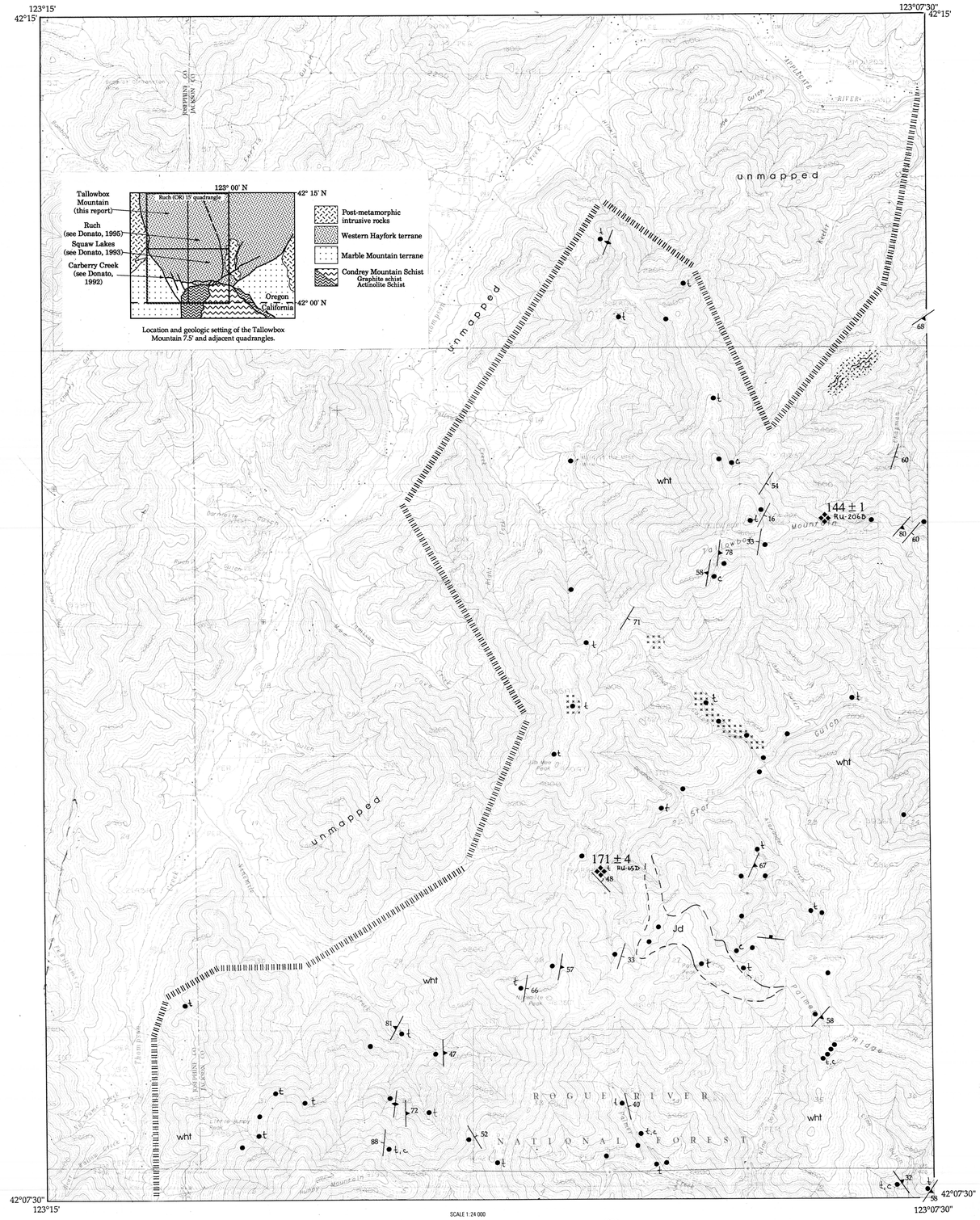
DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

OPEN FILE REPORT
95-641



Base from U.S. Geological Survey, Tallowbox Mountain, 1983
Lambert conformal conic projection

SCALE 1:24 000

Contour Interval 40 Feet

1927 North American Datum

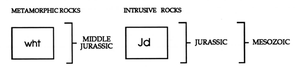
Geology mapped by M. M. Donato, assisted by S. L. Tomlinson, 1991, P. Weston, 1992, and C. White, 1995.

OREGON
QUADRANGLE LOCATION

PRELIMINARY GEOLOGIC MAP OF THE SOUTHEASTERN PART OF THE TALLOWBOX MOUNTAIN QUADRANGLE, JACKSON COUNTY, OREGON

by
Mary M. Donato
1995

CORRELATION OF MAP UNITS



DESCRIPTION OF MAP UNITS

INTRUSIVE ROCKS

Jd **Hornblende diorite (?Jurassic)**—Medium-grained, equigranular intrusive rock composed predominantly of strongly-zoned intermediate plagioclase and green-to-brown poikilitic hornblende, with minor quartz (estimated <5%), relict clinopyroxene cores enclosed by hornblende, and opaque oxide. Secondary minerals include chlorite (after biotite?) and epidote. Composes the intrusive body at Palmer Peak. Age is uncertain but presumed to be Jurassic on the basis of textural and compositional similarity to other Jurassic plutons in the region, and on its relative lack of alteration and metamorphic recrystallization

METAMORPHIC ROCKS

wht **Western Hayfork terrane (Middle Jurassic)**—Protolith predominantly greenish-gray volcanogenic sandstone and interbedded grayish-brown to black argillite and rare conglomerate. Some units exhibit graded beds and partial Bouma sequences, suggesting deposition by turbidity currents. Sandstone is well-sorted, fine- to coarse-grained, and is composed dominantly of plagioclase, clinopyroxene, brown to greenish-brown hornblende, and variable amounts of mafic to intermediate volcanic and volcaniclastic lithic fragments. Plagioclase and clinopyroxene are the dominant phenocrysts in volcanic lithic fragments, but hornblende is also present. Unit is regionally metamorphosed to greenschist facies; a typical metamorphic mineral assemblage is: chlorite-actinolite-albite-epidote/clinozoisite-sphene. Primary igneous hornblende and clinopyroxene are commonly partially or completely replaced by actinolite, but are preserved locally. Weak flattening foliation and cleavage are locally developed but the unit is mostly undeformed. These rocks previously have been considered part of the Applegate Group, believed to be Late(?) Triassic and Jurassic by Wardlaw and Jones (1979), based in part on Jurassic radiolarians from the western part of the unit (Irwin and others, 1978). Unit correlated with the Middle Jurassic western Hayfork terrane of Wright and Fahan (1988) (the Hayfork Bally meta-andesite of Irwin, 1972) by Donato and others (1995). Equivalent to unit vsa of Donato (1992)

EXPLANATION

Approximate boundary of mapped area

Contact—Dashed where approximately located; dotted where concealed; queried where uncertain.

Bedding—Showing strike and dip

Metamorphic foliation or schistosity—Showing strike and dip

Vertical metamorphic foliation

Joint—Showing strike and dip

Zone of strongly sheared and/or brecciated rocks—trend of lines not directionally significant

Area underlain by metamorphosed dioritic rocks

Hydrothermally altered zone—Characterized by presence of one or more of the following secondary minerals: pyrite, sericite, carbonate; clinozoisite.

Sample collection site—t = thin section; c = chemical analysis given in Barnes and others (1995)

171 ± 4
RU-206B

$^{40}Ar/^{39}Ar$ sample locality—Showing hornblende cooling age in millions of years and sample number

INTRODUCTION

The Tallowbox Mountain 7.5' quadrangle is the northwest quarter of the Ruch (Oregon) 15' quadrangle. This mapping was originally undertaken in 1991 to augment geologic, geochemical, geochronologic, and structural studies in the northern Klamath Mountains, with the intent to publish a geologic map of the entire Ruch 15' quadrangle at 1:62,500. In order to make the information available as the work progressed, the component 7.5' quadrangles were released as open file maps at 1:24,000 as they were completed (Donato, 1992; 1993). Due to changes in program priorities, the Tallowbox Mountain 7.5' quadrangle was not completed. This map presents the available data.

GEOLOGIC SUMMARY

The Tallowbox Mountain quadrangle is underlain almost entirely by rocks of the western Hayfork terrane of Irwin's (1966) western Paleozoic and Triassic belt of the Klamath Mountains Province. Until recently, rocks in this belt in southwestern Oregon were known simply as the Applegate Group, an extensive unit that includes a wide variety of volcanic, sedimentary, and crystalline rocks in southwestern Oregon. These rocks were originally described, but not named, by Diller (1914), who believed that they were Devonian and Carboniferous in age on the basis of poorly preserved fossils in limestone. The rocks were later named the Applegate Group by Wells and others (1949), who assigned them a Triassic(?) age. Later reconsideration of fossil collections caused the age of the Applegate to be revised to Late(?) Triassic (Wells and Peck, 1961). Still later revision of the age of the Applegate to Late(?) Triassic and Jurassic by Wardlaw and Jones (1979) was based on Jurassic radiolarians from the western part of the Applegate Group as reported by Irwin and others (1978). Recently, this part of the Applegate Group has been correlated with Wright and Fahan's (1988) western Hayfork terrane (Barnes and others, 1993; Irwin, 1994; Donato and others, 1995).

The western Hayfork terrane in this region consists predominantly of subaqueous volcaniclastic rocks derived from a Middle Jurassic volcanic arc (Barnes and others, 1993; Donato and others, 1995), deposits of which today extend almost the entire length of the Klamath Mountains Province, a north-south distance of about 200 km (Wright and Fahan, 1988; Irwin, 1994). The unit is composed mainly of volcanic arenite with interbedded fine-grained sandstone, argillite, and rare volcanic conglomerate. Although some of the argillite horizons are fairly continuous along strike, they are not mappable as separate units. However, bedding is most commonly seen in argillaceous units, and bedding symbols on the map usually indicate interbedded argillite within coarser-grained sandstone units. Minor subaqueous eruptive rocks (pillow lava, pillow breccia, and hyaloclastite) occur within the depositional sequence; rare hypabyssal amygdaloidal andesite dikes or sills may represent the feeders for such eruptive products.

The volcaniclastic sequence is intruded by numerous small unmapped dikes, sills and plutons ranging in composition from diorite to granodiorite. On the basis of scant isotopic age data, discussed below, these intrusive rocks may be generally categorized into 2 age groups: a Middle Jurassic group (approximately 173 Ma) and a younger group which ranges in age from approximately 156 Ma to 145 Ma. The older group is roughly contemporaneous with eruption and deposition of the western Hayfork volcaniclastic sequence, and are probably petrogenetically related to Middle Jurassic arc volcanism. The dated hornblende-bearing dike (sample RU-65D, discussed below) and metaplutonic rocks in Ladybug Gulch are examples. The younger group intrudes the older arc complex and is represented by the 144-Ma hornblende porphyry dike (sample RU-216B) and possibly by the undated hornblende diorite pluton near Palmer Peak.

Local intense hydrothermal alteration is characterized by disseminated and vein sulfide, carbonate, sericite, silica, chlorite, and epidote-group minerals. Altered areas, shown on the map in cross-hatched pattern, appear in some cases to be associated with dacitic intrusive rocks (dikes or small stocks), the contacts of which were not mapped because of poor exposures.

The western Hayfork terrane underwent weak compressional deformation and regional metamorphism under sub-greenschist to greenschist-facies conditions. A typical metamorphic assemblage is actinolite-epidote-albite-sphene-chlorite. However, primary mineralogy and textures are locally preserved. The hydrothermal alteration and regional metamorphism may have been roughly contemporaneous, although specific evidence for the relative timing was not found.

ISOTOPIC AGE DETERMINATIONS

Hornblende separates from two samples within the Tallowbox Mountain quadrangle have been dated by $^{40}Ar/^{39}Ar$ methods. Both samples are dikes which intrude the volcaniclastic sequence. The isotopic ages represent the elapsed time since the mineral cooled below its closure temperature for Ar diffusion (estimated to be about 500° to 550°C for hornblende [McDougall and Harrison, 1988]) and therefore are interpreted as cooling ages. Sample RU-65D is a hornblende separate from a fine-grained, equigranular dike which intrudes volcaniclastic metagraywacke about 1.5 km northwest of Palmer Peak. This reddish-brown hornblende yielded a $^{40}Ar/^{39}Ar$ age of 171 ± 4 Ma (total fusion age). Sample RU-206B is a hornblende separate from a medium-grained hornblende porphyry east of Tallowbox Mountain. Reddish-brown hornblende from this body gave a $^{40}Ar/^{39}Ar$ plateau cooling age of 144 ± 1 Ma.

Additional age determinations from samples in adjacent quadrangles to the south and east bear on the interpretation of these ages. Table 1, after Donato and others (1995), summarizes the $^{40}Ar/^{39}Ar$ data for the Tallowbox Mountain quadrangle and for pertinent samples from adjacent areas.

Sample RU-65D is the oldest of three dated dikes which crosscut metagraywacke in the Applegate Dam vicinity. A hornblende diorite dike from the Ruch quadrangle gave a hornblende cooling age of 175 ± 2 Ma. Two additional age determinations on detrital brown hornblende separated from western Hayfork metagraywacke in the Applegate region near the California border (samples BL-116B and RU-316A) gave cooling ages of 172 ± 1 and 173 ± 1, respectively. Based on the slight degree of metamorphic recrystallization, the temperature of the metagraywacke during metamorphism probably did not exceed the hornblende closure temperature. Therefore these ages are interpreted as the eruptive age of the volcanic source rock which provided the detritus for the metagraywacke's protolith.

Together, these data allow tight constraints to be placed on the depositional age of the western Hayfork terrane in this region. The volcaniclastic sequence must be younger than (or roughly contemporaneous with) the youngest volcanic detritus of which it is composed, that is, 172 ± 1 Ma. The age of the oldest dike which intrudes the sequence, 175 ± 2 Ma, is consistent with this depositional age, within error limits. Therefore, the age of the western Hayfork terrane is interpreted to be about 173 Ma.

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Table 1. Results of $^{40}Ar/^{39}Ar$ geochronologic investigations of hornblende separates from the Applegate Gr Oregon.

	Quadrangle	Method	Rock type	Mineral	#steps	Age (Ma)
WESTERN HAYFORK TERRANE						
BL-116B	Bolan Lake	IH	graywacke	detrital hbl	8	172 ± 1
RU-316A	Squaw Lakes	IH	graywacke	olive green detrital hbl	8	173 ± 1
INTRUSIVE ROCKS						
RU-167A	Ruch	TF	hbl-phyric dike	green hbl	1	167 ± 3
RU-310	Ruch	IH	dioritic intrusive rock	green hbl	7	175 ± 2
RU-65D	Tallowbox Mountain	TF	hbl-phyric dike	brown hbl	1	171 ± 4
RU-206B	Tallowbox Mountain	IH	hbl-phyric dike	brown hbl	9	144 ± 1
RU-316C	Squaw Lakes	IH	hbl-phyric dike	brown hbl	10	156 ± 1

IH = incremental heating experiment. Age given is the weighted mean plateau age based on 100% of ^{39}Ar released.
TF = Total fusion experiment.
All analyses were performed at the U.S. Geological Survey, Menlo Park. See Donato and others (1995) for details. Additional analytical data are available from the authors upon request.