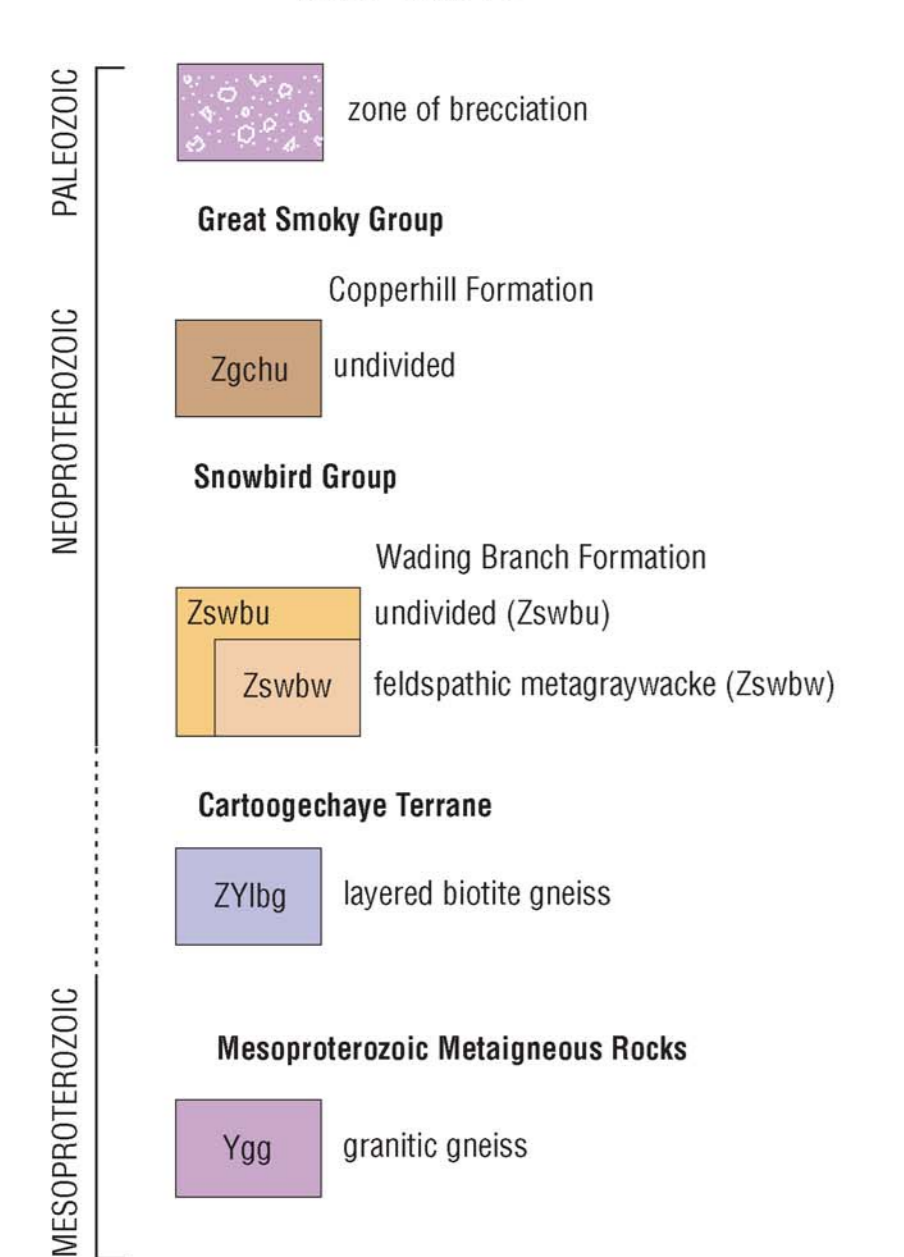
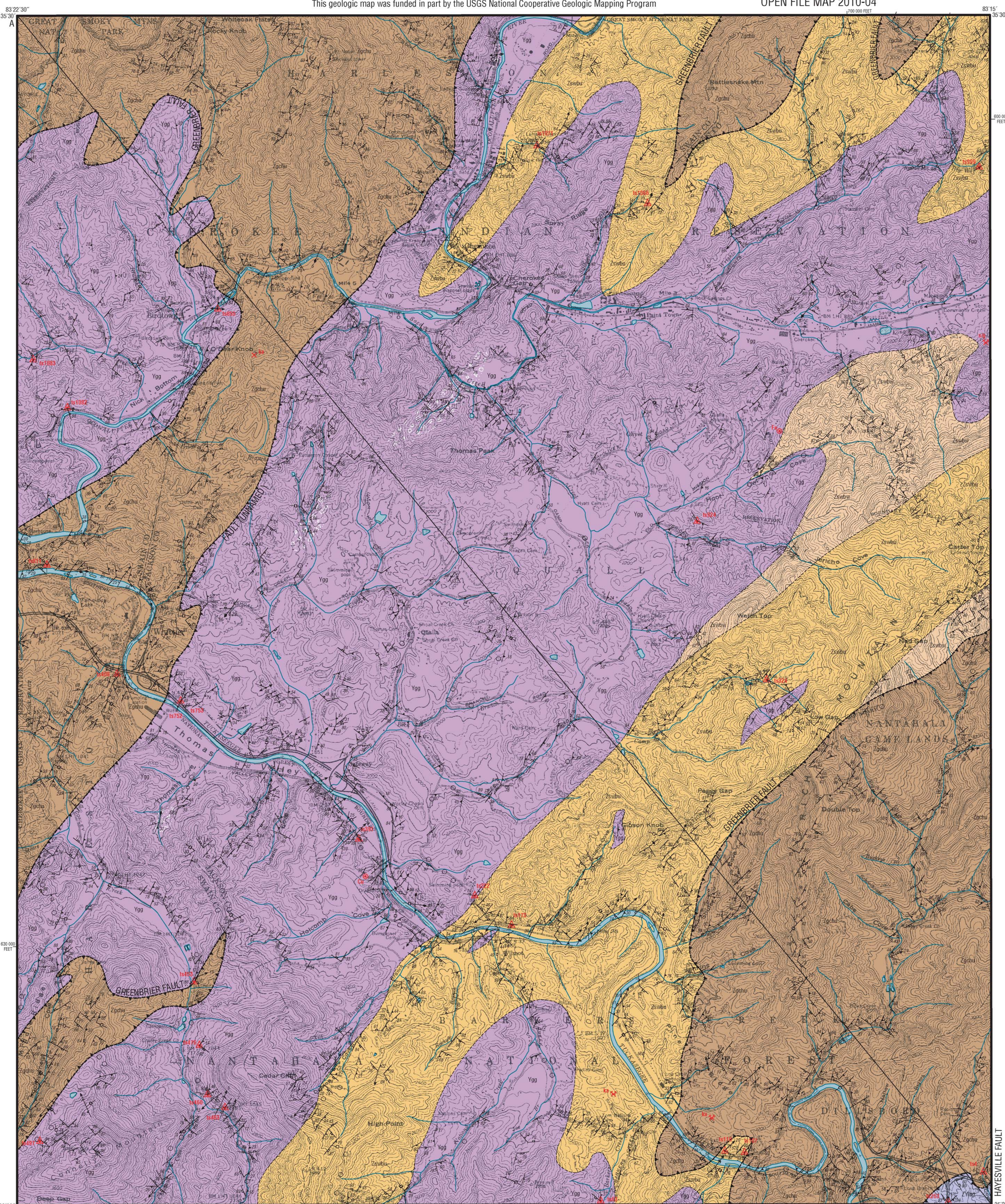
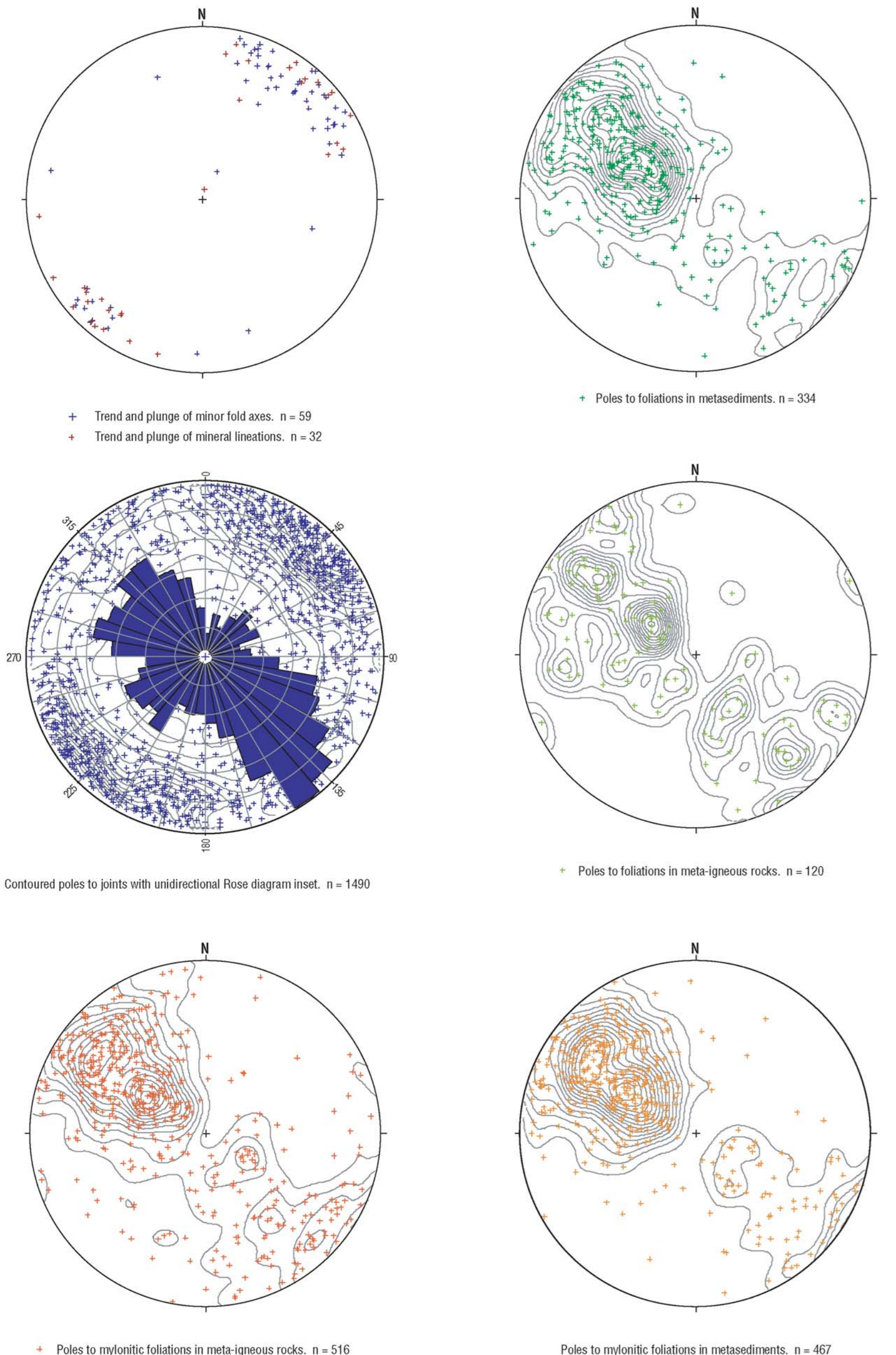


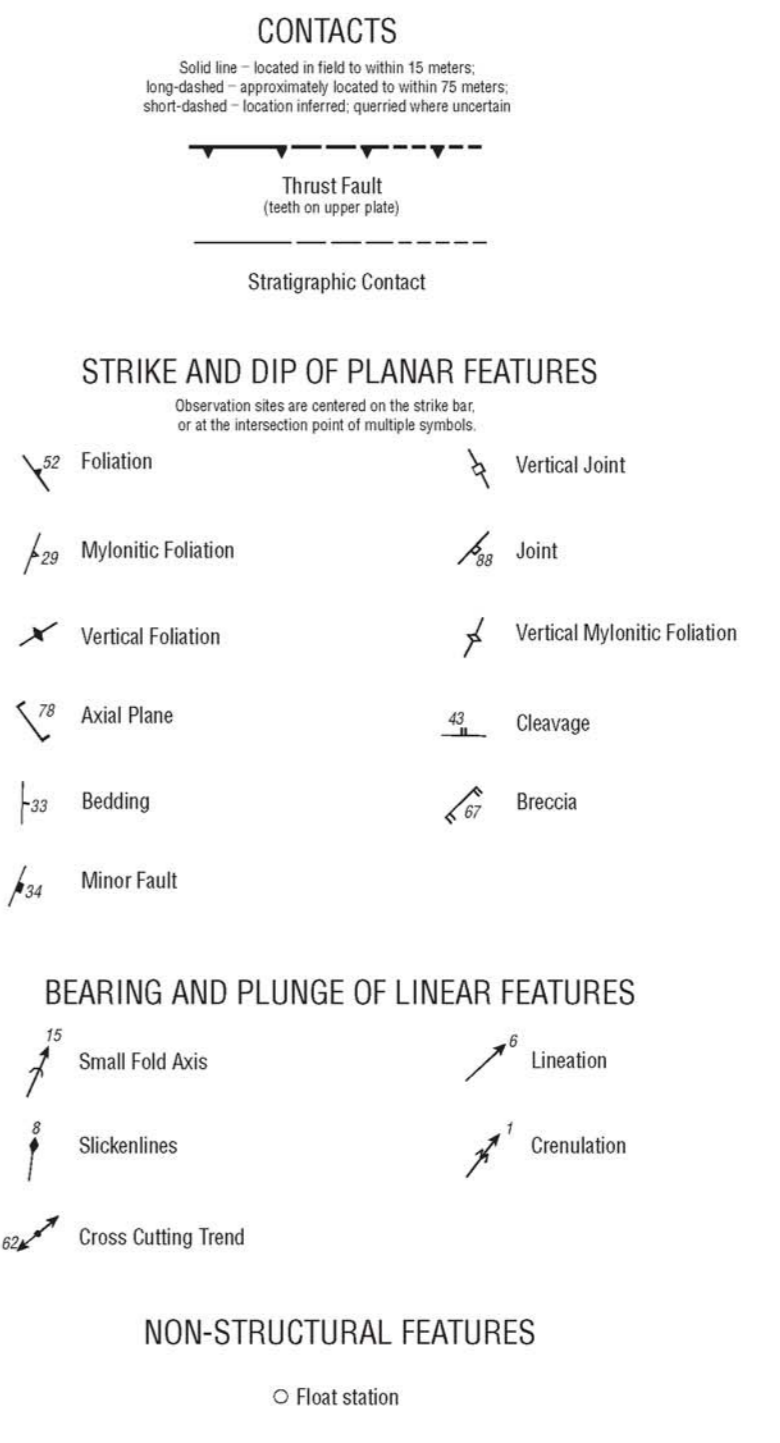
MAP UNITS



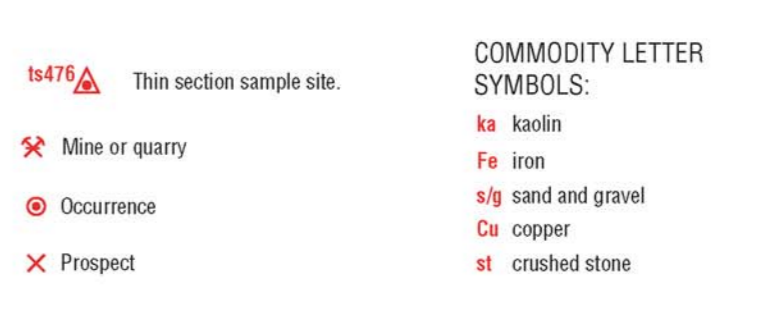
SCHMIDT EQUAL AREA STEREOINET DATA



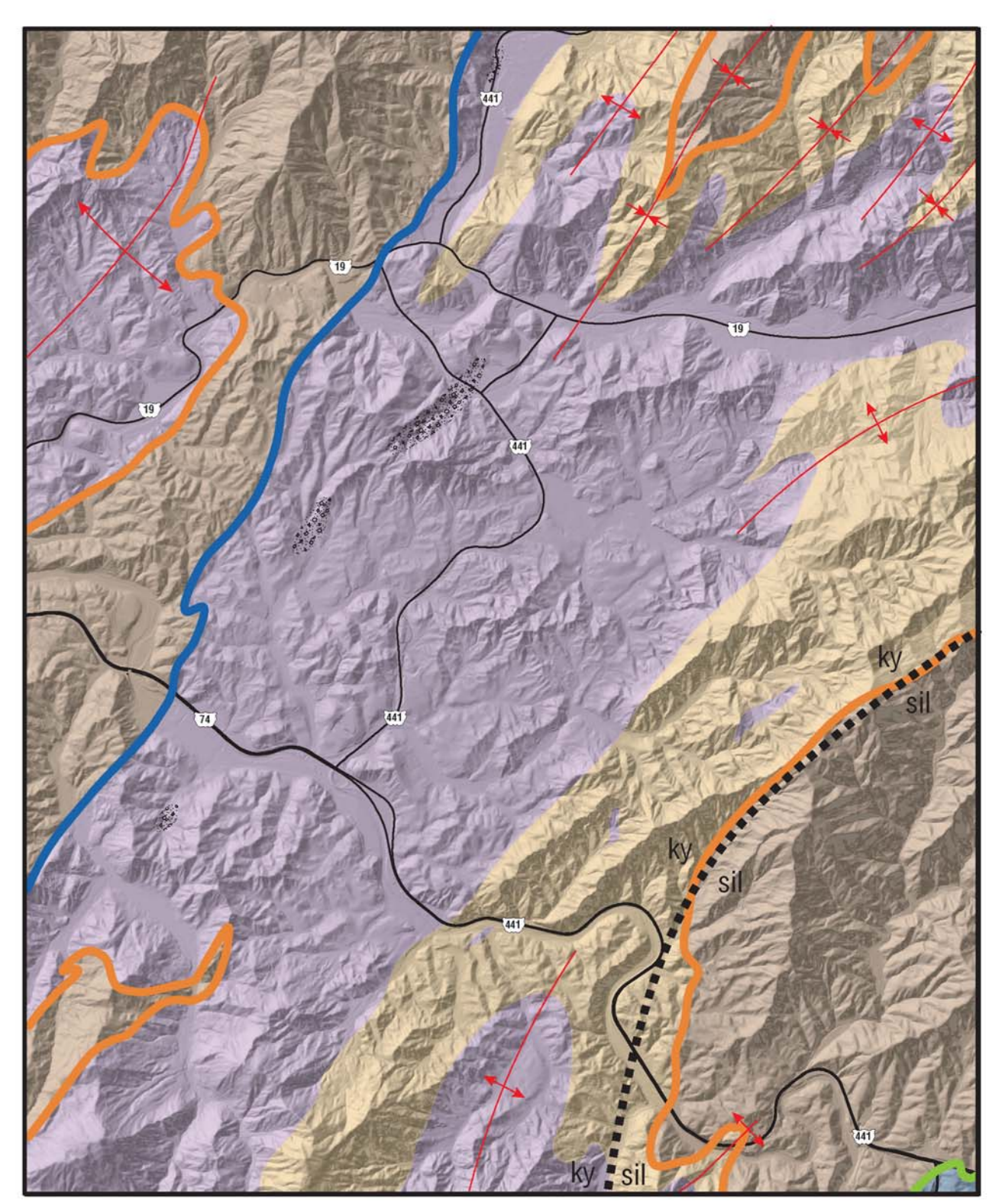
STRUCTURAL FEATURES



MINERAL RESOURCES



TECTONIC AND METAMORPHIC CONDITIONS



ROCK DESCRIPTIONS

**GREAT SMOKY GROUP**  
**COPPER HILL FORMATION UNDIVIDED (Zgchu)** — Thick, interbedded sequence of metagraywacke, schistose metagraywacke, schist, granule metaconglomerate and calc-silicatic.

**Schist** is medium dark gray to dark gray; medium- to coarse-grained; inequigranular; lepidoblastic; thin to medium-grained; locally migmatic; locally sulfidic; consists of quartz, plagioclase, muscovite, potassium feldspar, garnet, epidote group minerals and minor accessory minerals.

**Schistose metagraywacke** is medium gray to medium dark gray, commonly stained yellowish dark gray; strongly foliated; fine- to medium-grained; inequigranular to lepidoblastic; locally migmatic; locally sulfidic; consists of quartz, plagioclase, muscovite, biotite, garnet, kyanite and/or sillimanite, and iron sulfide minerals (pyrrhotite, pyrite).

**Schist** is medium gray to medium dark gray; medium- to coarse-grained; inequigranular; lepidoblastic; thin to medium-grained; locally migmatic; locally sulfidic; consists of muscovite, biotite, quartz, garnet, kyanite and/or sillimanite, pyrrhotite, pyrite, graphite, and other accessory minerals.

**Granule metaconglomerate** is medium gray to dark gray; medium- to coarse-grained; poorly sorted to graded; subangular to subrounded grains; granule to pebble conglomerate with a sandy matrix in which the larger grains are usually well sorted and consist of clear to white quartz, white feldspar, and finer blue quartz.

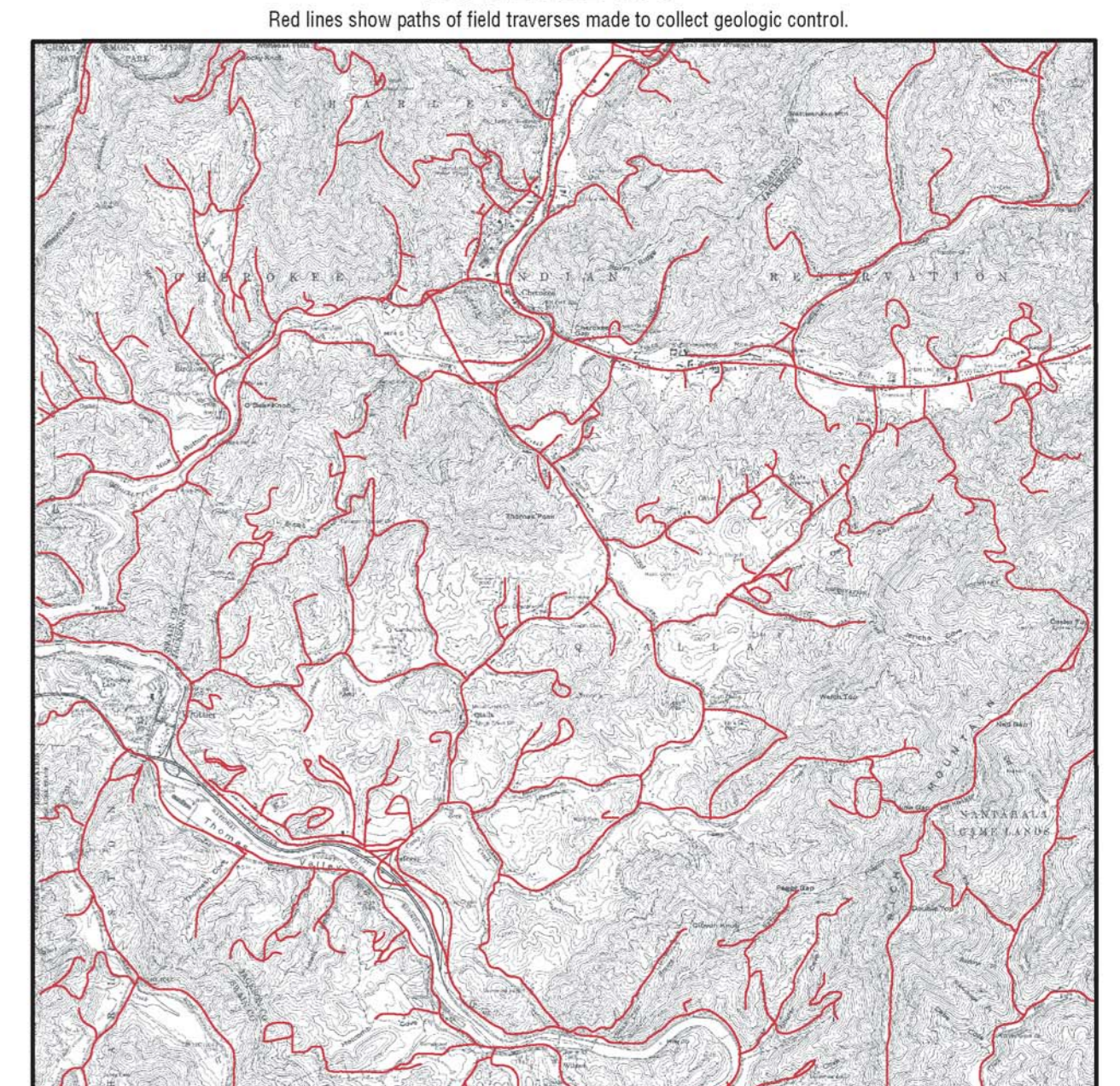
**SNOWBIRD GROUP**  
**WADING BRANCH UNDIVIDED (Zswbu)** — Dominantly schistose metagraywacke interbedded with metagraywacke, muscovite schist and granule metaconglomerate. Schistose metagraywacke is medium gray to dark gray, medium-grained; inequigranular; lepidoblastic; well foliated; thin layered; consists of quartz, muscovite, potassium feldspar, plagioclase, biotite, ilmenite and other black opaque minerals, and minor accessory minerals. Metagraywacke is pinkish gray to grayish-pink coarse-grained; feldspathic.

**WADING BRANCH FELDSPATHIC METAGRAYWACKE (Zswbw)** — feldspathic metagraywacke interbedded with granule conglomerate with minor schistose metagraywacke and muscovite schist. Feldspathic metagraywacke is moderate reddish orange to pinkish gray to tan; medium- to coarse-grained; well foliated; commonly mylonitic; poorly to moderately well sorted; subrounded fragments; medium- to thick-bedded; consists of quartz, potassium feldspar, plagioclase, sericite and minor accessory minerals.

**CARTOOGECWAY TERRANE**  
**LAYERED BIOTITE GNEISS (ZYtbg)** — medium gray to dark gray; inequigranular; granoblastic to lepidoblastic; well foliated; migmatic; highly layered; layer thickness ranges from millimeters to meters; consists of plagioclase, quartz, biotite, hornblende, garnet, potassium feldspar, epidote group minerals, muscovite, ilmenite and minor accessory minerals. Interlayered with biotite gneiss, amphibolite, and biotite schist.

**MESOPROTEROZOIC METAIGNEOUS ROCKS**  
**GRANITIC GNEISS (Ygg)** — A heterogeneous metamorphosed igneous unit dominated by granitic gneiss interlayered with biotite granitic gneiss, amphibolite and garnetiferous gneiss. Granitic gneiss is pinkish gray to brownish gray to light gray; medium- to coarse-grained; inequigranular; granoblastic to lepidoblastic; mylonitic to weakly foliated; consists of plagioclase, quartz, potassium feldspar, biotite, sericite, epidote group minerals, garnet, hornblende and accessory minerals. Amphibolite occurs as minor pods and lenses ranging in size from millimeters to meters.

TRAVERSE MAP



WHOLE ROCK ICP ANALYSIS\* OF SELECTED SAMPLES

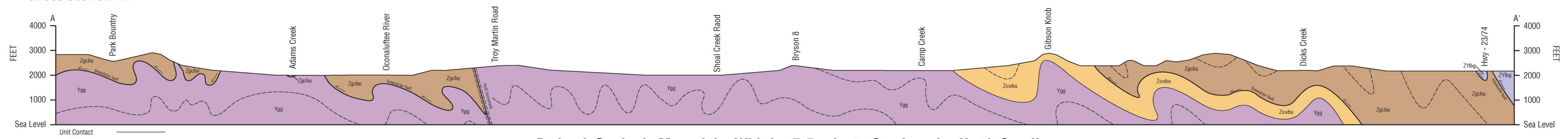
SAMPLE #	COORDINATES (State Plane NAD 83)	ROCK TYPE	MAP UNIT	OXIDES IN PERCENT														ELEMENTS IN PPM <sup>†</sup>													
				SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	MgO	CaO	Na <sub>2</sub> O	K <sub>2</sub> O	TiO <sub>2</sub>	P <sub>2</sub> O <sub>5</sub>	MnO	Cr <sub>2</sub> O <sub>3</sub>	Co	Ba	Zn	Ni	Cu	Sr	Zr	Y	Hf	Mo	Ag	Li	SUM <sup>‡</sup>				
10106	330.317N; 200.50E	mylonitic metagraywacke	Zgchu	51.8	12.20	5.5	1.02	1.86	1.59	0.38	1.52	0.16	0.00	12	466	77	21	35	135	300	157	34	19	13	1	100.28					
10107	189.263N; 200.23E	muscovite schist	Zgchu	58.5	19.55	3.59	1.28	0.73	1.36	0.50	0.85	0.24	0.05	0.00	51	1028	256	33	27	94	132	144	45	13	17	6.5	99.98				
10108	201.909N; 218.59E	mylonitic schistose metagraywacke	Zgchu	60.26	25.18	11.22	1.92	0.42	0.52	0.91	0.24	0.12	0.01	18	894	89	28	37	83	176	222	81	31	23	19	59.98					
10109	198.280N; 213.23E	mylonitic granitic gneiss	Ygg	68.56	14.21	3.75	1.2	1.62	1.79	6.50	0.34	0.13	0.05	0.00	< 1401	46	< 20	25	315	296	121	34	18	8	1.3	99.98					
10110	188.857N; 212.90E	felsic gneiss	Ygg	72.89	12.29	3.19	0.2	1.09	2.53	5.51	0.2	0.13	0.04	0.00	8	1038	29	< 20	267	800	64	40	7	0.7	100						
10111	189.280N; 213.23E	sandstone	Zgchu	75.47	11.95	4.7	1.56	1.15	2.14	2.64	0.69	0.12	0.05	0.00	15	560	84	< 20	163	263	462	29	10	1.4	99.97						
10112	192.030N; 218.59E	mylonitic metagraywacke	Zgchu	77.71	10.64	3.38	0.72	1.19	2.09	1.12	0.65	0.14	0.09	0.00	13	272	53	< 20	31	179	539	31	32	12	6.5	99.99					
10222	192.030N; 217.23E	pyrrhotitic granitic gneiss	Ygg	62.31	14.95	4.89	1.07	2.33	3.39	3.76	0.53	0.18	0.04	0.04	5	1232	89	< 20	28	414	248	124	27	13	10	1.4	99.99				
10223	188.200N; 223.00E	layered migmatite	ZYtbg	52.86	20.56	10.44	3.09	1.95	2.37	4.4	1.13	0.34	0.16	0.016	48	1039	167	22	31	258	376	171	70	24	23	6.96					
10224	184.900N; 203.60E	metagraywacke	Zgchu	62.15	9.49	4.99	1.01	0.97	1.38	3.39	0.42	0.13	0.05	0.05	< 62	10	< 20	< 20	1933	488	117	16	12	9	2.7	100					
10391	193.142N; 216.40E	metagraywacke	Zgchu	58.97	20.78	7.87	0.24	2.13	0.48	0.23	0.93	0.22	0.14	0.006	6	886	83	< 20	29	183	479	74	36	15	7.2	99.98					
10408	191.579N; 213.07E	mylonitic metagraywacke	Zgchu	49.21	24.9	11.02	3.11	1.88	1.60	2.89	0.82	0.19	0.01	0.01	35	855	85	28	127	170	164	73	19	0.7	99.98						
10409	191.579N; 214.43E	mylonitic metagraywacke	Zgchu	70.92	14.55	7.8	0.28	2.13	3.45	4.59	0.35	0.11	0.04	0.004	< 1662	40	< 20	24	513	164	35	5	4	0.2	99.99						
10410	190.050N; 214.70E	mylonitic metagraywacke	Zgchu	60.73	14.46	3.53	0.9	2.14	3.18	4.43	0.43	0.26	0.004	< 1305	54	< 20	24	373	252	129	14	14	5	0.7	99.99						
10411	190.700N; 214.43E	mylonitic granitic gneiss	Ygg	57.45	17.36	4.41	2.71	3.43	2.73	2.83	1.1	0.26	0.12	0.00	7	467	128	< 20	33	364	264	76	11	13	2.4	99.99					
10412	189.250N; 212.90E	trondhjemite	Ygg	69.25	14.42	3.42	0.82	1.26	2.26	3.96	0.41	0.13	0.06	0.003	< 1599	41	< 20	21	444	186	60	14	7	6.3	99.99						
10413	188.770N; 213.04E	mylonitic granitic gneiss	Ygg	62.01	8.32	1.71	0.18	0.32	0.86	0.58	0.06	0.02	0.005	< 1347	6	< 20	190	348	< 20	22	12	3	0.7	100							
10414	194.800N; 214.30E	mylonitic granitic gneiss	Ygg	63.02	14.21	3.62	0.9	2.6	2.53	5.22	1.06	0.39	0.003	10	2400	109	< 20	27	445	918	141	37	26	5	1.8	99.99					
10415	194.800N; 214.30E	alter mylonite	Zgchu	60.84	15.29	5.02	1.09	4.57	3.33	3.39	1.32	0.8	0.11	0.003	6	1649	125	< 20	22	700	436	173	32	15	1.1	99.99					
10416	190.400N; 212.90E	mylonitic metagraywacke	Zgchu	61.16	7.95	3.96	0.76	0.24	4.35	0.44	0.07	0.04	0.002	6	1196	48	< 20	31	121	227	32	10	6	5	1	99.99					
10417	190.400N; 215.00E	granitoid schist	Ygg	67.89	12.23	5.16	0.65	3.37	1.86	4.26	0.56	0.17	0.11	0.003	8	1649	125	< 20	22	700	436	173	32	15	1.1	99.99					
10418	196.640N; 200.51E	granitoid schist	Ygg	36.07	8.28	20.26	22.1	2.87	0.21	0.08	1.4	0.03	0.23	0.333	70	40	130	400	138	23	78	< 20	18	22	28	6.94					
10419	200.620N; 223.00E	meta-schist	Ygg	60.08	6.47	1.65	0.06	0.11	0.28	3.88	0.18	0.02	0.02	0.003	< 920	10	< 20	25	102	126	31	12	< 1	0.9	100						

This Open-File Map is preliminary. It has not been externally reviewed for conformity with the North Carolina Geological Survey Geologic Map Series editorial standards or with the North American Stratigraphic Code. Further revisions or corrections to this Open File Map may occur prior to its release as a North Carolina Geological Survey map.



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CROSS SECTION A-A'



Bedrock Geologic Map of the Whittier 7.5-minute Quadrangle, North Carolina

By  
 Bart L. Cattanaach and G. Nicholas Bozdog

Geology mapped from August 2009 to June 2010. Map preparation, digital cartography and editing by G. Nicholas Bozdog and Bart L. Cattanaach.

2010