

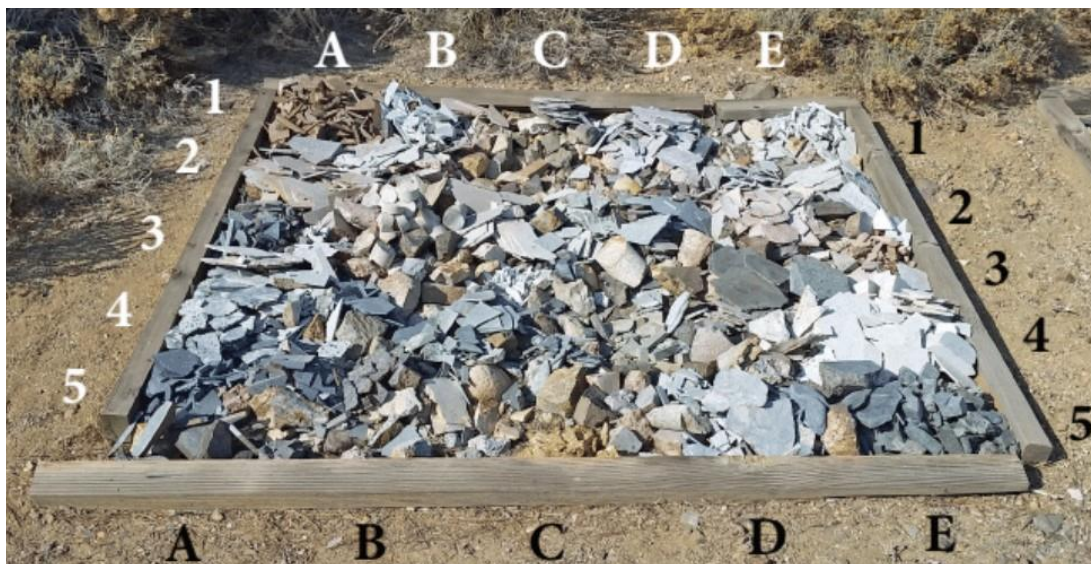
Guide to Cut Rocks in the South (left) Rock Garden northwest of the Great Basin Science Sample and Records Library

Feel free to take a few pieces for your personal rock and mineral collections, but **please take only one of any rock or mineral**. Also, please do not move the rocks around too much as you explore, so the grid will still be accurate for others. Thank you. Enjoy Nevada's great and interesting geology.

Use this grid for approximate locations.

	A	B	C	D	E
1	A1	B1	C1	D1	E1
2	A2	B2	C2	D2	E2
3	A3	B3	C3	D3	E3
4	A4	B4	C4	D4	E4
5	A5	B5	C5	D5	E5

There is some logic to where rocks are located. Volcanic (extrusive igneous) rocks are on the left (mostly columns A & B), and intrusive igneous rocks are on the right (mostly columns D & E). Felsic (silicic) igneous rocks are near the top (mostly rows 1 & 2); mafic (basic) igneous rocks are at the bottom (mostly row 5); intermediate igneous rocks are in between. Ores and metamorphic rocks are mostly in the middle. Metamorphosed ultramafic rocks are at E5. Sedimentary rocks are mostly to the right (columns D & E).



The following list is ordered by approximate location (A1 to E1, A2 to E2, A3 to E3, A4 to E4, A5 to E5). Photos are of samples taken from the rock garden and preserved inside the Great Basin Science Sample and Records Library.

Label written on rock	Location	Description
VITRIC TUFF	A1	Rhyolite vitric tuff , Jackpot, Elko County [Miocene, erupted from above the Yellowstone hot spot ~12 million years old (Ma)]
WASHINGTON HILL	B1	Flow-banded rhyolite , Washington Hill, Storey County [~11 Ma]
ROCHESTER	B1	Rochester Rhyolite , part of the Triassic Koipato Group, Coeur Rochester silver mine, Humboldt Range, Pershing County

Label written on rock Location Description



WINDOUS BUTTE

B1

Rhyolite ash-flow tuff, partially altered to green celadonite, $K(Mg,Fe^{2+})(Fe^{3+},Al)Si_4O_{10}(OH)_2$, Windous Butte Formation, Grant Range, Nye County [an Oligocene volcanic-rock reservoir in the Trap Spring oil field in nearby Railroad Valley]



**SPHERULITIC
DEVITRIFIED RHYOLITE**

B1

Rhyolite (spherulitic devitrified, flow-banded rhyolite), Montezuma Range, Esmeralda County [Miocene]



EAGLES

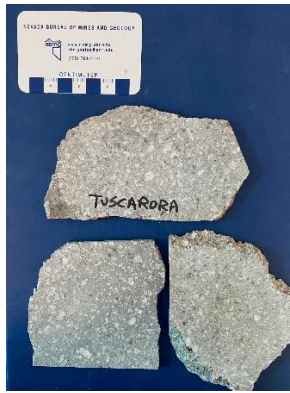
B1

Rhyolite [Miocene], volcanic rock with crystals of sanidine, $KAlSi_3O_8$, plagioclase, $(NaAlSi_3O_8 - CaAl_2Si_4O_8)$, biotite, $K(Mg,Fe^{2+})_3(AlSi_3O_{10})(OH,F)_2$, magnetite $(Fe_3O_4 - Fe_2TiO_4)$, and quartz, SiO_2 , Eagles House, northeast of Grimes Point, Churchill County

Label written on rock **Location** **Description**

TUSCARORA

C1



Porphyritic rhyolite [Eocene] with phenocrysts of **plagioclase**, $(\text{Na,Ca,K})(\text{Al,Si})_2\text{Si}_2\text{O}_8$, **quartz**, SiO_2 , **hornblende**, $(\text{Ca,Na,K})_{2-3}(\text{Mg,Fe,Mn})_3(\text{Al,Fe})_{2-1}(\text{Si,Al})_8\text{O}_{22}(\text{O,OH,F})_2$, **biotite**, $\text{K}(\text{Fe,Mg})_3\text{AlSi}_3\text{O}_{10}(\text{OH})_2$, and **sanidine**, $(\text{K,Na,Ca})(\text{Si,Al})_2\text{Si}_2\text{O}_8$, Tuscarora Mountains, Elko County. This 39 million-year-old rock is approximately the same age as gold mineralization along the Carlin trend and many other major gold-producing areas in Nevada.

DUMORTIERITE

D1



Dumortierite, $\text{Al}_7\text{O}_3(\text{BO}_3)(\text{SiO}_4)_3$, is the lavender mineral, with andalusite, Al_2SiO_5 , and quartz, SiO_2 , in this metamorphosed Rochester Rhyolite, part of the Triassic Koipato Group, Lincoln Hill, Humboldt Range, Pershing County. Some samples also have both lavender and blue dumortierite. A few samples have only blue dumortierite and quartz; these are from the nearby Champion mine.

Label written on rock Location Description

GRANITE

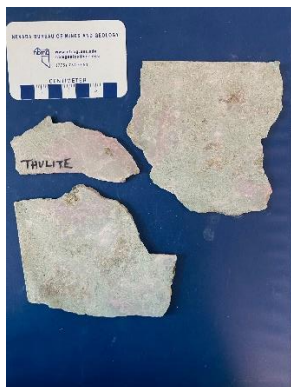
E1



Granite [Cretaceous] from the shaft dug for the 12.5-kiloton underground nuclear test, 367 meters below the surface, detonated on 26 October 1963, Project Shoal, Sand Springs Range, Churchill County. Minerals include orthoclase, $KAlSi_3O_8$, plagioclase, $(NaAlSi_3O_8 - CaAl_2Si_4O_8)$, quartz, SiO_2 , biotite, $K(Mg,Fe^{2+})_3(AlSi_3O_{10})(OH,F)_2$, and magnetite $(Fe_3O_4 - Fe_2TiO_4)$.

THULITE

E1



Epidote (green), $Ca_2Al_2FeSi_3O_{12}(OH)$, and **thulite** (pink), $Ca_2(Al,Mn)_3Si_3O_{12}(OH)$, from a boulder of hydrothermally altered Cretaceous granitic rock in Quaternary-Tertiary sediments, Warm Springs Valley, Washoe County

RHYOLITE TUFF

A2



Several rhyolite tuffs are around this location. Among others are: **Nine Hill Tuff**, Carson City, Stop 3 on the 2014 Earth Science Week field trip [Oligocene, ~25 Ma]

Label written on rock Location Description

SANTIAGO

A2



Tuff of Santiago Canyon, erupted from a caldera in central Nevada and deposited in the Virginia City area, later affected by propylitic alteration (characterized by pistachio-green epidote, $\text{Ca}_2\text{Al}_2\text{FeSi}_3\text{O}_{12}(\text{OH})$, dark green chlorite, $(\text{Mg,Fe,Al})_3(\text{Al,Si})_4\text{O}_{10}(\text{OH})_2 \cdot (\text{Mg,Fe})_3(\text{OH})_6$, here replacing pumice fragments, and white albite, $\text{NaAlSi}_3\text{O}_8$), Virginia City, Storey County [~ 23 Ma]

MICKEY PASS

B2



Mickey Pass Tuff [Tertiary] Pumpkin Hollow, Lyon County

EASTSIDE

B2



Rhyolite breccia [Miocene] Eastside Project, Monte Cristo Range, Esmeralda County

Label written on rock **Location** **Description**



Thh **C2** **Tuff breccia [Tertiary]** Panther Valley area, Washoe County



DONNER **D2** **Granodiorite [Cretaceous]** part of the Sierra Nevada batholith, Donner Pass area, Nevada County, California

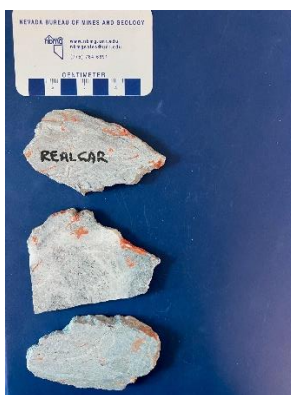


ESW'13-1 **D2** **Andesite [Miocene, ~16 Ma]** with epidote, $\text{Ca}_2\text{Al}_2\text{FeSi}_3\text{O}_{12}(\text{OH})$, and pyrite, FeS_2 , Desert Research Institute, Washoe County, Point 9 on the 2013 Earth Science Week field trip

Label written on rock Location Description

REALGAR

D2



Gold ore with realgar (AsS) and calcite (CaCO₃), Cortez Hills mine, Lander County. NOTE: on a freshly cut or broken surface, realgar is red, but when exposed to sunlight, it turns orange; to preserve the red color, keep it covered or in a dark place.

TOURMALINE

D2



Schorl, Na(Fe,Mn)₃Al₆B₃Si₆O₂₇(OH,F)₄, a black **tourmaline**-group mineral, with quartz, SiO₂, and goethite, FeO(OH), Buena Vista Hills, Pershing County

AZTEC

E2



Sandstone—Nevada State Rock [Aztec Sandstone, Jurassic] Spring Mountains, Clark County

Label written on rock **Location** **Description**



GILBERT ANDESITE

A3

Andesite [Gilbert Andesite, Miocene] Monte Cristo Range, Esmeralda County



TOQUIMA

B3

Rhyolite tuff [Oligocene], pieces of diamond-drill core from a gold-exploration project, Toquima Range, Nye County



CASTLE PEAK

B3

Tuff of Castle Peak [Miocene, ~24 Ma] Monte Cristo Range, Esmeralda County

Label written on rock **Location** **Description**

ANHYDRITE

E3



Anhydrite, Ca_2SO_4 , metamorphosed Jurassic marine gypsum, $\text{Ca}_2\text{SO}_4 \cdot 2\text{H}_2\text{O}$, from the Adams Claim (Art Wilson Co.) gypsum mine, Virginia Range, Lyon County

POGONIP

E3



Zebra dolomite, Cambrian Notch Peak Dolomite, Long Canyon gold deposit, Pequop Mountains, Elko County

MAJUBA

A4



Rhyolite with quartz [SiO_2] phenocrysts, K-feldspar [$\text{KA1}_3\text{Si}_3\text{O}_8$] and plagioclase [$\text{NaAl}_3\text{Si}_3\text{O}_8$ - $\text{CaAl}_2\text{Si}_2\text{O}_8$] phenocrysts; some samples have malachite [$\text{Cu}_2\text{CO}_3(\text{OH})_2$] and azurite [$\text{Cu}_3(\text{CO}_3)_2(\text{OH})_2$] (Late Oligocene), Majuba Hill, Pershing County

Label written on rock **Location** **Description**



MAJUBA BX

A4

Breccia with fragments of rhyolite with quartz [SiO₂] phenocrysts, and tourmaline, [Na(Fe,Mn,Li,Al)₃Al₆B₃Si₆O₂₇(OH,F)₄] replacing K-feldspar [KAl₃Si₃O₈] and plagioclase [NaAl₃Si₃O₈-CaAl₂Si₂O₈] phenocrysts and in the matrix of the breccia; some samples have malachite [Cu₂CO₃(OH)₂] and azurite [Cu₃(CO₃)₂(OH)₂] (Late Oligocene), Majuba Hill, Pershing County



MAJUBA TOUR

A4

Rhyolite with quartz [SiO₂] phenocrysts, and tourmaline, [Na(Fe,Mn,Li,Al)₃Al₆B₃Si₆O₂₇(OH,F)₄] replacing K-feldspar [KAl₃Si₃O₈] and plagioclase [NaAl₃Si₃O₈-CaAl₂Si₂O₈] phenocrysts (Late Oligocene), Majuba Hill, Pershing County

Label written on rock Location Description

KENDALL CUT

B4



Andesite [Miocene] with propylitic alteration, characterized by dark green chlorite, $(Mg,Fe,Al)_3(Al,Si)_4O_{10}(OH)_2 \cdot (Mg,Fe)_3(OH)_6$, and pistachio-green epidote, $Ca_2Al_2FeSi_3O_{12}(OH)$. Some samples have veinlets of quartz $[SiO_2]$, galena $[PbS]$, chalcopyrite $[CuFeS_2]$, and sphalerite $[ZnS]$, Kendall cut, Comstock Lode, Virginia City, Storey County

ANDESITE

B4



Andesite [Miocene] from outcrops near the Great Basin Science Sample and Records Library, Nevada Bureau of Mines and Geology, Washoe County

MAGNETITE + APATITE

C4



Magnetite, Fe_3O_4 , and **apatite**, $Ca_5(PO_4)_3(OH,F,Cl)$, Jurassic iron ore from the Buena Vista mine, Buena Vista Hills, Churchill County

Label written on rock **Location** **Description**

PUMPKIN H

C4

Copper-iron ore [Jurassic] with chalcopyrite (CuFeS_2) and magnetite (Fe_3O_4), Pumpkin Hollow property, Lyon County



EPIDOTE

D4

Epidote, $\text{Ca}_2\text{Al}_2\text{FeSi}_3\text{O}_{12}(\text{OH})$, mostly from Triassic meta-basalt or meta-andesite, Carson River area, Carson City



NV PACKARD

D4

Rhyolite, part of the Triassic Koipato Group, Nevada Packard mine, Pershing County



Label written on rock **Location** **Description**



RIO TINTO

D4

Pyrite, FeS₂, Rio Tinto mine, Elko County



NV Hg

D4

Limestone [Mesozoic] with veins of calcite [CaCO₃], Nevada Quicksilver mine, Humboldt Range, Pershing County



CARRARA

E4

Marble [Cambrian Carrara Formation], composed mostly of calcite, CaCO₃, Carrara quarry, Bare Mountain, Nye County

Label written on rock **Location** **Description**



BASALTIC ANDESITE

A5

Basaltic andesite (lava flow) with microscopic crystals of pyroxene, $\text{Ca}(\text{Mg,Fe})\text{Si}_2\text{O}_6$, plagioclase, $(\text{NaAlSi}_3\text{O}_8 - \text{CaAl}_2\text{Si}_4\text{O}_8)$, and magnetite $(\text{Fe}_3\text{O}_4 - \text{Fe}_2\text{TiO}_4)$ [~ 1 Ma], north side of Carson City



LOCKWOOD

A5

Basalt (lava flow) with mostly microscopic crystals of olivine, $(\text{Mg,Fe})_2\text{SiO}_4$, pyroxene, $\text{Ca}(\text{Mg,Fe})\text{Si}_2\text{O}_6$, plagioclase, $(\text{NaAlSi}_3\text{O}_8 - \text{CaAl}_2\text{Si}_4\text{O}_8)$, and magnetite $(\text{Fe}_3\text{O}_4 - \text{Fe}_2\text{TiO}_4)$, [~ 1 Ma] south of Lockwood, Storey County



SCORIA

B5

SCORIA (basaltic andesite with holes from CO_2 and H_2O that bubbled out of the lava as pressure dropped upon eruption), [~ 1 Ma], north side of Carson City

Label written on rock **Location** **Description**



FERRICRETE

C5

Ferricrete. This rock is composed of fragments of other rock (Quaternary colluvium) cemented with iron oxyhydroxide (goethite, $\text{FeO}(\text{OH})$) and iron oxide (hematite, Fe_2O_3) that precipitated from natural acid-rock-drainage spring water from a nearby mineralized area with quartz (SiO_2), alunite ($\text{KAl}_3(\text{SO}_4)_2(\text{OH})_6$), and pyrite (FeS_2). The fragments are hydrothermally altered Miocene volcanic rocks. Age of the hydrothermal alteration was also Miocene, somewhat younger than the age of mineralization on the Comstock Lode. Geiger Grade (Nevada Highway 341), Washoe County.



GNEISS

D5

Gneiss [Mesozoic], Samples with white feldspar augen (eyes) are from the Ruby Mountains, Elko County; other samples are from Mineral Ridge, Esmeralda County.

Label written on rock **Location** **Description**



BLUESCHIST

D5

Blueschist (metamorphosed basalt) with glaucophane, $\text{Na}_2(\text{Mg,Fe})_3\text{Al}_2\text{Si}_8\text{O}_{22}(\text{OH})_2$, Sonoma County, California



SERPENTINITE

E5

Serpentinite (California State Rock), composed primarily of antigorite [a variety of serpentine, $(\text{Mg, Fe}^{2+})_3\text{Si}_2\text{O}_5(\text{OH})_4$] and magnetite [Fe_3O_4] near GPS location $38^\circ 29' 05.19''\text{N}$ $122^\circ 14' 35.02''\text{W}$, Capell Valley Road (Route 128), Napa County, California

The following list is ordered alphabetically by the labels written on the rocks.

Guide to Cut Rocks in the South (left) Rock Garden northwest of the Great Basin Science Sample and Records Library

Use this grid for approximate locations.

	A	B	C	D	E
1	A1	B1	C1	D1	E1
2	A2	B2	C2	D2	E2
3	A3	B3	C3	D3	E3
4	A4	B4	C4	D4	E4
5	A5	B5	C5	D5	E5

Label written on rock	Location	Description
ANDESITE	B4	Andesite [Miocene] from outcrops near the Great Basin Science Sample and Records Library, Nevada Bureau of Mines and Geology, Washoe County
ANHYDRITE	E3	Anhydrite , Ca ₂ SO ₄ , metamorphosed Jurassic marine gypsum, Ca ₂ SO ₄ ·2H ₂ O, from the Adams Claim (Art Wilson Co.) gypsum mine, Virginia Range, Lyon County
AZTEC	E2	Sandstone—Nevada State Rock [Aztec Sandstone, Jurassic] Spring Mountains, Clark County
BASALTIC ANDESITE	A5	Basaltic andesite (lava flow) with microscopic crystals of pyroxene, Ca(Mg,Fe)Si ₂ O ₆ , plagioclase, (NaAlSi ₃ O ₈ – CaAl ₂ Si ₄ O ₈), and magnetite (Fe ₃ O ₄ – Fe ₂ TiO ₄) [~1 Ma], north side of Carson City
BLUESCHIST	D5	Blueschist (metamorphosed basalt) with glaucophane, Na ₂ (Mg,Fe) ₃ Al ₂ Si ₈ O ₂₂ (OH) ₂ , Sonoma County, California
CARRARA	E4	Marble [Cambrian Carrara Formation], composed mostly of calcite, CaCO ₃ , Carrara quarry, Bare Mountain, Nye County

Label written on rock	Location	Description
CASTLE PEAK	B3	Tuff of Castle Peak [Miocene, ~24 Ma] Monte Cristo Range, Esmeralda County
DONNER	D2	Granodiorite [Cretaceous] part of the Sierra Nevada batholith, Donner Pass area, Nevada County, California
DUMORTIERITE	D1	Dumortierite , $Al_7O_3(BO_3)(SiO_4)_3$, is the lavender mineral, with andalusite, Al_2SiO_5 , and quartz, SiO_2 , in this metamorphosed Rochester Rhyolite, part of the Triassic Koipato Group, Lincoln Hill, Humboldt Range, Pershing County. Some samples also have both lavender and blue dumortierite. A few samples have only blue dumortierite and quartz; these are from the nearby Champion mine.
EAGLES	B1	Rhyolite [Miocene], volcanic rock with crystals of sanidine, $KAlSi_3O_8$, plagioclase, $(NaAlSi_3O_8 - CaAl_2Si_4O_8)$, biotite, $K(Mg,Fe^{2+})_3(AlSi_3O_{10})(OH,F)_2$, magnetite ($Fe_3O_4 - Fe_2TiO_4$), and quartz, SiO_2 , Eagles House, northeast of Grimes Point, Churchill County
EASTSIDE	B2	Rhyolite breccia [Miocene] Eastside Project, Monte Cristo Range, Esmeralda County
EPIDOTE	D4	Epidote , $Ca_2Al_2FeSi_3O_{12}(OH)$, mostly from Triassic meta-basalt or meta-andesite, Carson River area, Carson City
ESW-13	D2	Andesite [Miocene, ~16 Ma] with epidote, $Ca_2Al_2FeSi_3O_{12}(OH)$, and pyrite, FeS_2 , Desert Research Institute, Washoe County, Point 9 on the 2013 Earth Science Week field trip
FERRICRETE	C5	Ferricrete . This rock is composed of fragments of other rock (Quaternary colluvium) cemented with iron oxyhydroxide (goethite, $FeO(OH)$) and iron oxide (hematite, Fe_2O_3) that precipitated from natural acid-rock-drainage spring water from a nearby mineralized area with quartz (SiO_2), alunite ($KAl_3(SO_4)_2(OH)_6$), and pyrite (FeS_2). The fragments are hydrothermally altered Miocene volcanic rocks. Age of the hydrothermal alteration was also Miocene, somewhat younger than the age of mineralization on the Comstock Lode. Geiger Grade (Nevada Highway 341), Washoe County.
GILBERT ANDESITE	A3	Andesite [Gilbert Andesite, Miocene] Monte Cristo Range, Esmeralda County
GNEISS	D5	Gneiss [Mesozoic], Ruby Mountains, Elko County

Label written on rock	Location	Description
GRANITE	E1	Granite [Cretaceous] from the shaft dug for the 12.5-kiloton underground nuclear test, 367 meters below the surface, detonated on 26 October 1963, Project Shoal, Sand Springs Range, Churchill County. Minerals include orthoclase, $KAlSi_3O_8$, plagioclase, $(NaAlSi_3O_8 - CaAl_2Si_4O_8)$, quartz, SiO_2 , biotite, $K(Mg,Fe^{2+})_3(AlSi_3O_{10})(OH,F)_2$, and magnetite $(Fe_3O_4 - Fe_2TiO_4)$.
KENDALL CUT	B4	Andesite [Miocene] with propylitic alteration, characterized by dark green chlorite, $(Mg,Fe,Al)_3(Al,Si)_4O_{10}(OH)_2(Mg,Fe)_3(OH)_6$, and pistachio-green epidote, $Ca_2Al_2FeSi_3O_{12}(OH)$. Some samples have veinlets of quartz [SiO_2], galena [PbS], chalcopyrite [$CuFeS_2$], and sphalerite [ZnS], Kendall cut, Comstock Lode, Virginia City, Storey County
LOCKWOOD	A5	Basalt (lava flow) with mostly microscopic crystals of olivine, $(Mg,Fe)_2SiO_4$, pyroxene, $Ca(Mg,Fe)Si_2O_6$, plagioclase, $(NaAlSi_3O_8 - CaAl_2Si_4O_8)$, and magnetite $(Fe_3O_4 - Fe_2TiO_4)$, [~ 1 Ma] south of Lockwood, Storey County
MAGNETITE + APATITE	C4	Magnetite , Fe_3O_4 , and apatite , $Ca_5(PO_4)_3(OH,F,Cl)$, Jurassic iron ore from the Buena Vista mine, Buena Vista Hills, Churchill County
MAJUBA	A4	Rhyolite with quartz [SiO_2] phenocrysts, K-feldspar [$KAl_3Si_3O_8$] and plagioclase [$NaAl_3Si_3O_8 - CaAl_2Si_2O_8$] phenocrysts; some samples have malachite [$Cu_2CO_3(OH)_2$] and azurite [$Cu_3(CO_3)_2(OH)_2$] (Late Oligocene), Majuba Hill, Pershing County
MAJUBA BX	A4	Breccia with fragments of rhyolite with quartz [SiO_2] phenocrysts, and tourmaline, $[Na(Fe,Mn,Li,Al)_3Al_6B_3Si_6O_{27}(OH,F)_4]$ replacing K-feldspar [$KAl_3Si_3O_8$] and plagioclase [$NaAl_3Si_3O_8 - CaAl_2Si_2O_8$] phenocrysts and in the matrix of the breccia; some samples have malachite [$Cu_2CO_3(OH)_2$] and azurite [$Cu_3(CO_3)_2(OH)_2$] (Late Oligocene), Majuba Hill, Pershing County
MAJUBA TOUR	A4	Rhyolite with quartz [SiO_2] phenocrysts, and tourmaline, $[Na(Fe,Mn,Li,Al)_3Al_6B_3Si_6O_{27}(OH,F)_4]$ replacing K-feldspar [$KAl_3Si_3O_8$] and plagioclase [$NaAl_3Si_3O_8 - CaAl_2Si_2O_8$] phenocrysts (Late Oligocene), Majuba Hill, Pershing County
MICKEY PASS	B2	Mickey Pass Tuff [Tertiary] Pumpkin Hollow, Lyon County
MIDAS	B3	Gold-silver ore , quartz (SiO_2) with naumannite (Ag_2Se), electrum (Au,Ag), and aguilarite (Ag_4Se S), Ken Snyder Mine, Midas, Elko County

Label written on rock	Location	Description
NV Hg	D4	Limestone [Mesozoic] with veins of calcite [CaCO ₃], Nevada Quicksilver mine, Humboldt Range, Pershing County
NV PACKARD	D4	Rhyolite , part of the Triassic Koipato Group, Nevada Packard mine, Pershing County
PHOENIX	C3	Copper-oxide ore in quartz monzonite porphyry [Eocene] with feldspar crystals partially replaced by chrysocolla, ~CuSiO ₃ •2H ₂ O, from the Phoenix Project, Battle Mountain district, Lander County
POGONIP	E3	Zebra dolomite , Cambrian Notch Peak Dolomite, Long Canyon gold deposit, Pequop Mountains, Elko County
PUMPKIN H	C4	Copper-iron ore [Jurassic] with chalcopyrite (CuFeS ₂) and magnetite (Fe ₃ O ₄), Pumpkin Hollow property, Lyon County
REALGAR	D2	Gold ore with realgar (AsS) and calcite (CaCO ₃), Cortez Hills mine, Lander County
RHYOLITE TUFF	A2	Several rhyolite tuffs are around this location. Among others are: Nine Hill Tuff , Carson City, Stop 3 on the 2014 Earth Science Week field trip [Oligocene, ~25 Ma]
RIO TINTO	D4	Pyrite , FeS ₂ , Rio Tinto mine, Elko County
ROCHESTER	B1	Rochester Rhyolite , part of the Triassic Koipato Group, Coeur Rochester silver mine, Humboldt Range, Pershing County
SANTIAGO	A2	Tuff of Santiago Canyon , erupted from a caldera in central Nevada and deposited in the Virginia City area, later affected by propylitic alteration (characterized by pistachio-green epidote, Ca ₂ Al ₂ FeSi ₃ O ₁₂ (OH), dark green chlorite, (Mg,Fe,Al) ₃ (Al,Si) ₄ O ₁₀ (OH) ₂ ·(Mg,Fe) ₃ (OH) ₆ , here replacing pumice fragments, and white albite, NaAlSi ₃ O ₈), Virginia City, Storey County [~23 Ma]
SCORIA	B5	SCORIA (basaltic andesite with holes from CO ₂ and H ₂ O that bubbled out of the lava as pressure dropped upon eruption), [~1 Ma], north side of Carson City

Label written on rock	Location	Description
SERPENTINITE	E5	Serpentinite (California State Rock), composed primarily of antigorite [a variety of serpentine, $(\text{Mg}, \text{Fe}^{2+})_3\text{Si}_2\text{O}_5(\text{OH})_4$] and magnetite [Fe_3O_4] near GPS location $38^\circ 29' 05.19''\text{N}$ $122^\circ 14' 35.02''\text{W}$, Capell Valley Road (Route 128), Napa County, California
SPHERULITIC DEVITRIFIED RHYOLITE	B1	Rhyolite (spherulitic devitrified, flow-banded rhyolite), Montezuma Range, Esmeralda County [Miocene]
Thh	C2	Tuff breccia [Tertiary] Panther Valley area, Washoe County
THULITE	E1	Epidote (green), $\text{Ca}_2\text{Al}_2\text{FeSi}_3\text{O}_{12}(\text{OH})$, and thulite (pink), $\text{Ca}_2(\text{Al}, \text{Mn})_3\text{Si}_3\text{O}_{12}(\text{OH})$, from a boulder of hydrothermally altered Cretaceous granitic rock in Quaternary-Tertiary sediments, Warm Springs Valley, Washoe County
TOQUIMA	B3	Rhyolite tuff [Oligocene], pieces of diamond-drill core from a gold-exploration project, Toquima Range, Nye County
TOURMALINE	D2	Schorl , $\text{Na}(\text{Fe}, \text{Mn})_3\text{Al}_6\text{B}_3\text{Si}_6\text{O}_{27}(\text{OH}, \text{F})_4$, a black tourmaline -group mineral, with quartz, SiO_2 , and goethite, $\text{FeO}(\text{OH})$, Buena Vista Hills, Pershing County
TUSCARORA	C1	Porphyritic rhyolite [Eocene] with phenocrysts of plagioclase , $(\text{Na}, \text{Ca}, \text{K})(\text{Al}, \text{Si})_2\text{Si}_2\text{O}_8$, quartz , SiO_2 , hornblende , $(\text{Ca}, \text{Na}, \text{K})_{2-3}(\text{Mg}, \text{Fe}, \text{Mn})_3(\text{Al}, \text{Fe})_{2-1}(\text{Si}, \text{Al})_8\text{O}_{22}(\text{O}, \text{OH}, \text{F})_2$, biotite , $\text{K}(\text{Fe}, \text{Mg})_3\text{AlSi}_3\text{O}_{10}(\text{OH})_2$, and sanidine , $(\text{K}, \text{Na}, \text{Ca})(\text{Si}, \text{Al})_2\text{Si}_2\text{O}_8$, Tuscarora Mountains, Elko County. This 39 million-year-old rock is approximately the same age as gold mineralization along the Carlin trend and many other major gold-producing areas in Nevada.
VITRIC TUFF	A1	Rhyolite vitric tuff , Jackpot, Elko County [Miocene, erupted from above the Yellowstone hot spot ~12 million years old (Ma)]
WASHINGTON HILL	B1	Flow-banded rhyolite , Washington Hill, Storey County [~11 Ma]
WINDOUS BUTTE	B1	Rhyolite ash-flow tuff , partially altered to green celadonite, $\text{K}(\text{Mg}, \text{Fe}^{2+})(\text{Fe}^{3+}, \text{Al})\text{Si}_4\text{O}_{10}(\text{OH})_2$, Windous Butte Formation, Grant Range, Nye County [an Oligocene volcanic-rock reservoir in the Trap Spring oil field in nearby Railroad Valley]

Label written on rock	Location	Description
WONDERSTONE	D3	<p>Nevada Wonderstone, rhyolite air-fall tuff [Miocene], south of Eagles House, Lahontan Mountains, Churchill County, Stop 3 of the 2011 Earth Science Week Field Trip. The rock has been altered by hot waters that deposited pyrite (FeS_2) and quartz (SiO_2). Rainwater later penetrated the rock and oxidized the pyrite to form liesegang bands of red hematite (Fe_2O_3) and orange and brown goethite [$\text{FeO}(\text{OH})$]. Miocene volcanoes in western Nevada were part of what is now the Cascade Mountains. This type of hydrothermal alteration is commonly associated with the gold and silver deposits that have been important to Nevada. Nevada, the Silver State, entered the Union in 1864 because its rich silver deposits on the Comstock Lode were needed for the war (hence the mottoes “Battle Born” on the state flag and “All for Our Country” on the state seal). We are currently in the midst of the biggest gold-mining boom in American history. Nevada leads the nation in gold production.</p>

Samples and photos are courtesy of Jonathan G. Price, State Geologist Emeritus, and others at the Nevada Bureau of Mines and Geology, University of Nevada, Reno