Geology & Cultural History of Ironwood Forest National Monument-IFNM, Southern Arizona

INFM Parameters

- *Established* 9 June 2000 - Exe. Order President W.J. Clinton
- *Land Mangement*: Bureau of Land Management
- *Footprint*: 188,619 acres (includes 59,922 acres non-federal lands, chiefly State Trust lands, and minor private holdings)
- *Cultural features*: 200+ Hohokam sites; historical mine-related sites
- Current Uses: Recreation, cattle grazing, mining on pre-existing mine sites
- *Threatened Species*: Ferruginous pygmy owl, desert bighorn sheep, lesser long-nosed bat, turk's head cactus

Physiographic Features

Basin & Range Province, Roskruge Mtns., Samaniego Hills, Sawtooth Mtns., Silver Bell Mtns., Sonoran Desert, Western Silver Bell Mtns.

Mining History

- Predominantly in the Silver Bell Mtns.
- Major Ore Deposit(s) type: porphyry copper
- Ore: copper, lead, zinc, molybdenum, gold

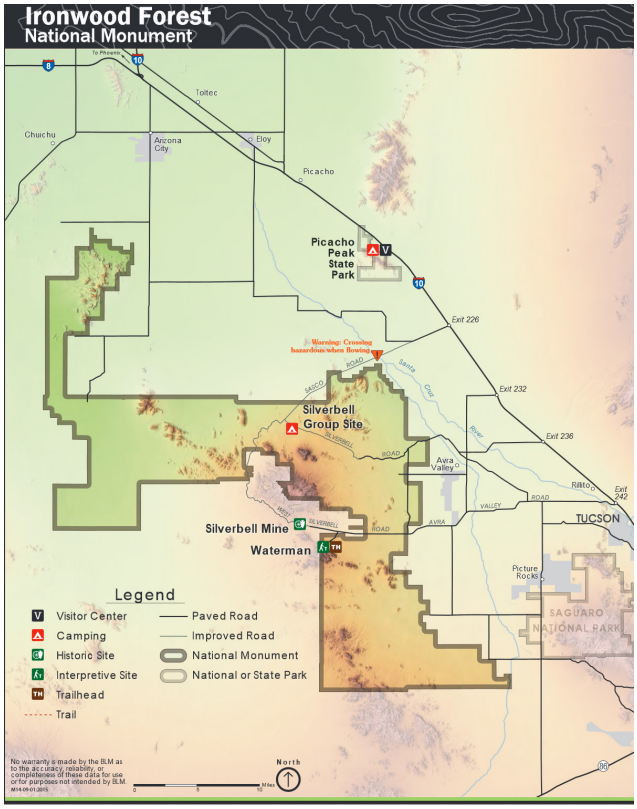
The IFNM surrounds and partially encompasses the Silver Bell metallic mineral district and either covers parts of or encompasses the Waterman, Magonigal and the Roskruge mineral districts. The most productive area has been the Silver Bell Mining District, where active mining continues to this day, immediately southwest of the monument, and by grandfather clause, on the the monument proper.

The Silver Bell Mmining District evolved from a collection of intermittent, poorly financed and managed underground mining operations in the late 1800s to mid-1900s struggling to make a profit from high grade ores; to a small but profitable producer, deploying innovative mining practices and advancements in technology to successfully develop the district's large, low-grade copper resource (D. Briggs, 2017).

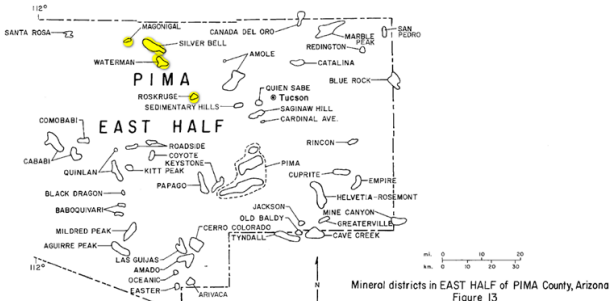
Production in the Silver Bell Mining District (Briggs, 2017)

Over the past 130 years, the Silver Bell mining district yielded approximately 2.27 billion pounds of copper, 6.6 million pounds of molybdenum, 3.7 million pounds of lead, 40.8 million pounds of zinc, 2,100 ounces of gold and 5.95 million ounces of silver. Copper mining adjacent to the IFNM continues today, with minor production of Mo, Pb, Zn, Au, and Ag.

Establishing what percent of production stems from the IFNM requires: 1) precise footprinting of mines; 2) assigning production values to properties on IFNM land.



Map of the Ironwood Forest National Monument (BLM).



Mineral districts in EAST HALF of PIMA County, Arizona
Figure 13

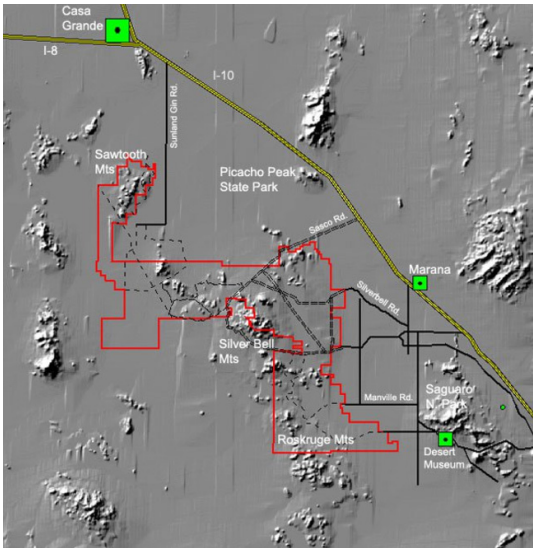
Mineral Districts of eastern Pima County. Yellow highlighted districts are incorporated in part or entirely in IFNM (AZGS B-196, 1985).

The presence of gold ore in the Ragged Top Wilderness Study Area (WSA) of the Silver Bell Mountains was first announced by the US Geological Survey in Oct. 1988 (Spencer and Sawyer, 1988). A small gold rush ensued with 45 new lode mining claims.

Concluding Statement. With the creation of IFNP in 2000, exploration for additional copper mineralization was discontinued on the monument. Exploration continues to this day on mining claims on BLM lands in the Silver Bell Mtns.

THE UNIVERSITY OF ARIZONA

ARIZONA GEOLOGICAL SURVEY AZGS



Physiographic features of IFNM.

Churn drilling on Copper Girl Hill at Silver Bell, (ca. 1940s)

Table 1. Silver Bell Mining District 1885-2015 (Unpbl data. Keith and Briggs). M=million, B=billion.

Operation	Period	Ore Treated Short Tons	Cu (lbs)	Mo (lbs)	Pb (lbs)	Zn (lbs)	Au (oz)	Ag (oz)
ASARCO Open Pit	1954-2015	92M	2.2B	6.6M	2.5M	605	736	4.8M
Atlas (BS&K)	1915-1964	147,548	3.4M	0	204,125	40.6M	677	64,866
El Tiro	1905-1930	201,668	21.3M	0	712,420	0	15	33,595
Imperi-al-Mammoth	1887-1930	1.1M	74.2M	0	166,554	150,835	139	1.0M
Young Amer-ica	1885-1918	4,146	0.9M	0	0	0	450	5,420
Other Produc-ers	1916-1957	1,560	77,396	0	67,840	6,050	97	5,212
Total	1885-2015	93.4M	2.3 B	6.6M	3.7M	40.8M	2,114	6.0M

Select Literature Resources

AZGS Publications at http://repository.azgs.az.gov

Briggs, D., 2017, History of the Silver Bell Mining District. Arizona Geological Survey Contributed Report, ~38 p.

Ferguson, C.A., Gilbert, W.G., Klawon, J.E., Pearthree, P.A., and Peters, L., 1999, Geologic Map of the Sawtooth Mountains and the North End of the West Silver Bell Mountains, Pinal and Pima Counties, Southern Arizona. Arizona Geological Survey Open File Report, OFR-99-16, 1 map sheet, map scale 1:24,000, 27 p.

Keith, Stanton B. (1974), Arizona Bureau of Geology & Mineral Technology, Geological Survey Branch Bull. 189, Index of Mining Properties in Pima County, Arizona: 143 (Table 4).

McClymonds, N.E., Page, H.G., and Haynes, C.W., 1959, Stratigraphy of the Waterman and Silver Bell Mountains; Trip II, road log, in Heindl, L.A., ed., Southern Arizona Guidebook II, combined with the 2nd annual Arizona Geological Society Digest: Arizona Geological Society, Guidebook II, scale 1:100,000.

Niemuth, N.J. & K.A. Phillips (1992), Copper Oxide Resources, Arizona Department of Mines & Mineral Resources Open File Report 92-10: 12 (Table 1).

Pearthree, P.A., and Skotnicki, S.J., 2000, Geologic Map of the Cocoraque Butte 7.5' Quadrangle, Pima County, Arizona: Arizona Geological Survey Digital Geologic Map DGM-06, version 1.0, map scale 1:24,000, 29 p., 1 map sheet and metadata.

Schnabel, L., Welty, J.W., Trapp, R.A. and Reynolds, S.J., 1986, Bibliography for Metallic Mineral Districts in Pima and Santa Cruz Counties, Arizona. Arizona Bureau of Geology and Mineral Technology Circular C-26, 52 p.

Sawyer, D.A., 1989, Excursion 7A: field guide to the Late Cretaceous Silver Bell caldera and porphyry copper deposits in the Silver Bell Mountains [El Tiro and Oxide pits area]: New Mexico Bureau of Mines and Mineral Resources, Memoir 46, scale 1:12,500.

Sawyer, D.A, 1996, Geologic map of the Silver Bell and West Silver Bell Mountains, southern Arizona: U.S. Geological Survey, Open-File Report OF-96-6, scale 1:24,000.

Sawyer, D.A., 1986, Late Cretaceous caldera volcanism and porphyry copper deposits, Silver Bell Mountains, southern Arizona: Arizona Geological Society, Digest v. 16, scale 1:100,000.

Sawyer, D.A., 1989, Excursion 7A: field guide to the Late Cretaceous Silver Bell caldera and porphyry copper deposits in the Silver Bell Mountains [Silver Bell and West Silver Bell Mountains]: New Mexico Bureau of Mines and Mineral Resources, Memoir 46, scale 1:143,000.

Southwestern Minerals Exploration Association, 2001, Mineral Potential of Eastern Pima County, Arizona, by Southwestern Minerals Exploration Association: Arizona Geological Survey Contributed Report CR-01-A, 50 p.

Spencer, J.E. and Sawyer, D.A., 1988, USGS finds gold in the Silver Bell Mountains. Arizona Geology, v. 18, #4.

Compiled by FM Conway and PA Pearthree