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The Newfound Region of New Hampshire.

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Thesis

THE NEWFOUND REGION OF NEW HAMPSHIRE

by

Carl Taylor Bond

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M.B.A., Boston University, 1950

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Approved
by

First Reader ...James P. Martin,...
Professor of Geography

Second Reader ....Harold....F..Crowley.....

Outline

Introduction

The Thesis:

The Physical Environment	1
Geology	3
Regional Physiology	7
Climate	10
Soils	13
Natural Vegetation	15
Land Use	17
Human Habitation	27
Water Problems	31

Conclusions

List of Illustrations

Relief Map	2-3
Average Annual Rainfall and Runoff	9-10
Soil Associations	12-13
Forest Type Associations	14-15
Land Use Map of the Newfound Region	R.Cover

Introduction

The Newfound Region is a cluster of nine towns in central New Hampshire approximately 105 miles from Boston University. These are the towns of Alexandria, Bridgewater, Danbury, Grafton, Groton, Hebron, Hill, and New Hampton.

These towns exhibit a remarkably high degree of physical, economic, and social unity which is revealed in indications ff a youthful stage of regionalism. It is the purpose of this thesis to employ the elements of geographic analysis to expose the major physical reasons for thiscondition.

Approximately one year was spent in studying the fragmentary information compiled on these towns, talking with local townspeople, and personally investigating the geographic elements relative to this thesis. Soon after this study was started, it became apparent that water was the most important single element in the Region's personality, and this is the central theme of this thesis. This is revealed in the Region's changing economic development which are both the cause and the result of changing social conditions.

This thesis is brief. There has been no attempt to load it with material of limited value. This is due to

a dislike on my part of running through a mass of writing in order to find the point, and also because very little information on this Region has been authoritatively written within the past twenty years.

I would refrain from classifying these towns as "declining New England hill towns". It appears to me that such an arbitrary writing off misses the important point that people are still earning a living in them. Nor does this label make known the fact that when these people make the transition to a new economy and get into balance with their environment, that a good living is still possible.

Investigating physical and social characteristics has been fascinating work. I am especially indebted to George Lewis of the Geography Department of Boston University, to Sulo Tani, State of New Hampshire Planning Director, and to Dr. Linwood Woodbury, President of the Newfound Region Association for their encouragement and cooperation.

The Physical Environment

The physical region consists of two watersheds and one watershed-district. The distinction between these two groups lies in the fact that the two watersheds--the Newfound Lake watershed and the Smith River watershed--are complete physical units from source to mouth within the region. The watershed-district--the Hill Reservoir District--on the other hand, consists of a number of short streams and a segment of one major stream all flowing into and out from a large reservoir. In the latter case there is source to mouth unity only on the shorter streams, but other criteria, namely economic and social, must be used to determine the boundaries on the major stream.

It is apparent today that town and county boundaries should have followed drainage divides rather than on navigable and later bridged streams and waterbodies, but unfortunately they were not. This makes the role of the geographer considerably more difficult in correlating available data with pertinent data. Local statistics are always scarce and since the few available are by towns only, it has been necessary to use this rather unsatisfactory unit rather than the one formed by nature.

The towns clearly have outgrown their boundaries,

if indeed, they ever fitted. The two watersheds and the watershed-district in the region lie in parts of 17 towns and 3 counties, and the nine towns of the region--Alexandria Bridgewater, Bristol, Danbury, Grafton, Groton, Hebron, Hill, and New Hampton--are not all within the watersheds named. This may seem to be rather a confusing situation in writing a report, but this is part of a geographer's impedimenta. At least it is a comforting thought to note that it is the watershed divides and not the political lines which have established the real boundaries for the region as reflected by its economic and social activities.

Highways follow the streams, people follow the highways, and land values follow the people. Judging by newspaper circulation, residence of factory workers, school attendance, residence of club members and similar criteria, it is clear that in this mountainous area, the relief and forests are still barriers to commerce and social relations.

Relief Map
(elevation in feet above sea level)

---400-500

---500-1000

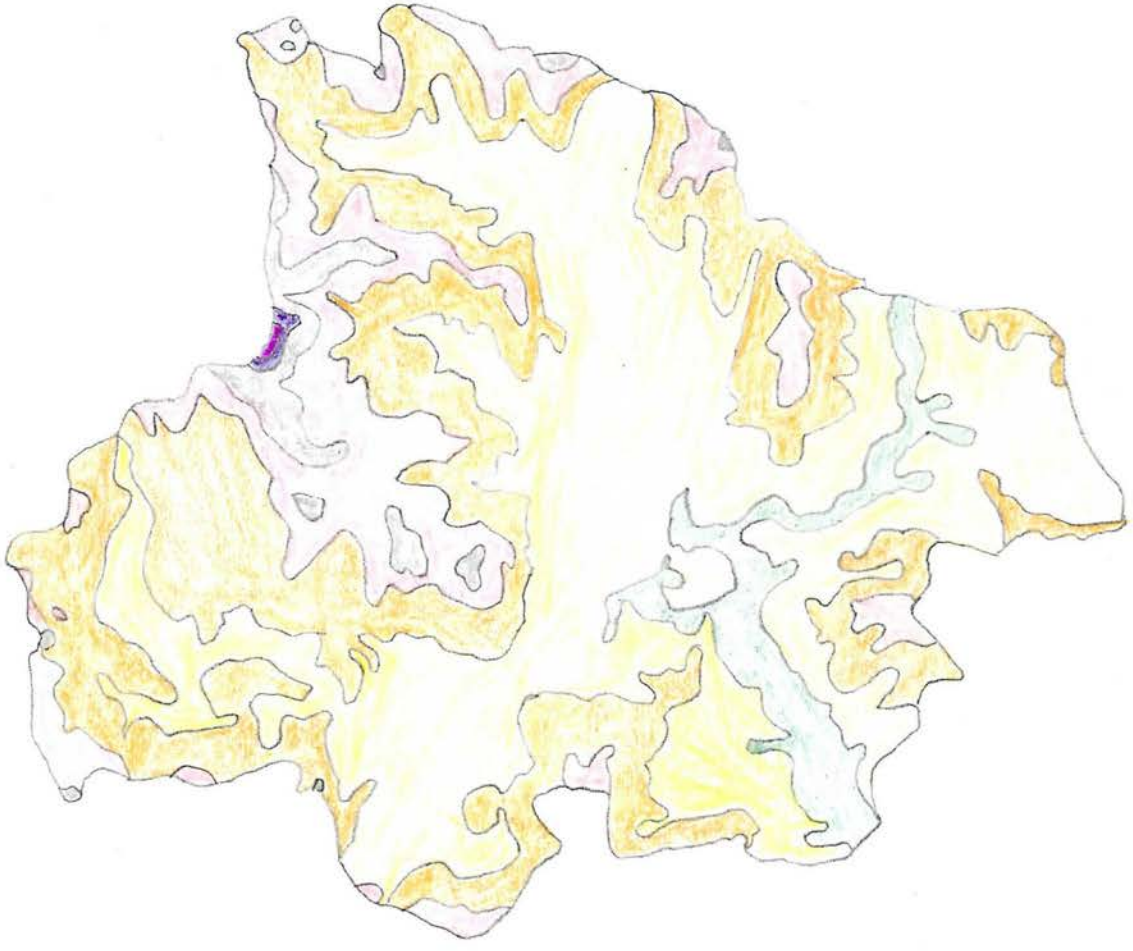
---1000-1500

---1500-2000

---2000-2500

---2500-3000

---3000-3200



Geology

Marland Billings of Harvard University places the earliest record of the region in the Ordovician Period of four hundred million years ago. There are traces of interlayered black and white rocks, known as Ammonoosuc Volcanics still visible. 1/

When volcanic activity and mountain building declined, the sea began to move in over the land. The battering of the waves caused coarse pebbles and sand grains and other marine materials to be laid down. 2/ This was the Silurian Period. When the water had cleared up, shellfish, the first form of known animal life here, moved over the region, and probably deposited considerable quantities of limestone. There are few traces of this material still in the region.

About 300 million years ago, thin alternating layers of sand and mud accumulated thousands of feet thick all over the region. These were pressed into hard, resistant quartzites and schists which today form the major peaks of the region, and for that matter, those of the surrounding regions.

1/ "The Cardigan and Rumney Quadrangles", Marland Billings, pp. 7. New Hampshire State Planning and Development Commission. (Concord, 1949)

2/ Ibid

This rock was solidified from heat and pressure during the Devonian Period, and then subjected to new disturbances. Tremendous intrusions of magma followed by general folding greatly altered the physical and chemical structure of the rocks. 1/ These were then refolded and subjected to more pressures until the resulting complex is entirely different from the original sedimentary rocks.

Eventually the seas withdrew and at the close of the Devonian Period a fine gray granite of very high quality as indicated by its dense crystal structure, known as Concord Granite, invaded the rocks in this area. About this time pegmatites were formed by molten materials solidifying in cracks. This is particularly important to present day developments since pegmatites are the source of beryl, feldspar, garnets, mica, quartz, black tourmaline, and a few rarer minerals. The western drainage divide is an intermittent belt of pegmatites and the most extensive mining activity of the entire State is located here. Extracting is not easy and mining operations are only carried out when market prices are abnormally high. At one time it was thought that silver could be found in the area in commercial quantities, but it appears that probably more

1/ "The Geology of New Hampshire", Charles Hitchcock, Vol. 2, pp. 74, (Concord, 1874-8) State Library.

silver was put into these hills than was ever taken out of them. Today, the region is a stone collector's paradise and is an important factor in the tourist trade.

Only the roots of original geologic formations are now apparent. The entire region is greatly worn down due to natural erosion.

The greatest disturbance in the region as far as its effects on modern living is concerned is not geologic, but geomorphic. The great ice sheet of the Pleistocene Period covered the region from 2,000,000 years ago to about 30,000 years ago. Most authorities believe that only one continental glacier covered the area, but a few contend that there may have been as many as three or four. In any event, the entire region is severely glaciated. Rock materials were moved an average of ten miles. 1/ This had the effect of changing specific details, but not the general features.

Scratches on Mount Cardigan, 3121 feet above sea level, indicate that ice several thousand feet thick moved over the region in a southeasterly direction. Peaks were rounded off, soil was scraped down, erratics were dumped in odd places, rivers were formed into lakes by damming, and

1/ "Biological Survey of the Merrimack Watershed", Hoover, New Hampshire State Fish and Game Department. Section on Geology. (Concord, 1939)

glacial till was scattered all over the region. Streams on the eastern side of Mount Cardigan were dammed until the ice in the lower valleys melted and the water escaped through an old exposed channel. Sculptured Rocks, a magnificent area of pot-holes in the Cockermouth River in Groton, indicate the effect of glacial melt and outwash in that area. Some of these holes are twenty to thirty feet deep and could not possibly have been worn down by the normal stream flow.

Newfound Lake owes its origin both to the over-deepening of an old river valley by the scouring action of the ice-bound rock and to the damming of the outlet by glacial till.

Glacial action has accounted in large measure for the present development of the region along recreational and manufacturing directions rather than toward intensive agriculture. The glaciated soils become increasingly stoney as one moves from the stream valleys to the divides and farming is not suitable for either mechanization or for continued fertility. On the other hand, the ponds and waterfalls glacially-created provided first water-power and now electric-power for manufacturing. Even more recently, recreation has formed around the esthetic values of these natural resources.

Regional Physiography

Paleozoic folding determined that the Smith River would run east to northeastward. This explains why Bristol and not Hill became the industrial center for the Region. The Smith River valley was not dug deeper by the continental glacier which came from the northwest, but instead, a large part of it was across the glacier's path and consequently became filled with glacial drift. This has left no large storage area for spring waters. Consequently, the volume of water discharged annually fluctuates from 250 to 2500 times. The valley can be near flood one week and be a mere trickle a few weeks later. This tremendous fluctuation proved to be too much to maintain industry, and the few people who tried to establish mills, soon gave it up.

The Newfound River valley terminating at Bristol became industrialized relatively early. Glacial action had gouged out the bottom of Newfound Lake to a depth of more than 168 feet and depositid glacial till across the lake's present outlet. The old lake or stream bed ran the same way as the glacial movement. The result has been to provide industry with a natural reservoir which maintains stream flow throughout the year.

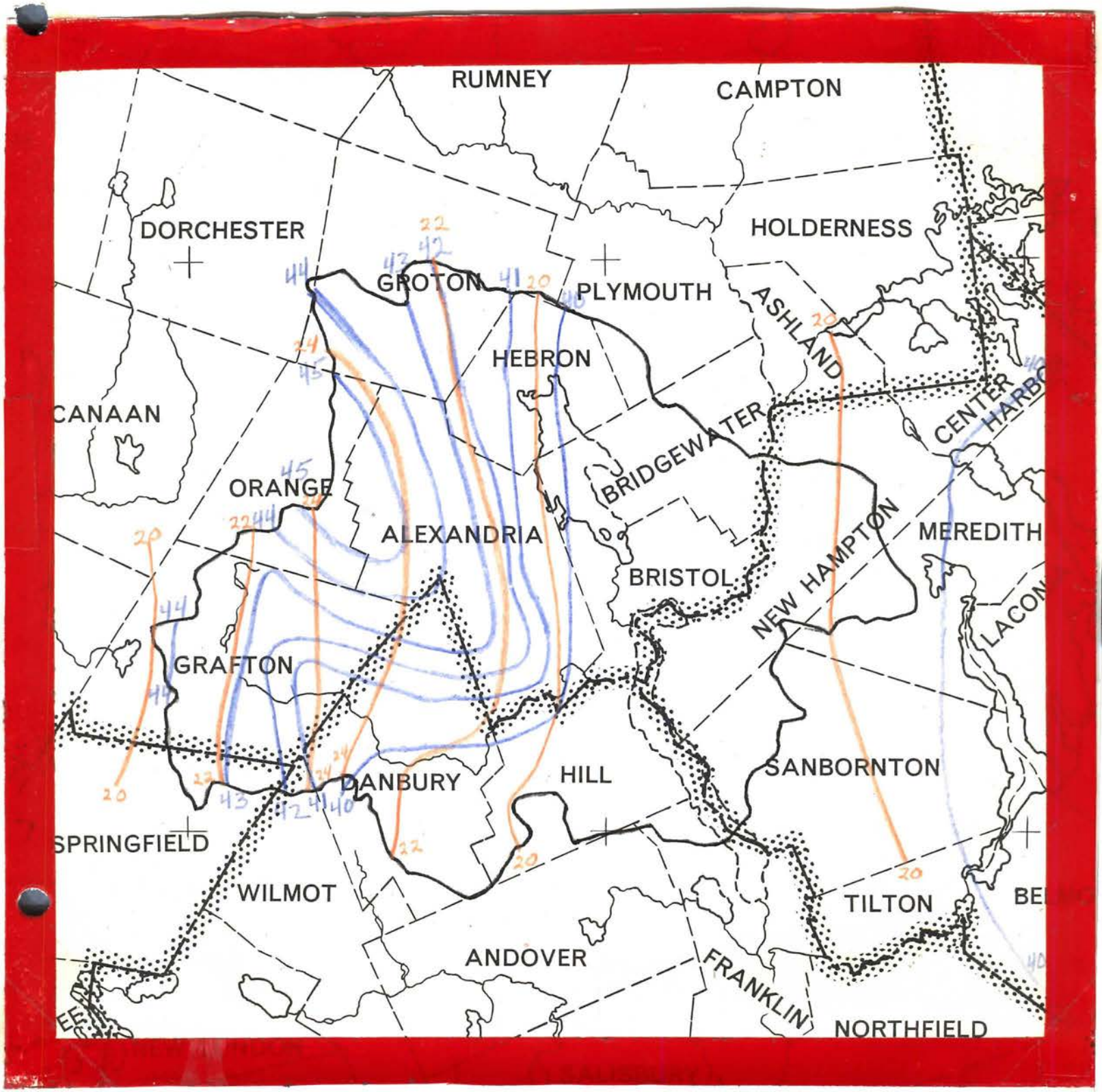
The two watersheds are closely related in geologic history. Wide beaches and sandy areas extending up the Cockermouth River in Groton indicate that Newfound Lake was once much larger. Soil survey maps support this by indicating lacustrine deposition in areas now above water level. The wide plain on which Bristol is located can only be satisfactorily explained by the fact that glacial melt filled the lake basin. The waters then must have laid across the present Alexandria Meadows, flowed out into the Smith River, around Gordon Hill, and down into the present cemetery area. Water then poured over the Bristol flood-plain and went out into the Pemigewasset by its present course. Bog Brook in Alexandria is a remnant of this former watercourse. The present lake level is twenty-eight feet lower than it was when water flowed this other direction.

Wave action caused by prevailing westerly winds coming down the valley eventually wore down the glacial till at the foot of Newfound Lake and waters were discharged in the present watercourse. This formed the present Newfound River.

The present Smith River egress was formed after the present Newfound River course was established. As a drainage divide appeared between the two rivers, a new

course was dug at Profile Falls, and the water passed down the Smith River valley through a deep gorge and so into the Pemigewasset. Just why this new gorge was cut instead of wearing down the present divide near the Bristol cemetery is a mystery. I have not been able to determine the answer to this either by reconstruction nor from checking available records. Perhaps deep borings can reveal the secret.

Average Annual Rainfall and Runoff
(in inches)



Source: USGS Water Supply Papers, U.S.W.B. Bulletins.

Climate

Climate, with its two hands--temperature change and precipitation, is Nature's architect. These elements are greater determinants of where people live and how they make their living than is topography or any other geographic feature. Weather, the daily expression of climate, is of prime importance in explaining the economic development of the Region.

The Region is in the belt of the prevailing westerly winds and is subjected to the mixing of continental and marine air masses. Cyclonic storm tracks from almost the entire United States and Canada are funneled across or within a few hundred miles of the Region. In addition, elevations range from less than 500 feet to more than 3100 feet above sea level within a distance of ten air miles causing considerable orographic cooling. This accounts for a 40-plus inch rainfall average each year which includes a good snow cover. This is reflected in a good forest cover and economic development along recreational and manufacturing lines.

The Region has two to five storms per month throughout the year. These storms occasionally cause floods, but are of great importance in the Region's long-

range prosperity. Eighty-five to ninety percent of the Region is forested and the entire area has a very high energy climate.

The general climatic pattern is for cold air masses to proceed southward over the Region while warm air moves in from the ocean or up the Connecticut Valley. When the two meet, storms generally occur. If the two air masses are of equal vigor, a stagnant front develops and a storm may last as long as a week. There are, however, great variances from this pattern making the area particularly difficult for forecasters.

This phenomenon was studied more intensively by the U.S. Forest Service in 1949. 1/ The Service reported that four types of storms occur over this area:

a. Stationary frontal type. This is the most common type of storm and causes heavy precipitation over the entire watershed for sustained periods of time. When this occurs in combination with melting snow cover, floods frequently result.

b. Intense cyclonic dusturbance with high intensity and short duration of precipitation. On September 16-17, 1932, this type of storm brought six inches of rain over

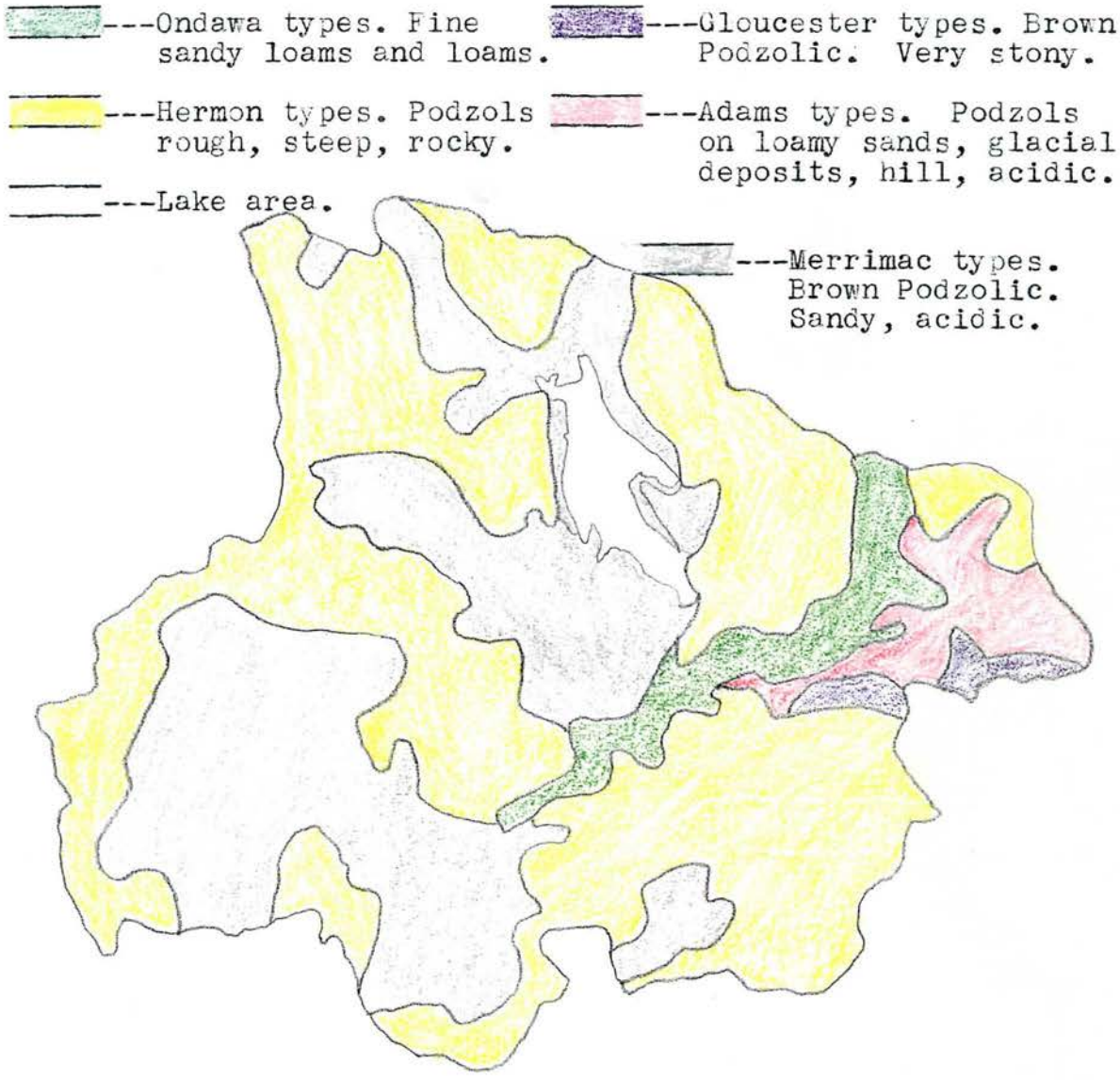
1/ "Flood Control Survey of the Merrimack Watershed", unpublished report by U.S. Forest Service. (Upper Darby, 1949)

the Region while adjacent areas received as much as eight inches.

c. Hurricaines are rare, but when they occur, as they did in September 17-22,1938, very heavy precipitation with extremely great intensity brought an average of 7.8 inches to the Region. Peterboro, New Hampshire, about 70 miles south, suffered severe storm damage and measured 15 inches of precipitation during this same time. These storms have occurred while a stationary front was in the area, thus increasing flood hazards. Since this particular month, September, is normally one of the driest, flood damage was light in proportion to the amount of precipitation.

d. Thunderstorms largely due to excessive cooling occur in small scattered areas but often have high, intense precipitation and can cause small local floods on the minor tributaries which afford little valley storage. As this type of storm may be artificially induced by cloud seeding, it offers possibilities in forest fire control. Wallace Howell claimed at a meeting of the New Hampshire Academy of Science at Keene, N.H. in May, 1951 that only about 1% of the moisture in the atmosphere is ever precipitated at any one time. If the seeding of cumulus clouds can increase this to 1½%, the result could mean as much as 50% increase in local precipitation. There is nolegislative authority for this development in New Hampshire.

Soil Associations



Source: University of New Hampshire Department of Agronomy

Soils

Under the conifers, particularly on the western mountain slopes, the soils are fully podzolized and belong to the Podzol great soil group. The other soils are somewhat less podzolized and belong to the gray-brown podzolic great soil group. Both are derived from granites and schists, the latter somewhat greater along the streams. Both groups are also highly acidic and this is revealed by the low calcium content, most of this base having been leached out by a high 40 inch average annual rainfall. Soils generally are either of upland glacial till in secondary origin or have been assorted by water action, however, there is, curiously enough, one small deposit of aeolian material known as Windsor Sand along the southern edge of Newfound Lake. It may be that the high wind velocities which accompany glacial motion created this wind-blown material.

It can safely be said that the soils are not good for sustained agricultural production, but they are adaptable for many uses. This is indicated by the Region's land-use pattern which will be mentioned later. A soil survey conducted by the U.S. Department of Agriculture in cooperation with the N.H. State University in 1938-40 revealed

that Ondawa was the only profitable cropland soil at the present time and it is found only in patches in the bottom lands of the Pemigewasset and Newfound River valleys. It is subject to periodic flooding which replenishes fertility and since this can happen at any time, it is of limited value for safe crop growing. Ondawa, like the other soils in the Region, also requires heavy liming for grass crops.

In general, the best soils form a narrow ribbon along the major streams. Sands and gravels predominate on the plateaus; rough, stoney soils cover the mountains.

Forest Type Associations

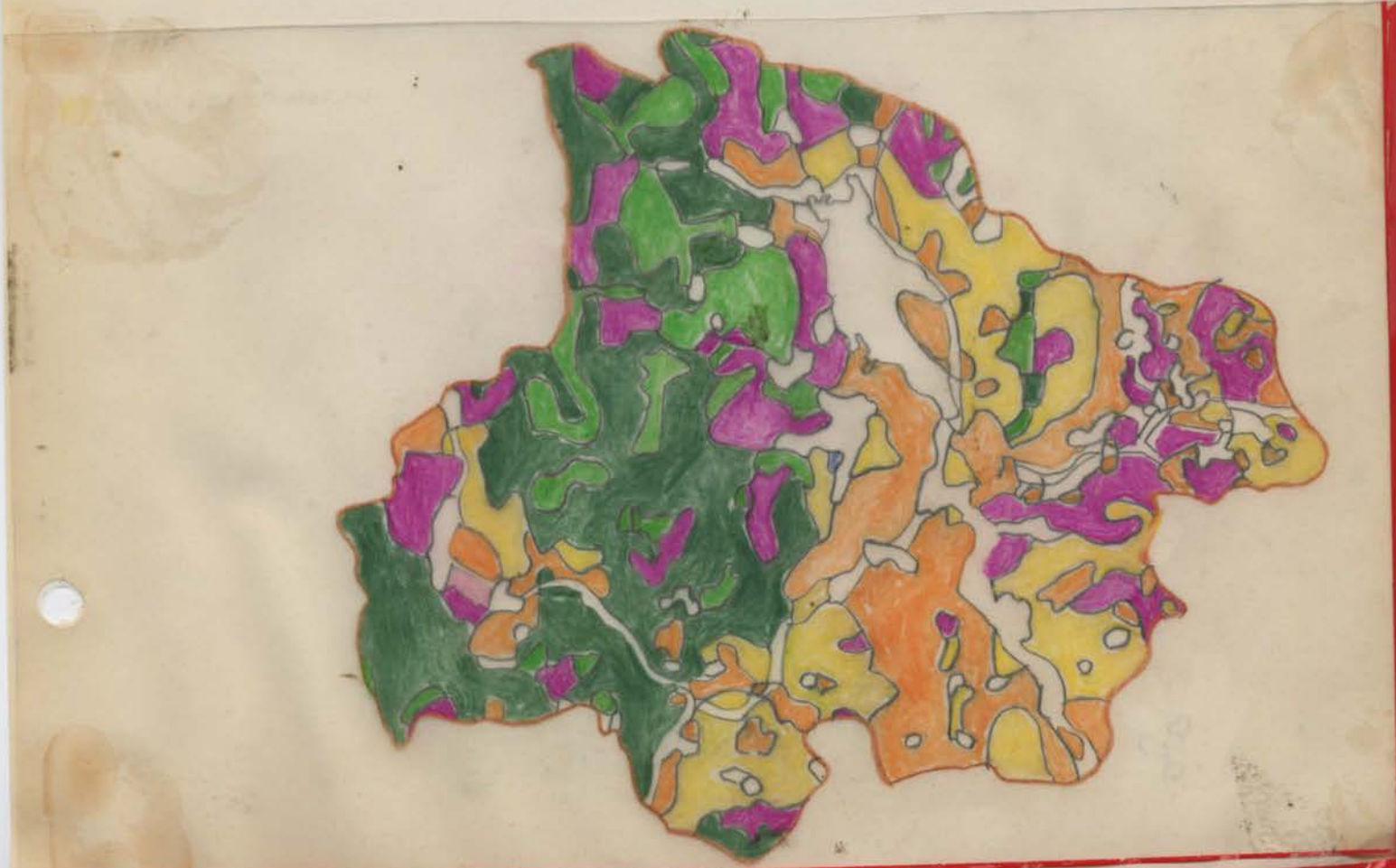
---White Pine. 50-100%. Frequently with mixed hardwoods due to cutting and failure to remove weed trees.

---Hardwood-White Pine. White pine 25-49% of stand with white and red oak, white ash and many lesser varieties.

---Spruce-fir-Hardwoods. Spruce and fir 50-74% of stand in mixture with hardwoods.

---Hardwood-Spruce. Spruce and fir25-49% of stand in mixture with hardwoods.

---Northern Hardwoods. Sugar maple, yellow birch, beech, basswood predominating.



Natural Vegetation

Due largely to its generous precipitation, this area has a climax vegetation of spruce and fir on the mountainous slopes, and northern hardwoods on the plateaus. The smaller valleys were frequently beaver-dammed and the only natural grasslands were found there. Along this grassland strip and along other streams were found the willows, the birches, the maples, and associated species which, in the larger perspective, makes the entire Region a transition zone between the belt of northern hardwoods and the conifers.

Trees grow well on these hills, better than any other type of vegetation, and along with water, are the greatest natural resources of the entire region. At present about 85-90% of the area is forest covered with very poor but fast growing stock. At least 60% of the 180,000 acres of woodland are entirely unmanaged, and the rule of "Cut out and get out" is still observed. The best trees are continuously harvested and seeding is from inferior stock. Present rate of growth is about 25 cubic feet per acre, or approximately one-fifth cord. Extensively managed, this could be increased to 60 cubic feet. Intensively managed, yields are as high as 180 cubic feet per acre.

Today, the area is primarily in hardwoods of low quality. These grow rapidly on areas where there has been a light burn or severe overcutting and a sufficient amount of light can get in. The conifers are found in great numbers on the slopes where they get their necessary cool, moist conditions. The lower and sandier areas are covered by white pine, the Region's traditionally great commercial cash crop. The commercial treeline appears to be about 2400 feet. There is considerable vegetation above this point, but inaccessibility or remoteness from shipping points discourage most woodcutters. 1/

Forest improvement is the greatest challenge that the Region faces today. There are tremendous possibilities for an integrated wood-products plant which can use poorer varieties and manage the forests. As yet the term "sustained yield" is meaningless to the average person who, at the same time, complains because of the lack of employment in the Region.

1/ "A Study of Runoff and Water Retardation in the Merrimack Watershed", U.S. Department of Agriculture--Forest Service, (Upper Darby, 1941). An excellent survey which mentions many of the points that I have made in this section.

Land Use

A study of the land and its inhabitants is the best way to determine the true character of the Region. The most outstanding single feature of the land use pattern is the ability of the area and its people to accept and adjust to changing economic conditions. This is largely based upon the flexibility of resource use. The history of the Region will reveal this quality.

Early settlers found a versatile land which would grow crops or trees, provide fish and game, and had plenty of pure water. It had, then, the basic requisites for human habitation. These people and those who followed found that they could collect pelts for the fur trade, cut trees for the King's Navy, or go into subsistence farming. The Newfound Region settler learned that he could make a living in a number of ways and the most successful proved to be those who could carry on several activities at once. Very few became specialists or single-croppers. They did not glean the rewards of specialization, but they always lived comfortably from their diversification. Self-sufficiency, to a high degree, gave him a spirit of individuality and independence from others that is still evident today. I can't believe that the grasslands farmer

with soils not suitable for diversification and who is accustomed to working as part of an economic whole has ever known this same individuality unless he migrated from the East.

The long, dreary winter months of relative inactivity provided the time to repair or build labor-saving devices and to make use of the animal and vegetable products he had harvested or collected. In this way he developed many skills and learned the value of doing a careful, conscientious job. This attitude is apparent today in the high degree of skillin local factories and in the accepted principle of doing a job well.

The decade between 1840 and 1850 marked a major turning point in the Region's land-use pattern. Subsistence farming was clearly on its way out. The soils had been found to lose their fertility rapidly, the best hardwoods were nearly all gone, sheep raising was no longer profitable due to Western competition. The people were learning that they could not overwork their resources, do each others work, and prosper. As the railroad brought Western food in, marginalism quickly developed, and the hills poured their inhabitants into the villages. For those people who made the change, individuality broadened sufficiently to accept village life, although this process

appears to have taken several generations. A few never did make the change and their homes gradually became the rural slums spotted throughout the Region.

It is important to note that the carrying power of the land was high enough to prevent a heavy decline in total regional population. There was a redistribution in the settlement pattern, a change from a relatively even to a concentrated distribution, and most of the farming villages lost population to the village of Bristol.

Manufacturing is the major cause for this redistribution. The second half of the 19th century saw a tremendous increase in production. The Civil War's need for materiel appears to have been the greatest single impetus to the construction of new factories. Once they were built and a labor force available, the Region was in a competitive position to supply goods to outside areas without the price subsidy of a war.

This new economic era saw a depletion of water and the remaining forest resources just as the previous one had seen a depletion of wildlife and soil. Now the streams not only furnished transportation, but power for the mills and processing water for the tanneries. 1/

1/ "History of Bristol, N.H.", Vol. I. Annals. Musgrove Printing House. (Bristol, 1904). Pp. 366 deals with the development of early manufacturing.

The larger streams became polluted, the spruce was cut for the paper mills, the great red and white pines went into the construction of new homes, and the remaining hardwoods went to the wood heel and furniture shops. By 1900 the entire Region was resource bankrupt, with the exception of the natural reservoir--Newfound Lake. One by one the great woodworking shops closed down until only the small specialty manufacturers continued.

Population declined parallel with forest resources in the smaller towns and had increased with the development of manufacturing in Bristol. As people left Bristol, others from the surrounding towns stepped in to take their jobs. In effect, Bristol's growth was dependent upon the use of the natural and human resources of the other towns.

Bristol deserves special mention. It was the only town to increase steadily in population right up to 1950. While the population in the other towns is roughly one-third what it was one hundred years ago, Bristol gained.

The early founders of this town must have had a geographer's acumen. The town was formed in 1819 by cutting off that part of the town of Bridgewater having the advantages of size, site, and location and leaving the parent with poor soil and a lot of mountain.

Bristol is a small, compact town with most of the Region's population. It is the crossroads for a federal and a major state highway with excellent communications with the larger populated areas of New England and beyond. Most important, the town has good waterpower, that is, it has both a natural dam and a natural reservoir. An excellent fall-line with Newfound Lake behind it (the town founders also took most of the lake from the other towns) led to a concentration of manufacturing in the town. The remainder of the region furnished labor and lumber and water.

The stumpage value of a tree is quite small compared with the value of articles produced from the tree. The towns producing the trees received a much smaller proportion of the total selling price of the product than did Bristol which accounted for most of the value added by manufacturing. Therefore, Bristol prospered and became the service center for the entire Region, the focal point for all economic and social activities. The other towns became economically dependent satellites.

Manufacturing flourished and the town of Bristol grew well until the forest resources were exhausted. Then, as the large producers were closing, the people turned to another means of income, and the resource base of the community's economy began to disappear.

At this point the Region's economic base changed from resource-orientation to labor-orientation and, in my opinion, this was the beginning of its industrial decline. Wood was no longer available in the necessary quantities at a favorable price. Only water, factories, and labor remained.

The woolen and shoe industries needed a small amount of processing water and a large amount of labor per unit of output. This new development kept the Region solvent for about 50 years, but eventually the tarrif advantage was lost, other regions could produce for less, other people would take smaller paychecks, and the secular trend caught up with these establishments. In despair the mills turned to the production of top-quality items, but eventually they could not meet their variable costs and were forced to migrate southward.

After the post World War II spurt had settled down, the Region was left virtually "high and dry" without a major manufacturing plant. A few small shops remained, but their combined profits and wages could not hope to maintain community services for any length of time. The community was left with old buildings, few developed resources, and a good labor supply.

There is manufacturing of a scale large enough to support the bulk of the labor force in the Region today only because there are a few old buildings, labor is willing to accept a smaller paycheck, and price levels are high. A producer did move in following the woolen and shoe crisis, but all raw materials are moved in, processed, and shipped out again. There is a slight amount of processing water used and a small amount of power produced for plant use. The Region is on an extremely shaky economic base as far as manufacturing is concerned and this is reflected by an unusual amount of labor unrest. Buildings are growing older and no new ones are being built, labor of other regions, such as: Puerto Rico or the Virgin Islands, can underbid local labor and may do so if the general price level declines and marginalism stops production. Most unfortunant, this is not generally realized and nothing is being done to get back to a resource-oriented economy. When the general price level declines, I feel that this industry will prove to be transitory and the Region will suffer a serious decline.

During this period of economic shifting, a new development was taking place which again reveals the Region's amazing capacity to adjust to new activities.

The five day work week, the automobile, the tendency for people to retire younger, and the natural attractiveness of the Region all contributed to the development of commercial recreation as a major source of income. The Region's physical resources now were valued for new qualities. The forests which had once contained the masts for the King's Navy and later had been cut for manufacturing were now prized for their aesthetic qualities. Water which had once floated logs and later turned wheels was now desired for swimming. Wildlife was able to grow better under new but poor deciduous forest growth than they had under the high, dense virgin cover, and sportsmen soon learned of this. Cabins sprang up around Newfound Lake and many of the more distant rural places advertised for "Summer Boarders". Newfound Lake is now heralded as the "fourth largest lake in New Hampshire, 168 feet deep, 22 miles around, and good salmon fishing". The Lake does have a species of land-locked salmon restrained by dams and pollution from becoming anadromous again. Mount Cardigan rising on the south-west side of the Lake is the nearest mountain to Boston over 3000 feet high on which there is good skiing. The entire region is within a three hour drive of Boston.

During a good week in the summer season approximately $40,000 is taken infrom vacationists expenditures within the Region. About 20% of this is for lodging and the balance for food, gasoline, amusements, fishing licenses, souvenirs, and liquor. There has been some attempt to promote four-season recreation, but, as yet, the results are not significant. However, the feature tourists want most is here: a lake-mountain combination.

The development of recreation as an industry has had the important effect of stemming the drop in real estate values which would normally fall in a declining area, and also in the maintenance of community services. In general, land prices today are lower the further one goes from the lakeshore and from Bristol village. Values along roads are also higher than the area in back of them, as is to be expected, but nowhere else does the rise in values equal that of the lakeshore during the past thirty years. Probably the best measure of recreation's effect upon the Region is in the offset of the decline of farmland by the rise of recreational property.

Manufacturing, although it is not on a secure basis, is still the Region's greatest source of year-round income. Agriculture has shrunk to a very minor position. Forestry is in a weak positon due to mismanagement. Rec-

reation has the theoretical capacity to become the major source of income, but this industry falls into the luxury trade, and if economic conditions decline, there could also be a decline in this field. Offsetting items would be the tremendous growing potential for forests if properly managed, the skilled labor supply, and the drawing-in effect of recreation, that is, in case of an economic depression people do not go as far from their homes for recreational purposes and vacations. In the case of the Region, its proximity to large population centers means that the effect of a depression is mitigated by the fact that people who formerly went greater distances will then come into the Region.

Human Habitation

Human habitation can not realistically be separated from land use and this subject is interwoven with land use in the previous section. This section will attempt to bring the Regional character into clearer focus.

Today there are about 5000 year-round residents in the Region and about 12,000 summer residents and tourists staying for a week or more. There is a growing realization that it takes both groups to make a community. It has been difficult for the permanent population to accept this fact, and right up to 1945 it was common to see "Restricted Clientele" signs throughout the tourist areas. Perhaps the difficulties in the manufacturing field will make these people realize their dependence upon their "vacation-neighbors" for their livelihood.

There is a serious social problem bearing upon the economic conditions in the Region. The birth rate has been stable for two decades and this past census showed the total population turning downward. The 45 to 65 age group is greater in the Region than it is in the State as a whole. The majority of youth leave the community after high school graduation and this is reflected in a high degree of apathy in the local people. Many feel that improvement is pointless

unless their children take over their property after them. Frequently, people attend public gatherings more for entertainment than for constructive action. There is a universal failing to recognize that there are limited opportunities for youth in the community and that the parents are the cause for this condition. There is a commonly heard rationalization: "Nobody helped me when I was a boy. If I could make a living, I don't know why he can't."

Provincialism is definitely ending its days in the Region. We noticed that in the past a man could change freely from one occupation to another. More recently he could move from a woolen mill to a wood-products shop to a machine shop or rent cottages to tourists. The attitudes which came out of these eras is still noticeable today, but are more of the cultural "baggage" than a true reflection of existing conditions. The loss of resources, the decline of manufacturing as the chief source of income, the dissatisfaction created by radio and newspapers, the influx of tourists, the dependence upon the products of other regions have all tended to widen the interests of the populace.

The old Yankee stock has become pretty well diluted by newer residents. Vacationists are gradually being worked into local affairs and many people who came as

tourists have purchased property and retired to it. On the whole this is a good sign since many of these newer citizens come with the idea of improving the community. Few, if any, ever become public wards or nuisances. Many of them show an interest in community affairs far greater than that exhibited by people who have lived here all their lives. They are instrumental in maintaining public services.

As long as the Region had resources, it was possible to shift from one activity to another. Today, we find a new situation with a decline in opportunity. In effect, it makes the Region more and more specialized and brings all the dangers of such specialization. It should be pointed out, however, that although it appeared that a man could change from one occupation to another at his volition, still in the larger sense, he was compelled to do so or lose out. The individuality and freedom that he thought he had, was not supported by logical analysis. We have examples where men did not make the change when economic pressures directed. Abandoned cellarholes are a sign of progress for these people responded to economic changes. On the other hand there are rural slums where people doggedly attempt to "stick it out" hoping for better days. These people accepted a lower standard of living, saw their prop-

erty deteriorate and, be unable to keep it in repair, and saw their children migrate to other areas where opportunities were greater. These, the induvidualists, are the problem-children of today. The modern resident is as dependent upon the rest of the world as are the people in other Regions.

Water Problems

Water and wood are the Region's greatest potential natural resources. Both have been abused, but of the two, water has made out a little better.

Water problems are of two types: control and use. Water control means the prevention of floods and the abatement of pollution. Flash floods do a moderate amount of damage and are better controlled by flood plain zoning than by any other immediate action. Some houses are repeatedly damaged and are dangerous to downstream construction, although no action has ever been taken to eliminate this hazard. Major floods are not controlled until they reach the Hill Reservoir below the Region's major damage centers. Downstream communities are protected by this flood control reservoir to the extent of 37% of the damages arising from the last major flood (1936). The entire village of Hill was moved in 1941 so that the U.S. Corps of Engineers could construct this reservoir. It is only closed in the event of high water. Most new construction is well above the highwater marks of the major floods and the moderate storage afforded by Newfound Lake holds flood damages to a relatively low figure.

Water pollution is a problem not yet faced.

The towns dump their sewage untreated into the streams. The Newfound and Smith Rivers, particularly the former, are seriously polluted at various points and nothing is being done to stop it. The Pemigewasset River is a veritable biotic desert for much of its distance, but in the Region it is polluted sufficiently to cause air pollution during the drier months. Nothing is being done about this. Newfound Lake has been classified by legislative act so that it is illegal to do anything to render this water body dangerous for swimming. In a few cases where pollution would interfere with bathing, it is run through septic tanks but in a few cases also it is dumped directly into the lake without even the advantage of natural filtering through soils. This, however, is only a matter of better law enforcement.

Headwater control by better forest management has a lot to offer both manufacturing and recreation, but as yet, it is scarcely recognized. Water retardation is a sound principle and the increased infiltration resulting from better forest management could substantially retard runoff, improve the smaller streams for fishing, maintain ground water tables, maintain lake levels, and bring other benefits to all people. Nothing is being done about watershed treatment although it is certainly needed.

The water resources of the Newfound Region, the last major resource, are being wasted. The flood control reservoir in Hill is allowed to fill with the spring run-off when it becomes dangerous to downstream communities. Water is stored until conditions are safe, and then it is released at a time when downstream power reservoirs are generally well supplied anyway. Consequently, no value is derived from this water. There are many uses for this water such as: release during the months of August and September. At this time one mile in five of the Region's streams either dries up completely or goes so low that fish can not live in it either from insufficient water to be protected, from warming up to temperatures which brook trout can not stand, or the increased concentration of pollution. 1/

At present there is insufficient storage capacity to control major floods, let alone store water for future use. There are several places where a conservation storage reservoir appears justifiable, and the attached U.S.G.S. map indicates areas where this has been proposed or can be done. There has been no study of costs, although it is generally agreed that sites must be multi-purpose to pay for their construction and maintenance. Amortization would be over a 50 year period.

1/ "Biological Survey of the Merrimack Watershed", Hoover, New Hampshire Fish and Game Department. (Concord, 1939)

Conclusions

The Newfound Region is a natural geographic unit from the viewpoints of physical, economic, and social criteria. Its topography, soils, natural vegetation, water, site, location, and size are the bases for its land use and pattern of human habitation.

Geographic elements have endowed this region with the capacity to change from one economy to another without a net loss of either population or property values. The loss of its two major resources: wood and water by overcutting and pollution, has left the region in a precarious economic condition today. The bases of both manufacturing and recreation can be strengthened by development of these resources.

Loss of young people and the influx of tourists have shaken the provincialism exhibited in the spirit of individuality for which the Region has been noted. This feeling was founded on the belief that inhabitants could take their choice of economic opportunities in a versatile land. It is apparent that choice was actually not voluntary but was shaped by economic considerations. Evidences of failure to recognize this is in the rural slums that dot the land.

Geographic advantages of Bristol were used to explain this town's rise while others in the Region declined.

Bibliography

General Reference:

U.S. Bureau of Plant Industry, "Soil Survey of Grafton County, New Hampshire", U.S. Department of Agriculture, (Washington, 1940)

U.S. Forest Service, "A Study of Runoff and Water Retardation in the Merrimack Watershed", U.S. Department of Agriculture. (Washington, 1941)

U.S. Forest Service, "Flood Control Survey of the Merrimack Watershed", U.S. Department of Agriculture. (Upper Darby, 1949) Unpublished.

Specific References:

Billings, Marland. "The Cardigan and Rumney Quadrangles", New Hampshire State Planning and Development Commission, (Concord, 1949)

Hitchcock, Charles. "The Geology of New Hampshire", Volumes 1-3, New Hampshire State Library, (Concord, 1874-8)

Hoover, Earl. "Biological Survey of the Merrimack Watershed", New Hampshire State Fish and Game Department. (Concord, 1939)

Musgrove, Richard. "History of Bristol, New Hampshire", Volumes I--annals, II--geneology. Musgrove Printing House, (Bristol, 1904)

New Hampshire State Planning and Development Commission. "New Hampshire Municipal Abstracts", Census and other data by towns. (Concord, 1944)

New Hampshire State Planning and Development Commission. "Population of New Hampshire". Basic data on growth and distribution since the time of settlement, 1623-1940. (Concord, 1946)

Thesis Abstract

The Newfound Region of New Hampshire is a cluster of nine towns approximately 105 miles from Boston University. These towns exhibit a remarkably high degree of physical, economic, and social unity which is displayed by evidences of a youthful stage of regionalism. Geographic analysis was used to determine the natural environmental factors shaping the Region's personality.

Water is the central theme in the Region's development. Water covered the area with a dense forest growth, provided for the animals that supported a collecting economy. Later water floated logs, turned waterwheels, later turbines, and washed wate products into streams. Even later water was valued for its recreational qualities: swimming, fishing, and aesthetic qualities. Today water remains as the only major natural resource. Even so, it has been badly depleted by pollution and waste of the spring freshet.

The boundary of the Region is not determined by political lines but by drainage divides. The people live figuratively with their backs to the mountains and their faces toward the Newfound Lake-Bristol Village area. The invalidity of town and county lines as indicated by a unity of interests within the Region reduces the value of statistical data collected by political divisions.

Geologic history of the Region begins about four hundred million years ago in the Ordovician Period. The entire area has been subjected to considerable alteration during this time, but movement of the continental glacier is of the greatest importance in explaining present-day activities. Soil was scraped down, erratics were dumped in odd places, rivers were transformed into lakes by damming, and glacial till was scattered all over the Region. This has led to manufacturing and recreational development rather than sustained agriculture.

Paleozoic folding followed by glacial movement determined in large measure why Bristol and not Hill became the service center of the Region. The Smith River lay across the glacier's path while the Newfound River lay in the same direction that the glacier moved. Consequently, the Smith River Valley tended to become filled with glacial drift while the Newfound Valley was dug deeper and dammed at one point. This provided a natural reservoir for the Newfound River terminating at Bristol Village, but provided very little valley storage for the Smith. This has led to extremely high water-level fluctuations on the Smith during the year, and moderate fluctuations on the Newfound. Mills need this maintenance of stream-flow which Bristol could furnish and Hill could not. Newfound Lake is an excellent natural reservoir.

The floodplain on which Bristol Village stands today was formed by glacial melt from the basin east of Mount Cardigan. Water passed out of the Newfound Basin by way of Alexandria Meadows and so into the Smith River Valley. It circled around Plumer Hill and went over the present cemetery area, over Bristol village, and so out to the Merrimack Valley. Wave action caused by prevailing northwesterly winds tended to later wear down the glacial drift deposited at the foot of Newfound Lake and change the watercourse.

The Region receives a forty-plus-inch average annual rainfall and two to five storms per month throughout the year. In general, cold air masses proceed southward over the area which warm air moves in from the ocean or up the Connecticut Valley. When the two meet, storms generally occur. If the two air masses are of equal vigor, a stagnant front develops and storms may last a week.

Heavy leaching and glacial deposition has left a paucity of good soils in the Region. Sustained agriculture is not generally possible because of quick loss of soil fertility and the dangers of inundation along the Pemigewasset and Newfound Rivers.

The Region is 85-90% forested but with low grade trees due to poor cutting practices. Forestry offers tremendous possibilities for future development, but little is

currently being done along these lines.

The most outstanding single feature of the land use pattern is the ability of the Region and its people to adjust to changing economic conditions. This has been largely due to a good natural resource base--primarily wood and water--upon which to fall in case of economic crises. Now the wood is gone and the water is polluted and wasted. Unless these conditions are changed, I believe that the Region is facing a serious economic decline. Recreation is largely uni-seasonal and is still considered by most people to be a luxury which can be reduced or eliminated in the event of an economic depression.

The versatility of an early land is credited with being the basis for a feeling of independence and individuality which early settlers developed. Today, this attitude is still apparent but is more of the cultural "baggage" of the Region than the reflection of actural conditions. Provincialism is also being eliminated by the greater dependence upon the rest of society for modern needs, the exodus of youth to other regions, and the influx of tourists who frequently become residents after their retirement.

During the history of the Region there have been three major economic cycles: subsistence farming, manufacturing, and recreation. There has been a staggered overlap

of these activities, but, until the 1950 census, there has been no population decline in total numbers. There has been a redistribution, however, and the smaller towns were as much as three times larger 100 years ago than they are today. Bristol alone increased in population by drawing upon the human resources of the surrounding towns.

Bristol is a town which deserves special mention. The founders of this town must have been endowed with a geographer's acumen. That part of Bridgewater which had the advantages of population, size, site, location, and soil was cut off in 1819 and formed into the town of Bristol. It is a compact town with a federal highway and a major state highway crossing through it, with most of the Region's labor force, with the major portion of Newfound Lake, with a natural reservoir and fall-line for manufacturing uses, and at the conflux of three valleys.

In the process of drawing upon the forest resources of the other towns, Bristol advanced at a tremendous pace while the towns supplying the materials declined in all respects. Stumpage value of a tree is a relatively small part of total selling price of products made from that tree. Bristol received wages and profits from the added value of manufacturing and consequently did much better financially than did the other towns.

Shifting from a resource-oriented manufacturing base to a labor-oriented base was the beginning of the Region's economic decline. This came when the forest resources were exhausted, the last large wood-working plants closed down, and woolen and shoe factories requiring large quantities of labor became the major producers. As the secular trend caught up with these later industries, an even more labor-oriented producer came into the area as its number one income producer. Today the largest source of Regional income imports all of its raw materials, makes a product requiring inexpensive semi-skilled labor, and exports all of its output. In my opinion, competition based on wage rates is unstable and unsound for this Region. During economic depressions when employment is needed most, labor can be underbid by people able to take a smaller paycheck. Because of this, the Region is on a shaky economic footing.

Redevelopment of forests and full utilization of water resources offer the greatest opportunities for the Region's economic prosperity. Both are the bases of sound recreational and manufacturing industries--the two activities for which the Region is best suited according to its geography. It appears at this time that there will be a continued decline of population in the Region until the people can again get into economic balance with their natural environment.

Land Use Map of the Newfound Region

of New Hampshire

---Year round service centers
Compact village life.

---Recreational areas with
seasonal population.

---State-owned recreational
areas. Only the one on
Newfound Lake has been
well developed.

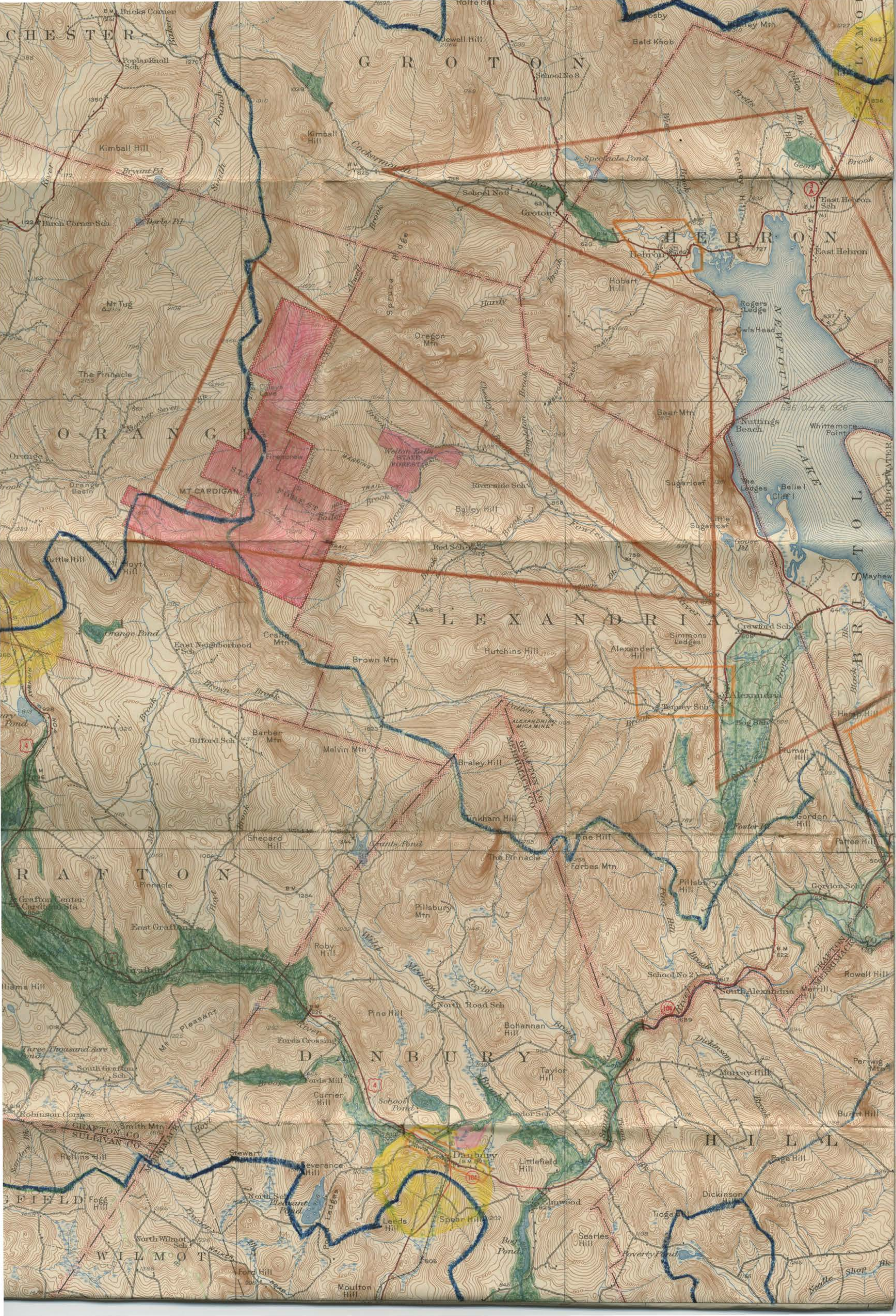
---Industrial Area: mfg.

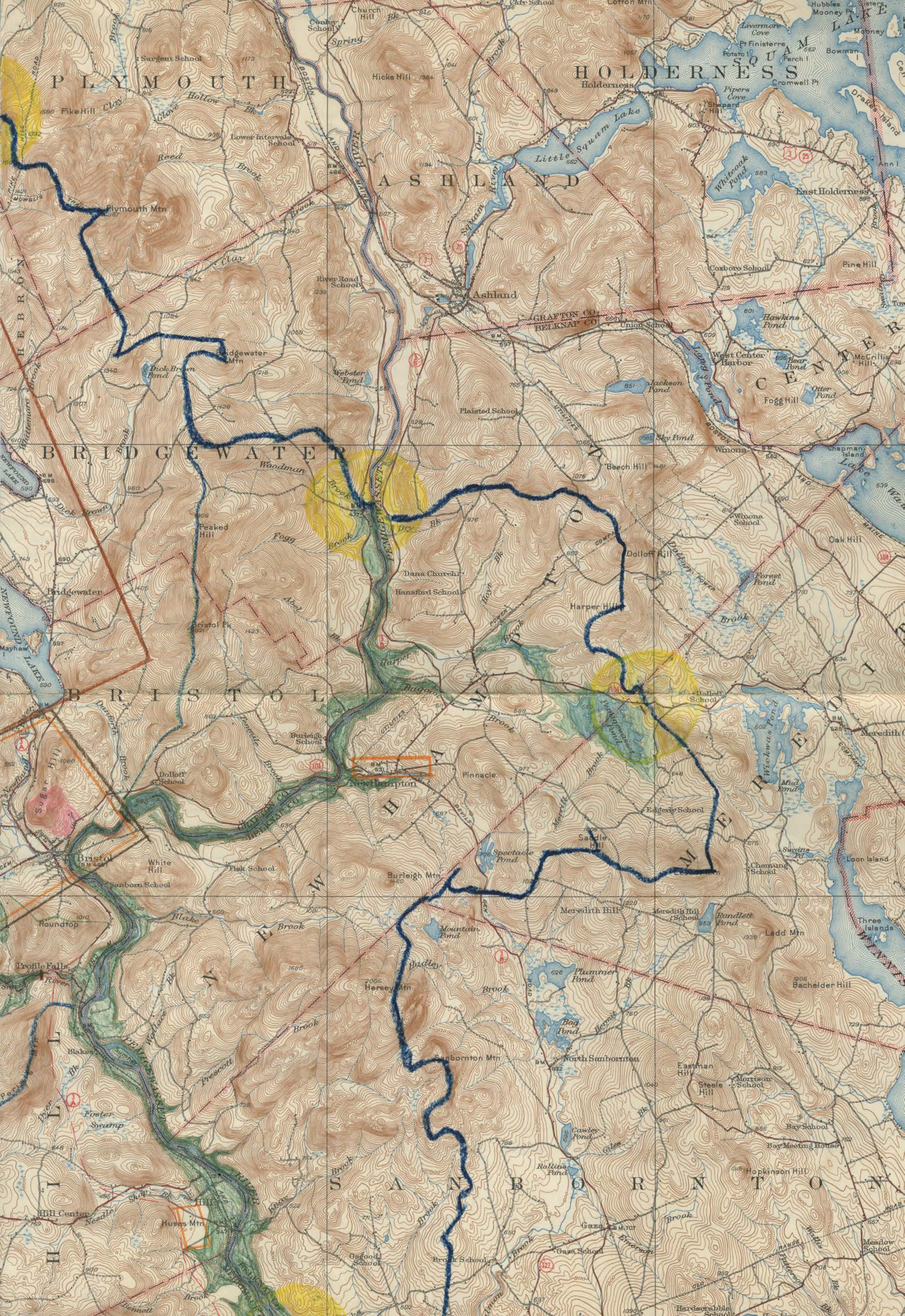
---Gateway. Major roads
lead to Bristol.

---Proposed water resource
developments.

---Drainage divide.

Note: Remaining land, about 180,000
acres, is forested. Total area
approx. 300 square miles.
Scale: Approx. 1 mile per inch.
Source: USGS base map.


CHESTER
Bucks Corner
Poplar Knoll Sch
Kimball Hill
Bryant Pd
Derby Pd
Birch Corner Sch
Mt Tug
The Pinnacle
Number Seven Bk
ORANGE
Orange
Orange Basin
MT CARDIGAN
Firescrew
STATE FOREST
Cilley's Cave
Davis Brook
Welton Falls STATE FOREST
Riverside Sch
Bailey Hill
Red Sch
Tuttle Hill
Hoyt Hill
Orange Pond
East Neighborhood Sch
Crane Mtn
Brown Mtn
Brown Brook
Gifford Sch
Barber Mtn
Melvin Mtn
Braley Hill
Shepard Hill
Grants Pond
GROTON
Jewell Hill
Kimball Hill
Cockermouth River
School No 8
School No 9
Groton
Spectacle Pond
Bald Knob
Hobart Hill
Oregon Mtn
Spruce Ridge
Hardy
HEBRON
Hebron
East Hebron Sch
East Hebron
Tenney Hill
Rogers Ledge
Owls Head
NEWFOUND LAKE
586 Oct 8, 1926
Bear Mtn
Nuttings Beach
Whittemore Point
Sugarloaf
The Ledges
Belle I
Cliff I
Little Sugarloaf
Goose Pd
Mayhew I
BRISTOL
BRIDGEWATER
LYMOUTH
ALEXANDRIA
Hutchins Hill
Alexander Hill
Simmons Ledges
Crawford Sch
Alexandria
Tenney Sch
Bog Sch
ALEXANDRIA MICA MINE
GRAFTON CO
MERRIMACK CO
Plumer Hill
Hemp Hill
Tinkham Hill
Pine Hill
The Pinnacle
Forbes Mtn
Foster Hill
Gordon Hill
Pattee Hill
Pillsbury Hill
Gordon Sch
GRAFTON
Pinnacle
Grafton Center
Cardigan Sta
East Grafton
Grafton
Williams Hill
Mt Pleasant
Three Thousand Acre Pond
South Grafton Sch
Robinson Corner
Smith Mtn
GRAFTON CO
SULLIVAN CO
Rollins Hill
Pillsbury Mtn
Roby Hill
Wild Meadow
Pine Hill
North Road Sch
Bohannan Hill
Fords Crossing
Fords Mill
Currier Hill
School Pond
DANBURY
Taylor Hill
Taylor Sch
Danbury
Littlefield Hill
Elmwood
Stewart
Severance Hill
North Sch
Pleasant Pond
Ledges
Leeds Hill
Spear Hill
Bog Pond
Fogg Hill
WILMOT
North Wilmot Sch
Ford Hill
Moulton Hill
School No 2
South Alexandria
Merrill Hill
Rowell Hill
Dickinson Brook
Murray Hill
Periwig Mtn
Burnt Hill
HILL
Page Hill
Dickinson Hill
Tioga Hill
Searles Hill
Poverty Pond
Needle Shop Bk



PLYMOUTH
HOLDERNESS
ASHLAND
BRIDGEWATER
BRISTOL
NEW HAMPTON
CENTER HARBOR
MEREDITH
HILL
SANBORNTON
HEBRON
SQUAM LAKE
Church Hill
Cooley School
Spring
Sargent School
Hicks Hill
Carr School
Cotton Mtn
Hubbles
Mooney Pt
Sisters
Livermore Cove
Pt Finisterre
Potato I
Perch I
Bowman I
Cromwell Pt
Holderness
Pipers Cove
Shepard Hill
Drakes Island
Pike Hill
Clay
Hollow
Glove
Bk
Lower Intervale School
Reed
Brook
Little Squam Lake
Owl
Squam River
Whiteoak Pond
East Holderness
Ann I
Plymouth Mtn
Mowglis
Pike
Trail
Boston
and
Maine
River
Coxboro School
Pine Hill
River Road School
Ashland
Grafton Co
Belknap Co
Union School
Hawkins Pond
Bridgewater Mtn
Dick Brown Pond
Webster Pond
Jackson Pond
Long Pond
West Center Harbor
Bear Pond
McCrillis Hill
Otter Pond
Fogg Hill
Plaisted School
Utilities
Sky Pond
Winona
Chapman Island
Lake Winnipesaukee
Whittemore Brook
Newfound Lake
Dick Brown
Woodman
Brook
Peaked Hill
Fogg
Dry Bk
Beech Hill
Dolloff Hill
Winona School
Oak Hill
Dana Church
Hanaford School
Hoyt Bk
Harper Hill
Forest Pond
Bridgewater
Abel Bk
Bristol Pk
Mayhew I
Pemigewasset
Harper
Bagoon
Dolloff School
Pemigewasset Pond
Wickwas Pond
Meredith Center
Burleigh School
Danforth Brook
Pemmaumit Brook
Pinnacle
Mud Pond
Sugar Hill
Newfound
New Hampton
Devils Den
Edgerly School
Bristol
White Hill
Fisk School
Burleigh Mtn
Spectacle Pond
Saddle Hill
Chemung School
Swains Pd
Loon Island
Sanborn School
Roundtop
Blake Brook
Mountain Pond
Meredith Hill
Meredith Hill School
Randlett Pond
Ladd Mtn
Three Islands
Profile Falls
Smith River
Hadley
Hersey Mtn
Plummer Pond
Bachelder Hill
Wallace Bk
Prescott Brook
Bog Pond
Hermit Bk
North Sanbornton
Eastman Hill
Steele Hill
Morrison School
Sanbornton Mtn
Blakes
Periwig
Dyer Bk
Foster Swamp
Cawley Pond
Giles
Bay School
Bay Meeting House
Rollins Pond
Hopkinson Hill
Shop Bk
Hill
Hill Center
Needle
Huses Mtn
Knox
Osgood School
Brook School
Gaza
Gaza School
Emerson
Range Road
Patterson
Wadlis
Meadow School
Bennett
Hardscrabble School