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Walter A. Anderson, State Geologist

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Title: Geologic Report to Accompany the Preliminary Geologic Map and Structure Sections of the Poland 15' Quadrangle, Maine

Author: John W. Creasy

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GENERAL INTRODUCTION

Rocks exposed in the Poland quadrangle, Maine, are polydeformed metamorphosed sedimentary rocks intruded by and admixed with S-type granites and genetically-related pegmatites of Devonian age. The metasedimentary rocks at sillimanite and sillimanite + K-feldspar grades of regional metamorphism lie on the southeast flank of the Merrimack Synclinorium and are correlative with lithologies of Silurian age described by Warner (1967) in the adjacent Buckfield quadrangle and by Pankiwskyj, et. al. (1976) and Ludman (1976) to the northeast. The granites are part of the Sebago pluton of Hanley (1939). In this context the geology of the Poland quadrangle may be divided into three zones of structural and lithological significance. The granites (zone 1) dip shallowly to the north and east exposing a broad irregularly-shaped contact zone (zone 2) between it and the structurally paraconformable metasedimentary rocks of zone 3. Rocks of the southern half of the quadrangle (zone 1) are chiefly grey medium-grained biotite-muscovite granites (Dgs) containing minor septa of pelitic metasediments. Granites of the contact zone exhibit textural heterogeneity (Dgh) and contain large and abundant septa of metasediments of diverse lithology; large outcrops of metasediments in this zone may represent *in situ* country rock. The northeastern third of the quadrangle (zone 3) is underlain by metasedimentary rocks correlated with the Sangerville Formation of Hussey (1979) and intruded by irregular but sharply bounded bodies of granite (Dgh) and pegmatite (Dp).

These metasedimentary rocks define a structure interpreted as an isoclinal and recumbent anticline (antiform?) refolded into a north-plunging east-dipping

asymmetric overturned syncline (synform?). Regional emplacement of the granitic rocks is not considered as intrusion into passive and brittle metasedimentary country rocks. Rather, it is interpreted as a dynamic process whereby partially molten and remobilized sedimentary rocks are kinematically related to the overlying and plastically deformed cover rocks through: (a) regional diapiric tumescence and/or (b) regional compressive forces. It is significant that structures observed in the Poland quadrangle have originated with or been strongly affected by this event of granite emplacement. A post-metamorphic normal fault, here defined as the Ben Barrows fault, strikes northeast across the northwest part of the quadrangle with offset down to the northwest.

Base metal mineralization is restricted to minor pyrite and pyrrhotite within fractures systems in the granites and as disseminated grains and mm-scale layers of syngenetic origin within metasedimentary rocks. The granites and calc-silicate rocks are considered as potentially favorable hosts to uranium and tungsten mineralization, respectively. Large-and light-elements are enriched in those pegmatites intrusive into metasedimentary rocks.

Given these general comments, the results and conclusions of this investigation are considered in greater detail below. The reader should consult the accompanying geological and structural maps and structure sections to supplement this narrative.

SCOPE OF INVESTIGATIONS, PREVIOUS WORK, AND ACKNOWLEDGMENTS

These investigations were carried out under contract to the Maine Geological Survey (contract number 911276) with remuneration calculated on a contract period of ten weeks.

Approximately ten weeks were spent in the field during the period 7 June - 29 August 1979 collecting lithologic and structural data. Four senior geology majors from Bates College, supported by a faculty research grant to me, spent a minimum combined total of twenty-three weeks in the field between 16 August - 1 November 1979. During this time I spent an additional two weeks in the field supervising and directing their researches. A minimum of an additional two weeks was devoted to compilation of the accompanying maps and structural sections and to preparation of this narrative.

Previous work in the Poland quadrangle is restricted to: (1) a general report by Fisher (1941); the unpublished Ph.D. thesis of Hanley (1939); a report by Farnsworth (1973) prepared for and on open file with the Maine Geological Survey (map lacking); and a reconnaissance lithologic map of the northeastern part of the quadrangle prepared by Pankiwskyj (1978). Only the data of Hanley (1939) and of Pankiwskyj (1978) have proved helpful in this investigation and in the preparation of the geologic and structural maps.

I acknowledge discussions with and data made available by Kost Pankiwskyj and Arthur Hussey II concerning the geology of the Poland and adjacent Lewiston quadrangle. I gratefully acknowledge my indebtedness to Alan Carter, Lisa Ebinger, Christopher Gammons, and Barbara Rudnick. Detailed mapping by these individuals in the northwestern quarter of the quadrangle stands as a major contribution to this report and represents work done in conjunction with their senior theses. Discussions with all of the aforementioned individuals has shaped and clarified my understanding of the geology and structure of the Poland quadrangle. Any errors of interpretation or of omission are the sole responsibility of the author.

LITHOLOGY AND CORRELATION

METASEDIMENTARY ROCKS

Three general lithologies dominate among the metasedimentary rocks of the Poland quadrangle: (1) fine- to medium-grained biotite-quartz-plagioclase rock with granoblastic texture (hereafter termed granofels); (2) pelitic schists, gneisses, and migmatites and; (3) granoblastic quartz-diopside-garnet plagioclase rock (hereafter termed calc-silicate). Additional minor lithologies include biotite quartzites and amphibolite. Any and all of these lithologies may occur within each of the map units indicated on the accompanying geologic map (described below). A wholly satisfactory stratigraphic column cannot be developed for the quadrangle by virtue of scattered small outcrops, isoclinal repetition of bedding, and the intergradation and/or interlayering of the lithologies themselves. The contacts shown on the geologic map are not sharp and represent a best fit to the available outcrop data. Nevertheless, correlation of map units with the lithologies of other workers (Warner, 1967; Pankiwskyj, et. al., 1976; and Hussey, 1979) is attempted. A brief lithologic description of metasedimentary rocks is represented below.

Calc-silicate rocks (Ssp and including Sstp).

Calc-silicate rocks crop out in at least three distinct belts in the Poland quadrangle. These are considered as the same original stratigraphic horizon for two reasons. First, specimens from each belt of outcrops are indistinguishable from each other. Secondly, a single, not three, calcareous horizon comparable in thickness to each belt (maximum calculated thickness of 1000m) in the Poland quadrangle is present in less metamorphosed and correlative

sections to the northeast (Pankiwskyj, et.al., 1976; Ludman, 1976). This unit is correlated with the Patch Mountain Formation of Warner (1967) and the Patch Mountain Member of the Sangerville Formation (Hussey, 1979).

This unit is comprised chiefly of mm- to cm-thick layers of calc-silicate lithologies interbedded with layers of biotite granofels of similar thickness. The layers of calc-silicate are composed of quartz, diopside, grossularite-rich garnet, actinolite, sphene, plagioclase, and minor calcite and clinozoisite.

Proportions of the first four-named minerals vary from layer to layer but the predominant lithology is granoblastic diopsidic ± garnetiferous quartzite. Siliceous marbles and idocrase-bearing tactite are minor lithologies. The layers of biotite granofels are composed of biotite-quartz-plagioclase in a granoblastic to moderately foliate texture. Garnet is locally a minor constituent but other pelitic indicator minerals are rare. The ratio calc-silicate: biotite granofels varies from 3:1 to 2:3 but most frequently is nearly 1:1. Systematic regional stratigraphic variation of this ratio has not been noted. Outcrops of this unit characteristically weather to produce "ribbon rock".

Although the lithologic alternations probably represent original sedimentary bedding, other primary sedimentologic features are not preserved. The minor (cm- to m-scale) structures so spectacularly displayed in nearly every outcrop indicate isoclinal folding with axial planes parallel to the cm-scale lithologic banding and to foliation, where developed, in the biotite granofels. Thicknesses calculated from the geologic map should thus be considered as an estimate of maximum thickness.

The rocks of Taylor Pond (Sstp) separate the calc-silicate rocks of the Patch Mountain Member (Hussey, 1979) from the metapelitic rocks described below. The best exposures of these rocks are on the low hills east of Taylor Pond and along Hotel Road, Auburn. Included within this map unit are a group of distinctive lithologies that together total approximately 100-200m in thickness. These lithologies include a few thin (10 cm) bands of amphibolite, bedded (cm-scale) calc-silicate, amphibole-biotite quartzite, biotite quartzite, and pelitic or granofelsic rocks containing boudins of calc-silicate.

Pelitic rocks (Ss and Swws).

The metapelitic rocks of the Poland quadrangle crop out: (1) in the eastern and southeastern part of the quadrangle, and (2) in a U-shaped band in the northeast part of the quadrangle. The former is here referred to as the gneiss of Washington Street (Ssws) and the latter as Sangerville Formation undivided (Ss) of Hussey (1979)

The gneiss of Washington Street is correlated with the Waterville Formation by Osberg (1974) and with the Sangerville Formation by Hussey (1979). This investigator has admittedly arbitrarily assigned this map unit to the Sangerville Formation but as a distinct lithology (Ssws) pending further study. This unit is well-described by Hanley (1939) as the Pejepscot Formation. Exposures on Washington Street extension, Auburn, are of medium-grained banded (cm-scale) biotite-garnet-sillimanite (fibrolite) gneiss; leucosome and melanosome are present in roughly equal proportions. Other lithologies include quartz-plagioclase-biotite gneiss and schist. Although broad open

folds are discernable over several outcrops, minor structures are nearly absent in this unit in the southeast part of the quadrangle.

The Sangerville Formation (Ss) cropping out in the northeast part of the quadrangle is separated from the gneiss of Washington Street by intervening outcrops of calc-silicate rock and the rocks of Taylor Pond. At the northern edge of the quadrangle, these rocks are continuous with the Nezinscot Formation of Warner (1967). Biotite-garnet-plagioclase±sillimanite±muscovite schists and gneisses are interlayered (metre-scale) with biotite±garnet granofels; the pelitic lithologies are dominant.

Biotite granofels (Ssa and including Ssal).

Biotite±garnet granofels crops out over a broad region northwest of the Ben Barrows fault and as a U-shaped area in the northeast part of the quadrangle. In both areas, this lithology is correlated with the Noyes Mountain Formation of Warner (1967) and the Anasagunticook Member of the Sangerville Formation of Hussey (1979). North of the Ben Barrows fault the calculated thickness of this unit is approximately 1000m.

To the north of the fault, the unit consists chiefly of fine- to medium-grained biotite-quartz-plagioclase rock. Proportions of these minerals vary giving the cm- to dm-scale banding observed in most outcrops. Anhedral and frequently elongate almandine is present primarily in the western part of this area. Granoblastic texture best developed in the eastern part of this area and to the south of the Ben Barrows fault is imparted to the rock by equant quartz and plagioclase. A weakly-to moderately-developed biotite foilation is present

parallel to the lithologic (mineralogic) banding. Calc-silicate rocks similar to those described above are interbedded with these biotite ± garnet granofels. Minor structures are strikingly absent; where present isoclinal recumbent folds are developed. This together with the granoblastic texture strongly suggests regional (?) thermal recrystallization has occurred.

A thin (30m) calc-silicate horizon is present within the biotite granofels north of the Ben Barrows fault. This interbedded quartz-tremolite-calcite-biotite-plagioclase and quartz-diopside-plagioclase rock is correlated with the Berry Ledge Formation of Warner (1967) and with the metalimestone horizon of the Anasagunticook Member of the Sangerville Formation of Hussey (1979).

GRANITES AND PEGMATITE

Granites and pegmatites intrude all of the map units described above. The granites and pegmatite are correlated with the New Hampshire magma series of Devonian age, although assignment of the granite of Black Cat Mountain to this age is tentative. The granites belong to the Sebago pluton as defined by Hanley (1939) but subdivision into (at least) three map units seems desirable: (1) granite(s) of the Sebago pluton(Dgs); (2) granite(s) with heterogeneous textures and admixed inclusions of metasedimentary rocks (hereafter heterotextural granites)(Dgh), and (3) the granite of Black Cat Mountain (Dgbc). The abundant pegmatites (Dp) genetically related to the first two above-named divisions are separately described.

Granite of the Sebago pluton (Dgs).

The medium-grained foliated grey biotite-muscovite granite cropping out over

the southwestern part of the Poland quadrangle is termed the granite of the Sebago pluton. This granite is broadly homogeneous in texture although gradation to pegmatitic texture may be present in single outcrops. Mineralogic variation is noted as the ratio K-feldspar:total feldspar ranges from 2:3 to 1:3. Biotite content ranges from 2 to 20% and is responsible for the variably developed foliation present in nearly all outcrops. Coarse muscovite is present in all handspecimens where it appears to be a late- (vapor) stage mineral. Small anhedral grains of garnet are a rare to minor constituent in most granites sampled. Septa of metasedimentary rocks, chiefly pelitic in composition are persistently present but not abundant (<2-4%) in all outcrops. Such septa range in size from mm-scale stringers to m-scale inclusions.

In thin section, large optically continuous grains of muscovite and included blebs of quartz preferentially replace alkali feldspar, chiefly along grain boundaries. Chloritization of biotite is common and moderately to pervasively developed. All samples show evidence of post-crystallization deformation such as polygonized and strained quartz, deformed polysynthetic twins in plagioclase, and bent grains of muscovite.

Heterotextural granites (Dgh).

These granites are mineralogically similar to the granites of the Sebago pluton but exhibit much greater textural heterogeneity, ranging from medium-grained granitic to pegmatitic on a cm-scale in a single outcrop. A second distinction is the size (m-scale) and abundance (up to 40%) of metasedimentary inclusions chiefly biotite±garnet granofels and biotite quartzite.

Areas of metasediment up to hundreds of metres in size crop out in this zone and may be either large inclusions within the granite or in situ country rock into which the granite has intruded. The attitudes of such inclusions or septa are sub-parallel to those measured in adjacent metasediments. In addition to the granitic rocks, migmatites are well developed in this unit. The metasedimentary fraction of these migmatites grades from the clearly evident (e.g., Pine Hill in Casco) to a palimpsest visible only on unweathered exposures (e.g., Rock-O-Dundee Hill in Oxford) and, ultimately, to foliated granites.

These observations lead to the conclusions that the heterotextural granites: (1) define the regional contact zone between the granites of the Sebago pluton and the metasedimentary rocks; and (2) record the anatectic origin of these granites.

Granite of Black Cat Mountain

The granite present on Black Cat Mountain is not observed elsewhere in the Poland quadrangle. It is a fine- to medium-grained pink biotite-muscovite granite. No foliation is observed and muscovite is present as large late-stage grains. Aplite dikes cut this granite but no pegmatite dikes have been observed. The texture is nearly homogeneous throughout; only one cm-wide septa of metasediment is present on Black Cat Mountain. The age of this granite relative to that of the more commonly encountered granite(s) of the Sebago pluton is not known but may be younger.

Pegmatite (Dp).

Pegmatite occurs throughout the Poland quadrangle. Within the granite(s) of

the Sebago pluton, schorl- and garnet-bearing biotite-muscovite granitic pegmatites are present as irregularly-shaped pod-like bodies grading into the surrounding granite. Such occurrences are noted in the heterotextural granites but pegmatite also occurs as tabular bodies 1-10m thick in sharp contact with the granite or metasedimentary rocks. Within areas of predominantly metasedimentary rocks, tabular pegmatite bodies parallel the lithologic banding present in the host rocks frequently dipping at low angles to the north and east. However, at contacts sufficiently well-exposed, clear cross-cutting relations are observed with respect to the lithologic banding and to minor folds. The pegmatites hosted by the metasedimentary lithologies are those enriched in light and large-ion elements.

STRUCTURAL GEOLOGY

Rocks of the Poland quadrangle have been subjected to polyphase deformation. Structural data are presented on the accompanying map. Although deformational styles are complex and not fully understood, several structural elements are recognized.

Primary sedimentary bedding (S_o) is recognized as lithologic banding on the cm-scale in the metasedimentary rocks, especially the calc-silicate lithologies. Other primary sedimentary features are not recognized in outcrop. Topping sense interpreted for a few outcrops displaying graded beds (?) is of doubtful significance, however, due to isoclinal folding described below.

Small (cm- to m-scale) isoclinal recumbent folds (F_1) are spectacularly displayed in the calc-silicate rocks. Axial planes of these folds (S_1) are parallel

to the lithologic banding noted above. Similar disharmonic folding is noted albeit infrequently in pelitic lithologies as well. The S_1 foliation is that measured in the field and recorded on the accompanying map.

This S_1 foliation is deformed by F_2 into the north-plunging asymmetric overturned syncline that dominates the northeast part of the quadrangle. Northwest of the Ben Barrows fault asymmetric isoclinal northwest-trending F_2 folds (Stoney Brook syncline of Hanley, 1939) are well displayed on a scale of 10-100m by the calc-silicate. Here the F_2 folds are clearly cross-cut by the pegmatite. Associated with pegmatite injection are F_3 folds developed as small (cm- to m-scale) en eschelon drag folds adjacent to contacts.

The significance of the Poland quadrangle in regional structural interpretations is clear when the north to northwest axes of F_2 folds is contrasted with the predominantly northeast-trending axes of major regional structures to the north and northeast. Guidotti (1965) suggests the northwest-trending asymmetric overturned folds in the Bryant Pond quadrangle are younger than the steeply dipping northeast-trending regional folds. The accompanying geologic map and structural sections suggest the northeast Poland quadrangle is dominated by a recumbent anticline (antiform ?) generated during F_1 and perhaps with an originally northeast trending axis. This F_1 structure has been deformed during the F_2 event into an asymmetric (east steeper than west) north-plunging (20-25°) and isoclinal syncline. Injection of pegmatite parallel to axial planes of F_2 produced gently dipping tabular pegmatite bodies that truncate F_2 folds and generate drag folds (F_3) adjacent to their margins.

Foliation of granitic rocks is also indicated on the accompanying structural map. This foliation is imparted by the parallel alignment of biotite grains or

by the orientation of septa of metasedimentary rocks. Attitudes are generally northeast or east dipping at 25-40° and frequently sub-parallel to adjacent metasedimentary rocks. These low angles of dip, the broad width of the contact zone, and the abundance of granite and pegmatite even in the northeast part of the quadrangle indicate that the granite dips northward and eastward under the structure(s) described above.

A newly discovered normal fault, here named the Ben Barrows fault, cuts northeast across the northwest corner of the quadrangle. The fault is documented on the basis of offset lithologic contacts and of silicified and sheared zones within the granites. The straight trace of the fault, three kilometers of apparent left lateral displacement, and the gentle easterly dips of the strata suggest a high angle fault with approximately 1-2 km of vertical displacement, down to the north. This fault is parallel to and has displacement in the same sense as the Moll Ockett fault (Guidotti, 1965) located 12 km to the northwest.

These structural data from the Poland quadrangle suggest that diapiric emplacement of granite caused regional asymmetric refolding of existing northeast-trending structures about axes parallel to the margin of the developing zone of partially molten and remobilized metasediments. Pegmatites developed as late-stage volatile-rich fluids moved into the overlying metasedimentary rocks parallel to axial planes of minor structures superimposed on the major northwest-trending folds. That brittle adjustment to this "regional tumescence" occurred is suggested by the "down-stepping" along the Ben Barrows and Moll Ockett faults.

Swarms of mafic dikes are present in the southeast corner of the Poland quadrangle. Individual dikes range up to 5 m in width and are traceable for

hundreds of meters. The location and orientation of these dikes is not shown on the accompanying map. However, the vast majority of these dikes strike to the northeast (N40-60E) and dip vertically. The total extension across this dike swarm is not known but 100 to 300 m seems likely.

Joints are well developed in granitic rocks and, to a lesser extent, in the metasedimentary rocks. The attitude of measured joint sets is north- to northeast-striking and vertically dipping.

MINERALIZATION

Pyrrhotite and pyrite are the only base metal sulfides observed in the field. The granites in the vicinity of the Ben Barrows fault are silicified and chloritized; pyrite is present as disseminated grains. Silicified joints within the granite also contain pyrite as disseminated grains. Alteration envelopes developed adjacent to these fractures have a width roughly equal to that of the silicified zone. Although these fractures have acted as solution passageways, the lack of stockwork veining and extensive alteration in the deep structural levels exposed are suggestive of late stage deuteric alteration and not of disseminated sulfide mineralization at present erosional levels or at depth.

The well-documented (Cameron, 1954) light- and large-ion element (Li, B, Cs, Be, U, Th, and P) enrichment in pegmatites is confined to those intruded into the metasedimentary rocks. This suggests a possible genetic connection since the garnet- and schorl-bearing pegmatites within the granite terrain are devoid of such enrichments.

The granites of the Sebago pluton and the heterotextural granites contain large and late-stage muscovite. This occurrence of muscovite, the anatectic origin of the granites, their above-average whole-rock concentration of U, and the radon-enriched groundwaters point to a favorable environment for uranium occurrence. It is suggested that the greatest concentrations and amounts of uranium are within the pegmatites.

The calc-silicate rocks host only minor sulfide mineralization, chiefly pyrrhotite, as disseminated grains and as thin (mm-scale) but locally persistent stringers of probably syngenetic origin. A few grains of scheelite are present in some specimens of the calc-silicate granulite. The regional abundance of calc-silicate rocks recrystallized at high temperatures and in the presence of a volatile flux from the subjacent granites point to a potentially favorable environment for tungsten mineralization.

SUMMARY GEOLOGIC HISTORY

A brief geologic history of the Poland quadrangle is outlined below.

(1) Sedimentation and development of primary bedding (S_o) (and (?) soft-sediment slumping) in Silurian time.

(2) Folding (F_1) to produce measured foliation (S_1) axial planar to minor isoclinal recumbent folds and probably axial planar to quadrangle-scale regional north to northeast-trending steeply dipping to overturned folds (anticline in the northeast part of the Poland quadrangle).

(3) Regional metamorphism of sediments continued in response to heat flux arising from anatexis occurring at deeper structural levels and was accompanied by upward diapiric emplacement of the(se) palingenetic magma(s)

(4) This upward emplacement resulted in the displacement and deformation (F_2) of the overlying metamorphosed rocks into tight meter-scale isoclinal asymmetric folds (observed primarily in the calc-silicate rocks) parasitic to (?) regionally developing north- and northwest-striking north-plunging overturned asymmetric folds (most strikingly, the syncline in the northeast part of the quadrangle).

(5) The continued influx of heat and fluids into the overlying metasedimentary rocks from the granites is noted by the:

(a) recrystallization of metasedimentary rocks to give generally granoblastic textures and (?) partial to total obliteration of pre-existing structures in the metapelite and metawackes, and

(b) emplacement of pegmatite parallel to axial planes of F_2 folds and development of cm-scale drag folds (F_3) adjacent to pegmatite contacts.

(6) The cooling and solidification of the granitic magma(s) was closely followed by:

(a) the muscovitization and chloritization of these granites by late-stage deuteric or hydrothermal fluids and

(b) the development of cooling joints which served as solution passage-ways and which in turn were locally filled by silica.

(7) The post-metamorphic and post-solidification (?) Ben Barrows fault developed as a regional adjustment to the granite tectonics described above.

(8) Injection of swarms of northeast-trending mafic dikes in Triassic (?) time reflected regional extension and mantle-derived magmatism.

It is speculated that the granites of the Sebago pluton in fact may be a multiple intrusion of several thick (100-200m) curved (?) sheets or "fingers" each of which may deform a surrounding envelope of cover rocks and which might, in a regional structural restoration, be stacked one over another with interdigitating metasediments. Hence, the septa preserved within the granitic terrain of the Sebago pluton and its contact zone may represent such interdigitated metasediments.

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GEOLOGY MAPPED BY CREASY, 1979, ASSISTED IN THE NW¼ BY CARTER, EBINGER, GAMMONS, AND RUDNICK AND IN THE NE¼ BY PROUST. THE MAPPING AND OTHER ASSISTANCE PROVIDED BY THE ABOVE NAMED BATES COLLEGE SENIORS IS GRATEFULLY ACKNOWLEDGED. FIELD MAPS OF PANKIWSKYJ, 1978, WERE USED IN THIS COMPILATION PRIMARILY FOR THE NE¼. THE UNPUBLISHED PH.D. OF HANLEY (1939, JOHNS HOPKINS UNIVERSITY) WAS ALSO USED IN THIS COMPILATION. THE COMPILER BEARS SOLE RESPONSIBILITY FOR ERRORS OF OMISSION.

EXPLANATION

INTRUSIVE AND RELATED ROCKS

Dp — PEGMATITE AND MINOR GRANITES WITH VARIABLE GRAIN SIZE.

Dgbc — GRANITE OF BLACK CAT MOUNTAIN. FINE- TO MEDIUM-GRAINED NON-FOLIATE TO WEAKLY FOLIATED PINK BIOTITE GRANITE CONTAINING SECONDARY MUSCOVITE. SEPTA OF METASEDIMENTS GENERALLY LACKING.

Dgs / Dgsm — GRANITE(S) OF THE SEBAGO PLUTON. CHIEFLY FINE- TO MEDIUM-GRAINED FOLIATE GREY BIOTITE GRANITE WITH SECONDARY MUSCOVITE. GARNET IS PRESENT IN SOME OUTCROPS. TEXTURE MAY VARY FROM MEDIUM-GRAINED GRANITIC TO PEGMATITIC WITHIN OUTCROP. SEPTA OF METASEDIMENTS ACCOUNT FOR 1-2% OF OUTCROPS (LOCALLY TO 30-40%); WHERE PRESENT SEPTA ARE OF PELITIC SCHISTS.

Dgh — GRANITE WITH HETEROGENOUS TEXTURES RANGING FROM MEDIUM-GRAINED GRANITIC TO PEGMATITIC WITHIN OUTCROPS. CHIEFLY GREY BIOTITE GRANITE WITH SECONDARY MUSCOVITE AND LOCALLY GARNET. METAMORPHOSED SEDIMENTARY ROCKS PRESENT AS SEPTA A FEW METRES THICK TO OUTCROPS HUNDREDS OF METRES IN SIZE. METASEDIMENTS AND GRANITE OFTEN ADMIXED ON THE OUTCROP SCALE.

STRATIFIED ROCKS

(CORRELATIONS TENTATIVE)

Ss — SANGERVILLE FORMATION. GARNET-BIOTITE±SILLIMANITE± MUSCOVITE SCHISTS AND GNEISSES WITH INTERLAYERED BIOTITE±GARNET GRANOFELS. PELITIC LITHOLOGIES PREDOMINANT.

Ssa / Ssag — ANASAGUNTICOOK MEMBER. CHIEFLY FINE-GRAINED BIOTITE GRANOFELS LAYERED ON THE SCALE OF 1-3 CENTIMETRES. PROPORTIONS OF QUARTZ, FELDSPAR, AND BIOTITE VARY AMONG LAYERS. GARNET IS PRESENT LOCALLY. PELITIC LITHOLOGIES ARE SUBORDINATE BUT INTERLAYERED WITH BIOTITE GRANOFELS. BEST DEVELOPED NORTH OF BEN BARROWS FAULT.

Ssal — METALIMESTONE. MEDIUM-GRAINED LAYERED GRANO-BLASTIC ROCK COMPOSED OF QUARTZ, DIOPSIDE, GARNET, PLAGIOCLASE, SPHENE, AND CALCITE. PROPORTIONS OF MINERALS VARY AMONG LAYERS. INTERBEDDED BIOTITE GRANOFELS MINOR. THIS THIN AND DISCONTINUOUS UNIT IS PRESENT NORTH OF BEN BARROWS FAULT.

Ssp — PATCH MOUNTAIN MEMBER. MEDIUM-GRAINED GRANOBLASTIC CALC-SILICATE ROCK INTER LAYERED WITH BIOTITE GRANOFELS (LOCALLY BIOTITE-GARNET GRANOFELS) ON A CENTIMETRES SCALE ("RIBBON ROCK"). DIOPSIDIC QUARTZITE AND QUARTZ-DIOPSIDE-GARNET ROCK ARE MOST FREQUENT LITHOLOGIES; MINOR THIN (LESS THAN 1 METRE) MARBLES ARE PRESNET IN THE HEBRON AREA. MINOR STRUCTURES ARE SPECTACULARLY DEVELOPED.

Sstp — ROCKS OF TAYLOR POND. THIN MAPPABLE UNIT CONSISTING OF AMPHIBOLE-BIOTITE QUARTZITE, BIOTITE QUARTZITE, AMPHIBOLITE, BIOTITE GRANOFELS WITH CALC-SILICATE BOUDINS, AND THINLY BEDDED CALC-SILICATE. TOTAL THICKNESS OF UNIT IS APPROXIMATELY 50-100 METRES. WELL EXPOSED ON EAST SIDE OF TAYLOR POND AND ON HOTEL ROAD, AUBURN. CORRELATIVE (??) WITH THORNCRAG NEMBER OF HUSSEY, 1979?

Ssws — GNEISS OF WASHINGTON STREET. GARNET-SILLIMANITE (FIBROLITE)-BIOTITE-MUSCOVITE GNEISS BEST EXPOSED ON WASHINGTON STREET EXTENSION, AUBURN. GNEISSIC BANDING ON SCALE OF 1 CENTIMETRE DEFINED BY QUARTZ-FELDSPAR LEUCOSOME AND GARNET-SILLIMANITE-MUSCOVITE-BIOTITE MELANOSOME. THICKER LAYERS AND LENSES OF PEGMATITE COMMON.

SPECIAL SYMBOLS

- LITHOLOGIC CONTACT, APPROXIMATE
- LITHOLOGIC CONTACT, INFERRED
- CONTACT SEPARATING GRANITES OF SEBAGO PLUTON FROM ROCKS OF THE CONTACT ZONE OF THE PLUTON.
- REGIONAL CONTACT OF THE SEBAGO PLUTON; SEPARATES ROCKS OF CONTACT ZONE FROM DOMINATELY METASEDIMENTARY TERRAIN TO THE NORTH AND EAST.
- ZONES OF SHEARED AND SILICIFIED GRANITE AND PEGMATITE IN NORTHWEST PORTION OF QUADRANGLE.
- TRACE OF BEN BARROWS FAULT, BALL ON THE DOWN SIDE.

SCALE 1 : 62,500

1 ½ 0 1 2 3 4 MILES

3000 0 3000 6000 9000 12000 15000 18000 21000 FEET

1 .5 0 1 2 3 4 5 KILOMETERS

Preparation of this map was supported by funds furnished by U.S. Geological Survey Contract No. 14-08-0001-17871.

Quadrangle Location

RECONNAISSANCE

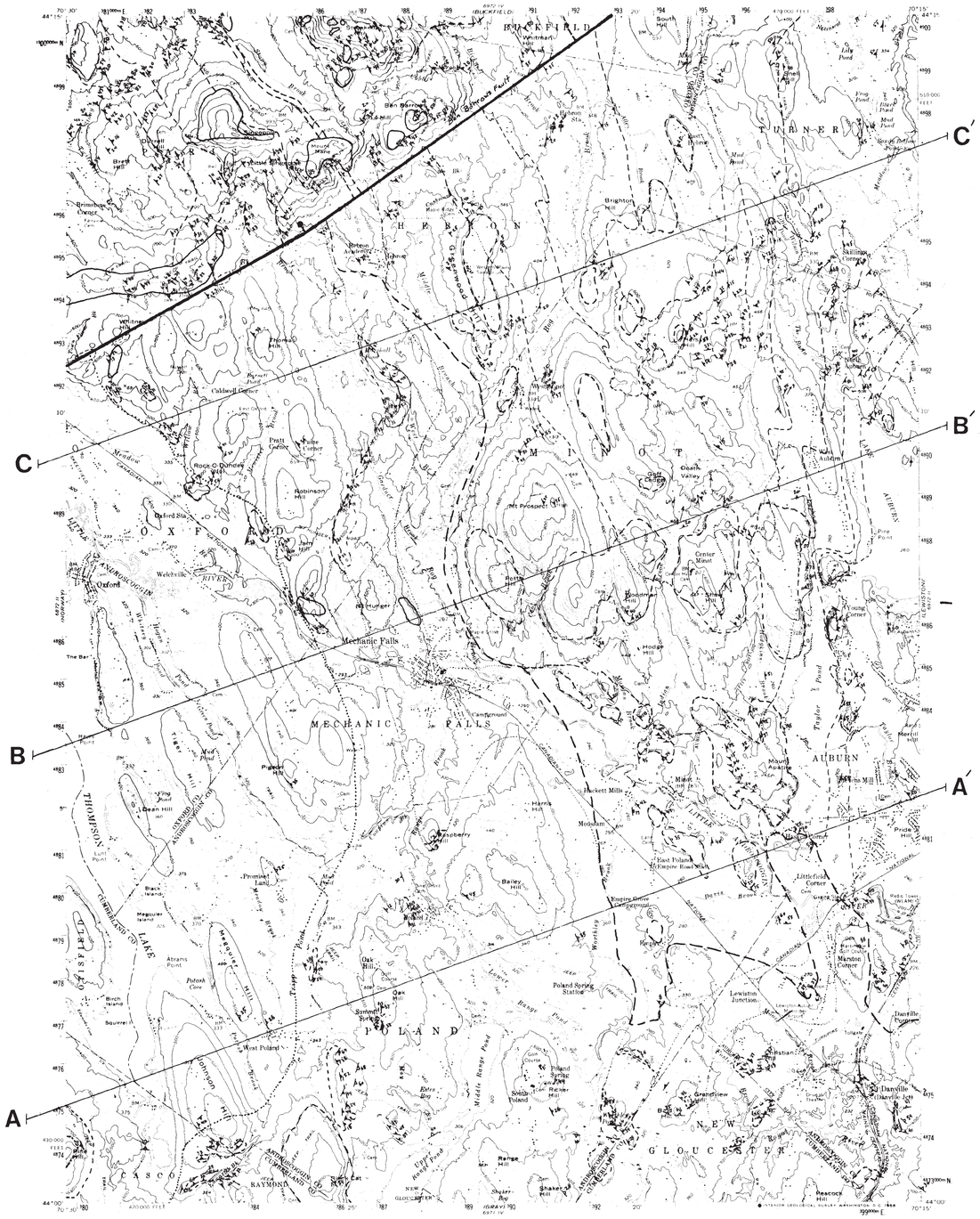
BEDROCK GEOLOGY OF THE POLAND QUADRANGLE, MAINE

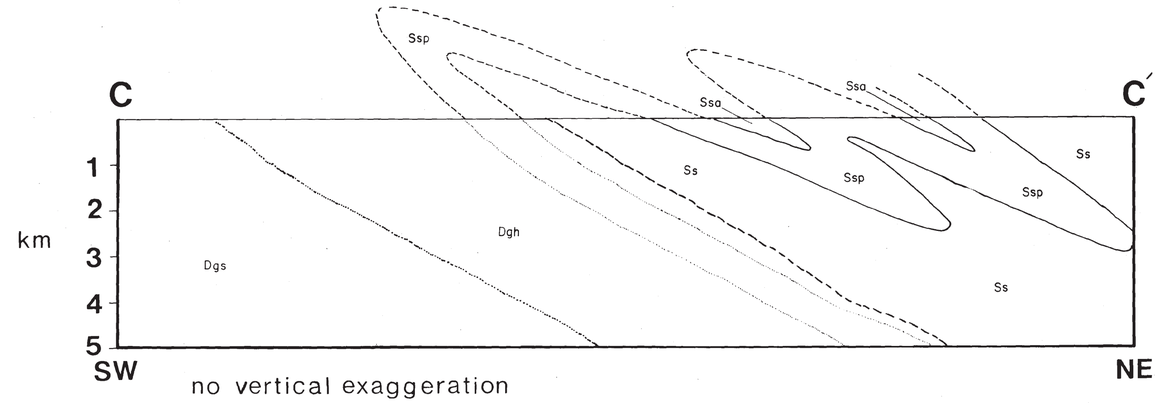
BY
JOHN W. CREASY
1979

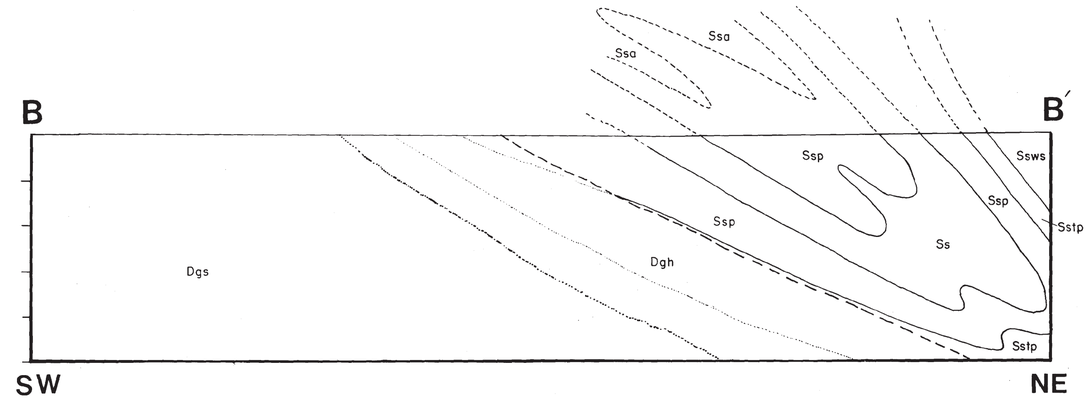
Maine Geological Survey
DEPARTMENT OF CONSERVATION
Augusta, Maine 04333

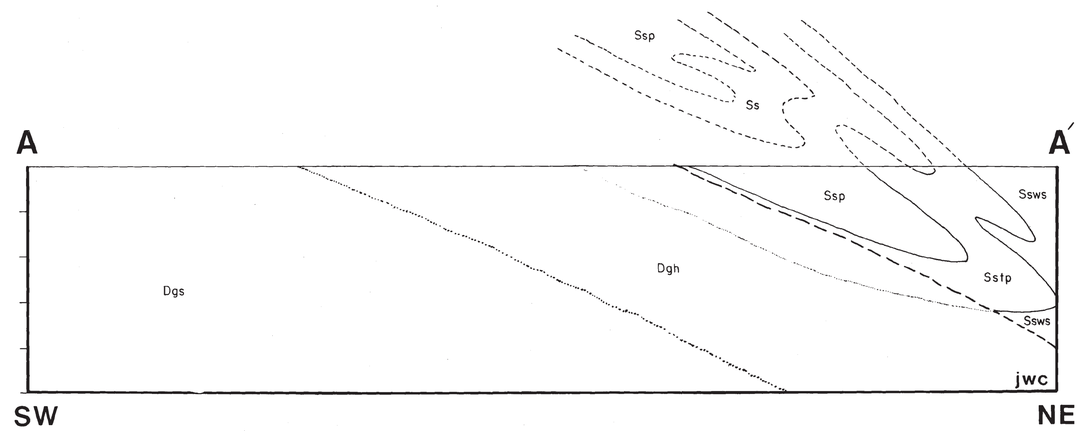
Walter A. Anderson, State Geologist

OPEN FILE NO. 79-15









SPECIAL SYMBOLS

- 46 — STRIKE AND DIP OF FOLIATION OR OF LITHOLOGIC LAYERING
- STRIKE OF VERTICAL FOLIATION OR OF LITHOLGIC LAYERING
- 28 — STRIKE AND DIP OF FOLIATION IN GRANITE
- 25 — STRIKE AND DIP OF AXIAL PLAN OF MINOR FOLD
- 18 — BEARING AND PLUNGE OF AXIS OF MINOR FOLD
- 18 25 — STRIKE AND DIP OF AXIAL PLAN AND PLUNGE OF MINOR FOLD
- T — TOPPING SENSE

OTHER SPECIAL SYMBOLS AS DESCRIBED IN EXPLANATION ACCOMPANYING PRELIMINARY GEOLOGIC MAP OF THE POLAND QUADRANGLE.

SCALE 1:62,500

1 ½ 0 1 2 3 4 MILES

3000 0 3000 6000 9000 12000 15000 18000 21000 FEET

1 .5 0 1 2 3 4 5 KILOMETERS

Preparation of this map was supported by funds furnished by U.S. Geological Survey Contract No. 14-08-0001-17871.

Quadrangle Location

STRUCTURAL MAP AND GENERALIZED STRUCTURE SECTIONS OF THE

POLAND QUADRANGLE, MAINE

BY

JOHN W. CREASY

1979

Maine Geological Survey
DEPARTMENT OF CONSERVATION
Augusta, Maine 04333

Walter A. Anderson, State Geologist

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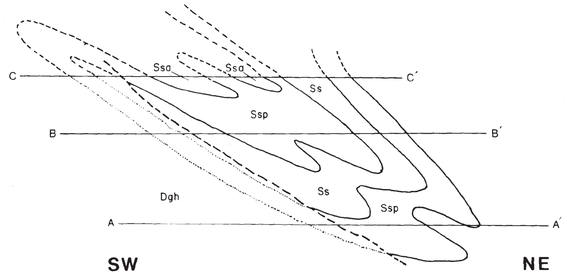
STYLIZED STRUCTURAL RESTORATION