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THE PERMIAN PIT RIVER STOCK OF THE McCLOUD PLUTONIC BELT, EASTERN KLAMATH TERRANE, NORTHERN CALIFORNIA

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The Klamath Mountains consist of several arcuate tectonostratigraphic terranes each characterized by its own unique lithology, stratigraphy, age, mineral deposits, and plutonic rocks. Of these, the eastern Klamath terrane is the easternmost and was the nucleus against which other terranes accreted. It contains the oldest granitoid plutonic bodies in the region including the Mule Mountain stock of Early Devonian age as well as the Pit River stock described here. The terrane represents a long-standing island arc which was active intermittently from early Middle Devonian through Permian time and produced two markedly similar volcanic sequences at different times in its history: an Early Devonian comagmatic suite consisting of the Copley Greenstone, Balaklala Rhyolite, and the Mule Mountain stock (Barker and others, 1979; Albers and others, 1981); and a Permian suite which includes the Dekkas Andesite, Pit River stock, and probably the Bully Hill Rhyolite.

Isotopic dating of numerous granitoid plutons, when analyzed in context with tectonic aspects of the Klamath Mountains, has resulted in subdivision of the region into several plutonic belts by some investigators (Lanphere and others, 1968; Irwin, 1984) (fig. 1). The easternmost of these is the McCloud plutonic belt, which includes the Pit River stock (Hinds, 1933), and also several elongate, irregular masses of quartz diorite. The Pit River stock as well as other plutonic rocks of the McCloud belt are believed to form a comagmatic plutonic-volcanic suite (Irwin, 1984) with the Dekkas Andesite and probably the Bully Hill Rhyolite because of their similarity in age and composition. The Pit River stock, 15 km north of Redding, is a north-south–trending, elliptical pluton about 8 km long by 2 to 3 km wide. Its long axis is approximately parallel to the trend of lithic belts within the eastern Klamath terrane. The stock consists chiefly of coarse-grained leucocratic granodiorite and albite granite and contains numerous inclusions of mafic hybrid rocks, including hornblende-quartz diorite and diorite. The stock is cut by numerous dikes including diabase, diorite, aplite, and most notably the Bass Mountain Diabase (Diller, 1960; Fraticelli, 1984). The stock intrudes clastic and volcaniclastic strata of the Lower or Middle Devonian Kennett, Mississippian Bragdon, and Mississippian and Lower Pennsylvanian Baird Formations. Metamorphism caused by the intrusion is manifested by recrystallization of tuff of the Baird Formation to form biotite-oligoclase hornfels along the periphery of the stock; however, the metamorphic effects do not extend more than a few meters into the sedimentary units. In the context of accretionary tectonics, the Pit River stock is one of a small group of preamalgamation plutons in the Klamath Mountains (Irwin, 1984).

A uranium-lead zircon age of approximately 261 m.y. is determined for the Pit River stock, which, on the basis of recent estimates for the geologic time scale (Harland and others, 1982), implies a Permian time of emplacement for the stock. This assignment is based on similar $^{207}Pb/^{206}Pb$ measurements (table 1) determined on two different-size fractions of zircon from quartz-hornblende diorite collected by John Albers at the north end of the stock (fig. 1). Unfortunately, the isotopic systematics for the Pit River stock are not as concordant as were found for the 400-m.y.-old (Albers and others, 1981) Mule Mountain stock, which is located about 2 km west of Redding and is compositionally similar to the Pit River stock. However, this minor discordance most likely represents some radiogenic lead loss in recent times as the rock approached the present-day surface. In such case, the $^{207}Pb/^{206}Pb$ age would still record the true time of emplacement, but the parent-daughter systems would have responded to the disturbance. Earlier published potassium-argon age determinations for the Pit River stock indicate a Triassic age (215 m.y., Zeller, 1965; and 246 m.y., Lanphere and others, 1968). Some superimposed thermal event may have been responsible for resetting these potassium-argon ages.

The decay constants used in calculating the ages are: $^{238}U = 1.55125 \times 10^{-10}$; $^{235}U = 9.8485 \times 10^{-10}\ yr^{-1}$; $^{232}Th = 4.9475 \times 10^{-11}\ yr^{-1}$; $^{238}U/^{235}U = 137.88$. The isotopic composition of common lead is assumed to be $^{204}Pb:^{206}Pb:^{207}Pb:^{208}Pb = 1:18.30:15.61:38.15$.

TABLE 1. Uranium-thorium-lead isotope ages of zircon, sample 81-WS-10, Pit River stock, California.

Mesh Size	Concentration (ppm)			Isotopic composition of lead (atom %)				Age (m.y.)			
	U	Th	Pb	^{204}Pb	^{206}Pb	^{207}Pb	^{208}Pb	$^{206}Pb/^{238}U$	$^{207}Pb/^{235}U$	$^{207}Pb/^{206}Pb$	$^{208}Pb/^{232}Th$
−150+200	672.4	376.2	26.97	0.010	81.65	4.341	14.00	240	242	261	221
−250+325	717.9	332.9	28.48	0.011	83.63	4.459	11.90	243	245	261	223

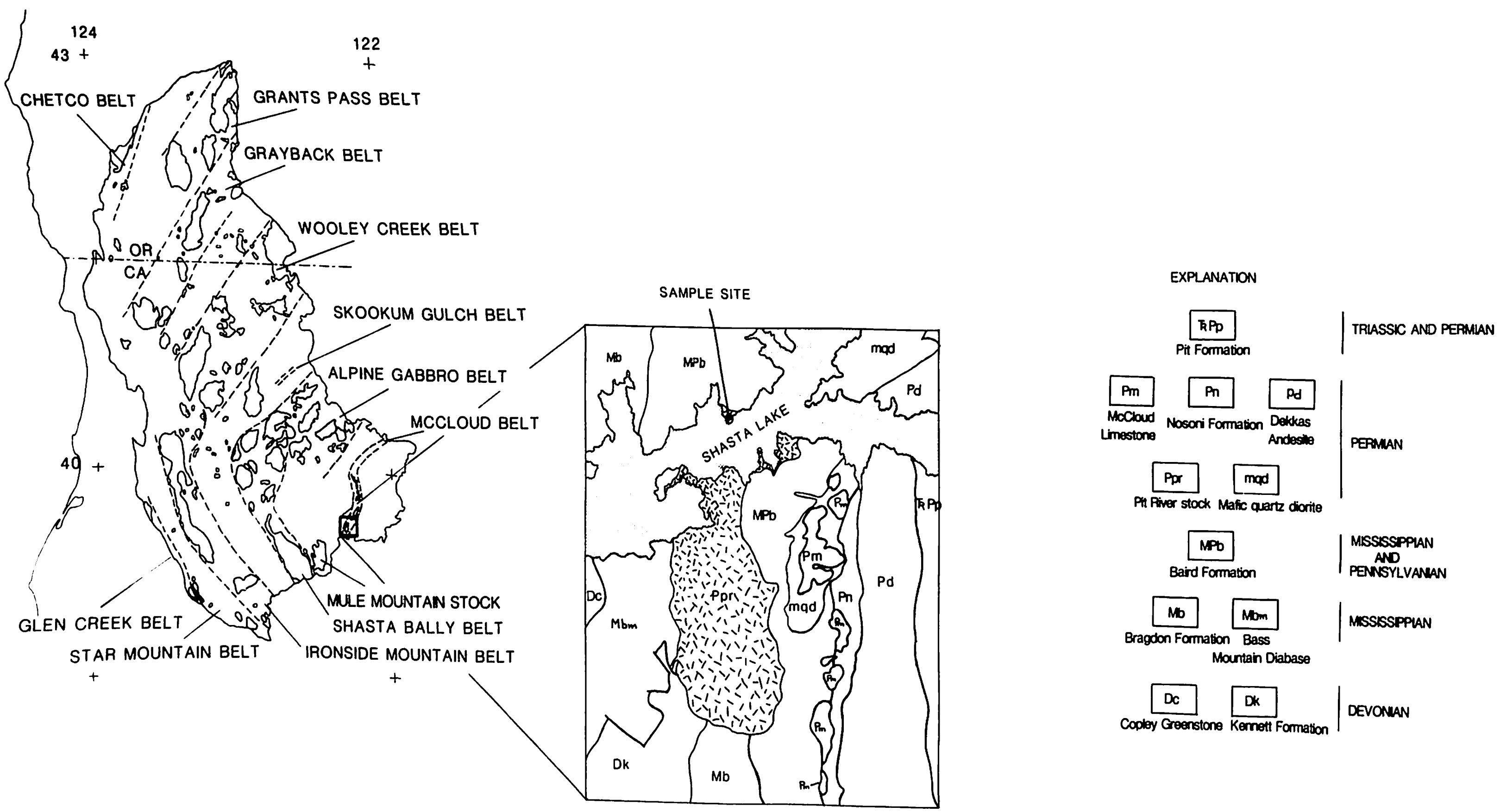

FIGURE 1. Generalized map showing outlines of major plutonic belts in the Klamath Mountains, California and Oregon (after Irwin, 1984), and an insert map showing the general geology and outcrop area of the Pit River stock.

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