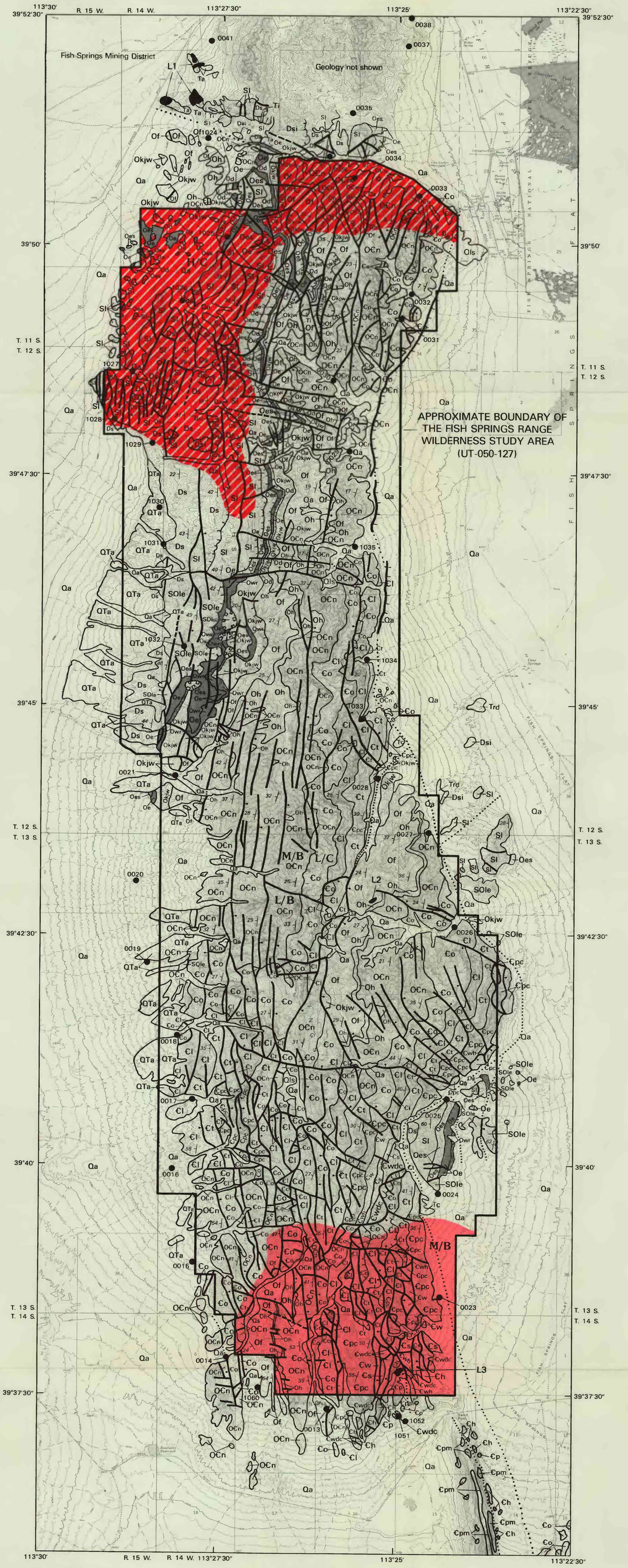


Base from U.S. Geological Survey 1:24,000 Fish Springs SW, Sand Pass NW, and Sand Pass, 1967

Geology compiled in 1986 by R. A. Yambrick, U.S. Geological Survey, from maps of Hintze (1980a,b,c)

SCALE 1:50 000

1 ½ 0 1 2 3 MILES

1 .5 0 1 2 3 KILOMETERS

16° TRUE NORTH MAGNETIC NORTH

APPROXIMATE MEAN DECLINATION, 1975

UTAH

EXPLANATION OF IDENTIFIED RESOURCES AND MINERAL RESOURCE POTENTIAL

Inferred subeconomic resource of high-purity quartzite—In the Middle Ordovician Eureka and Watson Ranch Quartzites

H/C **Geologic terrane having high mineral potential for lead, zinc, copper, molybdenum, silver, and gold, at certainty level C**

M/B **Geologic terrane having moderate mineral potential for lead, zinc, copper, molybdenum, silver, and gold, at certainty level B**

M/B **Geologic terrane having moderate mineral potential for high-purity limestone and dolomite, at certainty level B**—Applies to entire study area except the Eureka and Watson Ranch Quartzites (gray areas) and units of Quaternary and Tertiary age

L/C **Geologic terrane having low potential for low-temperature (less than 212°F) geothermal resources, at certainty level C**—Applies to entire study area

L/B **Geologic terrane having low potential for oil and gas and lead, zinc, copper, molybdenum, silver, and gold, at certainty level B**—For oil and gas, applies to entire study area; for metals, applies only outside the areas of high and moderate resource potential described above

CORRELATION OF MAP UNITS

Qa, Qls			QUATERNARY
QTa			QUATERNARY AND TERTIARY
Tc		Miocene and Oligocene	TERTIARY
Ta, Ti		Oligocene(?)	TERTIARY
Trd		Eocene	TERTIARY
Unconformity			
Dsi		Middle Devonian	DEVONIAN
Ds		Lower Devonian	DEVONIAN
Unconformity			
SOle	Sl	Middle Silurian	SILURIAN
	Oes	Upper Ordovician	SILURIAN
Oe		Middle Ordovician	ORDOVICIAN
Owr			ORDOVICIAN
Od		Pogonip Group	ORDOVICIAN
Okjw		Pogonip Group	ORDOVICIAN
Of		Pogonip Group	ORDOVICIAN
Oh		Pogonip Group	ORDOVICIAN
O€n		Lower Ordovician	ORDOVICIAN
€o		Upper Cambrian	CAMBRIAN
€l		Upper Cambrian	CAMBRIAN
€t		Upper Cambrian	CAMBRIAN
€pc		Upper Cambrian	CAMBRIAN
€w		Middle Cambrian	CAMBRIAN
€s		Middle Cambrian	CAMBRIAN
€wdc		Middle Cambrian	CAMBRIAN
€h		Middle Cambrian	CAMBRIAN
€p		Middle Cambrian	CAMBRIAN
€pm		Lower Cambrian	CAMBRIAN

DESCRIPTION OF MAP UNITS

Qa **Alluvium (Quaternary)**—Ranges from coarse gravel deposits on alluvial fans near mountains to silt in valley bottoms; includes older deposits of dissected alluvial fans and shoreline and other deposits of Lake Bonneville; thickness unknown

Qls **Landslide deposits (Quaternary)**—Blocks of carbonate rock formations; includes bodies near Fish Springs National Wildlife Refuge that appear to have slid off upthrown side of range-bounding fault

QTa **Older alluvium (Quaternary and Tertiary)**—Coarse gravel deposits on high-level dissected surfaces of alluvial fans; distributed extensively along west side of range; thickness unknown

Tc **Conglomerate (Miocene and Oligocene)**—Conglomerate composed of boulders of Eureka Quartzite and Ely Springs or Laketown Dolomites; poorly cemented; near west side of Fish Springs Flat; correlated by Hintze (1980b) with conglomerate of Skull Rock Pass; thickness unknown

Ta **Altered sedimentary rocks (Oligocene?)**—Silicified, bleached, and recrystallized carbonate rocks of Paleozoic age; classified here with Tertiary rocks to emphasize age of alteration; confined to west side of Fish Springs mining district (Hintze, 1980c)

Ti **Intrusive rocks (Oligocene?)**—Small plugs and dikes, composed of rhyolite, rhyodacite, and andesite; intrudes faults in Fish Springs mining district (Oliveira, 1975; Hintze, 1980c); altered locally; resembles late Eocene and Oligocene intermediate-composition rocks of Thomas Range and Drum Mountains (Lindsey, 1982)

Trd **Drum Mountains Rhyodacite (Eocene)**—Two dark-red to black flow remnants near west side Fish Springs Flat

Dsi **Simonson Dolomite (Middle Devonian)**—Dark-gray dolomite and light-gray laminated dolomite, interbedded; stromatoporoids abundant in some beds; about 1,000 ft thick, top not exposed

Ds **Sevy Dolomite (Lower Devonian)**—Light-gray laminated dolomite, unfossiliferous; about 1,000 ft thick

SOle **Laketown Dolomite (Middle Silurian) and Ely Springs Dolomite (Upper Ordovician), undivided**

Sl **Laketown Dolomite (Middle Silurian)**—Composed of four members (listed in descending order): Thursday Member, interbedded light- and dark-gray coarsely crystalline dolomite (155 ft thick); Lost Sheep Member, interbedded light- and dark-gray dolomite (180 ft thick); Harrisite Member, medium- to dark-gray cliff-forming dolomite (130 ft thick); and Bell Hill Member, interbedded light- and dark-gray coarsely crystalline dolomite (530 ft thick). Unconformably overlies Ely Springs Dolomite

Oes **Ely Springs Dolomite (Upper Ordovician)**—Composed of two members (listed in descending order): Floride Member, light-gray finely crystalline limestone (135 ft thick); and an unnamed lower member composed of dark-gray cliff-forming dolomite (upper 115 ft) and gray slope-forming dolomite (lower 140 ft)

Oe **Eureka Quartzite (Middle Ordovician)**—White to light-gray pure quartzite and quartz sandstone (200–300 ft thick)

Owr **Watson Ranch Quartzite (Middle Ordovician)**—Yellow-brown friable calcareous sandstone (110–150 ft thick)

Pogonip Group (Middle and Lower Ordovician)

Od **Deadman Spring Dolomite (Middle Ordovician)**—Light-brown sandy dolomite; interfingers with Kanosh Shale; 40–160 ft thick

Okjw **Kanosh Shale (Middle Ordovician), Juab Limestone (Middle Ordovician), and Wah Wah Limestone (Lower Ordovician), undivided**—In descending order: Kanosh Shale, gray shale and thin-bedded limestone (100 ft thick); Juab Limestone, gray cliff-forming limestone (150 ft thick); Wah Wah Limestone, gray thick-bedded silty limestone, fossiliferous (220–270 ft thick)

Of **Fillmore Formation (Lower Ordovician)**—Gray thin-bedded intraformational conglomerate and light-gray silty shale; 1,100 ft thick

Oh **House Limestone (Lower Ordovician)**—Light-gray, finely crystalline limestone; 125 ft thick

O€n **Notch Peak Formation (Lower Ordovician and Upper Cambrian)**—Dark-gray, coarsely crystalline limestone; cliff-forming, massive; contains thin beds of light-gray dolomite; 1,250 ft thick

€o **Orr Formation (Upper Cambrian)**—Composed of five members (listed in descending order): Sneakover Limestone Member, medium- to light-gray limestone (100 ft thick); Corset Spring Shale Member, greenish shale with lesser thin beds of limestone (40 ft thick); Johns Wash Limestone Member, medium- to dark-gray limestone, cliff-forming (200 ft thick); Candland Shale Member, interbedded olive-gray shale and dark-gray fossiliferous limestone (150 ft thick); and Big Horse Limestone Member, dark-gray, cliff-forming limestone containing oolite and calcarenite (550 ft thick)

€l **Lamb Dolomite (Upper Cambrian)**—Composed of interbedded light- and dark-gray cliff-forming dolomite; basal part contains abundant pisolites; about 800 ft thick

€t **Trippe Limestone (Middle Cambrian)**—Fish Springs Member at top consists of thin-bedded nodular limestone and intraformational conglomerate (130–300 ft thick); unnamed lower member is gray, massive, cliff-forming dolomite (450–600 ft thick)

€pc **Pierson Cove Formation (Middle Cambrian)**—Dark-gray mottled dolomitic limestone, massive and unfossiliferous; forms prominent cliffs above Wheeler Shale; approximately equivalent facies of the Marjum Formation; about 1,200 ft thick

€w **Wheeler Shale (Middle Cambrian)**—Yellow-gray weathering, fissile calcareous shale with *Elrathia* in upper part and abundant agnostid trilobites in lower part; about 450–590 ft thick

€s **Swasey Limestone (Middle Cambrian)**—Medium-gray, unfossiliferous cliff-forming limestone; 120–150 ft thick

€wdc **Whirlwind Formation, Dome Limestone, and Chisholm Formation, undivided (Middle Cambrian)**—Three formations listed in descending order: Whirlwind Formation consists of upper shaly limestone containing abundant *Ehmaniella*, middle ledge-forming limestone, and basal shaly limestone (about 160 ft thick); Dome Limestone is gray, unfossiliferous, and cliff-forming (140–220 ft thick); Chisholm Formation consists of, from top to bottom, olive-gray shale interbedded with thin-bedded limestone, dark-gray oncolitic limestone, and olive-gray shale and interbedded pisolitic limestone (180–230 ft thick)

€h **Howell Limestone (Middle Cambrian)**—Massive cliff-forming limestone, composed of unnamed upper member of light-gray limestone (220–310 ft thick) and underlying Millard Member of dark-gray oncolite-bearing limestone (210 ft thick)

€p **Pioche Formation (Middle and Lower Cambrian)**—Consists of Tatow Member (Middle Cambrian, 170 ft thick), at top, and unnamed lower member (Lower Cambrian, 420 ft thick). Brown quartzite interbedded with green shale and siltstone in both members; Tatow also contains limestone. Exposed only near south edge of study area

€pm **Prospect Mountain Quartzite (Lower Cambrian)**—Pink and gray, brown-weathering quartzite separated by silty partings and crossbedded. Exposed only on south boundary of study area; more than 2,000 ft thick in House Range to south

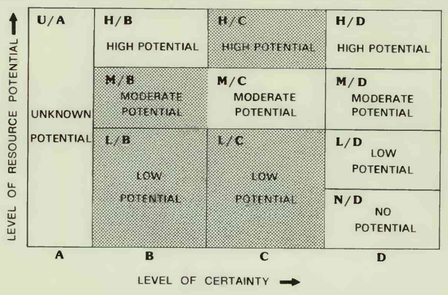
Contact—Dashed where approximately located; hachures indicate contacts mapped by Hintze (1980a,b,c) as attenuation faults but tentatively interpreted here as normal contacts; squares indicate bases of slide blocks

Fault—Dashed where approximately located; dotted where concealed; bar and ball on downthrown side

15 **Strike and dip of bedding**

0010 **U.S. Geological Survey geochemical sample locality**—Showing number. Anomalous sample 0039, not shown here, is 1.1 miles north-northwest of sample 0038

L2 **Landsat anomaly**—Showing number



LEVELS OF RESOURCE POTENTIAL

- **H** High mineral resource potential
- **M** Moderate mineral resource potential
- **L** Low mineral resource potential
- **U** Unknown mineral resource potential
- **N** No known mineral resource potential

LEVELS OF CERTAINTY

- **A** Available data not adequate
- **B** Data indicate geologic environment and suggest level of resource potential
- **C** Data indicate geologic environment, give good indication of level of resource potential, but do not establish activity of resource-forming processes
- **D** Data clearly define geologic environment and level of resource potential and indicate activity of resource-forming processes in all or part of the area

Diagram showing relationships between levels of mineral resource potential and levels of certainty. Shading shows levels that apply to this study area

IDENTIFIED RESOURCES, MINERAL RESOURCE POTENTIAL, GEOLOGY, LANDSAT ANOMALIES, AND GEOCHEMICAL SAMPLE LOCALITIES IN THE FISH SPRINGS RANGE WILDERNESS STUDY AREA, JUAB COUNTY, UTAH