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December 1, 1965

EVALUATION OF NEVADA SILVER PROPERTIES

CONCLUSIONS

Several properties have been seen which, provided suitable arrangements can be made, should be thoroughly examined, explored, and developed with the expectation of making them into mines.

This evaluation has only touched upon a few of the many silver mining possibilities to be found in Nevada.

RECOMMENDATIONS

Kern County Land Company should decide whether or not they are interested in any or all of the following silver properties described in this report:

1. Sixteen-to-One Mine near Silver Peak, Nevada.
2. West End Consolidated Mines Corporation at Tonopah, Nevada.
3. Comstock Lode at Virginia City, Nevada.
4. The Mabel and Garfield Mines near Mina, Nevada.
5. The Aladdin Mining Company, Railroad (Bullion) mining district near Elko, Nevada.

Options or other necessary agreements must be made with the property owners.

The exploration and development of the properties should follow the suggestions given in this and the attached property reports.

INTRODUCTION

During this past year both office and field examinations were made at silver properties in Nevada. At the beginning of the program, library research was conducted in the Pomona College Geology Library and the U. S. Geological Survey Library at Menlo Park, California. Since establishing headquarters in Reno, the first of April, the library and facilities of the University of Nevada and the Bureau of Mines have been available and were used when needed. During this period several rather lengthy examination trips were made to areas outside of Nevada.

Four weeks were spent in New Mexico during February and March, and four weeks in Wyoming and Montana during July and August. There were also several shorter expeditions: among them, one to Baja, California and one to Denver, Colorado. All of this outside activity, including office work and travel time, took the better part of three or more months from the silver program.

Some forty-one properties were considered during this evaluation period and thirty of them were directly related to the Nevada Silver Project.

Silver occurrences in Nevada, and throughout the western states, can be separated into many categories depending upon the use to which the information will be put. Two broad classifications, subdivided into groups, will be used in this report.

1. Silver value of the ore with respect to the value of the other metals in the ore:

    I. Predominately silver: More than half the value of the ore is derived from silver.

    II. Silver-Base Metal: Deposits in which the silver value approaches or equals the value of the other metals.

    III. By-product silver: Deposits that can be mined profitably for other metals without necessarily taking the silver value into consideration. Some base metal ores and the porphyry coppers are in this group.

    Figure 3 (following), taken from Silver Facts and Estimates, I. C. 8257, U. S. Bureau of Mines, 1965 shows the relationship between predominately silver or precious metal silver production and silver from base metal ores, porphyry copper deposits, and by-product silver.

2. Rock types in which the deposits are found:

   A. Related to Tertiary Volcanic and instrusive rocks:

      These deposits are found in the Tertiary Volcanic rocks, along the faulted or intrusive contacts of the Tertiary Volcanics with other rocks, and they may also be found in rocks adjacent to and intruded by Tertiary Volcanics.

   B. Non-Tertiary Intrusives:

      Deposits found in other igneous rocks and their related dikes.

   C. Sedimentary rocks and non-Tertiary volcanic and intrusive rocks:

      These are deposits that are usually formed as veins or replacements. They may be associated with intrusives and their related dikes.

Attached is a portion of the Tectonic Map of the United States which outlines the Tertiary Volcanic rocks in Nevada. There is an accompanying overlay, taken from the U.S.G.S. map Silver in the United States, locating the silver districts in Nevada that have produced more than 100,000 ounces of silver. When the overlay map is superimposed, these two maps show the geographic relationship between Tertiary volcanic rocks and the silver deposits. The locations of the silver properties considered in this report are marked on these maps.

The present price of silver is now greater than it has been in one hundred years. Production is not keeping up with consumption and the deficit of production with respect to consumption is expected to continue.

Figures 1 and 2 are copied from I. C. 8257, U. S. Bureau of Mines, 1965, Silver Facts, Estimates and Projections, and depict these trends. Figure 3 gives the price range and United States production since 1858. Since the conclusions given in I. C. 8257 are of interest, they have also been copied and attached to this report.

It is certain that the demand for silver will continue to be strong and that the consumption of silver will remain greater than the production of silver for many years to come.

Silver mines or prospects acquired at this time could well become profitable ventures.

INTERESTING PROPERTIES

Of the properties evaluated to date there are five that, if they can be acquired, warrant a thorough examination, the exploration of favorably mineralized areas and further development. They will now be classified and briefly described.

I-A Predominantly Silver Deposits - Related to Tertiary Volcanic Rocks.

The Sixteen-to One Property at Silver Peak, Nevada, is well into the development stage and shows promise of making a mine. The Mid-Continent Uranium Corporation, who is developing the property, has calculated over-all ore reserves as being 326,000 tons at $21.35 a ton for a total value of $6,960,100. Of this reserve, 296,000 tons are given for the main or foot-wall vein (which averages 12.5 feet wide), and 30,000 tons for the hanging-wall vein, (averaging 3.9 feet in width).

The Sixteen-to-One mine is being developed on a quartz vein in tertiary andesites and rhyolites. Values are predominately of silver which is accompanied by minor amounts of gold. The average assay is 14.14 ounces of silver per ton and 0.089 ounces of gold per ton. The vein has been explored for 400 feet along its strike, by drifting from the main adit. The Sixteen-to-One vein is known to extend, to the outcrop, 400 feet above the main adit level. Some work has been done between the adit and the out-crop. The vein has also been partially explored by diamond drilling for 1000 feet to the west of the main level workings, and for 300 feet below these workings. Where drill holes have cut the vein zone it has been found to contain near ore values.

Besides the Sixteen-to-One, the Mid-Continent Uranium Corporation has control of the following properties: The Mohawk or Argentite, the Sanger and the Nivloc (formerly the Desert Silver). There has been production from these properties in the past and reportedly moderate to sizable ore reserves remain.

The Sixteen-to-One mine, along with the other properties that are held by the Mid-Continent Uranium Corporation, in the Silver Peak (or Red Mountain mining district), Nevada, comprise a group of mines and prospects that have the potential of being developed into a profitable group of operating mines. If a deal can be made, they should be optioned and a comprehensive examination and development program initiated.

The West End Consolidated Mines Corporation at Tonopah, Nevada: This company owns the West End Mine, The Tonopah 76, and the West End Extension mines, totaling 290 acres of patented mining claims in the Tonopah mining district at Tonopah, Nevada.

These mines have been inactive since the nineteen-thirties and their ore reserves, as of that date, are mined out. The ore bodies occur along flat to steep dipping quartz veins in Tertiary volcanics. Vein widths vary, but, the better veins averaged about ten feet wide. The grade mined through 1920 - 1925 was 16.30 ounces of silver per ton and 0.176 ounces of gold per ton with a value at present prices of 27.19 a ton. From 1925 until the mine closed down completely in 1934, most of the mining consisted of leasing and cleaning up the old stopes. Little or no development work was done in search of new ore bodies.

The exploration possibilities at the West End Mines would include a search for the offset portion of the Ohio vein, developing new ore bodies along the extensions of known veins, and exploring for new veins or the faulted segments of known veins.

The Ohio vein has produced over $6,000,000 in high grade milling ore. The vein was stoped to where it was cut off by a fault. At the fault and vein junction, which was about 1,000 feet long, the vein averaged 10 feet in width. The faulted segment has not been found and it does not seem as if an extensive effort has been made to locate it. Besides exploring for the faulted portion of the Ohio vein, an effort should be made to develop new ore bodies along the southern extension of the Merton vein, south of the Ohio 600 level. A study of the geologic and other maps in their mine office at Tonopah should indicate where to explore for new veins or for the faulted segments of known veins.

Basing calculations on present metal prices at $1.29 an ounce for silver and $35.00 for gold, there is the possibility of developing new ore reserves along un-mined portions of the developed veins and adjacent to old stopes. This may be possible since, while the mines were operating, metal prices were lower than at present. The price of silver during the latter part of that period, averaged $0.66 an ounce through 1921 - 1925, $0.58 an ounce through 1926 - 1929, and $0.40 an ounce through 1930 - 1941. The price of gold did not rise from $20.67 an ounce to $35.00 an ounce until 1934, the year these mines finally were shut down.

A preliminary program to indicate the feasibility of opening up the West End Mines would include an office study to recalculate ore reserves, and the correlation of all available geological information. There should be 5000 feet of drilling, from the surface, part of which could be open hole, until the ore horizons were encountered. Check samples should be cut underground, possibly 1000 feet of sampling would be needed, provided an access way can be found into the mine.

Acquisition of the West End Mines should put the purchaser in a favorable position to acquire other properties in the Tonopah mining district, especially properties to the west and south. Nolan, in his suggestions for prospecting, in The Underground Geology of the Tonopah Mining District, Nevada Bureau of Mines Bulletin No. 5, 1935 writes: "The western extension of the productive zone offers more favorable possibilities". As I mentioned in my "Preliminary Report", there seems to be a reasonable chance that should a responsible company take over the West End Mines, the Tonopah Extension might become available.

The Comstock Lode extends from Virginia City through Gold Hill and to Silver City in Storey and Lyon Counties, Nevada. Production from the Comstock Lode was close to $400,000,000. It was noted as being a bonanza or high grade camp exploited, for the most part, by underground mining. Be that as it may, the Comstock has produced approximately 7,700,000 tons of low grade ore (averaging $9.25 a ton at present prices) from surface and near surface workings. Most of this production came from no deeper than 400 feet.

There is a reasonable chance that more of this low grade near surface material remains to be found and that sufficiently large blocks of ground can be obtained to prospect for such low grade open pit ore. Favorable zones located by the results of geologic mapping, surface sampling, and geochemical surveys would be explored by sampling and drilling, using a truck-mounted rotary drill.

I-C Predominately Silver Deposits in Sediments and Non-Tertiary Volcanics.

The Mabel mine, owned by the West End Consolidated Mines Corporation, and the adjacent Garfield mine are of the predominately Silver class and are in sedimentary and volcanic rocks of the Triasic, Luning and Excelsior formations. These mines are about eleven miles northwest of Mina, Nevada, in the Garfield mining district. They are on steep, narrow veins. The Mabel mine produced (at the then prevailing price of gold and silver) $481,627 in net smelter returns from 4310 tons of ore for an average value of $97.82 per ton. The value per ton at today's metal prices, with silver at $1.29 and gold at $35.00 an ounce, and lead at $0.16 a pound, is as follows:

			$ per ton
Silver	91.93 oz. per ton	=	$118.59
Gold	1.28 oz. per ton	=	44.80
Lead	5.10	=	16.32
	Total		$179.91

The Mabel, a small mine, was developed to the 700 foot level (130 feet of drift) and the maximum lateral extent was 800 feet on the 500 level. Mr. Budelman's report of February 1, 1934, says there is mill grade sulphide ore left in the mine and that high grade was found on the lower levels. He says the vein outcrop extends at least 2000 feet and that there is at least one parallel vein which has not been explored.

The Garfield mine, whose three interlacing veins extend into the Mabel claims, was developed by adits and has two miles of workings. It was mined to 350 feet below the surface. Production figures vary greatly for the Garfield mine ranging from $550,000 by Couch and Carpenter, 1943, to $6,000,000 by Lincoln, 1923.

These two mines, and the adjacent ground, offer possibilities of prospecting for ore bodies along narrow veins. The veins appear to have sufficient strike length so that even if the ore bodies remain narrow, from two to four feet wide, there is opportunity to develop sufficient ore for profitable mining. It is possible that continued development might discover that replacement deposits have formed along limestone beds of the Luning formation, as at the Simon mine, and the veins might widen when passing through more favorable wall rocks. The Mabel mine is in the primary sulfides, on the lower levels, but the Garfield mine apparently has not as yet been developed deep enough to reach the sulphide zone.

Options should be obtained on these two properties. The exploration campaign to be followed would consist of geological mapping and sampling combined with selected geochemical and geophysical procedures. This work would be followed up by the diamond drilling of favorable areas along the veins.

II-C-A Silver-Base Metal Deposits - In Sedimentary Rocks and related to Tertiary intrusives:

The Aladdin Mining Company has control of nearly all of the Railroad (Bullion) mining district in Elko County, Nevada, situated 28 miles southwest of Elko, Nevada. These deposits are in paleozoic sediments and are adjacent to a compound granitic-rhyolite porphyry intrusion and related rhyolite porphyry dikes. Production from the Railroad district has been estimated as at about $2,000,000 (old prices) in silver, lead and copper, with minor amounts of zinc and gold.

The main production has come from pipe-like ore bodies in the limestones and is often associated with rhyolite porphyry dikes. The pipe-like deposits produce high grade silver, lead and copper ore. Several of the pipes have been mined for 300 to 500 feet vertically and seem not to have been bottomed. There are indications that this mineralization continues down to the Davis Adit level, about 500 to 700 feet below the bottom of the old mines.

Skarn zones have developed along the contact of the sediments and the intrusive rocks, and at least one of the rhyolite porphyry dikes has been hydrothermally altered to halloysite. There are copper showings, as well as those of lead and zinc, along the skarn zones and in the altered dike. Small amounts of high grade silver-copper ore have been mined along the skarn and dike, and there are indications of low grade copper mineralization. Disseminated magnetite is found in the contact rocks, and reportedly a small body of magnetite has formed at the southern end of the skarn zone. There are gossan outcrops, in the limestones, that have not been adequately explored, and these might represent surface showings of other pipe-like ore bodies.

The major portion at the Railroad Mining district, which is held by the Aladdin Mining Company, will probably be available at reasonable terms. This is a well mineralized district and one that should be further explored. The geology should be mapped in detail, both on the surface and underground. One objective of such mapping is to determine the relationship of the mineralization to the contact zone and to favorable sedimentary horizons. Another objective would be to work out the stratigraphy and structure of the district so that projections could be made which might locate the Hamburg and Eureka dolomites. These beds are favorable ore horizons for rich replacement deposits at Eureka and in other mining districts. If the projections indicate that these beds are within reach, in the Railroad district, they should be explored for by drilling to see if, in the Railroad district, they are also well mineralized.

Surface mapping is out of the question for the next three to five months, due to heavy snow cover. However, work could start immediately in the Davis Adit. Mapping could be done and diamond drilling started, from the face of the Davis adit, to explore for the mineralized zone along the intrusive contact as well as drilling, from other locations, for extensions of the pipe-like ore bodies. A drift could be driven 350 feet to a diamond drill hole intercept which showed seven feet of silver, lead and zinc mineralization which assayed 4 ounces silver, 3.5% lead and 3.2% zinc.

As soon as the snow has gone, surface geological mapping would begin, as well as sampling and geochemical and geophysical surveys where needed. There would be underground diamond drilling, from the inactive mines, for downward extensions of their pipe-like ore bodies. Surface drilling would also be needed, along the skarn zone, and the hydrothermally altered dike.

Taken from U.S. Bureau of Mines I.C. 8257

CONCLUSIONS

1. Free world production of silver has been rising since World War II, but not in pace with increased consumption by industry, the arts, and coinage. Demands for industrial uses should continue to increase. Consumption in the arts is influenced by prosperity and the vagaries of fashion. The amount used for coinage depends on political decision.

2. Projections of supply and demand trends indicate an annual free world supply deficit of 300 to 400 million ounces during the next few years.

3. Net U.S. imports of silver have declined since 1962, and the rate of withdrawal from accumulated stocks, chiefly that of the U.S. Treasury, has accelerated until a net export situation developed in late 1964.

4. Reduction of the silver content in U.S. subsidiary coins would extend the total supply of silver but could be only a temporary palliative.

5. Elimination of silver in subsidiary coins would reduce withdrawals from Treasury stocks and should release a large quantity for industrial needs.

6. Net industrial consumption in the United States has been increasing for all major uses and may be expected to continue to increase in the foreseeable future.

7. Annual silver production of domestic mines, which averaged about 35 million ounces during 1955-63, is expected to increase moderately, perhaps to 41 million ounces by 1970.

8. About two-thirds of domestically mined silver is recovered as a byproduct in the treatment of base metal ores. Output of silver from these ores will be determined largely by base metal demands and prices and by plant capacities, and will be only nominally responsive to the price of silver.

9. The measured and indicated reserve of domestic silver-bearing ore is equivalent to a 16-year supply at the current production rate, and discovery and development of new ore can be expected as this reserve is mined; however, the anticipated productive rate of silver is grossly inadequate to supply projected domestic needs.

10. Useful estimates of silver reserves at prices 2 or 3 times the present price cannot be made at the present time because most straight silver mines have been idle for many years and information on the magnitude of the deposits is not available.

11. Silver prices 2 or 3 times the present level will stimulate the prospecting for new mines, the reopening of idle submarginal mines containing argentiferous ores, and the development of new reserves. The early effect on output will not be great.

12. Silver from other major producing countries of the free world--Canada, Mexico, Peru, and Australia--also is currently produced largely as a byproduct of base metal ores. Reserves are adequate for many years of mining, but the output will depend largely on the demand for base metals rather than silver.

13. The long-range demand for silver even without monetary usage promises an expansion that justifies geological, mining, and metallurgical research now to lay the groundwork for needed exploration and development of adequate silver resources for the future.

INTRODUCTION

Since 1959, owing largely to an increasing demand for U.S. coinage, current world silver production has been unable to meet world demand, and the price of silver has risen. U.S. needs have been met by imports and by drafts on U.S. Treasury stocks. The following paragraphs attempt to assess the magnitude of the world imbalance, to project trends, and to supply data and estimates for evaluating the crisis that impends if present trends persist and the Treasury stocks--1¼ billion ounces, December 1964--are exhausted.

Supply is appraised in terms of ore reserves and their responsiveness to exploration, development, and application of new mining and metallurgical methods, with special regard to stimulation of production through higher silver price. In addition, the possibilities of expanding secondary supply through better reclamation are considered.

The possibilities of substitution of other metals or silver-free alloys in industrial and monetary use are covered. In addition, the imponderable elements of demand, particularly the coin collecting vogue, speculation, and apparent widespread coin-hoarding, are given weight.

Taken from U.S. Bureau of Mines I.C. 8257

DOMESTIC SUPPLY AND DEMAND, 1955-1970

The tabulated data (table 1 and figure 1) disclose that total domestic consumption of silver will probably exceed mine production plus net imports by progressively increasing quantities in the period 1965-67. The deficit in new supply during this period can continue to be balanced almost entirely by withdrawals from Treasury stocks. After 1967, at the projected rate of withdrawal, Treasury stocks would not be adequate to balance the deficit in supply for both industrial and coinage requirements, and these stocks could be virtually depleted by 1968 unless consumption is reduced drastically. Hence, policies and programs must be established and developed at the earliest possible time to alleviate the growing imbalance in the supply of silver and to prevent an impending crisis which looms as the supply of silver coins in circulation is threatened.

Data in the attached table for the period 1955-63 are taken chiefly from Minerals Yearbooks; subsequent projected figures are based on the assumption that present policies with regard to silver coinage and disposal of monetary silver by the Treasury will continue unchanged.

Domestic mine production, which has averaged about 35 million ounces annually in the period 1955-63, is expected to show a moderate increase in the period 1964-70, perhaps to 41 million ounces by 1969.

Mines whose principal product is silver--that is, those in which the value of silver constitutes more than 50 percent of the total value of the ore--have furnished, on the average, about one-third of the total domestic output in recent years (table 2). This class of ore is expected to yield about the same proportion in the next few years and a somewhat greater portion of the total output thereafter, as most of the expected increase in domestic production will be obtained from high silver ores.

Mines whose principal product is other than silver, chiefly copper, lead, and zinc or some combination of these metals, furnish about two-thirds of the total domestic output. The quantity of silver obtained from these ores is not likely to change much in the next few years.

The recovery of silver from secondary sources such as scrap silverware, photographic wastes, and worn coins, which increased appreciably in the period 1955-61, has declined since, and is expected to level off in the range of 10 to 12 million ounces annually in the next few years.

Imports of silver have fluctuated considerably without showing a definite trend, and in recent years, have been affected by such factors as lend-lease returns, availability of Treasury silver, new production, and availability of world stocks. Exports have been rising since 1955 and probably will exceed imports in 1964 for the first time since 1945. As speculative stocks abroad appear to have been largely liquidated prior to 1964, it is expected that future net imports will constitute a lesser part of domestic supply than in the past.

Taken from U.S. Bureau of Mines I.C. 8257

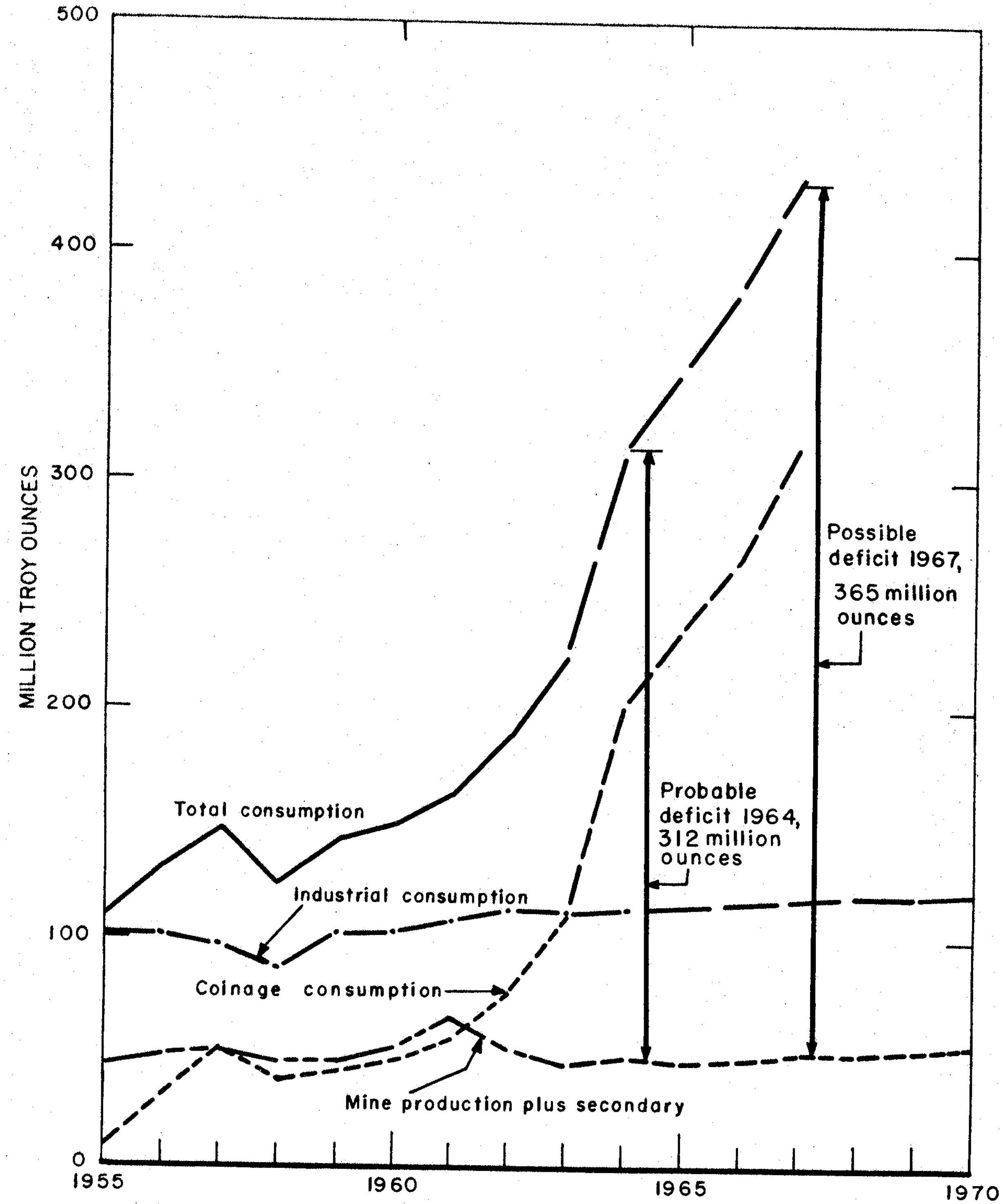


FIGURE 1. - U. S. Silver Production and Consumption 1955-63 With Projections to 1967.

Taken from U.S. Bureau of Mines I.C. 8257

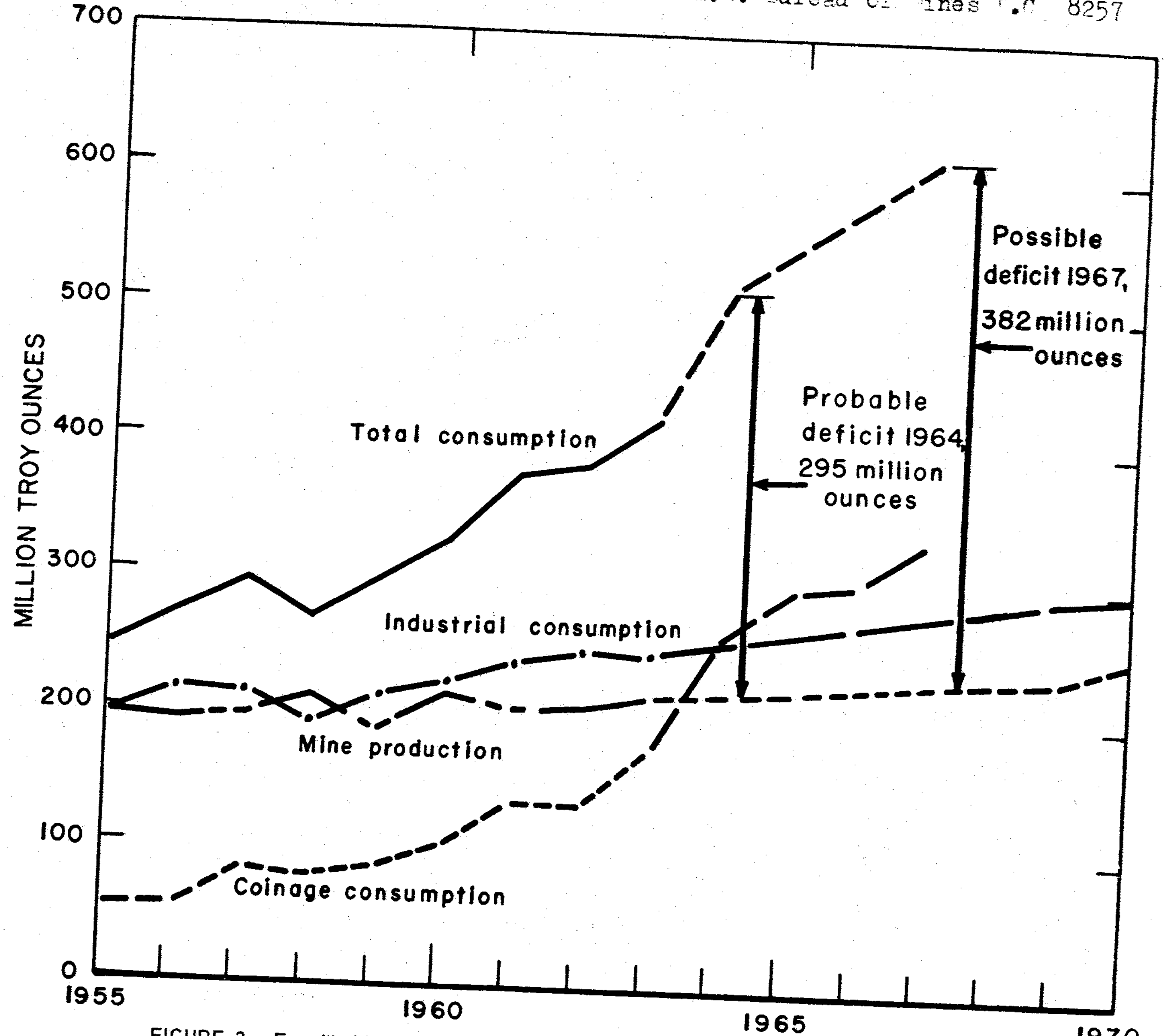
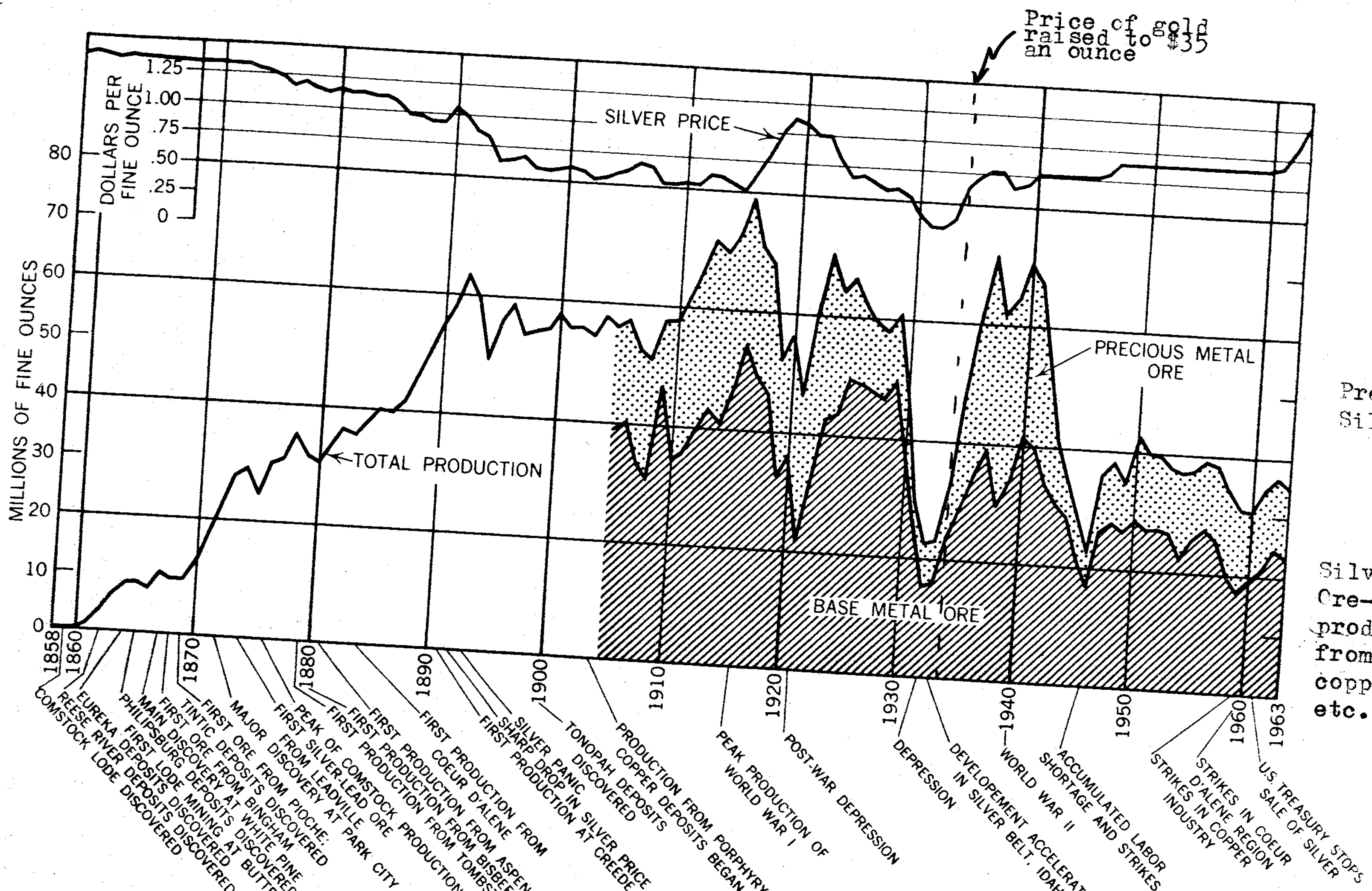


FIGURE 2. - Free World Production and Consumption 1955-63 With Projections to 1967.

Taken from U.S. Bureau of Mines I.C. 8257



Predominatly Silver ore

Silver Base Metal Ore- Includes By-product silver f from porphyry - copper deposits etc.

FIGURE 3. - Price and Production of Silver in the United States From 1858 to 1963. (Chart from U. S. Geological Survey from Data From Bureau of Mines.)

MONTANA (cont'd.)

brian and Ordovician limestone and dolomite. Lovering, 1930; Reed, 1950.

NEVADA

1. Leadville (Leadville mine). Veins in diorite porphyry dike and in andesite of Tertiary age. Overton, 1947. — 41°07' 119°25'
2. Sulphur. Veins and stringers in Tertiary rhyolite. Vanderburg, 1938a. — 40°54' 118°39'
3. Rosebud. Replacement veins and stringers in Tertiary rhyolite. Vanderburg, 1936. — 40°48' 118°36'
4. Antelope (Cedar). Replacement bodies in limestone; byproduct of copper in fissure in tourmalinized rhyolite. Vanderburg, 1936. — 40°41' 118°32'
5. Seven Troughs. Veins along basalt dikes cutting Tertiary volcanic rocks. Vanderburg, 1936. — 40°30' 118°38'
6. Trinity. Fissure veins in Cretaceous(?) granodiorite and in hornfelsed Jurassic slate. Vanderburg, 1936. — 40°20' 118°30'
7. Arabia. Fissure veins in Cretaceous(?) granodiorite and in xenoliths of Jurassic hornfels. Knopf, 1918b; Vanderburg, 1936. — 40°22' 118°24'
8. Relief (Antelope Springs). Vein in Triassic limestone. Vanderburg, 1936. — 40°12' 118°10'
9. Rochester. Replacement veins and stringers in Triassic rhyolite. Vanderburg, 1936. — 40°18' 118°11'
10. Kennedy. Vein in Triassic volcanic and sedimentary rocks. Vanderburg, 1936. — 40°23' 117°42'
11. Indian. Vanderbury, 1936. — 40°25' 118°09'
12. Buena Vista (Unionville). Veins in Triassic rhyolite and limestone. Lincoln, 1923; Vanderburg, 1936. — 40°28' 118°09'
13. Rye Patch (Echo). Fissure veins in Triassic limestone. Vanderburg, 1936. — 40°28' 118°12'
14. Star. Veins and bedding lenses in Triassic limestone. Vanderburg, 1936. — 40°33' 118°06'
15. Humboldt (Imlay). Veins in shale, quartzite, and limestone. Vanderburg, 1936. — 40°35' 118°13'
16. Sierra (Dun Glen, Chafey). Veins in silicified andesite near diabase dike, and fissure veins in limestone. Vanderburg, 1936. — 40°43' 117°52'

NEVADA (cont'd.)

17. Gold Run (Adelaide). Veins in limestone, quartzite, shale, and schist. Vanderburg, 1938a. — 40°47' 117°31'
18. Winnemucca. Veins in Triassic calcareous slate. Vanderburg, 1938a. — 41°03' 117°42'
19. Barrett Springs. Veins in shale. Vanderburg, 1938a. — 41°08' 117°49'
20. Paradise Valley. Fissure veins in calcareous slate. Vanderburg, 1938a. — 41°36' 117°27'
21. National. Veins in Tertiary volcanic rocks. Vanderburg, 1938a. — 41°50' 117°34'
22. Gold Circle (Midas). Replacement and fissure veins and lodes in rhyolite and along shattered contact between rhyolite and andesite. Emmons, 1910; Granger and others, 1957. — 41°14' 116°48'
23. Merrimac (Rip Van Winkle mine). Veins and bedding replacement bodies along faults bordering a graben in Mississippian shale and limestone. Granger and others, 1957. — 41°07' 116°00'
24. Tuscarora. Stockworks and lodes in Tertiary rhyolite and andesite porphyry. Emmons, 1910; Nolan, 1936; Granger and others, 1957. — 41°18' 116°15'
25. Good Hope. Lodes along shear zones in rhyolite flow breccia. Emmons, 1910; Granger and others, 1957. — 41°28' 116°30'
26. Cornucopia. Lodes in Tertiary andesite. Granger and others, 1957. — 41°34' 116°17'
27. Edgemont (Centennial). Fissure veins in Carboniferous(?) quartzite. Granger and others, 1957; Emmons, 1910. — 41°41' 116°11'
28. Aura (Bull Run, Columbia). Lodes in limestone adjacent to granodiorite stock, and veins in the granodiorite. Granger and others, 1957; Emmons, 1910. — 41°49' 116°05'
29. Mountain City (Cope, Van Duzer, Rio Tinto). Fissure veins in granite and metamorphosed limestone; byproduct of copper in secondarily enriched ore. Emmons, 1910; Matson, 1947. — 41°50' 115°59'
30. Jarbidge. Fissure veins in Tertiary rhyolite. Schrader, 1912, 1923; Granger and others, 1957. — 41°51' 115°25'

NEVADA (cont'd.)

31. Contact (Salmon River). Fissure veins, replacement bodies, and contact metamorphic deposits in Paleozoic limestone; veins in granodiorite near dikes of syenite and lamprophyre. Schrader, 1912, 1935; Granger and others, 1957. 41°47' 114°45'

32. Delano (Cleveland and Delano mines). Replacement bodies along bedding in brecciated Paleozoic dolomite(?). Granger and others, 1957. 41°40' 114°15'

33. Spruce Mountain. Replacement bodies along bedding, fractures, and faults in Mississippian limestone, partly at contact with porphyry dikes. Granger and others, 1957; Schrader, 1931. 40°34' 114°50'

34. Cherry Creek (Egan Canyon). Veins in Cambrian quartzite and in Cretaceous(?) quartz monzonite. Schrader, 1931. 39°54' 114°55'

35. Hunter. Replacement bodies in breccia along fault contact of Devonian dolomitic limestone with porphyry dikes. Hill, 1916. 39°37' 115°00'

36. Aurum. Replacement bodies along faults and bedding in Cambrian limestone. Hill, 1916. 39°37' 114°32'

37. Piermont. Veins in brecciated limestone at contact with porphyry and in slate. Lincoln, 1923. 39°30' 114°35'

38. Osceola. Lodes along fracture zones in Cambrian sedimentary rocks. Lincoln, 1923. 39°04' 114°23'

39. Taylor. Breccia filling and replacement bodies in brecciated Ordovician(?) limestone. Lincoln, 1923. 39°05' 114°40'

40. Ward. Veins and replacement bodies along contact of quartz monzonite porphyry dikes with Pennsylvanian limestone. Hill, 1916. 39°05' 114°53'

41. Ely (Robinson). Replacement bodies along veins and bedding, and contact metamorphic deposits in Devonian and Carboniferous limestones; byproduct of "porphyry" copper, disseminated in Jurassic(?) monzonite porphyry stocks. Spencer, 1917. 39°15' 114°59'

42. White Pine (Hamilton). Replacement bodies along veins and bedding in Ordovician dolomite; saddle reefs in Devonian limestone below shale. Hague, 1870. 39°15' 115°30'

NEVADA (cont'd.)

43. Newark. Vein in limestone. Lincoln, 1923. 39°32' 115°46'

44. Eureka. Replacement bodies along fissures, partly along bedding, in Cambrian limestone. Sharp, 1948. 39°30' 116°08'

45. Mount Hope (Mt. Hope mine). Replacement bodies along bedding and faults in Pennsylvanian limestone roof pendant in alaskite stock. Matson, 1946. 39°47' 116°10'

46. Diamond. Fissure veins in silicified limestone. Vanderburg, 1938b. 39°52' 115°53'

47. Union. Replacement bodies in limestone. Vanderburg, 1938b. 40°03' 116°03'

48. Mineral Hill. Replacement bodies cutting across bedding in Paleozoic limestone. Vanderburg, 1938b. 40°09' 116°06'

49. Railroad (Bullion). Replacement bodies in near-vertical chimneys at fracture intersections in Ordovician limestone; some contact metamorphic deposits. Granger and others, 1957. 40°31' 116°00'

50. Safford. Veins in andesite. Vanderburg, 1938b. 40°34' 116°20'

51. Buckhorn. Veins along fault in kaolinized brecciated basalt and scoria. Vanderburg, 1938b. 40°12' 116°28'

52. Cortez. Replacement bodies in Ordovician(?) limestone, partly within sheeted zones parallel to porphyry dikes. Emmons, 1910; Vanderburg, 1938b. 40°09' 116°35'

53. Bullion. Fissure veins and sheeted lodes in Carboniferous limestone, quartzite, and shale and in andesite and granodiorite. Vanderburg, 1939; Emmons, 1910. 40°22' 116°44'

54. Hilltop. Veins in brecciated quartzite. Vanderburg, 1939. 40°26' 116°48'

55. Lewis. Veins in granodiorite and in Carboniferous quartzite, limestone, and slate, in part with replacement. Vanderburg, 1939. 40°27' 116°52'

56. Battle Mountain. Veins and replacement bodies along faults in Carboniferous hornfels, conglomerate, and quartzite. Roberts, 1951. 40°33' 117°07'

57. Reese River (Austin). Veins in lower Tertiary(?) quartz monzonite and Paleozoic schistose 39°28' 117°04'

NEVADA (cont'd.)

quartzite. Vanderburg, 1939; Hill, 1915.

58. Kingston. Veins in limestone. Vanderburg, 1939.	39°11'	117°08'
59. Jackson. Fissure veins in andesite. Kral, 1951.	39°08'	117°36'
60. Mammoth (Ellsworth). Veins in Tertiary rhyolite dikes cutting Triassic(?) metavolcanic rocks. Kral, 1951.	38°58'	117°45'
61. Bruner (Phonolite). Veins in brecciated Tertiary rhyolite and andesite. Kral, 1951.	39°05'	117°48'
62. Lodi (Illinois mine). Veins in Triassic limestone and limy shale at contact with intrusive granodiorite. Kral, 1951.	39°00'	117°53'
63. Quartz Mountain (San Rafael mine). Veins in Triassic limestone along contact with intrusive granodiorite porphyry. Kral, 1951.	39°03'	117°58'
64. Broken Hills. Veins and stockworks in andesite. Vanderburg, 1937.	39°03'	118°02'
65. Wonder. Veins in Tertiary rhyolite. Vanderburg, 1940.	39°27'	118°02'
66. Chalk Mountain (Chalk Mtn. mine). Replacement bodies along fissures and bedding planes in dolomitic limestone. Vanderburg, 1940.	39°20'	118°07'
67. Fairview. Fissure veins in Tertiary andesite. Vanderburg, 1940.	39°13'	118°10'
68. Sand Springs. Veins in schist, limestone, and andesite. Vanderburg, 1940.	39°19'	118°25'
69. Rawhide (Regent). Veins in rhyolite, dacite, and andesite. Vanderburg, 1937.	39°02'	118°25'
70. Holy Cross. Narrow veins in rhyolite and andesite. Vanderburg, 1940.	39°05'	118°37'
71. Talapoosa. Lodes along shear zones in Tertiary rhyolite. Stoddard and Carpenter, 1950.	39°28'	119°15'
72. Peavine. Veins and replacement bodies in schist, in Cretaceous quartz monzonite, and in Tertiary andesite. Overton, 1947.	39°35'	119°56'
73. Galena (Commonwealth mine). Veins in metamorphosed tuff and hornfels. Overton, 1947.	39°21'	119°46'

NEVADA (cont'd.)

74. Flowery. Stringer network in andesite. Stoddard and Carpenter, 1950.	39°19'	119°36'
75. Comstock. Lodes and veins in Upper Tertiary igneous rocks ranging from diorite to andesite. Becker, 1882; Bastin, 1922; Gianella, 1936.	39°18'	119°38'
76. Silver City. Veins in Tertiary andesite and rhyolite. Stoddard and Carpenter, 1950; Gianella, 1936.	39°14'	119°37'
77. Como (Palmyra, Indian Springs). Veins in Tertiary volcanic rocks, chiefly andesite. Stoddard and Carpenter, 1950.	39°10'	119°28'
78. Yerington. Byproduct of copper. Disseminated deposits in quartz monzonite; contact metamorphic deposits in bordering limestone. Stoddard and Carpenter, 1950.	38°59'	119°10'
79. Wilson (Pine Grove, Rockland, Cambridge). Stringers and lenses along crushed zones in quartz monzonite. Stoddard and Carpenter, 1950; Hill, 1915.	38°40'	119°07'
80. Aurora (Esmeralda). Veins along fissures in Tertiary latite and andesite. Vanderburg, 1937.	38°17'	118°52'
81. Hawthorne. Vein along or near contact of granodiorite with Mesozoic limestone. Hill, 1915; Vanderburg, 1937.	38°28'	118°40'
82. Rand (Bovard). Breccia veins in Tertiary rhyolite and replacement veins in latite. Vanderburg, 1937.	38°48'	118°24'
83. MABEL Garfield. Veins in limestone and volcanic rocks. Vanderburg, 1937.	38°28'	118°20'
84. Santa Fe (Luning). Contact metamorphic deposits and replacement bodies in Triassic(?) limestones; veins in altered quartz monzonite. Vanderburg, 1937; Hill, 1915; Clark, 1922.	38°32'	118°06'
85. Silver Star (Gold Range, Mina, Douglas). Veins in Triassic conglomerates and Tertiary volcanic rocks. Vanderburg, 1937; Hill, 1915; Kerr, 1936.	38°20'	118°11'
86. Marietta (Black Mountain). Replacement lodes in Triassic(?) andesite tuff, quartzite, conglomerate, and limestone. Vanderburg, 1937; Hill, 1915.	38°17'	118°22'

NEVADA (cont'd.)

87. Buena Vista (Oneota). Veins in extrusive and intrusive igneous rocks and in adjacent hornfels and marble. Vanderburg, 1937.	37°55'	118°19'
88. Candelaria (Columbus). Veins in Ordovician(?) argillites and felsites. Knopf, 1922; Page, 1959; Vanderburg, 1937.	38°09'	118°05'
89. Bell (Simon, Cedar Mountains) (Simon mine). Replacement bodies in Triassic limestone along sides of alaskite porphyry dike. Vanderburg, 1937; Knopf, 1921a.	38°34'	117°52'
90. Union (Grantsville, Berlin). Replacement bodies in Triassic limestone; veins in Permian(?) meta-andesite, Triassic slate, conglomerate and limestone, and Tertiary andesite. Kral, 1951; Ferguson and Muller, 1949.	38°53'	117°35'
91. Twin River (Millett). Vein in slate. Kral, 1951.	38°55'	117°16'
92. Jefferson Canyon. Veins in Tertiary rhyolite and along contact with Ordovician slate. Lincoln, 1923.	38°44'	117°01'
93. Round Mountain. Byproduct of gold. Fissure veins in Tertiary rhyolite. Kral, 1951.	38°41'	117°04'
94. Belmont. Veins and lenses in Ordovician limestone and shale near contact with granite intrusive. Kral, 1951.	38°37'	116°56'
95. Manhattan. Byproduct of gold. Veins, lodes, and stockworks in Paleozoic schists and limestones and in Tertiary volcanic rocks. Kral, 1951; Ferguson, 1924.	38°33'	117°03'
96. San Antone. Veins in Permian volcanic rocks and in Ordovician limestone. Kral, 1951.	38°15'	117°14'
97. Tonopah. Replacement veins in Tertiary andesite and rhyolite. Kral, 1951; Hewett and others, 1936; Nolan, 1935b.	38°05'	117°14'
98. Divide (Gold Mountain). Veins along shear zones in upper Tertiary pyroclastic rocks. Knopf, 1921b; Hewett and others, 1936.	38°01'	117°12'
99. Lone Mountain. Replacement bodies in Cambrian limestone along contact with porphyry dike or with granite intrusive. Ball, 1907.	37°57'	117°25'

NEVADA (cont'd.)

100. Klondyke. Veins in Cambrian sedimentary rocks. Lincoln, 1923, Spurr, 1906.	37°54'	117°13'
101. Silver Peak (Red Mountain). Veins in Paleozoic sedimentary rocks. Lincoln, 1923.	37°46'	117°36'
102. Montezuma. Veins and replacement bodies in Cambrian limestone near contact with quartz monzonite. Lincoln, 1923.	37°43'	117°23'
103. Goldfield. Byproduct of gold. Replacement bodies in Tertiary dacite and other volcanic rocks. Lincoln, 1923; Ransome, 1909a; Searles, 1948.	37°42'	117°15'
104. Lida. Veins and replacement bodies in Cambrian limestones. Lincoln, 1923.	37°27'	117°33'
105. Hornsilver. Veins in Paleozoic sediments near borders of granite intrusives. Ransome, 1909b; Hewett and others, 1936.	37°22'	117°18'
106. Bullfrog. Veins and lodes along faults in Tertiary rhyolite. Kral, 1951.	36°53'	116°53'
107. Silverbow. Veins in rhyolite. Kral, 1951; Hewett and others, 1936.	37°53'	116°28'
108. Reveille. Veins and stringers in brecciated Paleozoic limestone. Kral, 1951.	38°01'	116°09'
109. Bellehelen. Fissure veins in rhyolite. Kral, 1951.	38°05'	116°28'
110. Tybo. Replacement bodies along a fault in quartz latite porphyry dikes that intrude Cambrian and Ordovician limestones. Ferguson, 1933; Kral, 1951.	38°22'	116°24'
111. Morey. Veins in quartz latite. Kral, 1951.	38°40'	116°15'
112. Tempiute. Veins in lower Paleozoic limestone. Hewett and others, 1936.	37°39'	115°37'
113. Groom (Groom mine). Replacement bodies along bedding and fissures in Cambrian limestone. Humphrey, 1945.	37°20'	115°46'
114. Bristol (Jackrabbit). Replacement bodies along intersections of fissures in Cambrian limestone. Westgate and Knopf, 1932.	38°05'	114°36'
115. Pioche. Replacement vein and bedded deposits along fissures in Cambrian limestone; veins	37°56'	114°29'

Index (cont'd.)

NEVADA (cont'd.)

in quartzite. Westgate and Knopf, 1932.		
116. Comet. Bedded replacement bodies in Cambrian limestone; veins in quartzite. Westgate and Knopf, 1932.	37°53'	114°37'
117. Ferguson (Delamar). Disseminated ore and veinlets in shattered Paleozoic quartzite. Hewett and others, 1936.	37°24'	114°49'
118. Yellow Pine (Goodsprings). Replacement bodies along fractures or folds in Mississippian dolomite. Albritton and others, 1954; Hewett, 1931a.	35°52'	115°31'
119. Eldorado. Fissure veins in Precambrian gneiss and schist and in quartz monzonite. Lincoln, 1923.	35°40'	114°50'
120. Searchlight. Breccia veins in metamorphosed lower Tertiary(?) andesite porphyry, in older volcanic rocks, and in Precambrian gneiss. Callaghan, 1939.	35°27'	114°55'

NEW HAMPSHIRE

1. Milan. Replacement lenses along schistosity in siliceous schist. Emmons, 1909.	44°34'	71°15'

NEW MEXICO

1. Cochiti. Veins and replacement bodies along fractures in monzonite. Anderson, 1957.	35°52'	106°27'
2. Willow Creek (Pecos) (Pecos mine). Replacement lenses in shear zone in Precambrian micaceous diorite. Krieger, 1932; Harley, 1940.	35°46'	105°40'
3. New Placers. Replacement pipe at intersection of fractured zone with Pennsylvanian limestone bed; byproduct of copper-gold in contact metamorphic deposits. Lindgren and others, 1910.	35°15'	106°12'
4. Magdalena. Replacement bodies in Mississippian limestone, mostly along crests of low folds. Loughlin and Koschmann, 1942.	34°05'	107°12'
5. Socorro Peak. Narrow veins in rhyolite and trachyte and associated tuffs and breccias. Anderson, 1957.	34°04'	106°58'
6. Black Range. Fissure veins in Tertiary andesite. Harley, 1934.	33°27'	107°43'
7. Apache (Chloride). Replacement veins in Tertiary andesite and	33°20'	107°45'

NEW MEXICO (cont'd.)

Pennsylvanian limestone. Harley, 1934.		
8. Hermosa (Palomas). Irregular replacement bodies along a faulted gentle anticline in Pennsylvanian limestone. Harley, 1934.	33°10'	107°43'
9. Kingston. Replacement bodies along fractures on axes of anticlines in Silurian limestone. Harley, 1934.	32°55'	107°43'
10. Lake Valley. Replacement bodies in Mississippian limestone. Harley, 1934; Jicha, 1954.	32°44'	107°34'
11. Cook's Peak. Replacement bodies on broad anticlinal arches in Silurian limestone. Anderson, 1957; Jicha, 1954.	32°33'	107°43'
12. Swartz (Carpenter). Replacement bodies along bedding, shear zones, and fractures in Ordovician limestone. Anderson, 1957.	32°52'	107°48'
13. Georgetown. Replacement bodies in Silurian limestone below Devonian shale near granite porphyry dikes. Paige, 1916.	32°51'	108°01'
14. Central (Hanover). Replacement veins on faulted contact between porphyry dikes and Carboniferous limestone, or in the dikes; contact metamorphic deposits; byproduct of copper in "porphyry" copper deposits of Laramide age. Anderson, 1957; Lasky, 1936; Schmitt, 1935.	32°47'	108°06'
15. Pinos Altos. Replacement bodies along fractures in Pennsylvanian limestone; veins across contact between granodiorite and diorite porphyry of Late Cretaceous(?) age. Anderson, 1957; Paige, 1911.	32°52'	108°14'
16. Chloride Flat. Stringers and pockets along joints and bedding in Silurian limestone associated with porphyry dikes. Anderson, 1957.	32°47'	108°18'
17. Fleming. Irregular pockets in Cretaceous quartzite. Anderson, 1957.	32°46'	108°25'
18. Burro Mountains (Tyrone). Byproduct of copper. Disseminated ore, secondarily enriched, in highly fractured quartz monzonite porphyry and in adjacent Precambrian granite. Anderson, 1957.	32°39'	108°28'
19. Black Hawk. Veins associated	32°42'	108°33'

mention to field geologist needs a reliable versatile assistant
to survey, sample, run errands for driller etc.
2e

There are two approaches that may be either that could be used in a continuation of the evaluation and search for Nevada Silver deposits.

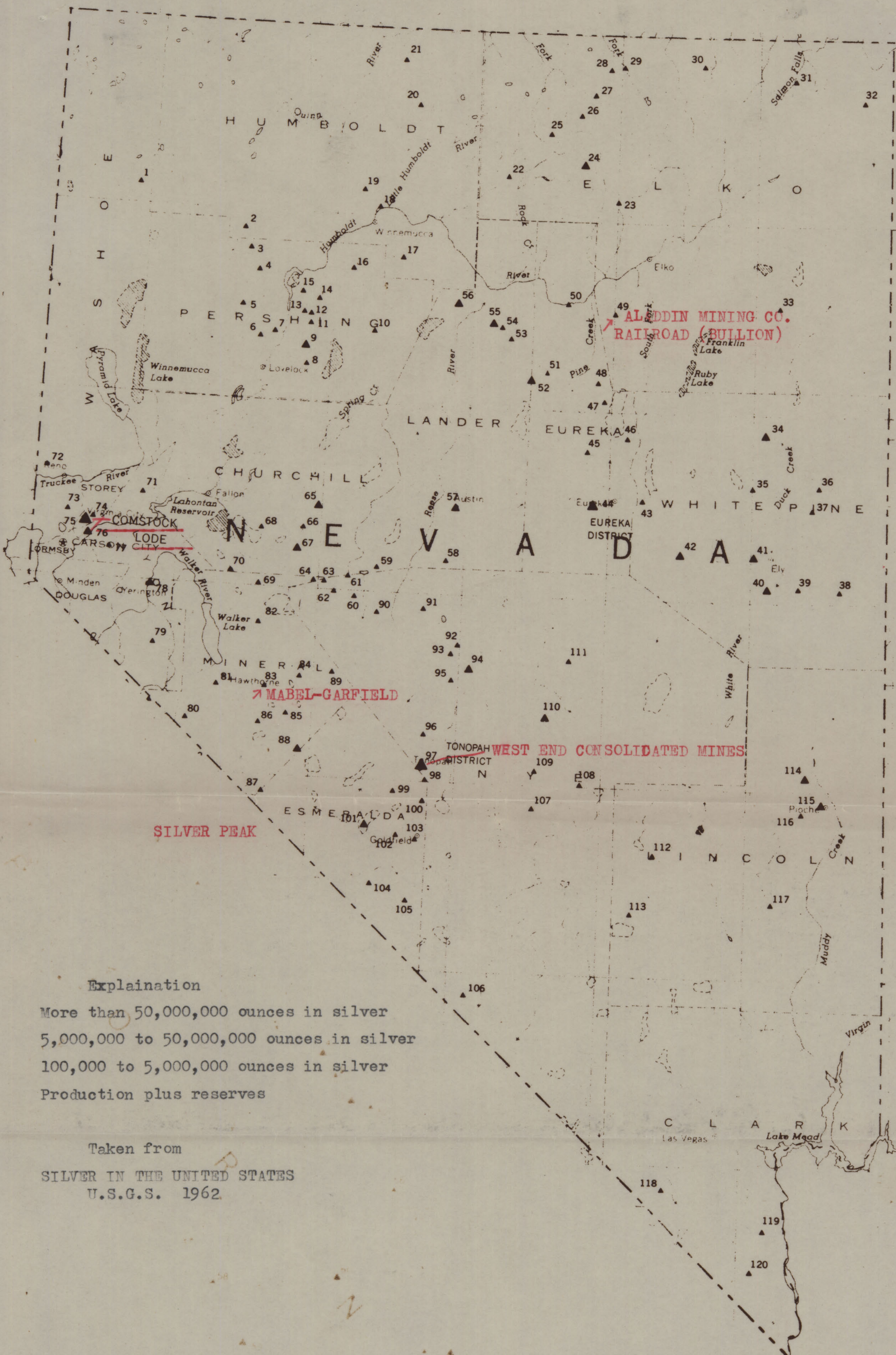
The evaluation program, can go on as it has for this past year, by searching out available properties and prospects in areas that have been silver producers in the past. and investigating new prospects that come to my attention. This method certainly brings to light promising mines, silver districts and prospects.

An additional proceedure would be to search for new prospects. This effort would be based on studies of regional and local geology followed up by geo-chemical surveys and sampling of outcrops. Favorable areas would then be obtained by negotiation or staking. and exploration followed up by whatever means appear necessary.

This latter method would take, one or more, field teams composed of a geologist and at least one assistant. They would need adequate transportation and field laboratory facilities, even though much of the geochemical analyses were to be done by a commercial laboratory. The results of the geochemical and field and office surveys would be recorded on a hand punched card file that would be readily transferable to I.B.M cards or any other computer system, for possible future analaysis.

The geologist in charge of each field party should have a reliable and verstile assistant. to take care of such things as surveying, routine geophysical and geochemical proceedures, staking, line cutting, hiring local help, and the payrolls and accounts, running errands for the drill crew and other miscellaneous duties. These are things that the geologist or engineer should not be burdened with, except in a supervisory position. Everytime the geologist or engineer ~~in charge~~ of a field party runs an errand for drillers, stakes a claim, looks through a transit, or does anyone of the miscellaneous odd jobs that come up, his skill and abilities, for which he was hired, are lost. The necessary routine jobs should be taken care of by a helper so that he is free to spend most of his time thinking ~~as much time as is possible thinking~~ and working on all aspects of the geological, mining engineering, and ore-dressing phases of the project with which he is involved.

Of course the ideal situation would be the use of a combination of these two methods.



Explaination

More than 50,000,000 ounces in silver

5,000,000 to 50,000,000 ounces in silver

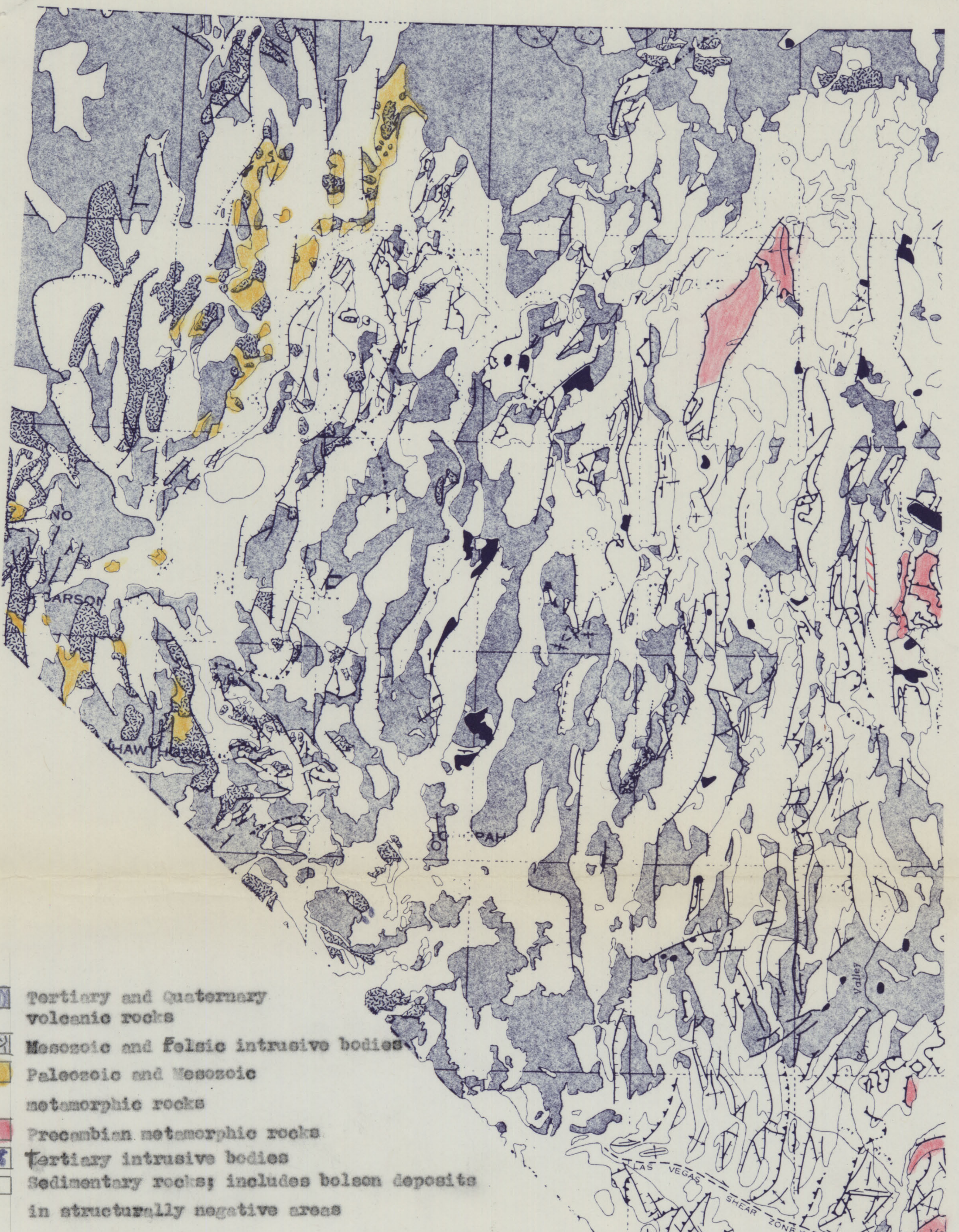
100,000 to 5,000,000 ounces in silver

Production plus reserves

Taken from

SILVER IN THE UNITED STATES
U.S.G.S. 1962

3860 0102



Tertiary and Quaternary volcanic rocks

Mesozoic and felsic intrusive bodies

Paleozoic and Mesozoic metamorphic rocks

Precambian metamorphic rocks

Tertiary intrusive bodies

Sedimentary rocks; includes bolson deposits in structurally negative areas

Taken from

TECTONIC MAP OF THE UNITED STATES

1962