata are locally enriched in carbon and trace elements such as V, U, Mo, and Se. Selenium has been the most troublesome environmentally. It can be leached by oxidizing ground or surface waters and may bio-accumulate to toxic levels in specific plants; various regulatory and reclamation activities were underway in the region to address this issue. Mined ore was processed into phosphoric acid fertilizers at Simplot’s Don Plant in Pocatello and at Agrium’s plant at Conda. Monsanto manufactured elemental phosphorus, largely used in its Round-Up™
herbicide, at its plant near Soda Springs (Figure 7). Each plant employs approximately 400 workers, and with phosphate and fertilizer prices remaining high, 2012 was a good year for the industry and region.

Monsanto was mining at the South Rasmussen mine while constructing the Blackfoot Bridge mine. They installed a thermal oxidizer at their plant to burn CO which had previously been flared off and allowed reduction in the overburden volume at the new mine. New mine construction at the Blackfoot Bridge mine included construction of several lined water management ponds (Figure 8).

![Figure 8. Construction of liner for pond at Monsanto’s Blackfoot Bridge mine.](image)

Agrium, a Canadian-based public company, was reclaiming the Dry Valley mine, which finished production in May, 2011. Agrium was mining at the North Rasmussen Ridge mine and doing reclamation work at the previously mined South and Central Rasmussen Ridge pits on the same property. One of the projects included installation of a GCLL
(Geosynthetic Clay Laminated Liner) over a 23-acre external overburden pile at South Rasmussen Ridge.

J.R. Simplot Company was in full production and mining panels B and F at their Smoky Canyon mine near the Wyoming border. The company completed the backfill of Panel E pit and was placing a Dinwoody Shale engineered cover over the Panel E backfill (Figure 9).

![Figure 9. Dinwoody Shale cover cap over Panel E backfill, Smoky Canyon mine.](image)

Each of the three major phosphate companies was involved in permitting and exploration activities for their next mine. Simplot was collecting baseline environmental data for their Dairy Syncline project, which includes 2133 acres of National Forest land. Agrium was working on a Draft Environmental Impact Statement of the 420-acre Rasmussen Valley project and conducting drilling and scoping studies on the 1051-acre Husky/Dry Ridge property. Monsanto did exploration drilling on their North Caldwell Canyon target.

Paris Hills Agricom, Inc., a subsidiary of Stonegate Agricom, Ltd., has done extensive exploration drilling, geotechnical studies, and groundwater monitoring at the proposed
underground mine in the Paris Hills near Bloomington, Bear Lake County. A feasibility study was released in December. Two beds within the Meade Peak Phosphatic member would be mined using continuous cutting machines, similar to technology used in coal and other sedimentary deposits. The Lower Ore Zone is higher grade and a tentative reserve is about 10 million tons at a grade of 29.4% P₂O₅, adequate for a 14-year mine life.
Idaho’s non-phosphate industrial minerals operations are scattered around the state (Figure 10). They reported that markets were more stable in 2012, and the housing and construction markets were showing signs of improvement.

Figure 10. Industrial mineral mines (excluding phosphate) in Idaho.
Aggregate, including sand and gravel and crushed stone operations, saw a resurgence of commercial construction markets, and transportation-related projects in north Idaho, particularly in the second half of the year. Unimin continued to mine and wash silica-feldspar sand at its Emmett pit and plant; the glass sand market was strong and the company expanded their product line (Figure 11). They were also re-certified by the Wildlife Council for their efforts to improve wildlife habitat.

U.S. Antimony’s Bear River Zeolite mine near Preston had a good year, shipping 10-15,000 tons of clinoptilolite zeolite to uses in water filtration, soil amendments, waste water treatment, animal nutrition, and other industries. Dimension stone operations included the Oakley stone quarries at Middle Mountain in Cassia County, Idaho Travertine’s cutting plant in Idaho Falls, and the Three Rivers Stone quarry in Custer County, although Three Rivers had a drop in production. Sandstone from the Table Rock quarry at Boise was quarried by Gerhard Borbonus Landscaping and cut to supply trim on the new Business School building at Boise State University.

Hess Pumice Products owns Idaho Minerals, U.S. Grout, and Hess Pozz. Hess mines raw material from its Wrights Creek pumice mine and perlite mine near Malad in Oneida County. Hess purchased the closed Owens-Corning cultured stone plant, hoping to re-open it in 2013. They added finer grinding capacity to the pumice plant and noted good demand in their export business and for oil field and grout markets.

Figure 11. Unimin’s Emmett sand plant, Gem County.
ENERGY

The Idaho Geological Survey (IGS) drilled four thermal gradient wells in southeastern Idaho as part of a multi-year U.S. Department of Energy sponsored program to compile data and assess geothermal potential of the nation. Information related to geothermal resources and potential in Idaho will be available on the IGS website and included in a national geothermal database. The holes are approximately 500 feet deep will be used to measure geothermal gradients in this area of recent volcanic activity and older overthrust and Basin and Range structural complexity.

Alta Mesa, a private Texas-based oil company, acquired the Idaho assets of Bridge Resources, including a number of oil and gas leases near the town of New Plymouth in Payette County. Alta Mesa conducted a helicopter-supported 3D seismic survey of the area where Bridge had drilled 11 wells in 2010. Seven of those wells were reported as containing commercial quantities of natural gas. Alta Mesa also ran a 2D survey with tightly spaced lines later in the year. The company was processing the data at year’s end. The hydrocarbon reservoir is in Tertiary lake bed sediments, but little information has been released.

EXPLORATION

The year 2012 was a very busy time for exploration in Idaho. Figure 12 shows the locations of exploration projects around the state. High prices for gold and silver fueled the interest, but base and minor metals also were targets. However, securing financing was starting to be difficult.

The lone industrial mineral exploration project was I-minerals’ project in the Helmer-Bovill clay district of Latah County; part of the area is on state leases. The company has been exploring the potential for clay, feldspar, and silica, and they shipped a few 1,000 ton samples of feldspathic sand, extracted from the old tailings of the clay pits at Bovill. Some material went to a Lewiston pottery maker for testing. I-minerals continued to work on a prefeasibility economic analysis of the kaolin resource.
Figure 12. Location of Idaho exploration projects in 2012.
Northern Idaho had several active exploration projects outside the Silver Valley (Figure 12). Black Mountain Resources, an Australian-based junior company, drilled 5000 feet in 16 holes at the Conjecture mine. The Belt sediment-hosted vein system hosts very high grade silver mineralization, as much as 715 g/t silver, in the remote Lakeview Mining District. This was the first work since the 1980s in the district. Black Mountain acquired the historical data and 38 claims. They also conducted an Induced Polarization (IP) survey and worked on the MorrisDecline into the Conjecture Shear Zone.

New Jersey Mining had a joint venture with Marathon Gold, a Canadian company, at the Golden Chest gold mine at Murray (Figure 13). The joint venture drilled 7000 meters in the first half of 2012 before stopping due to funding restrictions. The company was working on a 43-101 report on the open pit gold resource. A highlight of the drilling was drill hole GC-12-134 which intersected 7-m true thickness of 10.8 g/t gold.

United Silver Corp. continued its work designed to reopen the Crescent mine on Big Creek in the Silver Valley (Figure 5). The company had driven a new Countess Portal in
2010-2011 from the west side of the mountain; in 2012 they installed additional I-drifts off the ramp to explore the South vein over a 150-foot vertical span. They also widened the Big Creek #4 tunnel to serve as a secondary escapeway. United negotiated an agreement with the New Jersey mill at Kellogg to a process a 9000-ton trial run of the tetrahedrite-rich ore, but the experiment did not work out and the contract was terminated. In August, United Silver announced a stop to mine development activities to conduct a geologic evaluation of the South vein and optimize material handling methods.

Hecla Mining, operator of the Lucky Friday mine, had an aggressive drilling program at the Star mine, part of their extensive Silver Valley land package. The Star mine accessed part of the zoned Star-Morning Pb-Zn-Ag vein system, and it is located 1.5 miles northwest of the Lucky Friday mine. Hecla drilled 70,000 feet of core in three areas, but they principally focused on the Noonday and Moffitt vein systems at the Star by drilling from underground at the Star 2000 level.

Further south, Premium Exploration had another busy year exploring their Idaho Gold Project along the historically mined Orogrande shear zone, west of Elk City. They have been applying a multi-disciplinary mix of geophysics, geochemistry, drilling, and geology to target holes in the area which has seen several companies exploring since 1989. The 30-kilometer long shear zone in the batholith hosts several deposits, including Buffalo Gulch and the Friday-Petsite resource. The company released a 43-101 report in August which calculated an indicated resource of 21.5 Mt at 0.91 g/t gold plus an inferred amount of 5.9 Mt at 0.77 g/t gold, equivalent to a total of 775,000 ounces of gold in the ground at the Friday. Premium started a new 8000-meter drill program in November.

CENTRAL AND EASTERN IDAHO

Midas Gold Corporation had the largest drilling program in Idaho with 46,000 meters of diamond drilling in 2012 at their Golden Meadows project in the historic Stibnite District in Valley County. Midas has been able to acquire both of the historically divided property positions and unite the large, complex district under a single owner, enhancing the ability to explore and potentially mine the deposits, which now host over 4 million ounces of gold in the indicated resource category, plus nearly 3 million ounces inferred and 200 million pounds of antimony, as determined in the Preliminary Economic Analysis (PEA) released mid-2012. Stibnite was also a major tungsten producer during WWII. Three helicopter-supported drill rigs were still working in late fall (Figure 14).
The mineralization is structurally controlled next to and within a roof pendant of metasedimentary rocks included in granitic rocks of the Idaho batholith. Midas initiated metallurgical studies and continued exploration for other target areas. The known resource was located in three deposits: Yellow Pine, West End, and Hangar Flats to the south.

Near Salmon and surrounding Lemhi County, the pace of exploration work slowed slightly. Formation Capital Corporation continued Phase II construction work to develop a new underground cobalt-copper-gold mine in the historic Blackbird Mining District, southwest of Salmon. Formation built a new road from the mill site to the mine portal to avoid public road access and installed a powerline, as well as working on other site facilities. However, the company was still working to secure final financing, and though all permits were in place, the funding remained elusive. Spot cobalt prices were in the $14/pound range for most of 2012 but dropped below $12 in the last quarter of the year. Stratabound mineralization at the Ram deposit, discovered by Formation in the late 1990s, is probably continuous with the historically mined Blackbird workings. Considerable exploration potential exists in other ore zones as well.

North of Salmon, a new joint venture of Northern Vertex, a Canadian junior, and Idaho State Gold Corporation (ISGC) picked up the old Ditch Creek or Humbug property
drilled by AGR and others in the early 1990s. Northern Vertex added 34,000 feet in 40 core holes and 14 RC holes to the prior tally of 277 holes. Located approximately along the Trans Challis fault system, the area has little outcrop but hosts structurally controlled gold in sulfides with a quartz-carbonate gangue.

The Beartrack deposit was discovered in the late 1980’s by FMC during exploration along the Trans-Challis fault system near the ghost town of Leesburg. With higher gold prices, the now closed and reclaimed open pit gold mine was a tempting target to test. Owner Meridian Gold, part of Yamana Gold, drilled 21,000 feet in 13 holes from June to October below the reclaimed pit to test for deep sulfide mineralization. Beartrack produced approximately 600,000 troy ounces of heap leachable, oxide gold from 1995 to 2000.

Western States Silver drilled six core holes and conducted a soil geochemical survey at Leadville, exploring potential of the Pb-Zn-Ag replacement deposits south of Salmon along the range front of the Beaverhead Mountains. Late in the year, U.S. Rare Earths received permits to drill at their Diamond Creek rare earth property north of Salmon. They commenced drilling in early December with two short holes (< 600’). Permitting for other areas was in progress.

In far eastern Idaho’s Clark County, Otis Gold Corporation had a modest exploration program at their Kilgore Au-Ag project. They completed a 43-101 report which estimated an indicated resource of 520,000 tr. ounces of gold at a grade of 0.59 g/t and another 300,000 tr. ounces inferred at a grade of 0.46 g/t gold at the epithermal property. Otis drilled only six RC holes totaling 3200 feet on the North Target during the fall as they opted to conserve cash. The deposit tests have shown excellent metallurgy.

Western Pacific Resources tracked down and was evaluating the historic data for their Mineral Gulch property in Cassia County. Pegasus Gold’s Black Pine mine operated as an open pit, heap leach mine there from 1992 to 1998, extracting approximately 520,000 ounces of gold at a grade of about 1 g/t gold.

SOUTHWESTERN IDAHO

Atlanta Gold did not have an active exploration program at their Atlanta project in Elmore County. However, the company spent much effort on environmental issues resulting from a lawsuit over arsenic in discharges from the historic 900-level mine.
workings which the company had partly rehabilitated. The company was cooperating with the agencies to improve their settling ponds but in December, a judge imposed a $2 million fine on Atlanta, prompting the company to aggressively investigate new filtration methods to eliminate the arsenic problem.

In Boise County and the Boise Basin gold district, a custom placer mill recovered gold from stockpiles and waste dumps of the historic Gold Hill underground mine (Figure 15). The mill has multiple screens, jigs, sluices, etc., to extract gold for its owners, Gold Hill Mines and Idaho State Gold (ISGC). Knife River was contracted to haul the ore and run the operation.

![Figure 15. Custom designed placer processing plant in the Boise Basin.](image)

Terraco Gold Corporation continued to explore their Almaden or Nutmeg Mountain Gold Project, located at the old Idaho-Almaden mine, the state’s largest mercury producer. Terraco drilled HQ3 large diameter core in 32 holes totaling 8078 feet. They did metallurgical work as well on the hot spring type deposit which had a 43-101 resource of nearly 1 million ounces gold. The drills intersected one high-grade intercept of 1.5 meters of 10.8 g/t gold in a sulfidic breccia, and the company was hoping for more such intervals.

There were two additional and more diverse metals exploration projects active in southwestern Idaho in 2012. Mosquito Consolidated drilled at Cumo, the large (over 2 billion ton) molybdenum porphyry deposit in Boise County, even while the company was embroiled in internal corporate struggles. Mosquito drilled 9 core holes for 4,713 meters
in the spring and summer with hole 59-11 intersecting 201 meters of 0.133% MoS₂. The company consolidated under new management in October. However, in response to a lawsuit over the Forest Service’s approval of an Environmental Assessment (EA) for drilling, the judge required the Forest Service to address issues of groundwater on exploration projects. The ruling could serve as a precedent on other NEPA cases.

Thunder Mountain Gold, a small Boise-based exploration company, has a large private land position at their South Mountain property in Owyhee County. The historic underground workings exploited massive sulfide replacements and skarns. The company spent much of the year seeking financing and in November, they finalized an agreement with ISR Capital (Owyhee Gold Trust LLC). The agreement provides for a $1 million buy-in and a $2 million work commitment for ISR to earn a 25% interest in the property. Thunder Mountain quickly used the funding to recollar the Laxey Portal, moving it over slightly to excavate through caved ground. They planned to work over the winter setting up drill stations to explore the high-grade shoots of Pb-Zn-Ag-Au ore.

STATE ACTIVITIES

The Idaho Geological Survey published a new state geologic map in 2012. The full color map is at a scale of 1:750,000 and comes with cross-sections and an accompanying booklet with additional explanations and references for the geologic units. It updated the very old state map from 1978. In addition, new geologic mapping was also underway as part of the USGS-sponsored Statemap project in several areas in eastern and northern Idaho. The study of the geology and hydrogeology of the Mayfield area in Ada County was completed for the Idaho Department of Water Resources, and the geologic map and report published. As part of the multi-year, federally funded DOE ARRA project, geothermal information for Idaho was being compiled and the thermal gradient wells drilled in southeastern Idaho. Sampling and laboratory work was being conducted for research into the lithologic characterization and alkali-silica reactivity of Idaho’s aggregate sources, in a study funded by the Idaho Transportation Department.