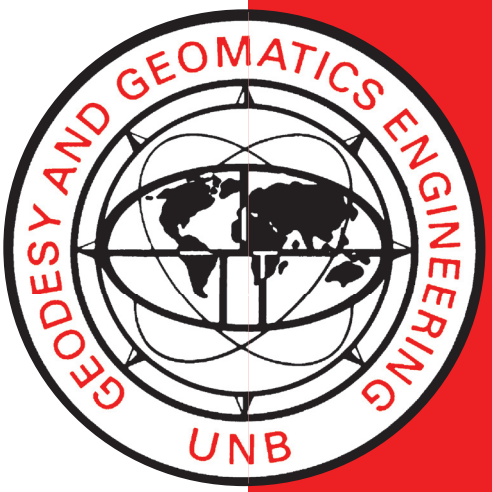
OUTLINE FOR A LAND INFORMATION SERIES IN THE HISTORICAL SECTION ATLAS OF CANADA

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PREFACE

In order to make our extensive series of technical reports more readily available, we have scanned the old master copies and produced electronic versions in Portable Document Format. The quality of the images varies depending on the quality of the originals. The images have not been converted to searchable text.

OUTLINE FOR

A LAND INFORMATION SERIES

IN THE

HISTORICAL SECTION

ATLAS OF CANADA

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PREFACE AND ACKNOWLEDGEMENTS

The need for this series of atlas sheets stemmed from my attempt to convey to my students the history of the exploration, the surveying, and the mapping of Canada in two or three one-hour lectures.

In my search for resource material, I found unlimited details in Don Thomson's Men and Meridians, and I found a partial synthesis in the atlas sheet on The Territorial Evolution of Canada. Between these two extremes there are countless books, articles, and maps focusing on one region or one period, but nowhere could I find a synthesis that gave the highlights of the activities in all regions for all time periods. If such a synthesis does not exist, then I assumed that others who attempt to tell the story of the exploration, surveying, and mapping of Canada would have a need similar to mine, and I concluded that something should be done about it. The series outlined here would, I believe, meet this need; the format would be similar to that of The Territorial Evolution sheet and the content would be the essence of Men and Meridians.

An informal proposal submitted to the Director-General of the Surveys and Mapping Branch, Mr. R.E. Moore, led to a contract for a feasibility study with Mr. Dan McKay, of the Historical Section of the National Atlas, as project officer. Subsequently, after some preliminary work and several discussions with Mr. McKay, I invited Mr. Lou Sebert and Dr. John McLaughlin to join me as co-investigators.

On behalf of Lou and John it is a pleasure for me to acknowledge the whole-hearted cooperation we all received from the many people with whom we discussed this project. We are especially indebted to Sandy Sandilands for giving us a written critique of our draft of the hydrographic sheet and to Dan McKay for his guidance and encouragement.

Angus Hamilton

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SUMMARY

This is a feasibility study on the publication of a land information series for the historical section of the National Atlas of Canada.

In the main part of the report the title, subtitle, aim, background, suggested presentation format, and a list of resources are presented for each of the eight sheets.

The reason for the inclusion of each sheet is preceded by a general rationale in which the following three points are discussed:

(1) This series is proposed as the first step in a strategy to overcome the "cartographic illiteracy" that is widespread in Canada.

(2) Depiction of the main steps by which Canada emerged from a "terra incognita" to a very well known land will help history teachers to describe our "victories" over nature that make our history as dynamic as that of countries whose victories were over oppressors or invaders.

(3) This series will be invaluable for those who need to see land information in Canada in perspective in order to make sound day-to-day decisions on the use of our most precious national resource - land.

It is concluded that the production of these sheets is both feasible and desirable, and it is recommended that the compilation and production of these sheets should be undertaken as soon as possible.

RATIONALE

General

The land information series of the historical section of a national atlas differs from other series, such as, say, physical geography, in that the land information section presents the history of information that describes land, but it does not attempt to describe the land itself.

Nine million square kilometres is a lot of land. No one human intellect can grasp and retain all the details of even a few square kilometres much less all the facts about nine million square kilometres. Hence we need "models", i.e., maps and other land-related data, in order to understand our land, in order to preserve it, in order to exploit it wisely and manage it effectively; in short, we need information in order to "know our land".

In "new" lands, i.e., those in which settled societies supercede nomadic societies, land initially is a "free good"--available at nominal cost to anyone. The only land information needed is an indication of the soil and the climate and some markers to delimit each person's homestead. As societies mature, good land becomes scarce, hence its value increases and there is intense competition for the more valuable portions. Every mature society has learned that a large amount of land information is needed in order to resolve the competing interests for scarce land in a reasonably amicable way. This pressure appeared in most European countries in the previous century.

As a consequence of the competition for scarce land, most European countries have developed quite comprehensive land information systems. On the other hand, in Canada, until a couple of decades ago, many land

information products were regarded as an unnecessary luxury; with only a few exceptions, land information was a victim of the pioneer syndrome. In the last couple of decades, that attitude has been changing; environmental controversies, pollution, loss of agricultural land, potential shortages of lumber and pulpwood, urban sprawl, the high cost of urban building lots and many other factors have contributed and are continuing to contribute to the recognition of the need for much more information about our land.

Accordingly, during the last couple of decades, there has been a rapid increase in the amount of land information; in fact, in some parts of the country, it is now on a par with comparable parts of Europe. What is not, by any means, on a par with any part of Europe is the general understanding of the role of land information in utilitarian decision making. Quite often this is simply because people are unaware that the information exists. The availability and wide dissemination of this series will contribute to the education of those who need to see land information in perspective in order to make sound decisions.

The maps, charts, photographs, and documents on land information in Canada are a form of infrastructure that is as essential to society in the information era as roads, railroads, and canals were to society in the industrial era. This fundamental concept was stated explicitly in the report of the U.K. Ordnance Survey Review Committee in 1979, "the national geodetic and topographic archive is part of the essential infrastructure of a modern state".

Information is itself a resource just as a road network, a power system, or a communications network is a resource. It costs money to acquire this resource; it costs money to maintain it. The cost to use it is nominal; failure to use it when it should be used is a waste of a

national resource. Our country is not rich enough to be able to afford waste.

If the land information resource is presented as part of the national atlas, failure to use this resource will be reduced, and if all the components of the land information subset are presented together, the improper use of this resource will be further reduced. Thus, there is a very practical utilitarian reason for including a land information subset in the national atlas.

Quite apart from this practical reason, there is another reason why land information should be included in the national atlas: it should be included as part of our cultural evolution, as part of our national awareness of one of our two great assets--land and people.

The character of every nation is shaped by the complex interactions between its people and its land. The land alters the people and the people alter the land. In order to understand a nation and hence to manage it effectively, it is necessary to have a large volume of information about both the land and the people.

The challenge that Canada's relatively small population faces in fully possessing our enormous territory has become a cliche. Early settlement proceeded on the sketchiest land information and with no systematic people information system whatsoever. By the mid-1800s the need for people information was recognized and the decennial census was initiated in 1851.

Concurrently with the introduction of the census and through to the early 1900s many "atlases" were published and there were many brave efforts to develop a land information system comparable to that which was in place in most European countries; these efforts came to naught because the task was too formidable and new land was always available. There was no need

for careful management of the land already settled. Lacking a structured system for information on land, various improvisations were developed.

As there were very few good maps available, it was not considered necessary to include the use of maps--either topographic or cadastral maps--in the school curriculum and hence there was no need to discuss maps at the normal schools and subsequently at university education faculties. Thus, to this day, the effective use of maps is not an integral part of Canadian culture. For the most part Canadians are "cartographically illiterate".

In the latter half of this century, technology, especially air photography and photogrammetry, has enabled Canada to move rapidly toward the European level of information on land. Now, in many parts of the country, we have good land information but neither elected legislators, administrators nor the population in general know how to use it effectively. Some "quick fixes" can be achieved by seminars, etc., but these are, at best, interim solutions. The only meaningful long-term solution is to introduce at least an awareness and some rudimentary understanding of land information into the school system. For this, it must first become an integral part of the programme in the education faculties of the universities. For their part, the education faculties cannot undertake this task until they are provided with the material to do so.

Whereas the history of most countries features battles won, kings crowned, oppressors overthrown, invaders repelled, etc., it is sometimes said that Canada has no history. In fact, Canada has a colourful history, a history of battles with nature; many were victories but some, such as John Franklin's last battle with nature, were defeats. The depiction of

many of these "battles" compactly on a few map sheets will be an invaluable resource for a teacher who wants to dramatize Canada's own history.

Thus there is an urgent need for material by which both the cultural and the practical role of land information in a post-industrial society can be communicated readily. As the national atlas is the most comprehensive guide to information on the nation's resources, there is no better way of telling the people of Canada that there is now a large volume of data on land information than by compiling a land information subset within the national atlas framework.

Sheet-by-Sheet

In addition to the general rationale for the inclusion of a land information series in the national atlas, there is a specific rationale for each of the sheets outlined in the previous section.

Rationale for Sheet #1: The Discovery of the Shape of Canada.

This sheet is included in the series because it shows the first generation of meaningful land information in Canada. This is important because it is a fundamental element in our national cultural heritage; as such it should be available in an easy-to-comprehend way to everyone.

Rationale for Sheet #2: Geodetic Positioning: The framework for mapping Canada.

The special rationale for this sheet is that it will dramatize the continuity from the work of the early explorers to the work of today's precise high-technology geodesists. It will demonstrate that the state-of-the-art has advanced dramatically in three and a half centuries,

but that the task is essentially the same--to determine coordinates with state-of-the-art technology.

Cross-references to other sheets in the series will remind the reader that a coordinate framework was necessary for the explorers' sketches and is still necessary for every map produced today. Compilation of this sheet will also prevent superceded work from being "lost". It will be a means of preserving the significant elements of geodetic history in Canada and for explaining geodetic culture to Canadians.

Rationale for Sheet #3: The Hydrographic Exploration of Canada's seaways and waterways.

In the first paragraph of his paper on "The History of Hydrographic Surveying in British Columbia", R.W. Sandilands makes a statement that could be used as the rationale for this sheet.

> Most people are aware of the requirements for maps or charts in the development of a country. Possibly the need for charts is greater than that for maps, as on land you can see ahead, you can stop in your tracks, you can alter your direction of advance easily. However at sea this is not possible. Unseen dangers lurk under the water; ships, and especially sailing vessels, are not easily stopped and have limited manoeuvrability. Thus the need for adequate hydrographic charts is essential for the colonization and development of a coast, and we have to thank the early exploring hydrographers who risked their ships and their lives for the safe passages we make today.

That statement is true for countries with limited coastlines. It is all the more true, and important, for Canada with the longest coastline of all nations. In addition to the opening of sea lanes, Canadian hydrographic charts served as horizontal control for countless land maps that were drawn inland from the coast or the shores of the Great Lakes. Hydrographic charting is an important aspect of the geography of Canada. An understanding of how and when it developed is an important aspect of the

history of Canada. Serving as it does both the geography and the history of the country, this sheet deserves a place in the Atlas of Canada.

Rationale for Sheet #4: The Original Land Surveys of Canada.

Regardless of whether it was for the Bretons in the early 1500s or for the sons of prairie farmers pushing north from the Peace River country in the 1950s, some form of boundary survey was done. Sometimes it was systematic, as in the Dominion Land Survey System; sometimes it was piecemeal, as in much of the Atlantic Provinces. Sometimes it was done after there had been some settlement; sometimes it was done in vain, as in some of the northern parts of Ontario and of the Prairie Provinces, where the land was never settled.

Although there is much in common with other atlas sheets, such as those depicting settlement, there is much that is different. It tells a different story; it is part of our heritage. Whether wisely done or not, original land surveys have been found to be essential for the orderly settlement of any new land.

Rationale for Sheet #5: The land registries of Canada.

The study of the effect of the land registration system on the culture of a society is a relatively new field of study. Nevertheless, it is an important one because many developing countries are now undertaking major land reform programs without recognizing that the form of land registration can have a significant impact on a land reform program. Canada is a particularly fruitful field in which to study land registration; this is because we have a relatively primitive grantor/grantee system in the east and a Torrens, i.e., a guaranteed title, system in the west. Production of

an atlas sheet showing land registration will be invaluable for researchers on land registration.

It will also reveal the magnitude and the locations of one of the larger sources of archival data in Canada.

Rationale for Sheet #6: Early Mapping for Economic and Social Development in Canada.

There seems to be a gap in the knowledge that most educated Canadians have in the history of the mapping of their country. Such people know of the work of the explorers and are generally familiar with modern maps, but they have only a vague notion about what took place in between. This sheet is designed to show such people what areas were mapped in detail by surveyors (not explorers) during the nineteenth century, and how these surveyors did their work. The explorers made great, and admirable, journeys and produced small-scale sketch maps of their travels. The surveyors whose work is described on this sheet measured the ground, either by chain, by pacing or, later on, by a micrometer range-finder. They produced maps that were needed immediately for settlement, for land accounting and for resource development. Their work was not as accurate as that of the twentieth century topographers, but it was sufficient unto the day, and their maps were available when they were needed.

Rationale for Sheet #7: The Evolution of Topographic Mapping in Canada.

Canada was one of the last of the industrialized countries to start a topographical survey. The very size of Canada and its regions of almost impossible access (at least in the first years of the twentieth century) deterred the government officials from starting a program of general

purpose topographic mapping. One can almost hear the cries of "who needs it" that would greet any official who proposed the formation of a topographical survey. However, the military establishment and the Geological Survey were two groups that expressed a need for topographic maps. Within a few years the general need of the whole country for a good system of maps was apparent.

This sheet carries the story of the spread of topographic knowledge across the country. This story will be of interest to geographers, to historians, and to the general public. The availability of old topographic maps in map libraries will interest those who are studying the changes in the face of Canada.

Rationale for Sheet #8: Early Photography and Remote Sensing of Canada.

There is persuasive evidence that most Canadians have no idea of the extent and availability of the air photos of Canada. The followers of many scholarly disciplines could use air photos in their work but don't do so either because they don't know they exist or don't know how to obtain them. This sheet should do much to clear away these mysteries and misconceptions. Without getting down to the level of a "how to" graphic, this sheet should suggest uses for old and modern air photos that can be employed by individual researchers. From a mercenary point of view, this sheet should promote more and better use of the National Air Photo Library.

Remote sensing is still a mystery to many peple. Although the information on remote sensing given on this sheet will not answer all questions, it will answer some and it will state that there are people at the Canada Centre for Remote Sensing that will answer the rest.

AIM, BACKGROUND, PRESENTATION AND RESOURCES FOR COMPILATION

For each of the eight sheets that has been identified for this series, a concise statement of the aim, i.e., the message to be conveyed, is followed by a narrative on the background, a proposed format for the presentation, and a list of resources for use in compiling it.

SHEET #1

Title

The Discovery of the Shape of Canada.

Subtitle

The first recognizable planimetry of Canada.

Aim

The purpose of this sheet is to show when the general shape of the more prominent features of the Canadian landscape emerged and insofar as possible to give credit to the surveyor-explorers who made the observations.

Background

The shape of Canada emerged incrementally over a period of some 400 years. There are countless maps showing the extent of the knowledge of Canada's principal features at various epochs. For example, by 1632 Champlain had compiled a map depicting in clearly recognizable form the coastlines of the Atlantic provinces, the St. Lawrence River and gulf, and the lower section of the Ottawa River. Similarly in 1703 the De l'Isles (father and son) published a map on which the main features of Quebec and Labrador as well as Lakes Ontario and Erie are clearly recognizable.

The methodology used by the De l'Isles and others in compiling their maps is aptly described in a paper by Heidenreich and Dahl, published in the December 1980 issue of The Map Collector, as "drawing on direct observation and often aided by native geographical accounts...manuscripts and printed maps...collectively, illustrate the growing European knowledge of the interior of the continent."

Thanks to the dedication of historical cartographers, such as Heidenreich and Dahl, and to those who are compiling the Historical Atlas of Canada, a substantial stock of resource material is being built up for those who are interested in specific periods of our history.

In all of this work, the emphasis is on the state of knowledge at specific epochs. In mathematical jargon, the historical researchers are treating time as the independent variable.

Those who are not particularly concerned about any one epoch but wish to know when a certain level of knowledge (e.g., clearly recognizable features) became available must still refer to many sources. There is a need for one sheet on which the progression of knowledge (of clearly

recognizable features) over the entire 300 to 400 years of discovery is depicted. In other words, there is a need for a sheet showing the "march of the surveyor-explorer". In mathematical jargon, the level of knowledge would be the independent variable and time would be the dependent variable.

Obviously, "clearly recognizable features" is far from precise. Nevertheless, with few exceptions, there is a distinct difference between maps based on "direct observations" and those based on "native geographical accounts." The intent here is to include the first map compiled using direct observations.

Presentation

1:7.5 m with some inserts. It is proposed that this sheet be compiled in the same way that a photographic mosaic is compiled. Specifically, for each region of the country, the "first clearly recognizable" depiction would be selected and mosaiced to fit (approximately) with adjacent pieces of the mosaic. The period during which the work was done (or the date of publication) and the name of the surveyor-explorer who did it, or the name of the cartographer would be clearly shown on each mosaic segment (see example attached).

It is suggested that each mosaic segment be a slightly different colour; for example, the segments on the east coast could start at the blue end of the spectrum and the segments for the high arctic could terminate at the red end of the spectrum.

The mosaic origin of this sheet will need to be emphasized rather than de-emphasized in order to ensure that it is never mistaken for a map. To achieve this, techniques such as leaving a distinct gap between pieces,

and, as noted above, the use of colour and overprinting of date(s), source(s), etc., should be used as much as possible.

Resources

Berkeley, E. and D.S. Berkeley (1974). Dr. John Mitchell: The Man Who Made the Map of North America. Chapel Hill.

Crouse, N.M. (1924). Contributions of the Canadian Jesuits to the Geographical Knowledge of New France, 1632-1675. Ithaca.

Dahl, E.H. (1982). "Treasures of the National Map Collection, Public Archives of Canada." Brochure for an exhibition of 100 original maps, atlases, globes and architectural plans, 1490-1982, Public Archives of Canada, Ottawa.

Delanglez, J. (1943). "The sources of the Delisle map of America, 1703." Mid America, Vol. 25, No. 4, pp. 275-98.

Heidenreich, C.E. (1976). "Explorations and Mapping of Samuel de Champlain, 1603-1632." Cartographica, Monograph No. 17.

Heidenreich, C.E. and E.H. Dahl (1982). "The French Mapping of North America, 1600-1760." The Map Collector, reprinted by Abacus Press, September (originally Issue 13, December 1980, p. 2-11; Issue 19, June 1982, p. 2-7).

Thomson, D.W. (1966). Men and Meridians. Vol. I, Thorn Press Limited. Available from the Queen's Printer.

SHEET #2

Title

Geodetic Positioning: The framework for mapping Canada.

Subtitle

Where, on Earth, are we?

Aim

The purpose of this sheet is to depict, in layman's terms, the role of positioning, i.e., of geodesy, in the development of mapping in Canada and hence in our understanding of Canada.

Background

When the first surveyor-explorers began their work in Canada, the science of geodesy was in a primitive state. Although Copernicus' theory had been accepted, very little was known about the size and shape of the Earth; the great debate between the British and the French as to whether the Earth was an oblate (pumpkin-shaped) spheroid or a prolate (egg-shaped) spheroid had not even begun. The astrolabe was available for determining latitude to within a mile or two but, without portable chronometers, there was no way of getting an absolute determination of longitude. Approximate differences in longitude (relative longitudes) could only be determined by

dead reckoning (keeping a record of the distance and direction travelled). It takes little imagination to visualize the difficulty of dead reckoning when in a canoe or when following a winding trail through the forest.

Despite the lack of good instruments and good working conditions, some of the early surveyor-explorers did outstanding work.

The important point to note here, however, is that the objective of determining the latitude and longitude of points on the surface of the Earth was the same then as now.

In neither an ideal world nor in the real world is it possible to make a useful map without a framework--a network of points whose positions relative to each other is known. In an ideal world with no economic or technical constraints, a very precise geodetic framework would be established before any mapping at all was done. In the real world, if no network at all is available, all a map maker can do is to sketch by eye what he can see from one place, then move to another place and make another sketch. If the framework necessary to determine the distance between the two places is not available, then the two sketches cannot be related to each other, and a meaningful map cannot be produced.

For very small scale maps (such as an atlas sheet), the accuracy of the relative positioning can be relatively low (a few kilometres), however, for larger scales, higher accuracy is required. Ultimately for scientific purposes, such as the measurement of continental drift, an accuracy of a very few centimetres is required. Needless to say, the cost usually increases with the accuracy and, of course, the equipment and methodology for making more accurate measurements are improving along with improvements in technology.

There have been several stages in the evolution of position

determination in Canada.

(1) The methods used by the early surveyor-explorers. Champlain, and others in the first generation of surveyor-explorers, used the astrolabe (for latitude determination to within approximately one or two minutes of latitude, i.e., one or two miles), and dead reckoning, as described briefly above. Subsequently the method of lunars was developed, and surveyor-explorers, such as David Thompson, could determine both latitude and longitude to within a few arc-minutes.

(2) The methods used for land surveys. By the time extensive land surveys for settlement were getting under way, portable chronometers had been developed, and with sufficient time and care both latitude and longitude could be determined from star observations quite precisely (within a few arc-seconds). Although these positions were precise, i.e., repeatable, they were subject to the "deflection of the plumb-bob", and hence differ by as much as an arc-minute from the true value. Relative positions for additional points were determined from conventional gound surveys.

These methods provided the framework for the surveys depicted on Sheet #4 and many of the maps on Sheet #6.

(3) Methods used for early hinterland mapping. Despite the effect of the deflection of the plumb-bob, there was no better method than "exploratory astro" to provide a framework for much of the early mapping of the hinterland.

(4) First-order geodetic surveys. The establishment of a framework of first-order geodetic control has been the objective of the more advanced countries since the middle of the eighteenth century. The methodology has changed dramatically and is still changing; nevertheless the objective was

and still is to provide a control framework for all the surveying and mapping of the country, and for many other activities.

(5) Positioning for scientific purposes. This topic is included to show that as positioning technology is now available with a precision much higher than that normally needed for mapping, it is being used to contribute to other aspects of land information.

Presentation

Panel #1: Position determination by the explorer-surveyors.

Cartographic part: A section from Sheet #1 (map based on observations by the explorers) with an overlay of one of the folkloric maps of the same region.

Pictorial part: Picture of an astrolabe and perhaps another instrument used by the early explorers.

Narrative: A brief outline of the way in which latitude and longitude were determined using the instruments pictured.

Message: The relatively primitive work of the early surveyor-explorers was the key to replacing myths by facts about the coastline and the major waterways.

Panel #2: Early astronomic observatories, astronomic boundaries, principal meridians, and base lines.

Cartographic part: The international boundary, the principal meridians of the D.L.S. system, provincial boundaries, and any other astronomically-observed township base lines, etc.

Pictorial part: An early observatory, e.g., the Brydone Jack, and one

of the big field transits.

Narrative: Brief notes relating to the cartographic and pictorial parts.

Panel #3: Astronomic positioning in northern Canada.

Cartographic part: The first edition of part of an 8-mile to the inch map overlaid with a map based on the work of the surveyor-explorers. NOTE: This should be selected to show the improvement in position rather than the increase in the amount and complexity of detail.

Pictorial part: Picture of equipment used in the field survey, in particular the radio receiver and chronograph, should be shown clearly.

Narrative: In lieu of a narrative comparable to that in the other panels, there would be a very small scale chart showing the location of the astro points in the north.

Panel #4: Geodetic first-order control.

Cartographic part: Portion of a large scale map overlaid by a blow-up of a 1:250,000 that was done with minimal control.

Pictorial part: Pictures of various first-order equipment for horizontal and vertical control.

Narrative: A brief explanation of the pictorial part.

Panel #5: Scientific geodesy.

Cartographic part: Overlay of current map of North America and one showing the continent before it drifted to its present position.

Pictorial part: One or two pictures showing, say, VLBI.

Narrative: A brief explanation of techniques and objectives for

scientific geodesy.

Resources

For Panel #1:

Berkeley, E. and D.S. Berkeley (1974). Dr. John Mitchell: The Man Who Made the Map of North America. Chapel Hill.

Crouse, N.M. (1924). Contributions of the Canadian Jesuits to the Geographical Knowledge of New France, 1632-1675. Ithaca.

Dahl, E.H. (1982). "Treasures of the National Map Collection, Public Archives of Canada." Brochure for an exhibition of 100 original maps, atlases, globes and architectural plans, 1490-1982, Public Archives of Canada, Ottawa.

Delanglez, J. (1943). "The sources of the Delisle map of America, 1703." Mid America, Vol. 25, No. 4, pp. 275-98.

Heidenreich, C.E. (1976). "Explorations and Mapping of Samuel de Champlain, 1603-1632." Cartographica, Monograph No. 17.

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Thomson, D.W. (1966). Men and Meridians. Vol. I, Thorn Press Limited. Available from the Queen's Printer.

For subsequent panels:

The annual reports and files of the Geodetic Survey of Canada.

SHEET #3

Title

The Hydrographic Exploration of Canada's Seaways and Waterways.

Subtitle

The first soundings of our seas.

Aim

To illustrate the extent and development of the early charting of the coastal waters of Canada and the Great Lakes.

Background

Much of the Canadian landmass was originally explored by expeditions working inland from the seacoasts or from the St. Lawrence River. Early settlements in Canada were dependent on the maintenance of the sea link with France and England. The safety of shipping in Canadian waters was of vital importance to the colonists and mariners alike, and for this reason the authorities controlling the development of North American settlements gave considerable priority to the production of charts of the approaches to the Canadian coast and the St. Lawrence River. The following is a brief outline of this work.

East coast and St. Lawrence: This charting was started during the

French regime with Jolliet and Franquelin making early contributions, and later (and more expertly) by Jean Deshayes, Testu de la Richardiere, and Gabriel Pellegrin.

After the fall of New France, the British continued this work. Cook, DesBarres, and Holland made important contributions to the knowledge of the approaches to the east coast of Canada. This work was interrupted by the American Revolution but was resumed early in the nineteenth century by officers of the British Hydrographic Office, particularly Hurd, Lockwood, Owen, and Bayfield.

West coast: The first sighting of Canada's west coast by Europeans was made by the Spanish expedition led by Captain Juan Perez in 1774, but no charting was accomplished. Cook visited these waters briefly in 1778, but no significant charting resulted from this expedition. The first important work was done by Captain George Vancouver between 1792 and 1794. At the same time, the Spanish hydrographers, Galiano and Valdez, were working in the area. Although relations between England and Spain were tense at the time, there was fortunately no animosity between the men of the two survey expeditions. On several occasions they were able to exchange data to improve the charting of both parties. The charts resulting from the Spanish work were rarely if ever used due to a policy of secrecy on the part of the Spanish navy, so it was the work of Vancouver that first opened Canada'a western sea lanes.

After Vancouver's departure, there was little official hydrographic activity on the west coast until Commander Belcher and Lieutenant Kellett arrived in 1839. In 1846, due to the Oregon Dispute, there were six ships of the Royal Navy on the coast, including two survey ships (HERALD and PANDORA). Charting was carried out until 1848. The gold rush of 1854

brought additional interest to the west coast and in that year the survey ships THETIS and VIRAGO produced charts of various harbours and channels.

The initial definitive charting of Canada's west coast was brought about as a result of the ignorance of the channels in the San Juan Islands area through which the Treaty of Oregon defined the Canada/U.S. boundary in somewhat ambiguous terms. These surveys were carried out by Captain G.H. Richards, HMS PLUMPER (1857-61), and the complete charting of the coasts of the colonies of Vancouver Island and British Columbia to various suitable scales was continued by Richards, HMS HECATE (1861-63), and Staff Commander D. Pender, H.B.C. chartered steamer BEAVER (1863-70).

The Great Lakes: The initial survey of the Great Lakes is largely the story of the technical career of Henry Bayfield. The work was started in 1815 by Commander William F. Owen but was turned over to Lieutenant Bayfield at the end of the 1816 season. The survey of the Lakes and the St. Lawrence turned out to be his life work until his retirement in 1856.

Arctic coast and Archipelago: The use of Hudson Bay as an entry into western Canada was known to British mariners from the early days of the Hudson's Bay Company, but the Bay was not charted until 1886. The search for the Northwest Passage and the subsequent search for the lost Franklin party turned the attention of the Royal Navy further north. It can be said that original charting of Canada's arctic waters continues to the present time.

Presentation

Cartographic presentation

The presentation of this data must be done separately by maps of the

three coasts and the Great Lakes. Even then, large-scale insets of Nova Scotia and Vancouver Island will probably be necessary, because of the density of charting in these areas compared to the arctic coast. The graphic presentation should be restricted to the showing of the coverage by published charts. The neatline of significant charts should be drawn to scale on the map, and each outline should be given a serial number so that an adjoining tablulation can give the chart title, date, and hydrographer.

The data can be divided into two eras or epochs. It can be said that modern charting got its start with the establishment of the British Hydrographic Office in 1795. The effect of this agency was not seen in Canada until the early years of the nineteenth century, so the division of the work shown on this sheet could conveniently be divided into the pre-1800 era and the post-1800 era. The chart outlines could then be colour-coded with pre-1800 in red and post-1800 in blue.

The earliest charting should be the first true hydrographic chart of the area and not a land map that happens to show a few soundings. The latest charting should be the "earliest modern coverage" but some research will have to be done to establish which charts qualify for this honour. On the east coast, the end of Commander Shortland's work in 1865 might be a cut-off date. On the Great Lakes, the end of Bayfield's work could be considered the end of an era. On the west coast, the 1857-70 surveys are the obvious place to stop. In the arctic, the work is still in progress.

Pictorial presentation

The navigation and charting methods of the eighteenth and early nineteenth centuries were fairly simple, and there is an opportunity here to illustrate the system with pictures or line drawings. The following are

suggested:

- Navigation instruments, i.e., sextant, marine chronometer, sounding line with markings.
- A line drawing illustrating the relation between the elevation of the pole and the latitude of the observer.
- An illustration of sounding (see attached).

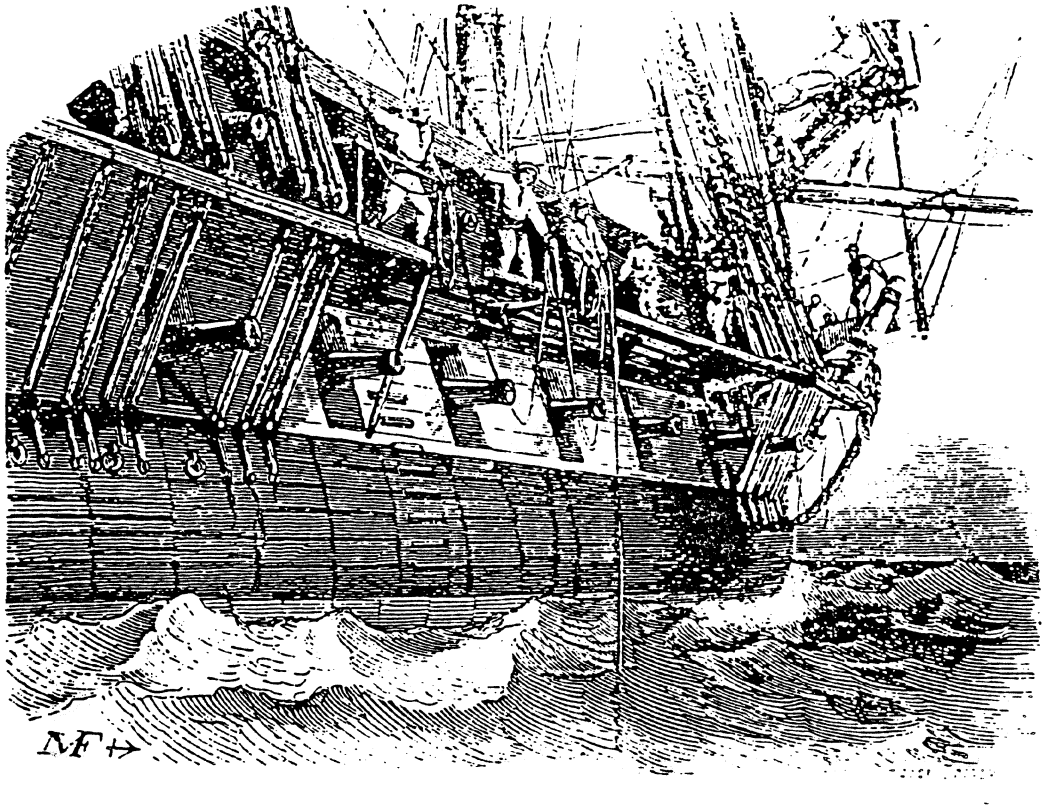
Narrative

The text should cover, in as few lines as possible, the history of the charting of Canadian waters. Emphasis must be given to the earliest significant work, but there should be information presented on charting not illustrated graphically (because of lack of space) but which contributed to better charts. The use of charts outside of navigation must be pointed out. For instance, the first land mapping of the Atlantic provinces, southern Ontario, and southern Quebec owe much of their accuracy to the hydrographic charts that were available when they were drawn. In British Columbia, the coastal charts were connecting links between various land mapping projects that were extended inland up river valleys.

The narrative must try to catch the epic dimensions, and even the glamour and fascination, of the charting of our coastline.

Resources

The National Map Collection holds original charts of almost all significant charting of Canadian waters. In addition, this division of the Public Archives of Canada holds British Admiralty chart catalogues and a good collection of texts and journals on hydrography and hydrographic



A Sounding Team of Five Seamen in the Chains.

The ship appears to be under way so the soundings are probably under ten fathoms.

exploration. The Chartmakers and the hydrographic chapters of Men and Meridians give a good overview of Canadian charting.

The following monographs are more detailed:

West coast:

Sandilands, R.W. (1970). "The history of hydrographic surveying in British Columbia." The Canadian Cartographer, December.

Fillmore, S. and R.W. Sandilands (1983). The Chartmakers: The History of Nautical Surveying in Canada. NC Press Limited, Toronto.

Great Lakes:

Sandilands, R.W. (1980). "Hydrographic surveying in the Great Lakes during the 19th century." The Canadian Cartographer, June.

Arctic coast:

Verner, Coolie (1972). "Explorers' maps of the Canadian arctic." Cartographica, Monograph 6.

Sandilands, R.W. (1981). "Charting the Beaufort Sea." Lighthouse, Edition 24, November, pp. 10-12.

East coast:

Sebert, L.M. (1983). "Charting of the Gulf of Maine." In: Delimitation of the Maritime Boundary in the Gulf of Maine area (Canada/United States of America), Annexes to the Counter-Memorial submitted by Canada, International Court of Justice, Vol. III, State Activities.

St. Lawrence River:

Pritchard, J.S. (1979). "Early French hydrographic surveys in the Saint Lawrence River." International Hydrographic Review, Vol. LVI, January.

McKenzie, R. (1984). Admiral Bayfield. The Champlain Society, Toronto.

SHEET #4

Title

The Original Land Survey of Canada.

Subtitle

Surveys for orderly settlement.

Aim

The aim of this sheet will be to describe the evolution of the original land surveys of Canada. It will focus on:

(a) the extent of survey at particular stages in our country's development;

(b) the nature of the survey (i.e., whether systematic or unsystematic);

(c) the primary sources of information concerning these surveys.

Background

Land surveys are performed to provide a means for the spatial organization of society and to provide certain information necessary for the orderly settlement and development of the land. There are various forms of land surveys, of which the most fundamental and legally significant are the original surveys.

Original surveys are carried out when land is first alienated from the

state (the Crown in Canada), and provide the legal framework to which all subsequent subdivision, assembly and retracement surveys are related. Original surveys may be of a systematic nature (when all parcels of land are referenced to a common physical or mathematical framework); or they may be defined as unsystematic when each parcel or small group of parcels employs its own independent reference framework. The Dominion Land Survey System of Western Canada is a well-known example of a systematic survey, whereas the metes and bounds surveys of the Maritimes are a classic example of the unsystematic approach (if and when all surveys in the Maritimes are related to the coordinate systems, then this distinction will no longer apply).

It is not possible to map out all the subdivision and retracement surveys which have been performed in Canada (for one thing it would be virtually impossible to organize the necessary documentation), nor would such an exercise be particularly germaine to the task at hand. It is therefore proposed for both conceptual and practical reasons to concentrate solely on the original surveys.

The original land surveys are closely associated with the major periods of settlement in this country. In this context, it will be important to distinguish:

(a) The surveys carried out by the French engineers and surveyors in support of the seigneurial system of land tenure. The first mentioned of a seigneurial grant in New France dates from the 1620s. By 1758, there were approximately 210 seigneuries in Canada involving more than 3 million hectares of land. It should be noted that while no new seigneuries were granted after the fall of New France, vestiges of the seigneurial system remained until 1854.

(b) The earliest land grants and surveys made on behalf of the English Crown. While dating from the 1720s, these surveys were begun in ernest after the Treaty of Paris. In December of 1763, the first Royal Instructions were issued for land grants in Canada. The next year Captain Samuel Holland and his deputy surveyors began the survey of the Ile St. Jean, followed by the survey of Cape Breton, etc.

(c) A significant stepping up of these surveys following the influx of the loyalists into Canada and the Maritimes after 1780. Of special significance during this period were the major township surveys. In Ontario, for example, the earliest townships were laid out along the Saint Lawrence River west of the Seigneurie of Longueil in 1783-84. Over a period of time a variety of original survey systems evolved in Southern Ontario, resulting in more diversity than in any other province (as noted by R.I. Gentilcore in an essay published in Ontario History).

(d) The subsequent surveys for the Red River settlers in 1812 and Vancouver Island in the 1850s. The initial surveys in the Vancouver Island Colony were carried out by Joseph Pemberton between 1851 and 1858. He employed a more or less rectangular system, but allotments were surveyed as isolated parcels. Rectangular surveys were commenced on the mainland in 1859. Subsequently the "district lot system" was introduced and became the most widely used survey system in the province.

(e) The Dominion Land Survey System of western Canada which was commenced in 1871. By 1930 when the responsibility for resource management was transferred to the provincial governments on the prairies, more than 200 million acres of land had been surveys in Manitoba, Saskatchewan, Alberta and parts of B.C.

(f) The surveys carried out since 1930 to flesh out the original survey fabric in the South and to extend the surveys into the North. In this regard, special consideration might be given to the aboriginal settlement claims process in the north.

Presentation

A single map of Canada at 1:7.5 million scale showing the land as far north as the Yukon coast should be sufficient. The sheet should be designed, perhaps, using the "Territorial Evolution" example to distinguish between the systematic and unsystematic surveys at various stages in their development.

In the text, the principal sources of information concerning the original surveys (i.e., the provincial crown lands records and the federal Surveyor-General records) should be noted.

Resources

Principal sources of information for this theme will be provided by the provincial Directors of Survey/Surveyors General and the Surveyor-General of Canada. As well much has been written on this theme in the land survey and settlement geography literature. Well-known examples include:

Burridge, J.H. (1952). "Land surveys of Newfoundland." The Canadian Surveyor, Vol. 6, No. 3, pp. 2-7.

Burridge, J.H. (1956). "History of surveys in Newfoundland." The Canadian Surveyor, Vol. 10, No. 6, pp. 14-23.

Cote, G. (1956). "Public lands and cadastral surveys in Quebec." The Canadian Surveyor, Vol. 10, April, pp. 69-79.

Dickie, R.E. (1957). "Problems in Nova Scotia granting of lands and surveying." The Canadian Surveyor, Vol. 11, No. 6, pp. 41-45.

Gentilcore, R.L. (1969). "Lines on the land." Ontario History, VLI (2), June, pp. 57-73.

Gentilcore, R.L. and G. Head (1984). The History of Ontario in Maps. University of Toronto Press.

Harris, Richard (1968). The Seigneurial System in Early Canada. University of Wisconsin Press, Madison.

MacGregor, J.G. (1981). Vision of an Ordered Land. Western Producer Prairie Books, Saskatoon.

Milgate, R.J. (1946). "Land development in Nova Scotia." Proceedings of the C.I.S., pp. 40-52.

Milgate, R.J. (1954). "Surveys in Nova Scotia." The Canadian Surveyor, Vol. 8, No. 10, pp. 11-14.

Schott, Carl (1981). "Landnahme and kolonisation in Canada, am beispiel Sudontarios." Excerpts translated in the Canadian Geographer, XXV, 1.

Sebert, L.M. (1963). "The history of the rectangular township of the Canadian Prairies." The Canadian Surveyor, XVII (5), pp. 380-389.

Sebert, L.M. (1980). "The land surveys of Ontario 1750-1980." Cartographica, Vol. 17, No. 3.

Taylor, W.A. (1961). "System of survey in British Columbia, 1851-1961." Unpublished manuscript data October 23.

There are also extensive works by Dr. Don Thomson, Prof. William Wonders of the University of Alberta, and Prof. Andrew Clark of the University of Wisconsin.

SHEET #5

Title

The Land Registries of Canada.

Subtitle

Archives for deeds and mortgages.

Aim

The aim of this sheet will be to:

(a) Trace the introduction and evolution of land registration across the country.

(b) Distinguish among the various types of registration introduced (and especially the fundamental distinction between active and passive systems).

(c) Delimit the boundaries of the various land registration offices (which varied over time).

(d) Describe the current arrangements and sources of land tenure information.

Background

Land registration systems are designed to provide a public record of legal interests in land. They may be either passive or active in nature.

Passive systems provide a form of archival storage for documents pertaining to land tenure; the state is not responsible for examining these documents or ascertaining their legal validity. The registries of deeds employed in the Atlantic provinces and much of Ontario are examples of passive systems.

Active systems on the other hand entail the active involvement of the state in the conveyancing process. An interest ordinarily cannot be transferred unless the appropriate instruments of conveyance have been examined and approved by public officials. The state then provides a record of the current title to the land, and not merely a record of documents pertaining to the title. The state may also assume a responsibility for "guaranteeing" the title. The Torrens land title systems, as used in Western Canada, are examples of active land registration.

Every province has its own unique land registration history and no two provinces have exactly the same kind of system (even on the Prairies, each Torrens system has its own variations). A brief thumbnail sketch for each jurisdiction follows.

(a) Land registration came rather late to Newfoundland. In the beginning, of course, there was a prohibition against permanent settlement, and it was not until 1699 that the English Parliament first acknowledged claims to private land ownership. During the 18th century, naval governors issued grants and delivered judgements, but without the aid of public recording offices. There was an effort by Chief Justice Tremlett to introduce a form of land registration in 1807 with an order that instruments of conveyance would be deemed void unless registered with the Supreme Court; however, this order was almost immediately rescinded. It was not until after Newfoundland achieved representative government that a

registry of deeds system was authorized (in the Judicature Act of 1824). This provided for 3 registries, in St. Johns' Harbour Grace and Ferryland. By 1883, the latter two offices had been closed and since that time all deeds in Newfoundland have been registered in St. Johns. Even today it is estimated that the root of title to more than 50% of private land holdings in Newfoundland is based upon occupation.

(b) Rudimentary deed registry systems were introduced into the Maritimes by statute in the latter part of the eighteenth century (the Registry Act was one of the first statutes passed by the New Brunswick government in 1784-85, for example) and were based in part on the English examples of Yorkshire and Middlesex and the recording statutes of the Plymouth, Massachusetts and Virginia colonies. These statutes had four characteristics which still are largely germaine to the Maritimes:

1) the instrument of transfer, before recording, must be acknowledged before a public official;
2) the entire instrument must be recorded;
3) legal priority is generally assured the grantee by the act of recording;
4) the instrument is operative without record, with the title passing before the instrument is recorded.

Registry offices in the Maritimes are organized on a county basis.

(c) Registration in Quebec is also based upon a form of land registry, or "old" system approach. Efforts to introduce some form of public notice for land conveyances dates back at least to 1539 and an ordinance of Villers-Cotterets. An effort to develop a land registry office (bureaux d'enregistrement) was made by Murray in 1760, but this effort failed. The first formal registration offices were established in

1830 in the counties of Drummond, Sherbrooke, Shefford and Missisquoi. Further offices were established in 1831 (Beauharnois and Megantic) and in 1834 (Deux-Montagues and Acadie). In 1841 by statute some of these offices were abolished and others reconstituted. By 1860 the major features of the land registration system were incorporated into the civil code. The current structure and organization of the registry offices is defined in the Civil Codes, articles 2158-2182.

(d) The original land registration system of Ontario was very similar to the land registries of the Maritimes. The first deeds registration act was passed by the legislature of Upper Canada in 1795. Major changes were subsequently made to this act in 1851, 1865 and 1873 (the act of 1873 has virtually the same form as current legislation). Because of these changes (such as introducing a geographical index), the Ontario system is referred to as an "improved deed registry". In 1885 Ontario passed a land titles act which introduced the concept of active land registration based upon the English Land Transfer Act of 1875. Initially the act applied only to Toronto and the County of York, and only to lands which had not already been alienated (as a consequence most property in Toronto, for example, is still under the registry system). The land titles system was extended to a number of areas in Northern Ontario in 1887 and, since the major alienation efforts came later, most of the north is under land titles. Through successive amendments to the legislation, land titles has been extended to virtually all of the province. However, the majority of private holdings are still within the land registry system. Land registration offices in Ontario are organized in the following manner. The Registry Act provided for the establishment and maintenance by the county authorities of at least one office known as a Registry Office in and for each county in Southern

Ontario. In general this office is found at the County Town, usually in close proximity to the Court House. Some heavily populated counties such as York, Grey, Wellington, Durham, Northumberland and Lanark, have been divided for registry purposes into ridings (north, east, south, west) with a separate Registry Office for one or more ridings. In addition the cities of Toronto, Ottawa and London have separate Registry Offices. Each district of Northern Ontario has a Land Titles Office; as well the Master of Titles in the Northern district serves as Registrar of Deeds. In addition, in Southern Ontario Land Titles Offices have been established at Toronto, Ottawa, Whitby, and St. Thomas, and elsewhere.

(e) In Manitoba prior to 1870 dealings in land were not supported by a public register. The Hudson's Bay Co. did, however, allow anyone who wished to deposit documents affecting land to do so in the office of their accountant. When Manitoba became a province, a Registry Act was one of the first statutes passed by the legislature. Subsequently, registry offices were opened in each county. In 1885 the Real Property Act came into force and established a land titles system based upon the Torrens model. The province was divided into 8 land titles districts, with the Winnipeg office serving over half of all parcels. Currently more than 90% of all private land holdings are under land titles.

(f) Land registration in the Northwest Territories was defined in the Territories Real Property Act of 1886. The system was based upon Torrens land titles and was continued in Alberta and Saskatchewan after provincehood in 1905 through the passage of provincial Land Titles Acts.

(g) Land titles legislation was introduced to Vancouver Island in the first Torrens legislation on the continent and the Land Registry Ordinance of 1870 provided for the continuation of this system in the combined colony

of British Columbia. British Columbia is divided geographically for registration purposes into seven different areas, each having its own land registry office: Kamloops, Nelson, Prince George, Prince Rupert, Vancouver, Victoria and New Westminster.

(h) The Torrens form of land registration has also been introduced into the Yukon and Northwest Territories and is described in the Canada Land Titles Act of 1974. Section 8 of the Act provides that any portion of the Territories may be constituted as a land registration district and section 10 provides for the establishment of a Land Titles Office. There have not been significant registrations to date in the North (e.g., it is estimated that approximately 15,000 CTs have been issued in N.W.T.).

(i) Finally it should be noted that the Department of Indian and Northern Affairs also maintains registries for certain native lands.

Presentation

A single map of Canada at 1:7.5 million scale showing the land as far north as the Yukon coast should be sufficient. The sheet should be designed, perhaps, using the "Territorial Evolution" example, to distinguish between active and passive registration at various stages in their evolution.

The location of all land registration/land registry offices should be indicated, as well as the date of closure where required. Consideration should be given to delimiting the current boundaries of the land registry districts. This will require inset maps for eastern Canada.

In the text, the principal sources of information concerning land registration (i.e., provincial Registrar-Generals of Titles/Chief

Registrars of Deeds, and the federal registry officials) should be noted.

Resources

Principal sources of information for the land registration theme will be provided by the provincial Registrar-Generals of Title and Chief Registrar of Deeds (or their equivalent), and their federal counterparts. Much has been written on the subject, particularly in the legal and, to a lesser extent, surveying literature. There does not, however, appear to be any equivalent text to Thomson's Men and Meridians for land surveys. A few pertinent sources will include:

Di Castri, Victor. Thom's Canadian Torrens System. Burroughs and Co., Calgary, various editions.

Jones, Herbert (1886). The Torrens System of Transfer of Land: A Practical Treatise on the Land Titles Act of 1885, Ontario, and the Real Property Act of 1885, Manitoba. Carswell and Co., Toronto.

Land Registration and Information Service, Materials in their files for the Maritimes, Fredericton, N.B.

Reiter, B.J. and R.C.B. Risk (1979). Real Estate Law. Emond-Montgomery Limited, Toronto.

Sasseville, Gilbert (1972). "The cadastre." Notes published by the Department of Forestry and Geodesy, Laval University, Quebec City.

Taylor, F. and Irwin Davis (1978). Real Estate Law in British Columbia. Butterworths, Vancouver.

As well, most law schools have prepared extensive cases and materials on the provincial systems.

SHEET #6

Title

Early Mapping for Economic and Social Development in Canada.

Subtitle

Getting to know (us) our neighbourhoods.

Aim

To show the growth of knowledge of the detailed geography of Canada through the extension of land surveys in the nineteenth century, as opposed to the more general knowledge of the country being obtained by explorers who were investigating the more isolated regions.

Background

The nineteenth century was a period of great change for Canada. When the century opened, Canada was just a group of struggling colonies; when it ended, Canada was a country with an agricultural output of world importance and an industrial production of great potential. This change in the face of Canada will be apparent in other atlas sheets, such as those showing the growth of agricultural areas and the spread of the road and rail networks. This sheet will reinforce these themes and also indicate how this change in the Canadian geography was made known to the people.

There was a lot of mapping done in Canada in the nineteenth century, but it is safe to say that there was none undertaken that did not have an immediate and well-defined use. The first detailed mapping was that which resulted from the work of the township surveyors. Township maps were produced as an integral part of the surveyor's commission to lay out and subdivide the township. The maps were needed immediately to record the granting of homestead lots to the settlers, and subsequently to serve as planning maps for the modest services that were provided for the settlers, such as harbours, access roads, schools, and grist mills. At about the mid-point in the century, the township plans began to be used as input into a fairly wide range of county and district maps. Some of these maps were produced by government agencies but more were published by private cartographic companies in the form of county maps and atlases. The British military establishment used the township plans as bases for route-marching and manoeuvre maps of strategic areas such as the Niagara Peninsula and the Eastern Townships.

The movement of Canada into the industrial age had a pronounced effect on the Canadian people. The British North America Act, the settlement of the Prairies, the completion of a transcontinental railway, all contributed to a growing awareness of, and an interest in, the geography of Canada. This new interest manifested itself by a growth in the private map trade and additional activity in government mapping agencies. Canada was not ready, and certainly funds were not available, for the starting up of an official topographical survey. The answer for a time was to let the private companies carry part of the burden and for government agencies to use the work of the land surveyors where possible, and use rough and ready methods in wilderness regions. The Geological Survey of Canada for many

years relied on pace and compass methods for their base maps when they were operating in regions not covered by the land surveyors. In the Rocky Mountains, Surveyor-General Deville developed a survey method in which cameras were used to record the position of terrain features for subsequent office plotting of the topography.

In the closing years of the century, the attention of most Canadians was focused on the Yukon, and in particular the Klondike. Government surveyors and geologists had been active in the area even before the important gold discoveries. One result of this work was a series of maps of central and southern Yukon drawn at six miles to the inch. On the surveys to produce these maps, the Rochon micrometer was used to measure distances. This was a device that resembled a telescope but which presented a split image in the field of view. Distances were obtained by viewing a specially prepared rod that held two small targets exactly 1/10 of a chain (6.6 feet) apart. A micrometer allowed the adjustment of the split image to bring the targets into coincidence. A table of angles and distances gave the distance of the rod from the telescope according to the angle read on the micrometer. Traverses down the major rivers allowed the production of maps of reasonable accuracy. The photo-topographic method and the macrometer survey showed that Canadian surveyors were searching for suitable methods to map the vast forested areas of Canada. None of them realized how important the trials of a flying machine, at Kitty Hawk, North Carolina, woud be in the future surveying of Canada.

Although we must commend the nineteenth century surveyors for their vigour and ingenuity, their maps were not particularly accurate, and only in the Rocky Mountain survey (relatively a very small area) did their maps have contours. In many wilderness areas the drainage was poorly depicted.

This was not the fault of the surveyors, who knew full well the limitations of their work, but in the government policy of not allocating funds for a proper topographical survey. A leading surveyor of the time, Willis Chipman, delivered a paper at the annual meeting of the Ontario Land Surveyors in 1895 entitled "A plea for a Topographical Survey." In it Chipman describes some of the deficiencies in the best available mapping of Ontario (lakes are missing, rivers flow the wrong way, parts of settled townships are left blank, lakes are shown without outlets, etc.). The same remarks could apply to the other provinces. Eventually the government authorities took heed of such criticism, and early in the twentieth century a modest beginning was made in topographical surveying (see sheet #7).

Presentation

The mapping done by Canadian surveyors in the nineteenth century is certainly complex in that it consists of a number of different styles and scales and covers a number of quite unconnected parts of the country. This is easy to justify for it was the result of a small nation in terms of population trying frantically to produce adequate maps to answer urgent needs as they arose in various parts of a country covering half a continent. This atlas sheet must try to illustrate the grand scope of this mapping effort and the use of the maps in the development of the country, but also the effect of the maps on the enlightenment of Canadians regarding the size and value of their collective inheritance.

Cartographic presentation

There are two ways of illustrating this theme cartographically:

(1) On a map of Canada, at about 1:6 million scale, the various mapping projects could be shown. At this scale, the sheet lines of county maps, the Three-mile series, etc., could be shown. The base map could show railways as of 1899.

(2) The theme could be illustrated by a number of regional maps each designed to show a particular map series.

It is suggested that method (1) would be preferable. It would give a better concept of the relationship between the areas mapped and the whole area of Canada. It would show why the authorities were hesitant in starting a topographic survey over such as vast land. Although method (2) would be more economical in the use of space on the sheet, it would lose the opportunity of showing area mapped versus total area.

As most of the nineteenth century mapping took place in southern Canada, the map of method (1) could be cut off at the northern limit of the Three-mile series. The Yukon mapping could be illustrated on an inset map. This arrangement would leave about half the sheet for narrative and illustrations.

The following are some of the maps and map series that should be included on this sheet: the Bouchette maps; the Ontario and Quebec county maps; the MacKay map of Nova Scotia; the Maritime Provinces county maps; the Prairie Three-mile maps; the Yukon Six-mile series; nineteenth century geological mapping at medium and large scales; railway surveys of the period; Newfoundland geological and cadastral mapping.

Pictorial presentation

The narrative could be illustrated by drawings of survey instruments and survey methods, such as: chain and compass instruments; nineteenth

century theodolite; photo-topographic method; Rochon micrometer method; baseline and meridian surveying. The different styles of mapping could be shown by printing sections from selected maps.

Narrative

The narrative should be a brief account of the various mapping surveys of the nineteenth century and the use to which the maps were put. It should concentrate on maps and methods and not on biographies of surveyors.

Resources

Nicholson, N. and L.M. Sebert (1982). The Maps of Canada. Wm Dawson & Co., Folkstone, U.K.

Thomson, D.W. (1966). Men and Meridians. Thorn Press Limited. Available from The Queen's Printer.

Zaslow, M. (1975). Reading the Rocks. Macmillan, Toronto.

The Canadian Cartographer

The Canadian Surveyor

Cartographica

Department of the Interior, Annual Reports.

Geological Survey of Canada, Annual Reports.

National Map Collection

SHEET #7

Title

The Evolution of Topographic Mapping in Canada.

Subtitle

Discovering Canada's contours.

Aim

To illustrate the progress of topographic mapping in Canada, primarily by showing the progress of coverage of the basic scale of 1:50,000 (and its predecessor, the One-inch scale), but also the growth of other scales of federal and provincial topographic mapping.

Background

Canada was one of the last of the industrial nations to start a topographic survey. The first work of this type was begun by Canadian Army personnel in 1904, with the first sheets being published in 1906. Production by the Army unit was about five sheets per year until the First World War. The Geological Survey of Canada had produced its own base maps since the mid-1800s, and in 1908 this agency started to publish maps with sufficient topographic information that they could be used without the geological overprint as general purpose maps. These maps were called the A

Series and were made available to the public as topographic maps. In 1920 the Department of the Interior started a program to convert the planimetric sheets of the Three-mile series into topographic maps by the addition of contours and other map detail such as buildings, bridges, etc. Interior also started a program of One-inch topographic mapping using specifications that were very similar to those of the Army.

In 1927 the National Topographic System (NTS) was adopted by the Department of Defence and Interior but not the Geological Survey. That agency joined the unified topographic program in 1936. The NTS included maps at 1, 2, 4, 8, and 16 miles to the inch. For a time the Three-mile Series was allowed to continue in production, but eventually it was replaced by the NTS Four-mile Series. In 1950 the scales of the NTS were changed to the closest metric equivalents (i.e., 1:50,000; 1:125,000; 1:250,000, etc.).

The Eight-mile Series was the first of the NTS to be completed. This occurred in 1944 as a wartime project to provide topographic bases for an aeronautical chart series covering the whole country. Although it is correct to speak of this series as being completed in 1944, there were many areas on some arctic sheets that were left blank with the notation "unexplored" printed on them. Nevertheless, all sheets were available and they showed all known topography. In the early 1960s, the 1:1,000,000 series was derived from the sheets of the then 1:500,000 series. This was also an aeronautical chart series. It is interesting to note that no sheets of the Sixteen-inch Series were ever produced, even though the sheet-lines of this mythical series provided the basic grid of the NTS.

In 1971 the 1:250,000 Series was completed in 918 sheets. It is anticipated that the 1:50,000 Series will be complete in 12,995 sheets in

1994. There was a 1:25,000 Series published between 1957 and 1978, but it was discontinued after the publication of 688 sheets. The demise of this series was due to a decision to concentrate greater effort on the completion of the 1:50,000 Series, but also because the provinces were starting to produce topographic maps at or near the scale of 1:25,000.

The provincial entry into the field of topographic mapping started in 1965 when Quebec published its first 1:20,000 sheets. Today, Ontario, Manitoba, Alberta, and British Columbia have joined Quebec in the production of large-scale topographic maps. The Maritime Provinces have combined their efforts in the Land Registration and Information Service (LRIS) which, among other duties, produces large-scale topographic maps.

The 1:125,000 Series has also been discontinued after the publication of 97 sheets. It was felt that this series was something of a luxury for a country the size of Canada. Most of the uses that were foreseen for this series can be met by sheets of either the 1:50,000 or the 1:250,000 series.

In 1903 the Department of the Interior started production of two map series at 1:250,000 and 1:500,000. These were compiled maps put together from existing maps at various scales. No new surveys were conducted for these series, and they were published without contours. These maps, collectively known as the Chief Geographers Series, were published between 1904 and 1948. Publication was stopped because by 1948 the sheets of the various NTS scales covered the same area. Although not true topographic maps, this series is included here because it was contemporary with the NTS and for many years substituted for true topographic mapping.

Canada was not particularly interested in the international project to map the world at the millionth scale until the 1960s. As an experiment the Regina sheet was published in 1928 and the Ottawa sheet in 1929. These

were followed by the Halifax sheet in 1931, but then interest disappeared until 1964 when production was resumed. The Canadian sheets of the series were all published by 1981. There are 69 sheets published by Canada and five more published by the United States that cover parts of Canada. The specifications have been agreed upon by all participating nations, and control of modifications in these specifications in maintained by the Cartographic Section of the United Nations. The information on the Canadian sheets is, of course, derived from the 1:250,000 Series.

Presentation

This sheet should show the growth of topographic knowledge in Canada from the very modest beginnings at the start of the century. The slow but steady production of sheets at various scales before the Second World War is in rather startling contrast to the surge to complete the Eight-mile Series in 1944. The second great push to complete a series occurred in the late 1960s when great emphasis, and a major share of the resources of Topographical Survey, was allocated to the completion of the 1:250,000 Series. Today a determined effort is being made to complete the 1:50,000 Series but at least 50 percent of the resources of Topographical Survey must now be used for the revision of existing sheets of the current scales.

The overall picture displayed by this atlas sheet must be that of a flow of mapping, really an acquisition of past and present terrain data, that is slowly but surely covering the whole of Canada.

Cartographic presentation

The maps on this sheet will be progress maps showing the status of the

more important topographic scales at selected years between 1906 and the present. The following are factors bearing on the design of these maps.

(1) First editions only. As this sheet illustrates progress of knowledge, any display of sheet revision will only confuse the message. Therefore it should be stated, in the captions to progress maps, that the coverage indicated as occurring in a specific decade is for the first edition of that sheet. The text should cover revision policy.

(2) Some of the provinces are active in topographic mapping. This work must be illustrated where it presents new topographic knowledge. Therefore we must include the large-scale work (mainly 1:10,000 and 1:20,000) but not scales of 1:50,000 and smaller. In most cases the provincial small-scale maps are modifications in presentation and not new topography (e.g., 1:250,000 maps of B.C., Alta., and Ont., and the Quebec 1:200,000).

(3) The 1:50,000 NTS topographic map is Canada's basic map. It is the largest scale that is scheduled to cover the country completely in the foreseeable future. Although there are two styles (coloured and monochrome), it should be treated here as a single series because the amount of information portrayed, the accuracy standards, the revision policy, etc., are being set for the entire 1:50,000 production, and (more or less) adhered to equally in both styles.

(4) A single time-frame system should be used for the status maps so that the user of the sheet can compare the status of the various scales at given times in the history of the topographic mapping of Canada. This will require careful design because, for example, the 1:50,000 Series spans 80 years, while the 1:500,000 Series was completed in 14 years. An exception to this time-frame system might be made in the case of the large-scale

mapping (1:25,000 and larger) because it is all comparatively recent, and it may be more important to code the mapping by agency rather than by time. For the other scales, the following time steps are recommended:

(a) Sheets available before 1925.

(b) Sheets published between 1925 and 1940 inclusive.

(c) Sheets published between 1941 and 1950 inclusive.

(d) Sheets published between 1951 and 1960 inclusive.

(e) Sheets published between 1961 and 1970 inclusive.

(f) Sheets published between 1971 and 1980 inclusive.

(g) Sheets published after 1980.

If this system were to be used, the 1:500,000 Series would require two colours, the 1:250,000 Series four colours, the 1:50,000 Series seven colours.

1:50,000 status: This map should be given the most prominent display and should be at a scale of about 1:15 million. The caption should point out that before 1950 sheets of this series were published at the one-inch scale. The forecast completion date should be mentioned. As this will be the largest map on the sheet, the NTS sheet-line system should be clearly shown.

1:25,000 and larger scales: This status map should be at the same scale as the above but should show only southern Canada in the same manner as was done with the status maps on pages 81 and 82 of the 4th edition of the National Atlas. Instead of showing progress by time, this index could be colour coded by agency (federal or provincial) and by scale (1:10,000, 1:20,000, and 1:25,000). There is virtually no overlap by scales, and the caption could state the obvious, namely that provincial coverage is produced by the province in which it falls.

Other NTS scales: These will be shown in the same time-steps on small scale (perhaps 1:40 million) status maps, one for each of the 1:250,000, 1:500,000, and 1:1,000,000 scales. The 1:125,000 will not be displayed.

International Map of the World Series: The status of this series will be displayed in the same way as the "other NTS scales".

Chief Geographers Series: A small index map similar to that published in Maps of Canada, page 122, could be used for this series. Coloured corner ticks could be used to indicate the era of each first edition.

Pictorial presentation

A diagram showing the sheet breakdown of the NTS is essential on this sheet. The explanation could also refer to the major status map (that for the 1:50,000 Series) which will carry NTS sheet lines down to 1:50,000 sheets. Sample extracts from maps at various NTS scales could be shown. Photographs of photogrammetric plotters, EDM, and Doppler equipment would be of interest, if space permits.

Narrative

The text should include a brief history of Canadian topographic mapping. This should cover the technical changes over the years. The entry of provincial mapping agencies should be mentioned. A very brief mention of the IMW program (i.e., international cooperation) should be included.

Resources

Nicholson, N.L. and L.M. Sebert (1982). The Maps of Canada. Wm Dawson & Co., Folkstone, U.K.

Thomson, D.W. (1966). Men and Meridians. Thorn Press Limited. Available from The Queen's Printer.

National Map Collection, Public Archives, Ottawa, for status maps from 1907 to the present.

Surveys and Mapping Branch, Department of Energy, Mines and Resources, Ottawa, for status maps from 1907 to the present.

SHEET #8

Title

Early Photography and Remote Sensing of Canada.

Subtitle

When Canada posed for its first portraits.

Aim

To illustrate the availability of the early photography of Canada, both oblique and vertical, and to give a brief history of Canadian air photography and remote sensing.

Background

The use of air photography during the First World War caught the imagination of officials in both the Departments of Defence and Interior who saw it as an answer to the mapping of the vast wilderness areas of Canada. Because of the size of Canada, the oblique photography appeared to be the most promising for reconnaissance mapping at Four- and Eight-inch map scales. The Deville method of photo-topography was adapted to aerial oblique photography, and some useful mapping was carried out in the years leading up to the Second World War. During that war, the American Army

introduced the Tri-metrogon method of mapping which was used extensively to complete the Eight-mile map series. The oblique photography systems are not suited for the production of large and medium scale contoured maps, so they were abandoned in 1948 in favour of complete reliance on vertical photography.

By the early years of the 1960s, the whole of Canada was covered by vertical photography. Since that time, most of Canada has been reflown, parts of it many times at various scales. In 1972, the Landsat Remote sensing system went into operation and from that year to the present, Canada has had almost continual coverage of satellite imagery. In recent years, there has also been an increase in the use of special air photography, such as colour and false-colour photography.

Presentation

Cartographic presentation

Oblique and tri-met. The coverage of Canada held in the NAPL could be very nicely displayed on a map of Canada at 1:15 million. (This scale of map was used in the 4th edition of the National Atlas for double-page maps, and hence is a familiar scale to many researchers. Two such maps fit very nicely side by side on the 5th edition sheet.) For this coverage, the oblique could be given one colour and the Tri-met another.

Vertical coverage. Here the first available vertical coverage of cartographic quality should be shown, but only if negatives are in storage at the NAPL. The dates of the first cover, by decades, should be indicated by colour code. The following categories would probably be sufficient: Before 1940, 1940 to 1950, and 1950 to 1960. Most of Canada was covered by

1960 and the few remaining spots could be identified by a letter and described in the caption to the map (e.g., Area D, Belcher Islands, photographed in 1962). A suitable scale for this index map would be 1:15 million.

Remote sensing. Although a coverage map is not needed, a map of Canada showing the Landsat tracks would be useful. The scale of 1:30 million would be appropriate.

Special photography. An index map showing coverage of colour and false colour photography would be useful. Both federal and provincial holdings, if available for purchase by the public, could be displayed. This would require four colours. The caption could explain that where provincial photography is indicated, it is available from the province in which it falls. The scale of 1:30 million would be sufficient for this display.

Pictorial presentation

Photographs. Each of the types of photography should be illustrated. Full size prints would take up too much room on the sheet so samples trimmed to 3/4 size should be used.

Diagrams. Line diagrams explaining stereo coverage and how photos appear in a photogrammetric block should be included. A good model for these drawings appears on page 204 of The Maps of Canada.

Narrative

The text should cover the following subjects:

- History of air photography in Canada.
- Uses of air photography for mapping, for resource development, for social

studies, etc.

- The availability of air photography from the National Air Photo Library and from provincial outlets.
- Instructions in how to order air photography.
- The availability of air photography catalogues, and how to use them.

Resources

National Air Photo Library, Department of Energy, Mines and Resources, Ottawa, for coverage maps giving required data for the maps suggested above.

Surveys and Mapping Branch Library, Department of Energy, Mines and Resources, Ottawa, for texts on use and interpretation of colour and false-colour photography.

Thomson, D.W. (1975). Skyview Canada. Energy, Mines and Resources Canada. Available from Information Canada, Ottawa.

CONCLUSION

We conclude that it is feasible and desirable to present the historical highlights of the exploration, surveying, settlement, and mapping of Canada on an eight-sheet subset of the Historical Section of the National Atlas of Canada.

RECOMMENDATION

Whereas the themes recommended for the eight sheets mentioned above are fundamental to understanding the geography, and to a certain extent the history, of Canada; and recognizing that an understanding of our geography is fundamental to sound decision making at all levels:

It is our considered opinion that the compilation and production of these sheets should be undertaken as soon as possible;

and in view of the fact that the scope of the themes proposed for these sheets exceeds that of the Surveys and Mapping Branch;

WE RECOMMEND that the National Advisory Committee on Control Surveys and Mapping be asked to sponsor the compilation and production of these sheets.

POSTSCRIPT

During the preparation of this report, the investigators became aware of several items relevant to the surveying and mapping community in general and to the Surveys and Mapping Branch in particular; our comments on one of these items follows.

Early air photography of Canada. This is an irreplacable national resource. At present it is in the custody of the NAPL. NAPL undoubtedly has the best possible technical expertise for the care of this material, however, it is a production-oriented unit in a mission-oriented department. As such, it cannot be expected to rank archival responsibilities high in its priorities. On the other hand, the Public Archives division of the National Library has archival responsibilities and expertise. In particular, it has expertise and channels for guiding persons seeking archival materials.

It would be presumptuous from a very superficial contact with this matter to make any specific suggestion other than that it should be reviewed.