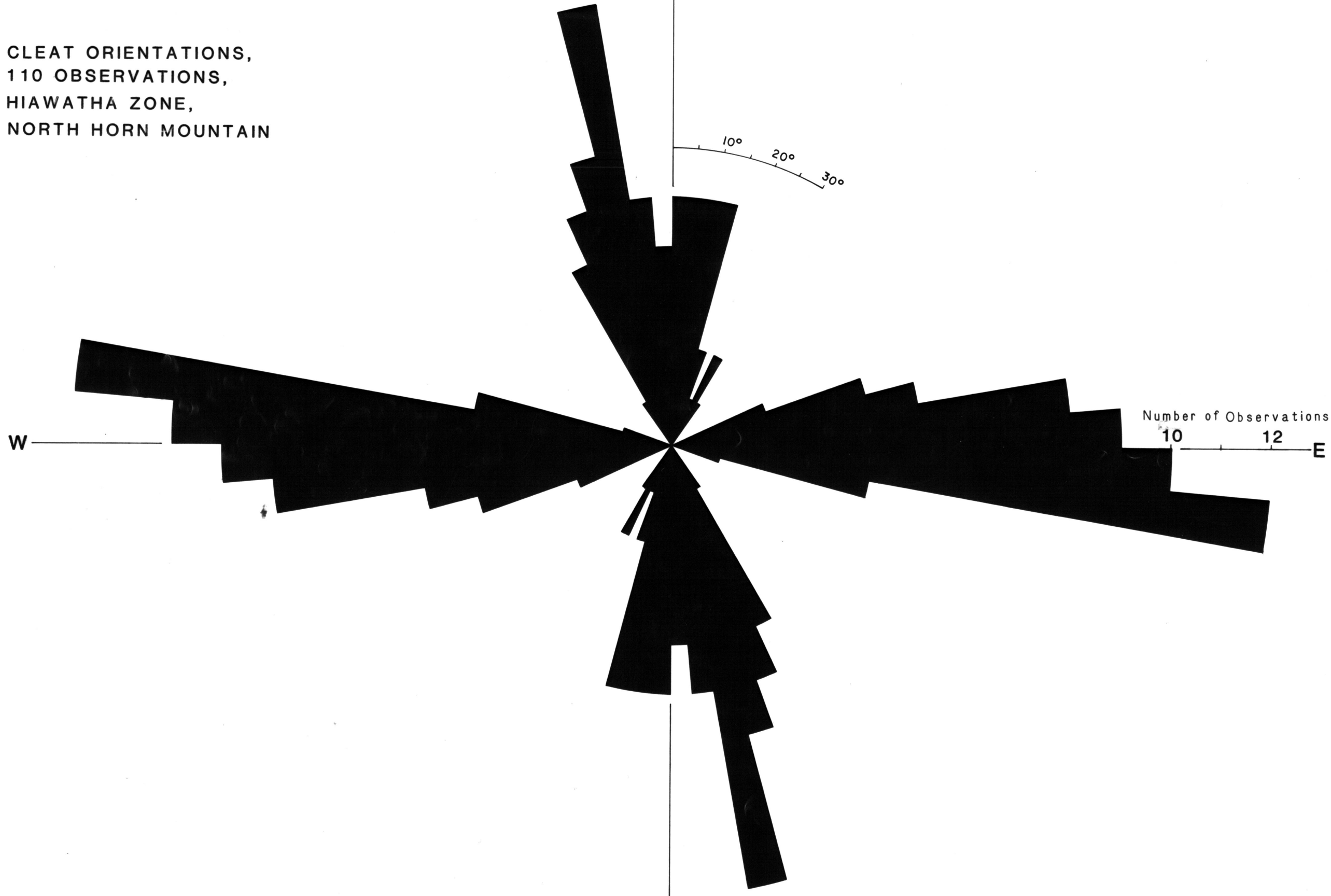
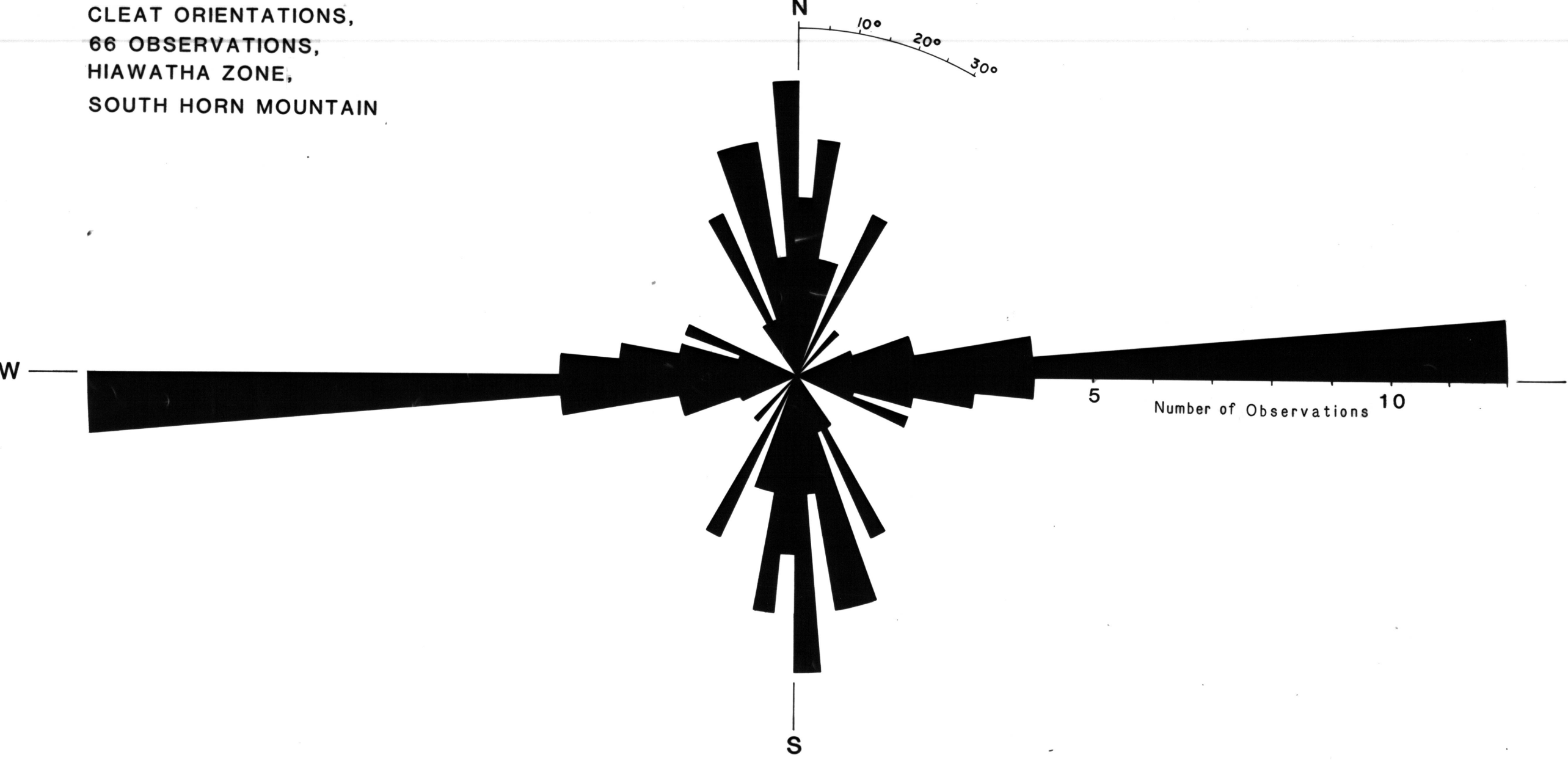


STRATIGRAPHIC SEQUENCE OF EXPOSED ROCKS			
NOT TO SCALE			
SYSTEM	SERIES	FORMATION	DESCRIPTION
QUATERNARY	Holocene and Pleistocene	Surficial deposits	ALLUVIUM (Qal)—Mostly moderately sorted and stratified subrounded to subangular clay, silt, sand, and gravel; includes some colluvium and alluvial fan deposits, particularly in broad valleys PEDIMENT DEPOSITS (Qpd)—Poorly sorted and stratified deposits composed of sub-angular to subrounded pebble- to boulder-sized clasts of reworked local sediments with interstitial clay, silt, and sand; locally partially cemented by calcium carbonate LANDSLIDE DEPOSITS (Qls)—Poorly sorted deposits of older surficial deposits and bedrock blocks derived mainly from Flagstaff Limestone and North Horn Formation COLLUVIUM (Qc)—Poorly sorted and stratified subangular to angular clay, silt, sand, and gravel
		Unconformity	
TERTIARY	Eocene	Flagstaff Limestone	FLAGSTAFF LIMESTONE (Tf)—Limestone, dark-bluish- to yellowish-gray; contains subordinate light-bluish- to yellowish-gray fine- to medium-grained medium even-bedded sandstone interbeds, shale interbeds, and very light- to yellowish-gray volcanic ash interbeds; cliff-forming. Moderate- to dark-reddish-brown fine- to medium-grained thin- to medium even-bedded sandstones occur in some localities in the upper part exposed in quadrangle. Fresh-water gastropods occur locally. Base conformable with North Horn Formation in map area. Only lower 35 m present in quadrangle. Formation 150-300 m thick elsewhere on Wasatch Plateau
		Unconformity	
TERTIARY	Paleocene	North Horn Formation	NORTH HORN FORMATION (Tkh)—Shale, gray, grayish-purple, moderate-red, or variegated; contains interbeds of light-brown fine- to coarse-grained medium even-bedded and massive lenticular sandstone, and thin- to medium-bedded gray limestone and lenticular conglomerate; slope-forming. Contains vertebrate fossils, particularly reptilian and mammalian. Base conformable and gradational with Price River Formation. About 375 m thick
		Price River Formation	PRICE RIVER FORMATION (Kpr)—Sandstone, grayish- to dark-yellowish-orange fine- to coarse-grained medium-crossbedded to massive; massive beds usually white to pinkish-gray; subordinate pinkish-gray to dark-yellowish-orange pebble to cobble conglomerate; clasts predominately light-gray quartzite, light-gray quartzitic sandstone, and grayish-black chert; medium-dark- to olive-gray shale. Great white sandstone unit mostly very pale orange to pinkish-gray medium- to coarse-grained massive; locally conglomeratic; stepped-topography-forming. Base conformable and gradational with Castlegate Sandstone. 30-60 m thick
CRETACEOUS	Upper Cretaceous	Castlegate Sandstone	CASTLEGATE SANDSTONE (Kc)—Sandstone, very pale orange to pinkish-gray medium- to coarse-grained massive; locally conglomeratic; local medium-dark-gray siltstone lenses; cliff-forming. Base locally unconformable with Blackhawk Formation; probably low-relief erosional surface. 60-85 m thick
		Unconformity (local)	
	Cretaceous	Blackhawk Formation	BLACKHAWK FORMATION (Kb)—Sandstone, grayish-orange to light-brown fine- to medium-grained medium- to large-crossbedded; moderate-yellowish-brown to medium-dark-gray shale; light-gray to medium-dark-gray siltstone; coal; stepped-topography-forming. Base conformable with Star Point Sandstone; paleochannels into upper Star Point Sandstone locally present. 185-230 m thick
		Star Point Sandstone	STAR POINT SANDSTONE (Ksp)—Sandstone, light-gray very fine grained to fine-grained massive to planar laminated; white to very light gray "cap" locally present; light-gray siltstone; light-gray shale; cliff-forming. 60-120 m thick
CRETACEOUS	Mancos Shale	Mancos Shale	MANCOS SHALE—Shale, dark- to light-gray, silty; gray siltstone; and yellow, brown, and gray, very fine grained to medium-grained sandstone. Only upper 375 m present in quadrangle. Total thickness about 1,255 m at Quitcaph Creek 25 km to the south (Spieker, 1931) Upper part of Blue Gate Shale Member (Kmb)—Shale, gray, silty; gray siltstone; and gray very fine grained sandstone. About 255 m thick Upper part of Emery Sandstone Member (Kme)—Sandstone, gray to yellow, very fine grained, thin-bedded; gray silty shale; and gray siltstone. About 25 m thick Middle part of Emery Sandstone Member (Kme)—Shale, gray, silty; gray siltstone; and gray very fine grained sandstone. 35-60 m thick Lower part of Emery Sandstone Member (Kme)—Sandstone, gray to yellow, very fine grained, thin-bedded; gray silty shale; and gray siltstone. 35-50 m thick Lower part of Blue Gate Shale Member (Kmb)—Shale, gray, silty; gray siltstone; and gray very fine grained sandstone. Only upper 25 m present in quadrangle. Lower part of member 503 m thick at Quitcaph Creek 25 km to the south (Spieker, 1931)

CLEAT ORIENTATIONS,
110 OBSERVATIONS,
HIAWATHA ZONE,
NORTH HORN MOUNTAIN



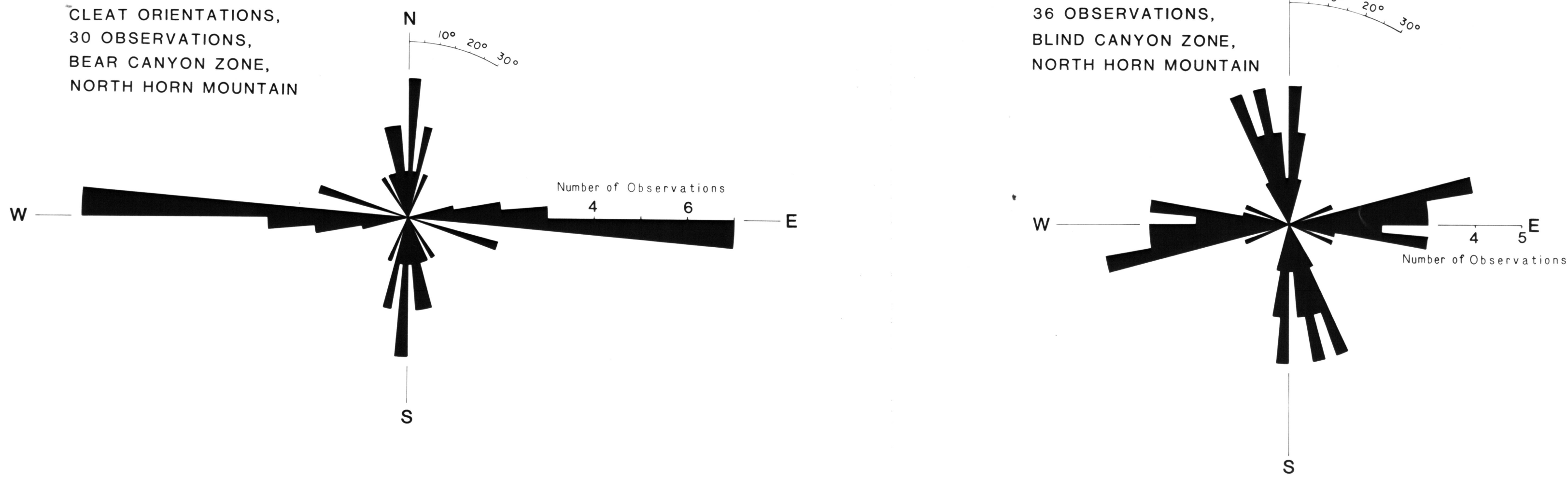
CLEAT ORIENTATIONS,
66 OBSERVATIONS,
HIAWATHA ZONE,
SOUTH HORN MOUNTAIN



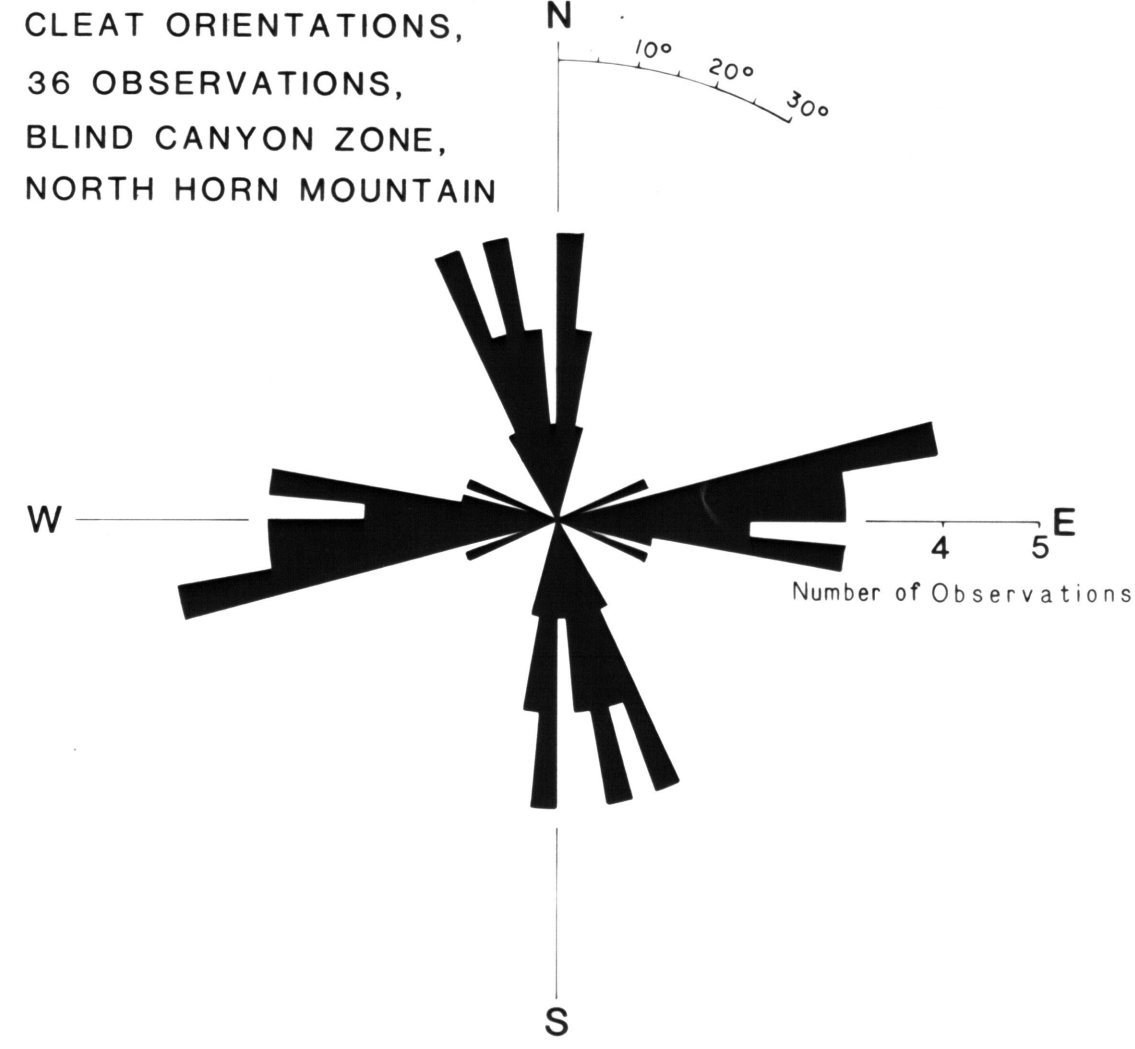
GEOLOGIC MAP AND COAL SECTIONS OF THE CAP QUADRANGLE, EMERY COUNTY, UTAH

By
Eugene G. Ellis
1981

CLEAT ORIENTATIONS,
36 OBSERVATIONS,
BEAR CANYON ZONE,
NORTH HORN MOUNTAIN



CLEAT ORIENTATIONS,
BLIND CANYON ZONE,
NORTH HORN MOUNTAIN



CORRELATION OF MAP UNITS			
Qal	Holocene and Pleistocene	QUATERNARY	Unconformity
Qpd			
Qls			
Qc	Eocene	TERTIARY	Unconformity
Tf			
Tkh			
Kpr	Paleocene	TERTIARY	Unconformity
Kc			
Kb			
Ksp	Upper Cretaceous	CRETACEOUS	Unconformity
Kmb			
Kme			
Kmb	Upper Cretaceous	CRETACEOUS	Unconformity
Kmb			
Kmb			

LIST OF MAP UNITS			
Qal	Alluvium	Kb	Blackhawk Formation
Qpd	Pediment deposits	Ksp	Star Point Sandstone
Qls	Landslide deposits	Kmb	Mancos Shale
Qc	Colluvium	Kme	Upper part of Blue Gate Shale Member
Tf	Flagstaff Limestone	Kme	Upper part of Emery Sandstone Member
Tkh	North Horn Formation	Kme	Middle part of Emery Sandstone Member
Kpr	Price River Formation	Kme	Lower part of Emery Sandstone Member
Kc	Castlegate Sandstone	Kmb	Lower part of Blue Gate Shale Member

CONTACT—Dashed where approximately located; dotted where concealed
FAULT—Dashed where approximately located; dotted where concealed;
questioned where conjectured. Bar and ball on downthrown side
COAL SECTION—Circled number refers to measured coal section. Line
points to top of coal section
STRIKE AND DIP OF BEDS

INTRODUCTION
The Cap quadrangle, in Emery County in central Utah, was mapped in 1977-79 as part of the U.S. Geological Survey's program to evaluate lands in the public domain for potential coal leasing. Mapping was done using U.S. Forest Service color aerial photographs at a scale of 1:15,840 on U.S. Geological Survey topographic maps at a scale of 1:24,000. The quadrangle was mapped previously by Spieker (1931) at a scale of 1:62,500.

GEOGRAPHY
The quadrangle is named for The Cap which is the top of North Horn Mountain in the northwestern part of the area about 14 km west of Orangeville, Utah. This area is part of the Wasatch Plateau and altitudes are from 1,825 m in the southeastern part of the quadrangle to 2,945 m in the northwestern part. There are no perennial streams in the area; the largest intermittent stream flows southeastward through Rock Canyon draining the central part of the quadrangle. North Horn and South Horn Mountains are gently rolling uplands bordered on the east by stepped-cliffs about 360 m high.

Resistant sandstones and limestones form cliffs throughout the area with less resistant shales forming gentler slopes that, in places, are covered by hummocky landslide deposits. Throughout the quadrangle, small areas of badlands have been formed in the shales of the Upper Cretaceous and Paleocene North Horn Formation, most notably on the western slopes of North Horn Mountain in the western part and in the Upper Cretaceous Mancos Shale in the eastern part. Extensive pediments slope eastward from the plateau cliffs.
Access to much of the area is by foot or by four-wheel-drive vehicle; the only improved (light-duty dirt) road is on the southern slope of North Horn Mountain. Unimproved dirt roads provide access to other points of both mountains and valley areas. There are no permanent habitations or active mines in the area.
Annual precipitation varies from less than 15 cm to at least 50 cm and increases with altitude. The vegetation zones found in this area are the Upper Sonoran, Transition, Canadian, and Hudsonian (U.S. Forest Service, 1978).

STRATIGRAPHY
Sedimentary rocks total about 1,100 m in thickness and range in age from Late Cretaceous to Tertiary. Lithology and thickness of the units are shown in the generalized stratigraphic section.

North Horn Formation is a flood-plain lacustrine facies, well known for its vertebrate fossils. Fossils of reptilia and mammals, in particular, have been described by researchers from the Smithsonian Institution (Gazin, 1941; Gilmore, 1946) and from various universities (for example, Jensen, 1966).

The Upper Cretaceous Price River Formation contains a distinct marker bed approximately 20 m thick about 30 m below the top of the formation. This marker bed, informally named the great white sandstone, is lithologically similar to the Upper Cretaceous Castlegate Sandstone in that it is very pale orange to pinkish gray, medium- to coarse-grained, massive, and locally conglomeratic. The great white sandstone forms a prominent cliff in this and adjacent quadrangles.

The Upper Cretaceous Blackhawk Formation is a deltaic facies and contains the major coal resources of the area. The Blackhawk is predominantly sandstone with lesser amounts of shale, siltstone, and coal. The sandstone is thicker and more extensive in the upper part of the formation than in the lower part, which contains the economically valuable coal beds.

The part of the marine, Upper Cretaceous Mancos Shale that occurs in this area has been divided into five units: the upper part of the Blue Gate Shale Member, the upper, middle, and lower parts of the Emery Sandstone Member, and the lower part of the Blue Gate Shale Member. This terminology is a modification of the work of Peterson and Ryder (1975), who reinterpreted parts of the Mancos Shale in southeastern Utah. The threefold breakdown of the Emery Sandstone Member follows that of Spieker (1931), who first mapped the Mancos Shale in this area.

STRUCTURE
The rocks generally dip very gently westward or northwestward in this area. Bideltone Hollow fault zone, with a displacement of about 355 m in this quadrangle, forms the western edge of South Horn Mountain. This graben is an offshoot of the large Joe Valley fault zone to the west; the fault in the extreme southwestern corner of the quadrangle is part of this large fault zone. Within these grabens are numerous small faults of diverse orientations that brecciate the zones. In the Joe Valley Reservoir quadrangle to the northwest, faulting within the Joe Valley fault zone has displaced Quaternary alluvium.

ECONOMIC GEOLOGY
Coal.—The coal beds in the area that meet current classification standards (Bass and others, 1970) are those in the Hiawatha, Blind Canyon, and Bear Canyon zones in the lower part of the Blackhawk Formation. These coal beds are generally lenticular. The lowest coal bed of the Hiawatha zone is usually the most laterally extensive although it may be cut locally by paleochannels. The thickest coal beds occur in the Blind Canyon zone; these beds tend to be less consistent in thickness than those in the Hiawatha zone. The coal beds in the Bear Canyon zone tend to be thin and not very extensive laterally. Coal cleats are oriented approximately N20°W and N90°E.
Coal analyses from this quadrangle (Doelling, 1972) show average values for high-volatile B bituminous coal to be 35.3 percent; moisture 7.7 percent; volatile matter, 38.8 percent; fixed carbon 49.5 percent; ash, 4.3 percent; and sulfur 0.77 percent.
Doelling (1972) reported reserves of 377,830,600 tons for this quadrangle—an estimate based on limited data.

Limestone.—Limestone of potential economic value is found in the lacustrine Flagstaff Limestone. At least some of this limestone meets the purity requirements for potential use in the sulfur dioxide scrubbing systems of coal-burning powerplants and as mine rock dust in coal mines. Analyses of samples have shown this limestone to be generally very pure with an average soluble carbonate percentage of 94.4 (Stamm, 1979).

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CONVERSION TABLE		
To convert	Multiply by	To obtain
Metric units		English units
Centimeters	0.3937	Inches
Meters	3.281	Feet
Kilometers	.6214	Miles

This report has not been edited for conformity with U.S. Geological Survey editorial standards.