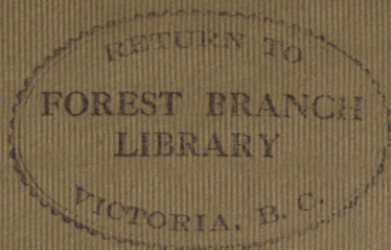


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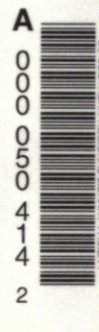
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Conditions in the Clay Belt of New Ontario

B. E. Fernow, LL.D.

Commission of Conservation

Canada, 1913

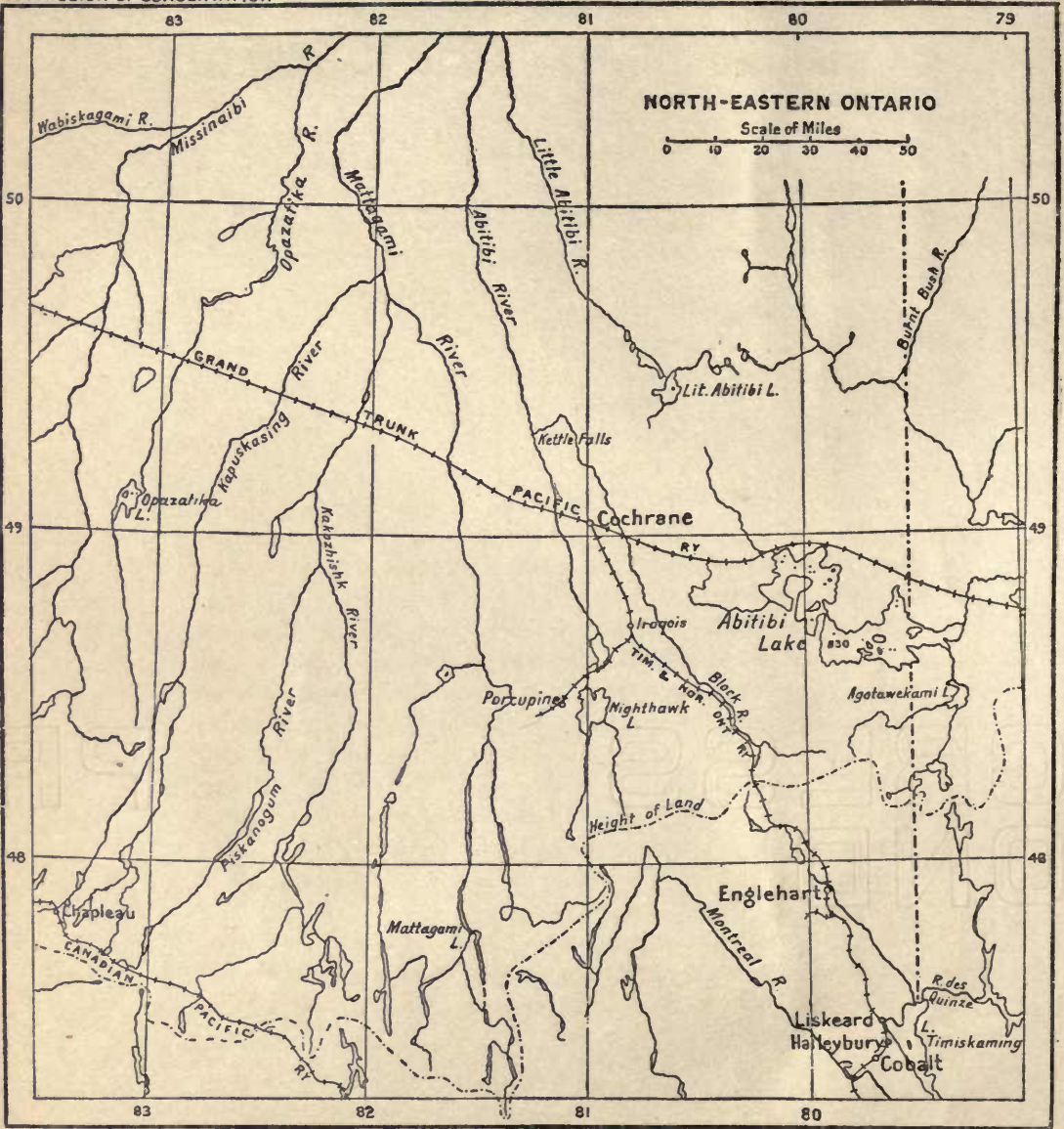
Commission of Conservation
Canada

HON. CLIFFORD SIFTON, Chairman
JAMES WHITE, Secretary

Conditions in the Clay Belt
of
New Ontario

BY
B. E. FERNOW, LL.D.





Conditions in the Clay Belt of New Ontario

Toronto, 28th December, 1912

Honourable Clifford Sifton
Chairman, Commission of Conservation
Ottawa, Ont.

Dear Sir:

Pursuant to your wishes I have made a rapid inspection of conditions along the National Transcontinental railway from Cochrane east and west for about 200 miles, and have pleasure in submitting the following statement.

Through the courtesy of Mr. H. M. Balkam, District Engineer, a motor car (power speeder) was placed at my disposal. This method of independent travel coupled with fair weather for at least four days afforded an unusually satisfactory opportunity for seeing conditions along the line, especially as at the season chosen (the week from October 15) the underbrush is leafless. At the end of my trip, however, I was stalled for two days in one of the engineers' residencies by the first snow of the season—15 inches on October 22.

Besides this personal inspection I had ample opportunity to overhear men familiar with the country.

Allow me to say at the very outset that I believe I have ascertained important facts as regards the condition of a part of the, so-called, clay belt, which, if properly realized, may be useful in its development.

1. *Forest Fires*

The railway line for 86 miles east of Cochrane is practically free from any serious fires. Whatever burned areas were seen, some five

or six spots, are small, close to the track, not more than a hundred yards or so wide, with one exception of somewhat wider extent.

The line for 110 miles west of Cochrane has suffered more. Not only are burnt spots more frequent, but in several cases the fire has spread over larger areas. Especially the mileage from 50 to 60 miles from Cochrane shows extensive burns. In most cases, however, the woodland burned was of inferior types.

On the whole, for this section of the road, it can be said that it has been unusually well protected. I am informed that a very extensive fire occurred about 180 miles west from Cochrane in better timber, and that, on the Quebec side, farther east, damage by fire has also been more extensive. The fact that winds in the summer are usually from the south accounts for the northern side of the tracks being more frequently burned. This also indicates the cause of the spread of fire as started from locomotives. To reduce the danger an additional 25 feet of fire lane has been cut out in spots by the contractors.

It is very doubtful in my opinion whether this wider opening is an advantage, since it only exposes a wider strip to the drying effects of sun and wind. Indeed, since no mineral soil is exposed, and no attempt is made to prepare this strip, covered with highly inflammable vegetable matter, for the purpose of a firebreak, it only increases the fire danger.

2. Character of Country

The country, as far as seen, is slightly undulating, occasionally hilly, and, sometimes, for considerable distances, flat. The one feature which impresses one most is the swampy condition of the country. In spite of the many rivers and minor water-courses the country is poorly drained; and, singularly enough, the most poorly drained level areas may be situated on elevated points rather than in depressions of the general level of the country, which will facilitate any draining operations. The best drained sections are found along rivers (although not always) in belts of a quarter to half a mile in width, and on gravelly or sandy hills.

While a greater portion of the soil is of a clayey nature the hills are largely sandy or gravelly deposits, glacial drift with small boulders; only occasionally does the rock come to, or near, the surface as exhibited in the few rock cuts on the railway line. The clay soil is, however, by no means uniformly of the same character. It varies in texture, colour, character of admix-

CONDITIONS IN THE CLAY BELT

tures, stratification, and chemical composition, and **the depth, especially of the overlying muck or peat layers varies, and, therefore, is of varying agricultural value.** This fact is apparently not fully realized in the attempts at settlement or colonization.

Indeed, there seems to be a widespread misconception that the whole country is **immediately** fit for farming.

So far as I can find out, with the exception of some chemical analyses of a few soils of this region made in the laboratories of the Ontario Agricultural College, no real soil examination in the field has been undertaken. **Such chemical analyses in the laboratory, as is well known, have only a very limited use as first indications of possible agricultural value, which finally depends to a much larger degree on physical conditions that can be ascertained only in the field.**

It is then still true, what the analyst himself stated in 1906* "The all important question, however, the one concerning the suitability of its (Abitibi district) soil for producing the ordinary farm crops in paying or even sustaining quantity, and the potentiality of the same for supporting an agricultural population for any length of time has not, as yet, been answered to any satisfactory extent."

The chemical analysis of 18 of even the "more promising" soils shows several of them as "undesirable, and none of them except No. 8 come up to the standard of a virgin soil."*

It is a striking, though perfectly explainable, fact that the soils which are reported as the poorest, nevertheless, bear good timber.

This fact simply accentuates another well-known fact, namely, that tree growth is largely independent of chemical composition of soil, but indicates merely more or less satisfactory drainage conditions. Agricultural use of the soil is, however, also influenced by these conditions, and liability to frost is very much increased by insufficient drainage.

The climatic conditions of the region are also still imperfectly known. A 13-year record at Abitibi shows the average date of the last frost in spring as June 8 and the average date of the first fall frost as September 14, denoting a rather short frostless season—the growing season beginning about three weeks later than in Old Ontario, and closing also earlier. Frosts in July and August are also to be

*See Thirty-Second Annual Report of the Ontario Agricultural College, 1906, page 58.

anticipated. The climate in this latitude is northern, with its usual short hot summer and long severe winter. Climatically, the distribution of tree species also differentiates this section from that south of the height of land; namely, by the absence of red oak and sugar maple—a certain indication of difference of climate.

Nevertheless, the more hardy root and grain crops mature. **Abundant sunshine and sufficient rainfall during the growing season will produce excellent hay crops, and, when larger areas of the country are opened up to the warming sun, and are drained, some of the deep fertile soils may produce even less hardy crops.**

3. *Forest Conditions*

COMPOSITION.—The whole country is densely wooded. Although there are twelve or thirteen tree species* found in this Northern forest, practically only two species form the bulk of the composition giving a very uniform aspect to the country, namely the black spruce and the aspen. For many miles, black spruce is the sole occupant of the poorly drained soils. Into these pure black spruce stands, here and there, tamarack—mostly dead trees, as a result of insect damage long ago—may enter. Lately, this species is beginning to revive and especially to seed the openings made by railway construction. The presence of any of the other species is an indication of improved drainage conditions. Next to black spruce the most frequent and the most important species is the aspen poplar (here called whitewood), and, as the drainage improves, not only does this species improve in numbers and size, but also balm of gilead (balsam poplar), white spruce and balsam fir appear. This latter is, however, not frequent and usually wormy. Cedar is rarely seen and is usually of poor development. Birch (paper) is also not frequent and less thrifty than the poplars. Jack pine occurs locally, usually as indicative of overdrained, gravelly soils, which it is apt to occupy exclusively, although it occurs sporadically in mixture with other species. The next valuable of these rarer species, the white spruce, represents hardly 20 per cent of the spruces.

The two important timber trees, white and red pine, occur in some very limited localities farther south. The sporadic occurrence of black ash is only of botanical interest.

A very rough estimate of the occurrence of the different species would give 60 to 70 per cent to the black spruce, 10 to 15 per cent

*Black spruce, white spruce, balsam fir, tamarack, jack pine, cedar, red pine, white pine, aspen, balm of gilead, paper birch, black ash, mountain ash.

CONDITIONS IN THE CLAY BELT

to the white spruce, about 15 to 20 per cent to the poplars, and 5 per cent to the rest.

COMMERCIAL ASPECTS.—While the country is densely wooded it is by no means all “timber.” Indeed, from the point of view of saw-mill supplies, the woods are disappointing. **Even for pulpwood the supply is not what the uninitiated may suppose, and what has been believed to exist.**

The early explorers travelled by canoe, and, hence, reported only the better developed timber of large sized white spruce, aspen, balsam poplar, which skirt the rivers on the well-drained portions in quarter to half mile belts, without realizing that, in the swamps beyond this belt, the bulk of the forest growth is black spruce of small size.

There is also an idea abroad that the small trees which cover vast areas are young trees, the result of recent fires. While in some cases this may be a correct diagnosis, it is not so in the majority of cases seen, in which the small trees are stunted, of considerable age and extremely slow growth, the result of poor drainage, as can be readily established by counting annual rings.

An attempt was made to classify from the standpoint of use, the forest growth visible from the railway. Even a layman may readily recognize at least three development classes using sizes for their distinction, namely the most frequent maximum heights and maximum diameters, not considering the “giants”, i.e. the unusual sizes which may occur occasionally in any class. All growth remaining below 40 feet in height and below 5 inch maximum diameter was classed as scrubwood; that above these dimensions, but remaining mostly below 60 feet and 8 to 10 inches in maximum heights and diameters, as second class, and that above these latter dimensions, making an *average* of 12 inches and 80 feet, as first class. In nature, these classes grade into each other, and to allow for these intermediate gradations two classes were interpolated between each of two main classes, namely those somewhat poorer than the best, and those somewhat better than the class below, the more or less frequent occurrence of the main class dimensions serving for these interpolated classes, so that, altogether, seven classes were distinguished.

To check the judgment, a few measurements of diameters on the stumps to be found in the clearings for right of way were made, which measurements, indeed, led to the classification. **These stump areas in front of the forest type itself were also used as checks to classify the**

type properly, since along the railway the better sizes have been culled.

With these classes in mind, expressed by numbers, a record of the character of the woods seen from half-mile to half-mile was kept along the entire line of 196 miles travelled. This record added up would give the number of miles of each class, and, translated into percentages, would give a fair idea of the relative proportion of the classes to be found in the country at large, **provided the conditions along the railway represent the average conditions of the country.** This question was discussed with competent informants, who seemed to agree in that the run east of Cochrane was through poorer country than the average, but that the run west was through average country.

As a matter of fact, from the detailed record the reverse seems true, except that on the west run no open muskegs occur, while one per cent on the east run is of that description. It is this latter fact undoubtedly which has left the impression on the people interrogated as to the poorer character of the east run.

The results of this enumeration permit the following statement: **Hardly 10 to 15 per cent of the forest is of the first class, i.e. containing sizes fit for logging. From 35 to 50 per cent of the area may by picking furnish small-sized pulpwood. From 35 to 45 per cent of the area is, from the standpoint of wood supplies, useless: it is either muskeg, near muskeg or scrubwood of a size hardly fit for fuel.** The record in seven development classes ran as follows, beginning with the best lands, in per cents: 4; 5; 14; 21; 17; 18; 22; the last two figures representing muskegs, open and with scrubby growth.

In corroboration of the relatively small value of the timber, I may cite the statement based on cruisions of one of the lumber companies situated on what are considered two of the best townships, which, therefore, may be accepted as fairly representative of the better class lands, including river banks. **Thirty per cent of their holdings are found unproductive, the productive land running 8 cords of pulpwood of 8 inch average diameter, or, possibly, 4000 feet B. M. per acre.**

From these findings, it will appear that the hope held out to settlers, that they may sell pulpwood, is only a very conditional one, namely, if they are settled on the better half of the land and within reach of a market that will utilize small sizes.

CONDITIONS IN THE CLAY BELT

In further corroboration of the **probability** that the proportion of agriculturally available soil may be approximately correct I may cite **the testimony of a timber agent** who on a map has indicated conditions from township to township travelled by him. The map showed in 70 townships, taken in sequence, 29 noted as clay, 10 as sandy, 17 as muskeg or near muskeg, 4 as swampy or lowland, and 10 as jack pine land.

CONDITIONS SOUTH.—A similar record of forest conditions was kept from Cochrane south, only not so precise. Here, fire has done much damage. Hundreds of square miles can be seen on this run, absolutely dead, the result of the Porcupine fire. A run of 12 to 14 miles through this fire belt is made from mile 194 to 206. Around Matheson the woods are all destroyed. Another extensive fire area, dating 25 to 30 years back, now recuperating, is crossed by the railway for another 15 to 16 miles to the height of land south from mile 192. Brush forest of jack pine, aspen and birch is practically all that can be seen on the south side of the height of land as far as Englehart, with, now and then, an island of better class. The country from Englehart north beyond Bourke is rough and rocky.

Altogether, the run of 120 miles from Cochrane to Englehart does not, by any means, raise but rather depresses the proportion of good timber.

AGRICULTURAL OUTLOOK.*—Disappointing as are the timber conditions, **the outlook for agricultural development is undoubtedly bright**, although here, also, too sanguine expectations are being entertained, and should be guarded against.

A classification of lands is here as needful as with the timber. **Most, if not all the land may, at some time, be capable of being turned into farm land**, but, unless the early colonization is properly directed, disappointment will be experienced through the irresponsible settlement of good, bad, and indifferent locations.

While the timber conditions are not necessarily indicative of agricultural soil values, they are so to some extent. The variation in tree development, as stated before, is mainly due to variation in drainage conditions: the best timber is found on the best drained lands (along the rivers); the shortness of the scrub forest is due to the water-table being close to the surface; and the intermediate heights denote merely difference in depth of soil—depth to water-table.

*Further details concerning agricultural conditions, gleaned from the reports of surveyors, are given in the appendices.

Agricultural requirements take into consideration (more than forest growth) the mineral components of the soil; hence the clay lands which are not too stiff, may be good farm lands, while they may not be favourable to forest growth, and sandy deposits may produce good timber, although for farm use they may be "too thin." But the same trouble which dwarfs the tree-growth is also an objection for the farmer—the lack of drainage. This condition brings with it other unfavourable conditions in this northern climate, namely frost conditions. Fortunately many of the poorly drained black spruce swamps are, as stated before, situated on elevated plateaux, and, hence the possibility exists of lowering the water-table or draining the land readily. Such draining, however, can, in many cases, not be profitably done by the small farmer but must be done on a larger scale to be successful.

In the real muskegs or moss barrens, probably most of the soils require special treatment to make them permanently available for farm use—at least, if the experience with similar conditions in other countries may be relied upon. **It is well known that muck soils like these may for a time produce excellent crops, and then suddenly decline,** unless they have been mixed with the underlying mineral soil or been treated with fertilizer. **Hence the thickness of the humus layer above the clay is in itself of moment in rendering farming more or less difficult. Altogether, there is enough variation in agricultural values to make investigation and proper direction of the colonist desirable.** It should be realized by him that not all soils are farm soils, and, especially in this climate, do not assure annually profitable crops. **Eventually, by the removal of the forest cover not only will the soil become drier, but warmer; frost which at present remains in the soil for most of the season will become rarer, and crops become more certain.**

Recommendations

I desire to reiterate that the above statements are the result of an altogether too brief and confined inspection. It should also be fully understood that these judgments do not refer to the clay belt as a whole, but merely to the small portion, north of the height of land, along the 200 miles of the Transcontinental railway. I have taken special pains to explain how the judgment has been arrived at. My first recommendation would be to **have this judgment more fully verified,** for it runs counter to many other opinions as to the value of

CONDITIONS IN THE CLAY BELT

this part of the clay belt. My judgment, briefly summarized, is that probably 50 per cent of the area involved does not contain any wood values, and that probably the same percentage of it is, **under present conditions**, undesirable to open for settlement. Whether these proportions are more or less correct matters little, if only the fact is realized, that more systematic and careful direction of settlement is highly desirable.

At present, as I understand it, townships as they are surveyed are open for settlement without differentiation. Many a settler will be misled into taking up unsuitable lands, and the experience of old Ontario (on the Trent watershed) will be repeated, namely of abandoned farms or else a degenerated population.

If these findings are communicated to the Provincial Government, that Government may perhaps be induced to consider the following recommendations:

1. A classification of lands regarding their fitness for farm use should be made, and settlers be kept out of the undesirable portions.

This is most easily done by attaching a proper person to the township surveys, who can roughly classify and describe the lots as they are laid out.

To fit persons for the service of classification, a 'soils' expert should first make a thorough study of the soils **in the field**, and devise the points for classification.

The opening for settlement should be made **by lots** rather than by whole townships, and judiciously placed windbreak belts should be excluded from settlement.

2. The fuel question will, sooner or later, become an important one, and forest reservations are, from this point of view, desirable. For this purpose the lighter soils may serve. It goes without saying that protection against fire, and especially judicious use of fire in clearing should be provided for.

3. A co-operative scheme of systematic draining should be inaugurated by the Government, after thorough study of what has been done elsewhere in this direction. Sweden, where somewhat similar conditions exist, and where systematic work in this respect is being done, furnishes one of the best examples to study.

4. **Not a model farm, but experimental farming under the variety of conditions met** might very properly be undertaken by

COMMISSION OF CONSERVATION

the Government to find out what treatment is necessary on the different soils, what crops can be expected to grow successfully, observing at the same time the variation and changes of seasons.

5. In connection with experimental farming, a few small and inexpensive experiments in the effect on tree growth of lowering the water-table and thinning out dense spruce stands might be inaugurated, to find out whether better wood production could be induced by such practices.

Altogether, it will be wise and in the line of rational use and conservation of resources to proceed more systematically and with more knowledge than has been, apparently, done so far, in the settlement of this exceedingly valuable portion of the province of Ontario.

In conclusion, allow me to refer to one of the enterprises, on the wisdom of which the Provincial Government **should be congratulated**. It is the contract with the Ontario Colonization Company, of which Mr. W. K. Jackson is President. They have undertaken to colonize systematically two of the better townships after or while logging the same. It is, I believe, the first large enterprise of this kind in the region. The firm, realizes that it has entered upon a task, by no means easy, but I can testify that a *bona fide* beginning has been made, and the practicability of the scheme will soon be demonstrated.

Hoping to have by these statements contributed towards a realization of what the Commission of Conservation stands for.

I am

Very truly yours,

(Sgd.) B. E. FERNOW

APPENDIX I

The following extracts from the official *Report of the Survey and Exploration of Northern Ontario*, 1900, are statements taken at random from the reports of exploring parties who covered the ground in Districts 1 and 2, referred to in the foregoing pages.

These explorers covered 50 miles north and south of Nivens' second-base line, a line running a short distance north of the Trans-continental railway.

They are adduced simply to show that besides all the good portions they describe, a considerable area was, even by the first explorers, regarded less favourably. The favourable portions of these reports have been deliberately left out in these extracts, since the object in quoting was only to disabuse the idea that unfavourable conditions are rare or localized.

P. 9. (Low-bush river). Most of the spruce, however, is of the black variety and scrubby in growth. Towards the head of the river we ran into jack pine, very small and not large enough for logs. The poplar is the largest timber, some few trees running up to sixteen inches in diameter, but these, as a rule, are faulty, being full of punk knots and covered with fungus, the larger portion of the poplar, however, is about seven inches in diameter and fairly sound. The tamarack all through this country is dead.

P. 9. Above the twenty-five miles to the head of the river there is no timber to speak of. Here we came on heavy clay rolling land covered with very open bush of small jack pine and spruce. This had evidently been an old brulé. This brulé runs back sixty chains from the river and falls away into a spruce swamp which is very wet. The average size of the trees in the swamp was four inches.

P. 9. I think that for a distance of about seventeen miles up this river and a distance of a quarter of a mile in from its banks, one should get one hundred and nineteen thousand, six hundred and eighty cords of pulpwood (spruce and poplar). Beyond this, the timber will only cut four cords to the acre, all spruce. For the last three miles of the river, the banks are much higher and covered with jack pine. At the rapids I went inland on a jack pine ridge and found the timber from five inches to seven inches diameter and limbed to

COMMISSION OF CONSERVATION

the ground. All up this river is fine farming land, being heavy clay soil which can be easily drained.

P. 9. For the first two miles up this river, the timber will cut twenty cords of pulpwood per acre for twenty chains on each side, and for the next eight miles the only timber is poplar, which grows just on the river banks, not running back more than two and one-half-chains, and will cut about ten cords to the acre. Behind this is all an open spruce and tamarack swamp with dead trees.

P. 10. (Moose Factory Road river). The timber up this river is almost altogether second-growth poplar, spruce and jack pine, most of it running from one inch to four inches in diameter, though on a few points or bends in the river good-sized poplar, balm of gilead and a few white spruce are met with, but not in quantities to be considered of any commercial value. Near the forks of the river a jack pine brulé is met which extends three or four miles on each side of the river. I went inland at the forks for about two miles north and found only jack pine, very scrubby, and not over eight inches in diameter, and limbed to the ground, and small spruce of no value. The land all the way up this river is good and rolling and would make splendid farms; the soil is heavy clay.

P. 10. The timber on the banks for from two to five chains is fair, mostly averaging eight to ten cords per acre, but beyond this the land falls away to flats and swamps, with much smaller timber which would only average about three or four cords of four-inch pulp wood per acre. The timber on the north shore of lake Abitibi is very small and of no commercial value, chiefly small poplar, spruce, white birch and balsam, and a few balm of gilead and some scrubby cedar and jack pine. A few small ash and elm trees were met with on two or three points, but none of any size. The timber back from the lake is chiefly small spruce, from three inches to seven inches in diameter, and quite one-quarter of it dead.

P. 11. From lac la France to Little Abitibi lake, the country is very flat, the timber being small and of no commercial value. At the south-west end of Little Abitibi lake I went into the bush due east found it a nice gentle rolling clay land with a covering of moss about eight inches deep with a clay sub-soil. The timber here is small, the maximum diameter twelve inches, spruce, balsam and birch averaging six inches, and will cut about ten cords of pulp wood per acre. The walking is very bad as there is so much fallen timber. Along the west shore of Little Abitibi lake, the land is low and timbered with spruce, too small for pulpwood.

P. 11. (Louis river). There is very little timber up this river, and most of the country is covered with a second growth of poplar from one to three inches in diameter.

CONDITIONS IN THE CLAY BELT

P. 11. On Montreuil lake, spruce, balm of gilead, poplar, balsam and white birch are the only trees, and these as a rule are under five inches in diameter.

P. 11. From Montreuil lake to where we found your base line, the timber is all small, and along the line from the twelfth mile post to the twenty-fourth is similar, and will only average three cords of six inch pulpwood to the acre. I went inland to the south of the line in several places between the twelfth and twenty-fourth mile posts, and found the land all the same, with the exception of an area of about five hundred acres that had no timber on it whatever, covered with short grass and very wet. Here I could put a pole down nine feet before striking clay. Several other stretches of over a mile wide were met with timbered with very low open scrubby spruce, not over four inches in diameter and the highest of them about fourteen feet in height. All through the country here, there are occasional white birch, poplar, balm of gilead, and balsam trees. From the twenty-fourth mile post to the thirty-second I was following up a waterway. To the south of a line along this waterway and up from it to the thirty-second mile post the timber is too small for pulp wood, it being chiefly small spruce, poplar, balsam and a few balm of gilead and white birch. The land is very low and wet with clay soil. It would be very hard to drain as the banks of the lakes and rivers are so low.

P. 13. A few miles below Duck Deer rapids I went into the bush on the west side for about four miles and found no timber after I left the banks of the river over four inches in diameter. Here the land is rolling and the soil clay and would make first-class farming land. This is one of the few places where we were not travelling through swamps. There is only about four to six inches of dry moss on the top of the clay. The trees grow very close together and will never come to anything until they are thinned out as there is no room for them to grow.

P. 13. He (an Indian) told us that the country we were over yesterday runs just the same until you come to the district boundary line run by Mr. Niven in 1898. There the timber gets larger but very little of it is over seven inches in diameter, though some odd poplar is fourteen to fifteen inches in diameter.

P. 15. (Summary). In general, the pulpwood is stunted, but along the margins of streams it is larger and of fair quality, the best areas being found along Lowbush and Circle rivers.

P. 15. In rear of this belt, so far as I have knowledge of the country, the timber is of little value, not averaging more than three cords per acre. Along the north shore of Abitibi lake the timber is generally small, but along some of the tributary streams there are occasional small areas of fair pulpwood.

P. 15. (Land). With the exception of occasional sandy and rocky ridges and the watershed, the soil throughout is clay of uniformly good quality. Moss to a depth varying from two inches to ten feet (inclusive of resultant moss peat), covers almost the entire country. Between Abitibi lake and river on the south, and the watershed on the north, about fifty per cent of the land is, in my opinion, good farm land. Drainage would considerably increase this proportion. To the south of the base line, and east of its twenty-fifth mile, a large proportion of the country is broken by swamp and muskeg, the intervening parts being chiefly clay and sandy ridges.

T. G. Taylor, Estimator, Exploration Survey Party No. 1.

P. 17. From the twenty-third to twenty-eight mile post the land is mostly all muskeg, or spongy moss covered with open swamps, in which we could sink to our ankles. This we concluded were good peat beds. The timber will not average more than four or five cords per acre for at least five miles north of these posts. From the twenty-ninth to the thirty-fourth mile post, five miles north, the country is valueless. There is no timber, all being open spruce and tamarack swamps. The only good timber is right on the line, but it is no depth.

P. 18. From the thirty-sixth to the fortieth mile post for five miles north, there are only small patches of timber that would make pulpwood, but not in quantity. There is no soil suitable for agriculture. From the fortieth mile post to the forty-eighth mile post, we walked six miles north and came through one open swamp after another, passing several small lakes running south.

P. 18. As there had been no change in the country since leaving the twelfth mile post, you considered we could work to better advantage from lake Abitibi.

M. B. Baker, Geologist, Exploration Survey Party No. 1.

P. 36. There is then fine clay loam in general all over this area as indicated on the map and is covered by a rather dense growth of spruce, poplar, balsam and balm of gilead, but not in sufficient size or quantity to be of commercial value as timber nor even as pulpwood. The trees are, as a rule, small, and the land would be easily cleared and being of a rolling aspect would be naturally drained.

R. W. Coulthard, Geologist, Exploration Survey Party No. 1.

P. 49. Spruce is the most common, and poplar next, of the prevailing timber. The only places where these were of any value as pulpwood were along the shores of small lakes, the banks of rivers, or the clay and sand ridges—but not, I should judge, to any startling amount.

CONDITIONS IN THE CLAY BELT

The other timber growing in the region examined by Mr. Bell and myself, is balm of gilead, white birch, white cedar, tamarack (mostly dead), balsam and banksian pine. Most of these are of little use. A few red pine and elm were observed in one or two isolated places. One also sees small dogwood, maple (soft) and cherry saplings, alder bush, etc., scattered throughout.

J. L. Bremner and J. M. Milne, Estimators, Exploration Survey Party No. 2. (From Cochrane West).

P. 56. (From Jawbone creek south on Abitibi river.) The timber along the banks is large spruce and poplar from six to twenty inches diameter, and as thick generally as it can grow. However, after getting back from water from one-half mile to one mile on the flat country, there is usually no poplar except on patches of rising ground, and the timber on the flat land is almost exclusively spruce and tamarack, and is smaller in size than what is on the banks, the spruce being from four to eleven inches in diameter, and the tamarack, from six to ten inches in diameter, and as before mentioned, a great deal of the latter is dead.

There are also considerable areas of what might be called muskeg. Although not naturally wet or boggy, it is low and flat and covered with a scrub growth of spruce and tamarack from two to five inches in diameter, very short and of no commercial value, but which where large enough would do for fuel. There are also small areas of this so-called muskeg with practically no timber on it at all; a heavy moss surface, with an occasional scrub spruce from two to six feet in height is all that can be seen.

P. 57. The timber along the Abitibi river, from Three Carrying Places down to Red Sucker creek, is practically the same as what we saw further up, good for a distance of about one-half mile from the banks, then muskeg with scrub alternating with belts of fair timber as one goes farther inland, and we noticed the farther north we got the poplar and white birch seemed to become more plentiful.

P. 58. After leaving Driftwood creek, there are some fair spruce and tamarack for one-half mile inland, but for the rest of the distance across this portage, there is nothing but scrub timber with only an occasional clump, large enough for pulpwood, say from five to eight inches in diameter, and a considerable muskeg is to be seen with only a scanty growth of small spruce thereon, this muskeg being close to a small lake and being rather wet.

We now struck Mattagami river at Loon portage, when we travelled west again, and found beautiful rolling land with good clay soil and fair timber on the greater part of it, some places having only a scrub growth of timber and other parts being what might be called dry muskeg, with practically nothing but a growth of alder, etc., thereon.

P. 58. However, if there is not much timber in this section it is splendid farming land, being high and slightly rolling with good clay soil and interspersed with some fine wild meadows, altogether a most desirable place to begin farming in.

P. 59. Returning again to Kapuskasing river and for six miles up it, we found good timber, but here at this point for about one mile we found on examination that the land back from the river is low and level and marshy with nothing but scrub timber on it, but again for three miles up, the timber is good.

P. 61. The general features of the country over which we have travelled are almost the same, rough swift streams and comparatively level flat ground after leaving the river bank, with usually a smaller growth of timber than that which is near the water.



P. 67. The timber along the Kapuskasing river, from Three Garrying Falls down to Red Sucker, is practically the same as what we saw further up, good for a distance of about one-half mile from the banks, then muskeg with scrub alternating with belts of fair timber as one goes farther inland, and we noticed the further north we got the poplar and white birch seemed to become more plentiful.

P. 68. After leaving Drillwood creek there are some fair spruce and tamarack for one-half mile inland, but for the rest of the distance across this passage there is nothing but scrub timber with only an occasional stump large enough for pulpwood, say from five to eight inches in diameter, and a considerable muskeg is to be seen with only a scanty growth of small spruce thereon, this muskeg being close to a small lake and being rather wet.

We now struck Mattagami river at Lion passage, when we travelled west again, and found beautiful rolling land with good clay soil and fair timber on the greater part of it, some places having only a scrub growth of timber and other parts being what might be called dry muskeg, with practically nothing but a growth of alder, etc., thereon.

APPENDIX II

In addition to the more generalized statements of the original exploration parties given in Appendix I, the following extracts from the more detailed official reports of the township surveyors for 100 townships, covering most of the region involved, will add to a more complete realization of the conditions to be found. In this case, the quotations have been made to bring out, so far as possible, the general condition of each township, good, bad or indifferent. Since the reports are not uniform in character and often diffuse in description, sometimes the character of the township does not very clearly appear, and it is not especially possible to arrive at the proportion of good, medium and poor conditions in certain townships. Of those townships on which the reports give sufficient detail to permit a definite statement, 20 per cent are poor and not fit for farm purposes, 40 per cent are of medium quality, and 40 per cent are deemed first class. This proportion will apparently vary little on the whole series.

The townships are arranged in sequence from East to West beginning at the southeast corner of the series.

The year for which the report was made and the page will allow ready reference and verification.

P. 94, 1904. (Cook township). The general aspect of the township of Cook is level, although the surface is broken by numerous rocky exposures, and small hills, and some few of considerable size which are conspicuous from a distance. . . . The character of the soil is not uniform. Of the total area of the township about ten to fifteen per cent is rocky and stony, about an equal amount muskeg and the remainder equally divided between sand and clay of variable quality. A considerable portion of the township is low and wet in its natural condition and cannot at present be considered desirable for settlement. When cleared, however, and drained, much of it will no doubt be valuable for grazing and other purposes. . . . Of spruce there is a goodly quantity from four to fourteen inches in diameter, and of good quality, which must prove valuable chiefly for pulpwood purposes. This timber stands fairly thick on the ground and although in patches more or less, will cover an area of about forty per cent of the township.

P. 92. (Barnet township). The township of Barnet is very similar to the township of Cook. A considerable part of the surface

COMMISSION OF CONSERVATION

is comparatively level, but there are numerous rocky exposures and stony hills of greater or less elevation.

About ten to fifteen per cent of the area might be considered rocky or stony, about an equal proportion muskeg, and the remainder about equally divided between sand and clay of variable quality, but the area of any kind in one place is apparently not large. A considerable part of the land in its natural condition is low and wet.

P. 112, 1905. (Playfair township). About ten per cent of the surface is rock, about fifteen per cent is muskeg which might be rendered productive by drainage; about twenty-five per cent might be classed as poor agricultural land, being too sandy. The remaining fifty per cent may be classed as good agricultural land. . . . Spruce is the predominating timber and is found on almost every lot in quantities sufficient for the settler for fuel and building.

P. 96, 1904. (McCann township). The flat and undulating lands are for the most part clay and clay loam of fair quality. The sandy plains referred to are, in my opinion, too light to be classed as good farm lands, while the eastern one-third of the township from its broken character is not desirable for agricultural purposes, although containing numerous small areas of good clay and sandy loam, particularly in the northeastern part. . . . Brulé of about thirty to forty years date covers the greater part of the township, the exceptions being near the east and west boundaries respectively, and in the vicinity of the larger lakes.

The second growth timber in the burnt part consists of banksian pine with white birch and spruce from two to six inches in diameter. Interspersed are small tracts or clumps of larger timber of good quality from ten to fifteen inches in diameter, having escaped the general conflagration. . . . About fifteen to twenty per cent of the whole township may be considered desirable for agricultural purposes. When railway facilities are obtained a fair amount of timber will be made available.

P. 81. (Egan township). The land is swampy in many places, but in general may be classed as undulating except in two or three instances where rocky hills rise to a height of two or three hundred feet above the surrounding country. . . . Almost the entire township is heavily timbered with large spruce, poplar, balm of gilead, birch, balsam, banksian pine with some cedar and dead tamarack. Much of this last timber is still sound enough for railway ties. . . . About sixty-five per cent of the land in this township is suitable for agriculture and when improved will make a good farming section. The greater part of the land in the first concession is unfit for settlement, and in my opinion the land in the unsurveyed territory to the south is also of poor quality.

P. 97. (Sheraton township). The southerly portion of the township is flat and swampy, thickly timbered with spruce, balsam,

CONDITIONS IN THE CLAY BELT

tamarack, white birch, poplar and cedar. . . . A considerable area of rolling, sandy land extends from concession one to concession six in the westerly part, on which area the principal timber is jack pine and spruce from four to twelve inches in diameter. The greater portion of the township is good agricultural land.

P. 106, 1905. (Michaud township). The northeasterly part of the township is mostly rolling sandy land of light quality; the southeasterly part is mostly a spruce swamp with sandy bottom. . . . A considerable part of the township was again run over by fire during 1905, and very little timber now remains upon it. . . . In my opinion this township is not adapted for immediate settlement.

P. 105. (Guibord township). The distribution of the several kinds of soil is about as follows: Clay, twenty-five per cent; sandy and rocky twenty per cent; loamy forty per cent; muskeg fifteen per cent. About seventy-five per cent, however, of the whole is swampy and not adapted to immediate settlement.

P. 109. (Hislop township). The township is for the most part good agricultural land, being chiefly clay and clay loam. There are, however, some small areas of sandy land and some of stony land, and a few rocky exposures. The fire of 1905 destroyed nearly all the standing timber with which the township was covered.

P. 79, 1904. (Bowman township). About sixty per cent of the land is well adapted for agriculture, being level or gently undulating clay land. . . . There is a considerable area of sandy land covered with small banksian pine. . . . Some of this timber attains a large size and is of good quality. In the northern and eastern parts of the township there is great quantities of fallen timber rendering the bush difficult to travel through.

P. 54, 1903. (Currie township). The soil is clay and clay loam, with an occasional area of sandy loam, and, although wet in places, can easily be drained, and all the small streams have a strong current. About ninety per cent of the township is well adapted for agriculture and most of the land, although hard to clear, can be made as productive as any part of the Province.

P. 77, 1904. (Bond township). As it is now only thirty per cent of the land is suitable for agriculture, but if the above mentioned improvements were carried out about seventy per cent can be made good agricultural land.

P. 90. (McCool township). The soil in the northeast part of the township is a variety of clay but is swampy and wet with occasional dry ridges. In the southeast section the soil is of a similar nature, but the country is more hilly, rocky and broken. The remaining two-thirds is sandy and unfertile, and is not desirable agricultural land.

P. 91. The unburned bush, occupying the eastern part of the township, is principally spruce about fifty years old, averaging six

COMMISSION OF CONSERVATION

inches in diameter. Examination shows that the annual growth of these trees, as indicated by the rings, is small. This I would attribute to the wet and unfertile quality of the soil.

P. 86. (Munro township). The township as a whole is not suitable for farming purposes. Along the southern and western boundaries is a strip of clay land, swampy in places, with dry clay ridges, timbered with spruce, balsam, birch, poplar, and jack pine. This portion, however, is broken with rock ridges. East of this is a series of sand plains and rolling sand ridges. This area has been swept by fire about seven or eight years ago, and is now growing up with an undergrowth of cherry, alder, birch, poplar and jack pine. This *brulé* is irregular in shape, and in it are scattered patches of green bush which have escaped the fire, but on the whole there is little timber of any value.

P. 84. (Beatty township). The township as a whole is a good one from an agricultural standpoint, it is nearly all undulating land, of a good quality of clay and clay loam, inclined to be swampy in some places. Along the east boundary there are some ridges of rock, but on the whole these are not of great importance, and the valleys between are mostly of excellent land. The western portion is very level. There is a large amount of valuable spruce, poplar, balsam and white birch, with a great amount of dead tamarack. Fire has overrun a few scattered portions, but on the whole these areas are not of great importance.

P. 75. (Carr township). The land in the township of Carr is a fine sandy clay having a sufficient admixture of sand to make it easily workable. About eighty or eighty-five per cent will be workable when cleared.

The timber where green consists of spruce, dead tamarack, poplar, balsam, birch and a few balm of gilead.

P. 73. (Taylor township). The soil is mixed with a sufficient admixture of sand to make it easily workable. I estimate that about eighty per cent of this land will be fit was for agriculture as soon as cleared, and I think that with drainage nearly all of it can be made farming land.

P. 71. (Stock township). The township of Stock consists of wooded swamp generally with some low ridges. In the sixth concession there is some higher land. There is also a considerable area of muskeg. Considerable drainage will be necessary to render this township fit for agricultural pursuits. I am of opinion that when the land becomes drained the soil in this township will be good land. The timber consists generally of spruce with dead tamarack, balsam, birch, poplar and a few balm of gilead, the sizes running generally from six to ten inches in diameter, though some poplar and birch reach as high as twenty-two inches. The timber is suitable for pulpwood and for railway ties.

CONDITIONS IN THE CLAY BELT

P. 64. (German township). The soil varies from stiff clay to light sand. The sandy soil for the most part is undulating and covered with an open growth of banksian pine; it occupies about one-fourth of the area of the township. The clay soil in places is undulating and here is a good clay loam with clay sub-soil. The level swampy parts of the township are very hard clay underlying moss and vegetable mould and even though drained would not be suitable for agriculture except it be for grazing purposes.

P. 63. (Matheson township). The township is very level and swampy except in the vicinity of the Porcupine and Frederick House rivers and Night Hawk lake where the ground is drier and rolling enough to permit of natural drainage. . . . The level ground which comprises the greater portion of the township has a very hard clay bottom covered with moss and vegetable mould. While it could be drained I do not consider that it would be good farming land, owing to the extreme hardness and viscous qualities of the clay.

P. 49. (Hoyle and Murphy townships). The agricultural capabilities of Hoyle and Murphy, and their proximity to the route of the Grand Trunk Pacific, (if indeed that railway does not pass through these townships), mark them out as being particularly valuable, and desirable for settlement, especially as by means of the Temiskaming and Northern Ontario and Grand Trunk Pacific railways, they will be so easy of access.

P. 50. (Hoyle township). This township is covered with an unbroken but open forest, almost wholly of spruce, except near the margin of the streams.

P. 57, 1903. (Milligan township). The township is low, wet and swampy, with the exception of a portion on the west side, which is composed of high sand and gravel plains. . . . The soil in the greater portion of the township is a light sand loam, and in places very sandy. It is, however, covered with several inches of rich mould. . . . Of the portion which has escaped the fire, at least sixty per cent is too wet and swampy for agricultural purposes, without some large system of drainage. Take it as a whole, I would consider it as a poor township for agricultural purposes.

P. 83, 1904. (Warden township). About seventy-five per cent of the township is available for farming purposes.

P. 47, 1903. (Coulson township). With proper drainage the country will no doubt form a valuable agricultural section.

P. 47. (Wilkie township). The township is practically of the same character as Coulson, rather more level, and certainly better. There is a large amount of spruce swamp, the spruce being small and scrubby.

P. 48. (Walker township). The township of Walker consists chiefly of rolling clay loam, broken near the river by deep ravines, and well drained and watered by an abundance of spring creeks. I would consider it good arable land.

COMMISSION OF CONSERVATION

P. 69, 1904. (Clergue township). About thirty per cent of the land is swampy, but with a good clay sub-soil and can be easily drained. The balance of the township being clay loam, sandy loam and sand. The sandy loam and sand are chiefly in the northwest and westerly parts of the township. It is safe to say that nearly seventy-five per cent of the township will prove good agricultural land. The timber on the two concessions across the south end of the township is chiefly spruce, poplar, and balsam and varies from small to medium size. In the swampy parts nearly eighty per cent of the timber is good spruce, poplar and balsam.

P. 61. (Dundonald township). Probably three-fourths of the land in this township are suitable for cultivation, consisting of a dry clay soil thickly covered with timber and a heavy undergrowth. There is, however, a considerable part of this good land that is more or less swampy, but it admits of comparatively easy drainage and will, doubtless, ultimately become good farming land. The only part which is wholly unsuitable for cultivation is a ridge of rocky hills crossing the township from the south boundary of lot five, in the first concession, to the eastern boundary of concession three. There is, besides, a tract of about five square miles in the northeasterly part of the township consisting largely of coarse gravel containing many drift boulders. Little of this is fit for cultivation, but on it is growing some valuable red pine. The whole township is thickly timbered, principally with spruce less than nine inches in diameter, but there are many large spruce up to two feet and over in diameter besides a considerable quantity of large poplar and some white birch of good size.

P. 55, 1903. (Evelyn township). I found little more than half of this township suitable for cultivation. . . . There is a belt of sandy hills stretching from the southeast corner of the township, where it is about two miles wide, to the northern boundary, where it is nearly the whole width of the township. . . . In all this sand belt there are on, or near, the surface many stones and drift boulders. This fact, and the coarseness of the sand in most places, would make it generally unsuitable for cultivation. . . . Most of the timber in the rest of the township is small spruce, seldom, except in the heavily timbered part near Frederick House lake, exceeding ten inches in diameter, while most of it is much smaller. In the southwest corner of the township and in the muskeg south of Ice Chest lake and lake Narandeu few trees exceed five inches in diameter.

P. 51, 1904. (Gowan township). Nearly one-half of the township is open swamp, perfectly level, with small trees from two to four inches in diameter and free from underbrush. . . . The surface is covered with moss and vegetable mould, while the sub-soil is mostly hard clay, though pockets of sand occur. That part covered with open swamp and comprising about one-half of the area would be unfit for agriculture. . . . The other half of the town-

CONDITIONS IN THE CLAY BELT

ship could be drained, but even then could not be called good agricultural land except less than ten per cent of the total area which is slightly higher than the surrounding land.

About fifty per cent of the township is covered with a heavy growth of spruce with some balsam and a small amount of poplar and white birch. The spruce comprises ninety per cent of the whole amount, and is of good quality. The remaining half of the township is sparsely covered with small spruce and tamarack.

P. 85, 1905. (Kerrs township). Generally speaking the soil of this township is a fertile clay or clay loam, with here and there a small swamp. There is quite a high, rolling or gravel belt about three-fourths of a mile wide along east side of the township, and a rolling rocky strip near the southwest corner. Along the north boundary from about the centre of lot 8 to about the centre of lot 11 the soil is a light sand and the timber is nearly all dead from fire. . . . Nearly all the timber on the east side of the township, over a strip three-fourths of a mile wide, has been burned very recently.

P. 88, 1904. (Knox township). The country is generally level though very much broken, especially near the Abitibi river, with comparatively deep ravines. . . . This, with the enormous amount of windfall prevalent makes travelling through the country exceedingly arduous. From the nature of the soil, a heavy gray clay, and from the manner in which these ravines have apparently been formed, I imagine this section of the country will present problems in the way of drainage for cuts and fills in the construction of roads and railways.

P. 87. (Rickard township). The remarks in the township of Knox apply equally to Rickard. The swamp being more extensive and the country generally more level, an enormous amount of windfall and dense undergrowth even in the swamps. The soil a heavy gray clay. Timber, spruce and poplar, about forty per cent arable land.

P. 70. (Teffy township). The township is very rough, being broken throughout by deep ravines. The soil is chiefly clay and about fifty per cent of the township is good for agricultural purposes, the other fifty per cent being too rough for good farming purposes. There is about five hundred acres of muskeg and only about two thousand acres of swamp in the township. Eighty per cent of the township is covered with good spruce, balsam, birch, poplar, balm of gilead and banksian pine in general from medium to large timber, twenty per cent is from small to medium size, but of good quality.

P. 68. (Calvert township). The soil in the east and south parts of the township is a rich clay, in places mixed with sand. In the northwest part the soil is a reddish sand and gravel mixture. The timber is of fair size, principally green, consisting of spruce, poplar, balsam, birch and cedar very dense, with some fine balm

of gilead in the vicinity of the streams, some large jack pine exists in the west part of the township and some sound dead tamarack was found in the swamps. A large amount of this timber is suitable for pulpwood, railroad ties and lumber.

P. 62. (McCart township). Of the one-fourth that I consider useless for agricultural purposes about one-half consists of muskeg covered with moss, peat and a few small scattered spruce from one to four inches in diameter. About two square miles consists of an outcrop of native rock. . . . The timber is mostly spruce, much of it large and valuable, many of the trees being as much as two feet in diameter. There is also on the drier land of the township much large poplar and white birch, besides considerable balsam and tamarack, the last dead or nearly so. Near the middle of concession one, there are a few large white pine. The sandy land in the southeast of the township is covered with small red pine mostly less than six inches in diameter, though there are in some parts of it a few trees reaching eighteen inches in diameter.

P. 58. (Little township). A generally level or gently undulating country, timbered with spruce, dead and decaying tamarack, poplar and white birch with alder and willow underbrush and considerable windfall. The average size of this timber is from two to ten inches with a very few spruce and poplar running up to eighteen inches. A few small areas aggregating about ten per cent of the total, lying in the southwesterly part of the township are covered with jack pine and white birch from two to ten inches in diameter. On these areas the soil is sandy and stony with many drift boulders. About thirty per cent of the township might be called swampy.

P. 53. (Tully township). This township might be shortly described as comprising thirty-six square miles of clay flats, the undulations being so gentle and of so small altitude as to give the impression to a person travelling over it of an almost perfect level. This impression would, of course, be corrected by observing the streams which flow regularly to the north and northwest, showing the country to dip in that direction. The soil throughout is a heavy grayish clay burning to light red in the fire, and although it usually has but a slight covering of mould, there was found to be in some locations a deposit of from one to three feet of black vegetable mould. It is also free from stone. A notable feature of this part of the country is the presence of considerable areas of open peat swamp. These appear to be almost perfectly level. The surface presenting the smooth even appearance of a lawn, mosses of various colours taking the place of grass. In such places there is usually found to be a deposit of from one to three feet of peat overlying firm clay soil, the timber being composed of spruce and tamarack thinly dispersed and rarely exceeding four or five inches in diameter. That these swamps are capable of being economically drained would appear from the fact that they do not occupy the lowest parts as it

CONDITIONS IN THE CLAY BELT

was observed, that on descending a gentle slope after passing through such a swamp the advantage of ample drainage was at once apparent from the firm clay soil and large timber. With reference to agricultural operations the chief need would be thorough drainage, and this being carried out would in our opinion render more than ninety per cent of the entire area of the township valuable to the farmer and stock raiser.

P. 61. (Prosser township). Almost the entire area would be available for agricultural purposes, the few rock outcrops probably not covering in the aggregate an area of more than three hundred acres. For successful cultivation drainage would be necessary over the greater part but would offer no difficulties in the way of outlet. . . . The timber here would be chiefly valuable for pulpwood. Considerable areas of windfall occur in the westerly part, one especially notable extending from the west boundary in concession four in a northeasterly direction across the township, almost the entire forest growth having been laid prostrate before a southwesterly wind.

P. 94, 1906. (Carnegie township). The whole is well adapted for agricultural purposes. . . . Spruce forms by far the greater part of the timber, and does not usually exceed twelve inches in diameter on the level bush lands, but on slopes and creek banks where the drainage is ample, numerous trees are met with of a diameter of twenty inches.

P. 97. (Reid township). Nearly all of this township is available and well suited for agricultural purposes, the flat lands offering no exceptional difficulties to drainage. . . . The whole area is covered with forest, and for the greater part thickly timbered. Spruce forms the chief, and in many parts the only forest tree, especially in that part lying west of the above named river (Mattagami). This tree ranges from three inches in the undrained flats to nearly two feet in diameter on high rolling ground.

P. 81, 1905. (Galna township). Generally speaking the soil of this township is a fertile clay or clay loam with here and there a cranberry swamp. Along the south boundary from about the centre of lot eight to about the centre of lot eleven the soil is a light sand. A large portion of the shore line of lower lake Abitibi is covered with boulders. . . . The spruce is nearly all good, clear timber, varying from four to fifteen inches.

P. 118, 1906. (Moody township). The greater portion of the township will require artificial drainage, but the natural facilities are so well developed that the artificial drainage will be a work comparatively of little cost. . . . Apart from a small area of muskeg to be found principally in concessions one and two, this township is particularly well adapted for agricultural purposes. The land is fertile and durable. The clearing can be quickly done and at little cost. Good roads can be built at a small cost. . . . On

COMMISSION OF CONSERVATION

the heavy clay land adjoining the stream is found a considerable stand of poplar from eight to eighteen inches in diameter, but the quality is not of the best, the larger timber being, as a general rule, decayed at the heart. On this heavy clay is also found the largest growth of spruce, a large percentage of the spruce running up to sixteen inches in diameter. Farther back from the stream on the higher land is found balsam and spruce. The balsam is of little value, but the spruce is good. On the next stretch, as the drainage decreases, is found the spruce swamp. The balsam has disappeared, but the quality and quantity of spruce improves. On the next stretch, as the drainage fails, moss-covered land develops. The forest has the appearance of a grove, being free from undergrowth. The spruce is uniform in size from six to ten inches in diameter, very tall and free from limbs. This is the invariable rotation of timber in the country: poplar, spruce and balsam, spruce swamps and spruce groves. The ideal lands for the agriculturist are the balsam lands and spruce swamp, corresponding to the basswood lands and ash and elm swamps of Southern Ontario. Apart from pulpwood there is not a great quantity of merchantable timber, but when a demand for pulpwood arises the unlimited areas of this timber will make the settlers independent of other sources of revenue.

P. 121. (Wesley township). This township may properly be described as an elevated plain considerably cut up with deep narrow ravines. . . . The land throughout is clay of varying quality. . . . The timber, apart from the pulpwood, is of small commercial value.

P. 87, 1905. (Edwards township). The south half of the township is in general gently rolling land; the north half is flat, much broken in the northeast. A large part of the north half is swamp, one-quarter of which is muskeg. A considerable area of sandy land extends northwesterly along the lakes from the southeast corner of the township, which, I think, will not prove good for farming purposes.

P. 93. (Aurora township). The township is almost entirely clay land. West of the Abitibi river the land is fairly level and of splendid quality; east of the river the land is very good, but for about two miles back from the river it is much broken by deep ravines. There is quite a large area of muskeg in the northeast corner of the township; on this muskeg area the timber is of no value. The timber increases in size as the river is approached.

Pp. 101, 102. (Newmarket township). About eighty-five per cent will, when cleared, be agricultural land. . . . The timber grows in belts and in sizes from four to fourteen inches.

P. 60, 1904. (Mann township). The average size of this timber ranges from two to ten inches in diameter, with scattered spruce and poplar up to fourteen and sixteen inches. . . . I would consider

CONDITIONS IN THE CLAY BELT

fully ninety per cent of the township will eventually be found suitable for cultivation.

Pp. 89, 90, 1906. (Duff township). West of this line is found a generally level or gently rolling country timbered chiefly with spruce of comparatively small diameter; while east of it the rolling character is more pronounced with the occurrence of ravines, larger timber and the occasional predominance of poplar and white birch as a factor in the forest growth. . . . The entire land area is covered with forest, which is chiefly composed of spruce, and, excepting on the rolling lands and creek banks, seldom exceeding twelve or fourteen inches in diameter.

P. 92. (Lucas township). When ordinary improvements in the way of drainage are carried out, there will be no waste land in this township. From an economical standpoint the forest is chiefly valuable as a producer of tie and pulp timber, although on the banks of creeks and rolling land larger trees are met with. The spruce appropriates most of the available root space and generally ranges from six to twelve inches in diameter.

P. 203. 1905(Crawford township). The township is generally level or gently undulating, timbered chiefly with spruce from two to ten inches in diameter, dead and dying tamarack of about the same size. There is a considerable area in the southerly portion of the township that has been destroyed by fire. . . . About seventy per cent of this township is well adapted for settlement, the remaining thirty per cent is swampy in character.

P. 69. (Mahaffy township). On each side of the river and for about a half mile inland the land is rolling in character, timbered with large spruce, poplar, birch and balsam, with a dense growth of willow and considerable windfall. The other portions of the township are generally level or gently undulating, timbered with spruce, dead tamarack, poplar, birch, balsam and cedar. This timber is as a rule under twelve inches in diameter. . . . About seventy-five per cent of this township is good rich black loam from eight to twelve inches in depth, with clay sub-soil; the remaining area is swampy.

P. 91, 1907. (Jamieson township). Stretches of muskeg are scattered throughout the township, the largest area being in the eastern part and are moss covered to some depth. . . . I would consider about seventy-five per cent of the land area to be good agricultural land. . . . On the higher ground back from the rivers are large, white spruce, balm of gilead, poplar, white birch to six or eight inches and balsam. Timber seemed to increase in size towards the rivers. The rocky hills in the southwestern part of the township were mostly covered with small banksian pine. About sixty per cent of the township was thickly grown with tag-alders and other underbrush, making the work slow and laborious.

COMMISSION OF CONSERVATION

P. 96. (MacDiarmid township). I would consider about sixty per cent of this township suitable for immediate settlement, while about sixty per cent of the remainder can under a proper system of drainage be made good paying agricultural land.

Pp. 59, 60, 1911. (Robb, Coté, Loveland, Byers, Thorburn, Moberly, Geary and Wilhelmina townships). The whole country may be termed low and flat, a large portion of it being rather swampy. . . . Throughout the northern townships, however, clay loam is found everywhere with ridges of sand occasionally cropping up and in some places in the swamp sand exists under the muck, instead of clay. . . . The entire townships are covered with pulpwood, with occasional good ridges of jack pine in Massey, Turnbull and Robb.

P. 62, 1907. (Line along the Transcontinental railway east to the interprovincial boundary from corner of Purvis and Steele townships). Probably one-half of the country is fit for agriculture. . . . The black spruce, balsam and birch is from six to thirteen inches in diameter, poplar from six to twenty inches, and the jack pine mostly from five to fifteen inches.

P. 90, 1908. (Berry township). The only timber of commercial value is spruce suitable for pulpwood. In the hilly portions and along the banks of the creeks the timber is spruce, balsam, and poplar with scattered white birch and banksian pine, all averaging from six to twelve inches in diameter. The soil is good clay loam and will be easily cleared for agricultural purposes, and owing to the National Transcontinental railway passing a couple of miles to the north of this township it should soon be settled and cleared.

P. 89. (Bonis township). The surface is fairly level with sufficient fall towards the large creeks to be easily drained, but at present a large part of it is wet and swampy. The soil is a good clay loam, and is well adapted for agricultural purposes. The only timber of any commercial value is spruce, and it is small in diameter and only suitable for pulpwood.

P. 92. (Steele township). The surface of that part of this township lying north of the line between concessions two and three (one-half!) is rolling and broken as a whole, while some of it is very hilly, and is not of any value for agricultural purposes, the soil being mostly sandy, mixed with stones and rock, and a considerable percentage of it has been burned over in the last few years.

P. 128, 1907. (Purvis township). The black spruce is found up to about thirteen inches, the poplar to about twenty inches. Jack pine to fifteen inches and balsam and birch to about twelve inches. . . . The soil is principally clay, and nearly all fit for farming.

P. 115. (Bowyer township). The township, for farming purposes, may be called very good. The land is nearly all clay, and has a large percentage dry enough on nearly every lot to enable a settler to clear and produce a crop in a short time. . . . With the exception

CONDITIONS IN THE CLAY BELT

of the jack pine, the timber is pretty evenly distributed, and attains in places a considerable size, the black spruce up to thirteen inches, in diameter and the jack pine fifteen inches, the poplar to twenty inches.

P. 124, 1906. (Marathon township). Generally speaking, the soil of this township is a fertile clay loam with here and there a small cranberry marsh or swamp, sometimes called muskeg, but I think improperly so. There is a small jack pine ridge running through the township in lots seven and eight, and as a consequence this is the roughest and most broken of any line in the township.

P. 125. (Sherring township). Generally speaking, the soil of this township is a fertile clay loam with a few cranberry marshes or swamps in the west and northwest parts.

Pp. 89, 90, 1905. (Mortimer township). The township as a whole is generally level or gently undulating with a good deal of swamp land. The soil is chiefly clay. The larger part of the township will, I think, prove good agricultural land, but a great part of it requires drainage to render it good for cultivation. There is considerable open swamp and muskeg in the north, centre, and northwest quarter of the township One-half of the township is well timbered with spruce, poplar, balsam and birch of good quality; one-quarter is covered with spruce from small to medium size; the other one-quarter is swamp and muskeg.

Pp. 91, 92. (Pyne township). The township as a whole is flat and largely composed of clay land. The eastern portion, however, resembles muskeg and the timber is very small. It is, however, capable of being easily drained, as the streams all flow in well marked valleys, with heavy timber in the valley and for a short distance back from the edge on either side. These muskeg areas are all high ground; on these areas the timber is entirely composed of small tamarack and spruce, not exceeding about four inches in diameter. The western portion is clay land, but is drier and more cut up by gullies of small streams running towards the Abitibi. As the river is approached the land becomes rougher and the timber larger.

P. 103. (St. John township). I estimate about sixty per cent of the land will become agricultural land. . . . The eastern portion of this township has a good growth of spruce; the southern and western belt consists of spruce and dead tamarack in sizes from four to ten inches; the central and northern belt consists mostly of small scrubby spruce and tamarack, the land in this portion being muskeg.

P. 122, 1907. (Hanna township). The largest and best timber is found along the banks of the Frederick House river, and is composed of all kinds, and I would recommend that one mile back, from each side of the river for the whole length of the township, be reserved for lumbering. . . . The land in this part of the Province can be easily

cleared, as the roots of the trees do not penetrate the clay, but seem to run along between the clay and the muck, and when the land becomes burnt over and drained the stumps can easily be moved. The country, although flat and level, can easily be drained, as the river and stream beds are sufficiently low to afford good drainage.

Pp. 105, 106. (Reaume township). The good timber of large dimensions is scattered over the whole area, and not much in any one place, but all the timber is suitable for pulpwood. . . . The country, although generally flat and level, can easily be drained, as the stream beds are sufficiently low to afford good drainage.

Pp. 71, 72, 1906. (Beck township). Timbered with spruce up to twelve inches in diameter, scattering white birch, poplar and balsam of average size and quality, a few balm of gilead and some scrub cedar; the whole country interspersed with spruce and tamarack swamps, alder and willow underbrush and considerable windfall, especially along the creeks. . . . On the whole I consider about fifty per cent of the township suitable for settlement, and with a proper system of drainage I am of the opinion that at least thirty-five of the remaining fifty per cent can be utilized.

P. 106. (Nesbitt township). The bulk of the timber in this township is black spruce, but the best of it is scattered all over the township, and not any great quantity in any one place. . . . The balsam I found was mostly of small dimensions, and only suitable for pulpwood. The white birch is mostly of small dimensions, but is good sound lumber. . . . The land can be easily cleared, as the roots of the trees do not penetrate far into the clay, but seem to run along between the clay and the muck, and once the land is burnt over and drained, the stumps can easily be moved.

Pp. 103, 104. (Aubin township). The bulk of the timber in this township is black spruce, but the best of it is scattered all over, and not any great quantity in any one place. Small black spruce is the only kind of timber I found growing in the muskegs. . . . The land can easily be cleared as the roots of the trees do not penetrate the clay, but seem to run along between the clay and the muck, and once the land is burnt over and drained, the stumps can be easily moved. The country, although flat and level, can easily be drained into the Mattagami river.

P. 65, 1908. (Kingsmill township). The soil of the northern and eastern portions is principally clay of good quality, while in the southwest it is inclined to be sandy, particularly in the first and second concessions west of lot seven. . . . The whole township is covered with spruce of varying sizes up to fourteen inches in diameter.

P. 128, 1906. (Sweatman township). Stretches of muskeg were found scattered throughout the township, not more than ten per cent of the whole township being muskeg, and most of this can be drained without much difficulty, as the surface is slightly rolling. . . . A small area of very sandy soil was found in the northeasterly

CONDITIONS IN THE CLAY BELT

part of the township, which would be of little use for agricultural land. In lot one, concessions two and three, a very steep hill of loose boulders was met with, a little very sandy soil was found on the top, the rest of the hill being entirely boulders of granite rock. In the balance of the township the soil is clay and sandy loam, and most of it is good agricultural land and would require little or no drainage, as the surplus water is easily carried off in the many ravines and small creeks which abound in the country. . . . Adjacent to the creeks and ravines, the timber was generally large and would be good for building material and lumbering in general. In the south and southeasterly part of the township quite a large area of land was found covered with a thick growth of small balsam and white birch. In the northeasterly part of the township, on the sandy soil already referred to, a thick growth of small spruce and jack pine was encountered. About eighty per cent of the township was found to be covered with a thick growth of tag-alder and other shrubbery which made our work extremely laborious and slow.

P. 130. (Stimson township). About thirty per cent of the land was found to be muskeg, some of it being sufficiently undulating to enable proper drainage. About four per cent of the township was sandy jack pine ridges. . . . The remainder of the township was found to be mostly good agricultural land, the soil being clay and sandy loam. . . . About seventy per cent of the timber is spruce, averaging from four to seven inches in diameter.

P. 95, 1905. (Fox township). The township as a whole is flat and largely clay. A comparatively small area of muskeg with clay sub-soil occurs in the southeast quarter and along the east boundary. The remainder of the township is clay land covered with a heavy moss. This moss-covered area is swampy in a rainy season, but the underlying soil is splendid clay, and when cleared and burned should make excellent agricultural land. The best timber is towards the west boundary and gradually decreases in size as the east boundary is approached.

P. 98. (Brower township). In close proximity to the larger creeks the land rises slightly in elevation, otherwise the township may be described as low and flat, with a large percentage of swamp and muskeg land, readily drained. The soil is a rich clay and clay loam overlaid in the swamps and muskegs with a depth of from one to three feet of muck and moss.

P. 100. (Lamarche township). The township in general is swampy. . . . The soil has a good clay sub-soil covered with a depth of from one to three feet of muck and moss. The timber of the township is principally spruce and dead tamarack averaging from eight to ten inches in diameter.

P. 78, 1906. (Fournier township). About 70 per cent will, when cleared and drained, become agricultural land. . . . The sizes generally run from 5 to 10 inches and in places to 15 inches.

COMMISSION OF CONSERVATION

P. 75. (Ottaway township). The greater portion will require drainage which will be easily accomplished owing to a fair general fall. The heavy moss now covering the country retards the flow of water and when this is removed there will be a good natural drainage not apparent at present. . . . The sizes (of the timber) run from five to ten inches and in places to 15 and 18 inches.

P. 101. (Lennox township). With a moderate amount of drainage, practically the whole of this township will be available for agricultural or pasturage purposes. . . . The timber in the eastern and western parts of the township is principally spruce of good quality and fair size.

P. 99. (Dargavel township). The township, on the whole, is a fairly good one and with a moderate amount of drainage practically the whole of it can be utilized for agricultural purposes.

P. 79, 1908. (Mabee township). The land is of a good quality of clay, showing some tendency to gravel on the poplar ridges, and is overlaid with muck in certain swampy sections. . . . It is not heavily timbered, but there is no brulé and with the exception of a few small poplar ridges, spruce is found in varying size and quality over the whole township.

P. 67. (Laidlaw township). The soil of the township is clay of good quality except in the extreme southwest corner, where it is sandy. . . . The timber is chiefly spruce, but the higher ground is covered with poplar, balm of gilead, birch and balsam. These poplar ridges are very numerous over the whole of the township.

Pp. 124, 125, 1907. (Kennedy township). The greater part of the township is timbered with small spruce averaging from four to eight inches in diameter. . . . The soil is chiefly a light coloured solid clay, which is almost entirely covered by moss varying from six inches in depth on the high land, to unknown depths in the muskeg, the greater part averaging two feet in depth.

P. 118. (Glackmeyer township). There is a very little muskeg, and nearly ninety per cent of the township will be good agricultural land.

P. 52, 1906. (Clute township)* About fifteen per cent consists of swamp or muskeg, and the remaining eighty-five per cent of the land may be classed as good agricultural land.

P. 43. (Calder township). The soil is uniformly of excellent quality, being clay and clay loam with generally a light deposit of black mould, and in the lower lands a considerable peaty deposit

*Concerning the township of Clute the following statement made by a contented homesteader is of interest. He claims that the estimate of 10 to 15 per cent of saw timber given on page 8, is, in so far as Clute is concerned, rather high; that by close picking 35 to 40 per cent of the land will furnish pulpwood. Along the river it might average ten cords. While there is no real muskeg in the township, there is much low scrub land where the clay is six feet below the surface and where little can be done with the land until it is well drained. With reference to the cost of clearing the land this settler stated that "much of the land cannot be cleared even for \$75.00 per acre, and the low black spruce land has to lie for a year exposed to the sun before it will burn."

CONDITIONS IN THE CLAY BELT

overlying it. . . . This township is by far the most readily adaptable to agricultural purposes that we have yet been called upon to survey, owing to its uniformly rolling and well drained surface. . . . Spruce forms the chief timber, and is usually of small size, seldom exceeding 12 inches in diameter. Poplar, white birch and tamarack of small size are also plentiful, and occasionally balsam. In only a few places was any quantity of timber of a merchantable size met with. . . . As a whole the township cannot be considered as a valuable timber prospect, but will furnish abundance for domestic supply. The bush is generally thick, and crowded with undergrowth of alder, small cedar, balsam and moosewood.

P. 41. (Bradburn township). That portion of the township lying west of the Mattagami river is of a more or less rolling character timbered with spruce up to 16 inches in diameter, balsam of gilead up to twenty inches in diameter, poplar, white birch and balsam of average size and quality, dead and decaying tamarack with alder and willow underbrush and considerable windfall throughout. . . . Taking the township as a whole, I would consider fully sixty per cent suitable for immediate settlement, and I have no doubt that with proper drainage, which can be easily effected, nearly all the remaining of the forty per cent can be made suitable for farming purposes.

Pp. 84, 85. (Sydere township). Some choice sections occur in various parts of the township, but as a whole, for agricultural purposes I would class Sydere as only medium. . . . A few large white spruce occur in various localities suitable for milling purposes, but they are not found in sufficiently large numbers to warrant the setting aside of the township as a timber reserve, but there is sufficient white spruce timber to supply the demand for local building purposes, and the township as a whole is well covered with pulpwood and fuel.

P. 72, 1911. (Shackleton township). Probably about one-half of the land will be found suitable for farming with drainage and as the percentage of rocky land is small, the agricultural possibilities of these townships are fairly good. The timber is chiefly spruce with here and there some medium sized poplar and some small white birch. The trees as a rule are not large and in many places are of shrubby growth, yet considerable areas of timber suitable for railway ties were passed through.

P. 94, 1909-10. (Blount township). In my opinion the township should not be opened for settlement until there is a local market for pulpwood at the railway crossing or at the dam. The wood would pay for clearing and encourage settlement.

Pp. 97, 99, 1907. (Leitch township). Black spruce forest extends over the greater portion of the township, on the higher lands these trees are from 8 to 12 inches in diameter but the great bulk of this timber is somewhat smaller. . . . Sandy loam was found in

COMMISSION OF CONSERVATION

a few places, while throughout the greater portion of the country the soil is clay or clay loam, overlying which is a layer of vegetable matter several inches in thickness on the higher lands, and from one to three feet thick on the wet land; and evidently this soil is well adapted for agriculture. . . . On the whole about sixty per cent of the total area will be good agricultural land after removal of the timber, and nearly all of the balance can be made good farming land by a system of drainage which will not be very expensive, as no drain would require to be of any great length to reach an outlet in a stream.

P. 86. (Colquhoun township). The area covered by this township consists largely of fine agricultural land, of a sufficiently rolling character to afford effectual drainage.

Pp. 94, 95. (Kendrey township). The whole township may be described as more or less rolling in character, timbered with spruce (white and black) up to sixteen inches in diameter, poplar, (white and black) up to twenty inches in diameter, white birch, balsam and cedar up to ten inches in diameter with considerable wind-fall, willow and alder throughout. Numerous swamps of limited extent and covered with small spruce occur in various parts. There is not more than one hundred and fifty acres of muskeg in the whole township. . . . I consider fully sixty-five per cent suitable for immediate settlement and with a proper system of drainage nearly all the remaining thirty-five per cent can be made suitable for agriculture.

Pp. 63, 64, 1908. (Haggart township). The whole township of Haggart may be described as a more or less rolling country timbered with spruce up to eighteen inches in diameter, balsam of gilead up to twenty-five inches in diameter, poplar, white birch, balsam and cedar of an average size and quality. . . . I would consider about fifty-five per cent of this township suitable for immediate settlement, and there can be no doubt that by a proper drainage of the swamps nearly all the remainder can be made suitable for agriculture.

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