AN ISOCHRONIC STUDY FOR WINNIPEG AND MONTREAL; PERIPHERAL AND INTERVENING AREAS

A Thesis
Presented to
the Faculty of Graduate Studies and Research
McGill University

In Partial Fulfilment
of the Requirements for the Degree
of Master of Arts

by
Laurie Andrée Paterson, B.A.
Montreal
April 1951

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THE REGIONAL EXPLANATION FROM WINNIPEG

The general pattern. The pattern of the isochrones radiating from the centre of Winnipeg is partly controlled by the topography of surrounding areas. These do not form a continuous prairie. There are wide variations in altitude and land surface. The Laurentian Plateau covers the northern and eastern area and continues south east from the southern tip of Lake Winnipeg. Between the height of land in the south east and the Riding Mountains in the north west lie the broad plain of the Red River Valley and the plateau of the Second Prairie Step.

In adjusting to this landscape the isochronic lines indicate these variations in topography. The pattern is full and even in the lowland area but the rise of the Second Prairie Step cramps and shortens the preceding lines. The Mountain area in the north west deflects and scatters the outline, while the Highland area in the south east causes considerable irregularity to the wide form in the Red River Valley. When the isochrones penetrate the Shield, where there is little or no organized farmland and few roads or railways, there is no pattern, only a continuous irregularity. Here the core of the isochrones consists of a long, narrow line or a series of "progressive islands"[1] from which the remaining lines extend, following the trend of the hydrography, and adjusting to the terrain.

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The complete pattern is composed of the many diversifications in individual areas. Local topography, economic development, patches of unused land, and the system of land division all control the formation of the many facets of the isochronic design.

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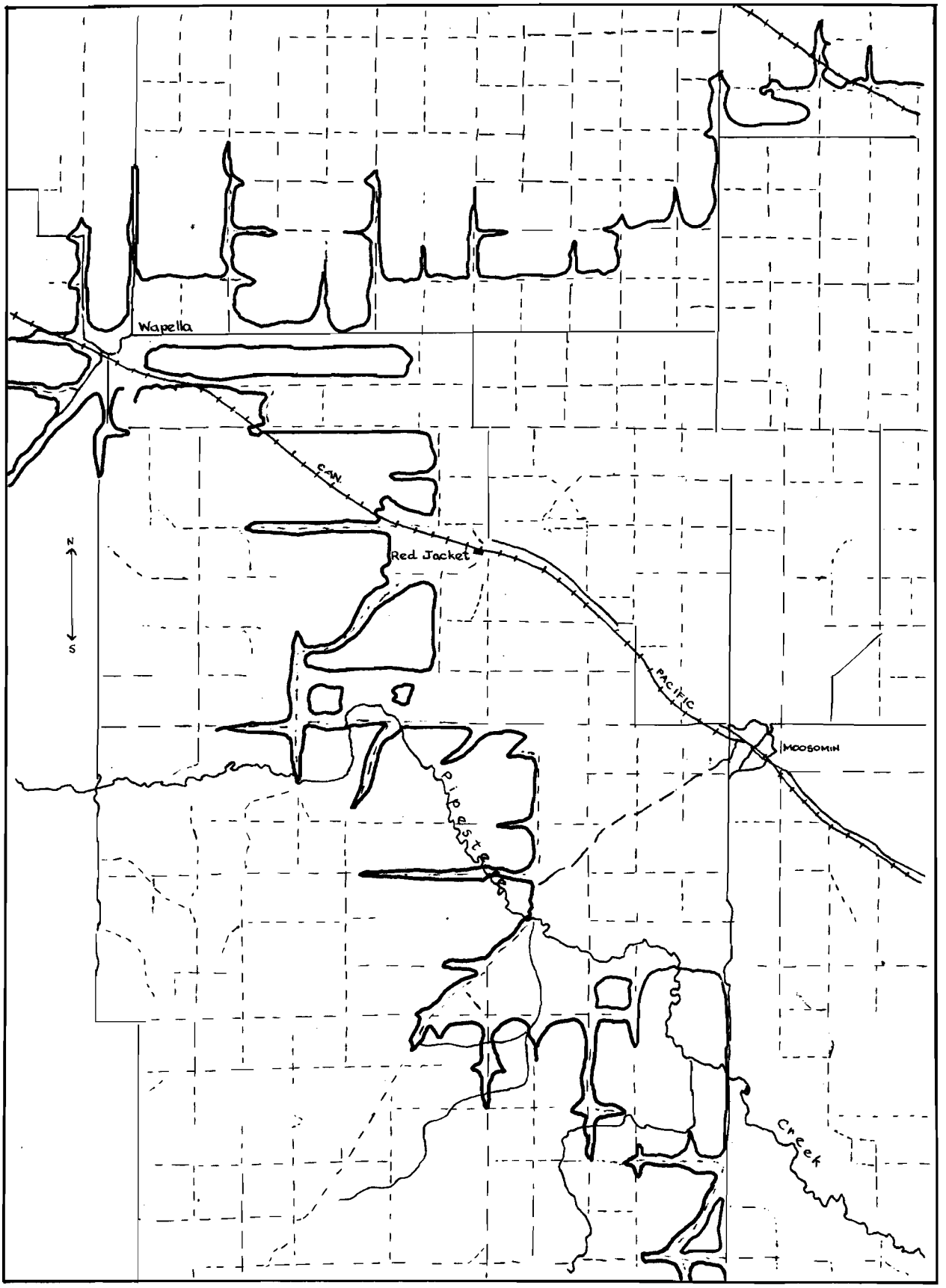
Wapella
C.M.N.
Red Jacket
N
S
PACIFIC
MOOSOMIN
Pipestone
Creek

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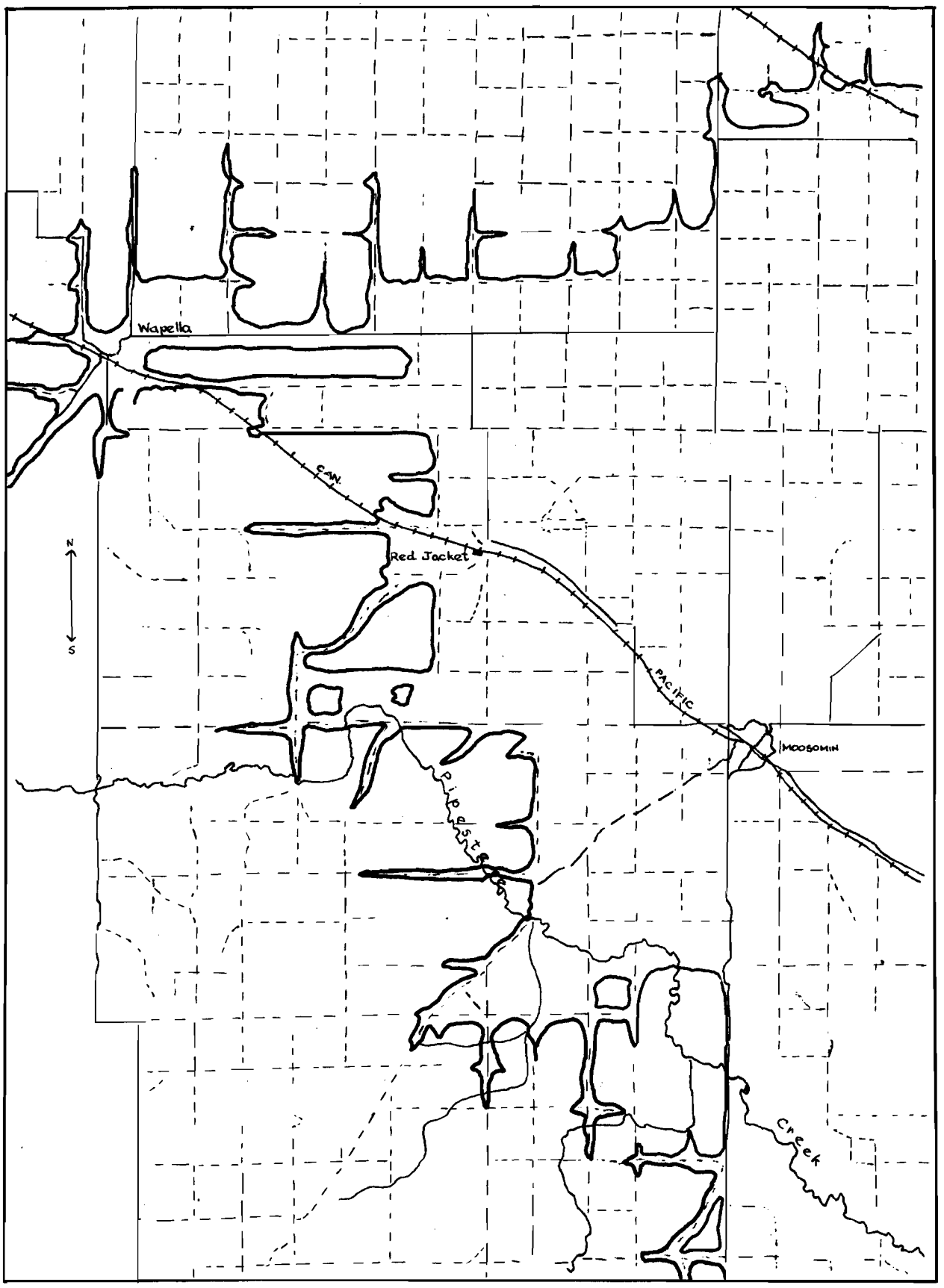
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Creek

-tions to an easy departure from this centre. The streets are wide and straight. Only traffic lights, school zones and suburbs hinder the traveller from rapidly reaching the limits of the built-up areas.

There are equal facilities for departing from the city in any direction. Eleven provincial highways radiate from the city to all parts of the province and connect with major routes of adjoining provinces and states. An equal number of railway lines also serve the travellers.

The first hour out from Winnipeg is well contained within the Lowlands. To the south and west the line falls within the Red River Valley which forms the southern part of the Lowlands. There are almost no topographical barriers in this first hour, as is apparent from the regular, circular pattern of the isochrone. The Red River does not affect the pattern, as there is adequate and equal transportation on both east and west sides of the river. The valley bottom is level, agricultural land. Excellent highways traverse this area with many miles of gravelled road. Third class roads are open practically every mile. This results in a full and even pattern.

A broad and complete zone up to the first hour indicates that the land is well settled and well utilized. South and west of Winnipeg there are few areas of unused land. This is a prosperous, well cultivated district. Truck farming and dairying are successful because of the proximity to the large market. Mixed farming and the production of sugar beets and soy beans give the region a diversified economy. Building stone, cement, clay and bentonite clay are obtained and processed here.

The Lowlands broaden to the north, and this area immediately north of Winnipeg within the first hour seems to be well settled and well served by roads. To the north east there are many "retarded islands"[2] within the first hour. Drainage here is poor because of clay soils, and there are several patches of unused land. Much of the poorer land is in hay and pasture. Dairying, market gardening and poultry raising are the main agricultural pursuits of the better districts. Much of Manitoba's potato crop is obtained here.

The town of Selkirk, being a terminal point for lake and river boat traffic, attracts and spreads transportation contained within the first hour. Much freight for trading posts and mining communities passes through this town. It is also the centre for the fishing industry on Lake Winnipeg. The marshy lands near the southern lakeshore attract many duck hunters.

Much of this area is only found within the first hour because the recreational centres north and east on Lake Winnipeg attract rapid transportation across these poorly settled districts and isolated patches of unused land.

The area south and west of Winnipeg. Within the second hour the isochrone reaches the border lands of the Lowland area in the south east. This area is poorly drained and stony. Here the regular pattern of the first hour becomes distorted and extends in long tenuous lines where main roads give way to trails. There are many retarded islands as the land becomes swampy and wooded, and so uncultivated and generally uninhabited. Railway speeds are exceeded by the few highways that traverse and encircle this area.

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2 A retarded island is a closed isochrone indicating an area of inaccessibility within the surrounding time limit.

South from Winnipeg, highways and railways paralleling the Red River route bring the town of Emerson, on the International Border, within the second isochrone. This includes the major part of the Red River Valley within two hours from the centre of Winnipeg. This area is well served by roads as it is one of the richest farming districts near Winnipeg. East to west transportation extending along the border also passes through Emerson. To the west, the pattern is broad and inclusive, but to the east it soon reaches the Highland area and becomes irregular.

To the west from Winnipeg the lines advance rapidly along the Assiniboine Valley. The speed of the transcontinental railways exceeds that of the highways as the latter follow the bends of the river. Because of its key location on this valley route, Portage La Prairie is an important transportation centre. All east-west transportation routes pass through this city which serves as the centre for the prosperous well settled diversified farming area, known as the Portage Plains. In addition to the Canadian Pacific and Canadian National main lines, branch lines to northern Manitoba pass through this centre. It is the junction of two main highways and also the headquarters of bus lines operating north to the summer resort of Delta on Lake Manitoba and south to Carmen. This is a major station for transcontinental bus lines and trucking firms.

Although its economy is based largely on agriculture, Portage has many growing industries. Apart from industries connected with farm products of milk and cream, poultry, seeds, honey and stock, there is brick making from local clays, and a research centre for flax fibre products. Portage is only a small competitor for Winnipeg, and depends

on rapid transportation to that centre for the marketing of truck farming produce, dairy products and seed potatoes.

The accessibility of the Portage Plains is emphasized by the isochrones continuing freely along the Assiniboine Valley, but receding rapidly to the south west. Directly south of Portage, the isochrone encircles a sandy, sparsely bushed area. This land is not recommended for agriculture, so there are no settlements and therefore no roads.

The Spruce Woods Forest Reserve interferes with the expanding development of the pattern because it prevents easy transportation to the south. The absence of section roads here results in retarded islands in the general road network.

Continuing west from the Lowland area, the third isochrone encounters the scattered hills that make up the southern extension of the Manitoba Escarpment. These hills are the Pembina, Tiger, and Cypress. Here, the pattern shortens as the land is gently undulating to hilly. Several moraines traverse the western region, forming stony ridges and small hillocks. These are difficult to cultivate and leave many patches of unused land where roads are poor or do not exist at all. The pattern is further disturbed by both the wide, deep depression cut by the Pembina River and the long, narrow lakes running against the general direction of the isochrones. This south west area is crossed by many good highways, but the general tendency of the pattern is shortened by the topographical barriers and broken by several retarded islands. The Pembina Hills attract winter tourists for skiing.

The Brandon area. The pattern continues rapidly along the Assiniboine Valley and reaches the city of Brandon in the third hour.

This city is another focal point for roads and railways. It is located astride two of the province's all weather highways, the Transcontinental, running east and west, and another north and south. There is also trucking service in every direction. To the south the fourth isochrone is deflected by the re-continuation of the escarpment. To the north the isochrone soon reaches the Riding Mountains and again the pattern is disturbed. However, to the west the pattern broadens out again as it soon reaches the open plains.

The city of Brandon is located amidst excellent farming lands and agricultural produce forms the basic economy. Outside the Metropolitan area of Winnipeg it has the greatest concentration of industry in Manitoba. Many highways and branch railway lines radiate from Brandon in order that it might serve both Western Manitoba and the Saskatchewan markets.

The Assiniboine Valley occupies a narrow area between the northern and southern extensions of the dissected escarpment. The isochrone surrounding Brandon soon becomes distorted as it extends from the valley. Much of the land to the south is poor, rolling sand dunes, wind blown from delta material. These areas are devoid of roads, as indicated by retarded islands and a receding pattern. Farms are scattered and roads irregular, and so the framework for the good highways crossing this area is uneven. Farther south, there is considerable tourist attraction among the many lakes. Throughout this southern area, local sand and gravel deposits assist in maintaining good roads.

The Second Prairie Step. Having ascended the escarpment or Second Prairie Step, the isochrones again spread out into the typical

prairie pattern. Here, the well sectioned roads serving the many settled areas of the Souris Plains in south western Manitoba give a solid body to the pattern of transportation. This is a rolling fertile plateau, broken in many places by hills, scattered wood lots, and patches of bouldered land. The fifth line abuts against, and threads through the Turtle Mountains, an isolated highland area rising above the general level of the uplands. Whitewater Lake, with its surrounding marshy lands, does not attract transportation, and therefore deflects the pattern southward. The sixth isochrone spreads out and extends across the Saskatchewan border. Here there is no topographical hindrance other than the Souris River and small tributaries entering to the south.

This is the true prairie of Manitoba, and is well settled and extensively farmed. There are small local seed industries and some small scale lumbering operations in the Turtle Mountains. The International Peace Gardens, owned jointly by Canada and the United States, are located across the mountain, and attract a number of tourists.

The Interlake area. North and north west of Winnipeg, the transportation pattern is controlled by Lake Winnipeg and Lake Manitoba. These large bodies of water penetrate so far to the south that they interfere with the general expansion of the isochrones, and prevent the continuation of the regular pattern immediately surrounding the centre of Winnipeg. There are many irregularities in the road system, especially in the area between the lakes.

The whole of this land lies within the bed of the glacial Lake Agassiz. The soil is boulder till conditioned by the action of lake water and resulting in gravel deposits and stony ridges. There are many scattered pockets of peat. Limestone forms the underlying rock and outcrops in the Gypsumville area. The land is flat, and slopes

slightly toward the north, but not enough to provide sufficient drainage. The resulting swamps explain the several retarded islands in the pattern.

Farther north the section roads become fewer because much of the land is used for large, open expanses of pasture. Much of the land is not settled at all, and there are many irregularities in the isochrones which tend to outline the settled areas along the railways. Most of the cross-country roads are third and fourth class. Many areas are isolated because of poor summer roads.

A regular pattern follows a good network of roads along the gravel ridge to Gimli. Several deposits of gravel are found throughout this area, facilitating the upkeep of roads. During the summer navigation season, Gimli is an important lake port for fishing fleets. Aside from being the centre for inland fisheries on Lake Winnipeg, it is the district centre for the surrounding mixed farming lands. Gimli's location on the lake provides natural facilities for popular summer resorts. Many hunters are attracted here during the duck hunting season.

West along the eastern shores of Lake Manitoba the pattern broadens to include the routes to St. Laurent and Gypsumville. There are few summer cabins along the lakeshore, but many fishing camps, so there is a fair network of roads extending from the highway to the lake. Settlers are mainly concerned with stock raising and side roads to the east are not frequent. Small farms tend to locate close to the highway leading to Gypsumville. Here beds of gypsum outcrop near Lake St. Martin, and are quarried. Gypsumville is connected by rail to Winnipeg where the product is processed. This small town is a centre for surrounding pioneer farms and fishing camps. The pattern widens here to include the canoe routes on Lake St. Martin, following the Dauphin River to Lake Winnipeg.

The isochrones close in shortly beyond Gypsumville, which is the end of road and rail. Farther to the north the land requires drainage before it can be settled. The remaining pattern is fairly consistent as there are few rivers in the country immediately north of Gypsumville.

Between the routes to Gypsumville and Gimli there is much abandoned land. Poor roads, inadequate drainage, stones, gravelly soil and shallow surface soil are responsible for the absence of dense settlement.

Farther north, towards Fisher Bay, the land continues to be level and poorly drained. The surface soil is thin and there are many retarded islands caused by marshes and hay meadows. The chief economy here is ranching. Riverton is situated on the highway directly north of Gimli. North of this settlement there is a small area that is relatively free from swamp and here farming land, with third class section roads, opens up the pattern for a short distance before the land again becomes swampy and the isochrones follow the one road north and east to the lake. The wide pattern collapses to narrow zones indicating the absence of roads.

The area west of the lakes. North west of Winnipeg the second isochrone flattens out in the marshes at the southern end of Lake Manitoba. This land crossed in the second hour is undulating and lightly wooded. North west up to the fourth isochrone the pattern is well filled with third class section roads. But north the drainage becomes poor and there are scattered marshes resulting in retarded islands, indicating unused land. Here drainage is necessary before the land can be cropped. Along the lake in the area of the Big Grass Marsh there are

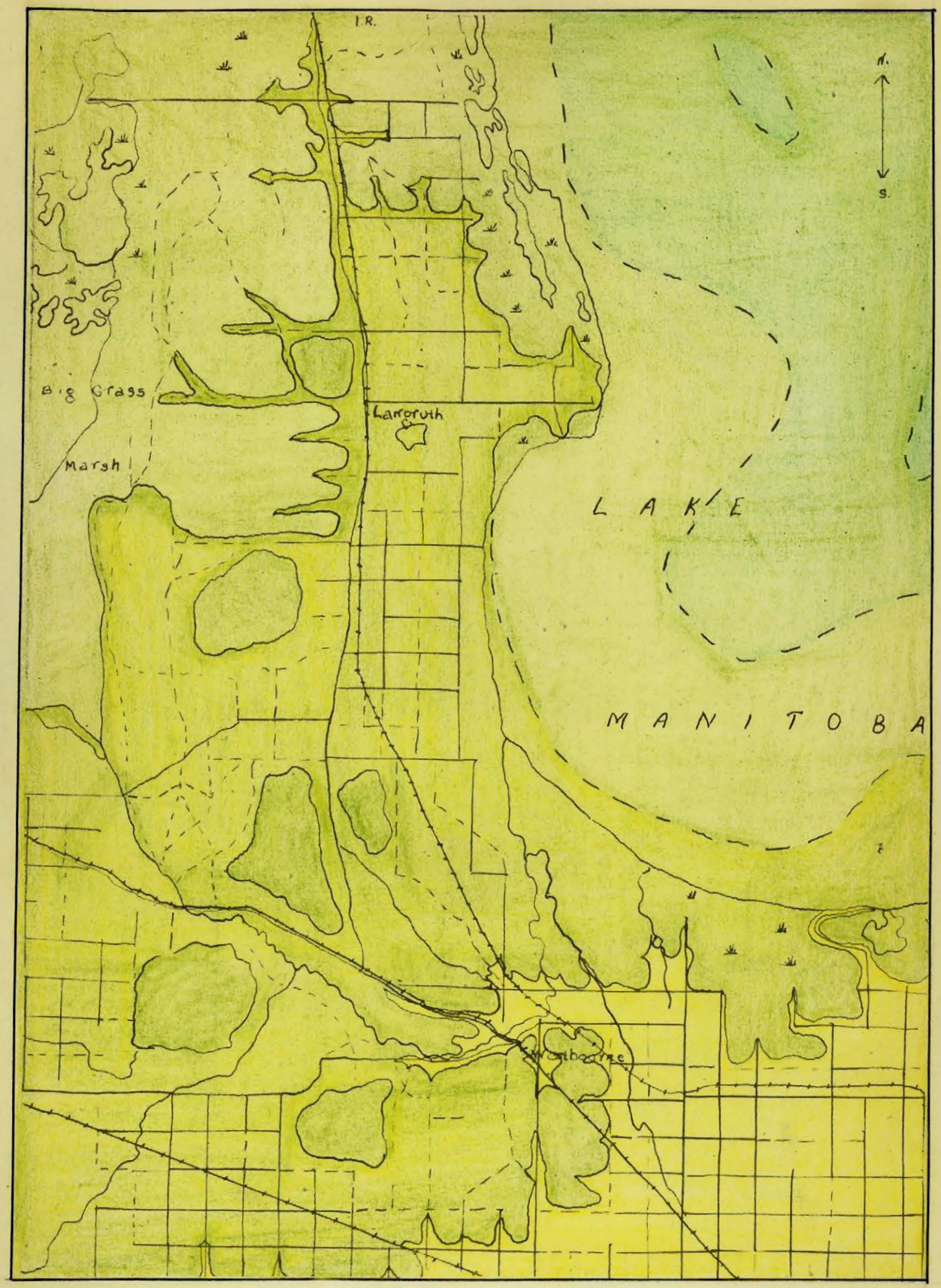

Fig. 2.

few roads. The land is marshy and wooded, and the pattern becomes irregular (Fig. 2.)

West of the lake there is a series of ridges and depressions running roughly parallel to Lake Manitoba. The topography in the area situated between the lake and the height of land varies from the present beach through level, gently rising plain to the ridges. These undulations are the main features of the landscape up to the Big Grass Marsh, ten miles west of Lake Manitoba. Beyond the marsh the land rises gradually to the Riding Mountains. The isochronic intervals shorten against the steeper slopes because there are few roads into the mountain. The ridges, running parallel to the lake, influence the drainage of the area between the mountains and the lake. There is no drainage eastward from the mountains. This results in ponding, which causes depressions of peat and swamp. Few third class roads cross these depressions, and the width of the pattern is decreased. Retarded islands encircle the larger expanses of ranching land in the country beyond the marshes.

The prevalence of gravel ridges throughout this country accounts for the good network of roads even in some of the marshy lands to the north. These gravel ridges are found extensively in the subsoil. Good trucking service is maintained throughout all of this area, which is specialized in mixed farming and dairying. Farming is reasonably prosperous here, but occasionally the abundance of gravel and stones makes the cost of land clearing prohibitive. A productive industry in this area is the salt from Neepawa. This salt is derived from the saline solution in the Devonian strata underlying the town.

Directly west of Winnipeg the isochrone follows the Assiniboine Valley straight through to the Saskatchewan border. The even pattern is broken only when it crosses the Assiniboine River and the

Minnedosa River, which cross at right angles to the pattern just west of Brandon (Fig. 3.). The land rises gradually to the Second Step. This country is well wooded and has an abundance of water and is therefore well settled. These conditions result in a well developed pattern expanding as it reaches the more level lands in Saskatchewan.

As the Assiniboine River swings north and west, the lands over which it crosses become more wooded. Roads decrease, especially on the Indian Reserves and on the gradual slopes of the Riding Mountains. This area of higher slope favours the growth of coarser grains, like oats and barley. With the natural advantages of pasture and shelter in the wooded hills, and water in the many streams, this area tends to specialize in livestock. Therefore there is much open land and the isochronic pattern is uneven. It is also disturbed in many places by the presence of sloughs which are often used for the production of wild hay.

The Mountain Area. The pattern widens south along the Riding Mountains, where there is a strip of prosperous, mixed farming land running east from Rossburn to Sandy Lake. Second and third class roads linking these settlements are well developed. But north the isochrones crowd against the heavily wooded slopes of non-farming lands. Retarded islands indicate the lack of north-south transportation, which is deflected east and west around the mountain. The isochrones penetrate the southern part of the mountain, as there is rapid transportation from Brandon to Clear Lake, the largest summer resort in Manitoba.

There are two summer roads across the mountain connecting settlements on the north side with the summer resort on the south. A narrow isochrone follows these roads and splits the pattern into a series of retarded islands on either side.

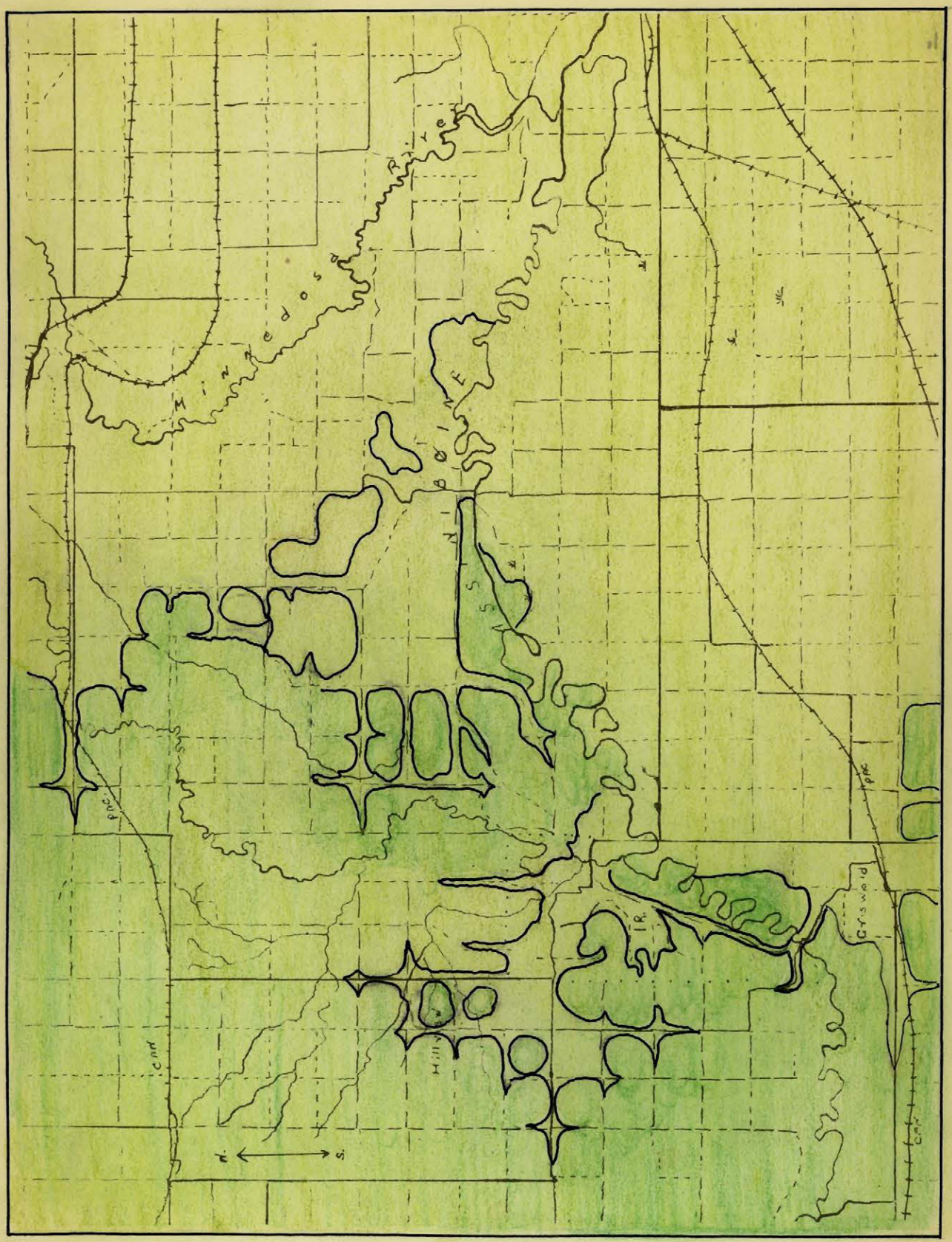

Fig. 3.

The pattern, compressed between the lake on the east and the mountains on the west, expands briefly to include the district of Dauphin. The town of Dauphin is situated in the lowland between the Riding Mountain to the south and the Duck Mountain to the north. This is the centre of a rich diversified farming area and a focal point for transportation routes in all directions.

To the west the lines extend along the depression of the Valley River. Rolling lands, many streams and much bush result in settlement fringing the highway, except on the Gilbert Plains where the pattern spreads more closely to the northern side of the Riding Mountain. North, into the Duck Mountain, the land is in forage crops and an irregular pattern outlines the scattered settlements.

North of Dauphin the pattern clings to the main road following the side of the mountain and avoiding the marshy lands along Lake Winnipegosis. The isochrones are compressed along the mountain, and do not extend to either side as settlement is close to the main road. Lands along the Forest Reserve in the Duck Mountain are heavily bushed and hilly. Here, a few settlers reside tax-free to compensate for not enjoying the privilege of improved roads to their farms or ranches.

A few lumber roads carry a wide extension of the pattern into the mountain. The pattern is wide because the speed on these roads is very slow. There is one second class road into the mountain, and it is outlined by a narrow isochrone. This road leads to the summer camps at Singuish Lake.

To the west the pattern extends out to the Second Prairie Step and becomes more regular. To the east the regularity soon loses itself in the marshes of the lake.

The Manitoba Escarpment, in the latitude of 52 degrees north, continues across the border between Saskatchewan and Manitoba. North, the Escarpment reappears in the Porcupine Hills and continues straight north. The valleys of the Swan and Big Woody Rivers lie in the gap of the Escarpment. The lowland is quite narrow being no more than twelve miles wide. Here the pattern broadens again to include the fertile farming lands of the valley.

The town of Swan River, situated in the midst of this farming area, is an important focal point for routes north from Le Pas, south from Winnipeg and west and south around the Duck Mountain from Saskatchewan.

This service centre contains many industries based on agricultural products and timber from the surrounding forest reserves. East from Swan River the drainage channels are not sufficiently developed and the lands become swampy. Roads discontinue and the pattern collapses to irregular lines with narrow intervals.

North, the isochrones advance rapidly towards the Shield. The transition is apparent by the different uses of resources. Absence of surveyed lands indicate areas of thin, poorly drained soil. Settlements only occur at railway sidings. There is an isochronic crossroad pattern surrounding Hudson Bay Junction just across the provincial border. Railways radiate in four directions from this station. To the east the isochrones advance in even intervals across the marshy lands towards Lake Winnipegosis. They quicken along the Red Deer and Overflowing Rivers. On the mountains the pattern continues in a series of concentric circles indicating a lack of roads from all sides.

Farther to the north the isochrones follow the only two lines of transportation, the railway and the highway. There is no further settlement until the Le Pas area is reached.

The Shield. Le Pas is situated amidst the marshy lands on the south side of the Saskatchewan River. This city is a natural centre for the varied economic pursuits of northern Manitoba; controlled fur trapping in the Summerberry Marshes, located a few miles south east of the city; fishing in the large lakes to the west and north; pulp and lumbering operations supplied by the large stands of spruce and jackpine; mixed farming in the deep silt deposits in the Carrot River Valley just south west of the city; hunting and canoeing for tourists, and wholesale trade to supply the mining industries to the north. These mines are located at Flin Flon, Sherridon, Snow Lake and Lynn Lake. All transportation routes pass through Le Pas; canoe routes, winter roads, one highway and two railways. Le Pas is also a centre for Canadian Pacific Airlines.

The highway and railway extend north into the Shield. The pattern widens at intervals to follow water routes. An isolated cluster of isochrones encircle the town of Flin Flon, and radiates a short distance to the twentieth hour. The final line crosses into Saskatchewan but does not meet with any transportation routes from the south. The resources of this area are copper, zinc, gold, cadmium and tellurium. Flin Flon is essentially a mining town and local roads lead only to surrounding deposits and connected settlements. The second class highway extending into Saskatchewan leads to a local summer resort on Amisk Lake.

A final cluster of isochrones surrounds the mining settlement of Sherridon, which is just included in the twentieth hour. The res-

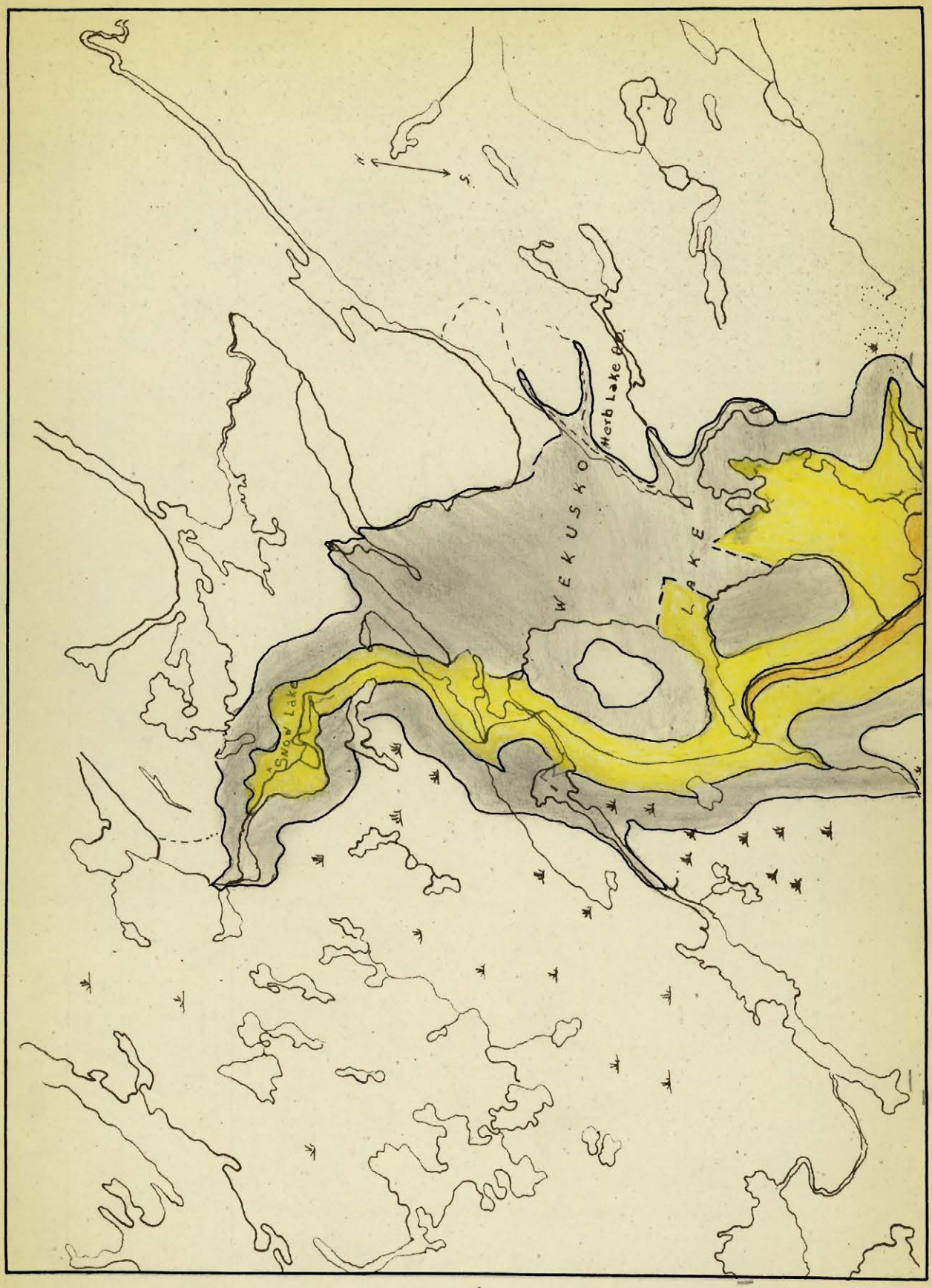

Fig. 4.

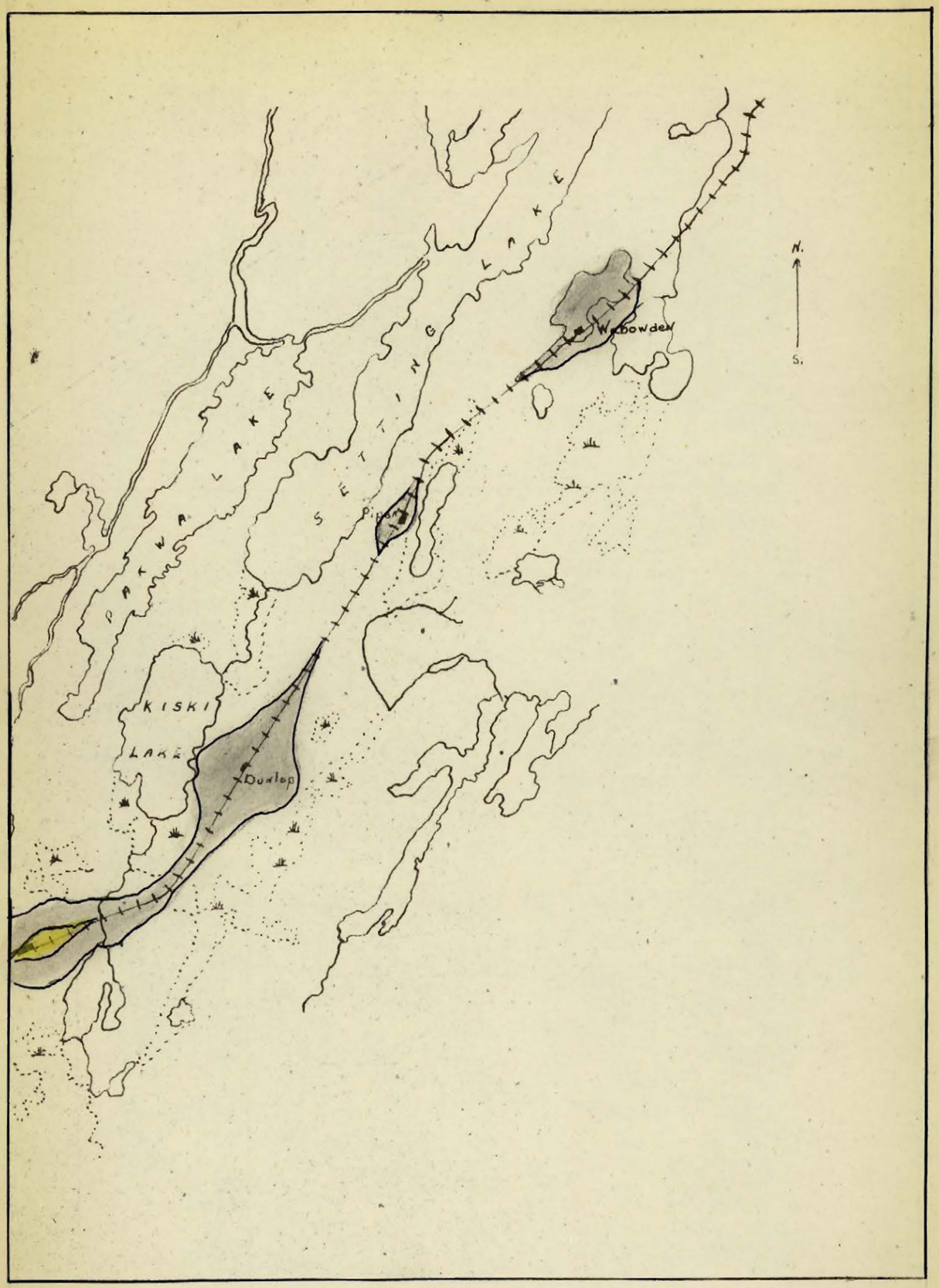

Fig. 5.

-ources of this area are copper, zinc and gold. The pattern widens to include the settlement of Kississing, a mile west of Sherridon. This village is the centre of local fishing and trapping.

All along the Hudson Bay Railway to the north and east of Le Pas the pattern adjusts to the Shield settlements. The isochrones collapse, widening only at stations or where water routes or the occasional road occurs.

At Mile 82. on the Hudson Bay Railway the pattern advances rapidly to the north, and clusters around the settlements of Snow Lake and Herb Lake. This extension is possible within the final limits of a few hours because there is a second class highway from the steel to the town of Snow Lake. The long, narrow Wekusko Lake widens out the pattern somewhat before the twentieth hour is reached. (Fig. 4.) Herb Lake, or Wekusko Lake, is a ghost mining village now existing for local trapping and fishing. It is now connected with Snow Lake, a new gold mining centre that is well advanced, and has now reached production stage.

This northern extension of the pattern ends with the twentieth isochrone, forming a progressive island around the station of Wabowden, Mile 136. on the Hudson Bay Railway (Fig. 5.). This final island is larger than the previous one at Pipun. This is explained by the lake on the north side of the town site of Wabowden. There are pockets of silt occurring along the railway from Cormorant to beyond Wabowden. There are small surveys but no roads. The pattern along the steel is relatively even, but there are some irregularities due to the prevalence of large patches of muskeg (Fig. 6.).

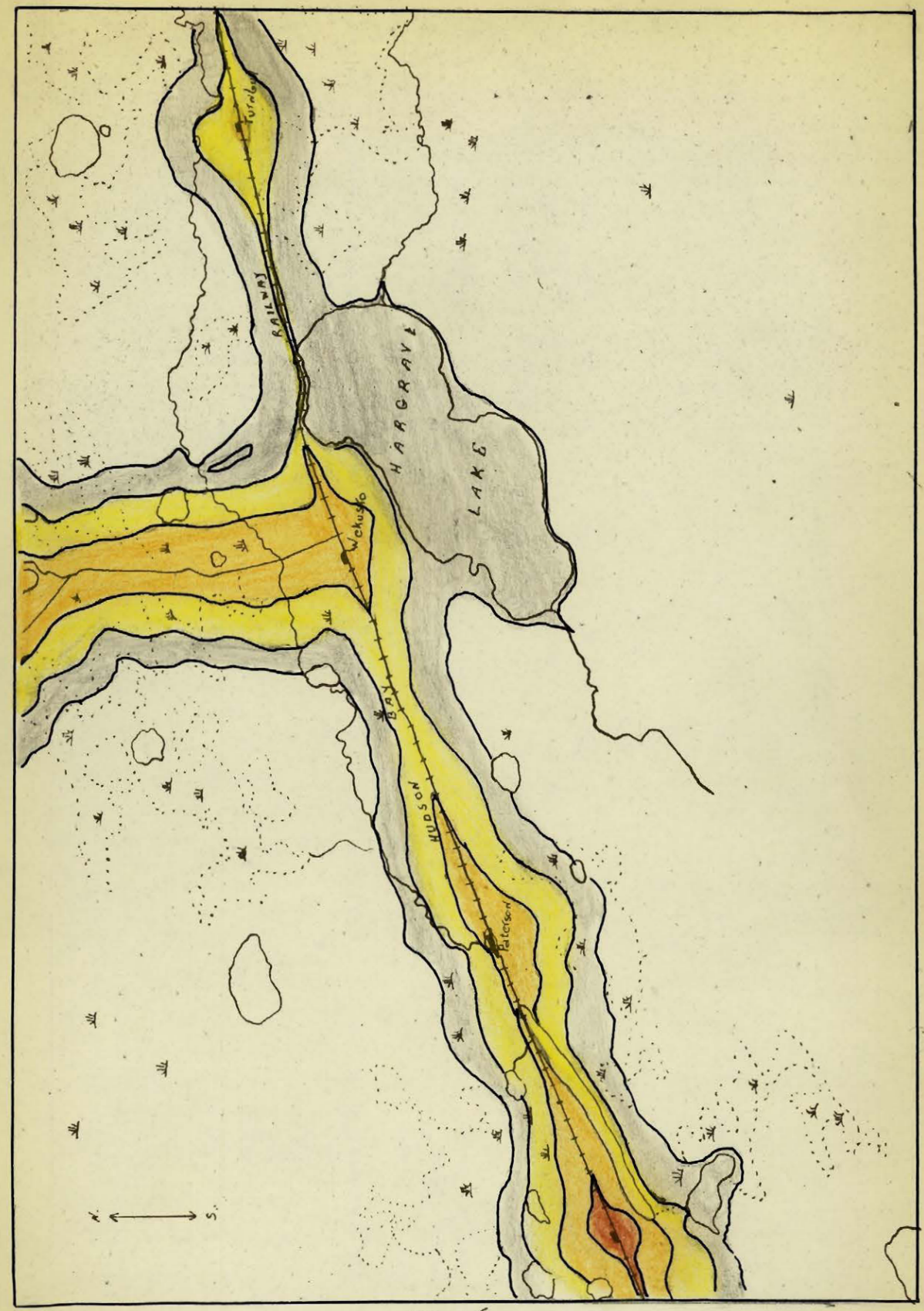
Turnbull
Fabyan
HARGRAVE
LAKE
Wekusko
Bay
HUDSON
Paterson
N
S

Fig. 6.

The Highland area. East from Winnipeg the first isochrone extends swiftly along the Canadian National Railway. The pattern soon loses regularity upon reaching the eastern border of the Red River Valley. Farming land becomes less as the land becomes more wooded and swampy. South east the second isochrone extends along the branch of the Canadian National Railway to Fort Francis. It recedes to encircle an area of unused land, and broadens to outline the occasional farming lands along the highway and railway.

East and south east of Winnipeg the expanding pattern is upset by the Highland area. This highland is a glacial drift plateau rising some 500 feet above the lowest part of the Red River Valley and characterised by wooded, sandy ridges with low swamp and bog. There are granite outcrops nearer the Laurentian Plateau toward the Lake of the Woods. This is an unsettled area, as is apparent by the lack of any system of roads. (Fig. 7)

The Greater Winnipeg Water District Railway crosses this swampy unsettled area and transportation proceeds in all directions from the isolated sidings. From these points, indirect connection is made with surrounding routes, or the travelling time is absorbed in the crossing of swamps and woods. The drainage is shallow and the roads throughout the Sandilands Forest Reserve are mere trails leading generally to the Lake of the Woods. Towards the International border, settlements following the railway enlarge the width of the isochronic intervals, but roads leading from these settlements are poor and infrequent, so the expansion to the north is irregular.


CAR.
NAT.
Marchand
N.
S.
Sandilands
Woodridge
NATIONAL
RAILWAYS
CANADIAN

Fig. 7.

The area north and east of Winnipeg. North east of Winnipeg the second isochrone encircles patches of swampy land and advances more rapidly than to the south east. Transportation to the recreation centres of Grand Beach and Victoria Beach on the south eastern shores of Lake Winnipeg is responsible for the greater speed in this direction. Between the railway to these points and the highway which follows the Winnipeg River north to Port Alexander, there is a large area of swampy, sparsely settled land enclosed by a series of retarded islands.

Across the Winnipeg River there are no roads except winter roads on which a walking speed is taken. Therefore, the isochrones follow the eastern shores of Lake Winnipeg and ascend the rivers in the same time as they advance across country. In the mining area of San Antonio, north east of Winnipeg, there are short roads along or between water routes leading to the mine centre. These roads alter the usual isochronic pattern of isolated settlements on the Shield.

To the east the isochrones advance rapidly to the power sites along the Winnipeg River. The close pattern of the Shield is broadened somewhat to include local roads to various river points and the Power Plant Railway to Pointe Du Bois on the Winnipeg River. The pattern enlarges at Bird River on the eastern end of Lac Du Bonnet where there are a few scattered settlements. South, there are isolated roads throughout the Whiteshell Forest Reserve. These roads increase the pattern surrounding Whitemouth and Rennie on the main transcontinental route to the east.

North east from Lac Du Bonnet the isochrones fan out, following the principal canoe routes and falling back to the overland travel on the hummocky, boggy Laurentian surface. This country is prospected

extensively and well worked for lumber, pulp and fuel. The Indians, living on reserves throughout the area, fish and trap in their local districts.

The absence of farming lands mark the rapid advance into the Shield. The soils are thin, and in many places granite and gneiss appear at the surface. There are many low hills and shallow depressions, innumerable lakes and patches of muskeg. The drainage is young, and therefore unsystematic and water transportation is hindered by rapids and waterfalls on the rivers. The lakes are variable in outline, and contain many rocky islands and reefs. Examples are Lake Nipigon and the Lake of the Woods. Some lakes are circular bodies of water, viz., Lake Nipigon and Trout Lake, while others are long, narrow extensions, viz., Lac Seul, north of Sioux Lookout and Long Lac, east of Nipigon.

Throughout this country are many small clusters of settlement. Some are only small progressive islands along the railways, and others are larger formations within the close isochronic pattern of the Shield. These larger clusters are mining centres, small agricultural districts, tourist resorts and locations of industry. Examples of these follow respectively: Red Lake, Dryden, Kenora and Fort Francis. The size of these isochronic clusters is determined by local roads fanning out for short distances, and by the presence of canoe routes on adjacent bodies of water. An example of this latter location is the mining centre of Red Lake situated on the lake of the same name.

The Kenora area. The pattern broadens at Kenora because here there are many small deposits of silt that are farmed on a small scale. Kenora is essentially a tourist centre because of the large Lake of the

Woods to the south and the highway connection to the United States through both Rainy River and Fort Francis. There are flour mills, paper mills and hydro-electric plants located here. Northern mining areas are served by air transport from this centre. Kenora is connected by road to Redditt on the Canadian National Railway to the north.

The Rainy Lake area. The fifth isochrone forks on the eastern end of the Lake of the Woods and turns south, following the highway in a sinuous outline to the International border at Rainy Lake. The pattern widens to include the mixed farming areas surrounding the centres of Rainy River and Fort Francis. A branch of the Canadian National Railway re-enters Canada at Rainy River and assists in widening the pattern of settlement along the border. There are several fourth class section roads here, but they discontinue a short distance from the railway, and in no place are they very regular as there are swampy patches interspersed through the farming land. A pulp and paper mill is located at Fort Francis. This town is situated on Rainy Lake and is therefore covered by a larger isochronic interval.

The pattern continues to the east from Fort Francis, following the railway to Fort William. Many progressive islands indicate that there are no roads and transportation radiates from the railway either by foot or canoe. Isochronic intervals increase whenever the railway crosses large bodies of water. There is a small cluster surrounding the town of Atikokan because a short road extends north to the iron ore at Steep Rock Lake. Throughout this area the pattern adjusts to the north east - south west trend of the hydrography as canoe routes take the place of roads. The small station, Kashabowie, on the Canadian

National Railway from Fort Francis to Fort William, may be reached as quickly by northern routes. Therefore isochrones meet here. Fourth class roads to isolated mines in the south west also tend to broaden the pattern at this point.

The Dryden and Sioux Lookout areas. The fifth isochrone continues east from Kenora. It threads through many small lakes and reaches Vermillion Bay on Eagle Lake in the sixth hour. Here is another isochronic cluster surrounding an isolated pocket of clay, a mixed farming area containing small settlements. Many routes of transport pass through this settled area. To the north, a second class road leads to Goldpines; it forks on the left to the gold mines at Red Lake and to the right the road continues to a Hudson Bay post on Woman Lake, and discontinues at the Jason gold mines on Casummit Lake. The size of the patterns surrounding these mining centres is determined by the respective lakes on which they are situated. Woman Lake is a long, narrow lake extending in the same direction as the road and so does not increase the lateral width of the pattern.

South east from Gold pines, Lac Seul carries a broad canoe route. A water route running north east to south west from Sioux Lookout to Fort Francis crosses the town of Dinorwice situated on the Transcontinental Highway south east of Dryden. A highway from Sioux Lookout joins the main route at Dinorwice, making this small town an important point of intersection. Throughout this area are several fourth class roads leading to and connecting small mining camps, lookout towers and rangers' cabins. These increase the width of the pattern extending to the southwest. There are numerous Indian Reserves located on the navigable water routes.

Another small cluster surrounds Sioux Lookout, a railway town situated astride four routes of travel. The Canadian National Railway passes through the town and a branch line extends south east to Fort William. North west and south west are canoe routes, already discussed. Sioux Lookout is the centre of an important lumbering and mining area. It contains both government and private airways, serving northern camps.

The Fort William-Port Arthur area. The Transcontinental Highway, the main line of the Canadian Pacific, branch lines of the Canadian National from Sioux Lookout and Fort Francis all converge at Fort William-Port Arthur, situated at the head of the Great Lakes system. For the greater distance these four routes advance as three patterns. Toward Lake Superior the speed on the highway is greater and the isochrones outlining this route recurve to meet the slower route from Fort Francis. These lines join at the small station, Kashabowie. Fourth class roads and many lakes widen the pattern between these converging routes.

A wide pattern surrounds Fort William and Port Arthur. This is a transportation centre for transcontinental traffic and the lake terminus for main and local lines. Fort William-Port Arthur is the largest inland grain shipping port in the world. It is also an important distributing centre for iron ore and lumber. To the east and north east the isochronic pattern is widened by Lake Superior because at this point the shore is low and flat. To the south, the highway branches down into the state of Minnesota. Several third class roads lead to nearby ore deposits and to small fishing settlements on Whitefish and Arrow Lakes, south east of Fort William. These roads increase the isochronic intervals as there is little farming land. The soil is thin and not suited to the growing of crops other than potatoes and berries.

The Lake Nipigon area. A third class road runs along the west side of Lake Nipigon almost meeting another from the north. Connection with north and south patterns is made across the lake, but there is a large space to the west where isochrones do not meet within twenty hours.

All three transcontinental routes pass north east through Loon Lake, about 30 miles north east of Fort William. Loon Lake is a summer resort and Red Rock a few miles further on is an important pulp and paper centre. The town of Nipigon, aside from being a tourist area, is the junction for the two railways; the Canadian National continuing north and east, and the Canadian Pacific branching south east along the lakeshore. From this junction these routes continue as separate patterns. The highway follows the Canadian National. A short highway branches north to a dam site on the Nipigon River. The watershed passes some fifteen miles north of Lake Nipigon and so Nipigon River is the outlet for the lake draining to the south. This river is used for driving logs down to Lake Superior for local use and for the United States. There is a network of local roads and transportation is continued across the lake, so the pattern is quite wide at this point.

East of the lake the pattern widens at intervals, outlining local roads to mining camps and following lakes and rivers crossed by the highway and Canadian National Railway.

The area between Redditt and Hearst. There are many railway stations along the main line of the Canadian National Railway from Redditt, north of Kenora, to Hearst, in the western edge of the Clay Belt. There is little organized settlement and the pattern does not extend

far to the north of the railway. Armstrong is the only town of any size between Sioux Lookout and Nakina. All other train stops are small sidings. These serve as fishing centres or contain small subsistence farms, but only contain five or six families. Many sidings exist only for maintenance men. There are a few airports and emergency landing fields along this route.

Since there is no other means of transportation but by train, the isochrones proceed in a series of progressive islands along this northern route. These islands appear at every train stop, and the remaining isochrones continue in every direction from them.

At Nakina a branch line of the Canadian National Railway swings south to join the main line at Long Lac. Another line continues east from Nakina across the Clay Belt and joins with the Northern Transcontinental from Quebec.

The area north of Lake Superior. Long Lac, a pulp and paper centre, is a divisional point for routes north to Nakina, west to Fort William, and for points east. The isochronic intervals are wide at this point because of local roads connecting the towns of Long Lac and Geraldon with nearby mining and lumbering camps. The long, narrow lake crossing the main routes increases the pattern for a short distance only because the isochrones are now thinning out to the twentieth hour.

East of Long Lac the isochrones separate into two patterns. The highway continues north and is joined by the branch line of the Canadian National Railway from Nakina so the pattern is somewhat broader here, but thins out toward the town of Hearst on the edge of the Clay Belt. At the small town, Opasatika, the twentieth isochrone from the west joins with the same isochrone from the east. This point is reached in approximately nineteen and one half hours.

The Canadian National Railway turns south east a short distance east of Long Lac. A separate pattern outlines this route to the small siding, Dishnish. The arrival at this point is indicated by a progressive island enclosed by the nineteenth isochrone. At this point, nineteen hours from Winnipeg, the same island is reached by the westbound train from Montreal.

A third pattern follows the Canadian Pacific Railway south east from Nipigon along the lakeshore. The isochronic intervals widen over the north shore of Lake Superior and extend almost to the International boundary. The shore is precipitous and winding, and there are numerous rocky islands a few miles out, but the pattern evens across the water. There are a number of pulp and paper operations along the shore, many logs being floated down the larger rivers. Much prospecting is done in this country north of Lake Superior.

The Canadian Pacific eastbound train reaches the dam on Esnagi Lake, between the stations Craselt and Franz, in eighteen and one half hours. In enclosing this point, the nineteenth isochrone connects both western and eastern patterns.

CHAPTER ONE

THE DEFINITION OF AN ISOCHRONE AND THE PURPOSE OF THE STUDY

The definition. An isochrone is a line connecting all the points equally distant in time from a given centre. (Gr. isos equal + chronos time)

The purpose of the study. The purpose of this isochronic study is to determine the patterns of relative accessibility centred on the two cities of Winnipeg and Montreal. This pattern is calculated with reference to the natural conditions, communications, and human geography of the areas concerned.

The significance of the study. From a study of this nature various human geographical considerations are derived that are useful for regional planning, military geography, and historical geography. Isochronic lines indicate topographic control and economic influence. They describe zones of influence and illustrate patterns of transportation and settlement. From an isochronic pattern it is possible to determine the character of an area; whether it is well settled, sparsely settled, isolated and poorly served, or an area of unused land.

It is possible to undertake several types of isochronic studies. The maps must be based on surveys of areas covered by specified time intervals progressing in all directions from a given centre. Other examples are maps showing the speed of mail and freight deliveries. The speed of any type of transportation or movement from a given point may be the subject of an isochronic study. These studies may include the spread of insects, rodents, and diseases, or of earthquake vibrations. The isochrones must indicate the rate of speed, but they may represent hours, years or seconds.

In all cases the work is purely theoretical, based on a formula or set of rules. The result is an analysis determined by the formula, the practical value being the proven point.

Review of the literature. There have been few isochronic studies made on areas in North America. Such studies were more frequent in Europe prior to 1940. A brief list of these works is given.

Author	Title	Published
	Isochrones showing the increasing speed of travel from New York City during the period 1800-1930 (in Atlas of Historical Geography of the United States)	Carnegie Institute of Washington and American Geographical Society of New York, 1932.
S. Lencewicz	Isochrones of Katowice	Warsaw, Poland, 1937.
W. Kubijowicz	Isochrones of Cracow and Lwow	Cracow, 1921.
	Isochrones of Kiev (in Atlas of the Ukraine)	1930
	Isochrones of Berlin (in Zeitschrift der Gesellschaft fur Erdkunde zu Berlin)	1920
S. Reich	Isochrones of Mail (unpublished Master's thesis, University of Warsaw, 1939)	
G. Phillip & T. Sheldrake	Distance in time from London by Rail and Steamer (in Chamber of Commerce Atlas)	London Geographic Institute, London, 1925.

CHAPTER TWO

THE SET OF RULES ACCEPTED AND THE SOURCE OF DATA

The isochrones on the map represent intervals of one hour. They are calculated from a set of arbitrary rules covering all conditions throughout the area studied. These rules follow.

The procedure. It is assumed that unlimited numbers of travellers are departing at the same time and are proceeding in all possible directions from the two centres of Winnipeg and Montreal. Four methods of transportation are possible. At any time where the speed can be increased or where one method ends and another begins, they are readily interchanged, providing it is reasonable to suppose that facilities are available. The intent of all travellers is to reach their certain destination by the quickest existing means of ground transportation.

The travelling facilities are these: by all trains departing from the two centres, by automobile, by motor equipped boats or canoes and by foot.

The speeds accepted. Controlled speeds are accepted only on the railways and the schedules on branch lines are not considered. The class and condition of all roads determine the speed of the automobiles. On all paved, oiled, and well gravelled roads considered as first class trunk highways, an average speed of thirty-five miles per hour is accepted; on gravelled, but narrower roads, considered second class, an average speed of thirty miles per hour; well travelled regional roads, twenty-five miles per hour; slightly travelled regional roads, fifteen miles per hour; wagon roads and winter roads, four miles per hour.

On short connecting tracks, local locomotives have an average speed of ten miles per hour.

On all water routes the average speed accepted is five miles per hour. Full portages between routes are made at one mile per hour. If the traveller walks free handed between routes, then the speed is four miles per hour. The time required to take a ferry across a small river is fifteen minutes. Across larger bodies of water the speed is six miles per hour.

Walking on a road or trail the average speed is four miles per hour; across an open field, two miles per hour; through wooded country one and one-half miles per hour, and over heavily forested land or swampy country, one mile per hour.

An average speed of fifteen miles per hour is taken within all city limits to account for the time lost in traffic lights, railway crossings and school zones. Also, this speed is observed while passing through towns and small settlements.

Additional rules. It is assumed that there are automobiles available in every habited area where roads exist. Therefore, the travellers may leave the train at any station and continue by road if they will gain speed in this way.

In changing to a water route, it is assumed that travellers carry their equipment with them, unless they are departing from a habited area, or from where there is at least an indication of a cabin, power site, or logging headquarters. Here, there would be boats available.

The crossing of rivers, streams, lakes, and other natural obstructions to pedestrians is avoided when it is possible to make a short detour.

Where not possible, the speed is calculated with reference to the terrain involved.

The extent of the pattern. To the north of both centres and covering the area between them, the isochrones are plotted till the twentieth hour is reached. This is within the time required for the lines east of Winnipeg to meet those west from Montreal. To the west of Winnipeg and to the east of Montreal the pattern is continued up to the fifth and sixth hours.

With one exception all isochrones discontinue at the International border. The Canadian National Railway crosses the border between the province of Manitoba and the state of Minnesota and re-enters Canada at the town of Rainy Lake in the province of Ontario. The isochrones follow this section of the railway and cover the territory included. Ontario Penninsula is not included in this study and the pattern discontinues south of Toronto.

Materials used and the source of data. Where possible the isochrones are plotted on topographic sheets on the scale four miles to the inch. A small section in the west is covered by sheets on the scale three miles to the inch, and the remainder on sheets on the scale, eight miles to the inch. These topographic sheets are now reduced to the scale of twelve miles to the inch.

The classes and conditions of roads are determined from the topographic sheets and from the latest provincial road maps. The speed of the trains is calculated from their respective time tables. Bus schedules are used to check motor speeds wherever possible. It is assumed that trains stop only at stations indicated in the time tables and that passengers leave the trains and proceed from these stations.

CHAPTER THREE

THE REGIONAL EXPLANATION FROM WINNIPEG

The general pattern. The pattern of the isochrones radiating from the centre of Winnipeg is partly controlled by the topography of surrounding areas. These do not form a continuous prairie. There are wide variations in altitude and land surface. The Laurentian Plateau covers the northern and eastern area and continues south east from the southern tip of Lake Winnipeg. Between the height of land in the south east and the Riding Mountains in the north west lie the broad plain of the Red River Valley and the plateau of the Second Prairie Step.

In adjusting to this landscape the isochronic lines indicate these variations in topography. The pattern is full and even in the lowland area but the rise of the Second Prairie Step cramps and shortens the preceding lines. The Mountain area in the north west deflects and scatters the outline, while the Highland area in the south east causes considerable irregularity to the wide form in the Red River Valley. When the isochrones penetrate the Shield, where there is little or no organized farmland and few roads or railways, there is no pattern, only a continuous irregularity. Here the core of the isochrones consists of a long, narrow line or a series of "progressive islands"[1] from which the remaining lines extend, following the trend of the hydrography, and adjusting to the terrain.

Despite these variations in the land surface, the isochrones immediately surrounding the centre and to the north west and south west follow a similar star pattern with the points of the star extending along the main trunk highways and transcontinental railways. The regularity of this pattern discontinues rapidly to the east.

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1 A progressive island is a closed isochrone indicating a greater speed along a chosen route. They are found only enclosing the area surrounding railway stations or sidings where the train stops.

The system of land division in any area is responsible for the basic isochronic outline. In the west the system produces a broad pattern (Fig. 1). The original township surveys were begun about the year 1883 when the land was being developed by the railway companies. The land is divided into townships, each containing thirty-six sections. Each section is one mile square. These sections each contain six hundred and forty acres, and in many cases are halved and quartered. Local earth roads enclose these sections in the well settled areas of good farming land. In poorer districts the road allowance is often a fourth class road, and in areas of unused land, a footpath. The main lines of transportation often cut across these local roads, but this grid system provides a broad framework for these trunk highways, and results in a wide, full pattern.

The complete pattern is composed of the many diversifications in individual areas. Local topography, economic development, patches of unused land, and the system of land division all control the formation of the many facets of the isochronic design.

The first hour. The Metropolitan area of Winnipeg surrounds the confluence of the Red and Assiniboine Rivers, 60 miles north of the International border, and 40 miles south of Lake Winnipeg. Rail and road routes converge on this narrow area, which is located almost midway between the ports of the Pacific and the Atlantic Oceans. Consequently, Winnipeg is a focal point for all roads and railways crossing the Dominion.

For the purpose of this study the centre of the city is taken from the financial district at Portage Avenue and Main Street. Situated on a broad flat plain, the city has no topographical obstruct-

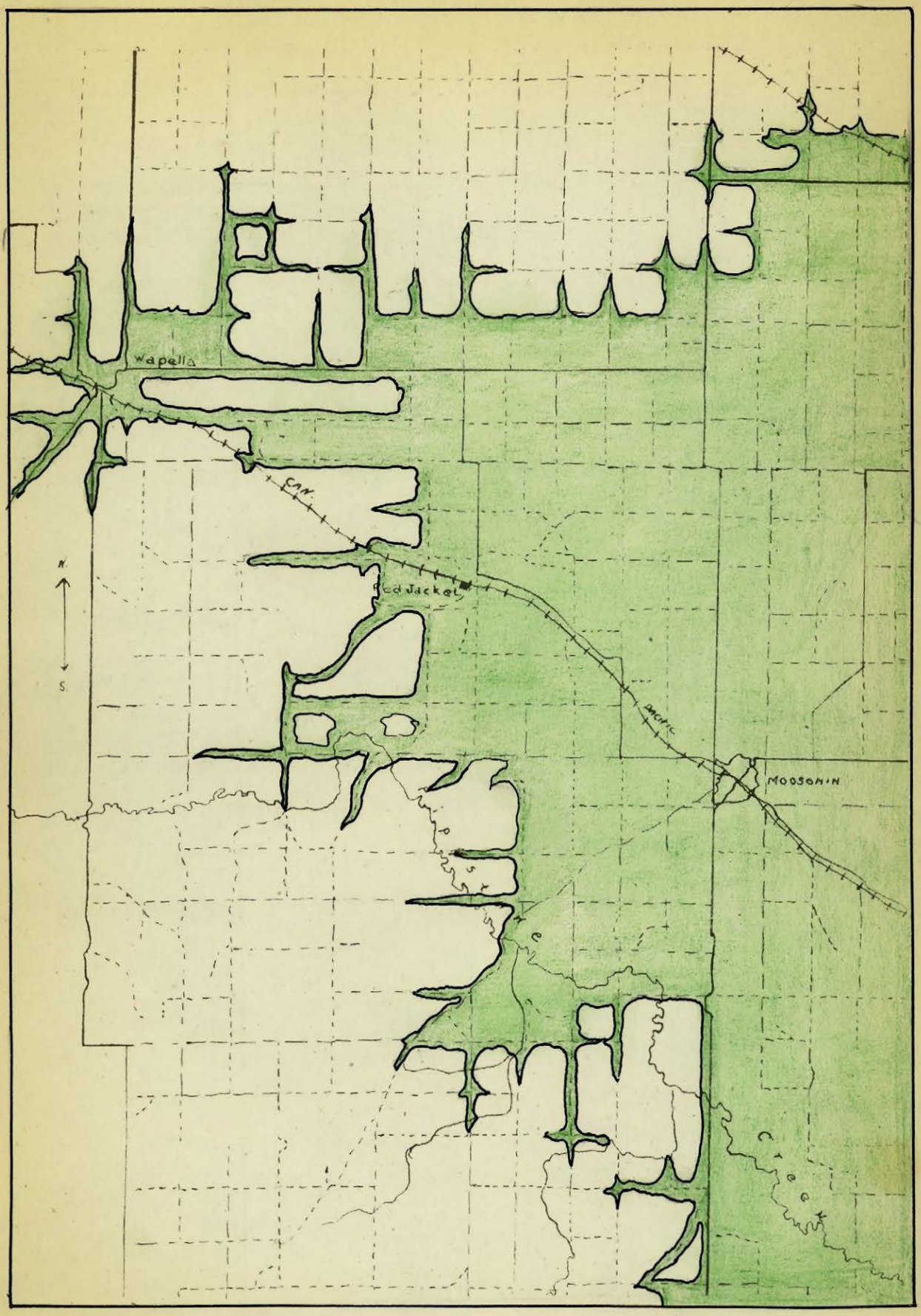

Fig. 1.

CHAPTER FOUR

REGIONAL EXPLANATION FROM MONTREAL

The pattern of the isochrones radiating from the centre of Montreal is controlled more by the topography than it is in the west. There are greater dissimilarities in the land surface and the entire area is contained within more definite physiographic regions. The isochrones expand easily along the St. Lawrence Lowlands, but shorten against the Appalachian ridges. Throughout the Eastern Townships there are many retarded islands, caused by lakes, small mountains and wooded land. Railways are not straight, as they are in the west, but curve through and around these topographic obstructions. The pattern changes rapidly when the isochrones penetrate the Laurentian Plateau within the second hour.

There is no regularity and little similarity in the pattern anywhere in the east. Since this pattern is controlled by the system of land division, it is apparent that the system in Quebec does not follow a regular division.

Because the St. Lawrence River provided the first means of transport when first settlements were being made, settlers had to have their land lots fronting the river. These lots in turn became split lengthwise to accommodate the heirs, as all sons inherited equal shares. In this way, all obtained river frontage and equal cross sections of pasture and woodlots. Tiers were laid out behind these when no more land was available. Third class roads do not follow all section lines as they do in the west. (Fig. 8.)

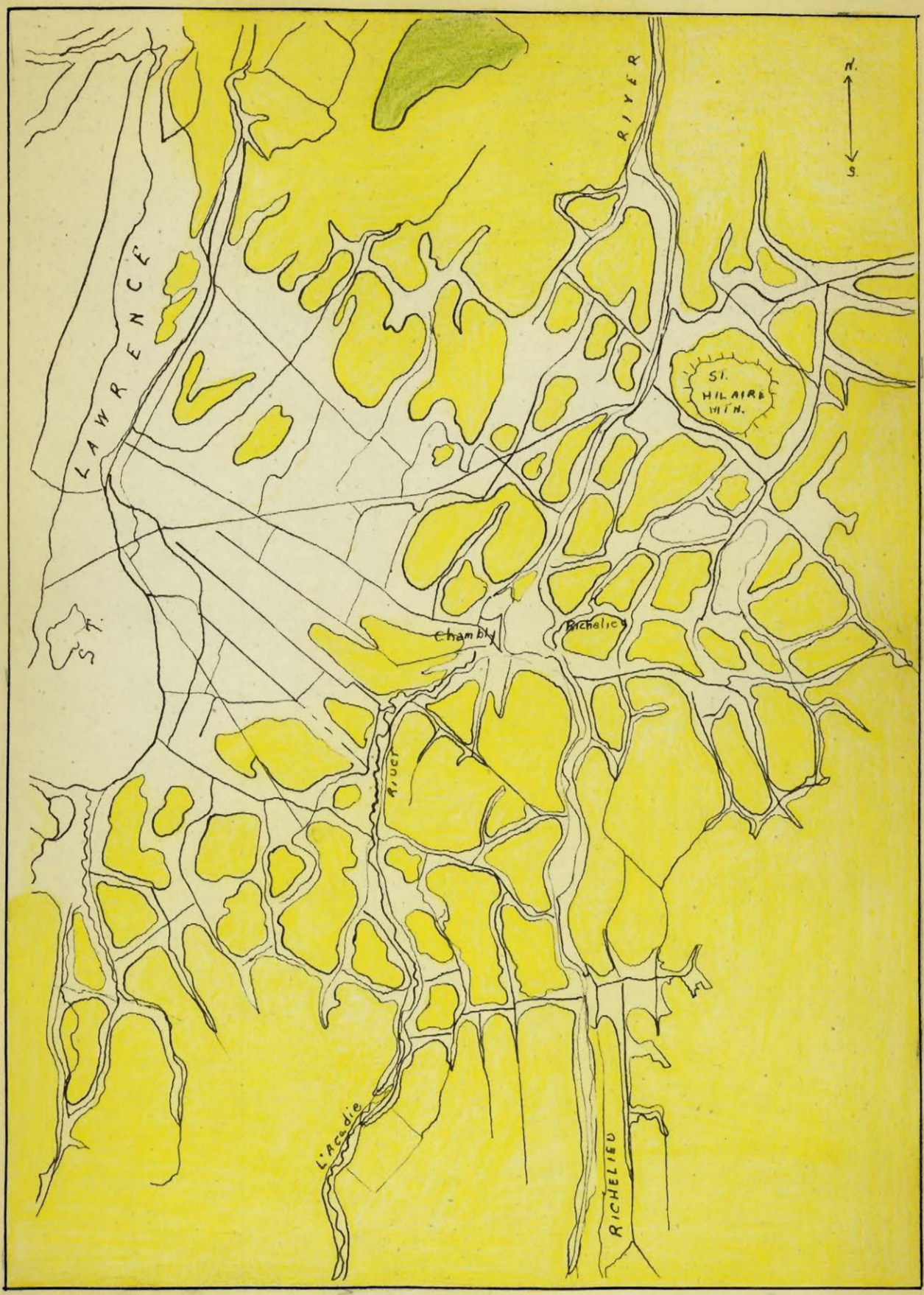
LAWRENCE
RIVER
N.
S.
ST.
ST. HILAIRE MTN.
Chambly
Richelieu
River
L'Acadie
RICHELIEU

Fig. 8.

There is a marked difference in the land division immediately across the provincial border of Quebec and Ontario. (Fig. 9.) The system in Ontario slightly resembles the division followed on the prairies. Farms measure eighty rods by two hundred rods and are arranged in blocks. Side roads separate the blocks and first or second class roads run along either side. Townships are not consistent in size or shape, and therefore roads do not coincide, and isochrones outlining them are irregular. In settlements bordering the Shield, where the soil is patchy and there are many lakes and rocky outcrops, the isochrones outlining such settlements present a confused pattern.

The first hour. The city of Montreal is situated on an island in the St. Lawrence River about one thousand miles inland from the Atlantic Ocean. This city is built on the Island of Montreal, on the terraces surrounding Mount Royal, the most westerly of the eight Montereg-ian Hills. The island is the largest of several, located at the confluence of the Ottawa and St. Lawrence Rivers, and is well connected by bridges to the mainland. The outline of the first isochrone illustrates the symbiotic relationship of the city to the surrounding areas.

Montreal is the terminus for many transcontinental routes, and a centre for branch routes extending to all parts of the province and to the United States. Transcontinental lines as well as branch lines of the Canadian National and Canadian Pacific Railways operate from the island. These Canadian lines are used by or connected with railways of the United States; the New York Central, the Delaware and Hudson, the Boston and Maine, the Central Vermont and the Rutland. All points in the province are linked by highways to the island. In addi-

Fig. 9.

-tion, Montreal is a trans-shipping port for cargoes from the Great Lakes and other countries and a port for passenger steamship travel to Europe.

Many railways and highways follow the rivers, and tend to give the transportation a north east to south west pattern. These routes were so directed to give communication to the first settlements scattered along the rivers. Railways and roads extending beyond the navigable waterways into the Appalachians to the south east and the Laurentians to the north, are later routes crossing the original pattern of transportation.

Montreal has many impediments to a speedy departure from its metropolitan area, taken at Central Station. The traffic is heavy, streets are narrow and winding, and in many places very hilly because of the mountain in the midst of the city. The suburbs of Montreal occupy a wide area and check the speed for several miles around the core of the city. Crossing canals and bridges to the mainland involves much time. This controlled speed within the city influences the pattern of the first hour.

The first hour carries the influence of Montreal beyond the island and onto the mainland. It is everywhere contained within the St. Lawrence Lowlands. The pattern spreads more directly to the east because here the exit from the centre of the city is more direct, despite the fact that part of the county of Chambly forms part of the greater Metropolitan area of Montreal. The pattern spreads both north and south along the Richelieu River.

The isochronic interval shortens to the south because at this point the St. Lawrence River widens somewhat and the departure along the southern route across the Lachine Canal and the Mercier Bridge involves much more time. The retarded island directly south on the mainland is caused by the absence of roads across the Caughnawaga Indian Reservation. The first isochrone extends along the main highways to St. Martine and St. Etienne and reaches St. Timothée by the New York Central Railway.

The pattern extends more to the east and west because of the longitudinal position of the Island of Montreal. The first isochrone just covers the tip of the mainland to the south west reaching points of Hudson and St. Lazare. To the west it is necessary to cross Jesus Island before reaching the mainland. Part of this island is a continuation of the metropolitan area of the city, and controlled speeds check the expansion of the isochronic interval to the west. At one point the first isochrone crosses the Montreal Plain and reaches Precambrian outcrops at St. Jerome. There are large retarded islands in this area, caused by low swampy land and patches of wooded land between farm lots.

North of the island of Montreal, the first isochrone just crosses onto the mainland.

There are many retarded islands in the first hour. The absence of an intricate network of section roads accounts mainly for this. There are also many patches of wooded areas and swamps. To the east, Bruno Mountain and St. Hilaire Mountain rise abruptly from the flat plain and the isochrone is deflected around them.

Agriculture is the dominant occupation within the limits of the first isochrone. Settlers in the low, flat farming lands of the Montreal Plain now specialise in dairying and mixed farming, including fruit farming. There are also certain local specialities, fibre flax at Vaudreuil and West Soulanges, market gardening immediately south west of Montreal and on Jesus Island, and apple orchards in scattered patches of sandy, gravelly soils.

Because this dense network of communications focuses on Montreal, and also because of the abundance of hydro-electric production, industry and manufacturing are dispersed in Quebec, and located throughout the province. Much of this industry is contained within the first hour. Apart from those industries located in Montreal, there are explosives manufactured at Beloeil, textiles at St. Hyacinth, and furniture, paper and metallurgy at Beauharnois.

The second hour. To the south, the second isochrone extends to and crosses the International border. The pattern is interrupted only by retarded islands enclosing patches of swamp and wooded lands, and by Covey Hill, located just on the border. There are many orchards in this area. South east this isochrone spreads to the edge of the Lowlands and into the Appalachians. The pattern follows the general trend of these mountains north east to Richmond. It is interrupted in many places by isolated occurrences of the Monteregian Hills, several lakes and swampy depressions.

This south and east area is well settled everywhere, and the importance of agriculture is continued. Dairying is a specialty in the southern settlements surrounding Huntington. Further south east,

the production of whole milk tends to be replaced by the production of butter, cheese and condensed milk. Milk products are especially important in the Piedmont, the transitional belt between the lowlands and the hills of the Appalachians. This area is covered with rich glacial fluvial deposits, and is a fertile farming land. Industrial locations represented in this second isochronic interval are the textile centres of Farnham, Richmond, Granby, Drummondville and Valleyfield.

North east the second isochrone recedes from Richmond to Drummondville to avoid the swampy land. Northeast from Drummondville the time is concentrated along the railway, and so the pattern tends to thin out a short distance to either side. The pattern is continued down the river to the Lake St. Peter region. This is a well settled area concentrating on mixed farming and dairying, and the production of maple syrup. Sorel, an industrial centre and a winter station for ships, is a market for this agricultural produce.

Because of the excellent facilities for transportation on either side of the St. Lawrence River, the river itself has ceased to be of importance for rapid communications.

Across the river the second isochrone includes many industrial locations, Jolliette, St. Jean, Berthierville, L'Assomption, Crabtree Mills and Louisville.

This isochronic interval is abruptly shortened after crossing the lowlands and penetrating into the southern edge of the Plateau. The tourist centres, Morin Heights, and St. Sauveur, located in the Laurentians, are reached within the second hour. The Lowlands widen as they approach the Ottawa River. The second isochrone extends westward to include these Lowlands.

This isochrone crosses the Ottawa River at Calumet and extends swiftly along the railways toward Ottawa, but recedes rapidly to the south east. A decided change in the pattern is noticed here. The provincial boundary has been crossed and the system of land division has changed. There are few topographical barriers to transportation in this area except a few large depressions of muskeg. Towards the limits of the second isochrone this agricultural region tends to be within the orbit of Ottawa.

The third hour. The third isochrone marks the limit of Montreal's influence down the St. Lawrence Lowlands. Westward the third isochrone is already within the influence of Ottawa.

East of Montreal the pattern extends well into the Eastern Townships of the Appalachian system. The isochrone crosses Lake Memphremagog between the first and second range, and proceeds to Sherbrooke. Near the International border the pattern parallels the second range, and then recedes to line with the first range, because the railway from Richmond swings to the northeast and cross-country roads do not run due east. Retarded islands enclose the peaks of Sutton Mountain.

The broad, mature valleys and the Piedmont are the most fertile lands in the Eastern Townships. Farmers specialize in dairying and cattle raising, and hay and clover are grown to support the dairy industry. Potatoes are a specialty in the Piedmont. Settlements alternating with wood lots cause large retarded islands in the pattern. The Eastern Townships are diversified in the nature of their industries. Asbestos is mined at Asbestos, and copper at Sherbrooke. There are scattered textile industries, the most important being located at Sherbrooke and Magog. Because of the abundance of lakes and rivers, this is also an important tourist area.

The isochrone recedes to the north west as it crosses the High Platform, an area between the Riverside Parishes and the Appalachians. This is a sandy plain with patches of heavy forest. It is poorly drained and swampy, and therefore contains few roads or settlements. Rivers contain many rapids and cannot be used for travelling into the interior. The long, narrow pattern following the railroad indicates an absence of any network of roads.

Agriculture is patchy here, consisting of dairying, potato growing and the raising of sheep. Small lumbering activities are carried on in winter, and the production of maple syrup is important. There are some wood industries at Victoriaville and East Angus.

The third isochrone widens out along the more settled areas of the Riverside Parishes on both sides of the St. Lawrence River, and continues to Deschaillons and La Perade. Farther back from the river the isochrone encloses Shawinigan Falls and Grand'mere, where there is a large concentration of industry, and penetrates into the Shield to St. Jovite and Ste. Agathe. The land rises and becomes more rugged. Tributaries cut into the bedrock and there are many rapids and falls. The pattern contracts to outline the few main roads.

Soils are sandy along the Riverside Parishes, and there are frequent early frosts, so agriculture is limited. Hay, potatoes and vegetables are grown on the land that is cleared, but there are many retarded islands enclosing woodlots.

Three Rivers is the third city in Quebec, and serves as a distributing and collecting centre for the agricultural surrounds. Because of its central position between Montreal and Quebec City, it di-

-vides the area of influence of the two cities. Three Rivers is one of the largest paper making centres of the world; textiles are a second industry, and also railway rolling stock. It is an important port, often handling as much traffic as Quebec City.

North of the Ottawa River the third isochrone penetrates well into the dissected southern edge of the plateau which crowds down toward Ottawa and Hull. The pattern is chaotic because the plateau contains many lakes of various sizes. There are several second class roads running north from the Ottawa River, and also numerous third class roads criss-crossing the area and giving the Shield pattern more width than usual. The outline is inconsistent, extending far into the hills in places and barely leaving the river in others. It tends to follow the river more closely toward Hull, but enlarges in a cluster around that city.

Lumbering was previously an important industry in the valleys of the dissected plateau, and several logging railways extend north from the river. Except for the Gatineau Valley, the area is sparsely settled. There are a few subsistence farms, but no organized settlement. Above Lachute, the human occupance of this area is linked with the Ottawa Valley. East of Hull, the Ottawa Valley is well settled. The third isochrone extends up the Gatineau Valley to Wakefield. South of Ottawa, the pattern is similar to that of the second hour, also interrupted by swampy lands.

The area east and north east of Montreal. The fourth isochrone continues almost due north from the International border to Quebec City. This interval crosses the Eastern Townships, the Piedmont, the High Platform, and forms a cluster in the Lowlands around Levis and Quebec

City. The small interval between the third and fourth isochrones indicates the general absence of east to west routes. Both roads and railways tend to run north east to south west following the trend of the Appalachians. To the south, the presence of large lakes interferes with the pattern, and there is a large retarded island enclosing Stoke Mountain and a smaller one encircling Ham Mountain. Many of these retarded islands in the south are caused by a lack of third class roads. The road pattern is more dense in the country just east of Victoriaville. More retarded islands appear in the densely forested areas of the High Platform. Several woollen mills are located in the sheep raising settlements of the Eastern Townships.

The fourth isochrone includes the Riverside Parishes between Three Rivers and Quebec City. This is a prosperous agricultural region, specialising in milk and dairy products, livestock and market gardening for the markets of Quebec City. The tributaries of the left bank of the St. Lawrence River produce hydro-electric power and support many industrial centres. There are large paper mills at Port Neuf, Port Rouge and Donnacona. The outline of the fourth isochrone on the left bank of the river is irregular, depending on the scattered roads that penetrate the Shield.

The fourth isochrone encircles Quebec City and Levis. Quebec City is the economic centre of the eastern part of the province. It is the focal point for railways and highways of this area, and also points to the north, notably Lake St. John and Gaspé.

The fifth isochrone almost reaches the eastern border of the province. Megantic is the most easterly point reached in the Eastern

Townships. The surrounding country is a rolling plateau, dissected by many streams with heavy timber around Megantic. This isochronic interval is broken in many places by several longitudinal lakes, lack of third class roads, swampy depressions, and by Megantic and St. Cecile Mountains. Farther north the area covered is similar to the interval of the fourth isochrone. There is an abundance of small rivers and lakes. The most important industry is the mining of asbestos at Thetford.

North west of the Townships the isochrone follows the St. Lawrence River north east to just beyond Montmagny. North east of Quebec City this interval covers the southern part of the Isle of Orleans and extends well up the western side, there being little transportation across the island. On the northern mainland the isochrone follows the highway to Ste. Anne de Beaupré, but recedes rapidly to outline the scattered roads penetrating the Shield. Here the plateau is greatly dissected and cross-country roads are scarce. There are few highways, but several trails continue for a short distance.

The North Shore. On the north shore of the St. Lawrence River the fourth and fifth isochrones increase the clustered pattern surrounding the settled areas of the piedmont of the Plateau. They outline the few highways and railways penetrating the escarpment. These routes follow the valleys of the tributaries of the St. Lawrence River. The railway to Chicoutimi extends up the valley of the Batiscan River; the northern route of the Canadian National joins the St. Maurice Valley and swings to the north west. There is a second class highway up this valley to La Tuque.

Lumbering for pulp and paper industries is the most important pursuit in this whole area. There are some agricultural settlements in the valleys, but little beyond La Tuque. These farmers sell their produce to the lumber centres. The railways provide access to hydro-electric power for industry, but attract little agricultural settlement.

Improved highways into the western Laurentians, especially in the counties of Terrabonne and Joliette, attract a large tourist trade. Small farms in the fertile land of the valley bottoms supply these centres with vegetable and dairy produce.

North of the Ottawa River routes into the Plateau follow the valleys of its tributaries; the Rivière Rouge, Rivière Petite Nation, Rivière du Lievre and the Rivière Gatineau. These roads lead to tourist centres in Mont Tremblant, to power installations on the Rivière du Lievre, and up the Rivière Gatineau to the Mercier Dam on Baskatong Lake. There is some small farming and lumbering around Mt. Laurier, at the end of the steel.

The Ottawa-Toronto area. The fourth isochrone outlines the Lowlands continuing up the Ottawa River to Shawville, on the north shore and Arnprior on the south. This is a farming district, and is well served by roads. Beyond these points the land becomes sandy and stony. The Lowlands discontinue and the wide pattern collapses to a narrow outline, enclosing poorer settlements along the Ottawa River.

South west, the isochronic interval shortens against the Frontenac Axis, a projection of the Shield to the south east. Here, the isochrone encroaches on an area devoid of roads. Farther south, the interval widens again as it encloses more farming land around Carleton Place and Smith Falls. South to the St. Lawrence River, the pattern is

extremely irregular as this is the point where the Frontenac Axis crosses the river. This narrow neck of land is completely broken by lake country. Along the north shore of the St. Lawrence River the fourth isochrone extends very rapidly along the railways. The pattern continues to advance in this way, the seventh isochrone enclosing a large area surrounding Toronto. In all intervals the pattern recedes rapidly as the speed on the railways is greater than on the roads, and this area is interrupted by many lakes and patches of swamp. There is a wide lowland area surrounding Toronto, and the pattern spreads farther to the north. This land, especially to the west of Lake Simcoe, is covered with lake silts. Potatoes, oats and hay are the chief crops, with some truck gardening and dairying nearer to the city of Toronto. The most important towns in this area are found along the lakeshore; Kingston, Belleville, Oshawa, Port Hope and Toronto. These centres are served by rapid transportation. Peterborough and Lindsay, two of the larger inland towns, are included within the sixth and seventh isochrones.

The Frontenac Axis. The expansion of the isochronic intervals to the south west results in another expansion to the north of Toronto, where transportation to the north improves. Because of the rapid routes to Toronto, the isochrones also advance more quickly to Georgian Bay. At this point the pattern north of Toronto joins the pattern expanding to the south of Manitoulin Island and south from North Bay. This meeting of isochrones emphasizes the retarded area contained in the Frontenac Axis and in the districts of Muskoka and Algonquin Park. Roads and railway branch lines cross this large territory, but there is no system of transportation, and the pattern outlining these

scattered routes is extremely distorted. There is an abundance of lakes in this country due to the hard granites of the Shield preventing regular drainage. Subsistence farming is practised in isolated patches of soil, but settlements are unprogressive. Farther north there are fewer farms. Agriculture is concentrated along the main road north of Toronto, and these farms are mostly in pasture.

There is an absence of large towns in the interior. Gravenhurst, Huntsville and Bracebridge are located along the north road, and Parry Sound on the road to Georgian Bay. Small villages are frequent along the Canadian National Railway, and the highway that crosses Algonquin Park and joins the main north road. Tourism is an important industry because of the many lakes, rivers and attractive Shield countryside. The most frequented spots are found around the Muskoka Lakes near Gravenhurst and the Lake of Bays near Huntsville. The lakeshore also attracts tourists. Two branch lines of the Canadian National and the Canadian Pacific, as well as a highway to Bying Inlet, serve the lakeshore settlements.

The Saguenay Valley and the Chibougamau area. The isochrones outline six extensions into the Plateau between Grand'mere and Quebec City. Five of these follow river valleys and the sixth follows along the southern edge of the Plateau to Baie Comeau. Four of these routes extend to the headwaters of the rivers at Lake St. John. The Canadian National Railway follows the valley of the Batiscan River, north to Chambord on Lake St. John, and the highway north from Quebec City follows along the valley of the Montmorency River. This route forks up the valley of the Chicoutimi River to the left, and up the valley of

the Pikauba River to the right. The shore highway branches up the valleys of the River du Gouffre and Ha Ha River. Farther north, the shore road again branches to the left and follows up the Valley of the Little Saguenay River.

The isochrones outlining these routes converge and encircle the Lake St. John area. Here is an economy well balanced by agriculture and industry. Dairying, livestock, and forage crops comprise the agricultural pursuits. Lumber camps and industrial centres are ready markets for all these products. The main industries are the pulp plants at Chicoutimi and Kenogami-Jonquiere, the paper mills at Port Alfred, Dolbeau and Alma; and aluminium at Arvida. A well developed network of roads around the lake and part way down the Saguenay River connects these centres and forms a large isochronic cluster in the close pattern of the Shield.

From Lake St. John, the pattern extends north west in a number of isochrones outlining the second class road to the copper-gold deposits on Chibougamau Lake. For a short way the pattern is regular, indicating the absence of rivers and lakes surrounding the road. The latter half of the road runs through a maze of lakes and rivers and the isochronic intervals widen to follow the water transportation on either side of the road.

North and slightly east of Lake St. John, there is a shorter extension of the pattern following two truck roads along the valleys of tributaries of the large Rivière Peribonca. These roads lead to dam sites on the rivers, to rangers' cabins and prospecting camps. The pattern does not extend to the Hudson Bay Company post on the southern shores of Manuan Lake. This is just beyond the twentieth isochrone.

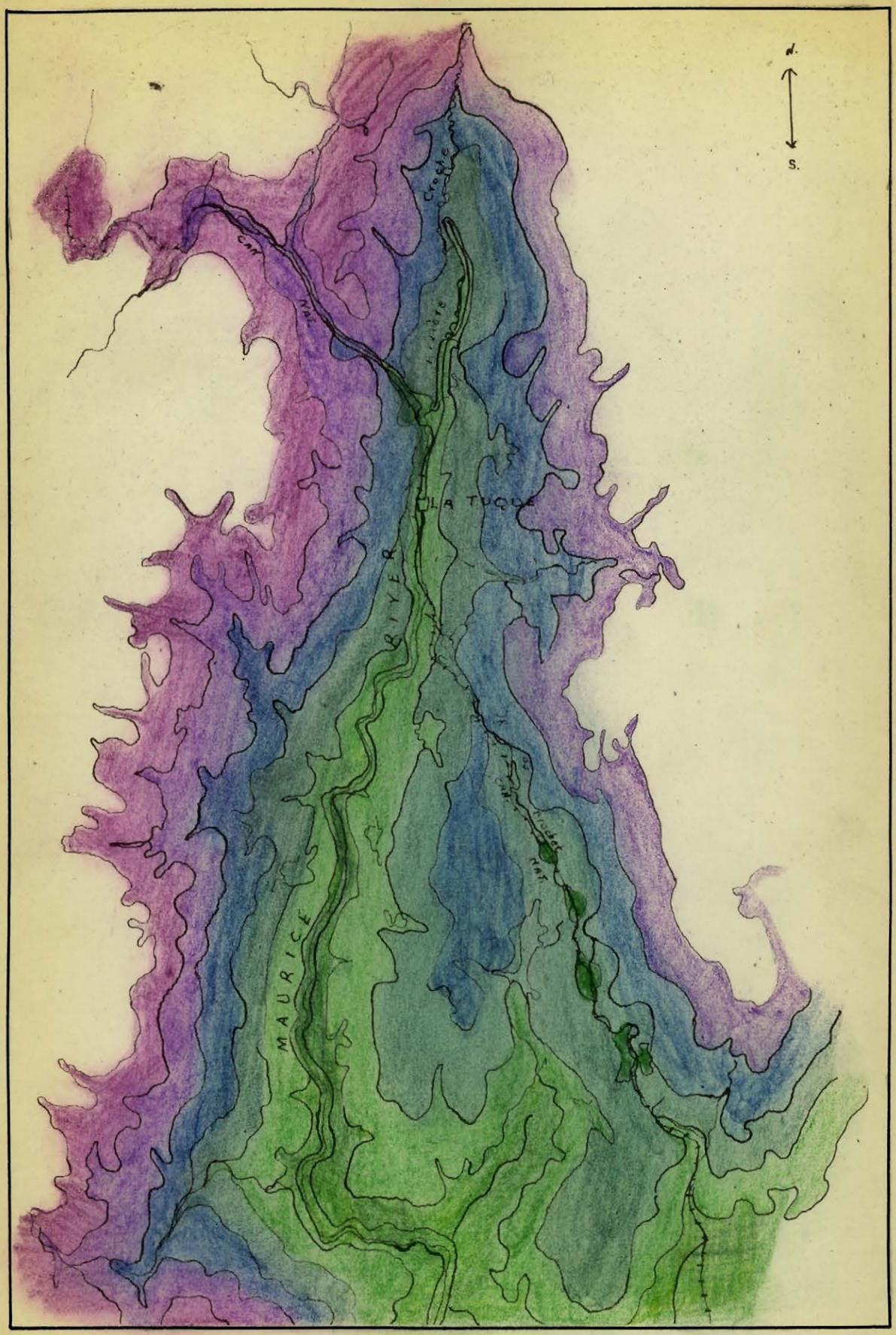

Fig. 10.

The core of the pattern extending north east to Baie Comeau is the first class highway along the north shore. Therefore this pattern remains relatively uniform up to the twentieth isochrone.

The area traversed by the Northern Transcontinental Railway. The highway to La Tuque runs along the valley of the St. Maurice River from Grand'mere to Fitzpatrick, just beyond La Tuque.(Fig. 10) It continues for a short distance along the valley of the Rivière Croche. Here the highway discontinues and the isochronic intervals shorten as further transportation is by water. At Fitzgerald, the Maurice River swings to the north west. The Canadian National Railway follows the valley of the St. Maurice to the station of Sanmaur. At this point the river swings north and the isochrones outline the canoe route to the Gouin Dam on Lac Gouin.

The Canadian National Railway continues north west across the Shield. The country on either side of this railway is well prospected and contains several scattered lumber operations. The railway crosses many lakes and rivers trending north east to south west, and the isochronic intervals widen out on either side along these water routes. These, in addition to the many short lumber roads, extend the pattern considerably to the south and north of the railway. On the southern side of the railway the isochrones almost meet with those coming north across the Shield. To the north there is a large gap between the railway, the highway running north west to Chibougamau and the winter road extending north east to Chibougamau from Langlade, a siding on the railway. A speed of 15 miles per hour is taken on this road, therefore the remaining time is soon exhausted and the twentieth isochrone encloses Mt. Springer, several miles west of Chibougamau. The isochronic intervals along this winter road are regular because the route follows the drainage pattern of the area. The isochrones penetrate into the

Gouin Reservoir following the wide water courses into this lake.

The Clay Belt. The lateral expansion of the Clay Belt forms the largest isochronic cluster in the pattern of the Shield. Five routes converge on this area. The relative uniformity of this cluster is maintained by routes entering both ends of the Clay Belt, only a few hours apart. This gives a greater depth to the pattern. In Quebec, the lateral trend is further emphasized by the system of dividing the land in long lots. In Ontario the subsidiary roads extend more to the north. The southern edge of the Clay Belt is penetrated by the tenth isochrone and the seventeenth isochrone surrounds Cochrane on the western side. In Ontario the isochrones outline the rectangular pattern of the land divisions. The entire pattern is broken by the large lake Abitibi and numerous smaller lakes. North, beyond the settled areas, the remaining isochrones penetrate the larger river courses, especially to the northeast where a highway follows for some distance along the Bell River.

Despite a diversified economy, the Clay Belt is dependent on supplies from outside centres. Agriculture consists of part time farming with a specialization in dairying. Farmers are wholly dependent on the industrial centres within the Clay Belt for markets. It is too remote to compete with outside centres because of perishable products and high transportation costs. However, agricultural produce within this area does not fully supply the large gold mining districts at Timmins, Kirkland Lake, Malartic and Rouyn.

Beyond Cochrane, the Clay Belt thins out, and settlement is found only along the highway. Lumbering is a more important industry with large paper mills at Kapuskasing. The watershed is to the north,

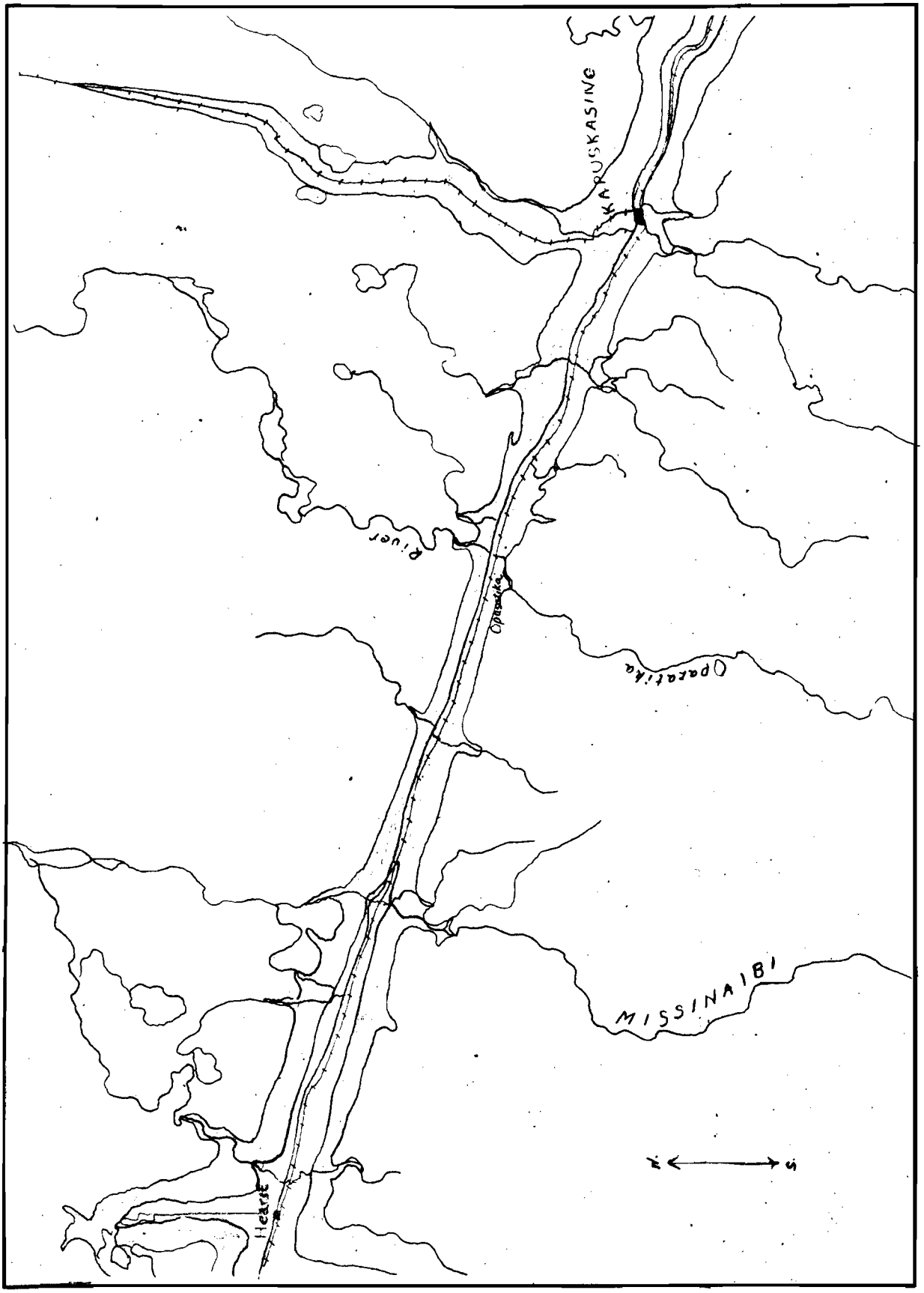
KAPUSKASING
River
Opasatika
Opasatika
MISSINAIBI
Hearst

Fig. 11.

and the larger rivers are used for floating down logs to the railway. Between Kapuskasing and Hearst the pattern consists of one isochrone which joins with the western pattern. (Fig. 11).

The Timiskaming and North Bay areas. South of the Clay Belt the isochrones surrounding the two routes into this region, the one from Mt. Laurier and the other from North Bay, encircle a large area of inaccessibility within the twentieth hour. The isochrones into this interior follow the rivers and lumber roads. This section of the Shield is well lumbered and contains many depots.

Many routes converge at North Bay on Lake Nipissing. Two highways extend into the northern Clay Belt from the Timiskaming area.

Like the Clay Belt, Timiskaming is an area within the Laurentian Plateau where the surface of the land has been modified by lacustrine deposition. Agricultural pursuits are similar to those of the Clay Belt, dairying and livestock, with part time lumbering. Two highways connect the Clay Belt with Timiskaming and North Bay. These highways run along either side of Lake Timiskaming and the isochrones outlining them widen to include settlement around Ville Marie and New Liskeard. Therefore, the Clay Belt does not form an isolated cluster, but is connected by a wide pattern to southern routes.

North Bay is on the southern border of these clay deposits, and is the centre of a mixed farming and lumbering district. The isochrones cluster here and radiate in several patterns along various routes, indicating that this is a transportation centre. Two transcontinental railways pass through North Bay and branch lines connect with transcontinental routes to the north. A highway extends south to Toronto and

east to Ottawa. These highways continue north to the Clay Belt and west through Sudbury to Sault Ste. Marie.

The Sudbury and Sault Ste. Marie areas. Sudbury is situated on a low, flat plain on the southern edge of a syncline which is the source of large quantities of nickel. From the surrounding isochronic pattern it is apparent that it is also a traffic centre. There is considerable settlement in this area between North Bay and Sudbury, and the pattern expands as the isochrones outline the side routes. The isochrones extending to the south joins with those advancing north from Parry Sound. A highway south from Espanola, on the route to Sault Ste. Marie, extends the pattern to another small farming area in the Shield, Manitoulin Island. The soil here is sandy with many rocky outcrops, but there is considerable settlement as the island is joined by a developed network of roads.

Along the northern shores of Lake Huron is another clay deposit. The few remaining isochronic intervals expand at this point to include the network of roads serving the agricultural settlements and extending into the Shield to connect mining camps with the highway on the lakeshore. Many small islands to the south are also included, the largest of these being St. Joseph Island, just south of Sault Ste. Marie.

The town of Sault Ste. Marie is a traffic centre for routes entering Canada from the United States. It is also a distributing centre for the surrounding agricultural settlements. The isochrones follow two routes for a short distance to the north. The highway is just included in the twentieth isochrone as it discontinues a short way up Lake Superior. The Algoma Central and Hudson Bay Railway connects Sault

Ste. Marie with the iron deposits at Michipicoten and the transcontinental routes to the north. This is a slow route and the pattern covers it for only a short distance north of Sault Ste. Marie. The isochronic intervals widen out over the lake, but the limit of the twentieth hour is soon reached.

The two transcontinental railways turn to the north west from Sudbury. The isochronic intervals are wide for some distance along the railways because several roads lead from the stations to mining camps. These roads and trails connect with trails pushing south from the Clay Belt and the patterns join in two places; in the south along a highway from Westree to Elk Lake and in the north by water route and winter road from Kenese Lake to Timmins.

The Canadian Pacific Railway continues with a wider pattern than the Canadian National. There is an abrupt expansion near the station of Chapleau. A long road penetrates south to Flame Lake and almost joins the isochrone surrounding a similar extension north to Mountain Ashe Lake. There are several large lakes crossing the railway at this point and this increases the isochronic interval. The few remaining isochrones enclose a large area near the station of Missinabie. Long narrow lakes cross the railway at this point, and a road joining the railway at Lochalsh from the Algoma Central and Hudson Bay Railway increases the interval of the final isochrone which encloses the point of meeting just west of the Station Franz.

Many of the stations along the railways contain a few houses only, and isolated farms. They are usually settlements for railway service. Many of the inhabitants engage in part time lumbering activit-

-ies. These stations are only a few miles apart, and serve to prevent the pattern from dwindling to a series of progressive islands. On the Canadian National Railway, the meeting point is contained within a progressive island, the only island. But on the Canadian Pacific to the south, the meeting point is contained within the eastern pattern. On the highway to the north, the meeting is contained within one pattern, joining east and west. Nowhere is this pattern broken into progressive islands. This is because at this point the railway is accompanied by the highway forming a continuous link to the surrounding land.

CHAPTER FIVE

THE MEETING OF THE ISOCHRONES FROM WINNIPEG AND MONTREAL

The distance on the Canadian Pacific Railway between Montreal and Winnipeg is one thousand four hundred and eight miles and on the Canadian National Railway, one thousand three hundred and fifty-eight and one-half miles. The distance by the Trans-Canada Highway is one thousand six hundred and fifty-four miles. The distance by the highway is greatest because it covers the Clay Belt to the north whereas the two railways follow south of this region.

The meeting of the isochrones on the Canadian Pacific just west of Franz, is at approximately half the distance, 713 miles being covered in the west and six hundred and ninety-five miles in the east. The meeting at Dishnish, on the Canadian National, also favours the western route, six hundred and ninety-nine miles being covered in the west and six hundred and fifty-nine miles in the east. The greater distance covered in the west in equal time is probably due to the number of large centres in the east through which the railways pass. Ottawa, North Bay and Sudbury are important traffic centres, while in the west Fort William - Port Arthur is the only large traffic centre.

The isochrones meet at Opasatika on the northern route. This point is eight hundred and seventeen miles from Winnipeg and eight hundred and thirty-seven miles from Montreal. Therefore, accessibility is shifted in favour of the east by highway and to the west, with a slight margin, by both railways. The greater speed by highway in the east is probably due to the larger network of roads. There are three routes possible from Montreal to Opasatika, while from Winnipeg there is only one.

CHAPTER SIX

THE INFLUENCE OF THE ENVIRONMENT

The greatest influence on the isochronic pattern is the control of the relief and the hydrography of the area considered. The wide variations in both are outlined by the isochrones.

Relief and topography.

Lowlands. Where there is no topographical obstruction to the free development of roads the isochrones following these roads expand in a broad pattern, the regularity depending on the road system. Such areas are dry flat plains, found on plateaus or in very large river valleys. These are areas of fertile soil and therefore densely populated and settlements are well connected by a network of roads. Examples of these are found immediately surrounding Winnipeg and extending west and north west. The broad, flat Red River Valley permits an even pattern, the Portage Plains to the west and the lands north of the plains to the mountains. Finally, in this western area a well defined example is the Second Prairie Step. (Fig.I)

Examples in the east are the St. Lawrence Lowlands above Montreal and the lands immediately surrounding Toronto to the north.

Fragments of this plain's pattern are found scattered throughout the Shield. These are the small deposits of clay including the larger Clay Belt. These small examples are found at Lake St. John, Kenora, Dryden, Rainy Lake and Sault Ste. Marie. (Fig.12)

Both railways and highways tend to be straight on the plains and so permit a rapid expansion of the isochronic interval. Cross country transport is relatively simple and gives width to the pattern.

Hills. Hills and small mountains considerably alter the

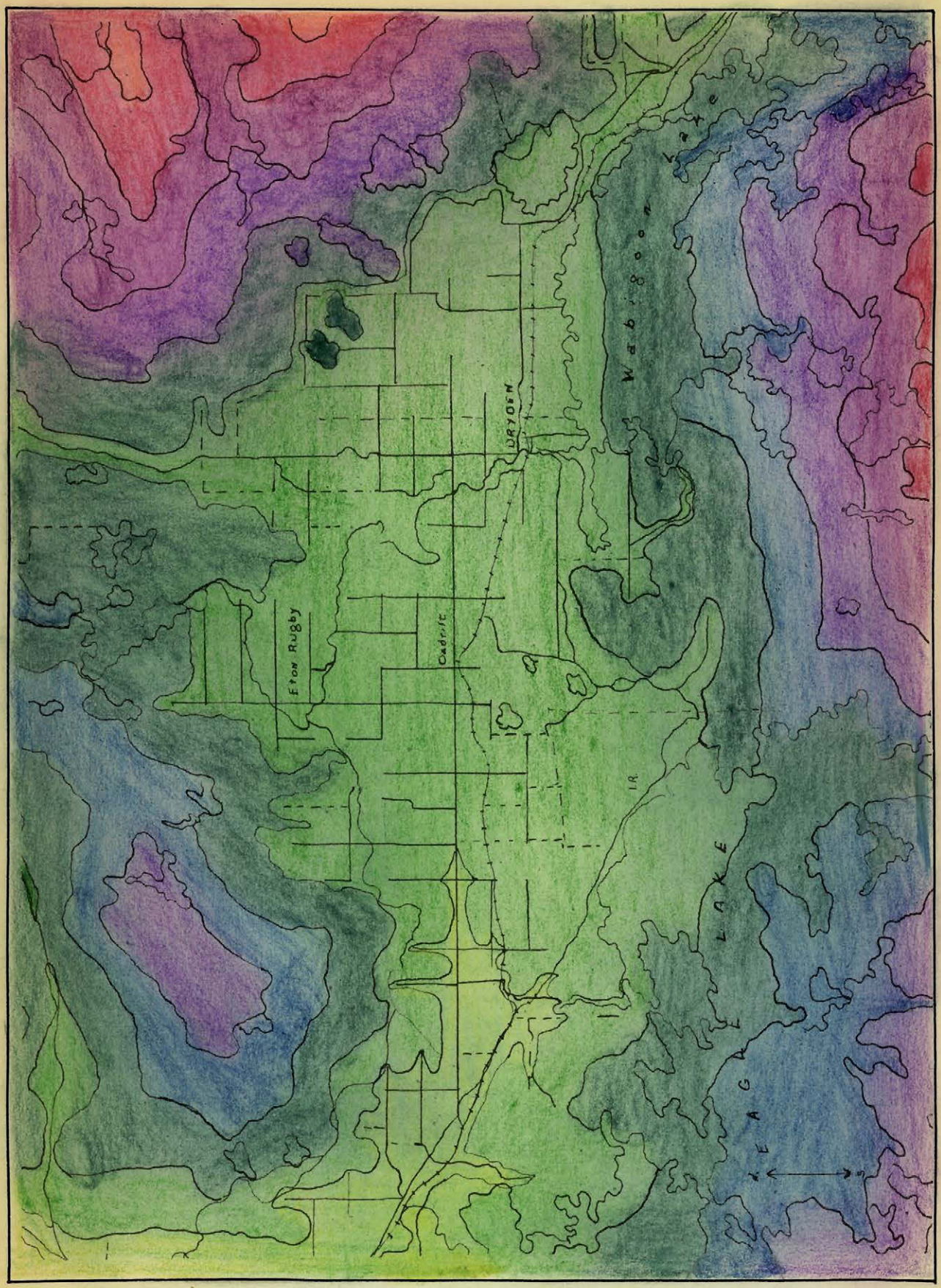

Fig. 12.

isochronic pattern. They either cause retarded islands or their isolated roads attract long, narrow isochrone away from the regular pattern. This depends on whether they are economically important, unfrequented obstacles or unexploited areas. The Monteregians are circular hills and disturb the pattern because they rise sharply some seven hundred feet above their surrounds. (Fig.13) They usually cause islands because they do not contain roads. Mount Royal, within the city of Montreal, is an exception. Mt. Bruno and Mt. Shefford have roads and isochrones penetrate over them. Several are well surrounded by roads and so are included in the next hour, and are not indicated as retarded islands.

The parallel ridges of the Appalachians are indirectly responsible for the direction of the pattern east of Montreal. In part, this pattern follows the drainage system of the Appalachians. Although these ridges are now only rounded hills they shorten the east to west extension of the isochronic interval. These hills are economically important and greatly exploited and have therefore attracted an irregular system of roads. There are retarded islands amongst them as in many cases roads are deflected around them instead of across. Megantic, Stoke, Ham, Sutton, Orford and Ste. Cecile mountains are the largest obstructions to the pattern.

The Laurentians, paralleling the north shore of the St.Lawrence River check any north west expansion from the lowlands. This is not an area of high relief but a series of low, rough hills. These hills are generally unfavourable for settlement and attract isochrones along widely dispersed roads with little cross country travel to fill in the pattern. Tourist industries, lumbering operations and hydro-electric

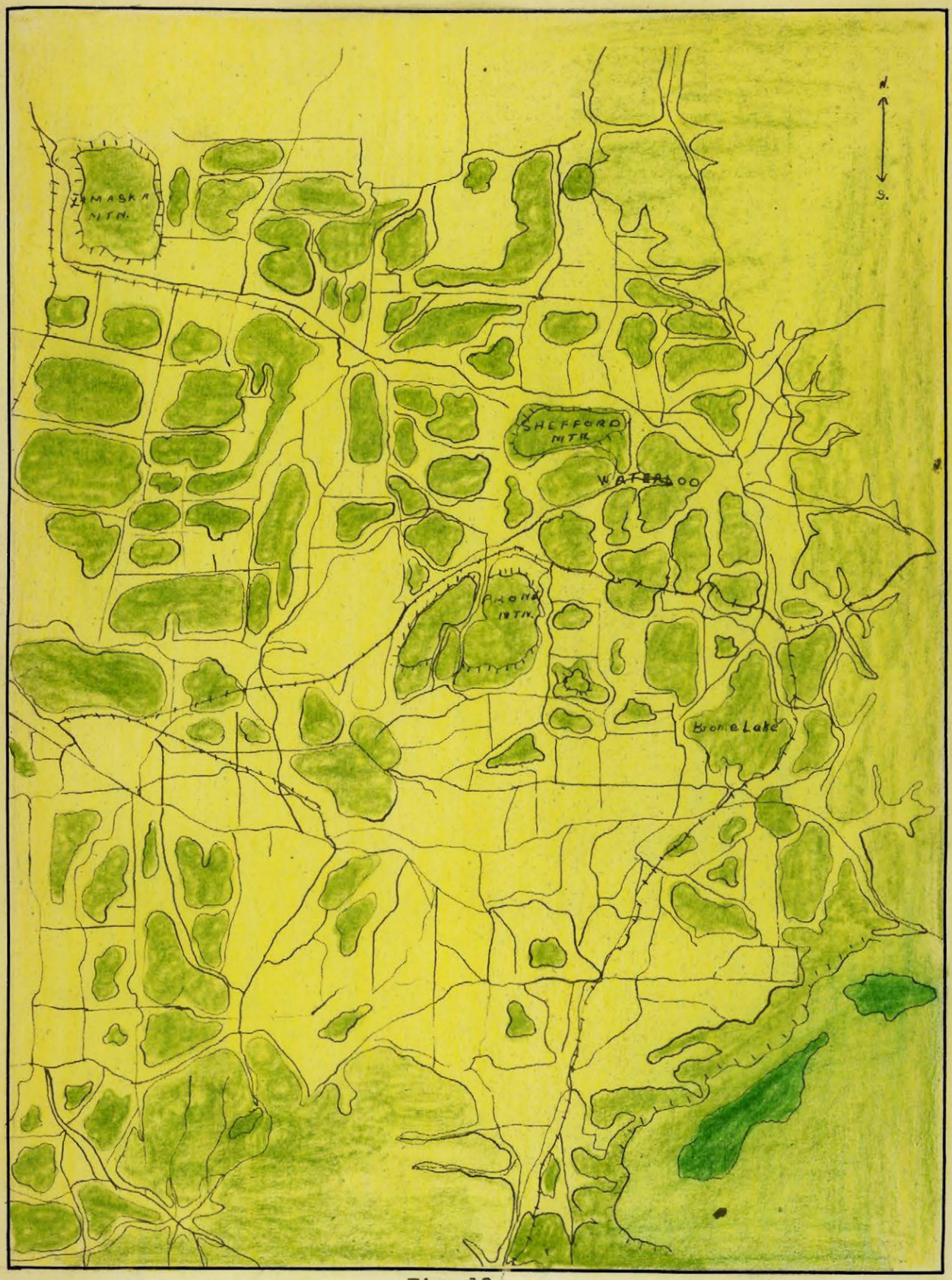

Fig. 13.

development result in scattered settlements that forms a contrast to the pattern of the Riverside Parishes. North of the Ottawa River the dissected Plateau presents a similar pattern contrasting to the well settled areas south of the river. (Fig.14)

Another example of the negative influence of areas of high relief is found in the Highland area in south eastern Manitoba. This high sandy ridge, the Bedford Hills, is an area of unused land. It is covered by an irregular pattern outlining the few routes crossing the hills. This pattern is broken by large and small retarded islands. This glacial drift plateau sharply limits the plains pattern of the lowlands to the west. (Fig.7)

The Pembina Hills, forming the southern extension of the Manitoba Escarpment, is another example of an economically important highland area. These hills are fairly well settled and interfere with the well developed pattern only by shortening the isochronic interval.

The flat table mountains forming the northern extension of the escarpment are examples of unexploited highland areas. Roads are deflected to either side and the pattern covering the mountains is composed of a series of concentric circles. (Fig.15) Riding Mountain, the most southerly, is cut in two patterns by the isochrone outlining the narrow road connecting Clear Lake to the north. Duck Mountain has one road into the interior and this somewhat upsets the circular pattern. The same applies to the Porcupine Hills, where one or two lumber roads into the uplands distort the series of circles.

Turtle Mountain, in southwestern Manitoba produces a pattern somewhat similar to that surrounding some of the Monteregian Hills. It is of more economic importance and one route crosses the slopes.

Fig. 14.

In a limited number of occasions highlands attract roads. One example is the highway across the ridge of the Bedford Hills in south eastern Manitoba. Another is the higher lands just east of the Lake of the Woods along which the highway follows to Fort Francis and the International border.

Valleys. Valleys, considered as relief, not as hydrography, attract roads and isochrones because in periods of early settlement rivers were the means of penetrating unoccupied territory. Many roads have developed along these river valleys. In the larger valleys there is a well developed isochronic pattern, while in the smaller valleys, the isochrones form a narrow pattern, outlining the settlements close to the road.

An example of a larger valley with a well developed pattern is the Red River Valley. The Assiniboine Valley attracts the pattern west through the broken portions of the Manitoba Escarpment. This is also true, on a smaller scale, for the valley of the Valley River between the Duck and Riding Mountains. (Fig. 15) An abrupt widening of the pattern is indicated in the valleys of the Big Woody and Swan Rivers between the Buck Mountain and the Porcupine Hills. A few short third class roads have already penetrated into the pioneer lands in the Carrot River Valley and attracted isochrones away from the main pattern. The end of the road in the Interlake country, north of Winnipeg, draws a narrow pattern along the valley of the Fisher River to Fisher Bay. The valley of Rainy River in south western Ontario is another example.

Many similar examples are found in the eastern pattern, especially along the valleys of the tributaries of the St. Lawrence River. The long, close isochronic intervals following along the valleys are

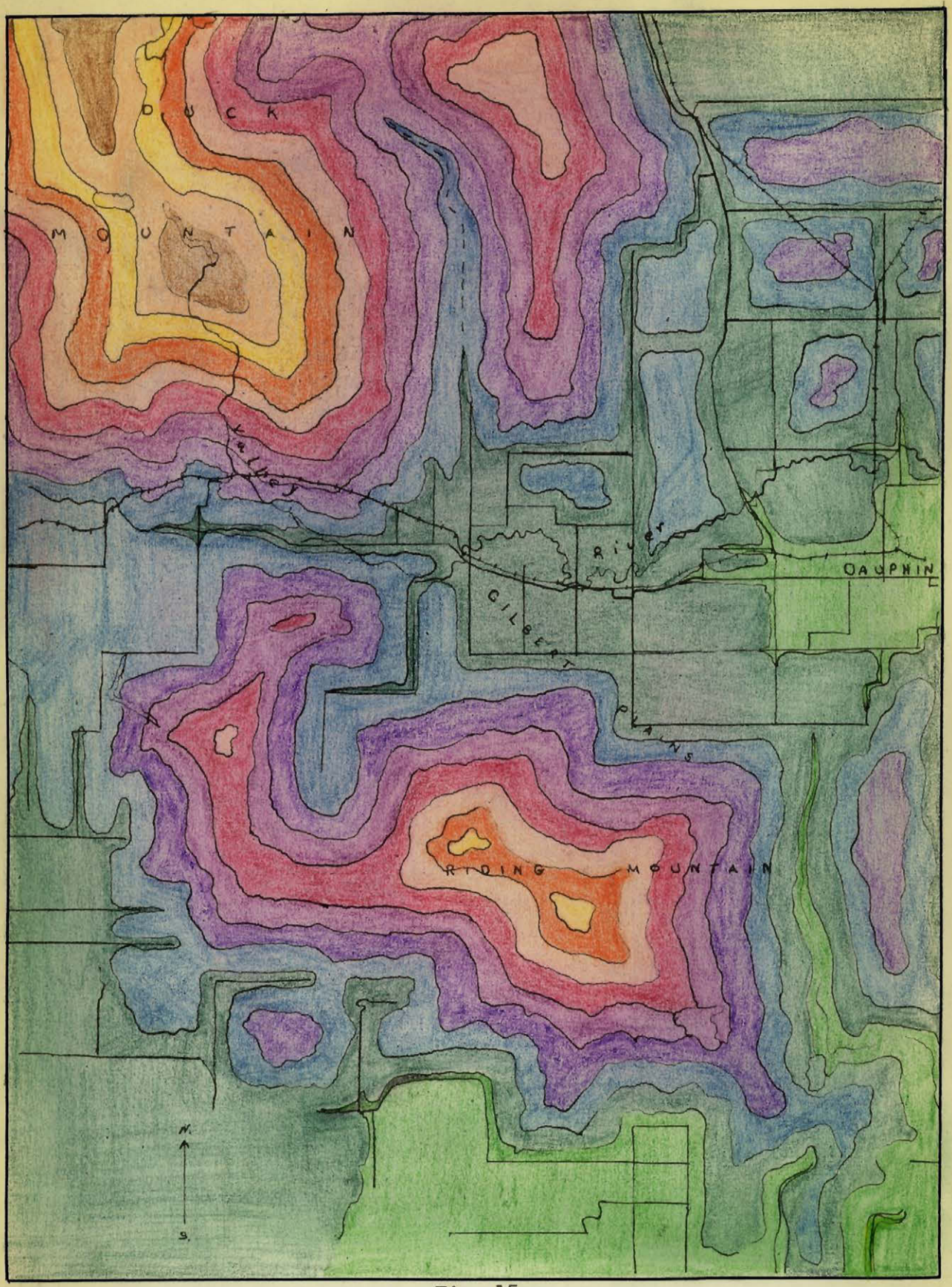
DUCK
MOUNTAIN
Valley
River
GILBERT PLAINS
DAUPHIN
RIDING MOUNTAIN
N.
S.

Fig. 15.

more apparent here because of the absence of roads on the Shield.

There is a cluster of isochrones surrounding the settlements along the Saguenay River Valley. Routes to the Lake St. John all follow river valleys.

A well defined example is the valley of the St. Maurice River. (Fig. 10) This valley attracts isochrones because it has been used for a highway to La Tuque, and as a route for the Northern Transcontinental Railway. Part of this railway follows the valley of the Brochet River. The valley of the Batiscan River is outlined by isochrones following the Canadian National Railway to Chicoutimi.

Similar examples are found along the tributaries of the Ottawa River. Roads follow the valleys of the deeply incised Gatineau, Rouge, and Du Lievre Rivers.

The Ottawa Valley, like the Assiniboine, attracts isochrones rapidly, and the point of the line is always plotted along the valley road. The St. Lawrence Lowlands is an example on a very large scale.

The valleys between the ridges of the Appalachians contain north to south routes and have influenced the pattern in this direction.

Other examples are found throughout the Shield between Ottawa and Kenora. The railways between North Bay and Sudbury both follow along river valleys and attract separate patterns. The isochrone immediately surrounding Fort William extends along five river valleys to the north. The same pattern is found along Nipigon River.

Hydrography. The control of the hydrography is apparent in the irregularities of the isochronic pattern. The influence of lakes, rivers, waterfalls,rapids and marshes is found everywhere throughout the area studied.

Lakes. The presence of large lakes often prevents the continuation of patterns typical to the areas in which they are found. The speed and method of transportation differs, and the isochrones must make adjustments. Lake Winnipeg and Lake Manitoba prevent the possibility of a regular pattern of the plains from continuing from Winnipeg. (Fig. 2) These lakes split the pattern to the north and retard it to the northwest. Farther northwest, the large Lake Winnipegosis prevents an eastern expansion.

The width of the isochronic intervals throughout the Shield depends almost entirely on the size and shape of the numerous lakes. Here the presence of large lakes tends to expand the isochronic interval, since the method of overland travel is either by foot or canoe, the latter is more rapid. In northern Manitoba roads and railways adjust to avoid large bodies of water, but when they contact them the pattern widens considerably (Fig. 16) In several cases the final pattern is broader than the previous one because it concludes in a lake district as Wekusko, Sherridon and Amisk Lake. (Fig. 17)

At Dryden the previous narrow intervals widen out suddenly. This expansion is only partially due to the presence of the clay deposits north of the highway. It is equally caused by the presence of long, narrow lakes to the south of the highway. (Fig. 12)

Red Lake, Trout Lake and Lac Seul increase the intervals of the isochrones outlining the isolated highways and trails into the mining districts north of Sioux Lookout. The large Lake Nipigon joins the patterns outlining the north and south transcontinental routes.

Lake St. John presents a unique example. Completely surrounded by roads, it assists in widening the local pattern.

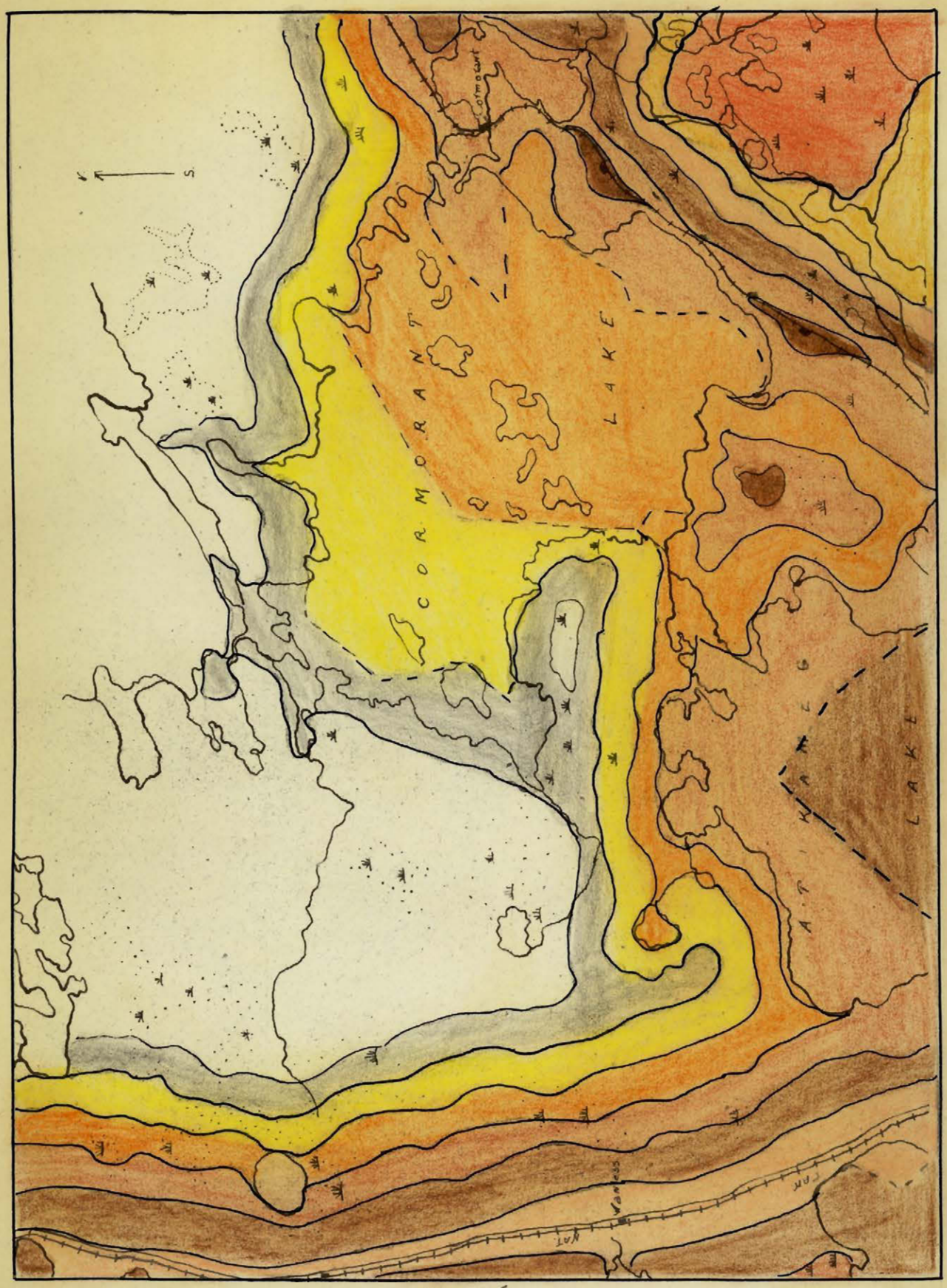

Fig. 16.

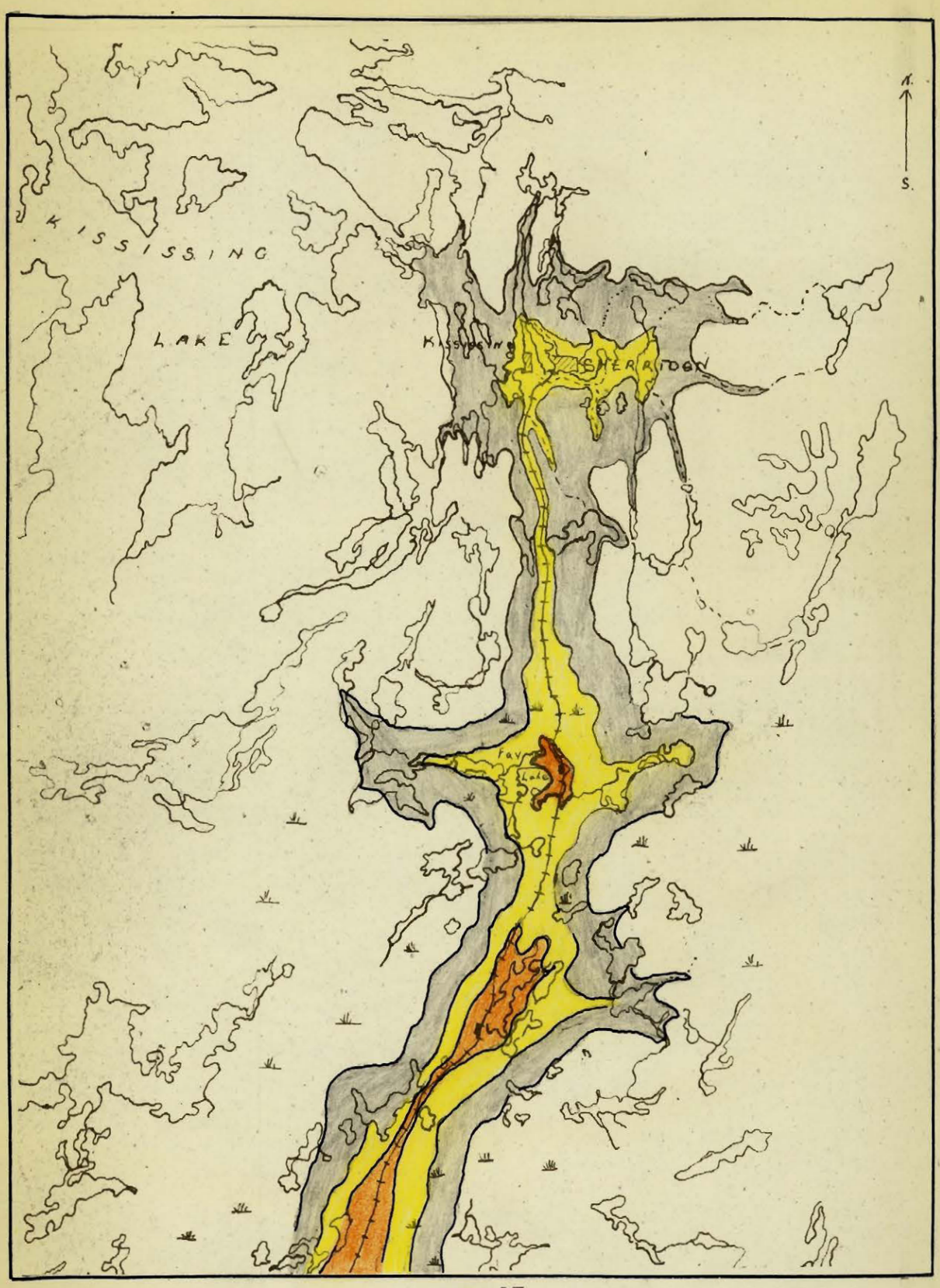

Fig. 17.

Lake of the Woods, crowded with rocky islands of many sizes presents a chaotic pattern. The isochronic intervals expand and contract as the methods of travel interchange.

Lake St. Louis and Lake of the Two Mountains, surrounding the Island of Montreal, assist in shortening the pattern because of the time involved in crossing them. Long, narrow lakes running against the general trend of transportation also cramp the pattern. Examples are Lake Memphremagog in the Eastern Townships and Pembina Lake in south western Manitoba.

Lakes are either absorbed into the isochrone reaching them or by the following interval; or they form retarded islands that cannot be crossed. The great majority are absorbed into the pattern.

Rivers. Rivers attract isochrones. The trend of the hydrography influences the entire pattern and generally controls the extensions of the outlying lines. Because they have influenced the direction of roads, rivers have considerable control over the direction of isochrones. Large rivers like the St. Lawrence, Ottawa, Red, Assiniboine, and the Winnipeg River are paralleled by highways and therefore advance the pattern. When highways follow the rivers on either side, this pattern remains uniform, but when a road follows along one side of a river only, then the river tends to reduce the lateral expansion of the pattern and is responsible for the uneven outline of the route until the river is crossed. An example of this pattern is found along the Fisher River in northern Manitoba.

Rivers in Quebec trending north and south like the Richelieu and the Chateauguay, cramp the spread of the pattern along the routes following them .(Fig.8) In the west, such rivers tend to disrupt the road network. These rivers are smaller and were not so important as canoe routes.(Fig.18) Rivers running against the direction of travel re-

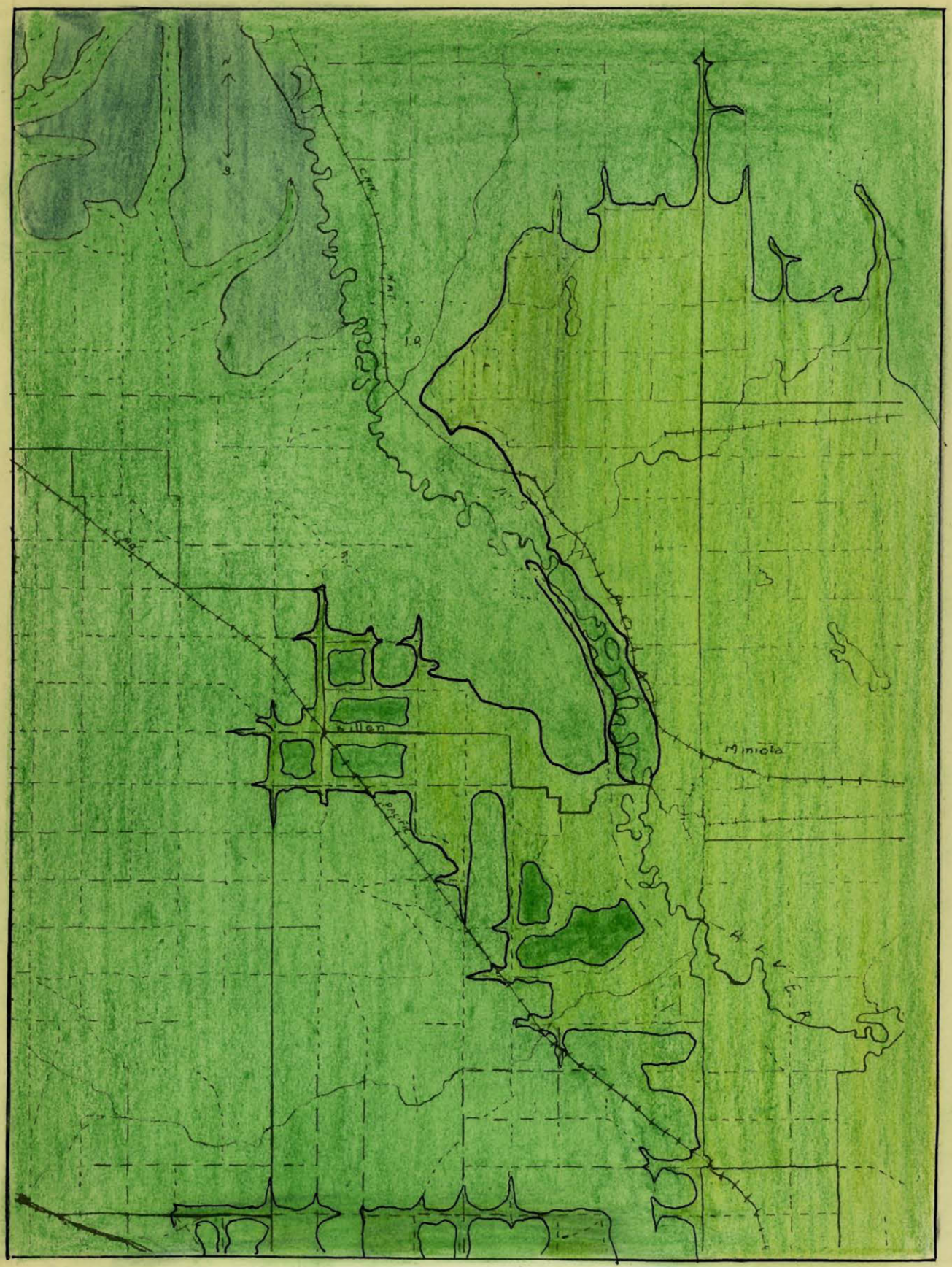

Fig. 18.

tard the isochronic interval further when they must be crossed by walking travellers. A suitable crossing place must be found or time reduced to ford the river. Most rivers however, have at one point been taken as canoe routes and therefore produce a general expansion across the country. As the territory contains numerous rivers, the pattern contains as many advancing points plotted along them.

The pattern expands along canoe routes much more rapidly than it does over land. In undeveloped territory all advancing isochrones are plotted along rivers. The isochrones along the eastern shores of Lake Winnipeg recurve to penetrate the interior more quickly than when they outline the overland travel farther to the south. Rivers are responsible for most of the lateral expansion on either side of transcontinental routes crossing the Shield.

When rivers contain many rapids and waterfalls they greatly retard the expansion of the isochronic intervals. A full portage, even along a portage route, involves more time than walking free handed. Therefore, the isochrones outlining canoe routes are often inconsistent in the width of their intervals.

However, waterfalls and rapids attract isochrones since they have attracted settlements. Many such examples are found on the dissected edges of the Shield on the north shore of the St. Lawrence River and also along the Winnipeg River. Dam sites are found throughout the Shield and short roads and railway tracks are often located nearby. Many settlements are located at the sites of rapids and fords. A few examples are Fort William, Kenora, Selkirk and Drummondville.

Swamps. A third hydrographic control is the ubiquitous occurrence of swampy land. This is a negative influence as everywhere it

causes retarded islands in the pattern or deflects the advancing isochrone. Transportation across these areas is either very slow or impossible. Swampy areas attract neither settlement nor roads and therefore no isochrones. They are patches of unused land. Two well defined examples in the west are the Big Grass Marsh just west of Lake Manitoba. (Fig.2) and the Highland area south east of Winnipeg.(Fig.7)

Vegetation. Expanses of forest land reduce the isochronic intervals if the traveller is walking and shorten the lateral expansion along roads through heavily wooded areas. Examples of this control are found throughout the Shield.

Forest reserves contained within well settled lands distort the regular pattern by deflecting the isochrones and causing retarded islands. An example of this is found south west of Brandon in the Spruce Park Forest Reserve. When these reserves occur in sparsely settled areas the change in pattern is not so apparent. The Duck Mountain Forest Reserve is an example.(Fig.15)

Forest reserves, contained in provincial parks attract isochrones through the area or along the border. Such patterns are found outlining roads through the Riding Mountain National Park and the Algonquin Park north of the Frontenac Axis.

CHAPTER SEVEN

CONCLUSIONS

Zones of influence. It is difficult to compare the centres of Winnipeg and Montreal with reference to either their geographic locations or their zones of influence. Winnipeg is at the crossroads of Canada's travel. The influence of this city extends north to the mining areas, west across the Second Prairie Step, east to Fort William, and south to the United States. There are no other large centres within a wide radius to attract the isochrones and distort the pattern expanding from one focal point. Brandon is the second largest city within the province and offers only a minute competition for Winnipeg. The trend towards decentralization is only beginning in Manitoba and all routes are focused on Winnipeg.

Montreal is the terminus of much transcontinental traffic in Canada. The influence of this city does not extend to the second hour beyond the provincial border to the west because of the nearby locations of Ottawa and Toronto. North, down the St. Lawrence River, the competition of Quebec City is encountered. The area of influence between these two cities is divided by the city of Three Rivers. The Clay Belt is equally connected with Quebec City and Hull, but is beyond the direct influence of either. North Bay, Sudbury and Sault St. Marie are within the orbit of Toronto and Ottawa. Beyond Lachute, the settlements in the Laurentians and along the Ottawa Valley are centered on Hull and Ottawa.

Decentralization has made rapid progress in the east and manufacturing and industry no longer centered only in Montreal. They have expanded beyond the larger centres of Quebec City, Three Rivers and Sherbrooke to the towns of Valleyfield, St.Hyacinthe,Shawinigan Falls,

Sorel, Drummondville and even smaller centres throughout the province. Many of these smaller centres are nearby or connected with other ports on the St. Lawrence River; Sorel, Three Rivers, Quebec City and the Saguenay ports of Chicoutimi and Port Alfred.

Several smaller centres because of their industries, adequately serve their surrounding areas and reduce the influence of Montreal. Sherbrooke is the hub of the Eastern Townships; Megantic is a distributing centre for a large district and Joliette is the heart of the eastern Laurentides.

The influence of negative areas. The negative areas immediately surrounding the two centres are illustrated on the accompanying map by distortions in the local patterns and by retarded islands. These negative areas have been discussed in connection with the control of highlands, swamps, and forests. The greater concentration of distorted patterns is found where the Shield encroaches upon the lowlands of the St. Lawrence and Red Rivers. These sparsely settled lands lie north east to south west of Winnipeg and north west of Montreal in the Laurentians. A third region surrounds Ottawa in the Gatineau Hills and the Frontenac Axis. The concentration is greater in the east because the Shield is higher and more rugged than in the west. These negative areas are responsible for decentralizing the pattern of accessibility from Montreal and for spreading the isochrones along the St. Lawrence and Ottawa rivers. Therefore, they weaken the influence of Montreal to the west. A similar, but less pronounced pattern east of Winnipeg, does not check the expansion of that centre to the same extent.

Pattern of accessibility. The areas of relative accessibility surrounding the two centres of Winnipeg and Montreal are outlined by isochronic calculations on the accompanying map. The preceding chapters of this thesis have discussed the trends of local patterns and the causes that shape them.

The western pattern is more regular because the variations in the topography are less extreme. Homogenious areas are more expansive. The system of land division is uniform and therefore patterns are similar. The centre of Winnipeg is well defined as all main routes extending to the settled regions of the province converge on this point. The isochronic pattern outlining these routes indicates both the economic and topographic control of this centre over the surrounding areas. The pattern expands from one centre only; north to the Shield, west over the prairies, south to the International border and east to Fort William and Fort Francis. This pattern indicates the dependence of these peripheral settlements[3] on the one large centre. At no point does another centre form a competing pattern.

In the east the pattern is not so well defined. The topographic controls are greater; higher relief, larger rivers, and an interrupted lowland. There is little similarity in the layout of farming land. The isochrones expand a few hours from Montreal and then appear to radiate from the other centres of Quebec City, Ottawa, Toronto and Sudbury. These isochrones outline routes that terminate in several large centres. Because the Northern Transcontinental Railway connects with Quebec City and branches to Chicoutimi, peripheral settlements to the north do not depend on Montreal. Neither do those to the south, being well served by centres

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3 Peripheral to the calculated pattern.

on Lake Ontario. The changing pattern of relief and hydrography and the various locations of industry between Montreal and Fort William deflect the isochrones and prevent the possibility of a pattern expanding from a single centre.

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Berens River, Manitoba	63 A
Brandon, Manitoba	62 G
Cormorant Lake, Saskatchewan-Manitoba	63 K
Hecla, Manitoba	62 P
Kississing, Saskatchewan-Manitoba	63 N
Neepawa, Manitoba	62 J
Selkirk, Manitoba	62 I
Waterhen, Manitoba	63 B
Wekusko, Manitoba	63 J
Armstrong, Ontario	52 I
Carroll Lake, Ontario	52 M
Dryden, Ontario	52 F
Ignace, Ontario	52 G
Kenora, Ontario	52 E
Lac Seul, Ontario	52 K
Lake St. Joseph, Ontario	52 O
Long Lake, Ontario	42 E
Nakina, Ontario	42 L
Nipigon, Ontario	52 H
Pointe Du Bois, Manitoba-Ontario	52 L
Quetico, Ontario	52 B
Rainy Lake, Ontario	52 C
Rainy River, Ontario	52 D
Sioux Lookout, Ontario	52 J
Trout Lake, Ontario	52 M
Ottawa, Ontario	31 G
Montreal, Quebec	31 H
Quebec, Quebec	21 L
Sherbrooke, Quebec	21 E

Scale 3 miles to 1 inch.	
Fairford, Manitoba	172
Turtle Mountain, Saskatchewan-Manitoba	21
Virden, Saskatchewan-Manitoba	71

Scale 8 miles to 1 inch.	Sheet No.
Broadview - Dauphin, Manitoba	42 SE
Chapleau-Sudbury, Ontario	41 NE
Chibougamau-Roberval, Quebec	32 SE
Chicoutimi-Rimouski, Quebec	22 SW
Geraldon-White River, Ontario	42 SW
Hearst-Cochrane, Ontario	42 SE
Ignace-Fort William, Ontario	52 SE
Kowkash-Martin Falls, Ontario	42 NW
Manitoulin-Owen Sound, Ontario	41 SE
Michipicoten-Sault Ste. Marie, Ontario	41 NW
Mistassini, Quebec	32 NE
Moosonee, Ontario	41 NE
Noranda-Waswanipi, Ontario-Quebec	32 SW
Pasquia Hills-Swan River, Manitoba	63 SW
Parent-Three Rivers, Quebec	31 NE
Pletipi, Quebec	22 NW
Quebec-Edmunston, Quebec	21 NW
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