UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

MINERAL RESOURCE POTENTIAL OF THE MIDDLE SANTIAM ROADLESS AREA, LINN COUNTY, OREGON

By

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Open-File Report 84-495

1984

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STUDIES RELATED TO WILDERNESS

Under the provisions of the Wilderness Act (Public Law 88-577, September 3, 1964) and related acts, the U.S. Geological Survey and the U.S. Bureau of Mines have been conducting mineral surveys of wilderness and primitive areas. Areas officially designated as "wilderness," "wild," or "canoe" when the act was passed were incorporated into the National Wilderness Preservation System, and some of them are presently being studied. The act provided that areas under consideration for wilderness designation should be studied for suitability for incorporation into the Wilderness System. The mineral surveys constitute one aspect of the suitability studies. The act directs that the results of such surveys are to be made available to the public and be submitted to the President and the Congress. This report discusses the results of a mineral survey of the Middle Santiam Roadless Area (06929), Willamette National Forest, Linn County, Oregon. The area was classified as nonwilderness during the Second Roadless Area Review and Evaluation (RARE II) by the U.S. Forest Service, January 1979.

SUMMARY

Middle Santiam Roadless Area is adjacent on the east to the Quartzville mining district, a district that has yielded small amounts of base- and precious-metal ores. Many rock types and alteration features that characterize the mining district occur only in the western part of the roadless area, and analysis of a few samples from this part of the roadless area indicates evidence of weak mineralization. The western part of the roadless area is therefore identified as having a moderate potential for small deposits of base and precious metals and a low potential for large very low-grade precious-metal deposits. The eastern part of the roadless area has a low potential for metalliferous deposits.

INTRODUCTION

This report describes briefly the geology and mineral resource potential of the Middle Santiam Roadless Area, a 43-mi^2 area in Linn County, Oreg. The roadless area incorporates a remote and largely undeveloped section of the upper reaches of the Middle Fork of the Santiam River as well as contiguous parts of the canyon walls.

During an examination of the area in August 1983, a reconnaissance geologic map was made and stream-sediment and bedrock samples were collected for both thin-section and X-ray diffraction studies and for chemical analysis. Some additional geologic mapping and sampling were done in areas marginal to the roadless area in order to better understand the distribution of rock units and metallic elements. Special emphasis was directed to that part of the area along its west margin that is adjacent to the Quartzville mining district; the Quartzville district is characterized by geologic features nearly identical with those of the western part of the roadless area.

Prior to the present study, the geology of the roadless area was mapped in broad reconnaissance by Peck and others (1964) as part of a regional study of the central and northern segments of the western Cascade Range. Several studies have been made of the gold- and silver-bearing deposits of the adjacent Quartzville district (Stowell, 1921; Callaghan and Buddington, 1938), and these studies of the mineral deposits have been summarized by Brooks and Ramp (1968). More recently the district has been restudied as a thesis problem (Munts, 1978; 1981).

Location and geography

The Middle Santiam Roadless Area is located in the western Cascade Range about 30 mi due east of Lebanon, Oreg. (fig. 1). The area, which is mostly timber covered, consists of about 27,700 acres distributed on canyon walls of the Middle Fork of the Santiam River and tributary canyons of Pyramid, Jude, Fitt, Egg, and Donaca Creeks. A part of the area extends north of the divide that separates the Middle Fork of the Santiam River and Quartzville Creek, a major tributary of the Middle Fork.

U.S. Forest Service primary and secondary log-haulage roads from U.S. Highway 20 and Oregon Highway 22 provide access to the north, east, and south margins of the Middle Santiam Roadless Area. Gravel-surfaced log-haulage roads owned by Weyerhauser Company provide access to the west margin of the area; these roads are accessible by permit only. At the time of the examination several roads were being constructed within the confines of the roadless area; one was being extended into the Swamp Creek drainage from the north and another was being extended from the south into several haulage spurs on the north wall of the canyon of Pyramid Creek.

A few trails provide access to several parts of the roadless area, but these are mostly poorly maintained.

GEOLOGY

Rocks in and near the Middle Santiam Roadless Area are predominantly Oligocene to late Miocene flows, breccia, and volcanic and epiclastic sediment. They represent part of a faulted and warped, generally monoclinal sequence of volcanic, volcaniclastic, and epiclastic sedimentary rocks that dip mostly southeast or are nearly flat lying. Most commonly these rocks have been correlated with parts of both the Little Butte Volcanic Series--which is here renamed the Little Butte Volcanics--and Sardine Formation (Peck and others, 1964). They have been intruded by medium- to small-sized bodies of diorite, quartz diorite, and andesite.

Stratigraphy

The stratigraphy and structures present in the area are characteristic of those found in the western Cascade Range of Oregon. The oldest rocks in the roadless area are of Oligocene and early Miocene(?) age and consist of interlayered sequences of basalt and basaltic andesite flows and breccia, andesitic mudflows (lahars), bedded tuffaceous sedimentary rocks, palagonitic and pumiceous lapilli tuff, and dacitic or rhyodacitic ash-flow tuff, all commonly assigned to the Little Butte Volcanics (heretofore termed the Little Butte Volcanic Series) (Peck and others, 1964). In places, along the lower

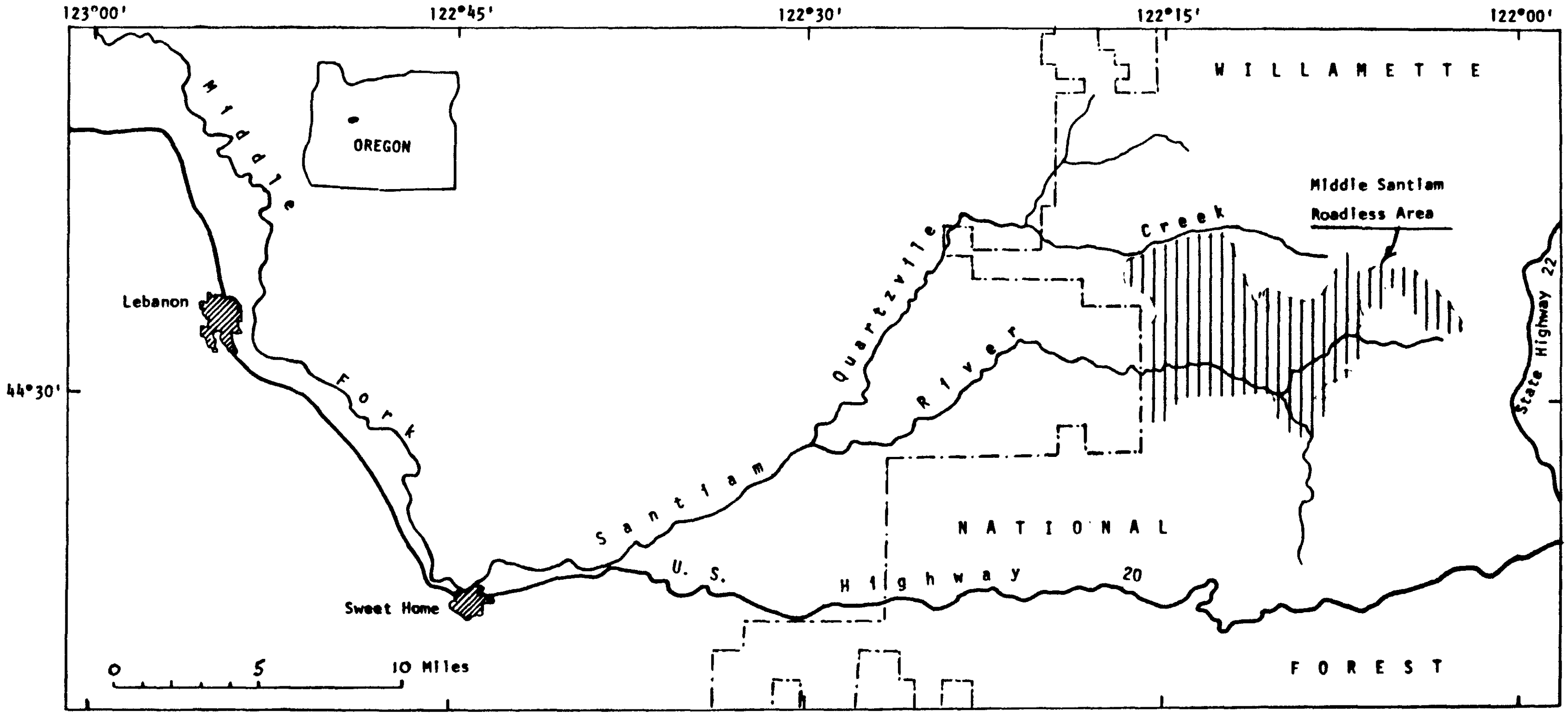


Figure 1.--Index map showing location of Middle Santiam Roadless Area

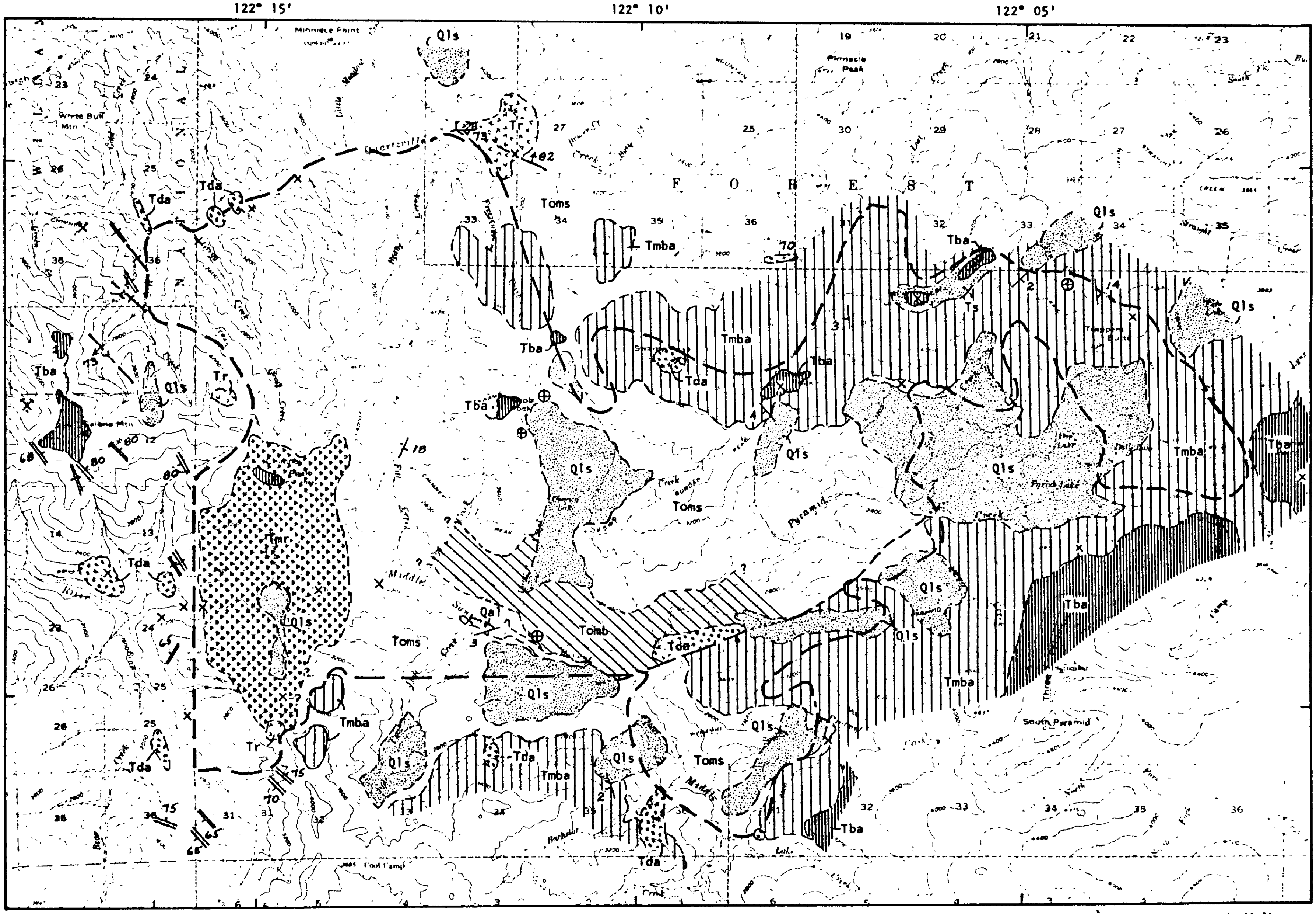
parts of the canyon of the Middle Fork of the Santiam River, the lower part of this sequence is dominated by mafic flows and breccia, which are overlain by a variety of volcaniclastic and epiclastic sedimentary rocks (fig. 2). Older, more deeply buried parts of this sequence show evidence of low-grade regional metamorphism, where original constituents are partly altered to zeolites (laumonite, leonhardite, stilbite?), calcite, and chlorite. In the western part of the roadless area where these layered rocks have been complexly intruded by small stocks and dikes, they are locally epidotized, argillized, pyritized, silicified, and sericitized.

Unconformably overlying the Oligocene and lower Miocene(?) rocks is a sequence of basaltic andesite and andesite flows and breccia, as well as some epiclastic volcanic sedimentary rocks, of middle Miocene age. Many of the flows are strongly flow jointed and, in most places, are either fresh or only slightly altered, commonly with hematite or clay minerals on joint surfaces. Both aphyric and plagioclase-, pyroxene-, and hornblende-phyric andesites are represented. The epiclastic volcanic sedimentary rocks are composed mostly of the same materials as the flows and breccia. Rocks of the sequence occur high on ridges, in places representing the caps for major divides between drainages. Invariably these rocks have been assigned to the Sardine Formation (Peck and others, 1964).

In places, along the divide between the Middle Fork of the Santiam River and Quartzville Creek, the middle Miocene rocks are lapped unconformably by upper(?) Miocene poorly sorted volcanic sedimentary rocks or by intermediate to mafic flows presumably also of late(?) Miocene age. On ridgecrests, toward the western part of the roadless area, discontinuous patches of unaltered plagioclase- and olivine-phyric and aphyric flows of olivine basalt and andesite are present. In a few places, the flows also contain phenocrysts of augite and locally are trachytic. The only evidence of alteration of these flows is manifested by iddingsite on fractures and peripheries of olivine crystals. Along the north margin of the roadless area, near Scar Mountain, these capping flows rest conformably? on nearly flat-lying volcanic sandstone, siltstone, and pebble conglomerate of late(?) Miocene age. This poorly sorted sediment may represent a late epiclastic phase of the middle Miocene volcanic sequence or, more likely, a separate wedge of sediment derived from the erosion of higher parts of the Cascade Range lying to the east; the sedimentary rocks thin rapidly toward the west and are missing throughout most of the western part of the roadless area.

Intrusive rocks of dioritic and andesitic composition and near-vent flows and domal? masses of dacite or rhyodacite are present in the western part and immediately to the west of the roadless area. In some areas the intrusive rocks and wallrocks are so complexly intermingled, altered, and so poorly exposed, that they are grouped into a unit termed the mixed rocks unit.

Small near-surface intrusions of hornblende diorite, quartz diorite (tonalite), and andesite cut the Oligocene and lower Miocene(?) volcanic and sedimentary rocks and are much more abundant in areas just west of the roadless area. Most intrusions are steeply inclined sheetlike bodies with a northwest trend, which is characteristic of trends of similar bodies within the entire region. Essentially all of the diorite and quartz diorite is propylitized and, locally, silicified, and sericitized. Many andesite or basaltic andesite intrusions occur as northwest-trending dikes that, in part,

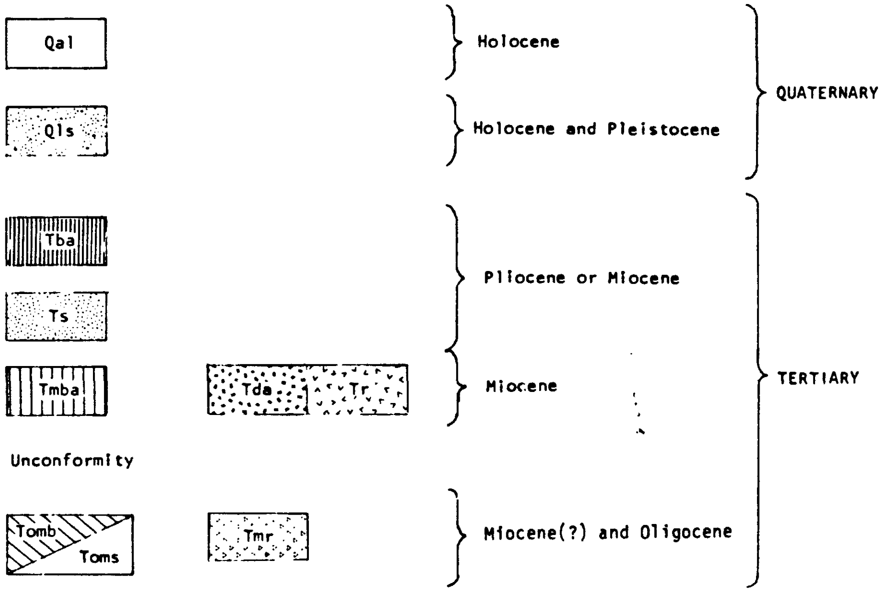


Geology by G. W. Walker
and D. R. Sherrod, 1983

Figure 2.--Geologic map of the Middle Santiam Roadless Area (6102), Linn County, Oregon.

EXPLANATION FOR FIGURE 2

CORRELATION OF MAP UNITS



DESCRIPTION OF MAP UNITS

Qal ALLUVIUM AND LOW TERRACE GRAVELS (HOLOCENE)--Unconsolidated sand, gravel, and boulders

Qls LANDSLIDE DEPOSITS (HOLOCENE AND PLEISTOCENE)

Tba BASALTIC ANDESITE AND BASALT (PLIOCENE OR MIOCENE)--Flows and some flow breccia of fresh, aphyric, and plagioclase-phyric olivine basaltic andesite and basalt. Age of unit is late Miocene or Pliocene

Ts EPICLASTIC SEDIMENTARY ROCKS (PLIOCENE OR MIOCENE)--Sequence composed dominantly of volcanic debris, including volcanic sandstone, some beds of pebble conglomerate with clasts of basalt, andesite, rhyodacite, and indurated lapilli tuff, and minor air-fall tuff. Age of unit is late Miocene or early Pliocene

Tmba BASALTIC ANDESITE AND ANDESITE (MIOCENE)--Aphyric and plagioclase- and pyroxene-phyric basaltic andesite flows and flow breccia; includes extensive outcrops of hornblende-phyric andesite on flanks of Swamp Peak. Some flows exhibit well-developed platy flow jointing, with joint surfaces commonly coated with a red iron oxide mineral (hematite?). Correlative, in part, with the Sardine Formation

Tda DIORITE, QUARTZ DIORITE (TONALITE), AND ANDESITE (MIOCENE)--Small, near-surface, commonly elongate stocks, altered large dikes, and circular to elliptical plugs. Most rocks in intrusions, as well as the adjoining wallrocks, are propylitized and epidotized, although several intrusive andesite bodies are largely unaltered. Age probably mostly middle Miocene as determined by comparisons with similar, radiometrically dated intrusions in adjacent areas

Tr RHYODACITE OR DACITE (MIOCENE)--Domes, plugs, and related flows of flow-banded, devitrified, and, locally, silicified rhyodacite or dacite

VOLCANIC AND SEDIMENTARY ROCKS (MIOCENE? AND OLIGOCENE)--Basalt and basaltic andesite flows and breccia, andesitic mudflows (lahars), bedded tuffaceous sedimentary rocks, palagonitic and pumice lapilli tuff, and dacitic or rhyodacitic ash-flow tuff. Includes some rocks originally mapped by Peck and others (1964) as Little Butte Volcanic Series and Sardine Formation. In western part of area rocks of this unit are extensively propylitized, and, locally, epidotized, argillized, zeolitized, or silicified adjacent to intrusions of diorite, quartz diorite (tonalite), and andesite (unit Tda). Unit age is Oligocene and early Miocene(?). Divided into:

Tomb Basalt and basaltic andesite flows and breccia--Shown where these lithologies are predominant

Toms Sedimentary and volcaniclastic rocks--Shown where these lithologies are predominant

Tmr MIXED ROCKS (MIOCENE? AND OLIGOCENE)--Propylitized, epidotized, and, locally, argillized and silicified rocks of units Tomb and Toms, intruded by plexus of altered diorite, quartz diorite, and andesite bodies. Altered wallrocks occur as screens between intrusions and rarely can be distinguished from the intrusions. Zones within unit, mostly northwest trending, contain abundant fine-grained pyrite, some quartz veinlets, and minor amounts of galena, chalcopyrite, tetrahedrite?, and sphalerite?. Pyritic zones locally weathered to thin and weakly developed iron and manganese-stained gossan

CONTACT--Dashed where approximately located; queried where uncertain

FAULT--Dashed where approximately located; dotted where concealed. Arrow shows direction and amount of dip. Bar and ball on downthrown side

STRIKE AND DIP OF LAYERED ROCKS

HORIZONTAL LAYERED ROCKS

STRIKE AND DIP OF FLOW JOINTING OR BANDING

STRIKE AND DIP OF INCLINED DIKE

STRIKE AND DIP OF VERTICAL DIKE

Mostly middle Miocene, but some may be as old as Oligocene

PROSPECT OR SMALL MINE

MINE ADIT

APPROXIMATE BOUNDARY OF ROADLESS AREA

fed the Oligocene and lower Miocene(?) flows and breccia, but mostly were the feeders for the middle Miocene basaltic andesite and andesite flows. The older andesite dikes are propylitized and altered, much like the diorite and quartz diorite, but some younger andesite dikes are comparatively fresh and appear to postdate the period of propylitic alteration.

On the north border of the area, low in the canyon of Quartzville Creek, is a 1-km^2 area underlain by flow-banded, autobrecciated, and devitrified dacite or rhyodacite that contains phenocrysts of plagioclase and an altered ferromagnesian mineral, now mostly chlorite?. Propylitic alteration, which characterizes some of the other rocks in this area, was not recognized in these silicic rocks. Presumably the vent for the dacite or rhyodacite is within the outcrop area, inasmuch as the flow banding and autobrecciation indicate a highly viscous magma that would flow only a short distance from the source.

A small mass of flow-banded dacite or rhyodacite crops out high on the west wall of Gregg Creek about 0.3 mi west of the border of the roadless area, and another small mass of silicified rock, possibly rhyodacite or dacite, is located near the southwest corner of the roadless area.

Near the west margin of the area the Oligocene and lower Miocene(?) volcanic and volcaniclastic rocks are intricately intruded by northwest-trending bodies of hornblende quartz diorite, diorite, and andesite, and both the wallrocks and intrusions are propylitized. In places the wallrocks appear to occur in sheetlike screens between steep sheetlike intrusions. Where outcrops are poor, propylitic alteration intense, and intrusive relations complex, it is not feasible to separate the intensely altered country rock from intrusive bodies and all phases are lumped, on the geologic map, as the mixed rocks unit. Both the larger separate intrusions and the mixed rocks unit are extensively and widely pyritized. Locally, northwest-trending shears, both in the intrusions and in the mixed rocks unit, contain quartz veins in places enclosed in weakly sericitized rock. The quartz veins exposed immediately adjacent on the west of the roadless area commonly contain pyrite, some chalcopyrite, galena, tetrahedrite, and sphalerite. Minor bournonite and stibnite(?) have been recognized in veins in the Quartzville district. These veins also contain some free gold, particularly in the upper oxidized parts of the deposits although gold was not recognized in any of the samples collected within the roadless area. In some places, the propylitized and pyritized rocks are oxidized to form weakly developed and mostly thin gossans. In this deeply dissected region, rapid erosion has prevented the development of extensive and thick gossans and related supergene concentrations of metals.

Surficial deposits include alluvial gravels along active stream channels combined with low terrace gravels and extensive landslide deposits on canyon walls of the Middle Fork of the Santiam River. The alluvial and terrace gravels are Holocene and the landslide deposits are both Pleistocene and Holocene in age; a few of the landslides are currently active, particularly where log-haulage roads have disrupted the land surface in areas of earlier landsliding.

ASSESSMENT OF MINERAL RESOURCE POTENTIAL

Although there is no record of production of minerals from the Middle Santiam Roadless Area, small quantities of gold and silver have been produced from mines in the adjacent Quartzville mining district (Callaghan and Buddington, 1938; Brooks and Ramp, 1968), and some placer gold has been recovered from stream gravels in and adjacent to the district. The ores of the Quartzville district also contain some lead, zinc, and copper, but records fail to indicate whether these metals were exploited as by- or co-products of the gold and silver mining. Total recorded gold production from 1863, when the district was first discovered, to 1968, is 8,557 oz valued at approximately 3.5 million in current (1983) dollars; placer gold apparently is not included in establishing these figures. Silver production is recorded at a total of 2,920 oz.

Ore deposits of the Quartzville district are principally associated with well-defined quartz veins and, in places, more diffuse silicification in and adjacent to northwest-trending shear zones that cut small intrusive bodies of Miocene(?) diorite, quartz diorite, and Oligocene and Miocene(?) volcanic and volcaniclastic wallrocks. Both the intrusions and the wallrocks are more or less propylitized, argillized, and, locally, sericitized. Ore minerals in the shear zones include sphalerite, galena, chalcopyrite, bournonite, and tetrahedrite; most of the gold is native and commonly occurs as wire gold in pockets. From available assay data (Oregon Department of Geology and Mineral Industries, 1951; Brooks and Rump, 1968), the distribution of metals in the more highly mineralized zones appears to be erratic, with gold values ranging from well below 0.1 to over 1 oz per ton and silver values from about 0.4 to over 30 oz per ton.

The geology, alteration, silicification, and metallic minerals that characterize the Quartzville district also are present in the western part of the roadless area, particularly in that part of the area west of Jude, Fitt, and Beabe Creeks. There is no past record of either mining or quarrying in the roadless area nor were any prospect pits or valid claims recognized during the present investigation. The geology of the eastern part of the roadless area differs from that along the west boundary in that it contains far fewer intrusions and both the intrusions and the Oligocene and Miocene(?) wallrocks are noticeably less altered; mineralized shear zones and areas of silicification were not recognized in surface exposures but may possibly be present at considerable depth beneath the surface.

Analyses of stream-sediment and rock samples collected from areas within and immediately adjacent to the roadless area (fig. 3) indicate the presence of anomalous amounts of copper, lead, zinc, gold, silver, and mercury. The highest gold values were obtained from rock samples collected about 1 mi west of the roadless area; one sample contained 0.2 ppm and another 0.25 ppm gold (table 1), or slightly less than 0.01 oz per short ton. The same samples contained 15 and 20 ppm silver, respectively. Grab samples of altered and bleached rocks collected within but near the west margin of the roadless area show gold values of 0.05 ppm or less. Analyses of samples from the eastern part of the area show no evidence of concentration of metallic minerals or of the alteration that characterizes the mineralized zones in the Quartzville district.

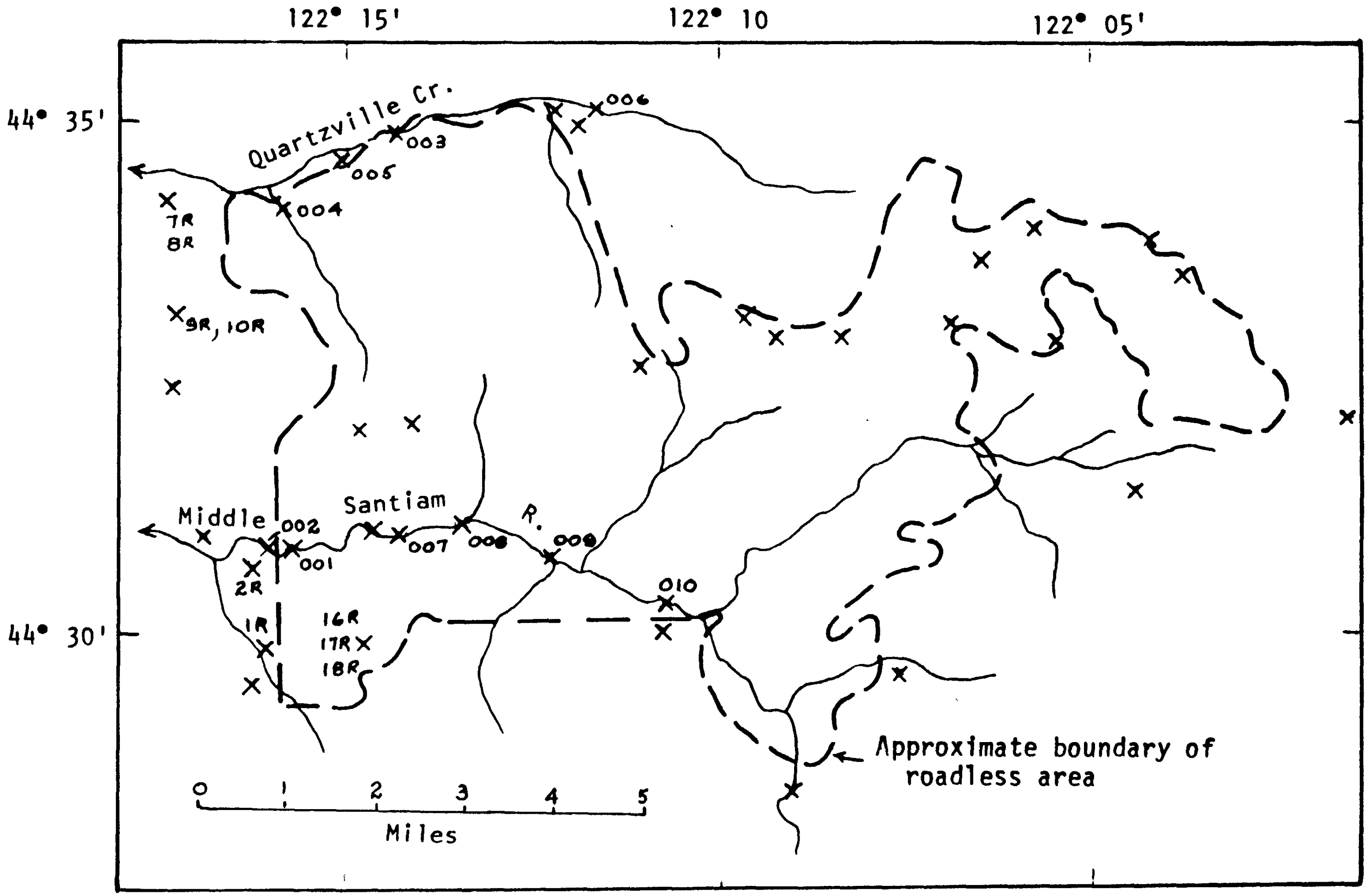


Figure 3.--Index to sample localities. X, unaltered rock sample; X_{1R}, altered or mineralized rock sample; X_{001}, stream-sediment sample.

Table 1.--Analyses of samples from the Middle Santiam Roadless Area (6102) , Oregon[1]

[AA, atomic absorption; ppm, parts per million; numbers in parentheses indicate sensitivity limit of method used; N, not detected at limit of detection; L, indicates detected, but below limit of determination; G, indicates greater than value shown. Analysts: J. Sharkey, M. S. Erickson, D. E. Detra]

	Semiquantitative spectrographic analyses (6-step)													
	Percent				(ppm)									
	Fe	Mg	Ca	Ti	Mn	Ag	As	B	Ba	Be	Bi	Cd	Co	Cr
Locality number[2]	(0.05)	(0.02)	(0.05)	(0.002)	(10)	(0.5)	(200)	(10)	(20)	(1)	(10)	(20)	(5)	(10)
1R	5	0.7	L	0.5	100	N	N	10	200	1	N	N	N	N
2R	3	.15	L	.2	50	N	N	50	150	L	N	N	10	50
7R	10	.3	.1	1	1,500	2	N	50	300	1	N	N	20	N
8R	7	.5	L	1	700	.7	N	30	200	L	N	N	20	N
9R	2	.5	.07	.3	500	15	N	500	200	1	20	N	10	50
10R	3	.3	L	.5	150	20	200	500	200	1	N	N	L	10
16R	5	L	L	.2	20	N	N	15	150	N	N	N	N	100
17R	10	L	L	.5	L	N	N	50	500	N	L	N	N	100
18R	3	L	L	.3	N	N	N	10	200	N	N	N	10	70
001S	20	2	1	G(1)	3,000	N	N	15	150	N	N	N	50	150
002S	15	2	1	G(1)	3,000	N	N	50	200	N	N	N	30	150
003S	7	2	1	G(1)	1,500	N	N	20	200	L	N	N	20	100
004S	3	1.5	.7	.5	700	N	N	200	150	1	N	N	7	50
005S	5	1.5	.7	.5	700	N	N	50	200	1	N	N	20	70
006S	5	1.5	1	.7	1,000	N	N	15	200	1	N	N	20	100
007S	15	1.5	1	G(1)	2,000	N	N	50	100	N	N	N	50	150
008S	15	1.5	1	G(1)	3,000	N	N	70	200	N	N	N	50	150
009S	5	1.5	.7	.7	700	N	N	50	150	1	N	N	7	50
010S	15	1.5	2	G(1)	3,000	N	N	50	200	N	N	N	50	200
					(20)[3]	(1)	(500)	(20)	(50)	(2)	(20)	(20)	(10)	(20)
001C	30	.07	1.5	.7	100	N	N	L	G10,000	L	N	N	70	30
002C	50	.05	1	.7	70	N	N	L	G10,000	L	N	N	100	30
003C	7	.5	10	2	700	3	1,000	20	G10,000	L	N	N	30	70
004C	(Insufficient sample for analysis)													
005C	2	.3	3	G(2)	500	N	N	150	200	L	N	N	15	50
006C	.3	.15	20	.3	500	N	N	L	70	N	N	N	N	L
007C	3	.07	5	2	200	N	N	L	G10,000	N	N	N	15	50
008C	10	.07	5	2	300	10	N	20	G10,000	L	N	N	30	50
009C	2	.05	1.5	.7	300	15	N	N	G10,000	N	N	150	50	50
010C	.7	.3	5	.3	30	N	N	20	7,000	L	N	L	N	50

[1]Looked for but not detected: W, Th.

[2]Locality number followed by S represents a stream-sediment sample that passes through a 1/8-in. sieve; a number followed by C is heavy-mineral concentrate of stream-sediment sample, with magnetic fraction removed; a number followed by R represents either mineralized or unmineralized rock specimen.

[3]Sensitivity for some elements on panned concentrates is less than that for stream sediments or rock samples.

ble 1.—Continued

	Semiquantitative spectrographic analyses (6-step)—Continued														AA	Detector
	(ppm)														(ppm)	
	Cu	La	Mo	Nb	Ni	Pb	Sb	Sc	Sn	Sr	V	Y	Zn	Zr	Au	Hg
cality number[2]	(5)	(20)	(5)	(20)	(5)	(10)	(100)	(5)	(10)	(100)	(10)	(10)	(200)	(10)		
1R	30	30	N	N	L	15	N	10	N	N	100	20	N	100	L(.05)	.02
2R	20	N	N	N	10	10	N	7	N	N	70	N	N	50	.05	1.1
7R	200	N	N	N	L	5,000	N	15	N	100	200	20	3,000	100	.1	1.1
8R	50	N	N	N	L	1,000	N	10	N	N	150	10	500	100	.1	.06
9R	3,000	N	N	N	10	500	N	7	N	N	100	L	2,000	70	.2	1.0
10R	2,000	N	N	N	L	5,000	300	10	N	N	100	L	5,000	100	.25	3.2
16R	50	N	N	N	L	50	N	L	N	200	70	N	N	100	L(.05)	L(.02
17R	70	N	N	N	L	20	N	10	L	700	150	10	N	150	L(.05)	.02
18R	50	N	N	N	15	L	N	15	N	300	100	30	N	100	.05	L(.02
001S	100	N	L	N	50	50	N	20	L	200	200	15	700	50	L(.05)	.02
002S	70	N	N	N	50	20	N	20	N	200	300	20	500	50	N(.05)	.04
003S	70	N	N	N	30	20	N	15	N	300	200	15	300	50	N(.05)	.04
004S	20	N	N	N	10	15	N	10	N	200	100	15	N	50	N(1.00)	.11
005S	50	N	N	N	15	15	N	15	N	200	100	15	N	70	N(.15)	.44
006S	30	N	N	N	10	15	N	10	N	300	150	15	N	50	N(.15)	.02
007S	70	N	N	L	50	15	N	20	20	200	300	20	500	100	N(.05)	.02
008S	70	N	N	N	30	10	N	20	N	200	300	15	500	70	N(.05)	.04
009S	20	N	N	N	10	10	N	15	N	200	100	20	200	100	N(.05)	.06
010S	70	N	L	20	50	20	N	20	N	300	300	20	500	100	N(.05)	.06
	(10)	(50)	(10)	(50)	(10)	(20)	(200)	(10)	(20)	(200)	(20)	(20)	(500)	(20)		
001C	2,000	N	N	N	100	2,000	N	L	N	700	50	100	N	G2,000		
002C	1,500	N	N	N	200	100	L	L	N	500	50	70	N	G2,000		
003C	2,000	300	N	N	30	10,000	N	50	N	500	100	700	N	G2,000	(Insufficient sample for analysis)	
004C	(Insufficient sample for analysis)															
005C	20	N	N	70	20	200	N	70	L	N	1,000	100	N	1,000		
006C	20	700	N	N	10	50	N	N	100	100	30	500	N	G2,000		
007C	1,000	50	N	N	20	50	N	10	N	700	70	150	N	G2,000		
008C	5,000	100	30	N	50	7,000	N	10	N	1,500	100	100	L	G2,000		
009C	100	100	10	N	50	150	N	L	N	10,000	30	70	N	2,000		
010C	10	50	N	N	10	20	N	10	N	1,000	20	100	N	G2,000		

Panned concentrates from stream-sediment localities (fig. 3) are composed almost entirely of common rock-forming minerals, principally magnetite, pyroxene, olivine, hornblende, and hypersthene; no metallic sulfide minerals or free gold were recognized in the concentrates. Some reddish to dark-reddish-gray grains in the panned concentrates are probably either hematite or martite or both. Several of the panned concentrates show anomalous amounts of silver, lead, or copper (table 1), particularly those obtained in the western part of the area, and a few show anomalous amounts of several other metals. Gold values of the panned concentrates were below the limit of detection (20 ppm) for the spectrographic analytical method used, and all panned concentrates contained inadequate sample material to be analyzed by the atomic-absorption method with a detection limit at 0.05 ppm.

The area of flow-banded rhyodacite or dacite along the north border of the roadless area (fig. 4, area II) shows little evidence of the type of alteration present in the Quartzville district and does not appear to be mineralized. Although no vent for these silicic flow rocks was recognized during the mineral resource investigation, a vent must be present somewhere within outcrop areas of the unit. Because alteration and metallic mineralization are commonly associated with vents of this type, the outcrop area of the rhyodacite or dacite has a low potential for metalliferous deposits (fig. 4).

Additional sampling and physical exploration of the western part of the roadless area (fig. 4, area I) are necessary to fully evaluate its mineral resource potential, but the areas proximity to and geologic similarity with the geology in the adjacent Quartzville district suggests a moderate potential for small deposits of base and precious metals. The area also has a low potential for large very low-grade gold deposits. Lack of anomalous amounts of base or precious metals in the eastern part of the roadless area (fig. 4, area III) and unfavorable geology indicate a low potential for mineral deposits. The boundary separating area I from area III is only approximate and is based primarily on geologic considerations.

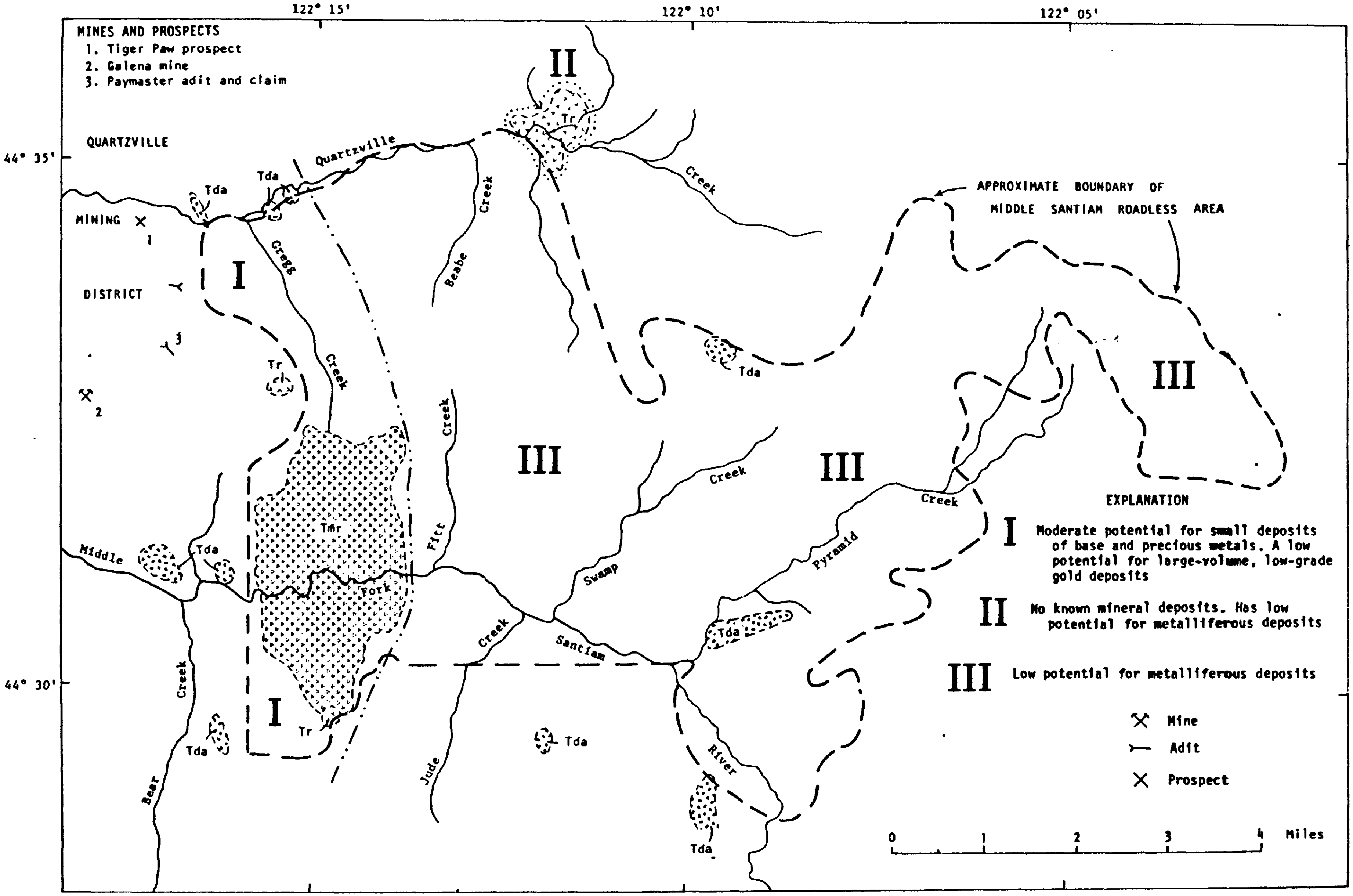


Figure 4.-- Mineral resource potential of the Middle Santiam Roadless Area (6929). Letter symbols are those used on the geologic map (fig.2).

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