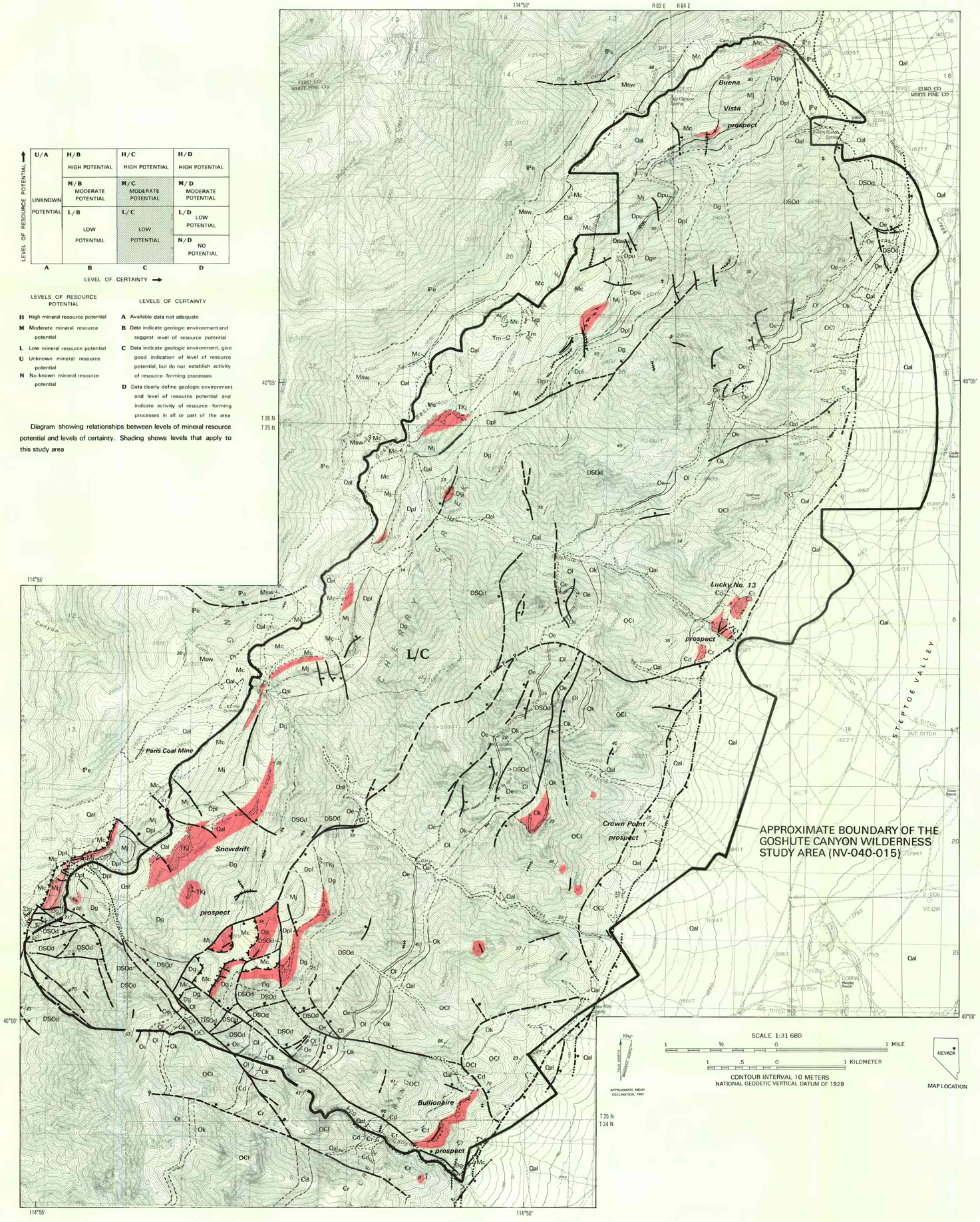
LEVELS OF RESOURCE POTENTIAL

- **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



SCALE 1:31 680

1 ½ 0 1 MILE

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 10 METERS
NATIONAL GEODETIC VERTICAL DATUM OF 1929

APPROXIMATE MEAN DECLINATION, 1987

MAP LOCATION

Base from U.S. Geological Survey, 1:24,000
Cherry Creek Station, Exchequer Spring, 1982;
Goshute Creek, McDermid Ranch, Paris Creek, 1984

Geology mapped by F.G. Poole and Maya Elrick in 1986

EXPLANATION

M/C Geologic terrane having moderate mineral resource potential for antimony, copper, gold, lead, silver, tungsten, and zinc, with certainty level C

L/C Geologic terrane having low mineral resource potential for antimony, copper, gold, lead, silver, tungsten, and zinc (except as noted above), and low energy resource potential for coal, oil and gas, uranium, and geothermal energy, all with certainty level C—Applies to entire study area

CORRELATION OF MAP UNITS

SURFICIAL DEPOSITS		
Qal		QUATERNARY
Unconformity		
INTRUSIVE ROCKS		
Tm		TERTIARY
TKj		TERTIARY OR CRETACEOUS
SEDIMENTARY ROCKS		
IPe	Middle and Lower Pennsylvanian	PENNSYLVANIAN
Msw	Upper Mississippian	MISSISSIPPIAN
Mc	Upper Mississippian	MISSISSIPPIAN
Unconformity		
Mj	Lower Mississippian	MISSISSIPPIAN
Unconformity		
Dpu	Upper Devonian	DEVONIAN
Unconformity		
Dgir	Upper Devonian	DEVONIAN
Dpl	Upper Devonian	DEVONIAN
Dg	Middle Devonian to Upper Ordovician	DEVONIAN / SILURIAN
DSOd	Middle Devonian to Upper Ordovician	DEVONIAN / SILURIAN
Unconformity		
Oe	Middle Ordovician	ORDOVICIAN
Ol	Middle Ordovician	ORDOVICIAN
Ok	Lower Ordovician	ORDOVICIAN
OCl	Lower Ordovician	ORDOVICIAN
Ꞓd	Upper Cambrian	CAMBRIAN
Ꞓr	Middle Cambrian	CAMBRIAN

DESCRIPTION OF MAP UNITS

SURFICIAL DEPOSITS

Qal **Alluvium and landslide deposits (Quaternary)**—Undifferentiated clay, silt, sand, and gravel in active streams and washes, talus, slopewash, alluvium in minor washes, braided-distributary deposits forming alluvial-fan aprons along mountain fronts, older alluvial fans and pediments forming higher terraces along mountain fronts, landslides, and hummocky masses of heterogeneous mixtures of soil material and rock fragments deposited by slow continuous downslope creep

INTRUSIVE ROCKS

Tm **Monzogranite dikes and sills (Tertiary)**—Gray and brown, fine- to coarse-grained, porphyritic to equigranular monzogranite. Crystallinity is relatively fine in the thin intrusives and on the margins of larger intrusives, otherwise coarse-grained. Minerals in the rock include feldspar (commonly altered to calcite), hornblende, and biotite, and some rocks contain pyrite, goethite, and display Liesegang banding. Dikes and sills are as much as 30 ft thick

TKj **Jasperoid (Tertiary or Cretaceous)**—Varicolored, hard and resistant siliceous-ferruginous (iron-rich) breccia containing quartz veins and, commonly, Liesegang banding. Most jasperoid is composed of fine-grained quartz and as much as 50 percent chalcedony or opal and contains vein quartz in rehealed fractures. Jasperoid ranges from dense silica rock to iron-oxide-rich, soft, siliceous rock and stockwork veinlets of silica in brecciated carbonate rock. Pyrite and limonite occur in some jasperoid. Most jasperoid bodies are subparallel to bedding and confined to limestone units directly below shaly mudstone and siltstone units, and they appear to grade into unaltered bedrock; less silicified limestone has the appearance of quartzite. Jasperoid stands out in strong relief from the surrounding terrain and forms isolated scabs on moderately steep dip slopes. Some faults locally contain podlike bodies of jasperoid. Thickness is as much as 100 ft

SEDIMENTARY ROCKS

IPe **Ely Limestone (Middle and Lower Pennsylvanian)**—Alternating thick-bedded, cliff-forming limestone and thin-bedded, slope-forming limestone. Resistant beds are yellowish-gray (when fresh, medium-to brownish-gray), laminated limestone composed of fragments of fossils, lime-mud pellets, and locally ooids set in a fine-grained lime-mud matrix. Some beds contain quartz sand and silt and others contain chert layers and nodules. Some nonresistant units are composed of calcareous mudstone. Thickness several hundred feet; top not exposed

Msw **Scotty Wash Quartzite (Upper Mississippian)**—Interbedded cliff- and ledge-forming quartzite to quartzitic sandstone and slope-forming mudstone, siltstone, and minor sandy limestone. Quartzite and sandstone beds are moderate brown to brownish gray (when fresh, gray), fine- to medium-grained, laminated to thin-bedded and commonly have rib-and-furrow current ripples, small- to medium-scale sets of cross laminae, burrows, plant stem impressions, channels as much as 2 ft deep and 10 ft wide, and sparse slump features. Beds commonly are variably iron-stained brown and red by Liesegang banding. Shale units occur between major quartzite and sandstone units and form benches. Upper part of formation is mostly interbedded light-olive-gray mudstone, siltstone, limy quartzite, sandy limestone, and fossiliferous detrital limestone. Lower part of formation contains local lenticular beds of bituminous coal as much as 2 ft thick. Thickness 600–1,000 ft

Mc **Chainman Shale (Upper and Lower Mississippian)**—Consists of an upper unit (about 1,000 ft thick) of slope-forming, light-olive-gray to olive-gray mudstone and siltstone containing minor sandstone and silty limestone interbeds and a lower unit (about 250 ft thick) of conspicuous, ledge-forming, light-gray micritic limestone and subjacent slope-forming, grayish-orange siltstone and limy siltstone and minor very fine grained sandstone and medium-gray phosphatic shale. Upper unit mudstone and siltstone beds contain scattered phosphatic siltstone nodules, ironstone and limestone concretions, and fossils. Lower unit slope-forming siltstone and minor sandstone commonly contain fossil meandering grazing trails, scattered black phosphatic nodules, and some iron-oxide Liesegang banding. Total thickness about 1,250 ft

Mj **Joana Limestone (Lower Mississippian)**—Consists of three major cliff-forming limestone units separated by indented limestone units. Cliff-forming units are composed of thin- to thick-bedded, medium-dark-to dark-gray, bioclastic limestone and minor biomicritic limestone having silty limestone partings and brown-weathering, black chert blebs, lenses, and discontinuous layers; upper cliff contains conspicuous coarse encrinitic limestone beds. Indented units between cliffs are composed of thin-bedded bioclastic limestone and minor biomicritic limestone having pale-red and pale-yellow silty and clayey limestone partings. Basal 6–15 ft of formation is a bench-forming, very thin bedded, nodular, fossiliferous limestone having pale-red silty limestone to limy siltstone partings. Entire formation commonly contains pelmatozoan (echinoderm) debris, horn and colonial corals, brachiopods, snails, and trace fossils. Total thickness about 320 ft

Dpu **Upper tongue of lower member of Pilot Shale (Upper Devonian)**—Bench-forming, platy, brown-weathering (when fresh, medium-dark-gray) siltstone to very fine grained sandstone unit that occurs between Indian Creek on the north and Goshute Basin on the south. Basal 1 ft contains a calcareritic lag bed having abundant fish fragments and conodonts. Entire unit is poorly exposed throughout the map area. Thickness ranges from 0 to 70 ft

Dgir **Tongue of Indian Ranch of Guilmette Limestone (Upper Devonian)**—Alternating cliff- and steep-slope-forming, interbedded, laminated to thin-bedded, nodular, tabular, and lenticular layers of medium-gray limestone and pale-yellow clayey and silty limestone to limy siltstone; nodular clayey and silty limestone units are mottled gray and yellow; fossils are sparse throughout the tongue of Indian Ranch. Base of the tongue is marked by a limestone-pebble conglomerate about 3 ft thick. The tongue is equivalent to the West Range Limestone of southeastern Nevada. Thickness ranges from about 500 ft at Indian Creek on the north to less than 1 ft northeast of Goshute Basin on the south

Dpl **Lower tongue of lower member of Pilot Shale (Upper Devonian)**—Slope-forming, platy and slabby laminated, dark-yellowish-orange to light-brown (when fresh, dark- to medium-gray) limy and dolomitic siltstone to fine-grained sandstone and silty to sandy limestone interspersed with cliffs and ledges of laminated to thick-bedded fine- to coarse-grained quartz sandy limestone to limy sandstone turbidites and conglomeratic debris-flow and grain-flow deposits containing flow rolls or slump folds, some cross-laminae, transported fossils, and minor limestone conglomerate. South of Indian Creek, the middle part of the lower Pilot Shale contains a persistent limestone unit as much as 45 ft thick composed of interbedded flaggy and slabby tabular to nodular, laminated to thin-bedded, light-gray limestone and grayish-yellow silty limestone and debris-flow and grain-flow limestone conglomerate and some chert stringers, fossil fragments, and trace fossils. Base of Pilot Shale is marked by a very light gray marlstone about 10 ft thick. Total thickness of lower tongue of lower member of Pilot Shale at Indian Creek is about 750 ft

Dg **Lower tongue of Guilmette Limestone (Upper and Middle Devonian)**—Characterized by massive cliffs of limestone in upper part and by ledgy slopes of interbedded limestone and dolostone in lower 250 ft of lower tongue. Upper part consists of cliffs having minor indented tabular, laminated to thick-bedded, medium-gray micritic to biomicritic limestone and laminated to very thin bedded, nodular to knobby limestone having pale-red and pale-yellow silty limestone partings; many beds are burrowed and fossiliferous; upper 50 ft of lower tongue consists of several limestone beds containing well-rounded, fine to coarse quartz grains; several limestone ledges in the lower part of tongue are fossil-rich layers containing amphiporids, cladoporids, bryozoans, corals, brachiopods, snails, and bulbous stromatoporoids. Lower part of tongue contains numerous light- to yellowish-gray (when fresh, olive-gray), silty and clayey, fine-grained dolostone algal laminites; base of tongue is marked by a 35-ft-thick slope-forming interval of yellowish-gray clayey and silty dolostone to dolomitic siltstone having scattered fine and medium grains of quartz. The lower tongue of the Guilmette Limestone is equivalent to the main Guilmette Limestone of eastern Nevada and western Utah. Total thickness about 575 ft

DSOd **Undifferentiated dolostone (Middle Devonian to Upper Ordovician)**—Consists of Middle Devonian Simonson Dolostone, Lower Devonian Sevy Dolostone, Silurian Laketown Dolostone, and Lower Silurian and Upper Ordovician Ely Springs Dolostone. Total thickness 2,700–3,900 ft

Simonson Dolostone: upper part consists of alternating beds of light- and medium-gray, thinly laminated, medium- to coarse-grained dolostone with conspicuous flat-pebble conglomerate, soft-sediment slumping, and solution collapse breccia; darker beds contain amphiporids, bulbous stromatoporoids, brachiopods, corals, cephalopods, snails, and pelmatozoans; thickness 1,000–1,500 ft.

Sevy Dolostone: relatively uniform light- to yellowish-gray (when fresh, medium- to brownish-gray), laminated to thin-bedded, nonfossiliferous, finely crystalline dolostone that forms conspicuous light-colored ledgy slopes; upper 60 ft contains subrounded to well-rounded fine to coarse quartz sand in thin beds and as scattered grains in dolostone; thickness 500–800 ft.

Laketown Dolostone: consists of upper and lower cliff-forming, medium-gray dolostone and a middle cliff- and ledge-forming, light-gray dolostone; dolostone is fine- to coarse-grained, laminated to thick-bedded, and fossiliferous; fossils include horn and colonial corals, brachiopods, pelmatozoans, bulbous stromatoporoids, and algal laminites; sedimentary features include chert lenses and discontinuous layers in the darker units and soft-sediment slumping, algal laminites, laminated grainstones, and oolitic layers in the lighter units; thickness 800–1,000 ft.

Ely Springs Dolostone: upper part is characterized by light-gray (when fresh, medium-gray), fine-grained, laminated to thin-bedded dolostone; a cliff-forming, medium-gray dolostone unit occurs above a basal 15-ft-thick, slope-forming, flaggy to platy, yellowish-gray to grayish-yellow and -pink silty and clayey dolostone unit; lower part consists of cliffy, dark- to medium-gray and minor light-gray, fine-grained dolostone having abundant, dolomitized tiny pelmatozoan debris, some corals, and some chert blebs and lenses; basal part consists of interbedded quartz sandy dolostone and dolomitic sandstone to relatively pure quartzose sandstone or quartzite; base of map unit is placed at the base of the first dolostone above the Eureka Quartzite; thickness 400–600 ft

Oe **Eureka Quartzite (Middle Ordovician)**—Ledge- and cliff-forming, interbedded, white, fine- to medium-grained orthoquartzite and less-well-cemented sandstone; some coarse-grained layers and small-scale cross laminae; bioturbated zones and vertical burrows (*Skolithus*) are common; quartzite and sandstone tend to have desert varnish and weather dark brown; thickness 3–50 ft

Ol **Lehman Limestone of Pogonip Group (Middle Ordovician)**—Ledgy slopes and minor cliffs of flaggy and slabby, laminated to thin-bedded, tabular to nodular, light- to medium-gray limestone and grayish-yellow to grayish-orange (when fresh, brownish-gray) silty and fine quartz sandy limestone and common bioclastic and intraformational rip-up limestone conglomerate-breccia beds 4–8 inches thick; nodular limestone is mottled gray and yellow; limestone is fossiliferous and commonly burrowed; fossils include trilobites, brachiopods, snails, sponge spicules, algae, and ostracodes. Upper 50–60 ft of formation consists of sandy limestone, limy sandstone, and sandstone composed of well-rounded fine to medium quartz grains; some beds are bioturbated, especially the top 6 ft; upper 50 to 100 ft is dolomitized locally. Formerly called Lehman Formation. Thickness 400–500 ft

Ok **Kanosh Shale of Pogonip Group (Middle Ordovician)**—Slope-forming, light-olive-gray (when fresh, olive-gray) shaly mudstone and siltstone (makes up about 50 percent of formation) and thin, ledgy, light-gray to grayish-yellow and grayish-orange (when fresh, medium-gray), nodular silty limestone (makes up about 50 percent of formation); trace fossils are common in limy mudstone and shaly limestone, and burrows are common in silty, nodular limestone; some fossiliferous calcarenite beds occur in upper part of formation; some silty limestone and limy siltstone beds in lower part of formation show a "chickenwire" fabric. Fossils include trilobites, brachiopods, ostracodes, calathids, and receptaculitids. Thickness 150–250 ft

OCl **Undifferentiated limestone (Lower Ordovician and Upper Cambrian)**—Consists of Lower Ordovician lower part of Pogonip Group and Upper Cambrian Windfall Formation. Total thickness 4,300–4,500 ft

Lower part of Pogonip Group consists of upper and lower cliff-forming units and a middle ledgy slope-forming unit. Upper unit is composed of laminated to thick-bedded, light- to medium-gray, fine- to coarse-grained limestone and grayish-yellow silty limestone and minor limy mudstone commonly containing bioclastic limestone and calcarenite; some silty beds are cherty; some flat-pebble conglomerate in lower part; thickness about 1,200 ft. Fossils are common and include calathid algae (*Receptaculites*), snails, brachiopods, straight-coned cephalopods, pelmatozoans, and burrows. Middle unit is composed of flaggy and slabby, tabular to nodular, laminated to thin-bedded, light- to medium-gray limestone and yellow- to brown-weathering, silty and very fine quartz sandy limestone, limy siltstone, fine-grained sandstone, and minor mudstone; commonly contains chert blebs and stringers, bioclastic and calcarenitic beds, flat-pebble conglomerate, oncolite (algal ball) layers, and limy siltstone burrows ("chickenwire" fabric); contains some possible mudcracks; fossils are common and include trilobites, brachiopods, snails, and trace fossils; many brown and orange "rusty" zones in middle unit due to large amount of quartz silt and fine sand in limestone beds; thickness about 1,100 ft. Lower unit is composed of laminated to thick-bedded, light- to medium-gray, fine- to coarse-grained limestone and subordinate grayish-yellow silty limestone commonly containing wispy to ropy chert, bioclastic and calcarenitic beds, flat-pebble conglomerate, small oncolite layers, and burrow mottling; upper part of unit is more silty and ledgy, whereas the lower part is less silty and forms a cliff with its base marked by an interval of laminated, olive-gray chert layers; thickness about 500 ft

Windfall Formation: consists of cliffs and ledges of platy, flaggy, slabby, and massive, light- to medium-gray (when fresh, medium- to dark-gray) laminated to thick-bedded limestone and pale-red, grayish-yellow, and brown (when fresh, brownish- to olive-gray) clayey and silty limestone to limy siltstone and cherty limestone; contains subordinate thin layers of micaceous siltstone and very fine to medium-grained quartz sandstone containing abundant large burrows and trace fossils; commonly contains bioturbated zones and bioclastic and calcarenitic beds; some flat-pebble conglomerate and oolite beds; cliffy units have less silt content than ledgy and indented units. Most thicker beds in the upper part of the formation are composed of stromatolitic limestone and silty limestone with hemispheroidal, columnar, and digitate stromatoporoids surrounded by calcarenite; middle part of formation contains platy and flaggy, laminated, medium-gray and pale-red to moderate-brown silty limestone beds containing conspicuous black chert, silicified trilobite fragments, and burrows. Lower part of formation is marked by a 30-ft-thick cliff composed of medium-bedded, light- to medium-gray, wavy-laminated, fine-grained limestone and silty limestone (Barton Canyon Member) that overlies the Dunderberg Shale; thickness of formation is 1,500–1,700 ft

Ꞓd **Dunderberg Shale (Upper Cambrian)**—Slope-forming, light-olive- to olive-gray, shaly and platy laminated tuffaceous mudstone and siltstone commonly containing ledges of light- to medium-gray (when fresh, medium- to dark-gray), very thin beds of nodular limestone and greenish- to brownish-gray-weathering silty limestone; some lensoid concretions of silty limestone and some clots of limestone contain silicified trilobite fragments; lower 50 ft of formation is mostly shaly mudstone containing lensoid concretions composed of laminated, fine-grained calcitic sediment. Thickness about 600 ft

Ꞓr **Raiff Limestone (Upper and Middle Cambrian)**—Cliff- and steep, ledgy slope-forming limestone and dolostone between bench-forming Dunderberg Shale above and Monte Neva Formation below. Cliffs and ledges consist of flaggy and slabby, laminated to thin-bedded, light- to medium-gray, fine-grained limestone, silty limestone, medium to coarsely crystalline dolomitized limestone (dolostone), and subordinate interbeds of brown-weathering limy siltstone; dolostone tends to be massive due to grain-size increase and destruction of bedding surfaces during recrystallization; most beds are burrowed and many silty limestone and dolostone beds show "chickenwire" fabric; many burrowed limestone and dolostone beds are mottled light brownish gray, light gray, and medium gray; contains some bioclastic, calcarenitic, and oolitic beds. At the mouth of Log Canyon, a nonresistent unit of interbedded, ledge-forming nodular limestone, silty limestone, and limy siltstone and slope-forming shaly mudstone and siltstone below the Raiff Limestone may represent the Middle Cambrian Monte Neva Formation. Due to this unit's limited exposure in the study area and the uncertainty of its correlation with the Monte Neva Formation, it is mapped with the Raiff Limestone in this study. Total thickness 2,000–3,000 ft

Contact—Dashed where inferred; dotted where concealed

Normal or reverse fault—Showing dip, dashed where inferred; dotted where concealed. Ball and bar on downthrown side; hachures indicate dike intruding fault

Thrust fault—Dashed where inferred. Sawteeth on upper plate

Strike and dip of beds

Inclined

Mine adit

Prospect pit

MAP SHOWING MINERAL RESOURCE POTENTIAL AND GEOLOGY OF THE GOSHUTE CANYON WILDERNESS STUDY AREA, ELKO AND WHITE PINE COUNTIES, NEVADA