Idaho Mining and Exploration, 2020

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Idaho Geological Survey
www.idahogeology.org

American Exploration and Mining Association
Virtual Conference
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Acknowledgements

• AEMA
• Idaho Dept. of Lands staff
• BLM and USFS minerals staff
• Industry geologists and companies
• IGS and Claudio Berti (IGS Director)
• Earl Bennett
• Fieldwork

Ginna at DeLamar: Which rhyolite is it?
2020 Highlights and Trends

- Mining: a critical industry
- Idaho ranked 8th by Fraser Inst.
- Phosphate is leader
- End to Lucky Friday strike!
- Gold and Silver Prices Up!
  - 11/17/2020 Spot Prices:
    - Au: $1882/tr. oz.
    - Ag: $24.48/tr. oz.
- Advanced Development Projects
- Return of Grass Roots Exploration
- Drills Turning

2020 – the Covid-19 pandemic year

Covid-19 Virus: Image from CDC
Leading Commodities: Phosphate rock, Sand and Gravel, Crushed Stone, Ag and Pb

Idaho Non-fuel Mineral Production

2019 data is preliminary.

Dec. 2014: Thompson Creek Mo on care and maintenance; large resource remains.

Idaho Mining

- **Coeur d’Alene District:**
  - Over 1.24 billion troy ounces Ag (38,568 metric tons)
  - Pb, Zn, Cu, Sb
  - Quartz-Siderite-Sulfide veins in PC Belt metasedimentary rocks
  - Very deep mines, ore extends vertically

- **SE Phosphate District:**
  - Also over 100 years production
  - Permian Phosphoria Formation
  - Sedimentary apatite-rich black shale of regional extent

Coeur d’Alene district (Silver Valley)

Operating in 2020:

• Lucky Friday mine
• Galena Complex
• Golden Chest (at Murray)

Exploration in 2020:

• Bunker Hill mine
Hecla Mining Company: Lucky Friday mine

2019 (strike): 633,000 ounces Ag by salaried employees
Q2 2020: 470,000 ounces Ag; Full 2020 projection: 1.6M oz. Ag

Mining: 30 vein, Gold Hunter, 6400 level and below.


Deep Gold Hunter veins drilled to below 8300 level, accessed from new #4 shaft. Reserve 80 M oz. Ag, with similar M+I.

RVM (Remote Vein Miner): Testing in Sweden; Idaho in 2021
Closely spaced holes allowed recognition and correlation of bedding that will help in understanding the geometry of the rock units in the mine.

**Geologists working on increasing confidence in vein locations in real-time, based on drilling and 3D modeling.**

Our staff geologists are updating our 3-D modeling by digitizing previously hand drawn geologic maps and updating our structural model with more data.

These maps provide data from which to begin modeling mine scale faults and other geologic features.

The fault modeling continues help with understanding seismic risks associated with faults.
Americas Gold and Silver Corporation

• **Galena Mine Complex**
  - Galena – operating
  - Coeur mine – adjacent
  - Ag-Pb veins and Ag-Cu veins

• 2019 – JV with Eric Sprott
  - $ 20 million invested for 40% stake

• 2020
  - Needed shaft and drift repair on 4300 and 5500 levels (5,300 ft. of drift, + rail)
  - Massive exploration and development drilling program
  - Over 48,000 feet by Nov. 1, 2020
  - Covid protocols for underground – checking temps and only 4 miners per hoist run

*Galena mine drill crew with new Hagby 1000*
Galena mine – 2020 Exploration

- **Multiple Drill Targets**
  - 72 vein
  - 360 Complex
  - Triple Point
  - Over 9,600 feet of drilling from 5500 level, targeting deep extensions (DH 55-124: 1,046 g/t Ag and 2.3% Cu over 2.4m)
  - Drilling into 2021

- **2020 Resource Expanded**
  - Reserve to 37 million oz. Ag + Inferred Resource increased 100% to 78 million oz. Ag
Galena mine

Drilling continues, new development drift to access more veins and drill stations on 5500 level. Five in-house drill crews and a contractor. Will mine newly drilled areas in 2021.

Geologist Morgan Vane, logging core at Galena mine

Ag-Pb vein intercept from 360 veins, 4300 level, Galena mine
New Jersey Mining: Golden Chest mine

2020: NJMC transitioning Idaho pit to new area; Raised $2.7 million for drilling down dip on Idaho vein. Added drill crew and equipment. Solidified land position in Murray District.

**Goal:** Double production in next year.

Au-quartz vein, Golden Chest mine, 2020

New Jersey mill at Kellogg, Idaho

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Endomines:
Friday mine, Elk City

- Orogrande Shear
- Underground
- Shipped 1st Au Con, Q2, 2020
- Start-up issues at mill
- IGS mapping Elk City region
Thompson Creek Mo Mill – Centerra Gold

Thompson Creek Molybdenum mine - extended care and maintenance since December, 2014. Permitted resource in ground.

2016 – present: Use Mo concentrator at Thompson Creek for limited beneficiation of concentrates from 3rd party customers. Process 20-25 million lbs. through leaching plant. Bulk cons ship to roaster in Langley, PA, or bagged onsite for HPM (high purity molybdenite) shipped direct to buyer.
Phosphate Mining in Idaho: 2020

Permian Phosphoria Formation:
Meade Peak Member - phosphatic black shale

Apatite (P), + C, V, U, Mo, Se, REE

SE Idaho phosphate supplies 22% of nation’s phosphate and 4% of the global demand. (BLM, 2020)

3 newly approved mine plans will replace depleted reserves.
Phosphate Processing Plants

- Itafos Conda Fertilizer Plant, 2019
- Simplot Don Fertilizer Plant, 2014
- Monsanto Elemental P Plant, 2014

3 Large Plants
Over 350 workers at each
Industry supports 4,500 jobs
Economic anchor to SE Idaho

Add $2 billion in value-added products to U.S. economy (BLM)
J.R. Simplot Co.: Smoky Canyon

Reclamation in Panel F (pit F1North)
Simplot segregates waste rock with leachable Se from more benign material. Places infiltration-limiting cover on seleniferous waste. Increases mining cost but decreases reclamation cost and reduces environmental impact.

87-mile long slurry pipeline takes ore to Pocatello plant.

Mining at Panel F
Also mining in Panel G, multiple pits.
**J.R. Simplot: New mine plans**

**East Smoky:** ROD released July, 2020. Adds 3-years to mine-life.  
*Panel B and new East Smoky panel in foreground.*

**Dairy Syncline:** ROD released April 7, 2020, to allow mining and development on 2,767 acres. 30-year mine life. Move and transition over next few years.
Mining in Mid-pit. Maximizing ore recovery and keeping safe work environment.

View over Mid-pit to backfilled North-pit reclamation. Also using external overburden pile with cover lysimeters.
Bayer (P4): Development work

Caldwell Canyon ROD issued August, 2019. Initial haul road construction to staging at closed Dry Valley mine, topsoil stockpiles, water management plans, etc. Construction of buildings in 2021.

Development drilling at Caldwell Canyon South pit property, 2020
54 holes for over 10,000 feet.
Itafos: Rasmussen Valley mine

Rasmussen Valley mine, looking south. 2020 a challenging year. Overburden placed at nearby South Rasmussen and Lanes Creek.

Mined approximately 2 M tons. Finished mining at private Lanes Creek mine and constructed test plot for stockpile and cover design.

Itafos purchased Agrium’s Conda Phosphate in 2018 just as Rasmussen Valley approved.
Itafos: Exploration and Permitting

- Husky 1/North Dry Ridge mine plan
  - Agrium discontinued permitting there in late 2014
  - Itafos requested BLM and Forest Service to restart permitting
  - May 2019 EIS process resumed
  - April 2020 Proposed Mine and Reclamation plan submitted
  - Dec. 2020 Public notice
  - 14 year mine-life, 1,145 acres

Paris Hills property: Received exploration permits but no activity.
Other Industrial Mineral Operations

• **Aggregate = $$_$$

• Diverse commodities & uses
  • Industrial garnet and pumice
  • Dimension stone
  • Lime
  • Zeolites and Clays
  • Industrial sand
  • Landscaping rock
  • Gemstones

• Stable, rural, smaller

• More affected by Covid, local issues, and visa issues?

• **Business slower but still strong in 2020**

**Treasure Canyon Calcium (May, 2020):** Submitted Plan to BLM for expanding limestone quarry in Franklin County to public land. In review.

**Steelhead** – Zeolites, new owner PDZ.
Aggregate: Construction Sand & Gravel, Crushed Stone

Second most valuable commodity in Idaho

Cope Sand and Gravel, Canyon County, March 2020

• IDL Surface mine reclamation plans: 100 + gravel pits and quarries (FY19 state royalty $ 1.1 million)
• Construction and Road Projects

Emerald Creek Garnet:
• Benewah County since 1930.
• Opta Minerals Inc.
• Almandine garnet - alluvial
• Water filtration, abrasives
• Good year, slightly slower markets

FS tourist garnet dig closed due to Covid

i-minerals: Bovill Project
• Latah County
• Revised to smaller operation
• Process clay only
• Prefeasibility Study: $48 million Capex for 10,000 tons halloysite and 20,000 tons metakaolin/year. (Millcreek Engineering, Mar. 2020)
  • 337 core holes and pilot plant testing
• Sept. 2020: Amended Operations and Reclamation Plan submitted to IDL. In review.
Dimension Stone: Southern Idaho

- Oakley Stone (Middle Mtn.)
  - Northern Stone Supply
  - Sawtooth Stone
  - Scrivanich
  - Oakley Mtn. Corp.
  - American Stone
- Table Rock Sandstone

Idaho State Activities

• Idaho Dept. of Lands (IDL) – Regulatory Reform
  2019: Idaho Legislature passed HB-141 (IMA sponsor):
  • Surface impacts of underground mines
  • Actual cost estimation of reclamation
  • Update of financial assurance methods
  • Modest fees
  • 2020: IDL Rulemaking

• IDAHO GEOLOGICAL SURVEY
  2020:
  • Geological Mapping and Research
    • Statemap - IGS-USGS
    • IGS – Industry (Integra Resources, others)
    • Critical Minerals, Data Pres. – IGS-USGS-IDL
  • Earthquake Response
    • Zach Lifton, Claudio Berti
    • USGS, BSU and Others
    • Aftershocks Continuing
  • Groundwater Projects: Raft River, Big Lost River basin
  • Geologic Hazards, Oil & Gas
  • Staying Safe
  • www.idahogeology.org

Idaho Champion Geologist Duncan McIntyre (left) explaining rocks to State Geologist Claudio Berti (center) and new IGS mapping geologist, Russ Di Fiori (right); Elk City area.
Earthquake (M6.5): March 31, 2020 (evening)

Main M6.5 Quake: Left-lateral strike-slip with some dip-slip on NNW fault.

USGS catalog: ~2280 aftershocks (11/12/20)

Still shaking. Toppled rock spire. Liquefaction at Stanley Lake beach.
• Advanced projects from 2019
• Covid-related slowdown in spring
  • Supplies, personnel delays
• Ramp-up in activity in late summer and 2nd half of year
• High Au, Ag prices
• Drilling with results
• Underground targets back
• Grass roots exploration
• Fraser Institute Ranking (8th in world)
Bunker Hill Mining Corporation - 2020

• Funding aggressive exploration. Ex-Barrick management. Option to acquire till 2022.

• 3D modelling of historic stopes, DH, mine workings: UTZ, Newgard, Quill ore zones.

• New focus on Ag at historic Pb-Zn mine (36mt of Pb-Zn-Ag ore). 43-101 done. Known 8 mt Zn ore.

• Drilling and sampling – UG and Surface. Deeper targets as well.

• Commitment to water management.

• PEA – early 2021.

Nov. 23: Reduced option price by 30% after negotiations with lessor, Placer Mining Corp. Expires Aug. 2022. More $ into ground.

Check Bunker Hill website for more details
Bunker Hill - underground

95 years of mining; 3,500 historic drill-holes; multiple vein sets and types; closed in 1981. No serious exploration since. 2020 – 10 DDH to date.

DHH 7035A: 1.5 m at 648 g/t Ag and 8% Pb.
Elk City Region: Gold Mines, Mapping, Exploration

- Historic Au mines – large placers
- New IGS mapping in progress
- Orogrande Shear Zone (N-S faults)
  - 20 km by 1 km regional structure
- Endomines Friday mine
- Prior permits: Bema – Buffalo Gulch, Erikson Reef (1990s) – never mined
- 2020: Idaho Champion, Bond Resources, Gold Lion, Endomines, New Jersey, others?
- Poor Exposure, metamorphics, intrusive rocks – ID batholith, Tertiary plugs

IGS Statemap Geologic Mapping Projects and Au mines
Idaho Champion: Baner Project

- 2018 Drilling – very good results; geophysics (IP) targeting tool
- 2020 – $8 million financing
- Historic Baner mine - subsidiary structure to Orogrande Shear
- Soil geochemistry, mapping, new claims
- Drilling: 2,200 meters; results pending

Gold-quartz-pyrite mineralization
Baner drillcore
Midas Gold Corp.: Stibnite Gold Project

- Historic brownfields Au-Sb-W district, Valley County
  - ~ 5 million troy oz. Au, significant Sb (critical mineral)
  - Produced tungsten, antimony critically needed in WWII
- **DEIS released for public comment: 8/2020** (420 MB, 1000s pages)
- 75-day public comment period over; in review by Forest Service
- **Final EIS/ROD: Q3 2021 expected**
- Large Project: 3 pits
  - Extensive reclamation and fish passage restored
  - 1 billion $ capex
  - 500 jobs
  - 15+ years project
  - Sole US antimony producer
  - Numerous technical issues
  - Exploration potential
- Ownership investment
  - Paulsen and Co. has 44% of shares
  - $ 35 million (March 2020)
Salmon Region: Au, Co, REEs

- Idaho Cobalt Belt – only US Co reserve
  - Mesoproterozoic Banded Siltites – complex
  - Lower Co price – less activity; Covid issues
- Jervois Mining: Idaho Cobalt Operation (ICO)
  - Adjacent to Blackbird mine; RAM discovery in 1997
  - 2019 drilling increased resource by 22%
  - Positive BFS, Financing
  - Covid-related delays; Maintaining infrastructure
  - Planning for 2021
- First Cobalt
  - Iron Creek Project
  - SE end of belt
  - Refinery in Cobalt, Ontario

- Rare Earth Elements (REEs) – NW belt
  - New Jersey Mining – acquisitions, surface sampling
    - Diamond Creek claims
    - Roberts prospect

- Gold: multiple areas & companies
  - Revival – Beartrack mine/Arnett Creek
  - Freeman Gold, Gaia, Hawkstone, Ophir, etc.

IGS Statemap quads for FY20 with Co and REE prospects, Salmon region
Jervois: Idaho Cobalt Operation

- **Jervois**: ICO 100%-ownership, permitted, underground portal site

- **43-101**: 5.24 Mt M+I @ 0.44% Co, 0.69% Cu, 0.53 g/t Au; plus 1.5 Mt inferred; open along strike, at depth

- Sept. 2020: Bankable Feasibility Study

- Second Half 2020 and first half 2021: Mill design and Construction Prep

- Mid-2021: Restart construction with goal of production by mid-2022

October 2018: eCobalt Solutions infrastructure

*Cobaltite with secondary erythrite*
First Cobalt: Iron Creek

- **Induced Polarity-Resistivity survey** completed in Fall, 2020.

- **Objective** - trace mineralization in the western portion of the resource below the Challis Volcanics cover, as well as to detect mineralization in the footwall identified at surface, but currently undrilled.

- Results will influence planned 2021 drilling program, currently in permitting with Forest Service.

- Metallurgical studies with Colorado School of Mines to improve beneficiation.

- Updated NI43-101: Indicated+Inferred of ~ 4.8 Mt at 0.3 CoEq

RUBY ZONE

- Cobalt-copper mineralization well exposed for +300m strike length along timber road in southern portion of property

- Similar siltite host rock to Iron Creek

- Channel sampling across 152m (500ft) strike extension

- Individual samples 1.5m (5ft) up to 0.48% Co (230 to 235ft)

*Cobalt bloom on semi-massive magnetite-pyrite*
Revival Gold: Beartrack and Arnett Creek

- Two projects – few miles apart
- Updated Mineral Resource:
  - Indicated 36.4 Mt @ 1.16 g/t Au; 47 Mt inferred
  - 43-101 (Feb. 2020)
- 10,000 m core drilling program underway
- **Beartrack mine** -
  - 5.6 km strike
  - Infill between pits
  - IP-RES Joss and Rabbit
  - NS Coiner Fault
  - Historic: ~ 600K oz. Au,
    - + Leesburg Placers

Reclaimed North pit at Meridian Gold’s Beartrack mine

2020 drilling, Beartrack project, 3 rigs into fall
Revival Gold: Arnett Creek

**Haidee Target:** surface leachable

**AC20-43D:** 0.63 g/t over 22.9 m

**2020:** 30 holes for 4,900 meters and 65 line-km of IP-RES. Expand and upgrade resource. PEA for Phase 1 leach operation (Nov.). Existing facilities, inc. ADR plant, at Beartrack.

2020 drilling, Arnett Creek
Freeman Gold: Lemhi Gold Project

Ditch Creek/Humbug Property:
N of Salmon/North Fork, old placers, AGR and others 1984-2013; 355 historic holes. New claims for 7,515 acre land position. Oxide gold.

Visible gold, Lemhi Gold project, Freeman Gold website

End October: 16 core holes, totaling 3,328 m completed. Visible Au in 6 holes logged.
Salmon Area – More Au in 2020

- **Gaia Metals – NE of Salmon**
  - Gold Dyke – 4 DDH, 457 m, twinned historic hole of 1.5 g/t Au, hit quartz veins, breccia
  - Carmen Creek/Freeman Creek
  - Surface mapping/sampling

- **Hawkstone Mining**
  - Lone Pine Project – historic resource, near King Solomon mine, on Trans-Challis east of Beartrack
  - Sampling, Drilling, Land acquisition
  - High grade (+ 10 g/t Au) intercepts/samples

- **Ophir /Minkap Res. - Breccia Project**
  - Gahsmith mine 1930s (South Musgrove)
  - Epithermal; 2019 samples,

- **US Gold – Challis Project**
  (MuscgroveCreek/Johnny’s Point resource)

- **Utah Mineral Res. – Kenney Creek**

- **Others?**
Excellon Resources: Kilgore Au-Ag Project

Centerra/Excellon: Oakley Project

- Otis Gold – Federal Court confirms 5-year exploration permit from Forest Service for Kilgore (large 2019 drill program and PEA, Clark County).
  - Kilgore Resource ~ 1 million oz. Au
  - Drill in 2021
  - Oakley project, Cassia County (optioned to Centerra for 70% earn-in). Cold Creek/Blue Hill Creek. Miocene epithermal targets. Large claim block.
  - Centerra drill plans

- Feb. 2020 – Otis acquired by Excellon Resources.
  - Kilgore Resource ~ 1 million oz. Au
  - Drill in 2021

- Gold Lion Resources – Robbers Gulch Project near Burley. Trenching, Permitted to drill.
Idaho Champion: Champagne mine, Butte Co.


2020 Drilling, Champagne mine 5,000 m program started in August, 2nd core rig added in late October. October – Ground IP-Resistivity Survey and Soil Sampling
Phoenix Copper Ltd.: Empire mine, Mackay 2020
(ExGen Resources, Konnex Resources)

**Cu + Au and Ag, Zn**

- 23 sq. km. claim area – historic Empire mine – polymetallic skarn, open pit geometry
- 32-hole Drill Program – RC and some core
- Hole KX20-26: 7.6 m of 4.38 g/t gold from 21.3 m depth
- Empire mine and Red Star prospect (Ag-Pb vein)
- Nov.: Updated 43-101 resource with 19% increase
  - 238K oz. Au, 7.6M oz. Ag, plus Cu, Zn in 23 Mt
- PEA underway for thiosulfate leach operation

Core rig at Red Star
**BeMetals/Thunder Mtn. Gold:** South Mountain, Owyhee Co.; Au, Ag, Zn skarn and replacement ore

- Private Land, underground
- Sept.: Phase 2 drilling
  - 2,400m in 25 holes
- Focus on extending Texas Zone and infill DMEA zone.
- 2019 (Phase 1, 20 DH for 2,290m):
  - SM19-006: 15.7 m at 21% Zn, 147 g/t Ag and 8 g/t Au
- Metallurgy and mineralogy studies, 2021 PEA
BLACK PINE 2020 – 10 M USD Exploration Program

- 46,000 meter Drill Program
- January 2020 - Plan Amendment submitted (+50 acres)
- 3 RC Drills / 1 Core
- Drilling on D1/D2 areas
- New D3 Discovery made
  - 96 m @ 1.44 g/t Au in Hole 152
- Testing 10 new target areas
- Securing process water - Abundant groundwater in the basin, yet no surface water/pits are dry
- Phase 1 & 2 Metallurgical Results delivered
  - 82.1% weighted average gold extraction ranging up to 94.5%
- Phase 3 Met testing commenced
- Maiden Resource Estimate to begin early 2021

Leapfrog mineralization models showing modelled gold mineralization >0.2 g/t Au are for illustrative purposes and are unconstrained by a robust geologic model. A 25m buffer around drillholes limits the model from gross overestimation. The intended purpose is to illustrate the relative position of gold mineralized zones to historic mining and topography to drive drill targeting. Models are subject to change with ongoing study and modelling.
BLACK PINE 2020 New D3 Discovery

**3 Drills on D-3**

- **LBP129**
  - 29.0 m @ 1.60 g/t Au
  - incl 19.8 m @ 2.09 g/t Au

- **LBP131**
  - 76.2 m @ 0.82 g/t Au
  - incl 22.9 m @ 1.65 g/t Au
  - 12.2 m @ 0.58 g/t Au
  - 12.2 m @ 0.77 g/t Au

- **LBP152**
  - 96.0 m @ 1.44 g/t Au
  - incl 32.0 m @ 1.95 g/t Au
  - incl 29.0 m @ 1.86 g/t Au

- **LBP127**
  - 33.5 m @ 1.98 g/t Au
  - incl 15.2 m @ 3.93 g/t Au
  - 30.5 m @ 1.11 g/t Au
  - incl 7.6 m @ 2.39 g/t Au

- **LBP138**
  - 67.1 m @ 1.20 g/t Au
  - incl 16.8 m @ 2.57 g/t Au

Liberty – deeper drill targets
Integra Resources: DeLamar Project, Owyhee Co. (also Florida Mtn., War Eagle Mtn.)

- **2020 Integra Program:**
  - Environmental baseline studies – water samples
  - Engineering and metallurgy
    - DeLamar/FM ores
  - Exploration – 3 rigs busy most of year
- **Florida Mtn.**
  - Drill at depth, oxide/transitional ore, east anomaly
- **War Eagle Mtn.**
  - Follow-up 2019 high grade
  - Drill geochem anomaly east of existing drilling
- **Black Sheep**
  - Surface mapping and sampling, greenfield

Kinross DeLamar mine - closed 1998. District production - 1.6 M oz. Au, >100 M oz. Ag
See Tim Arnold’s talk for more details
Integra - War Eagle Targets:

Extensions of historic veins –
Soil Geochemistry
2 parallel vein structures, multiple intercepts
Previously untested area

11/19/2020 Integra Press Release:

IWE-20-014: 
24.2 g/t Au and 655 g/t Ag over 7.6 m

IWE-20-017: 
21.85 g/t Au and 76 g/t Ag over 1.52 m

Max Baker is Integra’s Exploration Manager – see his session and Integra website.

Lindgren, 1898: classic descriptions of Silver City veins

War Eagle Cross Section: A-A

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• **THANK YOU!**

• [www.idahogeology.org](http://www.idahogeology.org)

• Virginia S. Gillerman, PhD, P.G.
  • Idaho Geological Survey, Boise
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This annual Idaho Mining summary presentation is available in a pre-recorded video format and also as this annotated Powerpoint presentation. A few minor updates have been made in these notes.

Thanks to the many people who provided information and helped with this summary presentation.

The year’s biggest news was not mining, but a tiny virus, named Covid-19, which affected industry and life in 2020. But mining and exploration activity in Idaho did continue, particularly in the second half of the year. Highlights are listed. In Idaho, mining was declared a critical industry and continued to operate, but companies had to develop new protocols for health and safety. In late 2019, the Fraser Institute's survey put Idaho 8th among global jurisdictions in Investment Attractiveness, a combination of mineral potential and public perception of mining.
Combined with rising gold and silver prices, plus a strong phosphate industry, that lead to a good year - except for the pandemic.

The value of Idaho’s non-fuel mineral production, as reported by the U.S. Geological Survey, remained flat, based on estimated 2019 production of about $550 million for raw ores. The value of phosphate processing is not included in these totals. The end of the strike at the Lucky Friday mine in early 2020 meant increased silver production in 2020.

Idaho has two “world-class” mining districts: Coeur d’Alene District (aka Silver Valley) in north Idaho and the Phosphate Reserve in southeastern Idaho. Both districts have been producing for over 100 years and are still active.
Two classic silver mines, the Lucky Friday and the Galena, operated in the Silver Valley in 2020. They are deep underground mines exploiting the high-grade Ag-Pb-Zn-Cu veins hosted in deformed and weakly metamorphosed Mesoproterozoic strata. Locations are shown in the map. The Bunker Hill mine, home of an exploration project, is shown on the west side of the district, which parallels the Osburn Fault and I-90 which runs along the South Fork of the Coeur d’Alene River. The Golden Chest mine, a gold mine, is located at Murray to the north.

Big news in the Silver Valley was the end to the 2 1/2 year strike at the Lucky Friday. Hecla committed to a return to full production by the end of the year. Covid caused delays to testing and installing the RVM (remote vein miner) machine still being tested in Sweden by Epiroc – formerly Atlas-Copco. Testing of the RVM was done in a silicified limestone mine in Sweden. It is essentially a longwall miner turned vertical. Only one similar machine is operating in a hard rock mine – one of the deep Au reef mines in South Africa. Hecla announced final 2020 production at Lucky Friday mine at Mullan was 2.0 million troy ounces of silver (2,031,873 tr. oz.).
Hecla geologists were working on better ways to quickly locate veins using 3-D compilation of historic records and detailed lithologic characterization in drillholes.

Americas Gold and Silver Corporation operates the Galena mine near the town of Osburn. The mine was busy using last year’s investment by Sprott to repair over 5000 feet of drift and rail infrastructure at the mine. The cash infusion also financed a massive exploration program with over 48,000 feet of drilling during the year – in spite of the Covid protocols needed underground. Announced 4th quarter production at Galena mine increased to approximately 295,000 troy ounces of silver and 5.8 million pounds of lead. Final 2020 production numbers are pending.
There are multiple exploration targets at the Galena, and geologists were especially interested in testing potential below the 5500 level, the deepest at the mine. One example of a + 1000 g/t silver intercept was in DH 55-124 with 1,046 g/t Ag and 2.3% Cu over 2.4m, indicating rich tetrahedrite ore that the district is famous for. Mid-2020 calculations at the mine doubled the silver resource base.

A nice thing about ore and veins at the Coeur d’Alene district is that you can easily see them in the visual logging, as this nice run of galena shows on the 4300 level intercept.

Idaho has two fairly new gold mines in north Idaho. At Murray, a historic placer district, New Jersey operates the Golden Chest mine which includes both an open pit and underground. The company sends the ore to their own mill at Kellogg. A successful financing late in the year was being used for drilling to test down dip targets on the gold-quartz veins at the mine.

At Orogrande, west of Elk City, Endomines, a Finnish company, operated the new Friday mine, a small underground property. The had some
start-up issues, particularly at the mill, but did ship gold concentrates out.

There was no mining at Thompson Creek in Custer County. The large molybdenum mine has been quiet since 2015. However, Centerra, the company who purchased the property started using the mill and company’s Mo expertise to process and beneficiate 3rd party concentrates. Over 20 million lbs./year of cons were shipped to the company’s roaster in Pennsylvania or bagged and shipped direct to the consumer as HPM (high purity molybdenum), used for lubricants.

Idaho’s second world-class district is the Phosphate Reserve in southeastern Idaho near the town of Soda Springs. Ore is in stratigraphic horizons in the Permian Phosphoria Formation, a sedimentary phosphate rock. Three large companies are active: Bayer, formerly Monsanto; Itafos, formerly Agrium; and J.R. Simplot Co., the giant Idaho-based agribusiness company (private). Idaho produces over a fifth of the country’s phosphate. Apatite is the ore mineral. In addition to the mines, there are
Three large processing plants operated in 2020. Two produce phosphoric acid fertilizers, which are mostly used by farmers in the Western US and the Monsanto, now Bayer, plant in Soda Springs is the only producer of elemental phosphorus in the Western hemisphere. Another fertilizer plant, in Pocatello was operated by FMC but it closed in 2001 and part of it remains as a hazardous waste site. (2019: FMC must pay Shoshone-Bannock Tribes $20 million in back fees plus $1.5 million annually in perpetuity. FMC had agreed to the annual payment but tried to argue that it was not obligated to pay it after plant closed. Plant operated, partly on tribal lands, for over 50 years till 2001. Left 22 million tons of hazardous waste stored onsite. EPA says would cost $4.7 billion to remove and is not technologically feasible.)
Simplot’s huge Smoky Canyon mine is near the Wyoming border. They mined in the F and G panel pits in 2020. An environmental issue, recognized in the late 1990s, in the phosphate district is the presence of selenium in the rock, particularly in the waste shale between the two ore horizons. Simplot now separates out the high Se waste and caps it with a more impermeable layer to avoid water infiltration that can oxidize and mobilize the Se. The practice is more expensive but better for the environment.

Permitting a new mine requires long lead times and considerable effort. In July, the BLM released the Record of Decision (ROD) approving the East Smoky panel, shown in the foreground. The current pits are in back. In April, 2020, the BLM/Forest Service released the ROD approving Simplot’s new Dairy Syncline mine plan proposal. This would be a 30-year mine-life project and require moving the facilities to a new location shown in the inset map.
Bayer (formerly Monsanto) and their operating company P4 were mining at the Blackfoot Bridge mine, principally in the Mid-pit while backfilling and reclaiming the North pit. Bayer’s reclamation includes placing impermeable covers on external overburden piles and using lysimeters to monitor their performance.

Bayer’s new mine proposal for the Caldwell Canyon project was approved in August, 2019, and the company did initial surface work and significant development drilling there to assist with mine design.

Itafos who purchased Agrium’s Conda phosphate operations in 2018 is the third company in the district. Itafos mined their Rasmussen Valley mine and also at the Lanes Creek mine, a private parcel. The started reclamation at Lanes Creek.
Itafos restarted permitting for the Husky 1/N. Dry Ridge lease and submitted a mine plan to the agencies in April. The property hosts a 14-year resource but includes some rugged terrain.

Idaho has many smaller industrial mineral operations, as shown on this map. They tend to be stable and important local employers in rural areas. Markets include: Construction, Home and Landscaping, Abrasives, Filtration, Soil Amendments, Cattle Food Supplements, Glass-making
In the past few years there have been few changes. However, at Emmett, Unimin now is now part of Covia. Emmett plant – glass-making markets for its feldspathic sands. Some golf course sand.
Aggregate is the second most valuable commodity (after phosphate). With tremendous growth in several parts of Idaho, especially the Treasure Valley (Boise-Nampa metro areas), high quality fluvial sand and gravel, like this pit exposes, were in demand by a busy construction and transportation industry. North Idaho’s aggregate is related to the glacial deposits. Other resources in north Idaho are the unique industrial garnets mined at Emerald Creek, and weathering-related clay deposits being evaluated at the old Helmar-Bovill district in Latah County. i-minerals has spent several years at Bovill and submitted a revised plan to the State, who owns much of the property.

Southern Idaho’s Oakley stone is one of our most famous products. The unique building stone, a thin-splitting micaceous quartzite, is quarried at several pits on Middle Mountain. The stone industry was hit hard by Covid and visa restrictions that prohibited the primarily Mexican workers from starting work for most of the season. Few locals will work in the quarries, and the Mexican stone workers return yearly with their expertise in stone splitting.
A few of Idaho state agency activities in 2020 are summarized in this slide. The Idaho Department of Lands regulates surface disturbance for mining on state and private land. They were engaged in writing new rules to implement legislation of the prior year. The Idaho Geological Survey (IGS) continued its research and public service projects with a few slow downs due to Covid.

Perhaps the most exciting event during 2020 was the March 31 earthquake which struck in the evening and was clearly felt over a wide area of the state from Moscow south to Boise. The shaking emanated from a M6.5 magnitude quake with an epicenter a few miles northwest of the resort town of Stanley in the Sawtooth Valley. The quake was not along a mapped fault but it and a sizeable swarm of aftershocks are along a projection of the Sawtooth Fault on the west side of Sawtooth Valley. Luckily there were no injuries nor significant damage to buildings. IGS worked with seismologists at Boise State University and the USGS to help monitor the aftershocks and review an apparent liquefaction event at Stanley Lake, a popular camping area.
The first half of 2020 was slow, due in large part to seasons and the global Covid-19 pandemic. However, many companies soon developed safety protocols for working and social distancing in Covid world and were quite active in the second half of the year as prices for Au and Ag continued to climb (Au at ~ $ 1900/oz. and Ag at ~ $ 24/oz.). In addition to advanced drilling programs, there was a renewal of grass roots exploration with selected historic mining areas getting attention for the first time in 30 to 50 years. The following summaries of larger projects starts in the north and goes south.

The famous Bunker Hill mine, one of the largest in the Coeur d'Alene district, is on the west end of the Silver Valley, and known more for massive lead-zinc production though silver was also mined historically. New management of the Bunker Hill Mining Corporation gained an exploration lease with option to buy the property renegotiated to mid-2022, and continued an aggressive program. The company has input the historic mine maps and drill data into computers and used 3D modelling to plot known ore zone resources and targets with a focus on high-Ag areas and veins. They started a surface drilling program and also drilled from underground.
More details are on the Bunker Hill website. Approximately 5000 feet of surface core was drilled and a 4000–foot underground drill program initiated to evaluate the silver potential of areas closer to the surface in the large mine. Bunker Hill started a new PEA (preliminary economic assessment) with a due date of 3rd quarter 2021 for restarting the mine and mining above the water table.

The Elk City region in Idaho County is one of several historic placer gold-producing areas in Idaho. A major mineralized zone was historically along the Orogrande Shear, a north-south trending structure to the west of Elk City, as seen on the map. The yellow-colored dots are gold mines in the IGS mines and prospects database. IGS has a new mapping project to map and compile the geology of the region. Active exploration was underway by several junior companies and small miners. Endomines’ new Friday mine is one of those along the Orogrande Shear.
Idaho Champion acquired and drilled the old Baner mine in 2018 with good results. The Baner vein is along a subsidiary fault to the Orogrande Shear zone. They returned in 2020 with a 2200-meter drill program, plus surface mapping and geochemistry. The quartz-pyrite-gold veins cut altered and fractured granodiorite. Results pending.

The most closely watched mining project in Idaho is Midas Gold Corporation’s Stibnite Gold Project in Valley County. Midas submitted their mine plan in September 2016 as a Plan of Restoration and Operations (PRO) to combine mining with reclamation in the Au-Sb-W district which has serious impacts from historic mining. Much of the Yellow Pine pit, shown here, dates from the 1940s war effort when it was the nation’s leading tungsten supplier. The long-awaited Draft Environmental Impact Statement (DEIS) was released by the Payette National Forest in August, 2020, and followed by a 75-day public comment period. Those comments will be reviewed by the Forest Service and other state and federal regulators with a Final EIS and record of decision expected in the 3rd quarter of 2021. The proposed project will recover about 5 million troy ounces of gold and significant antimony (a critical mineral) over the 15-year mine-life. Major points of contention with environmental groups and public include water quality, tribal fishing jurisdiction, increased human presence in a remote area, and
numerous technical issues. Paulsen and Co. bought 44% of the corporate shares in early 2020. Capital costs of the complex project are in the range of $1 billion.

The area of Lemhi County and the region near the town of Salmon are one of the most mineralized and prospected portions of Idaho. Salmon was a hotbed of action in the second half of 2020, with three principal commodities of interest: cobalt-copper, gold, and rare earths. New Jersey Mining expanded their interests by acquiring the Diamond Creek and Roberts rare earth claims north of Salmon. The red dots on the map are the rare earth (REE) occurrences. New Jersey conducted surface mapping and sampling. Diamond Creek most recently saw work a few years ago. The NW-trending Idaho Cobalt Belt hosts the nation’s only primary cobalt deposits (the blue dots on the map). The Cu-Co deposits are stratabound horizons in the Mesoproterozoic Apple Creek formation banded siltite units. Activity in the belt decreased from the previous two years as the price of cobalt slumped, plus the effect of Covid delays. Only the two largest projects were worked. Jervois Mining, an Australian company, had acquired eCobalt’s fully permitted project next to the old Blackbird mine in mid-2019.
Jervois Mining, an Australian company, had acquired eCobalt’s fully permitted project next to the old Blackbird mine in mid-2019. Drilling in 2019 expanded the resource at the RAM deposit and Jervois released a Feasibility Study in September and looked at optimizing the mine plan and mill design, with intentions for more on-the-ground construction work in 2021. The quoted 43-101 resource of 5.24 million metric tons (Measured and Indicated) at 0.44% Co, 0.69% Cu, and 0.53 g/t Au, comes with additional inferred material and is open along strike and at depth. Additional mineralized horizons are present within the land package. Prior operator eCobalt (the renamed Formation Capital Corp. who discovered the RAM in 1997) had constructed water treatment ponds and initial earthworks at the site. The Co-bearing mineral is cobaltite, CoAsS. Copper is largely in chalcopyrite.
The second advanced project in the Idaho Cobalt belt is on the southeast end at Iron Creek where First Cobalt, a Canadian Company, had an extensive drill program in 2018-2019. Their updated 43-101 lists a 4.8 Mt resource at 0.3 CoEq. The company did an Induced Polarization(IP)-Resistivity in the fall with the goal of tracing the ore horizon under Tertiary volcanic cover. Results are pending. They also are working with Colorado School of Mines on metallurgical research. The Ruby zone is newly discovered Co-Cu mineralization on a logging road east of the property and that area was sampled with individual samples as much as 0.48% Co. Mineralization at Iron Creek is in cobaltiferous pyrite with magnetite zones also present in the stratigraphy. Permitting is underway for future drilling.

Gold has long been a target in the Salmon region. Revival Gold had the largest program in 2020 with two adjacent projects near the closed Beartrack mine, formerly operated by Meridian Gold, and the Leesburg placers. Revival released a new 43-101 resource in February with 36 Mt indicated at 1.16 g/t Au, and 47 Mt inferred resource at the Beartrack mine. However, their 10,000-meter drill program will certainly change those numbers. They company was working to infill mineralization between the pits and prospect new areas with IP-Resistivity and structural mapping. A new interpretation of the NE-trending Panther Creek Fault,
which has been said to control mineralization, is that it is a bend off the N-S trending Coiner Fault, south of the mine.

Revival’s second project is only a few miles west of Beartrack up a subsidiary drainage called Arnett Creek. The area hosts historic placers and was drilled initially about 25-30 years ago by AGR (American Gold Resources). The poorly exposed system hosts gold in oxidized veins. Revival completed surface mapping and drilled 30 holes plus running 65 kilometers of IP-Resistivity to expand the leachable gold resource. One result of the infill drilling at the Haidee target was AC20-48D with 0.93 g/t Au over 28 meters. They released a positive Preliminary Economic Assessment (PEA) in November for a Phase 1 leach operation. The type of mineralizing system is enigmatic. Intrusives in the area have been dated as Paleozoic with the Cretaceous Idaho batholith not far away.
Another major gold project was being drilled by Freeman Gold Corporation at Ditch Creek, a tributary of Hughes Creek near North Fork. This large area, now called the Lemhi Gold Project, was placered extensively and also explored by AGR and others (1984-2013), resulting in 355 historic drill holes. Oxide gold is the target with mineralization in structurally controlled quartz veins which are well-oxidized near surface. Freeman had drilled 16 core holes, totaling 3328 m of a 5000 meter program by fall.

Several smaller gold projects were acquired and drilled in 2020. These tended to be high-grade, historic underground mines without recent exploration work. They included Gaia Metals northeast of Salmon up Carmen and Freeman Creeks at their Gold Dyke property. They drilled four core holes late in the year. Hawkstone Mining, an Australian company, picked up the Lone Pine project near the King Solomon mine, northwest of Salmon. Surface sampling near the adit returned over 10 g/t gold. Ophir Gold (formerly Minkap Resources) picked up the Breccia project near the old Gahsmith mine south of Musgrove Creek and did sampling. The epithermal prospect was (I think) formerly known as Porphyry Ridge (?). US Gold acquired the Johnny’s Point resource, also called Musgrove Creek. West of Challis, at a cherrystem into wilderness at Parker Mountain, a small company ran a VLF geophysical survey over epithermal veins in volcanics.
Moving south and east, another large precious metal project is at Kilgore which hosts a million ounce gold resource (indicated and inferred) in Tertiary volcanics and sediments. In Clark County Excellon Resources acquired Otis Gold in February in an all-shares transaction. Excellon is well-funded with assets and experience in Mexico and Germany. Otis also had claims in Cassia County south of Oakley near Cold and Blue Hill Creeks, and those were optioned to Centerra, who planned to drill targets suggested from an IP Survey. The area hosts large areas of silicified limestones. Another south Idaho project near Burley was acquired by newcomer to Idaho, Gold Lion Resources. Their Robbers Gulch project was sampled and trenched with a Carlin-style target model. They were permitting for drilling in early 2021.
Idaho Champion picked up claims around and including the old Champagne mine in the Lava Creek district, west of Arco. The small heap leach open pit mine was worked by Bema Gold but closed in 1992 at a time of low gold prices. Idaho Champion instituted an aggressive program that included 5,000 meters of drilling with a second core rig mobilized in late October, along with a surface IP-Resistivity survey and soil sampling. They enlarged their claim block to encompass a number of historic mines and targets in the district. Mineralization is epigenetic and hosted in Tertiary volcanics with some indications of being a high-sulfidation system. The company sees major potential in the district which has not seen any serious exploration since about 1990.

Idaho’s mineral resources and exploration targets include polymetallic systems such as skarns and replacement deposits. Many of these base metal districts have high gold and silver grades as well. Phoenix Copper Ltd. (with interests by ExGen and Konnex Resources) continued work at their Empire mine project, the core of which includes patented and private parcels just west of Mackay. The Empire mine proper hosts skarn ore but their nearby Red Star prospect is a Ag-Pb vein. The company had a 32-hole drill program of RC and lesser core footage. One hole (KX20-26) intersected 7.6 meters of 4.38 g/t Au from shallow depths. An updated 43-101 resource noted a 19% increase in
Another polymetallic district was being drilled by BeMetals at the South Mountain property of Thunder Mountain Gold. The private land parcel hosts a zinc skarn, well known to mineral collectors for its ilvaite crystals. But the skarn and related replacement deposits also have high precious metal grades. After some Covid-related delays, the company started a Phase 2 drilling program of 2,400 m in 25 holes from underground workings to extend the Texas zone and infill the DMEA zones. By late in the year, they had drilled 7200 feet of the planned 8000 feet. This was follow up to the 2019 drilling. One intercept, SM19-006, assayed 21% Zn with 147 g/t Ag and 8 g/t Au over 15.7 meters. Metallurgy and mineralogical studies were started with the aim of releasing a PEA in 2021.
Finally, southern Idaho had two very large gold projects in the advanced exploration/development stage in 2020. In southeastern Idaho’s Cassia County, Liberty Gold continued with a very large program at the Black Pine project. The former Pegasus mine operated for about five years, producing about 600,000 ounces from a heap leach mine that closed in 1997. Black Pine is a Carlin-type disseminated gold deposit in silty carbonate rocks. Liberty received permits for an expanded drill program in January and had 3 RC rigs and a core rig working most of the year. The property has a number of shallow, historic Pegasus pits and additional targets. Drilling focused on the D1 and D2 trends with new discoveries in the D3 area (96 m at 1.44 g/t Au in hole 152). Metallurgical test results were positive. The company and agencies were also looking at permits and sources for water supply if mining is implemented.

One of Liberty’s strategies was simple: drill deeper. The Pegasus drilling was shallow and Liberty has found mineralization in a lower limestone unit (blue in the cross-section) below the old pits. A number of intercepts have grades of over 1 g/t gold. The Pegasus mine closed in 1997 at a time of very low gold prices.
Last but definitely not least is Integra Resources’ DeLamar Project in Owyhee County in southwestern Idaho. It actually consists of four subprojects, two of which (DeLamar and Florida Mountain) could be considered development projects and two of which are more exploration (War Eagle, a known historic producer, and Black Sheep). Like other companies, Integra is looking at prior mines that closed at times of low gold prices but still had significant exploration potential. District production is approximately 1.6 million troy ounces of gold and over 100 million ounces of silver. The epithermal district includes the Kinross DeLamar mine which closed in 1998, the Florida Mountain resource permitted by Kinross as the Stone Cabin mine, the historic and first-mined high grade veins on War Eagle Mountain and a large area of greenfield targets, collectively called Black Sheep, which has numerous sinter and alteration signatures of epithermal and hot spring deposits. Integra had 3 drill rigs working most of the year, along with engineering and metallurgical studies and environmental baseline work. A regional geologic mapping project by the Idaho Geological Survey with the help of Integra is planned for completion in 2021.
Integra was using 3D modelling of the resources drilled. This image shows different ore classes in different colors (red would be oxide ore with green transitional and blue sulfidic) as well as potential locations of processing and mine facilities in gray. Florida Mountain lies a few miles to the west of the DeLamar facility with an existing haul road along the ridge top. The Kinross mine closed in 2000.

The DeLamar district, also known as the Silver City district, was discovered and worked initially in the late 1800s, first on War Eagle Mountain. Lindgren’s excellent description in 1898 is a classic of economic geology and led to his epithermal vein model, much of which is still in use today around the world. Integra consolidated the land position on War Eagle last year, and drilling there has returned some “bonanza” intercepts, such as these with over 20 g/t Au (~ ¾ troy ounce/ton) from November 2020. Hole IWE-20-014 intersected 24.2 g/t Au, and 655 g/t Ag over 7.6 m. Hole IWE-20-017 hit 21.85 g/t Au and 76 g/t Ag over 1.52 m. Integra’s soil geochemistry sampling helped indicate parallel vein structures and extensions in the previously untested areas. Much more information is on their website.
Visit the Idaho Geological Survey website (www.idahogeology.org) and contact the Survey’s economic geologist (Dr. Virginia Gillerman) and other staff for more information on Idaho mines and geology. Stay safe.