TOWER MOUNTAIN - GEOLOGIC LESSONS LEARNED FROM AN OPPORTUNISTIC FIRE

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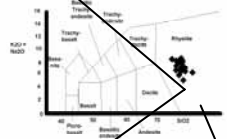
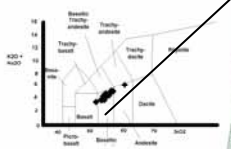
Dark outcrops of **Columbia River Basalt** overlie white cliffs of an ash-flow tuff that erupted from the Tower Mountain caldera. Ash-flow here is more than 100 ft thick

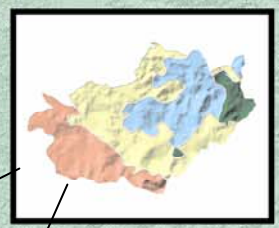
Lodgepole-dominated forests, shown in dark purple, grow mainly on rhyolites, which show as pink on the geologic map. Approximate caldera margin is marked by dashed, hachured line. Dashed line is approximate boundary to the Tower Mountain Fire.

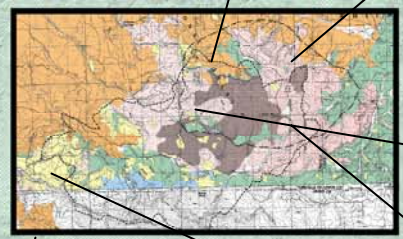
Tower Mountain is a large, late Oligocene rhyolite caldera complex that was first discovered following large fires in 1995 and 1996, when more than 50,000 acres were burnt following lightening storms. The resurgent core to the caldera was a densely forested highlands flanked by more sparsely forested benchlands of onlapping Columbia River Basalt lava flows. Striking contrasts exist in both geomorphology and forest cover between the heavily forested rhyolite core and adjoining basalt lava flow plateau. Much of the caldera was covered by dense stands of lodgepole pine. Areas covered by the **Columbia River Basalt** tend to be dominated by open stands of ponderosa pine which follow more permeable intraflow breccias, forming layered ridges where grasslands are separated by tree bands.

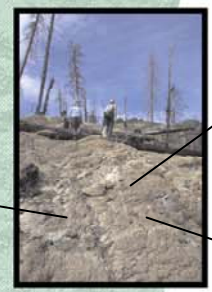
Tower Mountain Caldera











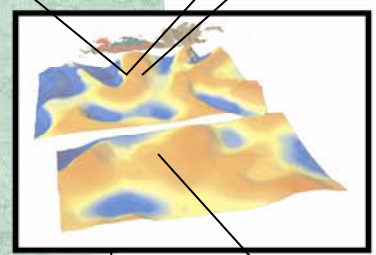
Volcanic rock names (**rhyolite**, basalt, etc) and map descriptions are derived from geochemical analyses.

Pre-fire vegetation included high alpine spruce- (green); lodgepole- (blue); mixed larch and grand fir- (yellow); and **ponderosa pine**-dominated (red) forests.

Caldera-fill tuffs, shown in green, form a highlands that marks the resurgent core to the caldera. Caldera margin is defined by **rhyolite domes and flows**, shown in red.

Bedrock and surficial **landslides** are both shown in yellow on the geologic map. Bedrock landslides occur where rhyolite ash-flows overlie tuffaceous sediments atop an eroded surface of impermeable pre-tertiary basement rocks, shown in blue; and where Columbia River Basalt flows overlie an eroded surface of andesite breccias, shown in green. Smaller, surficial slides and **debris flows** within the caldera-fill were triggered by thunderstorms following the fires.

Lodgepole forested rhyolites are high silica rocks with, for Oregon, unusually high levels of potassium. **Ponderosa pine-dominated basalts** are low silica rocks with low to moderate levels of potassium. Rhyolite flows and caldera-fill tuffs have locally been silicified and zeolitized. Hydrothermal alteration tends to harden the caldera-fill tuffs, which weather to angular chips. Clay component is low and few bedrock landslides occur within the caldera.



Paired aeromagnetic lows, shown as blue depressions, underlie domes on the caldera's east and west margins. The blue depression in the lower part of the diagram marks a large **gravity low** that underlies the caldera's core.