

U.S. Department of the Interior
National Park Service
Natural Resource Stewardship and Science Directorate
Geologic Resources Division



Whiskeytown National Recreation Area

GRI Ancillary Map Information Document

Produced to accompany the Geologic Resources Inventory (GRI) Digital Geologic Data for Whiskeytown National Recreation Area

whis_geology.pdf

Version: 9/24/2018

Geologic Resources Inventory Map Document for Whiskeytown National Recreation Area

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Geologic Resources Inventory Map Document



Whiskeytown National Recreation Area, California

Document to Accompany Digital Geologic-GIS Data

[whis_geology.pdf](#)

Version: 9/24/2018

This document has been developed to accompany the digital geologic-GIS data developed by the Geologic Resources Inventory (GRI) program for Whiskeytown National Recreation Area, California (WHIS).

Attempts have been made to reproduce all aspects of the original source products, including the geologic units and their descriptions, geologic cross sections, the geologic report, references and all other pertinent images and information contained in the original publication.

This document contains the following information:

- 1) **About the NPS Geologic Resources Inventory Program** – A brief summary of the Geologic Resources Inventory (GRI) Program and its products. Included are web links to the GRI GIS data model, and to the GRI products page where digital geologic-GIS datasets, scoping reports and geology reports are available for download. In addition, web links to the NPS Data Store and GRI program home page, as well as contact information for the GRI coordinator, are also present.
- 2) **GRI Digital Maps and Source Citations** – A listing of all GRI digital geologic-GIS maps produced for this project along with sources used in their completion. In addition, a brief explanation of how each source map was used is provided.
- 3) **Map Unit List** – A listing of all geologic map units present on maps for this project, generally listed from youngest to oldest.
- 4) **Map Unit Descriptions** – Descriptions for all geologic map units. If a unit is present on multiple source maps the unit is listed with its source geologic unit symbol, unit name and unit age followed by the unit's description for each source map.
- 5) **Geologic Cross Sections** – Geologic cross section graphics with source geologic cross section abbreviations.
- 6) **Ancillary Source Map Information** – Additional source map information presented by source map. For each source map this includes a stratigraphic column, map legend and report.
- 7) **GRI Digital Data Credits** – GRI digital geologic-GIS data and ancillary map information document production credits.

For information about using GRI digital geologic-GIS data contact:

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About the NPS Geologic Resources Inventory Program

Background

Recognizing the interrelationships between the physical (geology, air, and water) and biological (plants and animals) components of the earth is vital to understanding, managing, and protecting natural resources. The Geologic Resources Inventory (GRI) helps make this connection by providing information on the role of geology and geologic resource management in parks.

Geologic resources for management consideration include both the processes that act upon the Earth and the features formed as a result of these processes. Geologic processes include: erosion and sedimentation; seismic, volcanic, and geothermal activity; glaciation, rockfalls, landslides, and shoreline change. Geologic features include mountains, canyons, natural arches and bridges, minerals, rocks, fossils, cave and karst systems, beaches, dunes, glaciers, volcanoes, and faults.

The Geologic Resources Inventory aims to raise awareness of geology and the role it plays in the environment, and to provide natural resource managers and staff, park planners, interpreters, researchers, and other NPS personnel with information that can help them make informed management decisions.

The GRI team, working closely with the Colorado State University (CSU) Department of Geosciences and a variety of other partners, provides more than 270 parks with a geologic scoping meeting, digital geologic-GIS map data, and a park-specific geologic report.

Products

Scoping Meetings: These park-specific meetings bring together local geologic experts and park staff to inventory and review available geologic data and discuss geologic resource management issues. A summary document is prepared for each meeting that identifies a plan to provide digital map data for the park.

Digital Geologic Maps: Digital geologic maps reproduce all aspects of traditional paper maps, including notes, legend, and cross sections. Bedrock, surficial, and special purpose maps such as coastal or geologic hazard maps may be used by the GRI to create digital Geographic Information Systems (GIS) data and meet park needs. These digital GIS data allow geologic information to be easily viewed and analyzed in conjunction with a wide range of other resource management information data.

For detailed information regarding GIS parameters such as data attribute field definitions, attribute field codes, value definitions, and rules that govern relationships found in the data, refer to the NPS Geology-GIS Data Model document available at: <http://science.nature.nps.gov/im/inventory/geology/GeologyGISDataModel.cfm>

Geologic Reports: Park-specific geologic reports identify geologic resource management issues as well as features and processes that are important to park ecosystems. In addition, these reports present a brief geologic history of the park and address specific properties of geologic units present in the park.

For a complete listing of Geologic Resource Inventory products and direct links to the download site visit the GRI publications webpage: http://go.nps.gov/gri_products

GRI geologic-GIS data is also available online at the NPS Data Store Search Application: <http://irma.nps.gov/App/Reference/Search>. To find GRI data for a specific park or parks select the appropriate park(s), enter "GRI" as a Search Text term, and then select the Search Button.

For more information about the Geologic Resources Inventory Program visit the GRI webpage: <https://www.nps.gov/subjects/geology/gri.htm>, or contact:

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The Geologic Resources Inventory (GRI) program is funded by the National Park Service (NPS) Inventory and Monitoring (I&M) Division.

GRI Digital Maps and Source Map Citations

The GRI digital geologic-GIS maps for Whiskeytown National Recreation Area, California (WHIS) are listed below. Two primary maps are first listed. Together these two maps cover all of Whiskeytown National Recreation Area, as well as the surrounding area. Source maps used for each map are also listed as is how these source maps were used.

Digital Geologic-GIS Map of the French Gulch 15' Quadrangle, California (*GRI MapCode FREG*)

Albers, John P., 1964, Geology of the French Gulch Quadrangle, Shasta and Trinity Counties, California: U.S. Geological Survey, Bulletin 1141-J, scale 1:62,500 ([French Gulch 15' Quadrangle](#)). (*GRI Source Map ID 2962*).

The full extent of plate 1 from this source was used and all geologic features present on the plate including all mine area features (e.g., tailings piles) were captured. In addition, prominent map components (e.g., unit descriptions, cross sections) present on the plate, as well as the publication report, were also incorporated into this GRI digital geologic-GIS dataset and product.

Digital Geologic-GIS Map of the West Shasta Copper-Zinc District, California (*GRI MapCode WSCZ*)

Kinkel, A.R., Hall, W.E., and Albers, J.P., 1956, Geology and Base-Metal Deposits of West Shasta Copper-Zinc District, Shasta County, California: U.S. Geological Survey, Professional Paper 285, plate 1, scale 1:24,000 ([West Shasta Copper-Zinc District](#)). (*GRI Source Map ID 2961*).

The full extent of the plate 1 from this source was used and all geologic features present on the plate including all mine point features (e.g., mines, prospects) and mine area features (e.g., mine dumps, area mines) were captured. In addition, prominent map components (e.g., unit descriptions, cross sections) present on the plate, as well as the publication report, were also incorporated into this GRI digital geologic-GIS dataset and product.

In addition to the above maps the GRI also produced several 7.5' quadrangle component maps that collectively comprise the West Shasta Copper-Zinc District map.

Digital Geologic-GIS Map of parts of the Bohemotash Mountain Quadrangle, California (*GRI MapCode BHMT*)

Digital Geologic-GIS Map of the Igo Quadrangle, California (*GRI MapCode IGO*)

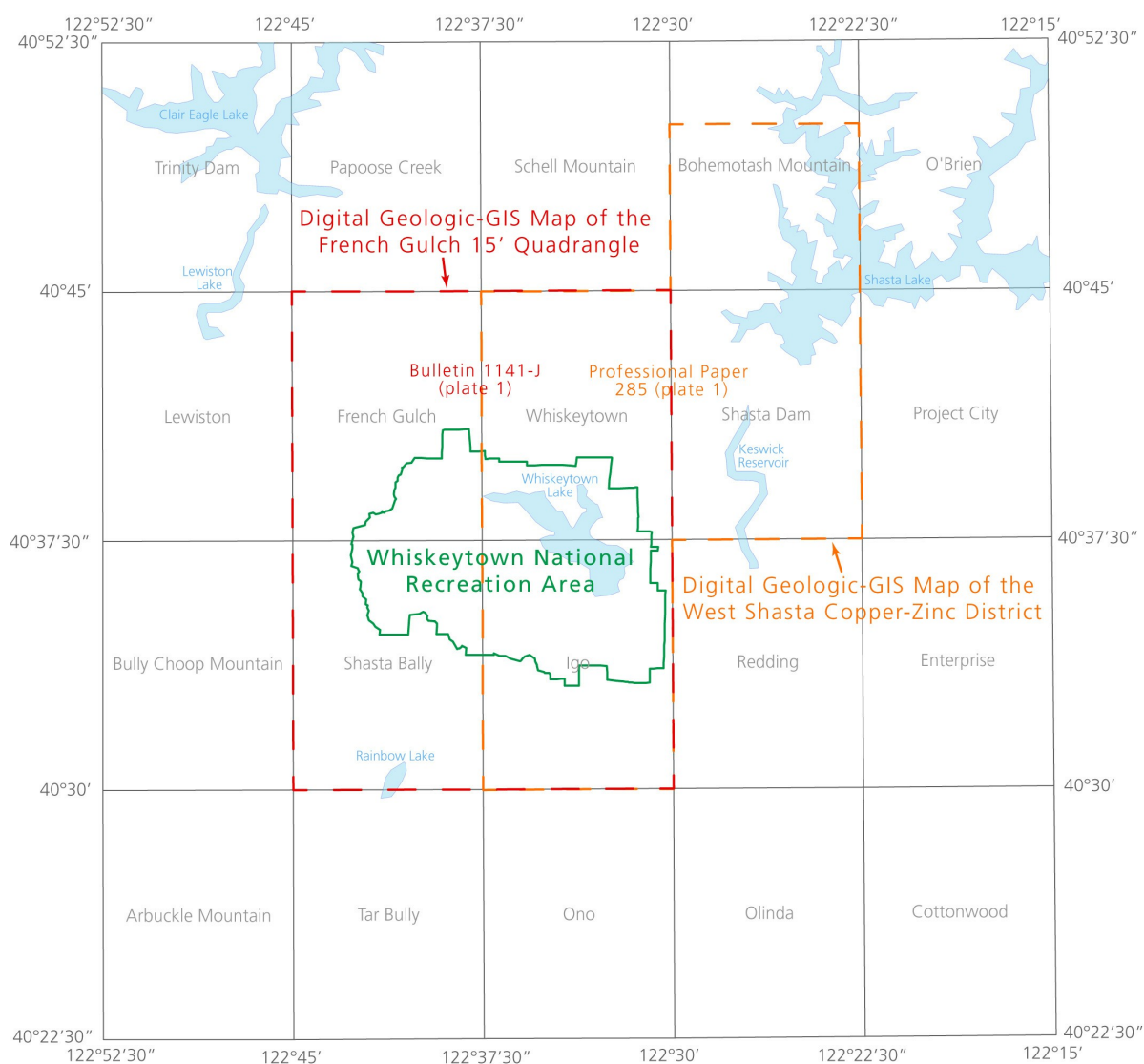
Digital Geologic-GIS Map of the Shasta Dam Quadrangle, California (*GRI MapCode SHDM*)

Digital Geologic-GIS Map of the Whiskeytown Quadrangle, California (*GRI MapCode WHSK*)

Additional information pertaining to each source map is also presented in the GRI Source Map Information (WHISMAP) table included with the GRI geologic-GIS data.

Index Map

The follow index map displays the extent of the GRI digital geologic-GIS data produced for Whiskeytown National Recreation Area. The boundary of the recreation area (shown in dark green, as of September, 2018) is also displayed, as is the extent of the two source maps used to produce the GRI digital geologic-GIS data. The extent of the GRI Digital Geologic-GIS Map of the French Gulch 15' quadrangle, derived from [USGS Bulletin 1141-J, plate 1](#), is outlined with a dashed red line and includes the following 7.5' quadrangles: French Gulch, Igo, Shasta Bally and Whiskeytown. The extent of the GRI Digital Geologic-GIS Map of the West Shasta Copper-Zinc District, derived from [USGS Professional Paper 285, plate 1](#), is outlined with a dashed orange line and includes the following 7.5' quadrangles: Bohemotash Mountain (parts of), Igo, Shasta Dam and Whiskeytown.



Graphic by James Winter (Colorado State University).

Map Unit List

The geologic units present in the digital geologic-GIS data produced for Whiskeytown National Recreation Area, California (WHIS) are listed below. Units are listed with their assigned unit symbol and unit name (e.g., Qaf - Artificial fill). Units are listed from youngest to oldest. No description for water is provided. Information about each geologic unit is also presented in the GRI Geologic Unit Information (WHISUNIT) table included with the GRI geologic-GIS data. Some source unit symbols, names and/or ages may have been changed in this document and in the GRI digital geologic-GIS data. With regards to the changing of unit symbols, this was done primarily to add a geologic time designation symbol (e.g., K for Cretaceous Period) to a unit symbol without such a symbol. Unit symbols, names and/or ages in a unit descriptions, or on a correlation of map units or other source map figure were not edited. If a unit symbol, name or age was changed by the GRI the unit's source map symbol, name and/or age appears with the unit's source map description.

Cenozoic Era

Quaternary Period

[Qaf](#) - Artificial fill
[Qcl](#) - Soil, talus and slope wash
[Qal](#) - Sand and gravel in stream beds
[Qls](#) - Landslide deposits
[Qg](#) - Sand and gravel
[Qrb](#) - Red Bluff formation

Mesozoic Era

Cretaceous Period

[Kc](#) - Chico formation

Cretaceous and Jurassic Periods

[KJbp](#) - Birdseye porphyry
[KJhb](#) - Hornblendite
[KJqp](#) - Quartz porphyry
[KJapd](#) - Aplite dike
[KJmg](#) - Metagabbro
[KJlp](#) - Lamprophyre
[KJap](#) - Andesite porphyry
[KJad](#) - Felsic dike rocks
[KJbqd](#) - Shasta Bally batholith
[KJbhgd](#) - Shasta Bally batholith, granodiorite and diorite
[KJbqd](#) - Shasta Bally batholith, coarse granodiorite and diorite
[KJbqd1](#) - Shasta Bally batholith, fine granodiorite and diorite
[KJgn](#) - Gneiss and amphibolite
[KJin](#) - Injected rocks and breccia
[KJp](#) - Peridotite
[KJag](#) - Mule Mountain stock, trondjemite
[KJag1](#) - Mule Mountain stock, siliceous, pseudoporphyrific albite granite
[KJbr](#) - Mule Mountain stock, intrusive breccia
[KJdb](#) - Diabase

Paleozoic Era

Mississippian Period

[Mbp](#) - Phyllite derived from Bragdon Formation

[Mbu](#) - Bragdon Formation, upper unit

[Mbl](#) - Bragdon Formation, lower unit

[Mbc](#) - Bragdon Formation, conglomerate bed in lower unit

[Mbds](#) - Bragdon formation, shale and siltstone

[Mbd](#) - Bragdon formation, conglomerate, sandstone and grit

[Mbd](#) - Bragdon formation, black siliceous shale

Devonian Period

[Dk](#) - Kennett formation, chert and shale

[Dkl](#) - Kennett formation limestone

[Dkt](#) - Kennett formation tuffaceous sedimentary rock

[Dbc](#) - Balaklala rhyolite, coarse phenocryst rhyolite

[Dbcp](#) - Balaklala rhyolite, coarse phenocryst rhyolite and volcanic breccia

[Dbct](#) - Balaklala rhyolite, coarse phenocryst rhyolite, tuff and tuffaceous sedimentary rock

[Dbm](#) - Balaklala rhyolite, medium phenocryst rhyolite

[Dbmp](#) - Balaklala rhyolite, medium phenocryst rhyolite and volcanic breccia

[Dbmt](#) - Balaklala rhyolite, medium phenocryst rhyolite, tuff and tuffaceous sedimentary rock

[Dbmg](#) - Balaklala rhyolite, medium phenocryst rhyolite and greenstone

[Dbmgp](#) - Balaklala rhyolite, medium phenocryst rhyolite and greenstone pyroclastic rock

[Db](#) - Balaklala rhyolite, nonporphyritic rhyolite

[Dbp](#) - Balaklala rhyolite, nonporphyritic rhyolite and volcanic breccia

[Dbt](#) - Balaklala rhyolite, nonporphyritic rhyolite, tuff and tuffaceous sedimentary rock

[Dbg](#) - Balaklala rhyolite, nonporphyritic rhyolite and greenstone

[Dbgp](#) - Balaklala rhyolite, nonporphyritic rhyolite and greenstone pyroclastic rock

Copley greenstone

[Dc](#) - Copley greenstone, keratophyre, spilite and metaandesite

[Dcp](#) - Copley greenstone, pyroclastic rock

[Dct](#) - Copley greenstone tuff, shaley tuff and shale

[Dcs1](#) - Copley greenstone, shale, shaley tuff and sandstone

[Dcs2](#) - Copley greenstone, greenstone tuff, rhyolite tuff and greenstone breccia

[Dcg](#) - Copley greenstone, gneiss and migmatite

Pre- Silurian

[Sch](#) - Abrams mica schist and Salmon(?) hornblende schist, undifferentiated

Map Unit Descriptions

Descriptions of all geologic map units, generally listed from youngest to oldest, are presented below. In addition to the unit descriptions present on each source map, information concerning geologic units can also be found in each source map's associated report. These documents can be accessed in the [GRI Ancillary Source Map Information](#) section of this document.

Qaf - Artificial fill (Recent)

Shasta Dam and caved area associated with the Mammoth Mine. No additional unit description provided. Unit present on source map: [West Shasta Copper-Zinc District](#).

Qcl - Soil, talus and slope wash (Recent)

Qcl - Soil, slope wash and talus (Quaternary)

Soil, slope wash and talus, (mapped only where bedrock geology is effectively obscured). Description from source map: [French Gulch 15' Quadrangle](#).

Qal - Soil, talus and slope wash (Quaternary)

No additional unit description provided. Unit present on source map: [West Shasta Copper-Zinc District](#).

Qal - Sand and gravel in stream beds (Recent)

Qal - Sand and gravel in stream beds (Quaternary)

No additional unit description provided. Unit present on source map: [French Gulch 15' Quadrangle](#).

Qls - Landslide deposits (Recent)

Qls - Landslide (Quaternary)

No additional unit description provided. Unit present on source maps: [French Gulch 15' Quadrangle](#) and [West Shasta Copper-Zinc District](#).

Qg - Sand and gravel (Recent)

Qg - Sand and gravel (Quaternary)

No additional unit description provided. Unit present on source map: [West Shasta Copper-Zinc District](#).

Qrb - Red Bluff formation (Pleistocene)

Qrb - Red Bluff formation (Pleistocene)

Older semi-consolidated gravels that may be correlative. Description from source map: [French Gulch 15' Quadrangle](#).

Qrb - Red Bluff formation (Pleistocene)

Sand and gravel. Qrb?, probably Red Bluff, but may be in part recent deposits. Description from

source map: [West Shasta Copper-Zinc District](#).

Kc - Chico formation (Upper Cretaceous)

K - Chico Formation (Cretaceous)

Conglomerate and sandstone. Description from source map: [French Gulch 15' Quadrangle](#).

Kc - Chico Formation (Upper Cretaceous)

Sandstone, shale, minor conglomerate. Description from source map: [West Shasta Copper-Zinc District](#).

KJbp - Birdseye porphyry (Cretaceous or Jurassic)

dp - "Birdseye" porphyry (Cretaceous or Jurassic)

Diorite porphyry, dacite porphyry, andesite porphyry. Description from source map: [French Gulch 15' Quadrangle](#).

bp - Birdseye porphyry (Cretaceous or Jurassic)

Includes diorite porphyry and dacite porphyry. Description from source map: [West Shasta Copper-Zinc District](#).

KJhb - Hornblendite (Cretaceous or Jurassic)

h - Hornblendite (Cretaceous or Jurassic)

No additional unit description provided. Unit present on source map: [French Gulch 15' Quadrangle](#).

hb - Hornblendite (Cretaceous or Jurassic)

No additional unit description provided. Unit present on source map: [West Shasta Copper-Zinc District](#).

KJqp - Quartz porphyry (Cretaceous or Jurassic)

qp - Quartz porphyry (Cretaceous or Jurassic)

No additional unit description provided. Unit present on source map: [French Gulch 15' Quadrangle](#).

KJapd - Aplite dike (Cretaceous or Jurassic)

ap - Aplite dike (Cretaceous or Jurassic)

Showing vertical and inclined attitude. No additional unit description provided. Unit present on source map: [French Gulch 15' Quadrangle](#).

KJmg - Metagabbro (Cretaceous or Jurassic)

mg - Metagabbro and lamprophyre dikes (Cretaceous or Jurassic)

No additional unit description provided. Unit present on source map: [French Gulch 15' Quadrangle](#).

mg - Metagabbro (Cretaceous or Jurassic)

No additional unit description provided. Unit present on source map: [West Shasta Copper-Zinc District](#).

KJlp - Lamprophyre (Cretaceous or Jurassic)

lp - Lamprophyre (Cretaceous or Jurassic)

No additional unit description provided. Unit present on source map: [West Shasta Copper-Zinc District](#).

KJap - Andesite porphyry (Cretaceous or Jurassic)

ap - Andesite porphyry (Cretaceous or Jurassic)

No additional unit description provided. Unit present on source map: [West Shasta Copper-Zinc District](#).

KJad - Felsic dike rocks (Cretaceous or Jurassic)

ad - Felsic dike rocks (Cretaceous or Jurassic)

Related to biotite-quartz diorite. Includes dacite porphyry and diorite porphyry. Description from source map: [West Shasta Copper-Zinc District](#).

KJbqd - Shasta Bally batholith (Cretaceous or Jurassic)

bqd - Shasta Bally batholith (Cretaceous or Jurassic)

Biotite-quartz diorite. Description from source map: [West Shasta Copper-Zinc District](#).

KJbhgd - Shasta Bally batholith, granodiorite and diorite (Cretaceous or Jurassic)

bhgd - Shasta Bally Batholith, biotite hornblende granodiorite and quartz diorite (Cretaceous or Jurassic)

No additional unit description provided. Unit present on source map: [French Gulch 15' Quadrangle](#).

KJbqd - Shasta Bally batholith, coarse granodiorite and diorite (Cretaceous or Jurassic)

bqd - Shasta Bally batholith (Cretaceous or Jurassic)

Biotite-quartz diorite. Description from source map: [West Shasta Copper-Zinc District](#).

KJbqd1 - Shasta Bally batholith, fine granodiorite and diorite (Cretaceous or Jurassic)

bqd1 - Shasta Bally Batholith, fine biotite granodiorite and quartz diorite (Cretaceous or Jurassic)

No additional unit description provided. Unit present on source map: [French Gulch 15' Quadrangle](#).

KJgn - Gneiss and amphibolite (Cretaceous or Jurassic)**gn - Gneiss and amphibolite (Cretaceous or Jurassic)**

Gneiss and amphibolite derived from Copley, Balaklala and Bragdon formations. Description from source map: [French Gulch 15' Quadrangle](#).

KJin - Injected rocks and breccia (Cretaceous or Jurassic)**in - Injected rocks and breccia (Cretaceous or Jurassic)**

No additional unit description provided. Unit present on source map: [French Gulch 15' Quadrangle](#).

KJp - Peridotite (Cretaceous or Jurassic)**p - Peridotite (Cretaceous or Jurassic)**

No additional unit description provided. Unit present on source map: [French Gulch 15' Quadrangle](#).

Mule Mountain stock**KJag - Mule Mountain stock, trondjemite (Cretaceous or Jurassic)****tag - Mule Mountain Stock, trondhjemite (Cretaceous or Jurassic)**

No additional unit description provided. Unit present on source map: [French Gulch 15' Quadrangle](#).

ag - Mule Mountain Stock, trondhjemite (Cretaceous or Jurassic)

No additional unit description provided. Unit present on source map: [West Shasta Copper-Zinc District](#).

Though originally mapped as Jurassic-Cretaceous in age, unit is dated at approximately 400 Ma on the basis of U-Pb dating in 1999 and cross-cutting relationships with Bragdon Formation and Shasta Bally Batholith (Irwin, W.P., 1999, Plutons and Accretionary Episodes of the Klamath Mountains, California and Oregon, USGS Open File Report 99-374).

KJag1 - Mule Mountain stock, siliceous, pseudoporphyrific albite granite (Cretaceous or Jurassic)**ag1 - Mule Mountain Stock, siliceous pseudoporphyrific albite granite (Cretaceous or Jurassic)**

No additional unit description provided. Unit present on source map: [West Shasta Copper-Zinc District](#).

Though originally mapped as Jurassic-Cretaceous in age, unit is dated at approximately 400 Ma on the basis of U-Pb dating in 1999 and cross-cutting relationships with Bragdon Formation and Shasta Bally Batholith (Irwin, W.P., 1999, Plutons and Accretionary Episodes of the Klamath Mountains, California and Oregon, USGS Open File Report 99-374).

KJbr - Mule Mountain stock, intrusive breccia (Cretaceous or Jurassic)**br - Mule Mountain Stock, intrusive breccia (Cretaceous or Jurassic)**

No additional unit description provided. Unit present on source map: [French Gulch 15' Quadrangle](#).

ag2 - Mule Mountain Stock, intrusive breccia (Cretaceous or Jurassic)

No additional unit description provided. Unit present on source map: [West Shasta Copper-Zinc District](#).

Though originally mapped as Jurassic-Cretaceous in age, unit is dated at approximately 400 Ma on the basis of U-Pb dating in 1999 and cross-cutting relationships with Bragdon Formation and Shasta Bally Batholith (Irwin, W.P., 1999, Plutons and Accretionary Episodes of the Klamath Mountains, California and Oregon, USGS Open File Report 99-374).

KJdb - Diabase (Cretaceous or Jurassic)**db - Diabase (Cretaceous or Jurassic)**

No additional unit description provided. Unit present on source map: [West Shasta Copper-Zinc District](#).

Mbp - Phyllite derived from Bragdon Formation (Mississippian)**Mbp - Phyllite (Mississippian)**

Phyllite derived from Bragdon formation by contact metamorphism of Shasta Bally batholith. Description from source map: [French Gulch 15' Quadrangle](#).

Mbu - Bragdon Formation, upper unit (Mississippian)**Mbu - Bragdon Formation, upper unit (Mississippian)**

Upper unit consisting of abundant conglomerate and sandstone, interbedded with siltstone and shale. Description from source map: [French Gulch 15' Quadrangle](#).

Mbl - Bragdon Formation, lower unit (Mississippian)**Mbl - Bragdon Formation, lower unit (Mississippian)**

Lower unit consisting of mostly shale, mudstone, and siltstone, with subordinate tuff and conglomerate. Description from source map: [French Gulch 15' Quadrangle](#).

Mbc - Bragdon Formation, conglomerate bed in lower unit (Mississippian)**Mbc - Bragdon Formation, conglomerate bed in lower unit (Mississippian)**

No additional unit description provided. Unit present on source map: [French Gulch 15' Quadrangle](#).

Mbds - Bragdon formation, shale and siltstone (Mississippian)**Mbds - Bragdon Formation, shale and siltstone (Mississippian)**

No additional unit description provided. Unit present on source map: [West Shasta Copper-Zinc](#)

[District.](#)

Mbdc - Bragdon formation, conglomerate, sandstone and grit (Mississippian)

Mbdc - Bragdon Formation, conglomerate, sandstone and grit (Mississippian)

No additional unit description provided. Unit present on source map: [West Shasta Copper-Zinc District.](#)

Mbd - Bragdon formation, black siliceous shale (Mississippian)

Mbd - Bragdon Formation, black siliceous shale (Mississippian)

No additional unit description provided. Unit present on source map: [West Shasta Copper-Zinc District.](#)

Dk - Kennett formation, chert and shale (Devonian)

Dk and Dk? - Kennett(?) formation (Devonian)

Gray and black cherty shale. Description from source map: [French Gulch 15' Quadrangle.](#)

Dk - Kennett formation (Devonian)

Chert and black and gray shale, mostly siliceous. Description from source map: [West Shasta Copper-Zinc District.](#)

Dkl - Kennett formation limestone (Devonian)

Dkl - Kennett Formation, limestone (Devonian)

No additional unit description provided. Unit present on source map: [West Shasta Copper-Zinc District.](#)

Dkt - Kennett formation tuffaceous sedimentary rock (Devonian)

Dkt - Kennett Formation, tuffaceous sedimentary rock (Devonian)

No additional unit description provided. Unit present on source map: [West Shasta Copper-Zinc District.](#)

Dbc - Balaklala rhyolite, coarse phenocryst rhyolite (Devonian)

Dbc - Balakala rhyolite, coarse phenocryst rhyolite (Devonian)

Porphyritic quartz keratophyre containing quartz phenocrysts larger than 4 mm. Unit Dbc includes much coarse volcanic breccia. The Balaklala rhyolite intertongues with and locally intrudes the Copley greenstone. Layers of greenstone interbedded in the Balaklala are mapped as Copley greenstone. Is also found as probable flows in Kennett(?) and Bragdon formations. Description from source map: [French Gulch 15' Quadrangle.](#)

Dbc - Balakala rhyolite, coarse phenocryst rhyolite (Devonian)

Porphyritic rhyolite containing quartz phenocrysts larger than 4 mm, characteristic of the upper unit of the Balaklala. Description from source map: [West Shasta Copper-Zinc District.](#)

Unit Dbc also exists as mapped areas with additional rock types, volcanic breccia, and tuff and tuffaceous sedimentary rock. These units, Dbcp and Dbct, respectively, are listed below.

Dbcp - Balaklala rhyolite, coarse phenocryst rhyolite and volcanic breccia (Devonian)

Dbc+ - Balaklala rhyolite, coarse phenocryst rhyolite and volcanic breccia (Devonian)

Unit [Dbc](#) with volcanic breccia - includes coarse volcanic breccia, tuff breccia, volcanic conglomerate, and flow breccia. Unit present on source map: [West Shasta Copper-Zinc District](#).

Dbct - Balaklala rhyolite, coarse phenocryst rhyolite, tuff and tuffaceous sedimentary rock (Devonian)

Dbc+ - Balaklala rhyolite, coarse phenocryst rhyolite, tuff and tuffaceous sedimentary rock (Devonian)

Unit [Dbc](#) with tuff and tuffaceous sedimentary rock. Unit present on source map: [West Shasta Copper-Zinc District](#).

Dbm - Balaklala rhyolite, medium phenocryst rhyolite (Devonian)

Dbm - Balaklala rhyolite, medium phenocryst rhyolite (Devonian)

Porphyritic rhyolite containing quartz phenocrysts 1-4 mm in diameter, characteristic of the middle unit of the Balaklala. Description from source map: [West Shasta Copper-Zinc District](#).

Unit Dbm also exists as mapped areas with additional rock types, volcanic breccia, tuff and tuffaceous sedimentary rock, greenstone and greenstone pyroclastic rock. These units, Dbmp and Dbmt, Dbmg and Dbmgp, respectively, are listed below.

Dbmp - Balaklala rhyolite, medium phenocryst rhyolite and volcanic breccia (Devonian)

Dbm+ - Balaklala rhyolite, medium phenocryst rhyolite and volcanic breccia (Devonian)

Unit [Dbm](#) with volcanic breccia – includes coarse volcanic breccia, tuff breccia, volcanic conglomerate, and flow breccia. Unit present on source map: [West Shasta Copper-Zinc District](#).

Dbmt - Balaklala rhyolite, medium phenocryst rhyolite, tuff and tuffaceous sedimentary rock (Devonian)

Dbm+ - Balaklala rhyolite, medium phenocryst rhyolite, tuff and tuffaceous sedimentary rock (Devonian)

Unit [Dbm](#) with tuff and tuffaceous sedimentary rock. Unit present on source map: [West Shasta Copper-Zinc District](#).

Dbmg - Balaklala rhyolite, medium phenocryst rhyolite and greenstone (Devonian)**Dbm+ - Balaklala rhyolite, medium phenocryst rhyolite and greenstone (Devonian)**

Unit [Dbm](#) with greenstone. Unit present on source map: [West Shasta Copper-Zinc District](#).

Dbmgrp - Balaklala rhyolite, medium phenocryst rhyolite and greenstone pyroclastic rock (Devonian)**Dbmgrp+ - Balaklala rhyolite, medium phenocryst rhyolite and greenstone pyroclastic rock (Devonian)**

Unit [Dbm](#) with greenstone pyroclastic rock. Unit present on source map: [West Shasta Copper-Zinc District](#).

Db - Balaklala rhyolite, nonporphyritic rhyolite (Devonian)**Db - Balaklala rhyolite, nonporphyritic quartz keratophyre and quartz keratophyre (Devonian)**

Nonporphyritic quartz keratophyre and quartz keratophyre containing quartz phenocrysts ranging from <1 to 4 mm. Unit Db includes much coarse volcanic breccia. The Balaklala rhyolite intertongues with and locally intrudes the Copley greenstone. Layers of greenstone interbedded in the Balaklala are mapped as Copley greenstone. Is also found as probable flows in Kennett(?) and Bragdon formations. Description from source map: [French Gulch 15' Quadrangle](#).

Db - Balaklala rhyolite, nonporphyritic rhyolite (Devonian)

Nonporphyritic rhyolite, characteristic of the lower unit of the Balaklala. Description from source map: [West Shasta Copper-Zinc District](#).

Unit Db also exists as mapped areas with additional rock types, volcanic breccia, tuff and tuffaceous sedimentary rock, greenstone and greenstone pyroclastic rock. These units, Dbp and Dbt, Dbg and Dbgp, respectively, are listed below. On the source map these unit symbols (Dbp and Dbt, Dbg and Dbgp) are unit symbols for the additional rock unit (e.g., Dbp for volcanic breccia), however, in combining these units which don't exist as their own mapped areas the GRI used these symbols when combined with unit Db. As an example, unit Dbp is volcanic breccia on the source map, however, on the GRI maps Dbp is volcanic breccia and nonporphyritic rhyolite (Db).

Dbp - Balaklala rhyolite, nonporphyritic rhyolite and volcanic breccia (Devonian)**Dbp+ - Balaklala rhyolite, nonporphyritic rhyolite and volcanic breccia (Devonian)**

Unit [Db](#) with volcanic breccia. Unit present on source map: [West Shasta Copper-Zinc District](#).

Dbt - Balaklala rhyolite, nonporphyritic rhyolite, tuff and tuffaceous sedimentary rock (Devonian)**Dbt - Balaklala rhyolite, tuff and tuffaceous shale (Devonian)**

No additional unit description. Unit Dbt includes much coarse volcanic breccia. The Balaklala rhyolite intertongues with and locally intrudes the Copley greenstone. Layers of greenstone interbedded in the Balaklala are mapped as Copley greenstone. Is also found as probable flows in Kennett(?) and Bragdon formations. Unit present on source map: [French Gulch 15' Quadrangle](#).

Dbt+ - Balaklala rhyolite, nonporphyritic rhyolite, tuff and tuffaceous sedimentary rock (Devonian)

Unit [Db](#) with tuff and tuffaceous sedimentary. Unit present on source map: [West Shasta Copper-Zinc District](#).

Dbg - Balaklala rhyolite, nonporphyritic rhyolite and greenstone (Devonian)

Dbg+ - Balaklala rhyolite, nonporphyritic rhyolite and greenstone (Devonian)

Unit [Db](#) with greenstone. Unit present on source map: [West Shasta Copper-Zinc District](#).

Dbgp - Balaklala rhyolite, nonporphyritic rhyolite and greenstone pyroclastic rock (Devonian)

Dbgp+ - Balaklala rhyolite, nonporphyritic rhyolite and greenstone pyroclastic rock (Devonian)

Unit [Db](#) with greenstone pyroclastic rock. Unit present on source map: [West Shasta Copper-Zinc District](#).

Copley greenstone

The Copley greenstone intertongues with the Balaklala rhyolite and contains numerous sheets of quartz porphyry indistinguishable from the Balaklala. These area here mapped as the Balaklala. Description from source map: [French Gulch 15' Quadrangle](#).

Dc - Copley greenstone, keratophyre, spilite and metaandesite (Devonian?)

Dc - Copley greenstone, keratophyre, spilite and metaandesite (Devonian?)

Includes volcanic breccia and agglomerate facies. No additional unit description provided. Unit present on source map: [French Gulch 15' Quadrangle](#).

Dc - Copley greenstone, keratophyre, spilite and meta-andesite (Devonian?)

No additional unit description provided. Unit present on source map: [West Shasta Copper-Zinc District](#).

Dcp - Copley greenstone, pyroclastic rock (Devonian?)

No additional unit description provided. Unit present on source map: [West Shasta Copper-Zinc District](#).

Dct - Copley greenstone tuff, shaley tuff and shale (Devonian?)

No additional unit description provided. Unit present on source map: [French Gulch 15' Quadrangle](#)

Dcs1 - Copley greenstone, shale, shaley tuff and sandstone (Devonian?)

No additional unit description provided. Unit present on source map: [West Shasta Copper-Zinc District](#).

Dcs2 - Copley greenstone, greenstone tuff, rhyolite tuff and greenstone breccia (Devonian?)

No additional unit description provided. Unit present on source map: [West Shasta Copper-Zinc District](#).

Dcg - Copley greenstone, gneiss and migmatite (Devonian?)

No additional unit description provided. Unit present on source map: [West Shasta Copper-Zinc District](#).

Sch - Abrams mica schist and Salmon(?) hornblende schist, undifferentiated (pre-Silurian)

No additional unit description provided. Unit present on source map: [French Gulch 15' Quadrangle](#)

The geologic cross sections present in the GRI digital geologic-GIS data produced for Whiskeytown National Recreation Area, California (WHIS) are presented below. Note that some cross section abbreviations (e.g., A - A') have been changed from their source map abbreviation in the GRI digital geologic-GIS data so that each cross section abbreviation in the GRI digital geologic-GIS data is unique. Cross section graphics were scanned at a high resolution and can be viewed in more detail by zooming in (if viewing the digital format of this document).

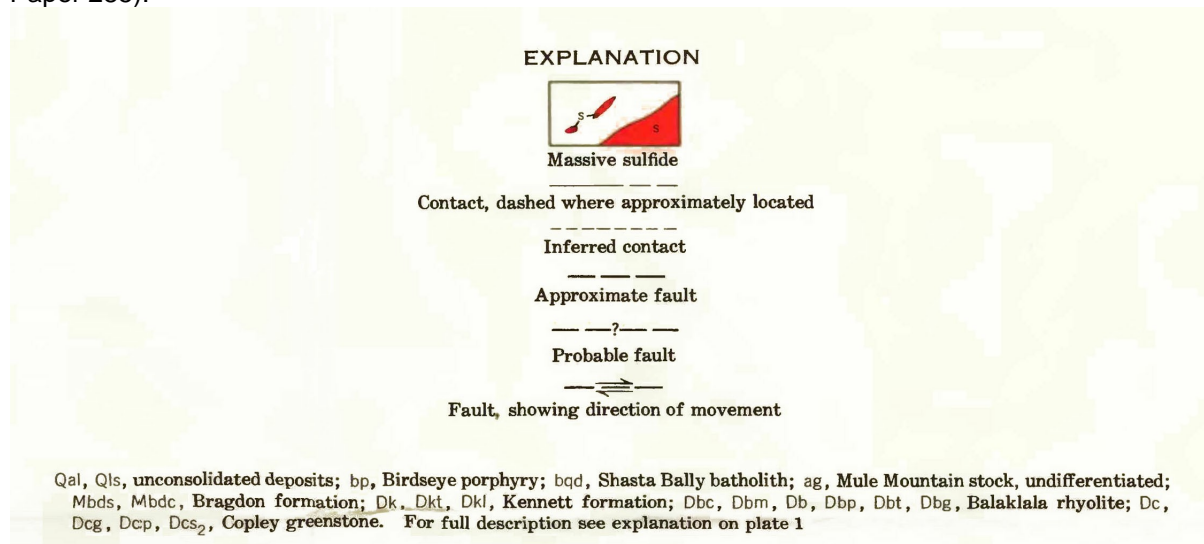
[illegible][illegible][illegible]

2018 NPS Geologic Resources Inventory Program

graphic is split into two graphics because of its length. No vertical exaggeration indicated on source map.

Cross Section Legend

The following legend applies to cross sections A-A', B-B' and C'-C' (cross sections from Professional Paper 285).



Graphic from source map: [West Shasta Copper-Zinc District](#).

Cross Section D-D'



Graphic from source map: [French Gulch 15' Quadrangle](#). Cross section A-A' on source map. No vertical exaggeration indicated on source map.

GRI Ancillary Source Map Information

The following sections present ancillary source map information associated with source maps used in completion of the GRI digital geologic-GIS data produced for Whiskeytown National Recreation Area.

USGS Bulletin 1141-J

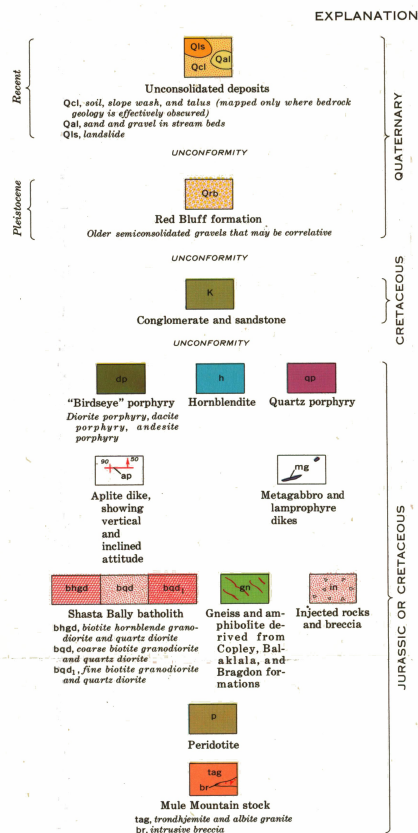
The formal citation for this source.

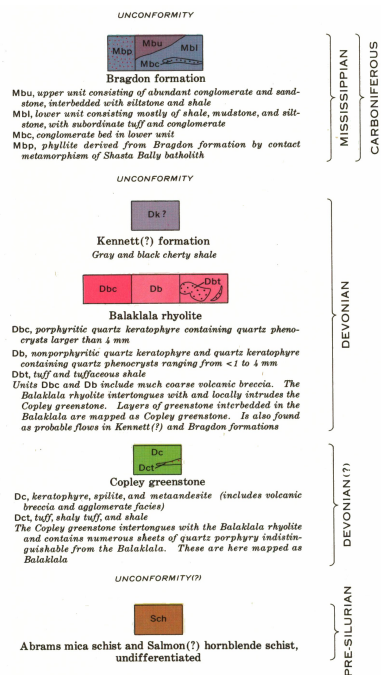
Albers, John P., 1964, Geology of the French Gulch Quadrangle, Shasta and Trinity Counties, California: U.S. Geological Survey, Bulletin 1141-J, scale 1:62,500 (*GRI Source Map ID 2962*).

The full publication can be found online at: <https://pubs.er.usgs.gov/publication/b1141J>

Prominent graphics and text associated with this source.

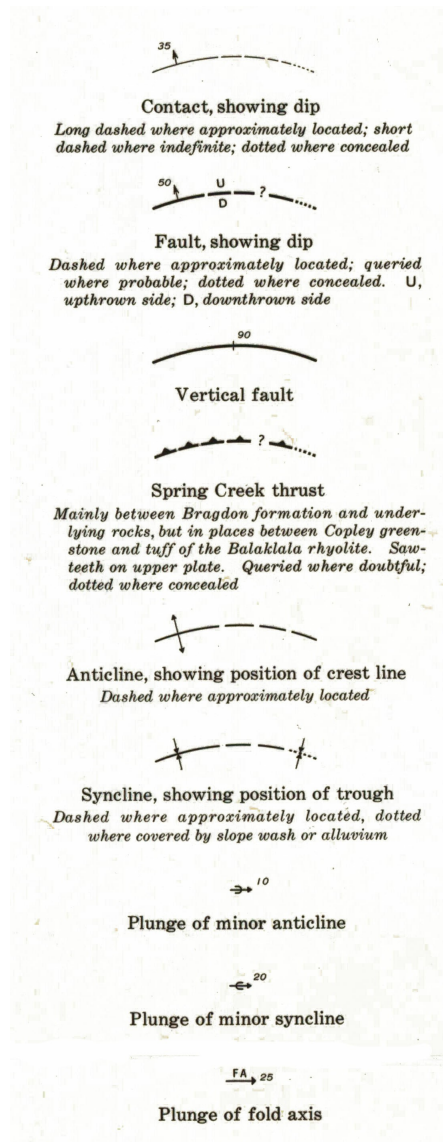
Correlation of Map Units

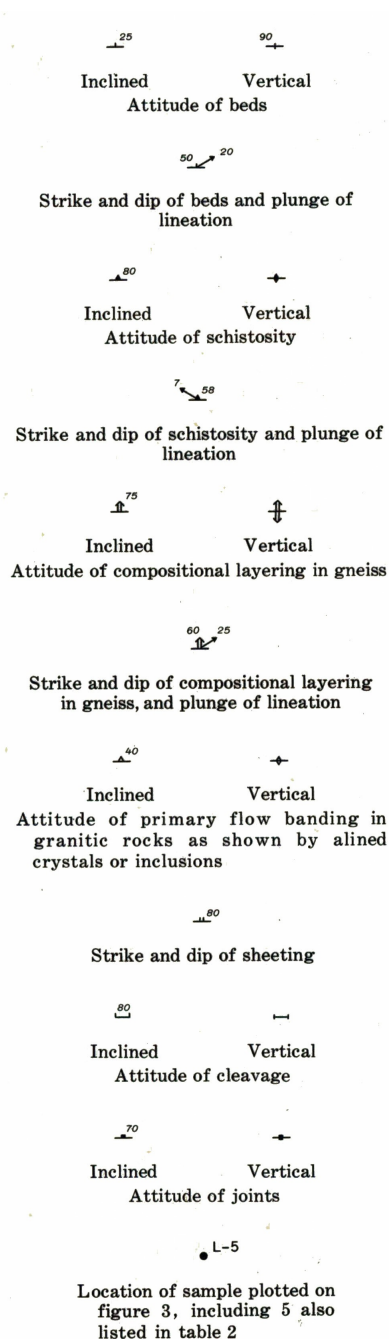




Graphic from source map: [French Gulch 15' Quadrangle](#).

Map Legend





Graphic from source map: [French Gulch 15' Quadrangle](#).

Report

A component of Bulletin 1141-J is a report booklet. The document contains information pertaining to the geology of the map area. The report is included as embedded PDF document and can be accessed by double-clicking the following link, [Bulletin 1141-J Report](#).

USGS Professional Paper 285

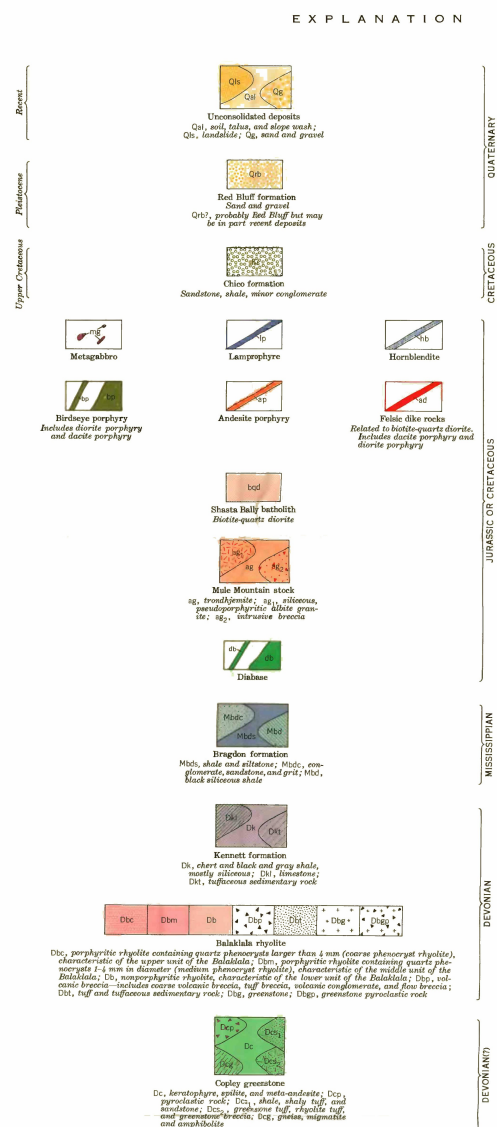
The formal citation for this source.

Kinkel, A.R., Hall, W.E., and Albers, J.P., 1956, Geology and Base-Metal Deposits of West Shasta Copper-Zinc District, Shasta County, California: U.S. Geological Survey, Professional Paper 285, plate 1, scale 1:24,000 (*GRI Source Map ID 2961*).

The full publication can be found online at: <https://pubs.er.usgs.gov/publication/pp285>

Prominent graphics and text associated with this source.

Correlation of Map Units



Graphic from source map: [West Shasta Copper-Zinc District](#).

Map Legend

— — — — —
Contact
Dashed where approximately located

- - - - -
Indefinite contact
Includes gradational contacts, inferred contacts, and indefinite boundaries

U \uparrow 30
D —
Fault, showing dip
*Dashed where approximately located;
U, upthrown side; D, downthrown side*

— \uparrow 90
Vertical fault

- - - - -
Concealed fault

— ? — ? —
Probable fault

— T —
Thrust fault
T, *upper plate*

— 80
Strike and dip of beds


— \uparrow 90
Strike of vertical beds


⊕
Horizontal beds


— 45
Strike and dip of foliation


— \uparrow 90
Strike of vertical foliation


70 \searrow 65
Strike and dip of foliation
and plunge of lineation



Strike and dip of primary flow
banding in granitic rocks
Aligned crystals or inclusions



Strike and dip of flow banding
in rhyolite and greenstone


Strike of vertical flow banding
in rhyolite and greenstone


Strike and dip of sheeting


Strike and dip of compositional
layering in gneiss and other
metamorphosed rocks


Strike and dip of joints


Strike of vertical joints


Mine


Prospect


Dump


Spring

Graphic from source map: [West Shasta Copper-Zinc District](#).

Report

A component of Professional Paper 285 is a report booklet. The document contains information pertaining to the geology of the map area. The report is included as embedded PDF document and can be accessed by double-clicking the following link, [Professional Paper 285 Report](#).

GRI Digital Data Credits

This document was developed and completed by Stephanie O'Meara (Colorado State University) for the NPS Geologic Resources Division (GRD) Geologic Resources Inventory (GRI) Program. Quality control of this document by James Winter (Colorado State University).

The information in this document was compiled from source maps and is intended to accompany the GRI digital geologic-GIS data) and other digital data for Whiskeytown National Recreation Area, California (WHIS) developed by James Winter, Stephanie O'Meara and Jim Chappell (Colorado State University; see the [GRI Digital Maps and Source Map Citations](#) section of this document for all sources used by the GRI in the completion of this document and related GRI digital geologic-GIS maps). Initial GRI digital geologic-GIS data production including digitization by Stephanie O'Meara, Victor deWolfe and Trista Thornberry-Ehrlich.

GRI finalization by Stephanie O'Meara.

GRI program coordination and scoping provided by Bruce Heise and Tim Connors (NPS GRD, Lakewood, Colorado).