

Description of rocks of the Boulder batholith, Basin quadrangle, Montana

Name	Symbol (pl. 1)	Typical grain size (mm)	Typical diagnostic megascopic features ¹	Texture	Approximate mineral composition, in percent					Specific gravity			Areal extent	Remarks
					Plagioclase ²	Alkalic feldspar ³	Quartz	Biotite and hornblende combined	Accessory minerals ⁴	Determinations (number)	Range	Average		
Early stage														
Porphyritic quartz monzonite...	g	0.5-2	Medium dark gray, fine to medium grained; plagioclase phenocrysts (4 mm) common.	Hypautomorphic, locally xenomorphic, porphyritic.	30-40 (An ₃₅₋₄₅ *)	25-30	20-25	10 to 15	a, c, e, m	3	2.67-2.68	2.68	Minor-----	Biotite disseminated and replacing hornblende; hornblende largely chloritized.
Butte quartz monzonite														
Porphyritic quartz monzonite...	bcl	2-3	Light gray to medium light gray, coarse grained; plagioclase (4 mm) and alkalic feldspar (4 mm) crystals common.	Hypautomorphic porphyritic.	35 (An ₃₅₋₄₀ *)	25	25	10 to 15	a, c, m, s, z	5	2.67-2.69	2.67	Major-----	Biotite in clusters of minute crystals associated with altered hornblende and in individual euhedral crystals.
Granodiorite(?) porphyry-----	bclb	2-3	Light gray, coarse grained; conspicuous ragged alkalic feldspar crystals (1-2 cm), abundant plagioclase phenocrysts (3-5 mm); altered hornblende phenocrysts common.	Groundmass hypautomorphic granular.	45-50 (groundmass, An ₂₅₋₃₀ ; phenocrysts, An ₄₀₋₄₅ *)	15-20	20-25	10	c, e, f, s, z	1	-----	2.64	Minor-----	Alkalic feldspar, probably microcline, in irregular masses partly replacing plagioclase, and in masses commonly containing fragments of other minerals; hornblende only as phenocrysts altered to chlorite and epidote; biotite, the most abundant mafic mineral in groundmass, as chloritized anhedral crystals.
Quartz monzonite-----	bmla	.5-2	Light gray or light brownish gray to grayish pink and pale red, medium grained.	Hypautomorphic granular.	35-45 (An ₃₀₋₃₅ *)	25-35	25-30	5	c, e, m, s, z	6	2.59-2.68	2.63	Major-----	Plagioclase embayed by alkalic feldspar and quartz; biotite finely disseminated and to a lesser extent clustered in small crystals around altered hornblende, small hornblende needles present locally; mafic minerals largely altered to chlorite, epidote.
Porphyritic quartz monzonite...	bmlb	.5-2	Light gray, medium grained; contains sparse alkalic feldspar crystals (2-5 mm) and conspicuous irregular clots of altered hornblende (4-10 mm in diameter).	Hypautomorphic porphyritic.	30-35 (An ₂₅₋₄₀ *)	25-30	20	10 to 15	c, e, m, s, z	2	2.59-2.61	2.60	---do-----	Hornblende as disseminated crystals and as the principal mineral in irregular mafic clots with associated biotite and chlorite; subordinate amounts of biotite also as minute disseminated flakes and as euhedral crystals.
Porphyritic quartz monzonite...	bmlc	.5-2	Light gray, medium grained; plagioclase (4-6 mm) and hornblende (2-3 mm) phenocrysts common.	Xenomorphic, locally hypautomorphic, porphyritic.	35 (An ₃₀₋₃₅)	35	20	10	c, e, m, s, z	-----	-----	-----	---do-----	About half of plagioclase as phenocrysts.
Quartz monzonite-----	bmd	.5-2; locally as much as 4	Medium gray, medium grained.	Hypautomorphic, locally xenomorphic, granular rarely porphyritic.	35-40 (An ₃₅₋₄₀ *)	25-30	25	10	a, c, m, s, z	8	2.62-2.71	2.67	Major-----	Plagioclase deeply embayed by alkalic feldspar and quartz; mafics commonly chloritized.
Quartz monzonite-----	bmdb	.5-1.5	Medium gray, tinted pink, fine to medium grained; rare alkalic feldspar (2-4 mm) crystals.	Xenomorphic, locally hypautomorphic granular, rarely porphyritic.	35-40 (An ₃₅₋₄₅ *)	30	20-30	5 to 10	a, c, m, s, z	5	2.57-2.66	2.66	---do-----	Biotite as disseminated grains, largely chloritized.
Quartz monzonite porphyry----	bmdc	.5-1.5	Medium gray, fine to medium grained; plagioclase (2-3 mm) and alkalic feldspar (5-10 mm, rarely 15 mm) crystals common; abundant biotite and hornblende.	Hypautomorphic or xenomorphic porphyritic.	35 (An ₂₅₋₃₀)	20-25	20-25	15 to 20	a, c, m, s, z	3	2.64-2.67	2.66	Minor-----	Alkalic feldspar locally is in myrmekitelike intergrowth with quartz; mafic minerals commonly are partly chloritized; large euhedral hornblende phenocrysts locally abundant.
Quartz monzonite-----	bfl	.2-1	Light gray, fine grained; local plagioclase (3-4 mm) and sparse hornblende (6-8 mm) phenocrysts.	Hypautomorphic or xenomorphic granular locally porphyritic.	30-35 (An ₃₅₋₄₅ *)	30-35	30	5	a, c, e, m, s, z	7	2.56-2.64	2.61	---do-----	Alkalic feldspar commonly is slightly more abundant than plagioclase; biotite as finely disseminated crystals and as clusters of crystals associated with altered hornblende.
Porphyritic quartz monzonite...	bfla	.2-1	Light gray, tinted pink, fine grained; plagioclase (2-6 mm) phenocrysts common.	Hypautomorphic or xenomorphic porphyritic.	30 (groundmass, An ₃₅₋₄₀ *; phenocrysts, An ₄₀₋₄₅)	35	30	5 bi only	a, c, m, s, z	6	2.55-2.62	2.58	---do-----	Plagioclase phenocrysts embayed by alkalic feldspar and quartz; biotite as disseminated ragged grains.
Quartz monzonite-----	bflb	.5-1	Light brownish gray to grayish pink, fine grained; local phenocrysts of plagioclase (1-4 mm), abundant chlorite and epidote.	Hypautomorphic or xenomorphic granular, locally porphyritic.	35-45 (An ₃₅₋₄₅ *; locally An ₄₅₋₅₀ *)	25-30	25-30	5 to 10 bi only	a, c, e, m, s, z	4	2.62-2.67	2.65	---do-----	Plagioclase deeply embayed by alkalic feldspar and quartz and moderately to strongly saussuritized; biotite as finely disseminated grains; abundant chlorite probably derived from hornblende.
Quartz monzonite porphyry----	bflc	.05-1	Light gray, very fine grained; abundant crystals of alkalic feldspar (2-8 cm), plagioclase (3-8 mm), quartz (1-6 mm), biotite (.5-4 mm).	Xenomorphic porphyritic.	5 45 (An ₃₅₋₄₀)	5 25	5 20	5 10	c, s	2	-----	2.64	---do-----	Groundmass of rock is composed of nearly equal amounts of alkalic feldspar and quartz, and comprises about 50 percent of the rock; alkalic feldspar crystals clearly replace groundmass; quartz phenocrysts rounded, deeply embayed and corroded by groundmass minerals, and locally appear granulated; biotite phenocrysts also deeply corroded by groundmass minerals, sparse hornblende needles rudely aligned; mafic minerals largely chloritized.
Porphyritic quartz monzonite...	bfd	.2-1	Medium gray to medium dark gray, fine grained; phenocrysts of plagioclase (1-4 mm) common.	Xenomorphic porphyritic.	25 (An ₃₅₋₄₅ *)	35	30	10	c, m	3	2.67-2.69	2.67	---do-----	Cores of plagioclase saussuritized; biotite finely disseminated; chlorite and magnetite probably derived from hornblende common.

¹ Size range of phenocrysts shown thus: (3-5 mm).
² Anorthite content shown thus: (An₃₅₋₄₅); plagioclase commonly progressively zoned; *indicates plagioclase crystals, commonly andesine, enclosed by thin rim of oligoclase (An₂₅₋₃₀).

³ Alkalic feldspar is typically microcline microperthite.
⁴ a, apatite; c, chlorite; e, epidote; f, fluorite; m, magnetite; s, sphene; z, zircon.
⁵ Percent of total phenocrysts, groundmass excluded.