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GEOLOGICAL SURVEY
WILLIAM MCINNES, DIRECTING GEOLOGIST.

Summary Report, 1918, Part D

CONTENTS

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SUMMARY REPORT, 1918, PART D.

ATHAPAPUSKOW LAKE DISTRICT, MANITOBA.

By E. L. Bruce.

Athapapuskow Lake district was the centre of considerable prospecting activity during 1918, and although no deposits were discovered that seem likely to produce ore, the new finds have proved that the area of copper-bearing formations extends much farther than had previously been suspected and that copper occurs in other types of deposits than those at Schist lake and Flinflon lake. Mining proceeded steadily throughout the year at the Mandy mine on Schist lake and the production for 1918 was approximately 15,000 tons of ore. This will probably contain at least as high a percentage of copper as the output for 1917, and the value should be over $1,250,000.

Drilling was continued at Flinflon during part of the winter of 1918 and the extension of the ore-body southward under the drift was located. The size of the ore-body has been thoroughly demonstrated, but the values are too low to make it possible to work under present conditions.

Some other deposits of disseminated chalcopyrite and of chalcopyrite and pyrrhotite have been opened up by test pits, but none of these seem to be large enough or of high enough grade to be important.

New discoveries of somewhat different type were made along the north and west shore of the east arm of Athapapuskow lake. The rock at the shore is fine-grained greenstone. Some distance inland this is intruded by the great granite batholith that forms the divide between the Mistik chain of lakes and those lakes that drain into Cranberry lakes and Elbow lake. In the dense greenstone are certain zones that have undergone slight fracturing, possibly at the time of the granite intrusion. The network of fractures has been filled by epidote, calcite, and quartz, along with which are segregations of copper minerals including both bornite and chalcopyrite. In some specimens chalcopyrite forms the central part and is completely enclosed by bornite. There is no evidence of any ordinary secondary enrichment and it seems that the change from centre to margin of these segregations must have been due to some change in the solutions from which the minerals were deposited. The presence of epidote in large amount is evidence of the contact metamorphic character of the deposits which are thus probably directly related to the granite intrusion. No definite shear zones or large veins have been located. The fractured and mineralized areas gradually fade out into massive barren rock. Prospectors after a little experience are able to locate the deposits of this type by reddish stains along joint planes of the rock, due no doubt to the alteration of the copper minerals. Rich samples can be obtained and high assay results have been given some publicity, but judging from any of the shallow test pits sunk on the recent discoveries none of the deposits is sufficiently high grade to produce working properties even under favourable conditions of mining, and under present conditions they are certainly not workable.

Two discoveries of gold-bearing quartz veins were made in this district during the latter part of the summer. Some very rich specimens of gold were taken from one of these, near Brunne lake west of Cranberry lakes, but unfortunately the pocket proved to be small and no other ore shoots have been found in the vein. The other vein is on the north side of Athapapuskow lake north of the outlet of the lake. It is said to be 2 to 3 feet wide and some good specimens have been taken from it.

Mining development in this district is not satisfactory, however. The production of ore has increased very considerably over that of the previous year, but the high grade ore-body at the Mandy mine is probably not of great size and hence the life of the mine under present conditions will not be long. No other high grade deposits have been found and other deposits that have been thoroughly explored are not sufficiently high grade to be workable until better transportation facilities are provided. The outlook, therefore, for continued mining in this section is not particularly bright. Much of the country has not yet been thoroughly prospected and it seems possible that in the unexamined areas other deposits may be found. If the mining industry is to continue in northern Manitoba every possible means must be taken to attract prospectors to the district, not merely to locate promising pieces of ground but to do thorough development work on the claims after they are staked. The proportion of actual assessment work performed, to the number of claims recorded, is very small, and actual development work should be made a necessary condition for the holding of a claim. The method of staking, too, is detrimental to prospecting, since under the present method it is impossible to determine the position of claims even when the location lines are well marked. Hence prospectors are very likely to choose absolutely new country in preference to a district where some claims have already been staked. This naturally discourages careful and detailed examination even of promising ground.

THE DISTRICT LYING BETWEEN REED LAKE AND ELBOW LAKE, MANITOBA.

By E. L. Bruce.

CONTENTS.

INTRODUCTION.

The investigation and mapping of the district between Reed lake and Elbow lake was completed in 1918, in collaboration with F. J. Alcock. The district is approximately 700 square miles in extent and lies between the Amisk-Athapapuskow map-area[1] and the Wekusko Lake area, the examination of which was completed by F. J. Alcock in 1917.

Reed Lake district lies between the 17th and 18th base-lines, ranges 18 to 22, W. 1st mer. From The Pas, where the Hudson Bay railway crosses the Saskatchewan river, the district may be reached by ascending the Saskatchewan river to Cumberland lake, crossing Cumberland and Namew lakes to the mouth of Sturgeon-weir river, and following that river and its first tributary, Goose creek, up to Athapapuskow lake. A portage of 1¼ miles across the divide leads to Cranberry lakes, the headwaters of Grass river, which forms a good canoe route through the Reed Lake district. An alternative and somewhat shorter route leads up Grass river from Wekusko lake which is now accessible by a wagon road from Mile 82 north of The Pas on the Hudson Bay railway.

Three months were spent in completing the field work. The methods of surveying were the same as those used in the adjoining area; all lakes that could be reached

[1] Geol. Surv., Can., Mem. 105.

by canoes were surveyed by micrometer and the connecting portages by chain and compass; geological boundaries away from the waterways were approximately located by pace and compass traverses and the smaller lakes were sketched.

Assistance in the field work was rendered by F. B. Mann. Thanks are due to Mr. George Morton for his hospitality while the party was in the vicinity of Reed lake.

GENERAL CHARACTER OF DISTRICT.

Topography.

The area lies almost wholly within the Pre-Cambrian shield and has the characteristic topography of that region, with low relief but rugged hummocky surface and youthful drainage. The arrangement of waterways is directly related to the disposition of the hard and soft rocks. Grass river, the main drainage system, and its lake expansions, lie in basins and troughs of schists and greenstone. A large part of the country inland from the waterways consists of uplands of granite from which the descent to the softer rocks is fairly sharp, although it is in no place very great, since the maximum difference in elevation is less than 100 feet.

The lakes in the schistose rock areas are usually long and relatively narrow, with bays extending along the strike of the schistosity. They are quite different in shape in the granite areas and are ordinarily more nearly circular, with bays extending in the direction of joint planes and of shearing, or occupying depressions in the glacial deposits.

Along the south side of Reed lake the rock is flat-lying dolomite and this by the sapping of the lower beds forms cliffs facing out over the rugged older rocks. The cliffs are in places 70 to 80 feet high and in a country of such low relief form rather striking features. Where the country is underlain by dolomite the drainage is usually poor on account of the flatness of the beds. The southern part of the district has been mantled with clay deposited in post-Glacial lakes and these clays mask the inequalities of the hard rock surfaces. This has still further retarded drainage and produced conditions favourable for the formation of muskegs.

Furs, Fish, and Game.

The fur trade has been the chief industry of this district for over a hundred years. It is still important, but the gradual opening up of the country and the forest fires that result from the carelessness of travellers are gradually reducing the number of skins taken each year, although the high prices now obtainable still keep the value of furs sent out annually nearly up to that of former years.

Recently, winter fishing has been begun in the large lakes north of Saskatchewan river. Reed lake and File lake in this district are now open lakes and last season a considerable quantity of fish was shipped from them. Unfortunately the price fixed was not high enough to pay freight charges and leave the fisherman a sufficient return for the hard and disagreeable work entailed. With proper regulations, fishing should form a stable industry.

Game is still fairly abundant in the Reed Lake district, but the larger animals—moose and caribou—seem to be decreasing in numbers, due to all the year round hunting. It will soon be necessary to establish game reserves as propagating centres for these as well as many of the fur-bearing animals.

Agriculture.

Only small areas of land suitable for agriculture are found in the Reed Lake district. One of these is now cultivated by several families living on the lake and yields a very fair return of vegetables. It is supposed to be the site of the North West Company's post, established by David Thompson in 1794, and if so, has no doubt been under almost continuous cultivation since that date. In the northern part of the area the soil is thin and will never support a farming community.

Water-powers.

Grass river is the largest stream in the district, but this part of its course is near its headwaters and the average flow is too small to give any large or regular supply of energy.

Forests.

Much of the area between Reed lake and Elbow lake is covered by small, second growth trees. At one time good timber could have been obtained, as indicated by the size of the charred trunks still standing. The growth rings of the largest of the growing trees show that the fires that destroyed the original forest must have occurred at least forty or fifty years ago. The only considerable area of timber of merchantable quality extends for some miles northwest of Reed lake.

GENERAL GEOLOGY.

The geology of the district between Reed lake and Elbow lake is much simpler than that of the neighbouring districts either east or west. Possibly this is due to an anticline, the crest of which lies in the Reed Lake district. Erosion has cut deeper into the rock surface along the axis than on the flanks of the anticline and has removed all traces of the younger Pre-Cambrian formations that give so much variety to the geology of the Amisk-Athapapuskow area to the west and the Wekusko Lake area to the east. The sequence of formations is as follows:

Table of Formations.

Quaternary	Recent Pleistocene	Peat, river silts. Lake clays. Till, sand, gravel.
	Unconformity.	
Palæozoic	Ordovician	Dolomite.
	Unconformity.	
Pre-Cambrian		Granite.
	Intrusive contact.	
	Amisk series.	Lavas—greenstone and derived schists.

Amisk Series.

The rocks of the Amisk series of the district between Reed and Elbow lakes are very similar to those first described under that name in the Amisk-Athapapuskow Lake area.[1] Originally they were lavas and volcanic fragmental rocks of medium composition, but the intense alteration to which they have been subjected has so altered most of them that the original structures of the extrusive rocks have been largely destroyed. The rocks in many areas, including the region bordering Elbow lake, now consist of massive greenstone or of very fissile chlorite schists. Narrow bands of sericite schists are found in the chlorite schists and they may represent squeezed dykes of more acidic material, flows of somewhat different composition from those that have formed the chlorite rocks, or beds of sedimentary material. Near the

1 Geol. Surv., Can., Mem. 105, p. 23.

granite, the rocks of the Amisk series have been severely metamorphosed, commonly to a granular rock that in the field has been called diorite but which seems to be, in part at least, a hybrid rock, formed by the impregnation of greenstone by granitic material, or the absorption of greenstone by the slow and gentle advance of the intrusive.

Granite.

Granite is the country rock of the greater part of the district. It occurs only a short distance inland from the waterways, in practically all localities. Ordinarily it is a very fresh, greyish to pinkish rock containing either hornblende or biotite as the main magnesium-iron mineral. It is intrusive into the greenstone which is rendered schistose along some of the contacts and at others is profoundly altered in composition, as already described.

Dolomite.

The Palæozoic dolomite has been described in other places[1] and there is nothing new to add to the descriptions already published.

Recent and Glacial.

The Recent and Glacial deposits are similar to those of the Athapapuskow area to the west. The southern part of Reed Lake district was occupied by a post-glacial lake or lakes and became covered with a mantle of fine lake clays. Along the north shore of Reed lake the beaches of one stage of these lakes are visible. North of Reed lake the clays do not occur and the glacial material consists only of local deposits of till in protected places.

The Recent deposits consist of peat bogs formed in undrained hollows and some recent river alluvium.

ECONOMIC GEOLOGY.

Reed Lake district has been less thoroughly prospected than any other part of the belt of basic rocks that extends from Amisk lake to Wekusko lake. This is in part due to the greater difficulty of reaching it. No discoveries of any importance have yet been made, but the large area of greenstone lying northwest of Reed lake and the other area of considerable extent lying along the base of the Ordovician between Island (Iskwasum) lake and the third Cranberry lake seem to merit more careful prospecting than they have yet received. On the whole, however, conditions in this district do not seem to have been as favourable for the formation of ore deposits as they were in the neighbouring districts. The chalcopyrite deposits of Schist lake and the gold quartz veins at Amisk lake and at Wekusko lake are directly connected with the final intrusions of granite and were carried out into the enclosing rocks by solutions containing the volatile constituents of the igneus rocks. It would be expected then that these solutions, on rising from the upper surfaces of the great body of the granite, would collect in the upper parts of the dome-shaped bodies, and hence that the valuable minerals would be found in veins or shear zones above unexposed bosses of granite, or arranged in a belt about granite masses only the upper parts of which are exposed by erosion. Where erosion has cut too deeply into the igneous rock the upper parts of the domes have been removed and with them the more valuable deposits of mineral. In a large part of the Reed Lake country this appears to have happened and hence the district is less favourable for prospecting than the less deeply eroded districts east and west. However, it should not be assumed that all the deposits of valuable minerals have been completely removed and the localities previously mentioned seem to be the most promising parts of the area for prospecting.

[1]Geol. Surv., Can., Mem. 105, p. 23.
Geol. Surv., Can., Mem. 30, p. 44.

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REED-FILE LAKES AREA, MANITOBA.

By F. J. Alcock.

CONTENTS.

INTRODUCTION.

General Statement.

The greater part of the season of 1918 was spent in the Reed and File Lakes region of northern Manitoba, extending the work of the previous season westward. Between the Wekusko Lake area mapped in 1917 and the Amisk-Athapapuskow district mapped by E. L. Bruce, there remained an area of approximately 770 square miles that had been only partly explored. The southwestern part of this intervening district was covered during the past season by E. L. Bruce and the northeastern part was mapped by the writer, thus completing the regional geological mapping of the whole belt of basic Pre-Cambrian rocks which extend from Amisk lake on the west to Wekusko lake on the east. As in previous work the method of surveying was by means of Rochon micrometer and surveyor's compass, with sextant readings for latitude at suitable intervals. Portages and meandering streams were surveyed by telemeter. Many of the smaller lakes and streams and the geological boundaries were located by pace and compass traverses.

Acknowledgments.

Thanks are due to Mr. Geo. Morton of Reed lake for valuable information about the region and for other courtesies. Assistance in the field was efficiently rendered by A. M. Corley.

Means of Communication.

The region may be reached from the town of The Pas, Manitoba, either by way of Saskatchewan river, or by the Hudson Bay railway. The former is a long route leading from Cumberland house through lakes Namew, Goose, and Athapapuskow, and down the Grass river. The Hudson Bay railway offers a choice of routes. Since the completion of the wagon road from Mile 82 to the south end of Wekusko lake, the easiest route to Reed lake is through Wekusko and Tramping lakes. A more direct summer route leads from Mile 41·5 on the railway, through Cormorant and Yawningstone lakes to Cowan river and thence by way of a number of small lakes and portages to the south end of Reed lake. A winter road from Mile 55 on the railway is used for hauling fish taken from Reed lake and the lakes north of it.

GENERAL CHARACTER OF DISTRICT.

Topography.

The region consists topographically of two divisions. The southern part is a flat country containing many muskegs and underlain by horizontal beds of Ordovician dolomite. The northern border of this belt is usually an escarpment varying in height up to 80 feet. Its outline is very irregular with many deep re-entrant bays. In places, the escarpment rises in vertical cliffs and in places in a series of steps.

North of the Palæozoic belt the country is typical of the Pre-Cambrian shield. The relief is low and the surface hummocky and lakes characterized by extremely irregular outlines and numerous islands are abundant. The lake shores are for the most part rocky, in many places showing steep cliffs. The dominant northeast trend is determined largely by rock structure.

Drainage.

The larger part of the area drains into Reed lake and thence by Grass river through Wekusko lake into Nelson river. The part of the area occupied by the basins of Methy, File, and Loonhead lakes drains northward by File river to Burntwood river. Four miles east of File lake the drainage is to the east into Squaw lake and thence into Wekusko lake. The divides are low, seldom rising over 100 feet above the level of the adjacent lakes. The streams are typical of the Canadian shield, having numerous lake expansions separated by stretches of rapids.

Grass river is the main canoe route through the area, but there are several others. One leads from Wekusko lake through Snow and Squaw lakes to File lake. File lake may also be reached from Reed lake by either of two routes. One of these leads from the north end of Reed lake, over a portage 3·8 miles in length, to Methy lake, and thence by a portage of 6 chains to File lake. The other route is from the eastern extremity of Reed lake by way of Little File river to Little File lake. A portage 1¼ miles long connects the northwestern arm of Little File lake with a bay on the east shore of File lake.

Population and Industries.

The chief industry of the region is the winter fishing on Reed and File lakes. Some trapping is also carried on. Though a certain amount of prospecting has been done in the district, nothing of importance has yet resulted from it. Agriculture is limited to a few gardens on Reed lake in which potatoes and other vegetables are raised.

The population of the area consists of a few people on Reed lake. The only Indians who visit the region are a few families from Pukkatawagan who sometimes winter at File lake.

GENERAL GEOLOGY.

The geology of the region is similar to that of the Wekusko Lake area described in the Summary Report, 1917,[1] and only a brief summary will be given here. The geological succession may be tabulated as follows:

Table of Formations.

Quaternary.	Recent Pleistocene.	Peat. Lacustine clays. Glacial drift.
	Unconformity.	
Palæozoic.	Ordovician.	Dolomite.
	Great unconformity.	
Pre-Cambrian.	Batholithic intrusives.	Granite-gneiss and its differentiates.
	Sedimentary complex.	Granite-gneiss. Staurolite-schist.
	Igneous complex.	Altered volcanic and intrusive rocks.

[1] Geol. Surv., Can., Sum. Rept., 1917, pt. D, p. 8.

Igneous Complex.

The rocks included under this head show a great variety of types. They consist of volcanic flows, dioritic intrusives, and tuffs and volcanic ash rocks. In composition they vary from rhyolite to basalt, those of intermediate composition, however, being the commonest. Some of the flows show ellipsoidal and amygdaloidal structures. Many of the rocks, particularly the diorites, are massive, but the majority are more or less schistified. The resulting rocks are chlorite, mica, and hornblende schists, the last variety commonly developed near the contacts with the granite intrusives.

Sedimentary Complex.

This group of rocks, which includes a variety of sedimentary schists and gneisses, has a much smaller extent in the Reed-File Lakes area than in the adjoining region surrounding Wekusko lake. It is limited to a narrow zone along the western shore of File lake and an area between File and Loonhead lakes. The narrow peninsula on the southwestern shore of File lake consists of staurolite-garnet schist. Immediately to the northeast is a series of banded gneisses, largely garnetiferous, which locally grade into garnetiferous quartz-mica-schists.

Batholithic Intrusives.

The larger part of the area is underlain by batholithic intrusives of deep-seated origin. They are dominantly granitic in composition, light-coloured, and in texture vary from massive to gneissic; locally, porphyritic varieties occur. Red granite is the commonest variety. Near the borders of the stocks, however, more basic hybrid types are commonly found which have the composition of monzonite and quartz-diorite. Pegmatitic differentiates are abundant.

Ordovician.

Flat-lying Ordovician dolomite forms low outcrops along the south shore of Reed lake.

Pleistocene and Recent.

The region shows abundant evidence of having been heavily glaciated. Drift, however, is not abundant and is confined to depressions and to the southwestern slopes of cliffs. Stratified lacustrine clay is found in the southeastern part of the area. Muskegs with peat deposits are common throughout the district.

ECONOMIC GEOLOGY.

A limited amount of prospecting has been done in the area and a number of claims have been staked. These represent two types of deposits, namely, quartz veins and mineralized sulphide zones. As in the Wekusko Lake region, the first type is considered to have been formed as the last effects of the granitic intrusions. Search, therefore, for this type of deposit should be concentrated along the borders of the granite stocks. The second type of deposit consists of small quantities of pyrite and pyrrhotite in iron-stained zones. None of these has as yet been shown to be of any importance.

WEKUSKO LAKE AREA, MANITOBA.

By F. J. Alcock.

CONTENTS.

INTRODUCTION.

General Statement.

The month of October and the early part of November were spent by the writer in completing the previous season's work in the region around Wekusko lake. A trip was made to Carrot River lakes in the northern part of the area; two weeks were spent making inland traverses east of Wekusko lake where the streams are too small for canoe travel; and the remaining time was spent on the mineral claims. Plane-table maps were made of two of the more important properties.

Acknowledgments.

The writer is indebted to Mr. J. P. Gordon, to Mr. Walter Neal, manager of the Rex mine, and to Mr. Hugh Vickers for assistance courteously extended to him during the season. Field assistance was rendered by A. M. Corley.

RECENT DEVELOPMENT.

Considerable development work was done in the Wekusko Lake region during the past year. The Rex mill commenced operations in April and in June the first gold brick produced in the district was shipped. One new prospect was also located in the spring.

During the summer the road from Mile 82 on the Hudson Bay railway, to the south end of Wekusko lake, was considerably improved by the provincial government. In November a road connecting this point on the lake with the Rex mine, a distance of 11 miles, was located.

A store at which prospectors can outfit has been established by Mr. Thos. Forrest on the lake near the Rex property.

GENERAL GEOLOGY.

A summary of the geology of the region was given in the Summary Report for 1917[1], and only a brief note regarding it will be given here. The basal rocks of the region consist of an ancient Pre-Cambrian complex of metamorphosed sediments and igneous rocks and intrusive masses of granite and granite gneiss. The igneous members include: volcanics varying in composition from rhyolite to basalt, tuffs and volcanic ash rocks, and intrusive dioritic rocks. Many of these have been highly metamorphosed, the more basic giving rise to chlorite, mica and hornblende schists and the more acid to sericite schists. The sedimentary rocks are represented by finely-banded garnet gneisses, staurolite and cyanite schists, arkose and conglomerate bands. All these types are intruded by stocks and batholiths of granite and dykes of pegmatite and lamprophyre. Overlying all these rocks in the southern part of the area and separated from them by a great unconformity are flat-lying beds of Ordovician dolomite.

[1] Geol. Surv., Can., Sum., Rept. 1917, pt. D, p. 11.

ECONOMIC GEOLOGY.

General Statement.

The ore deposits of the region are gold-bearing quartz veins. These are found traversing all the Pre-Cambrian rocks of the region and are considered to have been the latest after effects of the intrusion of the granite batholiths. The main veins of the area are situated near the border of a granite mass lying between Little Herb bay and Grass river. Future prospecting should be largely concentrated on the border zones surrounding similar stocks.

The more important properties of the area were briefly described in the Summary Report for 1917,[1] and only a short note regarding them will be given here.

Rex.

The Rex is the only property of the area which is actually producing. The rocks consist of interbanded rhyolite and arkose cut by lamprophyre dykes. The arkose is locally conglomeratic and in places is metamorphosed into garnetiferous gneiss. The vein lies in rhyolite near a contact with arkose. The volcanic rock is very hard, but along the immediate contact with the vein is slightly schistified.

Owing to a number of adverse conditions, such as scarcity of labour and high cost of transportation, operations during the summer and autumn were not found to be profitable; and in December work was suspended. The following information regarding production and values was kindly supplied by Mr. Walter Neal, manager of the Rex. Up to the end of November the production in gold bullion, not including concentrates, was in excess of $27,000. The shaft is down 127 feet with 5 feet of $30 ore in the sump. The south drift extends 250 feet from the shaft and the north drift 90 feet. The last 50 feet in the south drift furnished the best ore in the vein, from which an actual recovery of more than $19 per ton was made.

Northern Manitoba.

An option was taken by the Makeever Bros. on the Moosehorn and Ballast claims and the shaft was continued to the 100-foot level. Approximately 50 feet of drifting was also done.

Twin Lakes Group.

A new discovery was made in the spring of 1918 on the southern border of the peninsula lying between Little Herb bay and Grass river, which represents a type of deposit somewhat different from the ordinary quartz veins of the region. It consists of a mineralized pegmatite cutting massive red granite. The pegmatite is slightly coarser in grain than the granite, is more quartzose, and in places grades into true quartz veins. The contact of the pegmatite and the granite is locally quite distinct, but in places it is impossible to distinguish the two types. In such places the lead is distinguished by the mineralization which consists of sulphides, chiefly arsenopyrite, with pyrite and chalcopyrite in small amounts. A considerable amount of trenching has been done on the property. At one place the mineralized zone is 40 feet in width. The overburden yields gold on panning and in places the pegmatite and the quartz stringers contain visible gold. The area of the mineralized zone is apparently large and careful sampling is needed to determine the value.

[1]Geol. Surv., Can., Sum. Rept., 1917, pt. D.

SUPERFICIAL DEPOSITS AND SOILS OF WINNIPEGOSIS AREA, MANITOBA.

By W. A. Johnston.

The Winnipegosis map-area includes townships 30 to 36, ranges 16 to 22, the subdivided parts of townships 32 to 34, range 23, and township 37, ranges 17 to 20, west of the principal meridian in Manitoba. The area includes the townships surrounding the southern part of lake Winnipegosis and extends westward to the foot of Duck mountain. The total area embraced by the map is about 2,000 square miles, of which about 540 square miles are occupied by lake Winnipegosis and smaller lakes.

The Winnipegosis area is traversed along its western side by the Canadian Northern railway, and a branch line of the railway extends to the village of Winnipegosis on the shore of lake Winnipegosis near its southern end. Hence the greater part of the district lies within a few miles of the railway or of the shores of lake Winnipegosis and is thus readily accessible. A part of the area has been settled for a number of years, but the greater part is still unsettled, chiefly because the area is largely wooded and is in places swampy. At the present time, however, greater attention is directed towards the wooded areas with a view to settlement, because of the practical exhaustion of prairie land available for homestead entry in areas which are easily accessible.

The object of the past two season's work in the Winnipegosis area was chiefly to investigate the character of the superficial deposits and to map the different soils of the region in order to supply prospective settlers with information regarding the general character of the district, and to indicate the areas most suitable for settlement. Attention was also paid to the possibilities of drainage of the swampy areas and to the water supply.

A map on the scale of 3 miles to the inch, which will show the character and distribution of the different soils and of the forest cover, and a report embodying the results of the investigation, are being prepared.

During the past field season, D. K. C. Strathearn of Midland, Ontario, and A. Leslie Ham of Winnipeg acted as assistants.

GOLD-QUARTZ VEINS AND SCHEELITE DEPOSITS IN SOUTH-EASTERN MANITOBA.

By E. L. Bruce.

CONTENTS.

INTRODUCTION.

The area of Pre-Cambrian rocks in the southeastern corner of Manitoba received considerable attention from prospectors during the gold excitement in the Lake of the Woods district some years ago. Many test pits and shafts were sunk on quartz veins or shear zones impregnated with sulphides. At the Penniac group of claims just south of Star lake, mining and milling equipment was installed, but no production of any consequence resulted and for some years there has been little activity. In 1917 some of the old workings were sampled by J. R. Marshall of the Geological

Survey,[1] and assays of the samples showed appreciable amounts of platinum. Owing to the demand for this metal, a more thorough sampling of the veins from which the platinum-bearing specimens came, was considered advisable. Also some discoveries of scheelite had recently been made in the same district and these required examination. During July, 1918, a week was spent in the vicinity of Falcon and Star lakes and samples were obtained from practically all the old workings.

POSITION AND MEANS OF ACCESS.

The district lies between the main line of the Canadian Pacific railway and the Greater Winnipeg Water District railway and is easily reached by canoe from either of these lines. Winter roads have been made and there are no serious obstacles to the construction of summer roads should the development of mining warrant it.

GENERAL GEOLOGY.

No thorough study of the geology of the district has yet been made. A review of previous work and opinions is given in the Summary Report for 1917.[2] The oldest rocks of the district are volcanic in origin and consist of ellipsoidal weathering lavas and derived schists which are probably referable to the Keewatin. Areas of conglomerate occur folded in with the Keewatin rocks, but the conglomerate contains pebbles of the volcanics as well as fragments of various other rock types among which are relatively large oval pebbles of a reddish, rather friable rock which has the appearance of an arkose but may prove to be a somewhat abnormal granite.

The volcanic rocks and the conglomerate occur as a narrow belt between great areas of red granite which is intrusive into them. An isolated boss of granitic rock occurs south of Star lake. It intrudes both volcanics and conglomerate. In composition it is rather different from the red granite bounding the belt and it may have been intruded at a different period. It is variable in character; in places it has the appearance of a hornblende syenite, and in other places it is a very acidic binary granite. The binary granite occurs as relatively small elliptical areas without any very marked line of contact between it and the normal basic variety.

QUARTZ VEINS.

The gold-quartz veins from which platinum has been reported occur both in the granite and in the basic rocks intruded by the granite. Many of them are shear zones impregnated with quartz and sulphides. In such deposits the central part commonly consists of quartz of fine texture. Outwards the zone consists of silicified country rock impregnated with sulphides which may also form veinlets of solid mineral. The assays given below show that the greater part of the gold content is associated with the sulphides rather than with the quartzose part of the zone. In the granite, fissures are more definite and there is less impregnation of the walls by vein material. The deposits occurring in the basic rocks seem to be arranged as a sort of aureole about the boss of granite, and this, together with the occurrence of visible gold and other metallic minerals in the differentiated parts of the intrusive, seems to be rather conclusive evidence that the vein material was derived from the granite.[3]

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[1] Geol. Surv., Can., Sum. Rept., 1917, pt. D, p. 21.
[2] Geol. Surv., Can., Sum. Rept., 1917, pt. D, p. 22.
[3] Wallace, R. C., and Delury, J. S., Rice Lake district, mineral belt north of The Pas, Star Lake district in eastern Manitoba," Manitoba Public Utilities Commission.

The results of the assays of the various samples taken are as follows:

Sample No.	Claim.	Width sampled. Feet.	Inches.	Method of sampling.	Ounces Troy per ton of 2,000 lbs. Gold.	Platinum.
5	Magpie	7	..	Channel	None.	None.
6	Jewel	4	..	"	"	"
7	"	5	..	"	0·16	"
8	Georgius	4	..	"	None.	"
9	"	4	..	"	"	"
10	"	..	..	From dump	"	"
11	Enterprise	..	..	"	0·08	"
12	"	..	..	"	1·64	"
13	Hall	..	..	"	0·13	"
14	Boyes	..	..	"	2·42	"
15	Gold Coin	..	18	Channel fr. quartz	0·08	"
16	"	..	53	" " rock	None.	"
19	Sunbeam	22	..	"	Trace.	"
20	"	8	..	"	"	"
23	Waverley	1	..	" sheared rock	1·48	"
24	"	..	6	" quartz	Trace.	"
25	Penniac	..	8	" face of drift	0·14	"
26	"	..	..	Ore from pocket	Trace.	"
28	"	..	..	Tailings from mill	0·08	"
35		..	..	West side of Hawk lake, grab sample	None.	"
36		..	.	Northwest side of Hawk lake, grab sample frcm pit.	None.	"

Assayer: H. A. Leverin, Mines Branch, Dept. of Mines, Ottawa.

Mineral Claims.

Magpie. On the Magpie claim a shaft 8 feet by 8 feet has been sunk to a depth of 8 feet in a rusty-weathering, silicified zone. The strike of the zone is northeast and the dip is vertical. A little white iron is visible in the altered rock.

Jewel. Two shafts, 60 feet apart, have been sunk on a mineralized zone on the Jewel claim. The country rock is a dense, dark, hornblendic rock which is fairly massive. A zone one foot in width contains considerable sulphide.

Georgius. On the Georgius claim two shafts have been sunk, one along the hanging-wall, the other along the foot-wall of a sulphide impregnated zone which at the shafts is 30 feet in width. Pyrite or marcasite seems to be the most abundant mineral, but some quartz also occurs in the altered country rock.

Enterprise. A shaft has been sunk to a depth of 20 feet at the point where the main vein divides. Open-cuts have also been made along the vein. The material on the dump contains a considerable amount of pyrite and in the open-cut small pockets of chalcopyrite were observed.

Hall. The deposit examined on this claim is a lens of quartz 15 feet in length with a maximum width of 2 feet. It occurs in a dense, dark grey, dioritic rock which is somewhat schistose. The quartz lens cuts across the structure. Besides the quartz some molybdenite is present along with molybdite its alteration product.

Boyes. On this claim is a shaft 25 feet in depth, as well as a small open-cut. The deposit in the shaft consists of two veins of quartz, each averaging about 4 inches in width, separated by 8 inches of altered rock. The vein dips very steeply and along its hanging-wall side arsenopyrite and other sulphides form a selvage at

most an inch in width. This seems to be the part of the zone in which the highest values occur, but in choosing the sample only enough of this material was taken to form approximately an average of the mineralized zone.

Gold Coin. The country rock of the Gold Coin claim is a coarse-grained granodiorite or hornblende syenite with some biotite. In the pit there are two veins of quartz, 3 inches and 15 inches in width respectively. Along the foot-wall of the narrower vein which dips beneath the wider one, the rock is fractured slightly and is impregnated with arsenopyrite. The quartz is glassy and has dark zones which roughly parallel the walls. It contains arsenopyrite and smaller amounts of pyrite, the alteration of which has stained the quartz.

Sunbeam. The Sunbeam claim is also in the granitic boss. Several shallow pits have been sunk in a fine-grained, acidic mass of granite roughly oval in outline, 100 feet long by 75 feet wide. In places along the edge the normal syenite or granodiorite is distinctly banded parallel to the contact, but around the greater part of the border the acidic rock grades into the more basic normal facies. Apparently the acidic rock is a differentiate from the intrusive mass. The acidic granite itself is not homogeneous, but certain parts of it are so acidic and the rock is so fine-grained that it is practically an aplite. Gash veins filled with quartz occur in the granite mass, but no metallic minerals were seen in them. Grains of pyrite and small bunches of galena and zinc blende occur scattered through the unfractured granite and seem without doubt to be a part of that rock.

Waverley. The Waverley claim lies east of the Sunbeam in the granodiorite area. In this a pronounced shear zone strikes northeast and dips 50 degrees southeast. Along the foot-wall side is a band of quartz 6 inches in width. A shaft has been sunk to some depth along the shear zone and a shallow open-cut has been carried along the vein for a distance of 200 feet. Judging from material on the dump, quartz formed only a small part of the material taken out.

Penniac. More development work has been done on the Penniac group of claims than at any other point in the district. An inclined shaft has been sunk to a depth of 60 feet, the upper 35 feet of which has an angle of 60 degrees and the lower 25 feet, an angle of 40 degrees. From the bottom of the shaft drifts were carried northeast and southwest. The northeast drift is 70 feet long and the southwest drift is said to be of about the same length. Besides the shaft there are several large open-cuts. A mill was installed to treat the ore, but the mechanical arrangements were not as convenient as they might have been and the process used was an experimental one. Possibly this may have been a factor in the failure of the mine.

The country rocks of this group are more varied than those on any other claims examined. Keewatin volcanics form part of the surface rock and a belt of conglomerate extends from Star lake at least as far south as the workings. These rocks are intruded by the granodiorite boss referred to above. Much of the rock on the dump at the shaft seems to be a basic intrusive rock which possibly bordered the granodiorite, the main mass of which outcrops just east of the shaft. A large part of the solid rock northeast of the workings is covered by a sand plain.

Mineralization occurs at the Penniac in the shear zones in the conglomerate and lavas. Pyrite is apparently the most common mineral. The shaft follows a quartz vein that is fairly constant, but is in places broken into stringers. A quartz vein 8 inches in width is exposed in the face of the northeast drift.

SCHEELITE DEPOSITS.

Northwest of Falcon lake, which lies south of Star lake, several claims have been staked for scheelite and some work has been done on them. Development was still

in progress when the deposits were visited and since that time a small shipment of the material has been received for treatment at Ottawa at the Mines Branch, Department of Mines.

Most of the work has been done on the Empress claim and the deposits there are typical of the other occurrences. The deposits lie a short distance southeast of the main granite-greenstone contact. The scheelite occurs in a fine-grained, hornblendic rock, fairly massive, but with a roughly sheeted structure. Along the planes of sheeting quartz veinlets 15 to 20 feet in length and ¼ to ½ inch in width have been formed. The scheelite occupies vuggy lenses not associated with the quartz veinlets and not in all cases parallel to the sheeting. It occurs with relatively large amounts of epidote, smaller amounts of calcite, and occasionally garnet. The scheelite is in small white or reddish crystals and the association with calcite makes certain determination of its presence in a hand specimen rather difficult. The lenses which carry the scheelite are irregularly spaced, and usually only 2 to 4 inches in width and only a few inches to a few feet in length. They are probably of contact metamorphic origin and result from the intrusion of the neighbouring granite.

W. B. Timm of the Ore Dressing Laboratory, Mines Branch, Department of Mines, has kindly furnished a report on the milling tests of scheelite-bearing material from this district. The following is an extract from his report:

"*Summary.* The following is a summary of the results of this shipment of scheelite ore:

	Crude Ore.	Concentrates.	Tailings.
Weight in pounds	7,921	177	7,744
Analysis WO_3	1·65%	70·63%	0·073%
Content WO_3 in pounds	130·7 %	125·01%	5·69%

"*Conclusions.* By the above test a high grade tungsten concentrate of grade 70·63 per cent was made with a recovery of 95·7 per cent of the tungsten values in the ore. These results are very satisfactory for a low grade ore considering the comparatively coarse crushing necessary to obtain the separation."

As this shipment apparently consisted of cobbed material the return from the mill test is not encouraging.

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