GEOLOGIC SETTING

Mountain Home Demonstration State Forest (MHDSF) is within the southern portion of the Sierra Nevada Geomorphic Province (California Geological Survey 2002). The Sierra Nevada geomorphic province is a tilted fault block nearly 400 miles long. Its east face is a high, rugged escarpment, contrasting with the gentle western slope that disappears under sediments of the Great Valley. The Sierra Nevada consist of ancient accreted terranes and one or more former subduction zones. The former Farallon oceanic tectonic plate was driven beneath the present-day Sierra where it melted into large molten bodies known as batholiths and plutons approximately 140 to 180 million years ago. The terranes and sediments that accumulated in the subduction zone of this former plate boundary have been metamorphosed by the heat and fluids that radiated off the molten batholiths and plutons that eventually cooled to become the Sierran granitic rocks. Over the last five million years, faults developed along the eastern margin of the Sierra Nevada along which the range has risen to tower above the Basin and Range province to the east. The uplift of the Sierra Nevada changed the climate in California and Nevada forming a barrier to storms originating in the Pacific Ocean that moved eastward over the land. Increased precipitation allowed glaciers to cover the high Sierra during the Ice Ages of the past 100,000 years, especially in massive granites of the higher Sierra that are modified by glacial sculpturing.

ROCK TYPES

In general, MHDSF is roughly divided into two distinct rock types. The eastern portion of the State Demonstration Forest is underlain by metamorphic rocks while the western portion is underlain by granitic rocks (Figure 1). A brief description of these rock types is provided below.

The eastern portion of MHDSF is underlain by metamorphosed sedimentary rocks that represents a "metamorphic roof pendant" known as the Tule River pendant. The Tule River pendant consists of submarine sedimentary rocks (for example mudstones, siltstones, sandstones and limestone) that were metamorphosed when intruded by magmatic plutons and uplifted by faulting. In the area of MHDSF the metamorphic rocks consist of schists and hornfels (USGS, 2013). Schists are described as containing quartz-biotite and calc-silicate rock with sheet-like grains in a preferred orientation. Hornfels are fine-grained metamorphic rocks subjected to the heat of contact metamorphism with intruding magma chambers at a shallow depth (USGS, 2013). Small bodies of marble represent metamorphosed limestone are scattered within these metamorphic rocks (California Geological Survey, 1965 and 2020).

The western portion of MHDSF is underlain by granitic rocks (the granite of Dennison Peak, the Granodiorite of Mountain Home) (USGS, 2013) and undifferentiated granitic rocks (California Geological Survey, 1965 and 2020). Granite contains grains of minerals large enough to be visible with the naked eye that formed from the slow crystallization of magma below the Earth's surface. Granite is generally composed mainly of quartz and feldspar with minor amounts of mica, amphiboles, and other minerals. In MHDSF granitic rocks form discrete bodies called plutons that are relatively uniform in texture and composition and that have sharp contacts against each other and metamorphic rocks. Radiometric age dating indicates the plutons in and surround MHDSF are on the order of 99 to 103 million years old (USGS, 2013).

FAULTING AND LANDSLIDING

In general, faults with Historic (last 200 years) or Holocene (Last 11,000 years) rupture are considered "active." Late Quaternary (last 700,000 years) or Quaternary (last 1.6 million years) age faults are often referred to as "potentially active". No active faults are known to pass through MHDSF (CGS, Jennings and Bryant, 2010). The closest active or potentially active faults are the Kern Valley Fault (approximately 15 miles east of MHDSF), the Owens Valley fault group and Sierra Nevada Fault Zone (approximately 40 miles east of MHDSF), the San Andreas Fault Zone (approximately 90 miles to the west), and a group of active faults near Bakersfield (approximately 50 miles to the south). Major earthquakes such as the 1906 San Francisco, 1952 Kern County, and 1983 Coalinga quakes were felt and caused some minor to moderate property damage in Porterville (Tulare County General Plan).

Regional Geologic maps do not indicate the presence of large landslide masses within MHDSF, however when CGS has conducted site specific work within the forest we have observed bench step topography suggested the presence of deep-seated landslides. The 2030 updated Tulare General Plan indicates MHDSF to be in an area of competent igneous and metamorphic rocks with a low risk of landsliding. It should be noted that ground shaking due to earthquakes can trigger events ranging from rock falls and topples to massive landslides. Intense or prolonged precipitation can cause flooding and saturate slopes and cause failures leading to landslides. Wildfires can remove vegetation from hillsides, significantly increasing runoff and the potential for post-fire debris flows. Small landslides are a common occurrence along forest roads and may be locally present within MHDSF.

For these reasons, it is recommended that the California Geological Survey (CGS) conduct reconnaissance-level geomorphic mapping to identify the extent of landsliding within MHDSF. It may be necessary to obtain LiDAR of the forest area to accurately identify landslide features. A Certified Engineering Geologist should be consulted as deemed appropriate by an RPF where timber operations are proposed on or upslope of unstable features. As such, CGS will provide geologic evaluation as part of timber harvest document preparation as is done in other demonstration state forests.

Figure 1. Geologic map of MHDSF

References:

CGS, 2010, Jennings, C.W., and Bryant, W.A., Fault activity map of California: California Geological Survey Geologic Data map No. 6, map scale 1:170,000.

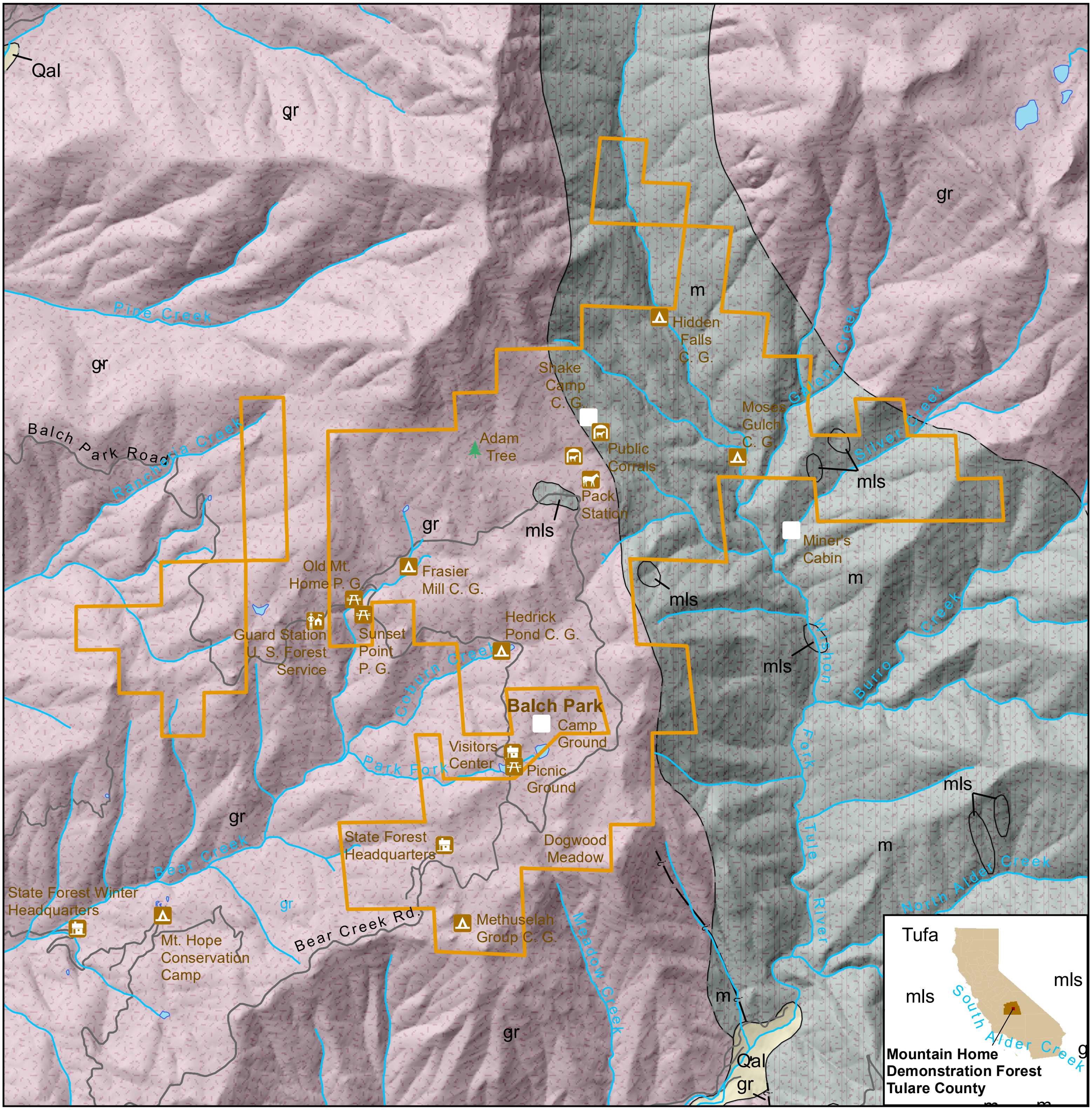
CGS, interactive, Jennings et al., with modifications by Carlos Gutierrez, William Bryant, George Saucedo and Chris Wills; Interactive Geologic Map of California, https://spatialservices.conservation.ca.gov/arcgis/rest/services/CGS/GeologicMapCA/MapServer, accessed 2020.

CGS, 2002, Note 36, California Geomorphic Provinces, https://www.conservation.ca.gov/cgs/Documents/CGS-Note-36.pdf

CGS, 1965, Geologic map California, Fresno Sheet, 1:250,000, Regional Geologic Map Series, O.P. Jenkins, R.A. Matthews, and J. L. Burnett, California Division of Mines and Geology, 1965.

Tulare County General Plan, 2010, http://generalplan.co.tulare.ca.us/.

USGS, 2013, T.W. Sisson and J.G. Moore, Geologic Map of Southwestern Sequoia National Park, Tulare County, California, Open-File Report 2013–1096.



Geology Source: Geologic map California, Fresno Sheet, 1:250,000, Regional Geologic Map Series, O.P. Jenkins, R.A. Matthews, and J. L. Burnett, California Division of Mines and Geology, 1965.

Geology Map

Mountain Home Demonstration Forest

Geologic contact

Fault

Solid where accurately located, dashed where inferred, dotted where concealed.

Roads

Streams

Water Bodies

Mountain House DF

Qal	Recent Alluvium
m	Pre-Cretaceous metamorphic rocks
mls	Pre-Cretaceous metamorphic limestone rocks
gr	Undivided Precambrian granitic rocks

N

0 0.5 1

Miles

1:50,000

JOINT 6.1

Background Source: USGS National Map 3D Elevation Program (3DEP)