

MINING AND TOURISM IN COLORADO, USA

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Abstract: Colorado, a once highly important mining State, is attempting to use old mines and their mining heritage as a tourist attraction as its economic base swings from mineral production to tourist activity. A gazetteer highlights the more important tourist mines, mine railways and ghost towns in the State.

INTRODUCTION

It is said that gold was first observed in Colorado by a party of whites and Indians on their way from Georgia to California in 1850. The Colorado rush did not come however until 1858 when one of the party returned and found more gold. reports of the time said the discovery was near Pikes Peak so the rallying cry went up "Pikes Peak or bust" (fig.1). The importance of mining to the State of Colorado can be seen from the 1860 Census, in this, of the 26,796 people who reported their occupations 22,086, or 82%, considered themselves to be miners. In the 1880s Colorado was usually second (after California) of the States for gold production but at the turn of the century Colorado became top producer of gold and silver. In 1907, 642 mines were reported at work; 51 of these were placer operations (hydraulic, surface pit and dredge) and 591 were underground mines. This was an age of expansion with a definite swing from placer to underground mining. Placer working had a shorter life in Colorado than elsewhere because the Rocky Mountains, source of the sediments, are relatively young in geological terms and have undergone a smaller degree of erosion. Gold and silver were not the only mineral products and a whole range of minerals has been worked including, in more recent times, uranium and molybdenum. Coal has also been an important resource; the first year of recorded production was 1864 when 500 tons was raised. By 1907 this had increased to over 11,000,000 tons and Colorado was ranked seventh producer in the American States.

The mineral industry of Colorado has suffered a major decline in the last few years. The value of non-fuel minerals produced has fallen from 1.2 billion dollars to 0.4 billion in 1986 and Colorado's rank among American States has now fallen from 7th in 1981 to 19th in 1986. This is despite a dramatic increase in gold output resulting from the opening of a large new gold mine at Summitville and the re-opening of another major producer at Sunnyside. However this was overshadowed by the collapse in the molybdenum market, the closure of the Climax mine and the intermittent working of the Henderson Mine. Total employment at these two mines in remote country was 5,000 in 1980 but in 1987 it was little more than 500.

The total employment in mining has fallen from 17,800 in 1981 to 7,500 in 1987 and small mining-based communities such as Creede, Leadville, Silverton, Craig and Meeker, once thriving towns, are now experiencing high unemployment and depressed conditions. The same situation applies in the coal mining industry where employment has fallen from 4,261 in 1980 to about 1800 in

1986. The number of mines has declined from 124 in 1960 to only 23 producing mines in 1986. Even the upsurge in the gold mining industry is not likely to affect the employment situation significantly although the new Summitville mine has taken on 350, for much of this is now done by the leaching of old mine tips. Both of the largest working mines today at Summitville and Cripple Creek/Victor are of this type.

Industrially orientated tourism has been an important aspect of American industry for many years; it is both an essential part of the openness of the American system and a highly effective form of public relations. Most of the larger companies such as Amax and Asarco produce glossy descriptions and short summaries (Appendix) of their operations and show a willingness to assist visitors. In depressed times, however, due to the uncertainty of the future and reduction in staffing the companies have great difficulty in maintaining this policy. The lack of tourist facilities at the mines in Colorado today is in sharp contrast to the situation observed in Arizona some five years ago when viewpoints, industrial tours and interpretative centres of a very high standard seemed to be available at every mine.

Tourists were encouraged and particularly well received at a working pyrite mill in Leadville but the uranium mine-sites are heavily fenced and visitors definitely discouraged. This is perhaps understandable when it is realised that the workforce in this particular industry has fallen from 22,000 in 1980 to 2,000 in 1986.

Of the thirteen underground tourist mines in Colorado known to the writer all except the four at Silverton, Ouray and Cripple Creek (2) are within 15 miles of each other; centred on Central City (3), Blackhawk (2), Idaho Springs (2) and one each at Clear Creek and Georgetown. The tourist mines in this group are all very similar, they are all former gold mines with a walk-in adit, a guide and a few mining tools on display. The Bobtail Tunnel in Central City has been slightly different, until the 1987 season as it used a "burro-pulled train" to carry its visitors. Following a great increase in the insurance indemnity costs this mine has now closed and some trials, with a view to reopening as a producing mine, are taking place. The Edgar Mine at Idaho Springs is also slightly different in that it is a training mine operated by the Colorado School of Mines. Visitors are conducted around as a public relations and information exercise and new equipment and techniques are on display. The Lebanon Mine is at a stopping point on the Georgetown preserved railway and can only be reached by train. Some of these tourist mines are obviously run on a

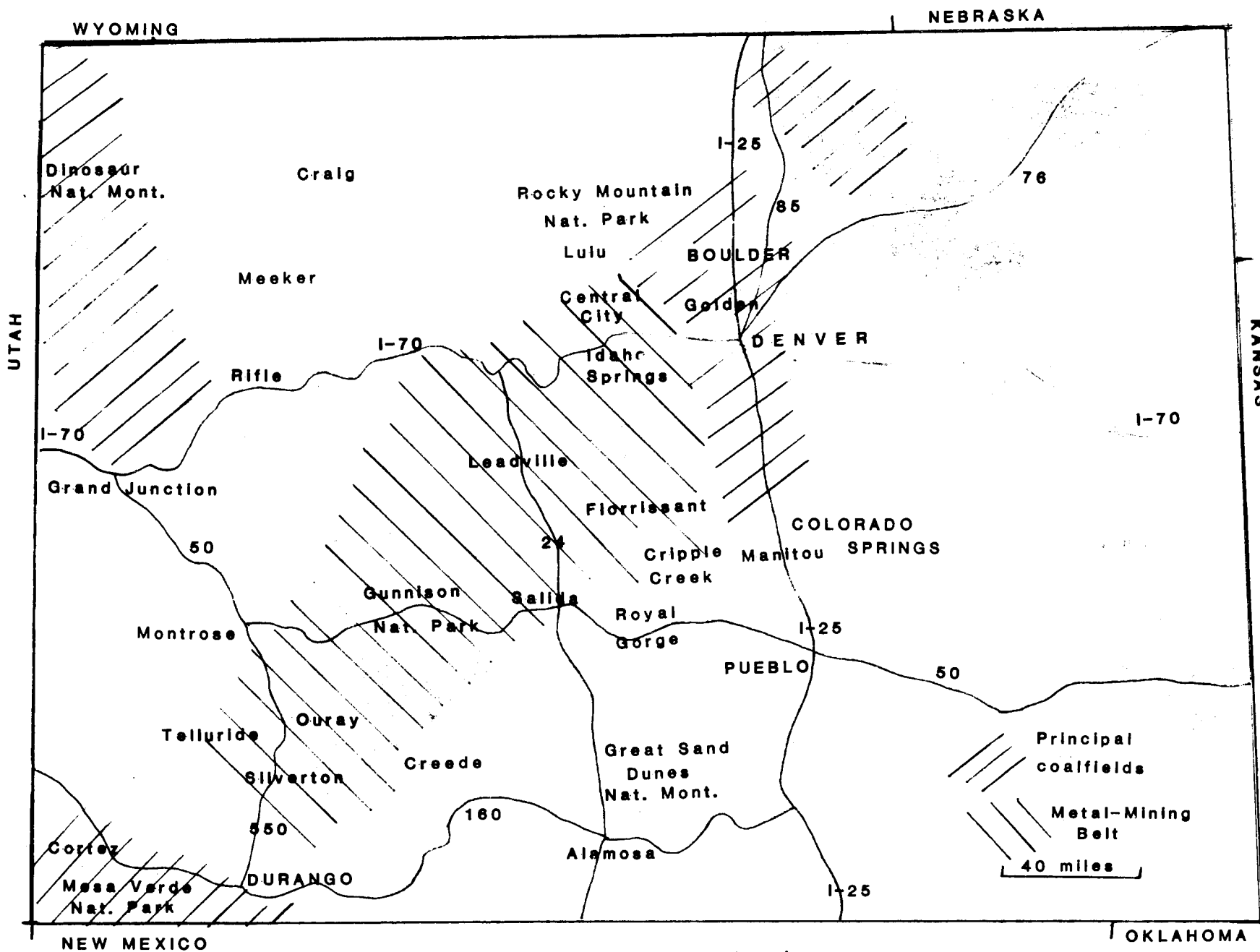


Fig.1. Mining centres in Colorado.



Plate 1. The preserved and protected Argo gold mill, closed in 1943, and now operated as part of a Wild West Theme Park in Idaho Springs (1987).



Plate 2. The remains of Stump Town and its mine on the Leadville mining trail.



Plate 3. The Molly Kathleen Mine at Cripple Creek, closed in 1961. But visitors can still see the workings 1000 feet down.



Plate 4. The present terminus of the Cripple Creek to Victor Railway (1987). The old mine railway has reopened over a two mile length for tourists.

shoestring budget and it is difficult to see how they all can survive. Several propose however to open all the year round in future through both the normal tourist season in the short summer and the longer skiing season in winter.

Outside the group, the tourist mine at Silverton is an "audio escorted, self-guided trip down the drifts" while the Matchless Mine at Leadville offers only a surface trip of the mine remains, the workshop and Baby Doe's cabin. The cabin is the restored home of Horace Tabor's second wife who spent thirty-five years of widowed seclusion after his death waiting for the good days of mining to return. The tourist mines at Cripple Creek, the El Paso and the Mollie Kathleen, are both shaft mines and excellent tourist attractions (although the El Paso Mine was closed in 1987 following a fire). The Mollie Kathleen is the deeper, the tourist trip is on the 10th Level and some 1000 ft down and takes in old stopes, winzes, crosscuts and drifts. On return to surface each visitor exchanges his ticket for a free specimen of ore which the operators claim "does actually contain gold" and a large lapel badge.

Two attempts at the development of a theme park have been made but both these are in their early stages. They are far removed from the highly polished examples at Calico, Columbia and Disneyland, all in California. The Argo Mill, a massive construction formerly used for processing the local ores, is a fine museum piece; it is complete with equipment and many additional artefacts. The "western style" street of shops alongside is as yet incomplete but it does provide an interesting backcloth to the regular and organised "shootouts". The Western Museum of Mining near Colorado Springs (being developed by professionals, enthusiasts and mining companies) is also at an early stage of development. It consists of large purpose-built buildings and several reconstructed structures including a small mill, within a recently developed mine area. In its third year of operation (1986) the museum attracted over 14000 visitors. There is a feeling that the museum ought to have been developed in an old mining area and not on a green field site both to add authenticity and to provide a focus for tourists.

Three "ghost towns" that seemed to be winning the struggle to attract sufficient tourists in order to survive are Central City, Cripple Creek and Georgetown. It is interesting to note that each has a sister town in a state of advanced decay, Blackhawk, Victor and Silver Plume respectively, and each was at the success-end of a preserved mining type railway. In addition each has one or more underground mine tours available. The business people of all the three successful towns were actively promoting their areas through maps and other literature and extolling the virtues of all his historic features. They are fascinating places with numerous gifts, antique and book shops, small museums and some well-preserved buildings. Their failed "sisters" are just the opposite often with unmade streets, a few junk shops and one or two hotels of doubtful standard. But they all have character and if the remaining residents can be persuaded to stay there may still be hope for them.

The high altitude, once booming town of Leadville has seen several mine closures recently and it can now be said to be at the economic crossroads. Attempts are being made to get into tourism and it already has several high standard museums and other attractions including specialist shops but is not, unfortunately on a well established tourist route. Leadville has had a number of railways and perhaps the

reconstruction of one of these would assist.

All the three railroads mentioned above seem successful. Other similar former mine railways, like the 45 mile Silverton-Durango Railway are definitely successful, advance booking for a seat being recommended months ahead.

Much work is being done in Colorado on the environmental improvement of mining sites, particularly at the mines most recently operated or still operating. The problems of revegetation at some of the mine sites is extreme; for example, at the recently closed Climax Mine, which is over 11,000 feet above sea level, there are less than 40 frost-free days per year and the annual precipitation is 25 inches 75% of which occurs as snowfall. At Climax research has been carried out on rehabilitation methods since 1955 and the company is expecting to have to spend up to 7000 dollars per acre in restoration costs. There are specialist companies in this field and much work is also done by colleges, universities and government departments. The American Society for Surface Mining and Reclamation holds regular conferences on the subject and publishes many important papers.

At the Bachelor Syracuse Mine at Ouray some planting and tidying up has been done but of special interest here is the surface area which has been converted into a tourist attraction and commercial barbecue site. The mine adit is still open and battery powered locos haul trainloads of visitors into the mineworkings. Everything here is very authentic; indeed the guides insist that the purpose of the tourist operation is to provide the money to keep the mine on "care and maintenance" so that it can be reopened as soon as the metal price is right.

Tourists however are not encouraged by the many posters and handouts distributed throughout Colorado describing the dangers in and around inactive mines. Their advice is to stay clear of old buildings, disused shafts and adits which may "contain water or poisonous fumes and are popular hangouts for dangerous snakes, spiders and bears, besides the problems of falls and physical instability".

GAZETTEER

Some notes follow on a selection of tourist mines and working mines with tourist interest, mining in museums, mine railways and ghost mine towns in the state of Colorado.

1. Idaho Springs. A small town often regarded as the centre of the first Colorado Gold Rush. In 1859 George A. Jackson discovered gold in Chicago Creek where it entered Clear Creek. The population and mining activity quickly increased, the town became the smelting centre for the area and by 1903 there were nearly 30 plants for ore treatment. The town is now mainly a touring centre but a number of small mines remain operational together with many part-time "hobbyist" mines. A four-mile long mine tunnel connects this area with Central City although it is nearly 8 miles over a rough mountain road (or 15 miles by tarmac road).

(a) The Edgar Mine is operated by Colorado School of Mines as a tourist, demonstration and experimental mine. In the 1870s it produced silver, gold, lead and copper but closed after the first world war. In 1921 the lease was

taken by the School. The present entrance is at 7,800 feet above sea level, visitors walk in with a guide, the aim is not to be a historical mine but to show modern mining developments. Until 1984 visits were free (about 10,000 visitors per year) but now with a small charge about 2,500 persons visit the mine each year. The mine employs between 3 and 20 workers depending on number of students being trained and the time in the tourist season.

(b) The Argo Mill and Double Eagle Mine. The mill is an extensive range of timber and sheet buildings complete with most of its equipment. It operated from 1913 until 1943. The tour consists of 14 stops commencing with the Double Eagle Mine (dating from the 1890s; only a 300 foot length is open to the public but the shot holes visible are notable). Other features on the tour include the rotary tippel, stamp room, mill feed bin, grinders, classifiers, ball mills and amalgamation tables. The tour concludes with cyanide leaching and the inevitable shop.

(c) Russell Gulch is an uncommercialised ghost town on the unpaved mountain road from Idaho Springs to Central City. It now consists only of a general store, four or five houses and many ruins. The mountain road itself has sheer drops alongside, the locals call it Oh-my-God-Road, with mines in various states of decay on both sides. Some of the mines are still active in a small intermittent way and almost every vehicle to be seen is a pick-up loaded with mining tools.

2. Central City has been called "the richest square mile on earth". John Gregory discovered lode gold here in 1859. At its peak the town had over 20,000 inhabitants, today it has only hundreds and many of these are "seasonal". Even so many historic buildings including an Opera House remain from its hey-day and there is also a town museum (in the old school), a Mining Museum and three tourist mines. It is a real "old mining town".

(a) The Lost Gold Mine is now entered from a general store and visitors walk down the mine "decline" or slope shaft viewing a mineral vein, an airshaft with daylight 125 feet up and several mining displays en route.

(b) The Bobtail Tunnel is on the opposite side of the road to the above. Until 1986 burro-hauled trains took parties of visitors about 300 feet into workings dating from 1865 to 1890. Each train had one burro pulling two "cars", each car carrying 20 persons. While one burro worked two rested. The tourist business has closed due to the high cost of indemnity insurance but mining continues on an exploration basis.

(c) The Central Gold Mine was entered from the Mining Museum, itself situated in a building dating back to 1868. (Its bricks still show the effects of the Great Fire of 1874.) The building is crammed full of old mining equipment including several complete steam and compressed air engines and only a narrow pathway remains through it. The adit can be seen but not entered as there is a dispute with the insurance company. When operating normally it consists of a 600 ft long walking tour.

(d) The Blackhawk and Central City Narrow Gauge Railroad. A former mine railway has been restored for passenger use along a half mile length from the Central City Station. Steam loco No. 71 is now operational and runs frequent half-hour trips pulling one or two coaches.

The company aims to open up a 4-mile length of track eventually which will run at a high level along the mountain side.

3. Blackhawk. Once called the "City of Mills" (even its name comes from that of the manufacturer of milling equipment, the Black Hawk Co of Rock Island) the city is now mainly derelict. Gold was found here in 1859 but mining could not prosper until Nathaniel Hill had perfected a matting furnace to smelt the ore in 1867. A guide of 1871 describes the city as being "Y" shaped with "but little level space at any point and the city is built irregularly along the gulches and against the mountain sides". The city area is littered with the remains of mines and mills and has three show mines.

(a) The Little Colonel Mine said to have been opened by Colonel Turner in 1942. The mine was closed by the sheriff soon afterwards as it is contrary to local laws to mine within a city. The mine then became a showmine and is claimed to be the oldest tourist mine in the State of Colorado. The owner, J. Blackburn, personally conducts about 8000 visitors around the mine each year, total length is 150 ft with several small mining display areas.

(b) The Old Timer Mine is a placer mine in Clear Creek just outside the City. (There are 6 underground "hobby" mines and 20 to 30 surface mines in the vicinity.) Work on the Hamilton placer commenced in 1887 and continued on a "spotty" basis until 1934 when for a time it was worked continuously. Work soon ceased however until 1961 when Old Bob, the present owner, took over and invited passersby to join him. He claims that "nearly always you will find some gold in the pan; hundreds have been rewarded by finding a nugget or two". The mine area is littered with mining equipment, mine holes and trenches and is generally the scene of intensive small-scale activity.

(c) Little Kingdom Mine is close to the above and is partly placer and partly underground. There is also a small dredge and a drag line operation. Jesse Peterson and a staff of up to seven run the mine both as a mining operation and for tourists, some of whom get hooked and spend weeks here gold panning. About twenty American buffalo also live on the site.

4. Georgetown. An attractive and prosperous little town set in a valley alongside a major highway. The Gold Rush arrived here in 1859 but the town became more famous as the "silver queen of the Rockies". Georgetown yielded Colorado's first silver and this became its major industry. The prosperity of the town became tied to the Georgetown Loop Railroad in 1884.

(a) The narrow gauge Loop Railroad connects Georgetown to the neighbouring city of Silver Plume, which is now very much the poorer relation although only about 2 miles away. The Loop Railroad had to cover 4.5 miles in great spirals in order to reach the high level Silver Plume station. During the journey the train climbed the steep valley sides and crossed four bridges (including Devils Gate high trestle bridge which spans 300 ft and towers 95 ft above Clear Creek). The original Loop Railway closed in 1939 and the railway and bridges were dismantled. However the whole railway, including the spectacular trestle bridge, has been reconstructed and in 1984 was reopened as a tourist line. Along the railroad the Lebanon Mine has been reopened as a tourist feature, the mine is only accessible by alighting

from the train at a "mine halt".

(b) The Lebanon Mine and Mill, like many others in this area, remains almost intact. It was operated during the 1870s and 1880s and then closed due to exhaustion. The complex includes the Mill, a blacksmiths shop, a miners' dry, an office and a toolshed. Tourists are met by a guide, provided with a helmet, and are then led through the mine workings where the guide demonstrates and describes mining methods. The tourist feature is being developed by the Colorado State Historical Society and has been open since 1977. The Railroad and Mine are now designated as the "Loop Historic Mining and Railroad Park".

(c) Silver Plume City is not only at the end of the present line (where there is also a small railway museum and depot) but also seems near the end of its life. The town is surrounded by well preserved but long closed mines, headframes and works. The main street is still unpaved, indeed the crossing stones used for stepping through the mud are still present between what were once the principal buildings. It looks and feels very much like a wild west town, the few remaining stores having high fronts, half doors and raised walkways.

5. Leadville was born during the "rush" of the 1860s and it was incorporated as a city in 1879. At this time it could boast 30,000 people, 28 miles of streets, 3 hospitals, 2 railways, 14 smelters and 160 mines. Now it is but a shadow of its former self with empty hotels (painted outside the closed Hotel Vendome can be seen "Rooms 1 dollar & 2 dollars; with bath 2 dollars and 3 dollars") closed railways, disused mines and derelict buildings separated by large areas of "vacant lots". Only one substantial mine remains, the Black Cloud, employing 140 persons including women miners, producing gold, silver, lead and zinc from a 1,655 feet deep shaft. The mine and town is at an altitude in excess of 11000 ft. Recently the large Climax Molybdenum Mine nearby closed and 3,200 workers have lost their jobs.

The town is trying to get on the tourist map but its altitude, harsh winters and the fact that it is not on a main tourist route are making this difficult. The town has a tourist mine (surface only), a heritage and mining museum and a mining gallery of particular note but "tours" of the surface mining remains are also well advertised.

(a) The Matchless Mine is the site of the "Baby Doe" Tabor legend. The mine remains much as it did during Baby Doe's thirty five year seclusion while waiting for the mine to once again pour forth its wealth. It never did and Baby Doe was found frozen to death in the mine cabin in 1935. In addition to the cabin visitors are shown the workshop, winding house, headframe and powder magazine. Scattered around the site are numerous other relics of the mine's former and more glorious days.

(b) The Leadville Heritage and Mining Museum contains amongst the usual memorabilia twenty fine dioramas depicting the various stages in mine development and the different mining techniques. These are the finest mining dioramas the writer has seen.

(c) The Mining Gallery is the largest of the three shops for mining enthusiasts in the town. It offers a very wide range of prints, paintings, photographs, books, models and sculptures with "ore as art".

(d) The Apache Pyrite Joint Venture Pyrite Mill while commercially extracting pyrites from old mine tailings using modern processes is also open to tourists. Visitors report to the reception window and after paying a fee are given a conducted tour of the plant.

Leadville has many small operators offering horsedrawn "van" and jeep tours of the mining area, including neighbouring ghost towns and the Chamber of Trade provides free trail leaflets (fig 5).

6. Cripple Creek, the "world's greatest gold camp", began when a cowboy discovered gold in 1891. By 1896 the population was more than 10,000 and four years later it was over 25,000, the city was then the fourth largest in Colorado. At this time it had 500 operational mines and 73 saloons but the gold started to run out. By 1920 the population was about 5,000 and by 1950 less than 1000. The city however is still quite lively although much reduced in size. It has four museums (including a "red light" museum), a range of souvenir, gem and book shops and underground mine tours.

(a) The Cripple Creek and Victor Narrow Gauge Railroad has been reopened as a passenger line over a two mile length. Trains are hauled by a 15 ton steam-powered iron horse of 0 - 4 - 0 type.

(b) The Mining Museum is housed in the 1896 Midland Terminal Railway Depot and adjoining buildings including the old Assay Office. The complex contains a wide collection of minerals, geological exhibits, mining relics and pictures. In the Yard there is a "hardrock park" with a good collection of winding engines and steam pumps, a horse whim and other large pieces of mining equipment.

(c) The Molly Kathleen Mine is a shaft mine, opened 1892 and closed for production in 1961 since when it has been a tourist mine. Visitors are taken into a cage and descend 1000 feet where a guide points out stopes, winzes, crosscuts and drifts during a short walk. Visitors are invited to select their own specimen of "gold ore" and to exchange their ticket for a large metal lapel badge on returning to the surface.

(d) The El Paso Mine is also a shaft mine but has recently been closed to tourists following a fire. The mine was similar to the above with visitors travelling to the 400 feet depth by cage.

(e) Victor. The ghost town of Victor is very much Cripple Creek's poor relation; most of the buildings are now empty or gone completely. A few junk shops and cafes stagger on and there is also a small museum in a former hotel. The surviving hotel still offers overnight visitors a "jug and basin with clean water" for use when washing. The CC&V Rail Road no longer reaches Victor and all the signs are that it will not survive as a separate community much longer.

SOME OTHER MINING COMMUNITIES AND TOURIST MINES.

Telluride was settled in 1875 by miners seeking gold and silver and by 1890 has a population of 3,000. It became a well appointed city with all facilities including an Opera House but by 1900 decline had set in. By 1930 the population had dwindled to 500 although in the last few

years it has again started to rise with the town's new image as a tourist, skiing and Film Festival resort. There are no tourist mines but jeep tours of surface remains are available and mining trails are much publicised. The city's museum also has a good mining collection. Nearby, the surface buildings at the Rico Mine have been preserved since closure in 1950 by the Anaconda Company. A few other mines are intermittently active and there is much evidence of exploration (including two bores alongside the main road now producing artesian hot water geysers up to 15 ft high). Ouray is another mining ghost town although still quite active as a tourist resort with hot water springs. There is a mining museum in the old hospital and a tourist mine, the Bachelor Syracuse Mine. Over 200 men were employed here until 1982 and the mine is now officially on "care and maintenance": the income from visitors is intended to cover this cost. Visitors are supplied with helmets and jackets and then mount wagons of the "one-leg either side a beam" type. This is then hauled 3350 ft into the mountain by battery locos and the guide explains all the usual mining features during a short walk. The operators also offer "full American breakfasts, cookouts and evening barbecues" based on the original mine buildings.

The Durango and Silverton Narrow Gauge Railroad was constructed 1879-1882 to provide transport for ore from the mines of the San Juan mountains. It now provides a 90 mile round trip steam-hauled tourist rail journey which usually has to be booked some months in advance. The town of Durango is a flourishing tourist resort while Silverton is reminiscent of other mining ghost towns. Silverton has a tourist mine, the Silver Queen, which is advertised as an "audio-escorted, self-guided trip down the drifts".

Aspen is another former mining town, but now it is a winter skiing resort. The Smuggler Mine has an adit and some original mining equipment but no other details are available.

Lulu, now uninhabited, is a ghost town in the Rocky Mountain National Park, it has several old mines and mining remains featured along the official trail leading to the town. Visitors are warned not to enter the adits as they are home to snakes and bears. Lulu City was platted (laid out) in 1880 and the population soon reached 500 but the mines surrounding the town were plagued by Indians and bears. The bears drove off the miners and their dogs at some mines during the winter of 1884 and the City was abandoned in 1885. Some of the miners' cabins, the mine buildings and grizzly bear traps can still be seen along the trail.

The Western Museum of Mining and Industry at Colorado Springs is on a greenfield, non-mining site. It was established in 1970 and now includes a large exhibition hall, stores and reconstructed mine and mill. Nearly 25,700 visitors toured the museum in 1986. Exhibits include a Carless Steam Engine, a 90 ton Nordberg steam stamp built 1900, an early 19th century Cornish walking beam steam engine and a winding engine and drum. The exhibit contains a full scale simulated mine area, numerous models and smaller exhibits, a 3-projector multi-media theatre show, an assay office, several steam and compressed air engines and a short mine railway. There is also a small souvenir shop and reception area and an old-time mining town saloon bar is under construction. The Museum employs 9 professional staff plus support staff and has

about 20 volunteer helpers.

Colorado School of Mines at Golden is probably America's premier mining school; founded in 1874 it now has 10 departments with 1600 undergraduates plus about 700 post-graduates. There are 195 academics plus technical and curatorial staff. The Geological Museum is open to the public and has a very fine mineral collection. Geological walking tours for members of the public leave the museum entrance at set times most days. During the half-hour walk visitors are shown two table mountains, lava flows, valley formations, uplifts and topographical forms and many types of rock. Scattered along the route are mining relics, mine tubs and other items of machinery. The School also operates the tourist and demonstration mine at Idaho Springs.

OTHER FEATURES OF RELATED INTEREST IN COLORADO

(a) Dinosaur National Monument: a quarry containing fossil remains of dinosaur and other ancient animals in an area of spectacular canyons cut by the Green and Yampa Rivers (partly in the adjoining state of Utah).

(b) Florissant Fossil Beds National Monument. The bed of an ancient lake with giant petrified redwood tree stumps and outcrops of fossil-bearing shale.

(c) Great Sand Dunes National Monument. The main dune field is 150 square miles in area with dunes up to 700 ft high nestling against the Sangre de Cristo Mountains.

(d) Rocky Mountains National Park has been described as "a concourse of lakes and rushing waters, mountains of rock, dells, and ravines of the most exquisite beauty", a spectacular area with snow-capped mountains rising to over 14,000 ft. The Park contains the sites of many mines and at least one ghost town, Lulu City.

(e) Mesa Verde National Park: a plateau incised by canyons with overhanging cliffs housing cliff dwellings, many of several storeys, in small villages on narrow shelves of rock. These villages were in use from about the 5th to the 13th centuries.

(f) The Black Canyon of the Gunnison: a small National Park along the 1,000 ft deep gorge cut into dark Precambrian gneisses with numerous granitic veins.

Also of interest in the State is the Royal Gorge, a narrow sheer-sided gorge over 1,000 ft deep to a fast flowing river, and the Cave of the Winds near Manitou Springs. Pikes Peak is the highest point with Front Ranges at 14,500 ft and has a toll highway to the top.

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SUGGESTED READING

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FURTHER INFORMATION

Informative leaflets and maps are available in all the tourist offices of the towns referred to in the text. These include Cripple Creek and Victor, Telluride, Ouray, Golden, Clear Creek County (Idaho Springs, Georgetown, etc). Most of these are free, or only a nominal charge, and are usually produced by the local Chamber of Commerce.

Similarly, free newspapers published by local business or tourist organisations packed with historic mining information are available in several areas, these include the Clear Creek Courant, Rocky Mountain Highlights, Silverton - San Juan Vacation Guide and Delta County Vacationer. Present-day newspapers contain a significant amount of contemporary mining information, including the Mineral County Miner published in Creede and The Gold Rush published in Cripple Creek. Special issue newspapers on individual sites and themes are a particular feature of this area. Each contains about 12 pages of articles on the theme or site with long extracts from "early day newspapers". The series is entitled "The Colorado Prospector" and subjects include Tabor's Matchless Mine, The Moffat Tunnel, Durango Railroad, Argo Mill, Cripple Creek Strike and Mining Ghost Towns, each costs about 50 cents. The address of the publisher is: 6879E Costilla Circle, Englewood, CO 80112.

Each of the National Parks and Monuments has a Visitor Centre with a wide range of books and trail guides. There is a charge for all of these.

Advice on possible visits to working mines can be obtained from: The Colorado Mining Association, 1500 Grant Street, Suite 330 Denver, Colorado 80203. Most of the principal working mines produce glossy booklets about the company and their operations, and there are a number of warning leaflets.

APPENDIX: Information supplied to visitors.

ASARCO Incorporated Leadville Unit (Black Cloud Mine)

Asarco's Leadville Unit is located about 6 miles southeast of Leadville, Colorado in the heart of the Colorado Mineral Belt. The surface plant is located in Iowa Gulch at an elevation of 11,087 feet above sea level. Mount Sherman (elvn. 14,005 feet) in the Mosquito Range is about 3 miles east of the plant.

The Leadville Unit, also known as the Res-Asarco Joint Venture, is a 50/50 joint venture between Asarco and Resurrection Mining Company, a wholly owned subsidiary of Newmont Mining Company. The Joint Venture was formed in 1956 so both companies could pool their resources to explore a down-dropped block of favourable dolomites located between Iowa Gulch and South Evans Gulch. Resurrection was the operator under the original Joint Venture agreement and Asarco became the operator in 1965.

The exploration programme proved so successful that the decision to put the property into production was made in 1968. The Black Cloud Shaft was started in 1969 and completed in 1970 at a total depth of 1655 feet. The surface plant and mill were completed in early 1971 and production from the property commenced in March 1971.

The orebodies in the mine are classical Leadville blanket type replacement sulphide ore deposits. Individual orebodies vary in size but typically have a thickness of 100-200 feet, a strike length of 100-300 feet and a width of 100-200 feet. Within the down-dropped block some of the orebodies have been offset by north-south trending faults.

The mining method used is random room and pillar mining using rubber tyred LHD (load-haul-dump) equipment for hauling the ore in the stopes. Ten foot vertical cuts or floors are mined at a time and each floor is backfilled with cycloned mill tailings prior to starting the next floor above. All drilling is done with pneumatically powered jackleg drills. Rock is supported by split-set type bolts (5ft. and 8ft. long) and to a lesser extent with timber. Most blasting is done with ANFO initiated by electric blasting caps. Ore is removed from the stopes via chutes utilizing 5 1/2 ton battery powered locomotives pulling 60 cubic foot (3 1/2 ton) ore cars. All ore is transferred to the bottom level in the mine (1500 level) where it is crushed to a minus 5 inch size and then hoisted to the surface. The mine has four operating levels.

Once the ore reaches the surface it is crushed to a minus 1/2 inch size before being transferred to the concentrator (mill). The next step is to grind the ore in a ball mill to a 50%-200 mesh size. This material, now in slurry form, is then run through two flotation circuits (lead and zinc) to recover as much of the valuable minerals as possible. The final mill products are a lead concentrate and a zinc concentrate. The lead concentrate is shipped to Asarco's lead smelter near Helena, Montana and the zinc concentrate is shipped to St. Joe Resources Co.'s zinc smelter near Bartlesville, Oklahoma.

Primary minerals produced at the Leadville Unit include lead (Pb), zinc (Zn), gold (Au) and silver (Ag). A typical ton of ore produced at the mine averages 3.6% Pb, 7.8% Zn, 0.07 oz. Au and 2.1 oz. Ag. For each ton produced from the mine only 18.6% or 0.186 tons is recovered as concentrate. Historically, the Leadville Unit has produced 3,124,000 tons of ore containing 123,500 tons of Pb, 251,000 tons of Zn, 229,000 oz. Au and 6,858,000 oz. Ag. The mine's average rate of production is about 218,000 tons p.a. There are 135 employees at the unit.