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A report on the geology of the Rumford area, Oxford and Franklin Counties, Maine

William T. Forsyth

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SUBJECT

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A REPORT ON THE GEOLOGY OF THE RUMFORD AREA
OXFORD AND FRANKLIN COUNTIES, MAINE

by

William T. Forsyth
Maine Geological Survey

This report in its present form is not designed to be released for publication, but is suitable for the Open File, subject to revision as a result of further studies.

August 28, 1955

A REPORT ON THE GEOLOGY OF THE RUMFORD AREA
OXFORD AND FRANKLIN COUNTIES, MAINE

William T. Forsyth
Maine Geological Survey--1955

INTRODUCTION

The Rumford quadrangle lies in Oxford and Franklin Counties, in western Maine and is bounded by latitudes 44-30N and 44-45N and by longitudes 70-30W and 70-45W. It is an area of mature topography with the highest elevation (3400 AT) being attained on the east shoulder of Old Blue Mt. The mapping of this area was undertaken by the Maine Geological Survey in an attempt to determine the regional structure and lithology as related to the many granitic pegmatites in the southern part of the quadrangle.

The occurence of pegmatites in this region has been known since the 19th century and they have been studied and worked intermittently since then. For a good description of the historical background, production figures, and a bibliography of the region, the reader is referred to U.S.G.S. Professional Paper 255 and Bulletin 6 of the Maine Geological Survey.

Field work in the present investigation consisted of barometer and compass surveys with some pace and compass traverses where the terrain was not suitable to the former method. Data was plotted on double scale blowups of the Rumford quadrangle. The investigation was carried out by the writer during portions of the field seasons of 1954 and 1955, assisted during those years by John A. DeWilde and Lawrence Kincaid respectively.

PREVIOUS WORK

Most of the previous work in this area has been confined to studies of the mineralogy and structure of the pegmatites in the Newry Hill-Black Mt. district. Shainin had mapped Newry Hill, Plumbago Mt., and Red Hill in a cooperative project with the U.S.G.S. and the Maine Geological Survey. His unpublished notes indicate that he had also examined and outlined a series of pegmatites on the top of Glass Face Mt. Larabee and others made a detailed outcrop map of the Whitecap-Black and South Twin Mountains region which proved very helpful to the writer. This group had also mapped in detail several other pegmatites in the quadrangle. Pratt and Congdon studied the occurence of gold in the Swift River and its tributaries , briefly mentioning the rock types encountered in the region. Kern Jackson studied some of the rocks in the northern half of the quadrangle but due to the limited area which he examined, did not see the regional inter-relationships of the formations which he described.

The present structure and stratigraphy is still tentative and subject to revisions. More detailed work is necessary in order to fully determine the variations in the gneissic rocks.

GEOLOGY

The Rumford quadrangle is underlain by a series of schists and gneisses which are cut by numerous intrusive bodies ranging from gabbro to granite pegmatite. Outcrops are more numerous along ridges and stream valleys than on side slopes. Glacial drift covers most of the area, with stratified outwash being confined to the lower elevations in the valleys. Several distinct terraces may be observed along the larger rivers and delta shaped deposits occur in the topographic depression near East Andover. These stratified deposits have been extensively

used as sources for construction material. Till is light blue and very compact but weathers to a brown porous composition down to an approximate depth of three feet. Till banks up to 30 feet thick may be seen on the East Branch of the Swift River about 2 1/2 miles above its confluence with the main branch.

Metamorphic rocks

The metamorphic rocks have been tentatively divided into three major units based on distinctive features of theoriginal sediments. From oldest to youngest they are (1), A series thinly interbedded micaceous quartzites and schists derived from arenaceous siltstones and clays with some minor pebble and granule gonglomerates and thin, apparently dincontinuous horizons of lime silicate rocks. Rocks of this type have been converted to gneisses in much of the eastern part of the quadrangle,(2), Black phyllite and interbedded quartzite with minor lime silicate horizons. The phyllites are locally converted to spangled muscovite schists and gneiss. All contain pyrite or pyrrhotite in variable amount, (3) Lime silicate granulite with interbedded biotitic quartzite.

Regional metamorphism has complicated the recognition of smaller traceable unitsalthough different metamorphic facies of the rocks are discernable.

Micaceous quartzites and schists. The rocks included in this group include Jackson's Byron Cyclical Schist, 2-Mica Schist, Noisy Brook Gneiss and Tumpledown Gneiss as well as other lithologically similar types. The finer grained schistose rocks are generally well banded at intervals from 2-3 inches but may range up to 18 inches. The banding tend s to be less continuous and more migmatitic in the coarser gneisses. Layers whose compositions indicate original pelitic

nature alternate with fine psammites. Cyclical gradations exist within these types and locally may be useful in determining tops and bottoms of beds. Jackson used this method over a short distance , but his generalization is not necessarily true due to reversals in direction of gradation seen at many places on the East Branch of the Swift River. These reversals are suggestive of isoclinal folding.

Staurolite is an important component of the rocks in the Byron region but it dissapears on the ridge which forms the northern boundary of the quadrangle above the East Branch. Other staurolitic rocks which vary in perfection of cyclical banding are found on Flathead Mt., North and South Twin Mountains, and Whaleback Mt. Staurolite in all of these localities frequently is altered to pseudomorphic aggregates of chlorite and sericite. Where staurolite or its alterations is absentin these rocks, the schists contain a greater percentage of biotite and garnet.

Interbedded lime silicate granulites and biotitic quartzites occur locally in horizons up to 12 feet thick, but cannot be traced out over any great distance. More often, but still only in a few places, these lime silicate beds are less than 10 inches thick. They consist of fine white granular quartz, green hornblende,diopside, and pink garnet with minor amounts of iron sulfide and traces of scheelite. These layers usually show a separation of the different constituents parallel to the margin. Because of their more competent mature relative to the adjoining schists, they frequently show boudinage , with the banding extending right up to the end of the segment. Ellipsoidal lime silicate concretions are also common in these schists and show a concentric zoning in contrast to that of the boudins. The concretions frequently show the following type of zoning from periphery to core: pyrite-Hornblende-diopside-garnet.

Quartz is present in all zones and scheelite has occasionally been observed in the cores.

Fine quartz pebble and granule conglomerate occurs between some of the schist layers. It has been observed on the easterly shoulder of Old Blue Mt. near elevation 3248, on the East B ranch 0.9 miles above its mouth, and 500 feet east of the easterly peak of Lake Mt. Grains of quartz ranging from 1/16 to 3/16 inches are usually elongated sub-parallel to the foliation and constitute 15-30% of the rock. The matrix is similar to the rock constituting the adjacent schists.

Coarser gneissic and migmatitic equavalents of the rocks in this group occur in the eastern and southern portions of the quadrangle. They are quite coarser and frequently show less preferred orientation of minerals than in the schists. Biotite and garnet are the dark minerals ranging in size from 0.1 to 0.3 inches in maximum dimension. Feldspar and quartz occur in variable amounts between the mica and generally show some elongation. Muscovite is present inlarger flakes which are both parallel to and cros cutting foliation. Portions of the rock mapped by Jackson as Noisy Brook Gneiss contain these flakes up to 0.9 inches poikiloblastically enclosing finer biotite and garnet.

Many of these rocks are migmatitic but although the micaceous portions appear slightly richer in biotite than their finer schist equivalents, it would seem as Billings suggested in the Mt. Washington region, that they are not rich enough in iron to be considered residual concentrations from the separation of the pegmatitic streaks. The presence of the small lit-par-lit pegmatites can probably be accounted for by the introduction of material from the nearby granitic masses which also dacreased their resistance to deformation. That these rocks are equivalent to the northern schists seems quite likely because of the

similar compositions and similar relationships of minor lime silicate bands and concretions within. The lime silicates are apparently unaltered with the exception of being coarser. This may be due their being less permeable to the mobilizing fluids. These lime silicate rocks and the less altered portions of the schists are undoubtedly what Jackson referred to as inclusions in what he thought might possibly be an altered intrusive body.

The presence of considerable quartz rich granitoid rock in the Walker Mt. region is still not satisfactorily explained. The rock has a near-equigranular texture but shows quite a bit of contorted gneissic streaking. Related areas of poikiloblastic gneiss are also highly contorted and themselves do not look much different from the granitoid rock, and may represent areas of slightly lower metasomatic or recrystallization activity. A crude and somewhat discontinuous transitional series varying from spangled muscovite schist, migmatite, poikiloblastic muscovite granitoid gneiss and finally poikiloblastic gneissic granite containing gneiss inclusions seems to occur in this region.

Black phyllite and quartzite. Black phyllites with dense dark quartzites interbedded at 2 to 8 inch intervals are found in generally narrow bands in many parts of the quadrangle. These rocks are very fine grained and usually lack megascopically visible minerals except iron sulfides and occasionally some lime silicate grains. These rocks are quite variable with respect to the proportions of phyllite and quartzite. In between Black Mt. and Whitecap Mt. the phyllite layers are nearly absent and the rock could best be described as a dense quartzite with a fine mica parting. On Farmers Hill the phyllite contains grains of grey chiastolite up to 0.2 inches in cross section. From Mine Notch to Black Mt. the formation is represented by a rusty spangled quart-muscovite schist in which the mica occurs as discrete subparallel flakes 0.05 to

0.1 inches in diameter. Lime silicate bands have been observed at a few places in this formation but only in trace quantity. There appears to be, however, a transitional zone between the phyllite and quartzite and the overlying lime silicate granulite in which the rock bears some of the characteristics of both formations.

Biotite occurs occasionally in very small amounts in this formation and garnet has not been megascopically identified at all.

Iron sulfides, excepting their occurence in the lime silicate pods, appears to be restricted to rocks of this formation and their oxidation products impart to it a heavy rust stain, not to be confused with that resulting from the oxidation of biotite. Melantlerite(?) frequently is found on the outcrops in addition to the red, yellow, and black oxides. The occurence of the sulfide is generally in elongate streaks up to 0.05 by 0.3 inches in size parallelling foliation planes. Occasional veins of pyrrhotite have been observed at the site of the abandoned"nickle"mine in North Rumford cutting both bedding and foliation at a high angle. Pegmatites on the same hill also contain minor amounts of pyrrhotite.

The origin of the sulfide in these and similar rocks has often beeh interpreted as syngenetic because of the association of the black organic(?) coloration with the sulfide bearing material. The vein and pegmatite occurences however complicate this idea unless it be assumed that the sulfide had been picked up by the pegmatites and their associated mineralizer fluids and redistributed along certain fractures. On the other hand, all of the contained sulfide might possibly have been selectively deposited in this horizon by epigenetic fluids. At the present time the writer does not offer any conclusions to the origin, but nevertheless feels that this rock type is a valid stratigraphic horizon.

Lime Silicate Granulite. A series of interbedded lime silicate granulites and biotitic quartzites is discontinuously exposed from Roxbury Notch to the southwest corner of the quadrangle near Howard Pond. The lime silicate bands arecomposed predominantly of fine white granular quartz with smaller amounts of green hornblende, diopside, and occasional garnet. The biotitic quartzites which have a brownish coloration contain no other visable minerals than those indicated in their name. In these beds the quartz also is fine grained and white and the biotite occurs as discrete flakes 0.05 inches in diameter. Differential erosion of the beds produces a washboard effect with the granulites occuring as ribs. Bands are quite variable in thickness but generally are consistent within one outcrop. Their width ranges from 2 to 18 inches. Being more competent material these rocks do not show the intricate folding found in the schists and gneisses, but instead form open rolls. Minor amounts of scheelite have been observed in this horizon as well as in the other occurences of lime silicate material.

Intrusive rocks

A wide variety of intrusive rocks are found in this area; the largest mass occupying the topographic depression in the nortwest portion of the quadrangle and extending up onto Old Blue Mt. This mass has been interpreted as being connected with the granodiorites exposed on the northwest side of Plumbago Mt. Smaller masses are found in the Swift River valley above Roxbury, near Frye, around the town of Rumford and on the northwest peak of Lake Mt. Smaller masses whose relations to their wall rocks are unknown are abundant throughout the schists of the Black Mt.-Twin Mt. region. The composition of the rocks which occur in different proportions throughout these different masses ranges from altered hornblendite, gabbro, granodiorite, quartz-monzonite,

granite, aplite, and pegmatite.

Hornblendite. This rock is exposed on a small knoll southwest of Partridge peak in Roxbury Notch. It is a coarse grained rock consisting almost entirely of 0.7 inch pseudomorphic aggregates of actinolite and chlorite after hornblende(?). Differential erosion produces a coarse knotty surface which shows neither banding nor foliation. Smaller dikes of this material can be observed in the new road cut on the southeast side of the canal in the center of Rumford.

Gabbro. Shainin described a gabbro on Plumbago Mt which has a discontinuous gradational rim of actinolite schist. The gabbro has a variable grain size and is composed of sub equal proportions of hornblende and labradorite. The contact between the gabbro and actinolite schist appears to be gradational making it difficult to say which rock is which in many places. The hanging wall of the Main Pegmatite on Newry Hill is composed of the well foliated and tourmalinized actinolite schist. Shainin believed that the alteration of the gabbro to the actinolite schist was effected during the emplacement of the larger pegmatites. The present writer offers the suggestion that the gabbro might have been forcefully emplaced as witnessed by the attitude of the banding in the wall rocks around this body , and that locally shearing action was strong enough to produce a peripheral foliation in the mass. Following the formation of the planar structure the alteration of hornblende to actinolite and chlorite could have been produced by fluids derived from the gabbro itself or from the younger acidic intrusives.

Granodiorite and granite. Rocks of this group compose most of the intrusive masses indicated on the accompanying map but the area has not been studied in sufficient detail to draw lines of contact between

the different types. Available evidence seems to point toward a sequence of the intermediate types being followed by mo re acidic types.

The granodiorite is generally well foliated and contains only biotite for mica. White sodic plagioclase, perthite, and quartz are the important constituents of the rock , being present in that order. Fine brown euhedral sphene is a readily recognizable accessory of this rock. Shainin reported a binary granodiorite on the north side of Plumbago Mt. This rock, however, does not have thw good foliation characteristic of that previously described. In the field this rock seems identical with that mapped by Larabee and others as quartzmonzonite and ganite in the Black Mt. region.

Muscovite leuco granites have been observed near the top of Old Blue Mt., on the east side of Record Hill and on the bank of the Swift River near the phyllite-schist contact. Rocks of this type were mapped as aplite by Jackson but that term has been reserved for another rock type by the present writer. These leuco granites consist of quartz and perthite with perhaps a little oligoclase. The muscovite is subhedral and may be as large as 0.3 inches. Garnet ranging from 0.05 to 0.1 inch is a common accessory. The texture of this rock varies from 0.1 to 0.2 inches. Narrow pegmatitic dikes with sharp boundaries frequently pass through this granite.

Aplite. Aplitic bodies from 1/2 to 28 inches wide occur throughout most of the metamorphic and intrusive rocks. They are muscovite bearing and have a sugary texture. Very fine garnet is a common accessory. In the metamorphic rocks these veins may be thrown into intricate ptygmatic folds which both parallel and cross cut relict sedimentary structures. Northeast of Muskrat Pond where the structure is highly contorted, these ptygmatic aplites are quite streaked and show boudinage. In the intrusive rocks they appear as straight dikes having

sharp contacts with the wall rocks.

On Whitecap Mt. aplites have been interpreted by Larabee as a thin skin overlying the coarser pegmatite in the manner of a border zone but the present writers observations suggest that they may be large dikes which inject and have been injected by the pegmatite which forms the bulk of the mountain top.

Pegmatites. The rocks in the southern part of the area are cut by many pegmatites. Those shown on the map represent only a small of those which probably are present in the area. A good example of the number of pegmatites which are exposed in the Black Mt. area can be seen in U.S.G.S. Professional Paper 255. In only those pegmatites which have been mapped by Shainin, Larabee, and others are the shapes as shown on the map reasonably accurately represented. The others are merely outcrop areas and their boundaries may continue in various directions.

The pegs of this region hafe both sill like and cross cutting relationships to their wall rocks and in many of these bodies a good zoning is shown. While white perthite and cleavelandite are the common feldspars in the western part of the quadrangle, many of the pegmatites within the intrusive complexes around the center of Rumford contain what appears to be snowy white microcline in addition to a higher percentage of biotite. Green apatite also is a common constituent of this latter type of pegmatite.

Of all the pegmatites observed during this investigation, no new commercial deposits of feldspar were uncovered. One beryl bearing pegmatite which extends from the southeast shoulder of South Twin Mt. contains several 5-6 inch beryl crystals within a small area in a

test pit known as the Beliveau Mica Mine. This can be reached by taking a dirt road westerly toward Swains Pond as far as the last farm house and then walking toward the pond on a tote road a distance of 2400 feet from which point the abandoned workings can be seen a short distance off the north side of the road.

A zoned hanging wall type (?) of mica deposit was seen on the property of Victor Binford on the northerly side of the main branch of a brook which passes through the east saddle between North and South Twin Mountains at an elevation of approximately 1250 feet AT. Most of the mica shows gross imperfections but might be worth further development to determine whether the character of the mica changes at all.

Foliated Intrusive . A peculiar type of rock is found in the intrusive complex around rumford and also in some of the metamorphosed sediments. This rock is fine grained and dark grey and has a pronounced foliated structure which is not parallel to its contact with adjacent rock. Biotite , in deformed plates, up to 0.5 inches in diameter produced the foliation which locally is quite distorted. It appears to have been introduced during the deformation which preceeded the emplacement of theother intrusives as they all cross cut this rock. On the other hand it might have been emplaced at an entirely different time and was subjected to the same deformationa; forces as the sediments. The rock appears to have a composition close to andesite but this has not been verified due to the fineness of grain size.

Structure .

The regional structure seems to be a series of tight isoclinal folds which do not extentd to any great depth and which probably are complicated by faulting. Isoclinal folds have been observed with a wave

length of3 feet and an amplitude of 15 feet, but this is an extreme case; the average observed fold having approximately a 3 foot wavelength and a 5 foot amplitude. Drag folds affecting 15 to 20 feet of thickness have been observed but generally are smaller. The nature of the out crops made it impossible to determine the geometry of many of these folds. Where they have been measured they appear to plunge from 30 to 75 degrees in a northeasterly direction. Axial planes are either vertical or dipping to the east indicating overturning at these localities to the northwest. Lineation consists of two types in the schists and finer grained gneisses: (1) the more common type is a fine wrinkling on the foliation which also plunges into the north except in the vicinity of major intrusions where they may have been deflected, and (2) elongated biotite grains which generally lie with 001 nearly at right angles to the bedding planes, but plunging into the north.

Schistosity and bedding are parallel of subparallel with only a few exceptions. A fracture cleavage is present in the finer schists and gneisses which intersects bedding and foliation at a higher angle. Although the azimuth of these three surfaces may change considerably over the quadrangle, the geometric relation of the fracture cleavage tothe bedding and foliation appears to be constant, indicating an anticlinal closure to the northeast or a synclinal closure to the southwest. The writer feels that this fracture cleavage is what has produced the wrinkling on the foliation surfaces.

Two zones of fractured and healed crusty milky quartz were observed (1) on the east shoulder of Black Mt. and (2) in a small gully just north of the Hanover-Newry Line, 0.4 miles northeast of the edge of the quadrangle. These masses appear to be the type usually

associated with major faults elsewhere in New England. The direction of fracturing and related topography suggests that these run in a northeast--southwest direction but no others on strike were located to confirm this hypothesis.

Dilatancy phenomena have been observed in many places. On the west shoulder of Glass face Mt. where the interbedded biotite-garnet gneisses and micaceous quartzites are wrinkled at 1/4 inch intervals, the crests of these wrinkles are filled with crescentic shaped quartz eyes. Elsewhere , lime silicate pods and bands which appear to have behaved more competently during deformation contain wedge shaped veins of quartz which originate in the marginal biotite-quartz layer and terminate in the lime silicate material. The writer speculates at this time that many of the pegmatites, expecially that which forms the top of Whitecap Mt. could have been emplaced by a similar process while the sediments were in a plastic condition.

The thickening and repetition of the phyllitic horizon between Flathead and Old Turk Mts. has been interpreted by Jackson as caused by faulting. Accurate recognition of the structure in this area weighs heavily on the correct interpretation of the regional stratigraphy. The increased number of folds found on the Swift River near BM 834 with accompanying loss of cyclothemic banding in the staurolite schists which could possibly be interpreted as a narrow core of an isoclinal anticlinorium, thereby placing the staurolite schists and their equivalents above the phyllite. Reverse stratigraphic relationships, however, are indicated by lithologically similar types in the Whitecap Mt.-Black Mt. region. R.H.Moench's mapping of the Phillips quadrangle(Ph.D.,Boston University, 1954) projected into the Rumford quadrangle would indicate that these staurolitic beds

are younger than the phyllite. The presence of occasional pebble conglomerated in rocks of the staurolite schist type suggests that these instead may be equivalent to Moench's older Rangely Formation, thereby favoring the faulting hypothesis for the repetition and thickening of the phyllite. C. W. Wolfe has said(pers. Comm.) that the rocks in the Byron section are quite ossibly equivalent to the Rangely instead of the younger Madrid Formation. Until some agreement on equivlaents can be reached, this writer prefers to rationalize the incongruity between stratigraphic and structural relations by assuming that the staurolite group is the oldest and is overlain by the pyritiferous phyllite which in turn is overlain by the lime silicate granulites in the manner of deposition related to a transgressive sea.

GEOLOGIC MAP OF THE RUMFORD QUADRANGLE

OXFORD COUNTY, MAINE

William T. Forsyth

August 28, 1955

L E G E N D

Metasediments

Wolfe's Stratigraphy:
Madrid Form. — Thinly bedded pinkish brown biotitic quartzites and lime silicate granulites

Parmachene Form. — Black pyritiferious phyllite, locally quartzitic or interbedded with dark gray quartzite. Locally metamorphosed to muscovite schist. Weathers rusty. Occasionally tremolite bearing.

Perry Mt. Form.
&
Rangely Cg.

. . . .

Jackson's Noisy
Brook Gneiss — Garnet - Stavrolite schists interbedded with mica quartzites. Local quartz pebble & granule conglomerate. Biotite may take place of stavrolite in schists. Zoned lime silicate pods locally abundant. Occasional thin borizon of lime silicate granulites similar to Formation No. 3. Rock locally metasomatized (?) and/or migmatitic (la).

Intrusive Rocks

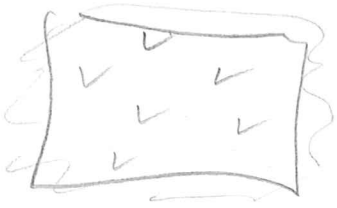
Pegmatite or pegmatite outcrop
White Cap Mtn. Pegmatite
Granite-Granodiorite complex with minor pegmatitic phases

Diorite-peripherally altered to chlorite-actinolite schist

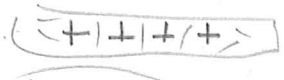
Gabbro-altered to massive chlorite & actinolite

Scale 1:62500

PEG - NOT 1

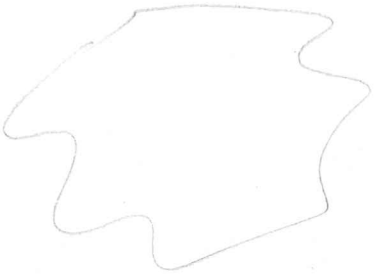


ACIDIC-INTRUSIVE COMPLEX CONSISTING OF MUSC BIOT GRANOD; BIOT GRANITE LEUCO GRANITE, & APLITE WITH SOME PEGMATITE

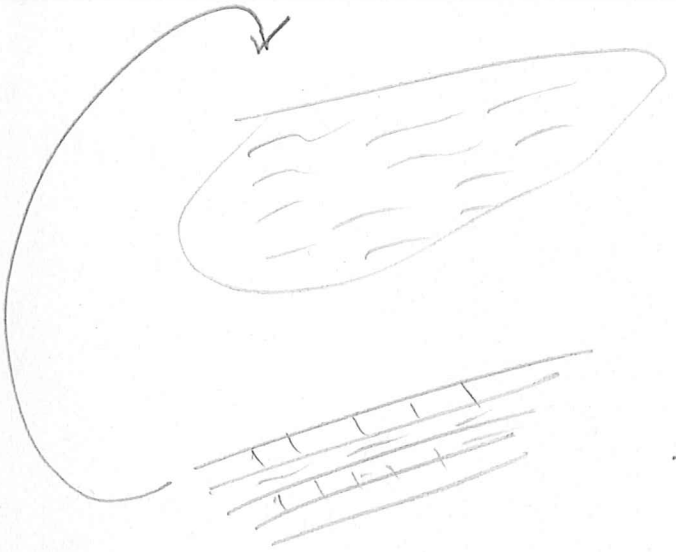


INT- TO ACIDIC IN ~~A~~LTERED HORNBLENDITE

GABBRO (INCLUDES SOME ACT SCHIST

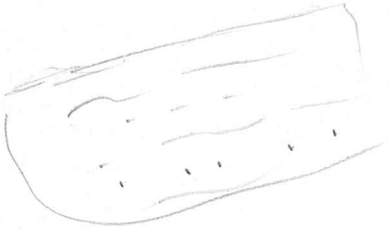


Whitecap Cy
PEG & ~~QTZ MONZONITE~~

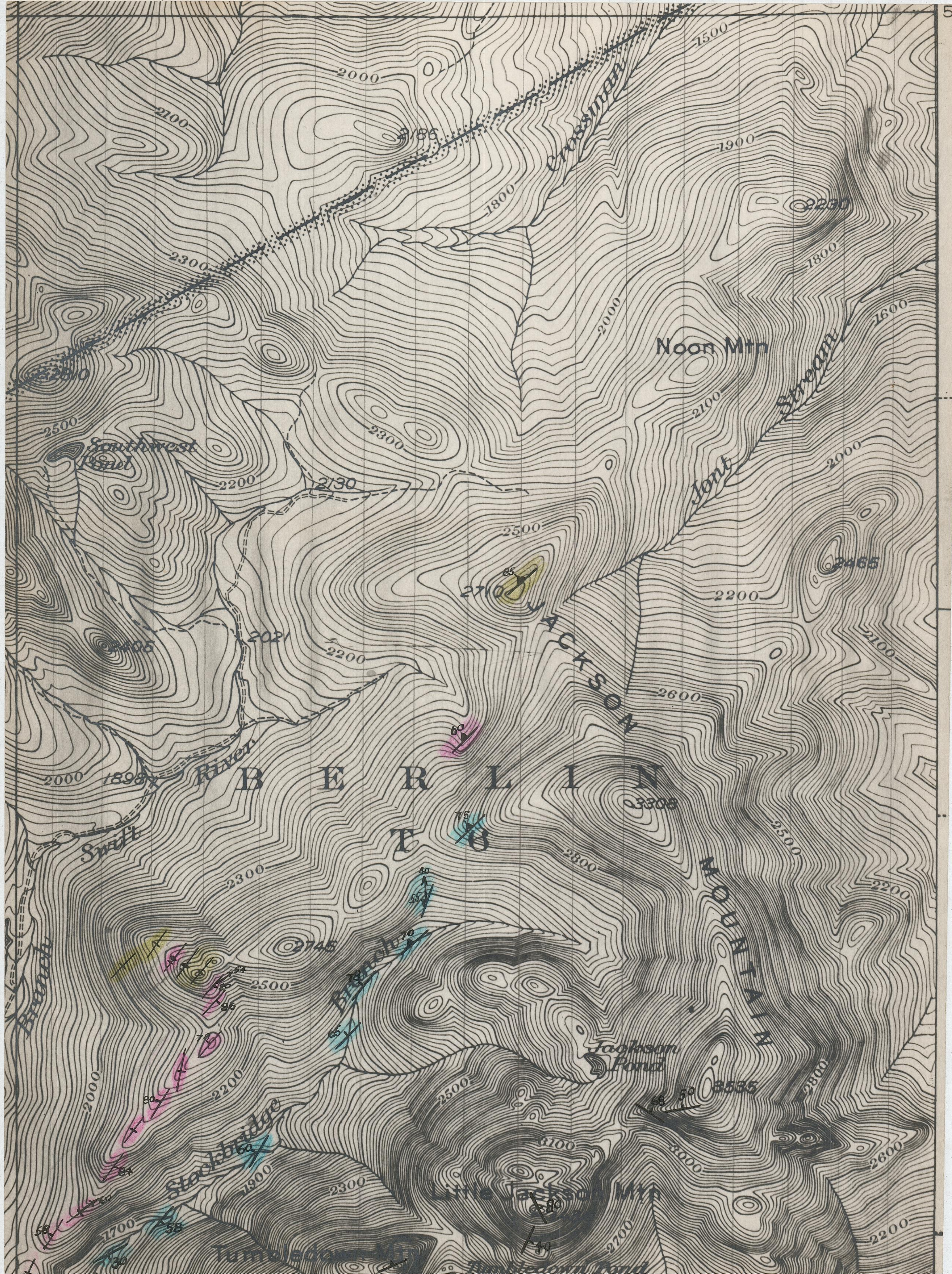


BLACK PHYLLITE; & QTZITE, ~~WITH SOME~~ ~~WITH SOME~~, SPANGLED MUSC SCHIST; LOCALLY COARSENS TO ~~M~~ GNEISS; GENERALLY CONTAINING IRON SULFIDES. TRACE OF LIME SILICATE BEDS

LIME SILICATE GRANULITE & INTER BEDDED BIOTITIC QTZITE WITH TRACES OF QTZ-BIOT SCHIST.



QTZ-MUSC-BIOT-GAR SCHISTS OR GNEISS INTERBEDDED WITH MICACEOUS QTZITES - LIME SILICATE CONCRETIONS COMMON LOCALLY. MINORS TRACES OF LI-SIL HORIZONS. & SOME QTZ PEBBLE CONGLOMERATE & GRITS. ~~FORMATION~~ LOCALLY IS A STAUROLITIC AT N. END OF QUANGLE



Crossman
Noon Mtn
Stream
Southwest Pond
JACKSON
BERLIN
TO
Swift River
Branch
MOUNTAIN
Jackson Pond
Stockbridge
Little Jackson Mtn
Tumbledown Mt
Tumbledown Pond
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2810
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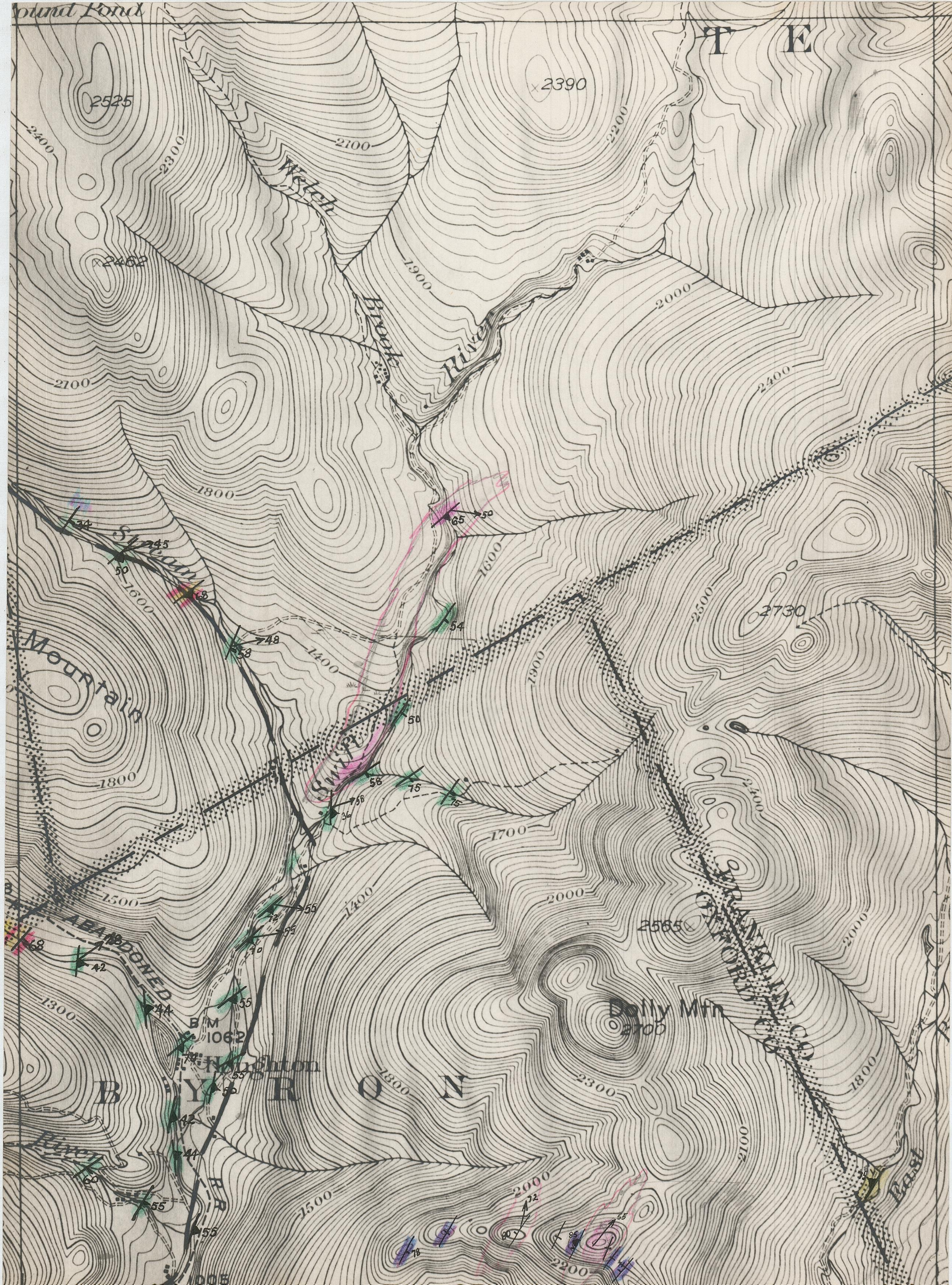

T E
2525
2390
2462
Welch
Brook
River
Stream
Mountain
Swift
2730
2565
Dolly Mtn
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B M
1062
Houghton
ABANDONED
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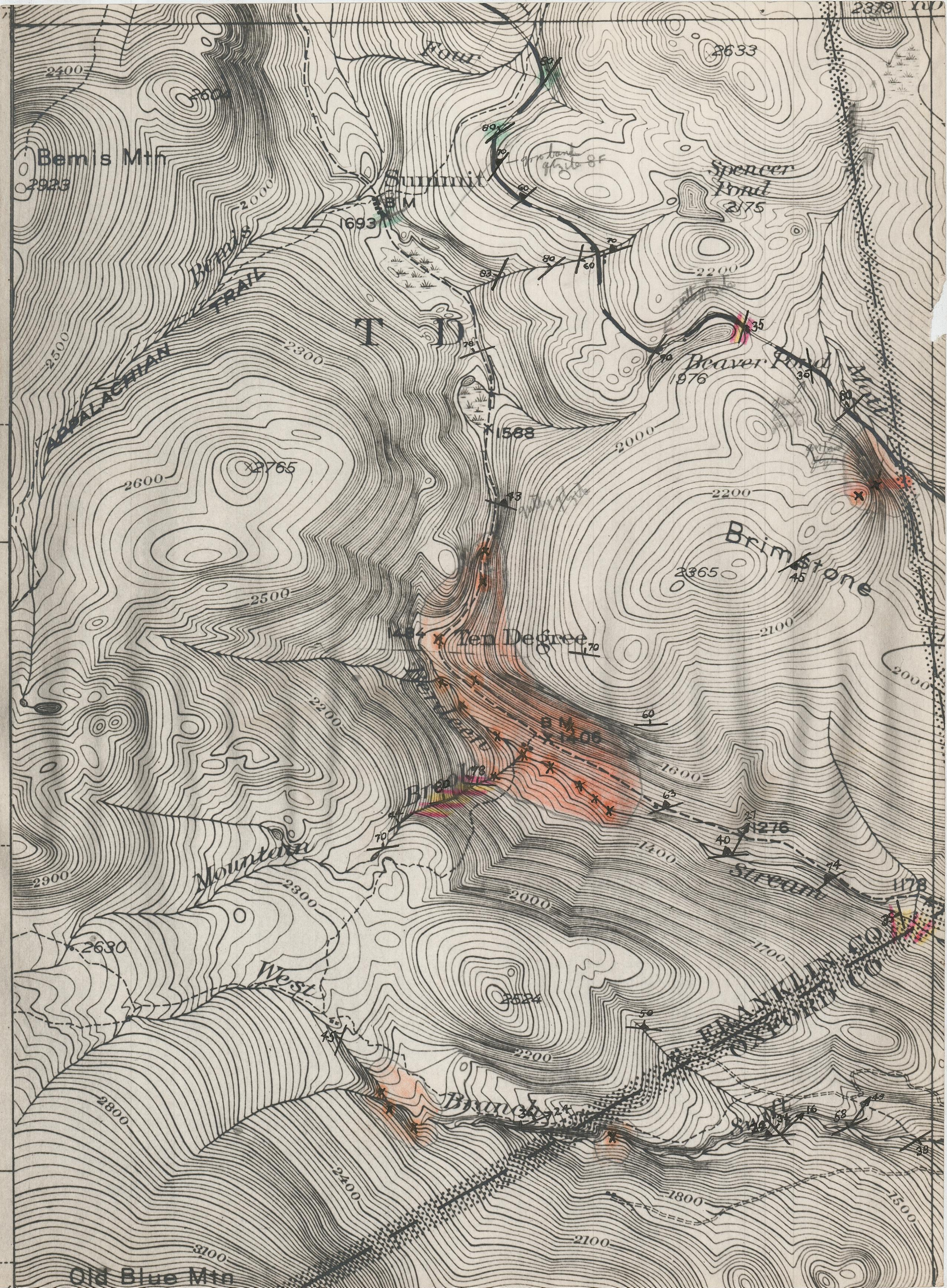
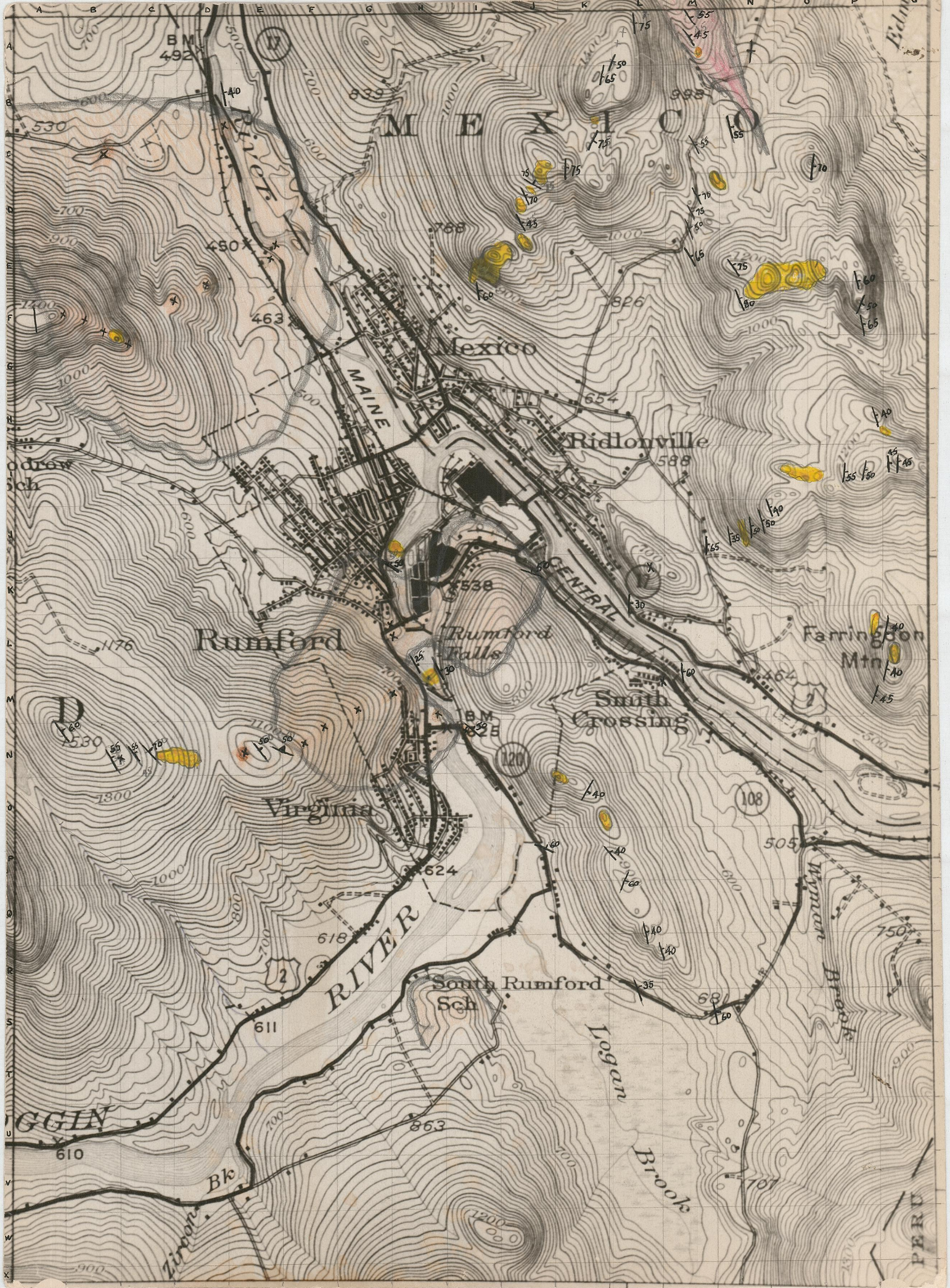
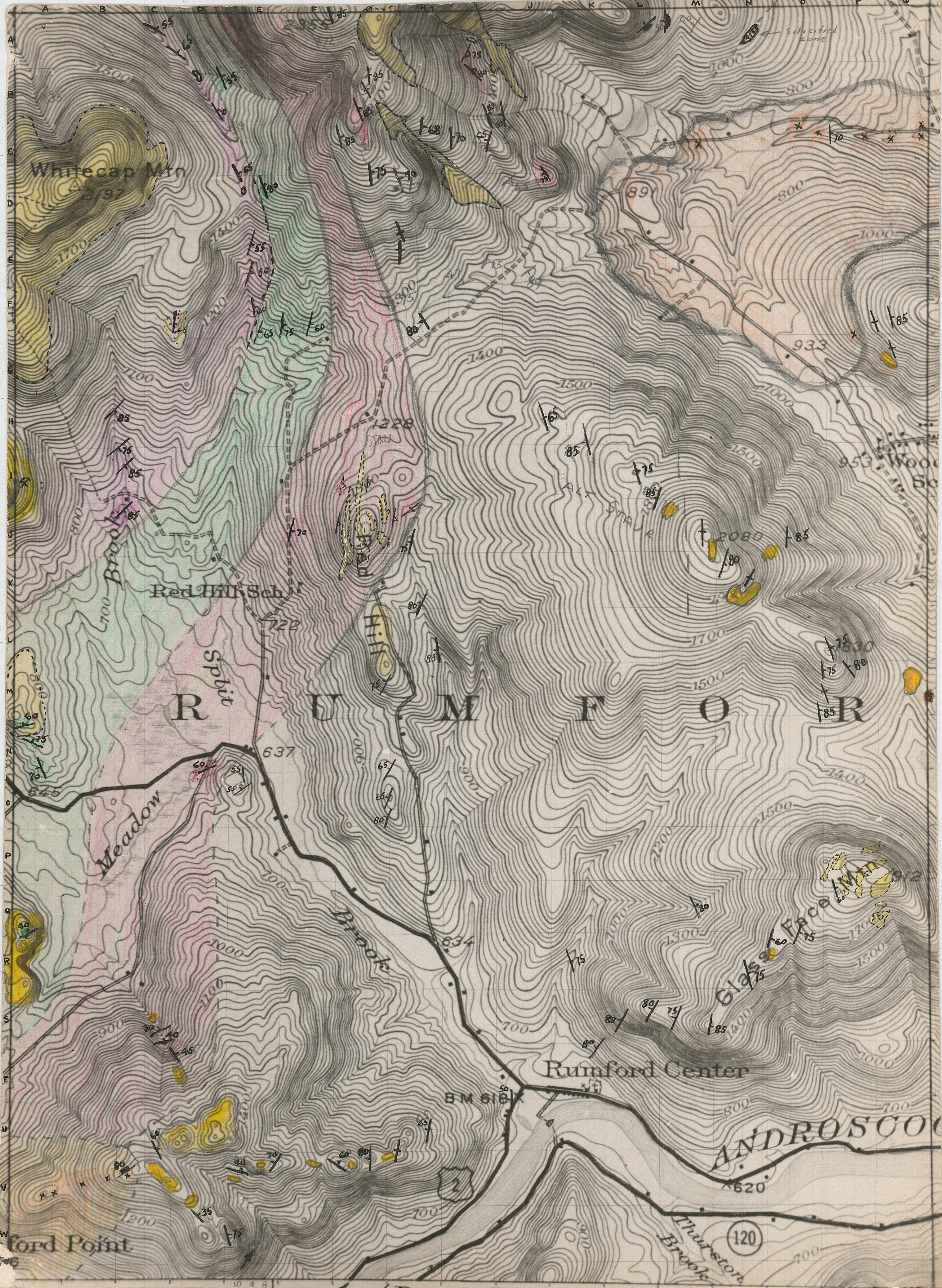
FRANKLIN CO
OXFORD CO
East

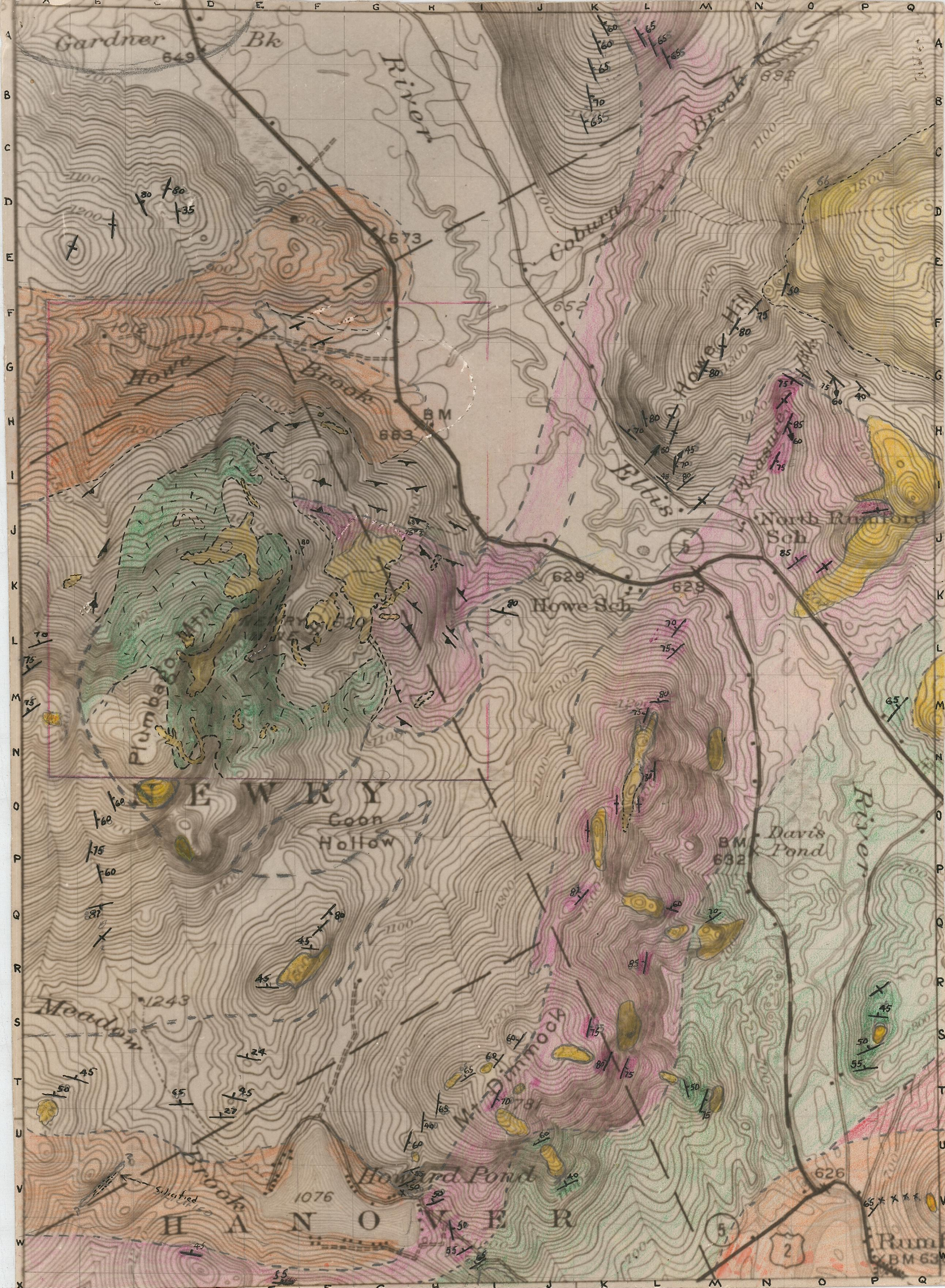


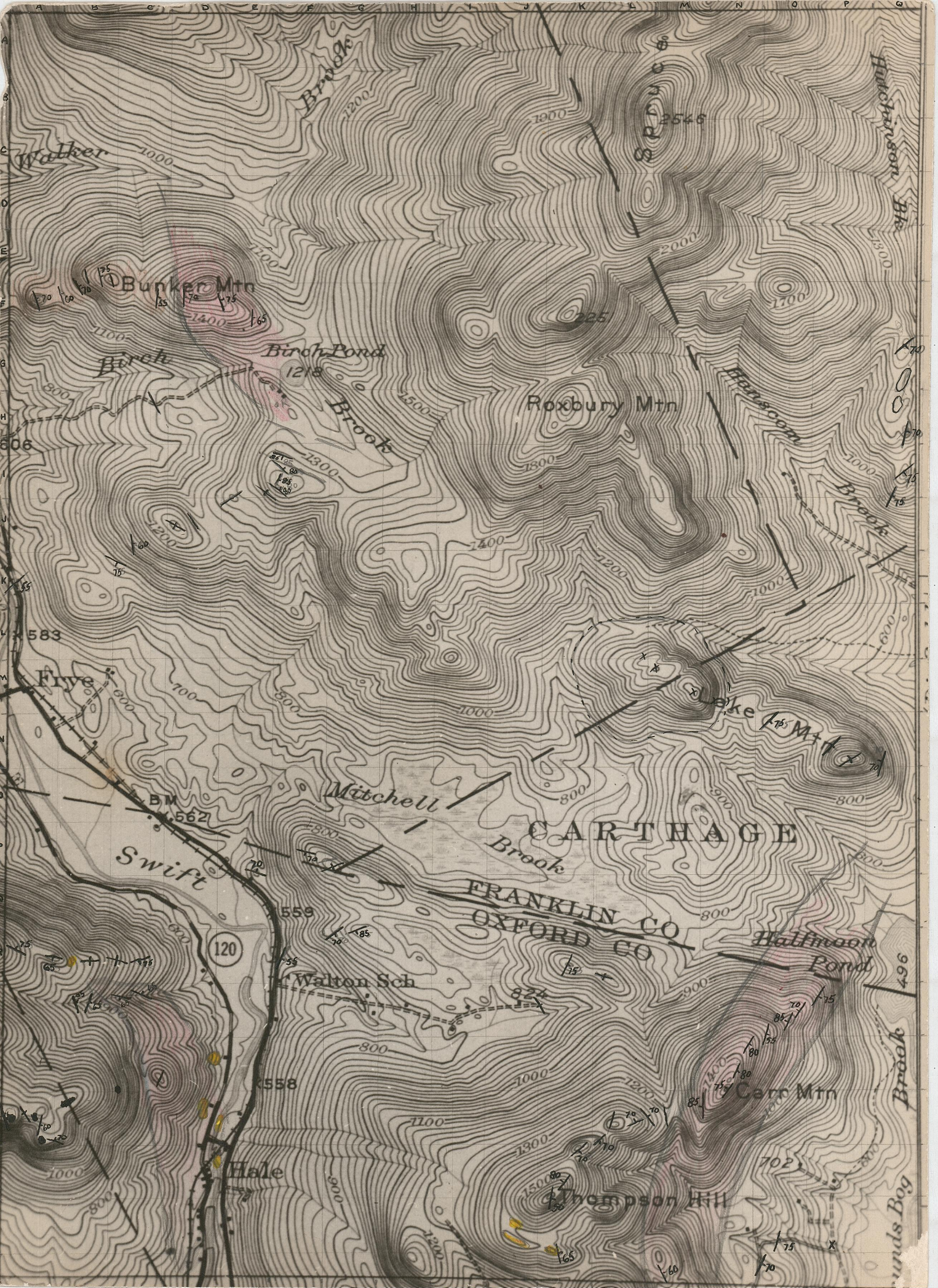
Four
2633
2379
2400
2604
Bemis Mtn
2923
Summit
B M
1693
Spencer Pond
2175
2000
Bemis
APPALACHIAN TRAIL
T D
Beaver Pond
1976
2500
2300
1568
2765
2600
2200
Brimstone
2365
2500
Ten Degree
2100
2000
B M
1406
2200
1600
1276
Mountain
Stream
1178
2900
2300
2000
1700
2630
West
2524
FRANKLIN CO
OXFORD CO
2200
2800
Branch
2400
1800
1500
3100
2100
Old Blue Mtn

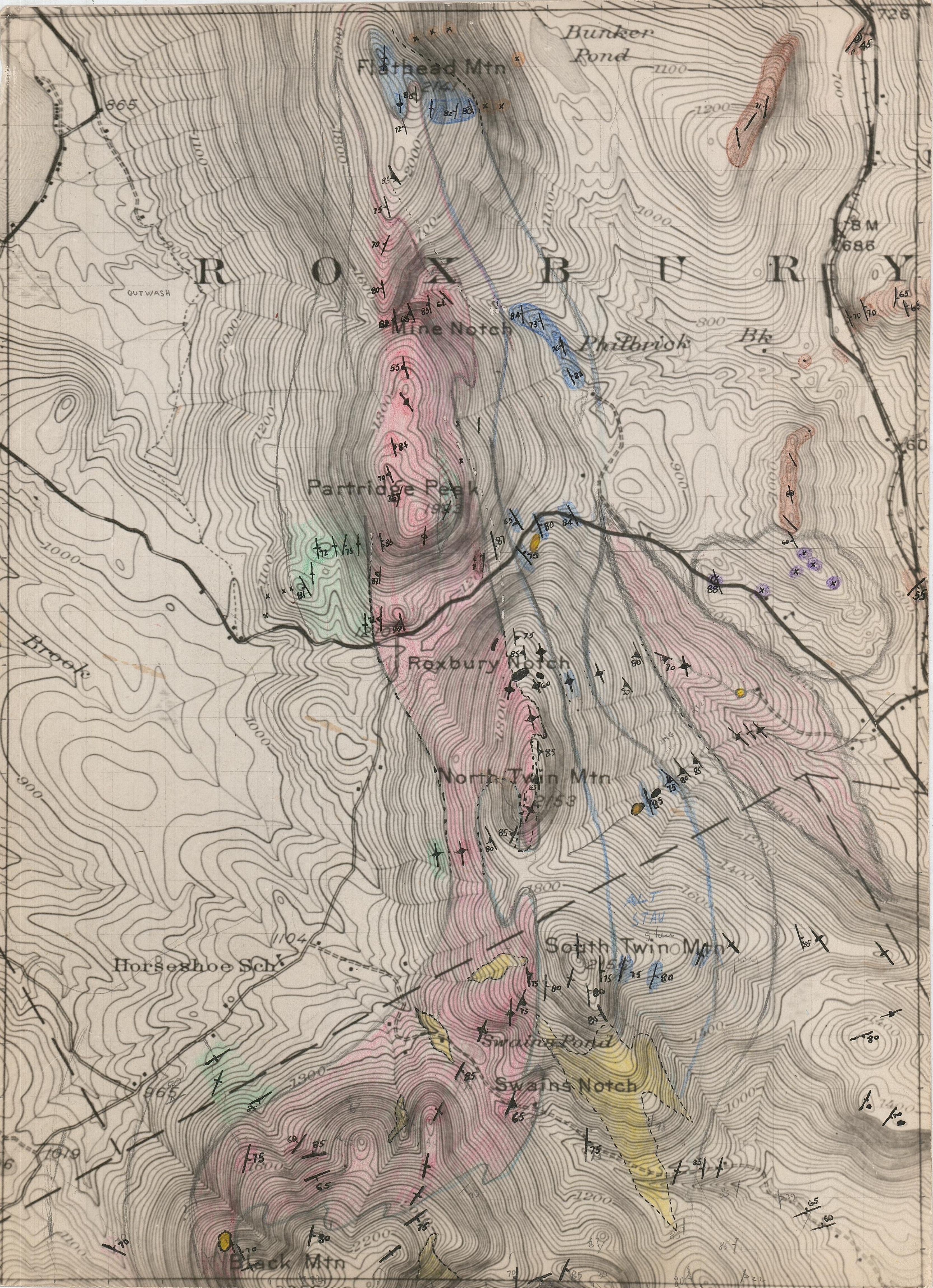

MEXICO
Androscoggin River
MAINE CENTRAL
Mexico
Ridlonville
Rumford
Rumford Falls
Virginia
South Rumford Sch
Smith Crossing
Farrington Mtn
Logan Brook
Hyman Brook
RIVER
PERU
BM 492
BM 825
788
826
998
654
588
538
1176
1530
624
618
611
610
863
505
750
707
463
464
450
530
839

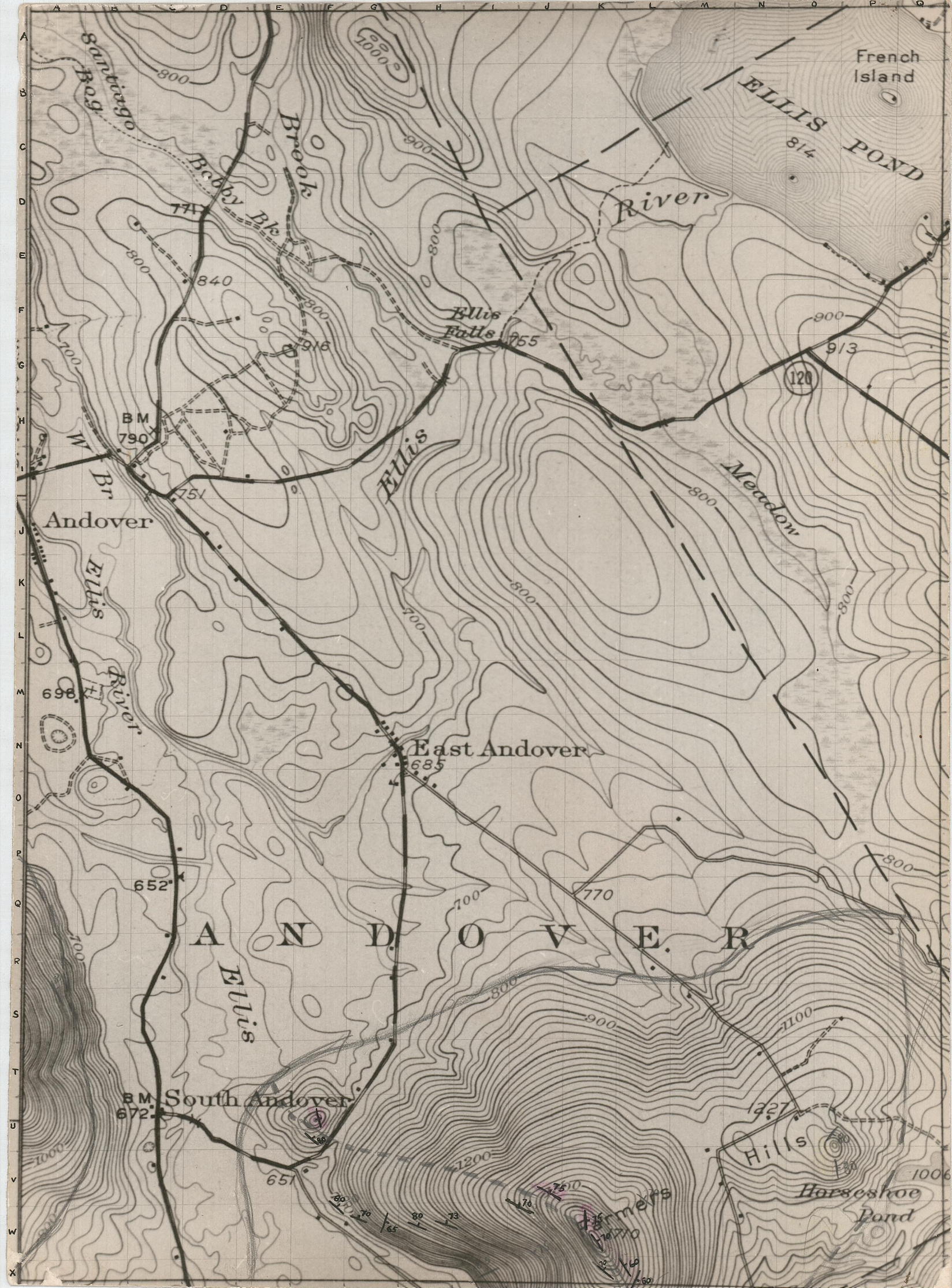


Whitecap Mtn
Red Hill Sch
Split
Brook
Meadow
Brook
R U M F O R
Glass Face
Rumford Center
ANDROSCO
Thurston
Brook
ford Point
120


Gardner Bk
649
River
673
Coburn Brook
692
Howe Brook
BM 683
Howe Hill
Ellis
Treasure Hill
North Rumford Sch
629
628
Howe Sch
Plumbago Mtn
Goon Hollow
BM 632
Davis Pond
River
Meadow
1243
Mt. Dimmock
781
Howard Pond
Silicified
1076
626
Rum
BM 63


Walker
Brook
Bunker Mtn
Birch
Birch Pond
1218
Brook
Roxbury Mtn
Hutchinson Hill
Hutchinson
Brook
606
583
Frye
Lake Mtn
Mitchell
Brook
CARTHAGE
BM
562
Swift
559
FRANKLIN CO.
OXFORD CO.
120
Halfmoon
Pond
496
Walton Sch
824
558
Carr Mtn
Brook
Hale
Thompson Hill
702
Bog


Flathead Mtn
2141
Bunker Pond
ROXBURY
OUTWASH
Mine Notch
Philbrick Bk
Partridge Peak
1943
Roxbury Notch
Brook
North Twin Mtn
2153
South Twin Mtn
Horseshoe Sch
1104
Swains Pond
Swains Notch
Black Mtn
BM 686


French Island
ELLIS POND
814
River
Santiago Bog
Bobby Bk
Brook
771
840
916
800
900
1000
700
Ellis Falls
755
913
120
BM 790
W Br
Ellis
751
Andover
Meadow
Ellis
River
698
East Andover
685
652
770
A N D O V E R
Ellis
BM 672
South Andover
651
1100
1200
1000
827
Hills
Farmers
Horseshoe Pond

BERLIN

NOBLE

WELD

Tumbledown Road

Tumbledown Mtn.

3035

Byron

Notch

1418

1279

1102

Tumbledown

Brook

867

952

Brush Mtn.

2705

West Mtn.

2800

Muskrat Pond

West Brook

Brook

2700

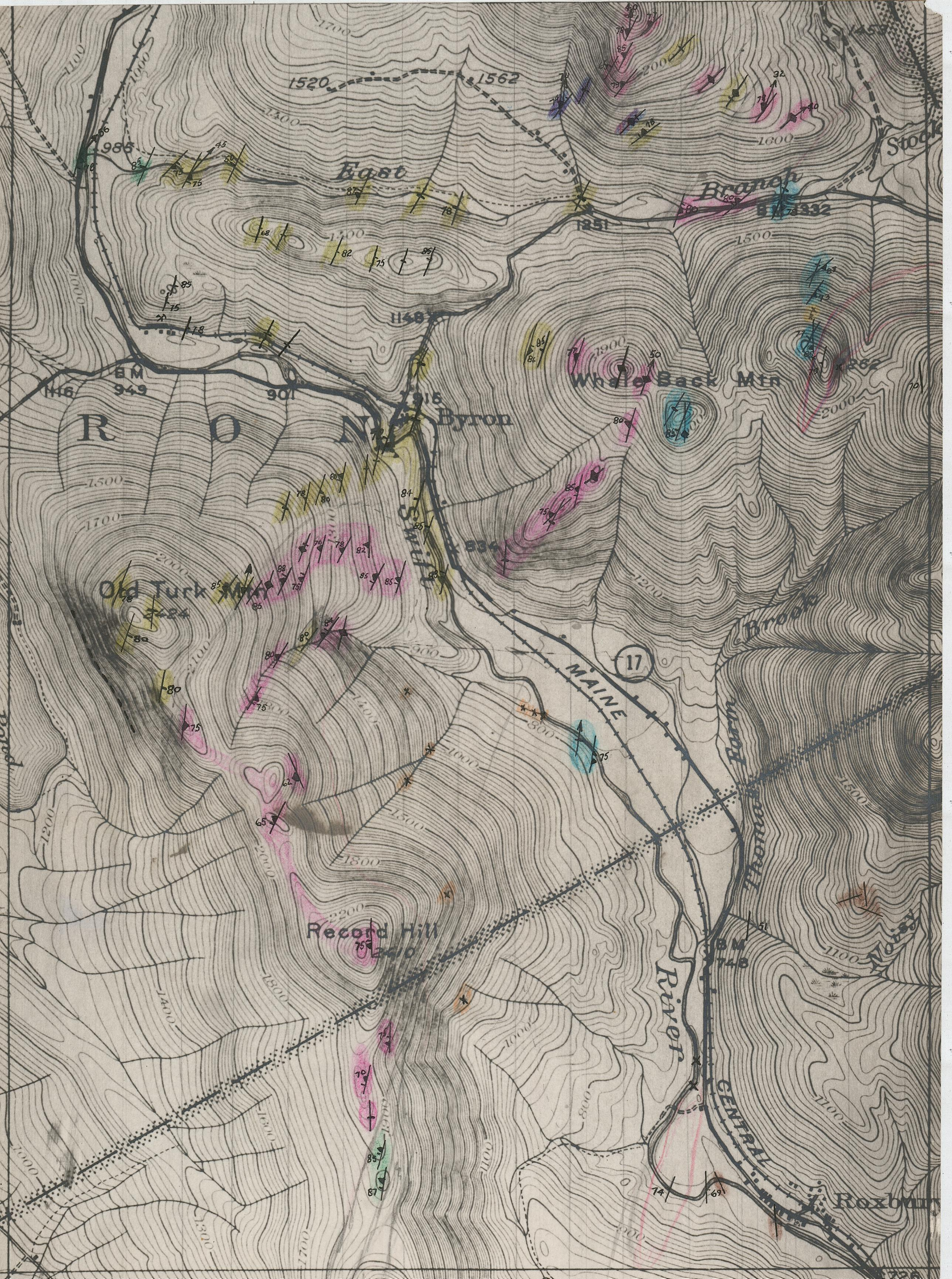
Walker Mtn

Snowman Bk

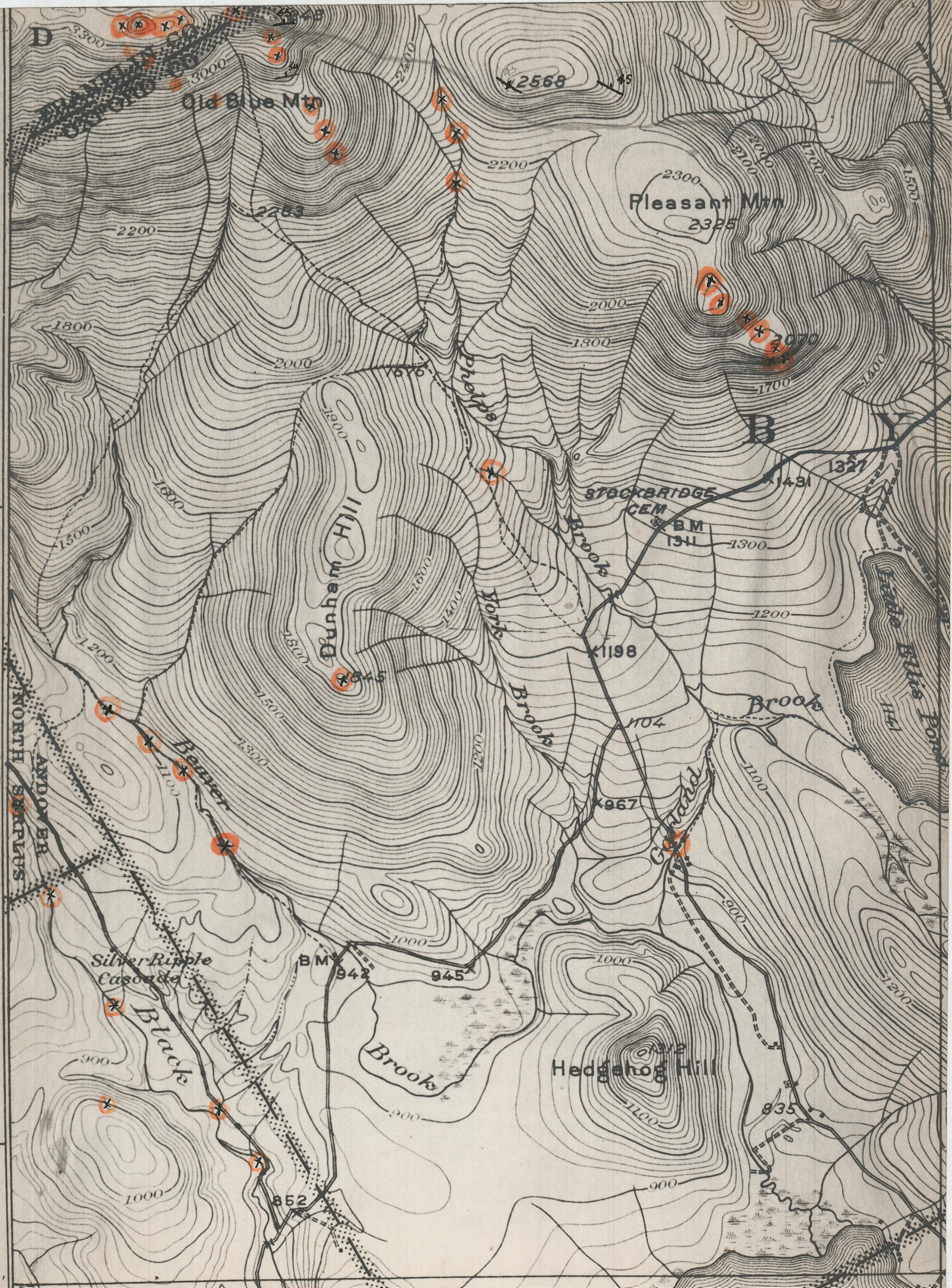
Sweet Bk

Moxie

2508



East
Branch
Whale Back Mtn
Byron
Old Turk Mtn
2424
Swift
Maine
17
Central
Brook
Thomas
Record Hill
2410
River
Roxbury
B M
949
B M
748
1520
1562
1251
1148
915
901
1116
986
534
2262
2332



D
FRANKLIN CO
OXFORD CO
Old Blue Mtn
2568
2283
2200
2300
Pleasant Mtn
2325
2070
1700
B
Y
1431
1327
STOCKBRIDGE CEM
BM 1311
1300
1200
2000
1800
1676
Phelps
Dunham Hill
1845
York
Brook
1198
1104
967
Brook
Little Ellis Pond
1141
Garland
NORTH
ANDOVER
SURPLUS
Beaver
Silver Ripple Cascade
Black
BM 942
945
1000
Brook
Hedgehog Hill
835
900
852