TABLE 1.--Threshold concentrations for geochemical anomalies, Sapphire Wilderness Study Area and contiguous roadless areas, Granite and Ravalli Counties, Mont.

[spec , six-step semiquantitative spectrographic analysis; AA, atomic-absorption analysis; ppm, parts per million; L, lower limit of detection in ppm taken as threshold concentration; leaders (--), not applicable; pct, percent]

Element	Threshold for anomaly: Spec	Threshold for anomaly: AA
Stream-sediment samples		
Ag	1 ppm	1 ppm
Cu	30 ppm	10 ppm
Pb	100 ppm	50 ppm
Sb	--	1 ppm
Zn	200 ppm (L)	30 ppm
Cd	--	0.5 ppm
Panned-concentrate samples		
Ag	1 ppm	--
Au	10 ppm (L)	0.2 ppm
Co	30 ppm	--
Cu	50 ppm	--
Mo	10 ppm (L)	--
Ni	150 ppm	--
Pb	100 ppm	--
Sn	20 ppm	--
W	100 ppm (L)	--
Th	1,000 ppm	--
Rock samples		
Ag	10 ppm	10 ppm
Au	10 ppm (L)	1 ppm
Co	30 ppm	--
Cu	100 ppm	50 ppm
Mo	5 ppm	--
Ni	100 ppm	--
Pb	100 ppm	30 ppm
Sb	100 ppm (L)	5 ppm
Sn	10 ppm (L)	--
W	50 ppm (L)	--
Zn	200 ppm (L)	20 ppm
Tl	0.5 pct	--
As	200 ppm (L)	--
Cd	20 ppm (L)	0.5 ppm
Hg	1 ppm (L)	3 ppm
La	70 ppm	--
Nb	20 ppm (L)	--
Sc	20 ppm	--
Sr	700 ppm	--
V	150 ppm	--
Y	70 ppm	--

TABLE 3.--Criteria and rating of potential for occurrence of resources in the Sapphire Wilderness Study Area and contiguous roadless areas, Granite and Ravalli Counties, Mont.

I. Mesothermal veins and replacement zones

Criteria	Rating
a. Presence of an identified resource that contains commodity elements such as gold, silver, lead, copper, zinc, molybdenum, or tungsten. Metal-bearing veins and replacement bodies are known to occur in mines and prospects, and production from mines may be recorded.	
b. Presence of zones of alteration, shear, or replacement of original rock, which commonly contain sulfide-bearing quartz veins or disseminated sulfide minerals; or known occurrence of metal-bearing veins.	High potential: Must satisfy criteria a and b, and usually satisfies criteria c, d, e, and f.
c. Presence of host rocks favorable for fracturing that would permit access by mineralizing solutions or favorable for replacement by mineralizing solutions.	
d. Geochemical identification of anomalously high amounts of commodity elements, as well as pathfinder elements, such as arsenic, tin, antimony, bismuth, cadmium, nickel, or cobalt, in veins, replacement bodies, or in samples from streams that drain a mineralized area.	
e. Presence of a contact zone between plutonic rocks and sedimentary rocks.	Moderate potential: Must satisfy criteria b, d, and g, and usually satisfies criteria c, e, and f.
f. Favorable setting for mineralization suggested by interpretation of geophysical data. Such a setting could include areas of relatively lower gravity that may be related to areas of alteration in plutonic rocks, or areas of relatively high magnetic intensity that may be related to exposed or buried intrusive rocks.	
g. Possible occurrence of small bodies of resources. Scattered prospects may be present, but mines and prospects showing extensive development are absent.	
h. Possible occurrence of prospects in area, but resources not known to occur.	Low potential: Must satisfy criteria b, i, and j, and usually satisfies criteria e and f.
i. Possible occurrence of zones of alteration, brecciation, or replacement of original rock, which may contain metalliferous veins or possible occurrence of small veins.	
j. Geochemical identification of low, but anomalous, amounts of some commodity elements and of a few pathfinder elements, such as arsenic, tin, antimony, bismuth, tungsten, cadmium, nickel, and cobalt, in rocks or in stream sediments.	

II. Placers

Criteria	Rating
a. Presence of identified resource in surficial deposits. Placer mines or prospects may have recorded production of gold, and may contain concentrations of silver, lead, copper, zinc, tungsten, tin, or rare-earth elements.	High potential: Must satisfy criteria a, b, c, and e, and may satisfy criteria d and f.
b. Geochemical identification of gold and some other elements, such as silver, lead, copper, zinc, or tungsten, above threshold values, as well as pathfinder elements such as arsenic, tin, thorium, antimony, bismuth, cadmium, nickel, or cobalt in surficial deposits, which may be related to metalliferous veins or disseminated deposits upstream.	
c. Probable or known occurrence of metalliferous veins, replacement bodies, or disseminated mineral occurrences upstream from area.	Moderate potential: Must satisfy criteria b and c, and may satisfy criteria d, e, and f.
d. Possible presence of scattered prospects in area, but no identified resources in most of area.	
e. Presence of visible gold and heavy minerals in panned-concentrate samples from surficial deposits.	Low potential: Must satisfy criteria d and f, and may satisfy criterion c.
f. Geochemical identification of low concentrations of gold or a few pathfinder elements near, or slightly below, threshold values in panned-concentrate or stream-sediment samples, which may suggest the presence of metalliferous veins upstream from area.	

III. Disseminated rare-earth elements in plutonic rocks

Criteria	Rating
a. Presence of rocks known to contain rare-earth-bearing minerals such as allanite.	
b. Geochemical identification of anomalously high amounts of elements such as vanadium, scandium, cobalt, yttrium, lanthanum, thorium, tin, zirconium, titanium, or niobium in rock samples or in deposits of streams that drain the rock body.	
c. Presence of a contact zone between plutonic rocks and sedimentary rocks in or close to area.	Low potential: Must satisfy criteria a, b, c, and d.
d. Favorable setting for plutonic rocks suggested by interpretation of aeromagnetic data, such as a relatively high magnetic intensity that may be related to intrusive rocks.	

IV. Miscellaneous possible replacement, vein, and disseminated resources

Criteria	Rating
a. Presence of favorable rocks, such as gabbro or pegmatite, that may contain disseminated metals such as gold, silver, copper, zinc, or titanium in low concentration.	
b. Geochemical identification of anomalous, but low, amounts of gold, silver, copper, zinc, titanium, or rare-earth elements in rock samples.	Low potential: Must satisfy criteria b and c, and may satisfy criteria a and d.
c. Presence of host rocks favorable for fracturing that would permit access by mineralizing solutions or favorable for replacement by mineralizing solutions.	
d. Favorable setting for plutonic rocks suggested by interpretation of aeromagnetic data, such as a relatively high magnetic intensity.	

TABLE 2.--Summary of mines and prospects in the Sapphire Wilderness Study Area and contiguous roadless areas, Granite and Ravalli Counties, Mont.

No. on map	Name (commodity)	Geologic or Geomorphic setting	Workings and production	Sample data and resources of mines and prospects
1	Bowles Creek placer (rare-earth elements).	Narrow valleys; streams drain granodiorite.	None----------	Seventeen samples from 10 pits in Bowles Creek; 13 panned samples from tributaries. Allanite averaged 0.015 percent.
2	Kent mine[1] (gold, silver, copper, and lead).	Sulfide-bearing quartz veins and lenses in shear zone that may extend for 1,700 ft. Shear zone is as much as 10 ft wide.	Caved adit and shaft estimated to have 2,000 ft of workings; 3 small pits. Production 1933-35: 341 tons of ore, which yielded 88 oz of gold, 5,932 oz of silver, 197 lb of copper, and 2,162 lb of lead.	Thirteen samples: two chip samples across 2.5-ft-wide shear zone contain 0.34-1.06 oz of gold per ton and 53.9-242.1 oz of silver per ton. Samples from dumps contain 0.04-0.22 oz of gold per ton and 4.8-12.9 oz of silver per ton, as well as some copper, lead, and zinc.
3	Unnamed[1] prospect (silver).	Quartz vein 0.8 ft wide and about 220 ft long, in granodiorite.	Three prospect pits----------	One chip sample across vein contains 3 oz of silver per ton. Two grab samples contain 0.1 and 1.7 oz of silver per ton.
4	Kentz mine[1] (molybdenum and silver).	Molybdenite-bearing quartz veins in widely separated shear zones and fractures; veins as much as 1.5 ft wide and 40 ft long within 370-ft-wide zone.	Two adits, 40 ft and 80 ft long	Thirteen samples: six samples contain 0.01-0.23 percent molybdenum; five samples contain 0.9-1.7 oz of silver per ton.
5	Ross Fork Rock Creek placer (gold).	Stream gravel, sand, silt, and reworked glacial deposits.	None----------	Twenty-two panned samples from along Ross Fork and its tributaries. One sample shows a trace of gold.
6	Green Goose-Holy Hogan prospect (copper).	Sulfide-bearing quartz vein 12 in. wide beneath a gabbroic sill 18 in. wide in upper member of Mount Shields Formation. Some mineralized rock may be stratabound.	A 35-ft-long adit and two pits	Six chip and two grab samples: copper content from 0.04 to 0.09 percent, except one chip sample that contains 0.38 percent copper.
7	Mosquito Basin placer (gold).	Sand and silt in remnant glacial bogs which formed behind lateral moraines.	Three shallow pits----------	Three panned samples: no gold detected.
8	Todd prospect (gold).	Sulfide-bearing quartz vein, 1-12 in. wide, in upper Mount Shields Formation. Gold may be associated with pyrite in the vein.	A 23-ft-long adit, a 40-ft-long trench, and a pit.	Three chip samples across vein contain 0.01-0.05 oz of gold per ton. One sample from stockpile contains 0.26 oz of gold per ton.
9	Last Chance prospect (gold).	Dump and workings indicate several quartz veins at least 7 in. wide. Veins not exposed.	Two caved adits and six trenches.	Ten samples from dumps and stockpiles contain as much as 0.01 oz of gold per ton and 0.05 oz of silver per ton.
10	South Fork Rock Creek placer (gold).	Stream gravel, sand, silt, and reworked glacial deposits.	Two prospect pits----------	Seven channel samples from four test pits. Eight panned samples from creeks. Gold present in one test pit.
11	Little Wonder prospect (gold).	Thin, sulfide-bearing quartz veins in granodiorite in east-trending shear zone as much as 22 ft wide and 300 ft long.	Caved adit about 50 ft long, a 15-ft-long adit, and two trenches.	Nine samples: two chip samples across vein contain 0.04-0.14 oz of gold per ton. One select sample contains 0.17 oz of gold per ton.
12	Unnamed prospect.	Thin quartz vein in granodiorite.	Two prospect pits----------	Four grab samples from dumps and stockpiles. Only traces of metals.
13	T. W. T. prospect (gold, silver, and lead).	Two quartz veins 1-10 in. wide.	Two prospect pits----------	Three chip and five grab samples contain as much as 0.04 oz of gold per ton, 1.2 oz of silver per ton, and 0.43 percent lead.
14	Millers mine (gold, silver, copper, lead, and zinc).	Sulfide-bearing quartz veins in shear zones in granodiorite. Veins vary from a fraction of an inch to, reportedly, 9 ft wide. Veins explored for 400 ft.	Workings flooded or caved. Extensive main workings on Miller vein. Numerous other small workings adjacent to claim group. Production from veins between 1929-37 and 80 tons of dump material in 1968: 817 oz of gold, 4,145 oz of silver, 2,177 lb of copper, 76,436 lb of lead, and 22,397 lb of zinc.	Resources not determined for main Miller vein. Fifty-three samples collected from dumps, stockpiles, and other veins. One dump contains about 6,200 tons that average 0.05 oz of gold per ton and 0.37 oz of silver per ton, and other dump contains 490 tons that average 0.03 oz of gold per ton and 0.26 oz of silver per ton. Dumps also contain 0.5-1.0 percent lead and zinc combined.
15	Townsend prospect (gold).	One or more thin sulfide-bearing quartz veins in granodiorite. Veins not exposed.	Two flooded shafts, 20 pits and trenches.	Nine grab samples and two select samples: select samples contain 0.02-0.03 oz of gold per ton, and minor silver, lead, and copper; and one grab sample of dump material contains 0.01 oz of gold per ton.
16	Log Cabin prospect (silver).	Sulfide-bearing quartz veins in shear zone in granodiorite and Wallace Formation. Veins not exposed.	Five caved shafts having about 580 ft of workings and 11 pits or trenches occur along quartz veins and shear zones.	Sixteen samples of dump and stockpile material: four samples of quartz veins from stockpiles along main vein in granitic rock average 15 oz of silver per ton.
17	Lutz Creek (a.k.a. Gold Bar/Agnes/Townsend) placer (gold).	Northeastern part Frogpond Basin.	Two trenches, 15 ft and 50 ft long; possibly site of former small-scale mining.	Samples outline gold-bearing placer 6-10 ft deep, about 1,000 ft long, and 50-300 ft wide. Weighted average gold content (from surface to bottom of excavation) is about 0.005 oz of gold per cubic yard.
18	Nancy Lee prospect (gold).	Sulfide-bearing quartz vein at least 750 ft long and as much as 16 in. wide. Vein not exposed.	Three shafts 6-12 ft deep, and five small pits and trenches.	Ten samples from dumps contain as much as 0.02 oz of gold per ton. One select sample from easternmost pit contains 0.05 oz of gold per ton.
19	Ohio prospect (unknown).	East-trending quartz veins and lenses in shear zone in granodiorite.	Thirteen pits and trenches-----	Eleven samples: only traces of metals.
20	Mayflower prospect (unknown).	Weathered, sheared, limonite-stained granodiorite.	One shallow pit----------	One sample: only traces of metals.
21	Airedale prospect (unknown).	Two parallel, sulfide-bearing shear zones 10 ft apart and 0.9-3 ft wide. Contain quartz blebs, limonite-stained gouge, and disseminated limonite.	One adit 30 ft long and a 10-ft-deep shaft.	Four samples: only traces of metals.
22	Indiana prospect (unknown).	Altered granodiorite--------	Two trenches 13 ft and 20 ft long.	Two grab samples: only traces of metals.
23	Heaney mine (a.k.a. Frogpond lode) (Gold).	Sulfide-bearing quartz vein 1 ft wide and 500 ft long. Vein not exposed.	Caved shaft, a 25-ft-long cut and three trenches. Five tons of ore shipped in 1937 yielded 2 oz of gold, 9 oz of silver, and 367 lb of lead.	Ten samples: two select samples of stockpiles range from 0.10 to 0.14 oz of gold per ton and 0.10 to 1.5 oz of silver per ton. Select sample of quartz from cut contains 0.03 oz of gold per ton.
24	Montana Prince claim group (gold, silver, lead, and zinc).	Several parallel sulfide-bearing quartz veins in shear zones in granodiorite. Veins vary from a few inches to 9 ft wide, and one may extend 1,000 ft in length.	Main adit reported to have 1,500 ft of workings that crosscut five veins. Also a caved shaft reported to be 62 ft deep and a 32-ft-long crosscut; a caved shaft reported to be 75 ft deep and a caved adit about 35 ft long. Thirty-two other pits and trenches scattered in claim group.	Thirty-four samples from dumps, but high values of metals from only two claims: (1) Thor claim contains 0.37 oz of gold per ton; and (2) Montana Prince claim contains 0.15 oz of gold per ton. Assays reported in 1923 from veins in the main adit average 0.19 oz of gold per ton, 2.0-20 oz of silver per ton, 1.0-2.0 percent lead, and 2.0-6.0 percent zinc.
25	J. P. prospect (gold, silver).	Several 1.0-in.-wide quartz veins in 2.0-ft-wide shear zone in middle of Mount Shields Formation.	Ten-foot-long shaft and two trenches.	Three samples: only traces of metals.
26	Tuscarora prospect (gold, silver).	Small zones of altered granodiorite cut by two limonite-stained shear zones 1-12 in. wide.	Two shafts, 10 and 18 ft long; a vertical shaft 10 ft deep; seven trenches and six pits.	Nine samples: a select sample and grab sample contain 0.06 and 0.02 oz of gold per ton, and 1.8 and 0.1 oz of silver per ton.
27	Lutz mine (a.k.a. Gold Leaf mine) (gold, silver, and lead).	Two main sulfide-bearing quartz veins; south vein 0.2-0.3 ft wide and may extend 920 ft; north vein not exposed.	South vein exposed by two adits, 12 pits, and trenches. Lower adit caved at 700 ft; upper adit 475 ft long. North vein has five shafts 15-30 ft deep, 14 pits and trenches, and 1 adit. Ore shipments from 1910-40 totaled 34 tons of ore that yielded 50 oz of gold, 197.5 oz of silver, 232 lb of copper, and 6,912 lb of lead.	The south vein contains identified resources of 92,000 tons containing 0.06 oz of gold per ton, 0.43 oz of silver per ton, and 0.31 percent lead. The ore minerals occur in shoots of 350-10,000 tons with moderate continuity downdip but only several feet along strike. Likelihood is high for similar tonnage and grade for north vein. Stockpiles total approximately 10 tons containing 0.13 oz of gold per ton and 0.58 oz of silver per ton.
28	O'Brien prospects (silver and gold).	Several sulfide-bearing quartz veins in shear zones in Mount Shields Formation near contact with granodiorite. Exposed shear zone is 2.7 ft wide and contains a 0.5-ft-wide quartz vein.	Numerous small workings in area of about 2,400 ft long and 1,200 ft wide.	One chip sample across vein in adit contains 5.2 oz of silver per ton and 0.1 oz of gold per ton. A sample from a 1-ton stockpile contains 0.05 oz gold per ton and 48.9 oz silver per ton. Many samples contain lead, copper, and zinc.
29	Joker prospect (silver?).	Quartz veins and stringers in altered granodiorite and Mount Shields Formation. No veins exposed.	Three trenches and five pits--	Five samples: one sample of quartz vein in stockpile contains 0.7 oz of silver per ton.
30	Unnamed prospect (unknown).	Dumps contain altered granodiorite and vein-quartz fragments. No veins exposed.	Six trenches and three pits---	Twelve grab and select samples: only traces of metals.
31	Unnamed prospect (gold and silver?).	Workings along 280-ft zone. Fragments of quartz and altered granodiorite contain pyrite and galena. No veins exposed.	Three trenches and four pits--	Four select samples from dumps: one sample contains 0.02 oz of gold per ton and 0.4 oz silver per ton.
32	Unnamed prospect (gold and silver?).	Thin quartz veins in altered Mount Shields Formation. No veins exposed.	Caved shaft estimated to be 40 ft deep, 1 trench, and 11 pits.	Fifteen grab and select samples of dumps and stockpiles: two grab samples contain 0.4 and 2.2 oz of silver per ton. A select sample contains 0.01 oz of gold per ton, 2.8 oz of silver per ton, and 0.05 percent molybdenum.
33	Unnamed prospect (unknown).	Mount Shields Formation------	One trench on top of ridge----	One sample: only a trace of metals.
34	Unnamed prospect (unknown).	Sulfide-bearing quartz vein 3.5 ft wide in granodiorite.	Two caved adits 100 ft apart. Upper adit at least 80 ft long; lower adit may be 200-300 ft long.	Four samples: one select sample contains as much as 0.01 oz of gold per ton, 1.7 oz of silver per ton, and 0.09 percent copper.
35	Banner mine[1] (gold, silver, and copper).	Sulfide-bearing quartz veins 4-9 ft wide.	Flooded and caved shaft at least 240 ft deep with lateral workings at 138-ft and 225-ft levels. Production records from 1921 to 1936 and 1962 to 1975 show total recorded production of 1,979 oz of gold, 5,896 oz of silver, and 20,935 lb of copper.	No samples taken. All workings inaccessible.
36	Copper Creek placer (gold).	Reworked glacial deposits in streambed and terraces.	None----------	Twelve channel samples from six pits and twenty panned samples contain traces of gold.
37	Rainbow prospect (gold).	Two prospects: (1) gold prospect in quartz vein about 17 in. wide, in quartzite; (2) gold and quartz-crystal prospect is 600 ft north of first prospect.	Gold prospect has caved adit 30 ft long. Gold and quartz-crystal prospect has trenches.	Two chip samples across vein average 0.09 oz of gold per ton. A select sample from stockpile contains 0.01 oz of gold per ton.
38	Senate mine[1] (copper and silver).	Sulfide-bearing veins along common shear zones; disseminated sulfide minerals occur in carbonate-bearing replacement zones in Mount Shields Formation quartzite.	Workings total about 900 ft of drifts, crosscuts, and winzes. About 3,500 ft of diamond core drilling. Production of small tonnages in the 1890's.	Stentz (1975, p. 14) reported that "mineralization may have been peripheral to a series of small deep-seated 5-20 million ton ore bodies." Drill intercepts gave the highest values of 0.44 percent copper.

[1]Mines or prospects located outside of study area.

TABLE 4.--Summary and rating of areas of potential resource occurrence, Sapphire Wilderness Study Area and contiguous roadless areas, Granite and Ravalli Counties, Mont.

[Au, gold; Ag, silver, Cd, cadmium; Co, cobalt; Cu, copper; La, lanthanum; Mo, molybdenum; Nb, niobium; Pb, lead; Sb, antimony; Sn, tin; Th, thorium; Ti, titanium; V, vanadium; W, tungsten; Y, yttrium; Zn, zinc]

Area No. on map	Location	Commodity elements	Type of occurrence	Criteria for rating	Estimate of size and grade of deposits	Mineral resource potential
			Mesothermal veins			
1	Frogpond Basin, T. 3 N., R. 16 and 17 W.	Au, Ag, Cu, Pb, Zn, W.	Sulfide-bearing quartz veins and lenses along fractures, joints, and shear zones in granodiorite and in sheared rocks of the Missoula Group. Sulfide minerals are disseminated in altered host rock.	In area of Millers, Montana Prince, and Lutz mines: I. a, b, c, d, e, f. In area peripheral to above mines that contains numerous prospects: I. b, c, d, e, f, g. Headwaters of Sign Creek and on ridges west and east of Sign Creek: I. e, f, h, i, j.	Small deposits of probable moderate or high grade. Small deposits, grade not estimated. Possible small deposits, probable low grade.	High Moderate Low
			Placers			
		Au-------	Stream deposits in Moose, Cuba, Sign, and Lutz Creeks, and an unnamed tributary north of Cuba Creek, and an unnamed tributary to Copper Creek may contain placers. Because streams drain glacial deposits that may contain gold; till, outwash, and modern stream channels are considered possible placers. Frogpond Basin has similar deposits that may contain gold.	Lutz Creek and part of Frogpond Basin: II. a, b, c, d, e. Other surficial deposits in Frogpond Basin: II. b, c, d, e. Moose Creek: II. b, c, d, e, f. Cuba Creek: II. b, c, d, e. Unnamed tributary north of Cuba Creek: II. b, c, d, e. Sign Creek: II. d, f. Unnamed tributary to Copper Creek: II. d, f.	Extent of deposit not known, probable low grade with some zones of moderate grade. Extent of deposits not known, grade not estimated. ----------do.---------- ----------do.---------- ----------do.---------- Extent of deposit not known, probable low grade. Extent of deposit not known, grade not estimated.	High Moderate Do. Do. Do. Low Low
			Mesothermal veins and replacement bodies			
2	Senate Mountain area and Middle Fork of Rock Creek, secs. 12, 13, 14, 23, and 24, T. 3 N., R. 6 W.	Cu, Au, Ag, Pb.	Sulfide-bearing quartz veins and lenses in fracture zones in Mount Shields quartzite. Replacement of quartzite by sulfide and carbonate minerals in lenses and pods in quartzite. Mineralization in veins localized by many shear zones, which may also have controlled location of replacement zones.	In area of Senate mine and Ivanhoe Lake: I. a, b, c, d. On ridges west and north of Senate mine and south to Ivanhoe Lake: I. b, c, d, g.	Extent of deposits not known. Probable low grade. Extent of deposits not known; grade not known.	High Moderate
			Placers			
		Au-------	Stream deposits in two unnamed tributaries to Middle Fork of Rock Creek that drain east from Senate mine and from cirque north of the mine area contain possible placers, as does the Middle Fork of Rock Creek below confluence of these tributaries.	In two unnamed tributaries that drain east from Senate mine and from cirque directly north of Senate mine area, and in Middle Fork of Rock Creek below confluence of tributaries: II. b, c, d.	Possible small deposits of probable low grade.	Moderate
			Mesothermal veins			
3	Meyers Creek, sec. 15, T. 3 N., R. 16 W.	Au, Ag, Cu, Mo.	Sulfide-bearing vein along bedding plane parallel to shear zones in quartzite. Effects of alteration or replacement of host rock absent.	In area of developed Rainbow prospect along Meyers Creek: I. a, b, c, d.	Possible small deposit, grade not estimated.	High
			Placers			
		Au-------	Stream deposits in Meyers Creek and an unnamed tributary to Meyers Creek below Rainbow prospect contain visible gold in panned concentrates. Because gold may be present in some till, parts of glacial deposits are considered possible placers. Veins at Rainbow prospect probable source of gold in placers.	In upper Meyers Creek and in unnamed tributary below developed prospect: II. b, c, d, e. In lower Meyers Creek downstream from area of moderate potential: II. d, e, f.	Possible small deposit. of probable low grade. Possible small deposit of probable low grade.	Moderate Low
			Mesothermal veins			
4	Middle Fork of Rock Creek, sec. 36, T. 4 N., R. 16 W.	Au, Ag, Cu.	Sulfide- and limonite-bearing quartz veins in quartzite.	At Banner mine and area surrounding mine: I. a, b, c, d, f.	Possible small deposit, grade not estimated.	High
			Mesothermal veins			
5	Ross Fork of Rock Creek, sec. 3, T. 4 N., R. 16 W.	Mo, W, Ag.	Sulfide-bearing quartz veins cut granodiorite near contact with sedimentary rocks. Veins occur along shear zones but do not extend into sedimentary rocks.	In area of Kentz mine: I. a, b, c, d, e, f.	Small vein deposit, full extent of veins not known; grade not known.	High
			Mesothermal veins			
6	South Fork of Rock Creek (land grid absent).	Au, Ag, Pb, Zn.	Sulfide-bearing quartz veins along shear zones(?) and fractures in granodiorite. Extent of alteration of intrusive rock not known.	In area of prospects along South Fork of Rock Creek: I. b, c, d, f, g.	Small vein deposits. Extent of veins not known, grade not estimated.	Moderate
			Placers			
		Au-------	Several panned-concentrate samples of stream deposits contain gold. Glacial deposits considered as possible placers because modern streams drain till and because till may have been transported north into the South Fork of Rock Creek from Frogpond Basin. Source of gold may be local veins in South Fork drainage basin or in Frogpond Basin.	In drainage basin of South Fork of Rock Creek: II. b, c, d.	Possible small deposits of low grade.	Moderate
			Mesothermal veins			
7	Point Lookout area, about 0.5 mi east of Medicine Lake (land grid absent).	Au, Ag, Pb, Zn.	Sulfide-bearing quartz veins. Main vein at Kent mine occurs along a shear in granodiorite.	In area of Kent mine: I. a, b, c, d, f. East of Kent mine near prospect 3 (table 2): I. f, h, i, j.	Small deposits of probable moderate to high grade. Possible small deposits, probable low grade.	High Low
			Mesothermal veins			
8	Green Canyon Creek, Green Canyon Lake, and ridge to southwest above Green Canyon Lake, secs. 31, 32, and 33, T. 4 N., R. 16 W.	Au, Zn---	No sulfide-bearing quartz veins known. Presence of zinc and cadmium suggests genetic relation to mesothermal veins in Frogpond Basin.	On ridge above Green Canyon Lake: I. f, h, i, j.	Possible small vein deposits, grade probably low.	Low
			Placers			
		Au-------	Stream deposits contain anomalous concentrations of gold and cobalt. Glacial deposits considered as possible placers because modern streams drain till and because glacial deposits may have been transported from the Frogpond Basin into Green Canyon drainage basin.	In Green Canyon downstream from cirque basin: II. d, f.	Possible small deposits, grade not estimated.	Low
			Miscellaneous occurrences			
9	In saddle about 0.5 mi southwest of Gongdon Peak, and along Skalkaho Creek and Ross Creek (land grid absent).	Au, Co, Mo.	Sulfide minerals occur near contact of gabbro dike and possibly as disseminated sulfide in Mount Shields quartzite. Veins rare.	In area southwest of Gongdon Peak: IV. a, b, c.	Probable small vein or stratiform body; grade probably low.	Low
			Placers			
9	In saddle about 0.5 mi southwest of Gongdon Peak, and along Skalkaho Creek and Ross Creek (land grid absent).	Au-------	Stream deposits of upper Skalkaho Creek and Ross Fork contain visible gold or contain gold above threshold concentration at several localities. Glacial deposits considered as possible placers because modern streams drain till. Several sources of gold possible: (1) vein or disseminated minerals southwest of Congdon Peak (prospect 9, table 2); (2) Kent mine (area 7) ; and (3) mesothermal veins in South Fork of Rock Creek (area 6).	In upper drainage basin of Skalkaho Creek: II. c, d, f. Along Ross Fork of Rock Creek: II. b, c, d, e, f.	Possible small deposits, probable low grade. Possible small deposits, probable low grade.	Low Moderate
			Disseminated rare-earth and related elements			
10	West side of north part of Sapphire batholith along topographic divide from Ross Fork on the south to headwaters of Bowles Creek. Includes tributaries to West Fork of Rock Creek.	Au, La, Nb, Y, V, Sn, Th.	Allanite, sphene, epidote, and zircon accessory minerals in granodiorite on west border of the Sapphire batholith. Allanite is most likely origin of rare-earth and associated elements. Late-crystallizing melt may have penetrated sedimentary rocks along the border of pluton.	West side of northern part of Sapphire batholith: III. a, b, c, d.	Possible large disseminated deposit of very low grade.	Low
			Placers			
		Au, Sn, Th.	Streams that drain rare-earth-bearing rocks contain anomalous concentrations of tin, thorium, and gold. Tin, thorium, and gold probably derived from accessory minerals or small veins in granodiorite.	West Fork of Rock Creek, Bowles Creek, and unnamed tributaries west of West Fork of Rock Creek: II. c, d, f.	Possible small deposits of probable low grade.	Low
			Mesothermal(?) veins			
11	Daly Creek between Falls Creek on east and Skalkaho Creek on south.	Au, Ag, Pb, W.	No mesothermal sulfide-bearing veins located, but geochemical signature in placers and in rock samples suggests their presence. Zones of shear and alteration occur in canyon of Daly Creek.	In rocks exposed in Daly Creek: I. h, i, j.	No known deposits; possible low-grade veins.	Low
			Placers			
		Au, Cu, Ni, Co.	Stream deposits of Daly Creek contain slightly anomalous concentrations of gold, copper, nickel, and cobalt, which may originate from gabbro dikes and plugs. Slightly anomalous concentrations of gold, silver, lead, tungsten, antimony, and zinc may originate from unknown mesothermal veins.	In stream sediment in Daly Creek: II. c, d, f.	Possible small deposit of probable low-grade.	Low
			Placers			
12	Copper Creek, secs. 17, 21, 28, and 34, T. 3 N., R. 16 W.	Au, Ag, Pb.	Stream sediments contain anomalous concentrations of commodity elements and some pathfinder elements. Glacial deposits are considered as possible placers because modern streams drain till. Mesothermal veins and replacement bodies occur upstream.	In stream sediments of Copper Creek: II. b, c, d.	Possible small deposits of probable low-grade.	Moderate
			Mesothermal veins			
13	Area upstream from Zakes Meadows along tributary to Ross Fork, secs. 9 and 14, T. 4 N., R. 16 W.	Cu, Zn, Sb.	Stream sediments contain small, but anomalously high, concentrations of copper, zinc, and antimony that may be related to sulfide-bearing veins in rocks upstream. Veins were not found.	In rocks in drainage basin upstream from stream sediments in Zakes Meadows area: I. h, i, j.	Possible small veins, grade not known.	Low
			Mesothermal(?) veins			
14	Area upstream from unnamed tributary to Moose Creek about 1.5 mi west of Frogpond Basin, T. 3 N., R. 17 W.	Ag, Cu, Co, Cd.	Stream sediments contain small, but anomalously high, concentrations of silver, copper, cobalt, and cadmium that may be related to sulfide-bearing veins in rocks upstream. Veins were not found.	In rock in drainage basin upstream from stream sediments of Moose Creek near Frogpond Basin: I. h, i, j.	Possible small veins of low grade.	Low
			Mesothermal(?) veins			
15	East side of Table Mountain (land grid absent).	Au, Ag, W.	Sparse sulfide-bearing veins exposed in prospects in quartzite of Mount Shields Formation near contact with porphyritic granodiorite. Veins show brecciation and country rock sheared at some places.	Area of prospects on east side of Table Mountain: I. b, c, d, e, f, g.	Probable small deposits, grade not estimated.	Moderate
			Miscellaneous occurrence			
16	On ridge about 0.75 mi southeast of Bare Hill, sec. 4, T. 3 N., R. 17 W.	Y, La----	Rock samples of metamorphosed Mount Shield and Wallace Formations had low, but anomalous, concentrations of yttrium, lanthanum, and strontium. Source of high anomaly not known.	Rock samples from metamorphosed Mount Shields and Wallace Formations: IV. b, c.	No known deposit. Grade not known.	Low
			Miscellaneous occurrence			
17	On ridge above Snow, Legend, and Spud Lakes, secs. 17 and 18, T. 3 N., R. 17 W.	Pb, Mo---	Rock samples of metamorphosed Wallace Formation contain slightly anomalous concentrations of lead and molybdenum. Source of anomaly not known.	Rock samples from metamorphosed Wallace Formation: IV. b, c	Probable low grade----------	Low
			Miscellaneous occurrence			
18	North of Martin Creek, sec. 19, T. 3 N., R. 17 W., and sec. 24, T. 3 N., R. 18 W.	Ag, Cu---	Pegmatite dike and gabbro dikes. No sulfide-quartz veins known.	In area of dikes: IV. a, b, c	Probable low grade----------	Low
			Possible mesothermal veins			
19	Head of Sleeping Child Creek, secs. 3 and 10, T. 3 N., R. 18 W.	Zn-------	Origin of high anomaly from rock samples not known. May result from sulfide-bearing quartz veins.	In headwaters of Sleeping Child Creek: IV. b, c.	Possible small veins---------	Low
			Miscellaneous occurrence			
20	On ridge about 1.3 mi west of Kent Lake.	Cu, Ti---	Dike about 3 ft wide cuts quartzite of Mount Shields Formation. No altered or mineralized rock at surface.	On ridge: IV. a, b, c --------	Possible small disseminated deposit, probable low grade.	Low

MINERAL RESOURCE POTENTIAL MAP OF THE SAPPHIRE WILDERNESS STUDY AREA AND CONTIGUOUS ROADLESS AREAS, GRANITE AND RAVALLI COUNTIES, MONTANA

By

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