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Tree-ring studies in Canada: A bibliography and data base

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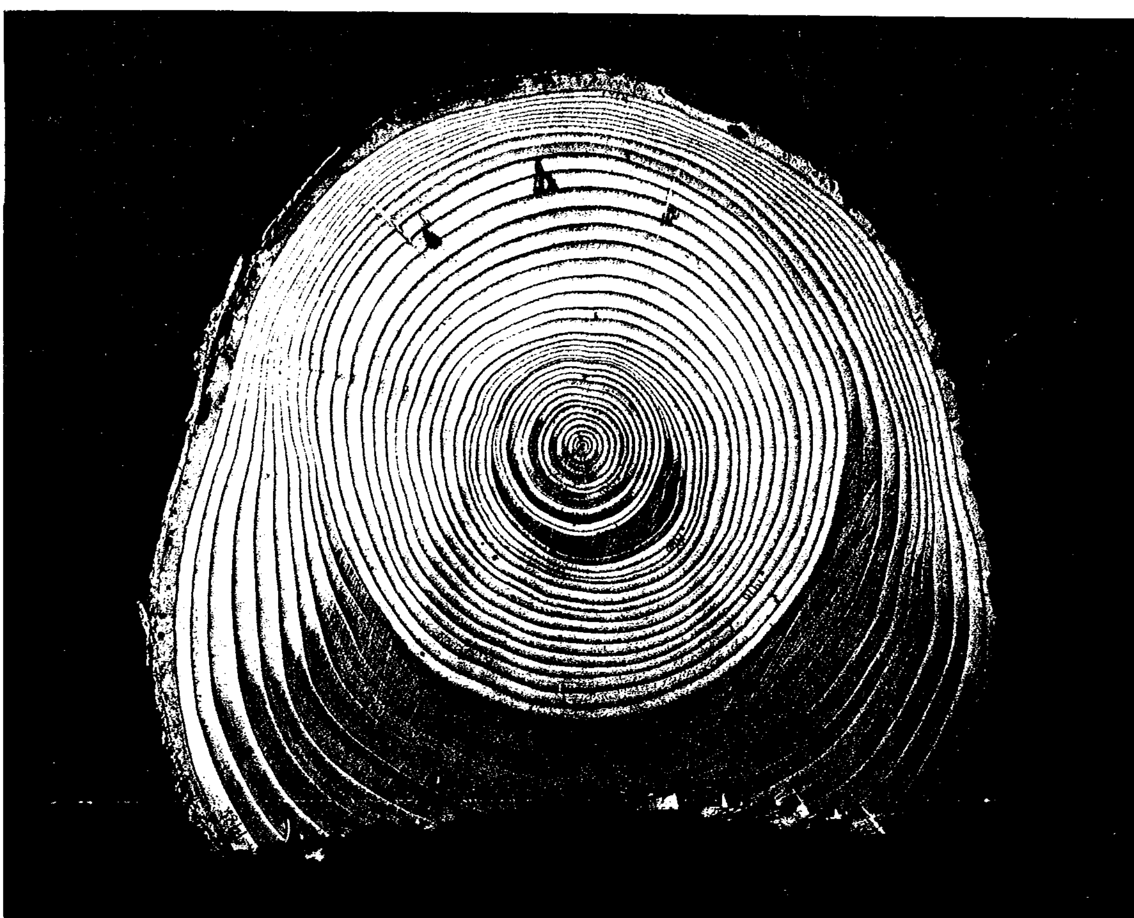
1991



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COVER: A cross-section of an Engelmann spruce, sampled in 1983 from a snow avalanche track in Banff National Park, showing a record of major avalanche damage (tilting) in 1956 and 1974. (Courtesy of G.N. Fraser)

TREE-RING STUDIES IN CANADA:

A BIBLIOGRAPHY AND DATA BASE

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ABSTRACT

This report presents over five-hundred and fifty references dealing with tree-ring research in Canada, with specific reference to dendroclimatology, dendrochronology and dendrogeomorphology. This inventory is an important initial step in the evaluation of the potential contribution that tree-ring studies can make to the Canadian Global Change Program. The bibliography provides a comprehensive picture of the development and scope of tree-ring research in Canada over the last 60 years. A brief summary of the history and development of tree-ring analysis within Canada is also given.

The major uses for tree-ring data in Canada to date have been for the interpretation of past climatic conditions, geomorphic and hydrological processes, and for the examination of tree growth and development. Information on study location, species utilized, specific techniques and methodology used are abstracted for most articles. References are also included to sites in adjacent areas of the United States which are of interest to Canadian researchers.

A listing is also provided for all tree-ring chronologies developed for 355 Canadian sites plus 41 sites in Alaska and Greenland with details (where available) of site, species used, geographic location, number of samples and first and last dates of chronologies. This listing provides a preliminary inventory of available tree-ring data for Canada and a source to aid the recovery of such data for the compilation of a National Tree-Ring Data Base. Some preliminary comments on the nature of the available data base are provided.

This bibliography and chronology listing is a first attempt to summarize the published Canadian tree-ring literature; studies carried out by government agencies (federal and provincial) and private industry are not as readily available and may therefore be less completely sampled. In addition to this printed report the data may be made available in a dBASE IV data base management system.

ACKNOWLEDGEMENTS

This project was initiated as a Global Change Project within Terrain Sciences Division by the first author and we would like to thank Dr. D.A. St-Onge, Director and Dr. D.G. Harry for their assistance and cooperation. The authors would like to thank the many individuals who have contributed material to this data base from their own files and particularly the assistance given to the second author by the Centre d'études nordique, Université Laval and the University of New Brunswick during the preparation of this report. Computing facilities were provided by the Department of Geography, University of Western Ontario and the assistance of Judy El Feki during the preparation of the final report is also appreciated. The final report was edited by H. Dumych and M. Leflar, Geological Survey of Canada.

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INTRODUCTION

The International Geosphere Biosphere Program (IGBP or Global Change) was formally launched by ICSU at Berne, Switzerland in 1986. Together with other global scientific programs such as the World Climate Research Program (WCRP) it seeks to address the growing concern that the collective activities of mankind are now of sufficient magnitude to modify the way in which the global environmental system operates. This "uncontrolled experiment" is likely to be the dominant force for change at the surface of the earth over the next century.

To be able to detect the effects of anthropogenic forcing on present global systems or to model and predict changes over the next century it is necessary to understand the interactions and feedbacks between the major components of this system (biosphere, atmosphere, lithosphere, cryosphere and hydrosphere). This can be done by monitoring present relationships and by examining the spatial and temporal interactions between these systems in the past. A primary area of concern has been the effects of increased atmospheric concentrations of radiatively active gases (RAGs or greenhouse gasses) on future global climates. Attempts to decipher this "greenhouse signal" in the available records are hampered by the fact that climatic variability on the timescales of decades to centuries is poorly known and understood. It is difficult to address this problem using the available instrumental record of climate in Canada because the record is too short (Toronto, the oldest record, dates back to 1840) and geographically biassed (few arctic stations have records of more than 40 years). The broader perspective given by the great number of paleoenvironmental studies also presents problems because these studies have generally focused on the more dramatic changes over much longer timeframes of the Holocene or Quaternary and do not have the resolution to address climatic variability at these timescales. To examine and model decennial to centennial variations in climate it is desirable to have perhaps a thousand years of record with annual or seasonal resolution that must be obtained from proxy data sources. The IGBP Core Project on Past Global Changes (PAGES) has identified the development of a global data set of proxy data with annual resolution for the last 2000 years as one of two priority areas for proxy data studies within IGBP (ICSU 1990). In Canada the obvious natural archives of such data are ice cores, lacustrine/nearshore marine sediments and tree rings. Available documentary sources that could provide proxy environmental data rarely predate 1700.

Until very recently dendrochronological studies received little attention in Canada. The literature is scattered, mainly originating from the United States, and few major facilities and scientists were domiciled in Canada. Although tree-ring studies have been carried out in Canada for over 60 years there has been no comprehensive attempt to pull this material together on a national basis to examine the available data. Therefore an important preliminary step in the evaluation of the potential role of tree-ring studies in the Canadian IGBP was to bring this literature together and evaluate the data base holdings for Canada held by Canadian and other scientists. This would provide an inventory of available materials and the potential data base on which future studies should build. This project was initiated under the Global Change Program in Terrain Sciences Division and planned to provide, in easily accessible form, an initial bibliography and outline of tree-ring holdings that would be useful to tree-ring workers in Canada and provide a scientific basis for the planning of any future national tree-ring projects that might be initiated in IGBP.

TIMETABLE AND RATIONALE

This project was initiated in February 1989 with a circular letter sent to over thirty individuals thought to be active within the Canadian tree-ring community. This letter requested information about active tree-ring research programs in Canada, personal data holdings and the availability of such data. The main compilation of the bibliography was accomplished during the summer of 1989 at the University of Western Ontario using library resources and personal reference collections. These data were supplemented by returns from correspondents, a visit to the Centre d'études nordique at Université Laval and some subsequent work at the Faculty of Forestry, University of New Brunswick.

OBJECTIVES

There were two primary objectives of this project; to provide a ready reference to the available literature on tree-ring research within Canada and to create an inventory of available tree-ring chronologies for Canada. In the bibliography specific emphasis is placed on dendrochronology, dendroclimatology and dendrogeomorphology. As only a limited time was available and the document could not be widely circulated to the research community prior to completion, it is both preliminary and incomplete, particularly in area of biological applications and physiology of tree rings. Nevertheless the material provided here will form a foundation from which other Canadian studies can build.

There are several more general publications with extensive bibliographies on tree-ring research but most concentrate on research carried out in Europe and the United States (Zon, 1927; Toumey and Korstian, 1937; Douglass, 1940; Agerter and Glock, 1965; Sitnikaite, 1978; Shroder, 1980; Egger and Lambert, unpublished, Grissino-Meyer and Butler, 1988) or focus on a restricted part of Canada (e.g. Copper and Fritts 1981 ; Jacoby 1982). This bibliography will be unique in attempting to cover all Canadian environments and all holdings of Canadian data. In addition, important references concerning adjacent areas of the United States or similar species in those environments will also be included. It is hoped that any significant omissions may be rectified in future editions of this work.

ORGANIZATION OF THE REPORT

Following this introductory section, the report is divided into five parts. Section II contains a brief historical review of aspects of tree-ring research within Canada and a summary of the status of current knowledge and activities. Section III discusses the bibliographic data base and the criteria used to classify information within it. Section IV presents a similar discussion of the compilation of the chronology data base. Finally, Sections V and VI contain abbreviated copies of the bibliographic and chronology data bases with summary indices. The Appendices contain a listing of common and latin names for the tree species used and of Canadian tree-ring researchers contacted during the preparation of this report.

SECTION II
HISTORY OF CANADIAN TREE-RING RESEARCH

INTRODUCTION

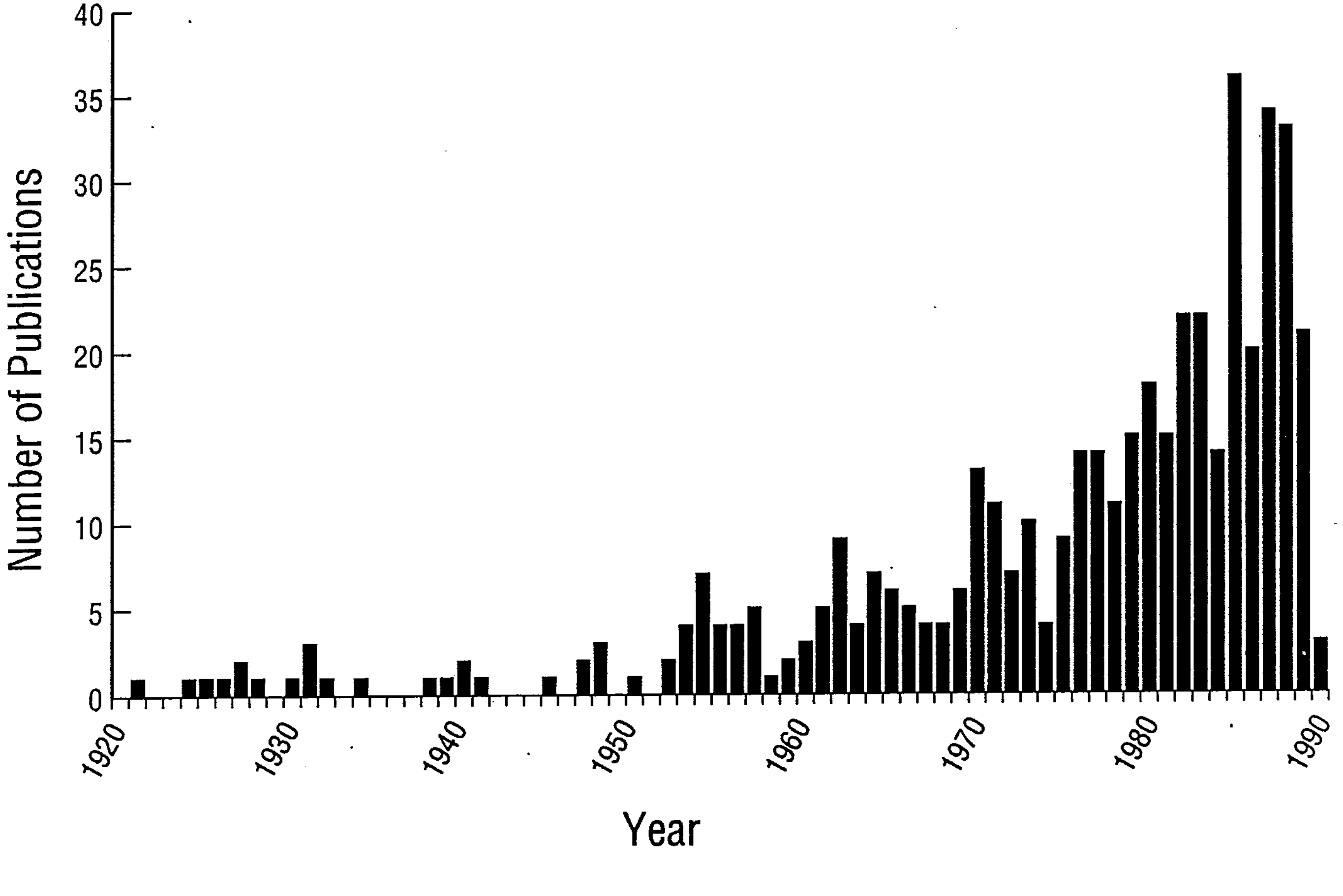
The development of the science of dendrochronology is discussed in detail by Fritts (1976, particularly for North America) and Schweingruber (1988). Observations on tree rings and their possible relationships to climate have been noted as far back as the time of Leonardo da Vinci (Stallings, 1937) but modern dendrochronology was inspired and initiated by A.E. Douglass (1867-1962) working in the American South West. Douglass discovered marker tree-rings in *Pinus ponderosa* that exhibited similar variations in ring pattern although samples were from different locations (Douglass, 1934) and was thereby able to pioneer the application of cross-dating techniques to chronology building. In 1937 Douglass founded The Laboratory of Tree-Ring Research in Tucson at the University of Arizona. Subsequently this laboratory has played a major role in the development of dendrochronology, particulary in North America.

THE EARLY YEARS IN CANADA (before 1940)

The first Canadian tree-ring studies were published in the 1920's and the growth of publication since that time is shown in Figure 1. The earliest studies were independent applications of tree-ring studies within forestry to investigate insect damage and predict the future growth of forests. Increment cores were first used in 1921 in the Algoma District of Ontario. Tree-ring counts (in rings-per-inch) from softwoods were used to interpret the relative growth of trees and determine the annual increment of tree growth (McCarthy and Robertson, 1921). Craighead (1925) examined the growth increment of conifers following spruce budworm attack in Québec and New Brunswick and observed a 50% decrease in ringwidth increment after budworm infestation. He also established a correlation between mortality and the rate of tree growth in Québec and New Brunswick before spruce budworm infestation.

Robertson (1926) developed a simple increment corer designed to remove large, solid, unbroken cores from large diameter trees. This was the first increment corer designed for removing sizable, intact cores from large trees.

Figure 1. Publication Frequency of Tree-Ring Articles.



Projected-growth tables for *Picea glauca, Picea mariana* and *Pinus banksiana* in Ontario were constructed using the total width of 10 and 20-year tree-ring segments (Sharpe and Brodie, 1927). This project was part of the Research Division of the Forest Service of Canada program designed to obtain information on the characteristics of growth in forested lands of Canada. Many early investigations utilized increment coring and tree-ring analysis to examine tree growth rates (Robertson, 1927, 1928).

The first Canadian study to develop a tree-ring chronology using ring-width data and crossdating techniques was carried out during an investigation into cyclical phenomenon, including the effects of fire and insect damage, in the jack pine forests of Manitoba. Gill (1930) suggested that within "...a radial cross-section of a tree, periods of excessively slow or fast growth may be noted, or it may be that one single annual ring will stand out as markedly different from its neighbours." These characteristics were used to aid in crossdating samples to develop chronologies for fire frequency and insect infestation frequency.

Following Gill's work, Powell (1932) compared the growth rings of white spruce and selected hardwoods to variations in wheat yields in Saskatchewan and two years later Lyon and Goldthwait (1934) published an unsuccessful attempt to cross-date *Pinus strobus* (white pine), *Tsuga canadensis* (hemlock) and *Pinus rigida* (pitch pine) of drowned forests in New England and Nova Scotia.

These early papers also included investigations into the effects of pollution on the environment: over 50 years ago Lathe and McCallum (1939) investigated the effects of carbon dioxide on the diameter increment of conifers.

MIDDLE PERIOD (1940-1970)

This period saw a continuation of isolated, sporadic Canadian studies until the development of the first government- financed dendrochronological laboratory in Canada at the Geological Survey of Canada (GSC) in 1967. This period is also characterised by regional investigations by individual researchers and the first attempts to set up regional networks of chronologies. The pioneer work of Giddings and Oswalt in the Yukon, Northwest Territories and Alaska plus Hustich in the Hudson's Bay area are of particular significance. The initial Canadian work from the Laboratory of Tree-Ring Research (Tucson) began with Schulman's investigations of Douglas Fir in Interior British Columbia and Alberta during the 1940's and 1950's. Subsequently the LTRR developed the first regional chronology network for Western North America (see Drew, 1975) with most of the sampling carried out by Fritts, Ferguson and Parker in the mid-sixties. Several important regional studies (e.g. Fritts, 1965, 1971) utilised this data base providing a model for regional reconstruction studies from tree-ring data. During this period of time the most active Canadian centre for tree-ring research appears to have been University of British Columbia, culminating in the conference organised in 1970 by Smith and Worrall (1970).

In 1967 Marion Parker joined Terrain Sciences Division of GSC from the Laboratory of Tree-Ring Research in Tucson and established the first recognised dendrochronological laboratory in Canada (Parker, 1970). He began to build a national data base and initiated the development of tree-ring densitometry in Canada. However, this experiment was short-lived and Parker moved westwards in the early 70's, first to University of British Columbia and later to the Western Forest Products Laboratory (now Forintek Canada Corporation) in Vancouver. He became a private consultant in 1981.

Parker has undoubtedly had the greatest influence on the development of tree-ring studies in Canada initiating the first (and to the present only) attempt to develop a national tree-ring data base, pioneering the development and application of densitometry in North America and, for many years, was the major advocate and proponent for tree-ring work in Canada. The pioneer work carried out in the 1970's was significant at both the National and international level. However, since that time, most of his work has been presented in contract reports or scattered through conference proceedings and is not readily accessible to a broad academic audience.

DEVELOPMENTS after 1970

In the last 30 years the science and practice of dendrochronology has changed drastically with the advent of computers, new techniques and centres of research. The computing revolution was pioneered by H.Fritts (see Fritts, 1963, 1976) and was taken up by Green and Worrall (1964) and Green (1965) in Canada. Rapid processing of data was enhanced by photometric scanning techniques for analysis of wood density that automatically recorded data on punched tape for computer analysis. Most subsequent development of computing techniques for tree-ring analysis has taken place outside Canada but two important recent technological innovations, tree-ring densitometry and isotopic analysis of tree-rings, have a significant Canadian component.

Tree-Ring Densitometry

Densitometric analysis involves measurement of X-ray images of specially prepared tree-ring samples. It facilitates the measurement of different intra-ring wood types as earlywood (large, thin-walled cells that develop early in the growing season) and latewood (thick-walled, small cells that develop late in the growing season) may be quantitatively distinguished based on their density characteristics. Earlywood and latewood together comprise a single growth-ring (tree-ring). Digitally recorded light transmission by a scanning densitometer through X-ray negatives of tree-ring series can be converted into earlywood, latewood and whole ring width and density values that may be automatically processed by computer. This technique greatly increases the range of ring variables available to researchers and automation speeds up the rate of data acquisition. Densitometry is, in fact, a specialised, early version of the image processing technology that will probably be the next major technological development in tree-ring measurement systems.

Densitometry was developed in 1963 by Hubert Polge of Nancy, France (Polge, 1966). The densitometric system provides a information on a wide array of tree-ring characteristics and thereby provides the potential to retrieve more climatological information than from tree-ring widths alone. Within Canada the slow, low resolution technique of Green and Worrall (1964) was quickly discarded when Parker (at G.S.C.) developed a tree-ring scanning densitometer and data acquisition system that extracted tree-ring density and ring-width data directly from specimens and X-ray negatives (Jones and Parker, 1970). This system was the first to provide large amounts of densitometric data. Development of this system has continued at U.British Columbia and, latterly, Forintek and is well documented in a series of reports by Parker, Jozsa and co-workers. In their classic paper in 1971, Parker and Henoch first reported that maximum latewood densities provided chronologies of greater statistical significance in correlations with climate than ring widths alone. Their findings established that climatological factors were correlated with a variety of ring density characteristics in addition to ring width. Subsequent work has confirmed and elaborated these findings (Luckman et al., 1985; Robertson and Jozsa, 1988) but application of densitometry in Canada has been curtailed because of limited facilities: the densitometric system developed by Parker and Jozsa at Forintek was the only densitometric tree-ring facility in North America for most of the 1970's and 1980's.

Isotope Studies

The isotopic chemistry of tree-rings involves analysis of isotopic ratios of carbon (^{12}C, ^{13}C, ^{14}C), hydrogen (^{1}H, ^{2}H or D) and oxygen (^{16}O, ^{17}O, ^{18}O) that are contained within the cellulose of tree-rings (Stuiver and Burk, 1985). The use of measures of isotopic concentrations in tree-ring series has already exhibited remarkable potential for extending our paleoclimatic data base (Epstein and Yapp, 1976, 1977). Again, though these techniques were originally developed in the United States, they were further applied and developed by Gray and Thompson (e.g. 1976, Gray, 1981 et seq.) at the University of Alberta, Edmonton and more recently by Edwards (Edwards et al., 1985) at the University of Waterloo. Ongoing research in this area (Edwards, pers. comm.) may lead to the development of better quantitative estimators of past climate from tree-ring records. Both densitometry and isotopic work offer considerable potential for the extraction of high resolution proxy climate data from tree-rings in conjunction with more traditional techniques.

Dendrochronological Studies

Dendrochronological studies and developments in Canada are discussed in Section IV where the available data base is briefly reviewed. In addition to these chronological investigations there have been extensive applications of tree-ring studies to a wide variety of dendrogeomorphic and dendroecological topics. These range from dating moraines and natural hazards (e.g. landslides, floods and snow avalanches) to investigations of spruce-budworm outbreaks, porcupine damage and fire history. Systematic applications of this type may be located in the bibliography by using the key word index (see Section V).

During the 1970's and 80's a number of groups have been active in tree-ring studies in Canada. Usually these studies have had a regional, thematic or technique-related focus and the few attempts to address large scale problems have been initiated from outside Canada. The obvious example is the work of Gordon Jacoby from the Lamont Doherty Geological Observatory of Columbia University, New York, who has systematically investigated sites along the northern tree-line from Alaska to Gaspe. The primary goal of this work is climatic reconstruction of an environmentally-sensitive ecotone on a continental scale. The most recent summary of this work is Jacoby and D'Arrigo (1989). The recent large scale collection activities of Schweingruber and Jacoby (see Section VI) will provide a network of site chronologies that will cover the last 200-250 years in the boreal forest/tundra ecotone and could provide the nucleus for a national data base for the boreal forest. During the last 20 years there has continued to be research and interest in Canada from the LTRR in Tucson and groups from the Institute of Arctic and Alpine Research (Boulder, Colorado) and the University of Washington in Seattle.

Within Canada, tree-ring studies are presently being carried out at several institutions but there is no obvious national centre. The strongest centres are the Centre d'etudes nordiques at Université Laval and Forintek Canada Corporation in Vancouver. The CEN group (led by Payette and Filion) has focused on ecological and geomorphic problems of subarctic Québec. There has been a strong emphasis on dendrogeomorphic studies,the ecology of treeline, treeline and forest dynamics. The Forintek group, led by Parker and subsequently Jozsa, has pioneered many practical and academic applications of tree-ring studies, particularly in the fields of densitometry, wood quality and some climatic applications. However, in the last few years these applications have been increasingly focused on the wood quality aspects of tree rings and few climate-related studies have been carried out (Jozsa, 1988).

Tree-ring studies at the University of Western Ontario (UWO) initially focused on dendrogeomorphology using tree rings to date glacier events (Luckman, 1977, 1988) and snow avalanche activity (Frazer, 1985). In the last five years this work has focused on developing long tree-ring records and using densitometry and isotopic studies (e.g. Luckman et al., 1985) to extract proxy data for the last millennium, building a regional data base of chronologies for the Canadian Rockies and evaluating tree-ring climate relationships in different species at altitudinal treeline.

At the University of Toronto (Forestry) Fayle, Scott and others have carried out intensive studies at treeline for the Churchill area and established innovative techniques for measuring growth over the entire tree (see Scott et al., 1988). Fayle was also involved with the development of the Tree-Ring Increment Measuring System (TRIM) by the Ontario Ministry of Natural Resources. Ontario MNR has developed a considerable data base using standardised TRIM and meteorological data for stands of trees usually less than 100 years old throughout Ontario. However, as these chronologies are generally short and based on multiple disc sections from the tree, they are not included in the chronology listings of this report.

Other active tree-ring researchers within Canada are listed in Appendix II and some details of projects may be found in either the Bibliography or the Chronology data bases (Sections V and VI). The available tree-ring data base is discussed in more detail in section IV.

CONCLUSION

In summary, the accelerating rate of publication shown in Figure 1 indicates the increasing interest in, and number and variety of tree-ring studies being carried out in Canada. The interest in proxy climate data may precipitate growth in this field of research but the literature to date indicates a much wider range of potential applications within Canada. There remains, however, a continued need for basic fundamental research into the relationships between tree rings, climate and other environmental stimuli for various tree species in different environments. There is also considerable need for the development of facilities within Canada to acquire and process tree-ring data (ring-width, densitometry and isotope geochemistry) and to make them accessible to university and government researchers. The scientific infrastructure for dendrochronology in Canada is skeletal and widely scattered: it will need facilities and trained personnel to meet the potential demands for environmental studies over the next decades.

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SECTION III
BIBLIOGRAPHY OF TREE-RING RESEARCH

INTRODUCTION

This bibliography provides a semi-annotated data base and is the first step towards a national compendium of tree-ring research pertinent to Canada. In selecting entries, primary emphasis was placed upon tree ring studies carried out within Canada or by researchers living in Canada. Additional North American literature is also included if it contains material that deals with (i) tree-ring sites in immediately adjacent areas of the United States; (ii) large-scale (hemispheric or global) climatic analysis involving Canadian data or regions and, (iii) topics of direct interest to Canadian researchers (e.g. similar species or discussion of the development of appropriate techniques).

The effective cut-off date for this literature review was August, 1989 although some later material up to March, 1990 may also be included. As with all initial surveys of the literature this bibliography is incomplete because of the limited availability of all potential source materials in the libraries used and the relatively short time constraints placed on the compilation.

Of the total of 561 references included in this bibliography 428 references were specifically identified to be of Canadian origin or contain Canadian data.

The initial objective was to identify sources for Canadian tree-ring chronologies and present this material in summary form with the bibliography. This paleoenvironmental bias of the research program suggests that the ecological and physiological literature may be underrepresented. Later versions of this bibliography may be more complete but we believe this initial bibliography contains most of the literature relevant to Canada.

The bibliography is also incomplete because it was not possible to consult all the references cited. Particular efforts were made to obtain copies of all materials which might contain chronology data: other materials were assigned lesser priority and may contain correspondingly less information. It is also possible that a small number of the general references may be inappropriately included and yield no direct tree-ring information or references when examined.

The entry for each article in this bibliography is divided into the following categories of information.

1. Reference number.
2. Author(s).
3. Year of publication.
4. Title of article.
5. Identification of publication containing article.
6. Scope (Measure of relevance to tree-ring research).
7. a) Geographic index.
   b) Species index.
   c) Application index.
   d) Techniques index.
8. Comments (A brief discussion on the key focus of the article).

Basic bibliographic information (author, date, title and publication) is provided for all references. The references are presented alphabetically by author with initials used in place of first names in all instances. The amount of information presented for each citation varies depending on whether the reference was consulted directly. The citations follow a standard pattern as in the example (Table 1).

TABLE 1: Sample Entry from the Bibliographic Data Base

162. FILION, L., S. PAYETTE, L. GAUTHIER and Y. BOUTIN. 1986.
Light rings in subarctic conifers as a dendrochronological tool. Quaternary Research 26: 272-279.

Scope:	**Focus**
Region:	**Bush Lake, Québec**
Species:	***Picea mariana***
Application:	**Dendrochronology, dendroclimatology, dendroecology.**
Techniques:	**Crossdating, earlywood, latewood, light rings, ring width.**
Comments:	- Light rings in black spruce are evaluated as diagnostic tools for effective establishment of cross-dates in tree-ring studies. - A master chronology of the years of light-ring formation was superimposed on the tree growth curve for Bush Lake presented in Payette et al. (1985) for the years 1398 to 1982. - Causes of light-ring formation are discussed.

All citations were serially numbered to provide access to them from indices of geographic location, species, application and techniques of interest. Where data are not available because either, (i) the source was not consulted directly or, (ii) the data fields were not applicable, the blank index entries are deleted from the data base. The criteria used for each index classification are given below.

SCOPE

The tree-ring information was initially classified under the variable SCOPE which designates whether the tree-ring material is incidental, significant or central to the subject of the source document. Three classifications were used. Articles classified as FOCUS are primarily concerned with tree-ring research. If tree rings were only one of several methods used or not the main focus of an article the focus of the article was classified as COMPONENT. Articles that simply mentioned tree rings or tree-ring analysis without significant detail were placed in the INCIDENTAL category.

INDICES

The key to efficient retrieval of information from this bibliography is the use of specialized index fields (geographic index, species index, application and techniques indices) located at the end of Section V. Detailed classification of indices was possible only for sources that were directly consulted during compilation of this bibliography. However, in all cases, preliminary classification for some indices was possible based on the information contained within the title of the article or related literature.

Species Index

Tree species were identified in this index by latin name. A listing of both common and latin names is provided for all species in Appendix I. Where the species were not specifically identified trees were indexed as driftwood, hardwoods or softwoods. Where the species was not applicable to the topic of consideration or where the species were not known the index category was deleted.

Geographical Index

Most of the citations in this bibliography cover research carried out in Canada and have been classified based on the province(s) or territory in which the work took place. Studies that involve sites throughout Canada or North America were classified at this level of generalization. Studies from the United States were included only when they contained some Canadian-based data, originated at sites located adjacent to Canada and/or are in similar ecological regions, or where they contained some data on new material of specific interest to Canadian researchers. When available, specific site locations were also included with the reference. In cases where the geographic origin of the data has no specific importance (e.g. in discussions of techniques) or was not available, this field was omitted.

Application Index

The application index was used to categorize the main application of tree ring work in the reference cited. The major subdivisions used were as follows;

Analytical techniques and data acquisition:	- development of new analytical and computational methods.
Dendrochemistry:	- investigation of isotopic and chemical characteristics of tree rings.
Dendrochronology:	- the development of tree-ring series.
Dendroclimatology:	- the use of tree-ring data as proxy climatic indicators.
Dendroecology:	- using tree-ring data to address ecological problems
Dendrogeomorphology:	- using tree-ring data to date or make inferences about geomorphic processes.
Dendrohydrology:	- use of tree-ring data for to infer water level/flow fluctuations (including droughts) in lakes and streams.
Glacial fluctuation and dating:	- use of tree-ring analysis (usually ring counts to date moraines) to determine the extent and chronology of glacier fluctuations.
Ring characteristics:	- investigations of the formation, composition and distinctive characteristics of tree rings.
Stand dynamics:	- investigation of changes in the species composition or extent of groups of trees or forest communities.
Tree growth and development:	- emphasis on the growth characteristics of individual trees using tree-ring interpretation.
Wood characteristics:	- emphasis on the aspects of wood quality and cell structure.

Techniques Index

This index is used to identify by keyword the specialized information or techniques used within the paper. The categories used were as follows: compression wood, computing, crossdating, damage effects (animal, geomorphic, human, insect, pollution), densitometry, drought rings, earlywood, false rings, frost rings, increment boring, isotopes (carbon, hydrogen or oxygen), latewood, light rings, reaction wood, review (includes all aspects of tree rings), ring count, ring pattern, ring width, sample preparation and laboratory techniques, scarring (fire or ice) and statistical methods.

COMMENTS

Brief summary comments, varying from one to several sentences in length, are given for each of the consulted references. In some cases, portions of the author's abstract or text were used with additions and explanations from the remaining text by the compiler. Emphasis was placed on a brief statement of the purpose of the study and on presenting components of results and conclusions. These comments should not be viewed as abstracts; the comments are very brief and are intended solely as an indication of content rather than a summary of results.

SOURCES USED IN THE LITERATURE SEARCH

The literature search for this bibliography was carried out principally over the period of May-August 1989 at the University of Western Ontario. The items consulted began with several obvious sources such as Schweingruber (1987), Fritts (1976), Hughes et al. (1982), etc., and available reprint collections in the Department of Geography, University of Western Ontario. Visits were also made to reprint collections and libraries of Centre d'etudes nordique at Université Laval and the University of New Brunswick. Many journals were examined in their entirety because of their obvious relevance to tree-ring work.

Within this bibliography the most extensive information on tree-ring analysis for a single journal was found in the Canadian Journal of Forest Research (40) followed by the Tree-Ring Bulletin (34) (Table 2). In addition to the above journals, publications made available by government organizations were also consulted. Major institutional sources of tree-ring publications were: Geological Survey of Canada Publications, Laboratory of Tree-Ring Research Publications and Forintek Canada Corporation report series.

Table 2. Number of Articles Consulted by Individual Journal.

JOURNAL	ARTICLES	JOURNAL	ARTICLES
Acta Geographica	4	International Journal of Applied Radiation and Isotopes	1
Advances in Ecological Research	1	Journal of Forestry	3
Albertan Geographer	1	Journal of Applied Meteorology	1
Annals of Botany	1	Journal of Geophysical Research	1
Annals of the Association of American Geographers	3	Journal of Glaciology	2
Annuals of the New York Academy of Sciences	1	Journal of the Colorado-Wyoming Academy of Sciences	1
Arctic and Alpine Research	20	Journal of Climate and Applied Meteorology	2
Botanical Review	1	Journal of Climatology	1
Bulletin of the Torrey Club	1	Le Naturaliste canadien	3
Canadian Alpine Journal	1	Mazama	1
Canadian Geographer	1	Monthly Weather Reviews	3
Canadian Journal of Botany	28	Mountain Research and Development	1
Canadian Journal of Earth Sciences	10	Natural Woodlands	1
Canadian Journal of Forest Research	40	Nature	15
Canadian Journal of Zoology	2	New Scientist	1
Canadian Society of Forensic Science Journal	1	Nordicana	2
Canadian Water Resources Journal	1	Palaeogeography, Palaeoclimatology, Palaeoecology	1
Climatic Change	5	Physical Geography	2
Climatological Bulletin	1	Professional Geographer	1
Dendrochronologia	1	Progress in Physical Geography	1
Earth and Planetary Science Letters	4	Quaternary Research	15
Ecological Monographs	6	Quaternary Science Reviews	1
Ecology	9	Science	13
Fennia	1	Syesis	1
Forestry Chronicle	30	Syllogeus	6
Forest Science	2	Tappi	2
Geographical Review	3	Tellus	1
Géographie physique et Quaternaire	4	The Professional Geographer	1
Geology	2	Tree-Ring Bulletin	34
Geos	1	Water Resources Bulletin	4
Holarctic Ecology	2	Wood and Fibre	2
		Wood Science and Technology	1

The citation of unpublished thesis material is incomplete because no comprehensive bibliographic source for theses was consulted. Theses from the following institutions are cited in the bibliography because they have been cited in the literature or were available in the libraries in which the compiler worked:

Brock University, Université Laval, University of Alaska, University of Alberta, University of Arizona, University of British Columbia, University of Colorado, University of Washington, University of Waterloo, University of Western Ontario and the University of New Brunswick.

SECTION IV
CHRONOLOGY DATA BASE

INTRODUCTION

A primary aim of this project was to assemble an initial listing of available tree-ring chronologies for Canada and present the sources for these data in a single document and standard format. This has proved a difficult task and has been only partially completed. In its present form the chronology data base contains material from many sources and even simple standardised data such as species,number of samples, dates of chronology, etc. are not available for all entries. A brief review of the sources used is necessary to understand the difficulties involved.

DATA SOURCES

The existing data are complied from seven major sources:

1. *Published Material*

   Information was extracted from the literature during compilation of the bibliography presented in Section V. Where multiple citations exist, authors may refer to several versions of the same chronology or provide different ancillary information. In addition, where data has subsequently been entered into a data base (such as (2) or (3) below), there may be no cross-reference to the original source.

2. *The Tree-Ring Laboratory Collections (TRRL) of the University of Arizona at Tucson.*

   These data consist of a computer printout, kindly furnished by Dr. M. Hughes, Director of the TRRL, giving data on site name and reference number,collector, species,first and last year of chronology, latitude and longitude for 106 sites collected in Canada over the last 50 years.

3. *The International Tree-Ring Data Bank at the University of Arizona.*

   This data bank contains standardised data meeting certain quality and format criteria: it contains a subset of those chronologies listed in (2) plus sites collected and submitted by other individuals. These data were also provided by Dr. Hughes and are in a similar format to (2). There are 36 Canadian sites in this listing. However, the tabulation provided for the present data base does not provide cross-references to the TRRL collections or the published literature.

4. *Lamont-Doherty Geological Observatory, Columbia University*

Dr. Gordon Jacoby of the Lamont-Doherty Geological Observatory kindly provided a listing of all LDGO North American treeline sites investigated prior to 1989 (41 chronologies plus 7 under development). These tables provide data on site name, latitude and longitude, species and first and last dates of chronologies.

5. *Forintek Canada Corporation, Vancouver.*

During investigations with GSC, University of British Columbia, WFPL and Forintek, M. Parker and, latterly, L. Jozsa assembled a considerable body of tree-ring data (both ring-width and densitometry) for a wide diversity of Canadian sites. Only a small fraction of these data have appeared in the published literature though most may be located in internal Forintek or contract reports. In 1982 the data for 50 sites were submitted to the National Archives of Canada and stored on computer tapes in a binary format. These data are the most comprehensive ring-width and density data set for Canadian sites. However this innovative idea has been overtaken by technology and the data are presently very difficult to access. The major problem is that with the advent of microcomputers and new forms of data storage few mainframe systems retain the software to read and translate binary tapes to a more useable format. Several attempts were made to access this material at UWO during this project using copies of the tapes provided by both the National Archives and by the Atmospheric Environment Service in Toronto (AES, Toronto have experienced similar difficulties with these data, D. McIvor and M. Berry, AES, pers. comm.). However, time and personnel limitations in the present project prevented access to the full data set. It is therefore recommended that translation of this archive material to a more accessible machine readable form (e.g. on floppy discs) should be made a high priority item, especially when one considers the relative cost of translation vis-a-vis the collection of the original data.

The documentation provided with these Forintek data deals mainly with data formats and provides no information about the sites themselves except for a name and listing of the number of records (cores?) per site. The minimum listing for Forintek sites therefore consists only of the site name and Forintek identification. Data for some sites have been extracted from various Forintek publications and, in addition, a subset of the chronologies were later used by Parker in an AES funded study of possible volcanic effects on tree-ring series (Parker, 1985). Copies of these chronologies were supplied to the author by M. Berry of AES and some details have been extracted about the sites.

6. *Dr. F.H. Schweingruber (Swiss Federal; Forestry Institute, Birmensdorf.)*

Dr. Schweingruber has carried out two extensive collection programs in Canada. In 1984 he collected a network of 80 sites in the Western Cordillera of North America (Schweingruber, 1988) of which 25 are in Canada. Dr. Schweingruber has provided the authors with the data for his Canadian sites plus a listing of site characteristics.

In addition, during 1989, Schweingruber and Jacoby sampled a network of 86 sites along the Canadian treeline from the Mackenzie River to Labrador. The name, location and some characteristics of these sites are listed in Section VI under the heading chronologies presently being developed.

7. *University of Western Ontario.*
Details from about 15 (mainly unpublished) sites being investigated at UWO are included in the listing.

DATA BASE FORMAT

Entries in the Chronology data base were categorised into fields similar to those used for the Bibliographic data base. Most categories are self-explanatory and a sample, fairly complete, entry is given in Table 3. The "technique" category is mainly used to indicate where multi-parameter chronologies exist for the same site, e.g. ring width and densitometric data. All of the Schweingruber and Forintek chronologies have both ring-width and density data. Within the "reference" field chronologies abstracted from the LTRR or ITRDB data bases are identified as (A)TRL and/or ITRDB and their reference numbers given.

Table 3: Sample Entry from the Chronology Data Base

Chronology Number	15
Site name:	BANFF
Province:	Alberta
Latitude:	051011042N
Longitude:	115029032W
Elevation:	1430 m
Species:	*Pseudotsuga menziesii*
Collector:	L.A. Jozsa and N.B. Schultz
Date of sample collection:	September, 1979
Number of trees sampled:	10
Number of cores used:	20
Application:	Dendroclimatology
Techniques:	Ring width, density, volume; earlywood width, density and volume, latewood width, density and volume, maximum and minimum density.
Chronology coverage:	1550-1978.
Reference:	Jozsa and Oguss (1985), Robertson and Jozsa (1988)

COMPATIBILITY BETWEEN SOURCES

Given such a variety of sources and multiple references to sites and chronologies by authors it is very difficult to verify discrepancies between cited chronologies without access to the original data. In some cases there are multiple chronologies from the same site (or closely adjacent sites) whereas in other cases authors may use slightly different versions of the same chronology in different papers. The listings supplied from TRRL and/or ITRDB, for example, are not cross-referenced and often contain more than one chronology for the same species at the same site. Where the TRRL and ITRDB entries appear to be the same chronology (i.e. all the available parameters match) they are combined as a single entry in the data base. However where TRRL/ITRDB sources list multiple chronologies for a site that are numbered individually, these are all listed in the data base. To add to this confusion there have also been place name changes at a number of sites (e.g. Great Whale River to Grande Riviere de la Baleine or Fort Chimo to Kuujjuak) or variation in the naming of chronologies by authors. Attempts have been made to remove the most obvious duplication but, when in doubt, duplication has been preferred to removal.

The final listing in Section VI includes all sites given in the above sources regardless of the level of detail provided. In addition, there are data for another 34 chronologies, numbered 400-433, which have not yet been included in the data base. Each entry indicates that a tree-ring chronology exists in some form for this site. Many sites have incomplete documentation and some duplication of entries remains. Nevertheless, the goal in attempting this compilation was to indicate what data are potentially available rather than to provide a data set of uniform high quality for immediate analysis. Reduction of possible errors, inconsistencies or omissions from this data base is seen as the task of individual researchers or subsequent projects to assemble national and/or regional data bases from the data sources identified here.

CHARACTERISTICS OF THE AVAILABLE RECORDS

The discussion of the distribution of sites, species used and length of record which follows utilises a subset of the data within the data base. As a standardized data set is not available for all chronologies, the summaries generated can only include those sites for which the pertinent data are available and therefore there are discrepancies between the total number of sites used to discuss species, length of chronologies, etc. If the data base contains multiple chronologies for the same species at a site collected by the same author, the data may be reduced to a single entry in the summaries presented below. Information from chronologies numbered 400-433 are included in these summaries.

Development of the Chronology Data Base

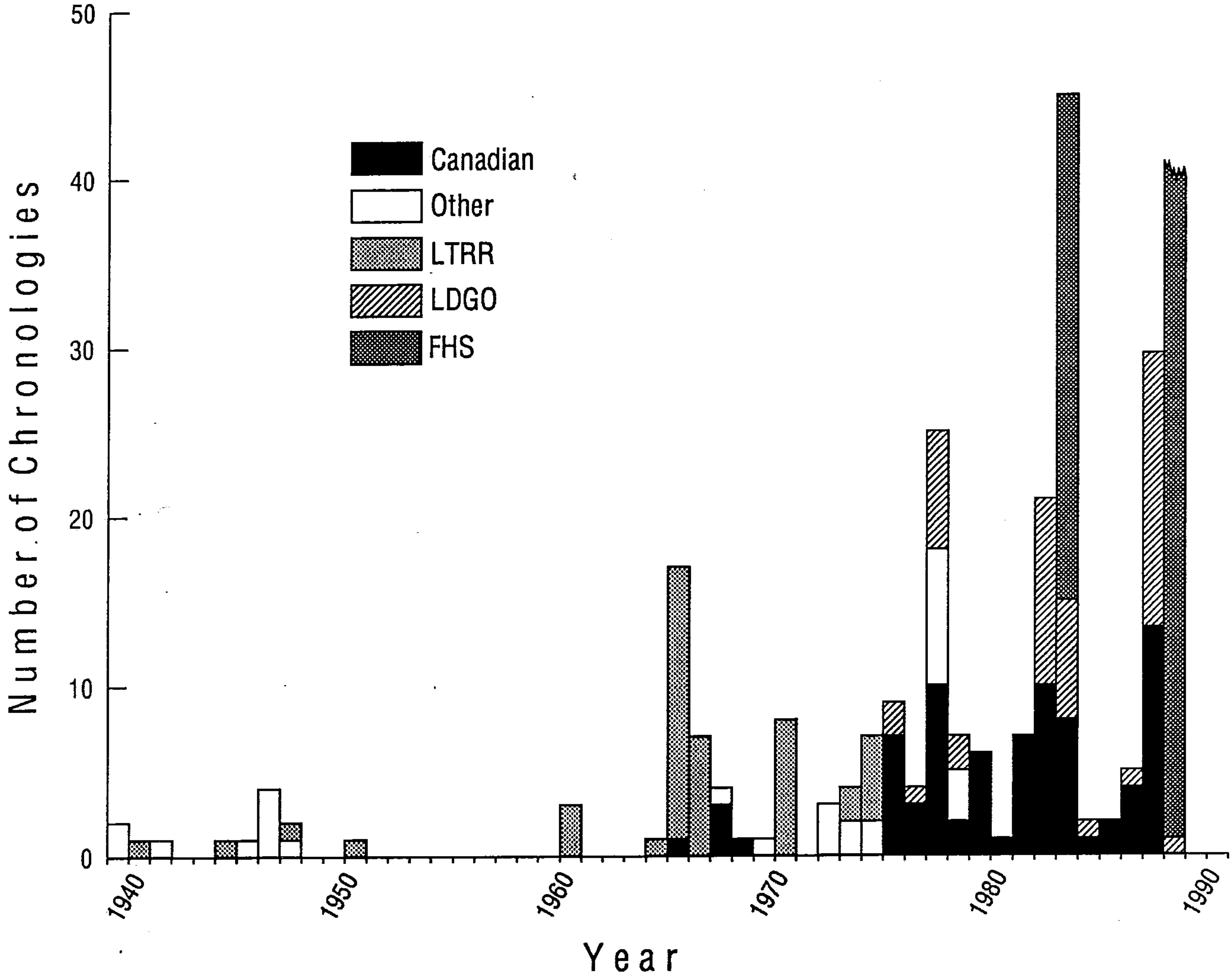
Despite its imperfections, this compilation provides a broad picture of the available data base for Canada and offers some interesting insights into the way it has been accumulated. Figure 2 shows 230 chronologies for which the last year of record is available. A map of sites is included as Appendix 3. In most cases the last year of the chronology can be assumed to represent the year before data collection and, therefore, this figure provides a measure of chronology acquisition and, indirectly, changes in the level of interest in dendrochronology in Canada over the period shown.

The chronologies collected prior to ca. 1950 established a geographical pattern that identified classic areas and themes for Canadian dendrochronology and has persisted through subsequent generations of researchers. Marr, in the late 1930's, and Hustich (1946) were the first to sample treeline sites in Labrador and Québec. Giddings (1940's) and Oswalt in the late 40's and early 50's sampled the boreal forest from Alaska into the Yukon and Mackenzie Delta areas. The first forays of LTRR into Canada were by Schulman who sampled moisture sensitive trees in interior British Columbia and at Jasper between 1940 and 1951. The published papers from these studies defined a focus and potential for tree-ring studies in Canada that has consistently reemerged in subsequent studies over the next half century. It is only in the 1980's that more diverse interests have appeared and Canadians have initiated dendrochronological exploration into other fields and geographical regions.

Following this initial period of chronology acquisition there is a long hiatus; few chronologies were collected between 1953 and 1965. During the 1960's and early 70's the pattern of chronology recovery almost entirely reflects the collection activities by LTTR (Tucson). Sampling for the network of sites for the western North America grid network (Fritts, 1971) took place during 1966 and 1967 focusing on dryland species in the western Cordillera. The chronologies ending in 1970 are associated with LTRR dendrohydrological investigations in the Peace-Athabasca Delta area (Stockton and Fritts, 1973).

Since the mid-1970's investigations have been more widespread and diversified with occasional "peaks" of activity usually reflecting individual projects. The picture presented in Figure 2 is a little misleading because the collection activities of Marion Parker during this period are underrepresented; it has not been possible to access all the data on the Forintek data tape and we have not been able to locate much of his earlier data. The generally high level of activity from the mid 70's to mid 80's results from several active groups. During the 1970's tree-ring data were collected by a number of government agencies in association with studies on the Mackenzie valley (e.g. chronologies 40, 105, 137) and most of the Forintek data base was built up during this period. Jacoby's first Canadian sites were sampled in 1975 and several collections resulted from work at INSTAAR (Institute of Arctic and Alpine Research, Boulder, Colorado e.g. chronologies 92-94). The UWO chronologies date from 1980 and CEN chronologies from 1982. During the 1980's the pattern of collection has been dominated by Schweingruber's two sampling networks. In 1984, 25 sites (30 chronologies) were sampled as part of a 80-site network of ring-width and density chronologies for the western cordillera. In 1989 Schweingruber and Jacoby sampled a similar network of 86 sites along the northern treeline. Data for these sites arrived too late to be incorporated into the data base but they are listed in Section VI.

Figure 2. Frequency of Tree-Ring Chronologies.



Species Used for Dendrochronological Studies

Table 4 is a listing of the species for which chronologies have been developed in Canada. Sixty-one per cent of the chronologies are spruce, Douglas fir and larch account for 24%, and pine and fir another 10%. No other species has more than 3 chronologies listed. Table 5 lists the 71 chronologies that extend back beyond 1652. These old chronologies are restricted to spruce (49%), Douglas fir (24%), larch (13%), pine(7%) hemlock and cedar (3% each).

These two tables show that white spruce is the most extensively utilised and widely distributed species, extending across the northern boreal forest from Alaska to Newfoundland. Black spruce is the third most frequently sampled species and has a similar range whereas Engelmann spruce is restricted to the Cordillera. All three species have produced chronologies and living trees over 600 years and offer the greatest potential for a Canada-wide network of long chronologies using the same genus. The focus has largely been on the northern treeline because of the sensitive tree-ring response to climate (particularly summer temperatures, see Jacoby and D'Arrigo, 1989) but it appears that spruce at altitudinal treeline also has similar high potential (Luckman, 1989). Larch has also been used in similar environments with *Larix laricana* being used in the boreal forests (oldest chronologies almost 400 years) and, more recently, alpine larch in the southern cordillera where the oldest trees exceed 600 years. The larch appear to be much more sensitive than spruce (see Colenutt, 1988) and offer good potential for further investigations. In all of the boreal forests, fire damage significantly restricts the length of available tree-ring records and old growth stands are difficult to find in many areas.

Table 4: Species for which Chronologies have been Developed in Canada

Taxa	Number of Chronologies	Earliest Date	Taxa	Number of Chronologies	Earliest Date
Abies amabilis	1	NA	*Pinus resinosa*	4	1550
Abies lasiocarpa	8	1711	*Pinus albicaulis*	1	1112
Fraxinus pennsylvanica	1	1916	*Pinus contorta*	4	1750
Larix laricina	19	1596	*Populus deltoides*	1	1913
Larix lyallii	7	1340	*Psuedotsuga menziesii*	27	1410
Larix occidentalis	4	1746	*Quercus* sp.	1	1460*
Nyssa silvatica	1	1705	*Thuja occidentalis*	3	ca.1180
Picea glauca	104	1340	*Thuja plicata*	1	NA
Picea mariana	25	1305	*Tsuga canadensis*	1	1524
Picea engelmannii	16	1323	*Tsuga heterophylla*	2	NA
Pinus ponderosa	4	1420	*Tsuga mertensiana*	1	NA
Pinus strobus	2	1650*	*Ulmus americana*	1	1943
			Total	239	

* = archaeological wood

NA = dates for chronology not available

Table 5: Canadian Tree-Ring Chronologies that Extend Back prior to 1650

NO.	LOCALITY / NAME	COORDINATES		COLLECTOR	TAXA	YEARS
	Yukon Territory:					
067.	Cornwall River	66° 48'	136° 22'	LDGO	*Picea glauca*	1568-1987
214.	McMillan Pass	63° 11'	130° 12'	LDGO	*Picea glauca*	1494-1987
293.	River Crag	65° 40'	138° 00'	LDGO	*Picea glauca*	1635-1975
323.	Spruce Creek	68° 38'	138° 38'	Church	*Picea glauca*	1570-1977
345.	Terasmae	64° 05'	138° 19'	LTRR	*Picea glauca*	1624-1964
353.	TTHH	65° 00'	138° 20'	LDGO	*Picea glauca*	1459-1975
417.	TTHH Revisited	65° 00'	138° 20'	LDGO	*Picea glauca*	1499-1987
	Northwest Territories:					
024.	Big Bend	66° 49'	116° 04'	LDGO	*Picea glauca*	1525-1977
065.	Coppermine	67° 14'	115° 55'	LDGO	*Picea glauca*	1428-1977
090.	Finnie Flats	64° 09'	102° 35'	LDGO	*Picea glauca*	1516-1983
111.	Franklin Mountains	65° 21'	126° 42'	LDGO	*Picea glauca*	1615-1983
150.	Hornby Cabin	64° 02'	103° 52'	LDGO	*Picea glauca*	1491-1983
206.	Mack Mountain	65° 00'	127° 50'	LDGO	*Picea glauca*	1626-1983
207.	Mackenzie Delta	67° 43'	135° 23'	Giddings	*Picea glauca*	1357-1946
303.	September Mountain	67° 11'	116° 08'	LDGO	*Picea glauca*	1340-1977
321.	Soapberry Hill	64° 17'	103° 32'	LDGO	*Picea glauca*	1495-1983
346.	Thelon Game Sanctuary	63° 05'	104° 12'	Dennis	*Picea glauca*	1574-1969
094.	Ennadai Lake	61° 00'	101° 00'	EFisk	*Larix lariciana*	1638-1977
	British Columbia:					
022.	Bennington Glacier	52° 42'	118° 20'	UWO	*Pinus albicaulis*	1112-1985
029.	Bull Canyon	52° 06'	123° 13'	Desloges	*Pseudotsuga menziesii*	1650-1985
120.	Gang Ranch	51° 32'	122° 16'	FOR	*Pseudotsuga menziesii*	1590-1968
139.	Haney	49° 01'	133° 03'	FOR	*Pseudotsuga menziesii*	1590-1975
159.	Kamloops	50° 45'	120° 23'	LTRR	*Pseudotsuga menziesii*	1420-1965
162.	Kamloops	50° 45'	120° 23'	LTRR	*Pseudotsuga menziesii*	1505-1965
230.	Naramata	49° 36'	119° 35'	LTRR	*Pseudotsuga menziesii*	1415-1965
261.	Pavillion Lake	50° 45'	121° 33'	LTRR	*Pseudotsuga menziesii*	1460-1960
262.	Pavillion Lake	50° 45'	121° 41'	LTRR	*Pseudotsuga menziesii*	1480-1965
331.	Stuie	52° 25'	126° 03'	Desloges	*Pseudotsuga menziesii*	1579-1983
113.	Fraser River	52° 00'	122° 00'	LTRR	*Pinus ponderosa*	1420-1944
163.	Kamloops	50° 45'	120° 33'	LTRR	*Pinus ponderosa*	1590-1960
231.	Naramata	49° 36'	119° 35'	LTRR	*Pinus ponderosa*	1500-1965
028.	Bugaboo Glacier	50° 54'	117° 47'	FOR	*Picea engelmannii*	1590-1975
408.	Floe Lake	51°.03'	116° 08'	UWO	*Larix lyallii*	1523-1987
	Alberta:					
015.	Banff	51° 11'	115° 29'	FOR	*Pseudotsuga menziesii*	1550-1978
016.	Banff	51° 09'	115° 29'	LTRR	*Pseudotsuga menziesii*	1461-1950
097.	Exshaw	51° 04'	115° 11'	LTRR	*Pseudotsuga menziesii*	1560-1965
155.	Jasper	52° 54'	118° 04'	LTRR	*Pseudotsuga menziesii*	1537-1947
165.	Kananaskis	51° 05'	115° 00'	FOR	*Pseudotsuga menziesii*	1630-1979
273.	Powerhouse	51° 12'	115° 31'	LTRR	*Pseudotsuga menziesii*	1410-1965

277. Pyramid and Patricia	52° 54'	118° 05'	LTRR	*Pseudotsuga menziesii*	1540-1965
279. Pyramid Lake	52° 54'	118° 06'	LTRR	*Pseudotsuga menziesii*	1630-1960
349. Tunnel Mountain	51° 10'	115° 33'	LTRR	*Pseudotsuga menziesii*	1460-1965
013. Athadome	52° 13'	117° 14'	UWO	*Picea engelmannii*	1646-1980
064. Columbia Icefield	52° 13'	117° 14'	FOR/UWO	*Picea engelmannii*	1323-1981
203. Larch Valley	51° 20'	116° 13'	UWO	*Picea engelmannii*	1638-1986
295. Robson Glacier	53° 09'	119° 07'	UWO	*Picea engelmannii*	1569-1982
339. Swan Hills	55° 25'	115° 25'	FOR	*Picea glauca*	1651-1978
405. Athabasca Snag	52° 13'	117° 14'	UWO	*Picea engelmannii*	1293-1898
406. Peyto Lake	51° 45'	116° 13'	FHS	*Picea engelmannii*	1634-1983
411. Nakiska	50° 50'	115° 15'	UWO	*Picea engelmannii*	1616-1987
412. Tyrwhitt	50° 36'	114° 59'	UWO	*Picea engelmannii*	1613-1987
201. Larch Valley	51° 20'	116° 13'	UWO	*Larix lyallii*	1538-1986
407. Sunshine	51° 04'	115° 47'	UWO	*Larix lyallii*	1440-1987
409. Marmot Basin	50° 50'	115° 15'	UWO	*Larix lyallii*	1650-1987
410. Nakiska	50° 50'	115° 15'	UWO	*Larix lyallii*	1563-1987
413. Highwood	50° 36'	114° 59'	UWO	*Larix lyallii*	1559-1987
Manitoba:					
056. Churchill	58° 43'	94° 04'	LDGO	*Picea glauca*	1650-1978
Ontario:					
400. Dixon Lake	45° 17'	78° 02'	Cook	*Pinus resinosa*	1550-1982
401. Pot Lake	45° 17'	79° 00'	Cook	*Tsuga canadensis*	1641-1982
Québec:					
128. Grande Rivière de la Baleine	55° 17'	77 °47'	CEN	*Picea glauca*	1640-1986
288. Richmond Gulf	56° 09'	76° 34'	LDGO	*Picea glauca*	1628-1982
026. Boniface-Bush	57° 05'	76° 00'	CEN	*Picea mariana*	1305-1803
034. Bush Lake	57° 47'	75° 45'	CEN	*Picea mariana*	1398-1982
062. Clearwater Lake	56° 03'	75° 03'	CEN	*Picea mariana*	1630-1982
118. Fort Chimo 4-L (Kuujjuaq)	58° 22'	68° 23'	LTRR	*Larix lariciana*	1650-1974
294. Rivière aux feuilles	58° 15'	72° 00'	Arquiller	*Larix lariciana*	1596-1978
121. Gaspé	48° 35'	65° 55'	LDGO	*Thuja occidentalis*	1404-1982
197. Lac Duparquet	48° 26'	79° 21'	Archambault	*Thuja occidentalis*	802 years
404. Rivière du Moulin	46° ?	71° ?	Cook	*Tsuga canadensis*	1524-1982
Labrador:					
301. Saltwater Pond	56° 31'	61° 55'	LDGO	*Picea glauca*	1602-1988
414. Nain	56° 27'	62° 05'	LDGO	*Picea glauca*	1574-1986

NOTES: (Includes all data from Section 6)

CEN	= Centre d'études nordiques, Université Laval
Church	= M. Church, Geography, University of British Columbia
Dennis	= J. Dennis
Desloges	= J. Desloges, Geography, University of Toronto
EFisk	= D. Elliot-Fisk
Cook	= E.R. Cook, Lamont-Doherty Geological Observatory
FOR	= Forintek Canada Corporation (L. Jozsa / M. Parker)
FHS	= F.H. Schweingruber
Giddings	= J. Giddings
LDGO	= Lamont Doherty Geological Observatory (G. Jacoby)
LTRR	= Laboratory of Tree-Ring Research, Tucson
UWO	= Department of Geography, University of Western Ontario
?	= data not available

Most of the studies in the Cordillera to date have focused on *Psuedotsuga menziesii*. Chronologies have been recovered from a network of lower treeline sites in interior British Columbia and Alberta sampled by LTRR in the mid-sixties and extended by Marion Parker in the 1970's. Most of these sites are trees growing at the drier margin of the montane forest and appear to be quite sensitive to moisture fluctuations (Robertson and Jozsa 1988). The oldest chronologies obtained so far are about 550 years old. However, Douglas fir are known to attain ages of over 1300 years on Vancouver Island, British Columbia (Parker and Jozsa, 1974; Parker et al., 1978). Several other species in the Coast Mountains of British Columbia are known to exceed 1000 years in age. For example, a yellow cypress (*Chamaecyparis nootkatensis*) with ca. 1600 rings was probably the oldest tree in Canada and another specimen with 1074 rings has been reported from Harrison Lake, British Columbia (L. Josza, pers. comm., 1990). Salvage work should be carried out on these old trees to evaluate their dendrochronological potential while significant stands of old growth forests remain.

The oldest chronology presently available in Canada is from a stand of *Pinus albicaulis* at Bennington Glacier, British Columbia, in the Canadian Rockies, that extends back to 1112 A.D. (Luckman, 1989). Unfortunately, this is the only chronology for this species in Canada and, compared with the United States, dendrochronological studies of pine in Canada are poorly developed. Four chronologies have been developed for three species of pine (Ponderosa, red and lodgepole) in quite different environments. Ponderosa pines were sampled as part of the LTRR network in British Columbia in the 1960's and extend back up to 500 years. Most of the red pine chronologies were recovered during Lamont Doherty investigations in eastern Ontario and provide a maximum of 450 years of record. The *Pinus contorta* chronologies are mainly from Schweingruber's western network but they rarely exceed 200 years in length. Presently there is also some dendrochronological work being carried out on white pine in Ontario (R. Suffling, B. Kronberg, pers. comm., 1990). All of these pines clearly offer considerable untapped potential for chronology development.

Most of the fir chronologies use alpine fir in the cordillera but this species, like *Pinus contorta*, has received little attention as it is relatively short lived (rarely more than 300 years) compared with other trees in this environment.

In the last few years there has been some exploratory work on cedars that suggests these trees may offer significant potential for long chronologies in eastern Canada. Only 3 chronologies for *Thuja occidentalis* are presently developed but they include one of almost 600 years from Gaspé and a chronology of ca. 800 years from Lake Duparquet in Québec*. In addition, studies by D. Larsen at the University of Guelph have located stands of white cedar with individuals up to 700 years old growing on the face of the Niagara Escarpment in Ontario. These preliminary results, plus the old yellow cypresses (Alaska cedar) reported from British Columbia suggest that cedar is worthy of further dendrochronological studies in Canada as it may have considerable potential to provide long records. Similar comments can be made about the potential from various hemlock species with at least one chronology exceeding 450 years but little dendrochronological work has been published on hemlock from Canada.

CONCLUDING REMARKS

This brief summary indicates the critical role played by certain individuals and organizations in setting up the presently available data base for Canada. Almost two-thirds (65%) of the chronologies shown in Figure 2 were collected by LTRR (22%), Jacoby (18%), Parker or Schweingruber (approximately 13% each, excluding the 1989 activities). The collected data holdings therefore clearly reflect the geographic, environmental and species biases that are built into those research programs and there has been little attempt to explore systematically the potential of all species or environments in Canada. There are, for example, no chronologies listed from Saskatchewan or the Maritimes (Nova Scotia, Prince Edward Island and New Brunswick) and very few from southern Ontario or Québec. Little explicit attention has been given to sampling in the west coast forests where the oldest Canadian trees occur. Although most attention has been focused on spruce (61% of chronologies) and Douglas fir, there is considerable potential for the development of long records using larch, various pines, cedar and hemlock from a range of environments across the country. In addition, possibly because of the lack of applications of dendrochronology to archaeological problems in Canada, there has been little development of sub-fossil "floating" tree-ring chronologies that could significantly extend the living-tree record. The material presented here indicates there is considerable potential to build up regional chronologies for several areas of Canada that could span the last 500-1000 years using a variety of species.

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* A recent news report (Hebdo Science, 632, 26 December 1990, Agence Science-presse, Montréal) indicates that the oldest tree at this site was 911 years old.

SECTION V
BIBLIOGRAPHIC LISTING AND INDICES

BIBLIOGRAPHIC LISTING

1. **AGERTER, S.R. and W.S. GLOCK.** 1965.
An annotated bibliography of tree growth and growth rings, 1950-1962. The University of Arizona Press, Tucson.
Scope: **Focus.**
Region: **North America.**
Species: **Hardwoods, softwoods.**
Application: **Analytical techniques and data acquisition, ring characteristics, tree growth and development.**
Techniques: **Review.**

2. **ALESTALO, J.** 1971.
Dendrochronological interpretation of geomorphic processes. Fennia 105: 1-140.
Scope: **Focus.**
Region: **Finland.**
Species: ***Alnus incana, Alnus glutinosa, Betula verrucosa, Juniperus communis, Picea abies, Pinus pubescens, Pinus silvestrus, Salix* sp.**
Application: **Dendrogeomorphology.**
Techniques: **Reaction wood, scarring.**
Comments:
- Basic principles, methods, and applications of dendrogeomorphology as they relate to interpretation of mass movements, glacial processes and fluvial processes are discussed.
- Selected Canadian studies are mentioned in text.

3. **ALEXANDER, M.E.** 1978.
Reconstructing the fire history of Pukaskwa National Park; in Fire Ecology in Resource Management Workshop Proceedings, Dec. 6-7, 1977. D.E. Dube (Ed.), Canadian Forestry Service. Information Report NOR-X-210. p. 4-11.
Scope: **Component.**
Region: **Pukaskwa National Park, Ontario.**
Species: **Softwoods.**
Application: **Stand dynamics (fire history).**
Techniques: **Damage effects, scarring (fire).**
Comments:
- Methodology for reconstruction of the fire history using dendrochronology is discussed.

4. **ALFARO, R.I. and R.N. MACDONALD.** 1988.
Effects of defoliation by the Western False Hemlock Looper on Douglas fir tree-ring chronologies. Tree-Ring Bulletin 48: 3-11.
Scope: **Focus.**
Region: **Chase, British Columbia.**
Species: ***Pseudotsuga menziesii.***
Application: **Dendroecology.**
Techniques: **Damage effects (insect), ring width.**

Comments:
- Annual rings of Douglas fir which sustained 1 year of defoliation by the western false hemlock looper showed a period of decrease in breast height ring width starting in the year that followed the damage.
- The magnitude of the decrease was related to the degree of defoliation; the decrease became progressively more noticeable in trees which sustained increasingly higher defoliation.
- This period of reduction lasted 1 to 5 years and was followed by a period of above-normal growth which was directly related to defoliation amount.
- Increase in defoliation caused a significant increase in index standard deviation, autocorrelation and mean sensitivity.

5. **ALFARO, R.I., E. WEGWITZ, A.D. ERICKSON, and W.J. PANNEKOEK.** 1984.
A microcomputer-based data reader and editor for the DIGIMIC Tree-ring Measuring System. Canadian Forestry Service Research Notes 4: 30-31.
Scope: **Focus.**
Region: **Canada.**
Application: **Analytical techniques and data acquisition.**
Techniques: **Computing, ring width.**
Comments:
- A powerful editor computer program written on an Apple II Plus microcomputer is presented.
- Computer program is designed to read and manipulate tree-ring data obtained with the (DIGIMICROMETER) DIGIMIC tree-ring measuring instrument, developed in New Brunswick.

6. **ARCHAMBAULT, S.** 1989.
Les cedres blancs (*Thuja occidentalis* L.) de grande longevite due lac Duparquet, Abitibi: une etude dendroclimatologique et ecologique. M.Sc. Thesis, in progress, Université du Québec à Montréal.
Region: **Lac Duparquet, Québec.**
Species: ***Thuja occidentalis.***
Application: **Dendroclimatology, dendroecology.**

7. **ARCHAMBAULT, S. and Y. BERGERON.** 1988.
Dendrochronology of northern white cedar (*Thuja occidentalis*). Ecological Society of America, Davis, California (Abstract).
Species: ***Thuja occidentalis.***
Application: **Dendroclimatology.**

8. **ARNO, S.F. and J.R. HABECK.** 1972.
Ecology of the alpine larch (*Larix lyallii* Parl.) in the Pacific Northwest. Ecological Monographs 42: 417-450.
Focus: **Incidental**
Region: **Alberta, British Columbia, Washington.**
Species: ***Larix lyallii.***
Application: **Stand dynamics, tree growth and development.**
Techniques: **Ring width.**
Comments:
- The objectives of this study were to provide basic information on the ecology of *Larix Lyallii* and to analyze the vegetational communities associated with alpine larch throughout its range.

9. **ARQUILLIERE, S., L. FILION, K. GAJEWSKI and C. CLOUTIER.** 1989.
Untitled. Submitted to the Canadian Journal of Forest Research.
Scope: **Focus.**
Region: **Riviere aux Feuilles, Post-de-la-Baleine, Québec.**
Species: ***Larix laricina, Picea glauca.***
Application: **Dendrochronology, dendroclimatology.**
Techniques: **Crossdating, damage effects (insect), ring width.**
Comments:
- Two dendrochronological curves of eastern larch/tamarack were produced for a region in subarctic Québec.
- Tree-ring signature of larch with respect to climate and biotic factors was evaluated.
- Tree-ring series showed similar variations, favouring growth at the end of the 19th and the beginning of the 20th century.
- Larch ring variation correlated strongly with summer temperatures.
- Comparison of larch and spruce chronologies show differences which could probably be explained by larch sawfly outbreaks.

10. **BAILLIE, M.G.L.** 1980.
Some observations of gaps in tree-ring chronologies; in Symposium on Archeological Sciences. H. Aspinall and S.E. Warren (Eds.). 4-7 January, 1978. University of Bradford Press.
Application: **Dendrochronology.**

11. **BAINS, B.S. and M.M. MICKO.** 1985.
Computerization of tree growth measurement in the wood quality; laboratory-improvement and modification of two systems. University of Alberta Agricultural and Forestry Bulletin 8: 63-66.
Region: **Canada.**
Application: **Analytical techniques and data acquisition, wood characteristics.**
Techniques: **Computing.**

12. **BALATINECZ, J.J. and H.W. ANDERSON.** 1989.
Effects of climatic factors of the formation of wood and its quality; in Climate Applications in Forest Renewal and Forest Production. D.C. MacIver, R.B. Street and A.N. Auclair (Eds.). Proceedings of Forest Climate '86, November 17-20, 1986, Geneva Park, Orillia, Ontario.
Scope: **Component**
Region: **Ontario**
Species: ***Larix decidua, Larix laricina***
Application: **Dendroclimatology, ring characteristics**
Techniques: **Earlywood, latewood**
Comments:
- Results of laboratory experiments and field observations are presented on the effects of photoperiod, drought, and temperatures on wood formation in larch and hybrid poplar as typical examples.
- Results fitted theory of limiting factors, that is, a factor that falls below an optimal range will set the pace for physiological processes that determine the differentiation and maturation of wood cells.

13. BALCH, R.E., F.E. WEBB and R.F. MORRIS. 1954.
Results of spraying against spruce budworm in New Brunswick. Canadian Department of Agriculture and Forest Biology Division Bi-monthly Progress Report 10.
Region: **New Brunswick.**
Application: **Dendroecology.**
Techniques: **Damage effects (insect).**

14. BALLANCE, R.H. 1982.
A microcomputer-based annual growth ring measurement system. B.Sc.F. Thesis. University of New Brunswick, Fredericton, New Brunswick. 69 p.
Region: **New Brunswick.**
Application: **Analytical techniques and data acquisition, ring characteristics.**
Techniques: **Computing.**

15. BANNAN, M.W. 1941.
Variability in wood structure in roots of native Ontario conifers. Bulletin of the Torrey Club 68: 173-194.
Scope: **Component.**
Region: **Ontario.**
Species: ***Abies balsamea, Larix laricina, Picea glauca, Picea mariana, Pinus banksiana, Pinus strobus, Thuja occidentalis, Tsuga canadensis.***
Application: **Ring characteristics, tree growth and development.**
Techniques: **Earlywood, latewood, ring width.**
Comments:
- Limited in discussion to secondary xylem of roots.
- Determines the range of structural variation in wood of 8 tree species native to Ontario.

16. BANNAN, M.W. 1955.
Vascular cambium and radial growth in *Thuja occidentalis* L. Canadian Journal of Botany 33: 113-138.
Scope: **Focus.**
Region: **Toronto, Ontario.**
Species: ***Thuja occidentalis.***
Application: **Ring characteristics.**
Techniques: **Ring width.**
Comments:
- Relationships between cambium and radial growth are discussed especially with respect to sequence of periclinal division on cambial reactivation.
- Seasonal variations in the width of the zone of cell generation, frequency of cell division across this zone, and the time factor in xylem and phloem production are also analyzed.

17. BANNAN, M.W. 1957.
Girth increase in white cedar stems of irregular form. Canadian Journal of Botany 35: 425-434.
Scope: **Focus.**
Region: **Toronto, Ontario.**
Species: ***Thuja occidentalis.***
Application: **Ring characteristics.**
Techniques: **Ring width.**

Comments: - The cambial response of *Thuja occidentalis* to application of radial pressures is discussed.

18. BANNAN, M.W. 1962.
The vascular cambium and tree-ring development; in Tree Growth Volume I, p. 3-21. T. Kozlowski (Ed.).
Scope: **Focus.**
Region: **Ontario.**
Species: ***Abies balsamea, Picea glauca, Picea mariana.***
Application: **Ring characteristics.**
Techniques: **Earlywood, latewood.**
Comments:
- Analysis of the development of the growth ring from vascular cambium.
- Discusses in detail cellular organization within growth rings, the site and extent of periclinal cell divisions, seasonal changes in tree-rings, factors influencing latewood development and variation of latewood within the tree.

19. BANNAN, M.W. and M. BINDRA. 1970.
The influence of wind on ring width and cell length in conifer stems. Canadian Journal of Botany 48: 255-259.
Scope: **Component.**
Region: **Ontario, Alberta.**
Species: ***Picea glauca, Pinus contorta, Pinus strobus.***
Application: **Ring characteristics, tree growth and development.**
Techniques: **Ring width.**
Comments:
- The relationships between wind, stem form, ring width, cell length, and frequency of multiplicative divisions in the cambium are analyzed with major emphasis on variations in tree growth response to prevailing wind directions.

20. BARRY, R.G. 1978.
Climatic fluctuations during the periods of historical and instrumental record; in Climatic Change and Variability: A Southern Perspective. A.B. Pittock, L.A. Frakes, D. Jenssen, J.A. Peterson, and J.W. Zillman (Eds.). Cambridge University Press, New York. pp. 150-166.
Scope: **Component.**
Region: **Northern Hemisphere.**
Application: **Dendrochronology, dendroclimatology.**
Techniques: **Ring width.**
Comments:
- Dendrochronological interpretation of past climates is discussed.
- The possibility of identifying seasonal changes in climate for the latest few centuries is also entertained.
- Historical climatic anomalies in North America are also addressed.

21. **BÉGIN, C.** 1983.
Analyse dendrochronologique d'un glissement de terrain dans la region du lac à l'Eau Claire (Nouveau-Québec). B.A. Thesis, Départment de Geographie, Université Laval. 48p.
Scope: **Component.**
Region: **Lac a l'Eau Claire, Québec.**
Species: ***Picea glauca, Picea mariana.***
Application: **Dendrogeomorphology.**
Techniques: **Reaction wood, ring width, scarring.**
Comments:
- Response of trees to landslide events are useful for exact dating of mass movement.

22. **BÉGIN, C.** 1985.
Morphologie genese et chronologie des glissements de terrain de Poste-de-la-Baleine, Québec subartique. M.A. Thesis, Université Laval, Sainte-Foy, Québec. 89 p.
Scope: **Component.**
Region: **Poste-de-la-Baleine, Québec.**
Species: ***Picea mariana.***
Application: **Dendrogeomorphology.**
Techniques: **Reaction wood, ring width.**
Comments:
- Tree-rings were used to date landslides that occurred within the last 250 years.
- Frequent landslides between 1818 and 1846 suggest cold and humid climate during that period.

23. **BÉGIN, C. and L. FILION.** 1985.
Analyse dendrochronologique d'un glissement de terrain de la region du lac à L'Eau Claire (Québec Nordique). Canadian Journal of Earth Sciences 22: 175-182.
Scope: **Focus.**
Region: **Northern Québec.**
Species: ***Larix laricina, Picea mariana.***
Application: **Dendrogeomorphology.**
Techniques: **Reaction wood, ring width, scarring.**
Comments:
- The peak periods of landslide movement in the Clearwater Lake region are dated using tree-ring analysis.

24. **BÉGIN, C. and L. FILION.** 1987.
Dating landslides in the Hudson Bay Area, Québec; in Proceedings of the International Symposium on Ecological Aspects of Tree-Ring Analysis. G.C. Jacoby and J.W. Hornbeck (Eds.). 290 p.
Scope: **Component.**
Region: **Grande Rivière-de-la-Baleine, Québec.**
Application: **Dendrogeomorphology.**
Techniques: **Ring pattern, ring width.**
Comments:
- Recent landslides along the estuary of the Grande Rivière de la Baleine are relatively and absolutely dated using master chronologies and growth curves from buried trees found in flowing sediments.

25. BÉGIN, C. and L. FILION. 1988.
Age of landslides along the Grandes Rivière de la Baleine estuary, eastern coast of Hudson Bay, Québec (Canada). Boreas 17: 289-299.

Scope: **Component.**
Region: **Poste-de-la-Baleine, Québec.**
Species: ***Picea glauca.***
Application: **Dendrogeomorphology, dendrochronology.**
Techniques: **Crossdating, light rings, reaction wood, ring pattern, ring width.**
Comments:
- Old landslides in the area were dated using radiocarbon dating and recent landslides were dated using dendrochronology.
- Tree-ring analysis was performed on buried upright trees found in sediments and on the surface of rotated blocks.
- Exact dates of landslide occurrences were obtained by the last growth year in dead trees.
- Tree-rings provided the date, season and short-term climatic context responsible for the inception of the landslide event.
- Frequent landslides in the early 19th century were associated with cold, humid climates in the spring and the summer.

26. BÉGIN, Y. 1986.
Dynamique de la vegetation riveraine du lac à L'Eau Claire, Québec Subarctique. These de Ph.D., Université Laval, Québec.

Region: **lac à L'Eau Claire, Québec.**
Application: **Stand dynamics.**

27. BÉGIN, Y. et J. LAVOIE. 1988.
Dynamique d'une bordure forestiere et variations recente du niveau de flueve Saint-Laurent. Canadian Journal of Botany 66: 1905-1913.

Scope: **Focus.**
Region: **Québec.**
Species: ***Fraxinus pennsylvanica, Populus deltoides, Ulmus americana.***
Application: **Dendroecology, dendrohydrology.**
Techniques: **Compression wood, ring width, scarring.**

Comments:
- A dendroecological analysis of the significant river floods as recorded by ring width patterns of uprooted woody plants, population growth and decay structures, and scars caused by ice damage on trees within the shore environment, provides direct evidence of a landward migrating shoreline.
- Regressive succession of vegetation was associated with the general rise and fall of year to year flood levels.

28. BÉGIN, Y. and S. PAYETTE. 1988.
Dendroecological evidence of lake-level changes during the last three centuries in Subarctic Québec. Quaternary Research 30: 210-220.

Scope: **Component.**
Region: **Clearwater Lake, Québec.**
Species: ***Picea mariana.***
Application: **Dendroclimatology, dendroecology, dendrogeomorphology, dendrohydrology.**
Techniques: **Compression wood, ring pattern, scarring.**
Comments:
- Dendroecological analysis of Clearwater Lake, water level fluctuations yield information on water levels for the past three centuries.
- Trees were progressively submerged by increasing water levels which reached a maximum this century.
- increasing water levels in the mid 1800's caused trees to lean due to the effects of extensive wave action, resulting in abundant scar formation and high tree mortality.
- Increased water levels are thought to be the result of increased snowfall that accompanies warm global temperatures.

29. BÉLANGER, S. 1987.
Dynamique écologique des krummholz d'épinette noire (*Picea mariana* (Mill.) BSP) et d'épinette blanche (*Picea glauca* (Moench) Voss) a Kuujjuarapik, Québec subarctique. B.Sc. Thesis, Départment de Geographie, Université Laval. 48 p.

Scope: **Component.**
Region: **Grande Rivière de la Baleine, Québec.**
Species: ***Picea glauca, Picea mariana.***
Application: **Dendroclimatology.**
Techniques: **Light rings, ring width.**
Comments:
- Krummholz trees are shown to be significantly affected by climatic variations.

30. BELYEA, R.M. 1952.
Death and deterioration of balsam fir weakened by spruce budworm defoliation in Ontario. Journal of Forestry 50: 729-738.

Scope: **Component.**
Region: **Lake Nipigon, Ontario.**
Species: ***Abies balsamea.***
Application: **Damage effects (insect), tree growth and development.**
Techniques: **Ring width.**
Comments:
- Radial increment is progressively decreased by continued severe defoliation by spruce budworm.
- Measurement of the reduction in growth offers information regarding tree vigour.
- Complete or near complete mortality of balsam fir occurred within eight years after severe infestation and defoliation.

31. **BERGERON, Y. and S. ARCHAMBAULT.** 1989.
Relation between fire cycle and recent climatic change in the southern boreal forest. Ecological Society of America, Toronto. (Abstract).
Application: **Dendroclimatology, stand dynamics (fire history).**

32. **BERGERON, Y. and D. GAGNON.** 1987.
Age structure of red pine (*Pinus resinosa* Ait.) at its northern limit in Québec. Canadian Journal of Forest Research 17: 129-137.
Scope: **Incidental.**
Region: **Lac Duparquet, Québec.**
Species: ***Pinus resinosa.***
Application: **Stand dynamics (fire history).**
Techniques: **Ring count.**

33. **BERRY, E.D.** 1964.
Some aspects of the springwood / summerwood variations in Douglas fir. B.S.F. Thesis, Faculty of Forestry, University of British Columbia.
Region: **British Columbia.**
Species: ***Pseudotsuga menziesii.***
Application: **Ring characteristics.**
Techniques: **Earlywood, latewood.**

34. **BESCHEL, R.E. and D. WEBB.** 1963.
Growth ring studies on arctic willows. McGill University, Axel Heiberg Research Reports: Preliminary Report 1961-1962, 189-198.
Scope: **Focus.**
Region: **Queen Elizabeth Islands west of Ellesmere, Northwest Territories.**
Species: ***Salix arctica.***
Application: **Dendroclimatology, tree growth and development.**
Techniques: **Crossdating, ring width.**
Comments:
- Arctic willow dating is proved to be difficult because growth sequences are only recognizable in young stems.
- Branches live only for a few decades and shedding produces ring variability in the main buried stems.
- Discontinuous rings and missing rings are common in *Salix arctica.*
- Variations in ring width are common and are similar from plant to plant.

35. **BESLISLE, L. et L. MAILLETTE.** 1988.
Stratégie de tolérance au vent chez *Salix uva-ursi*, une espèce de la toundra du Nouveau-Québec (Canada). Canadian Journal of Botany 66: 272-279.
Scope: **Incidental.**
Region: **Kuujjuarapik, Québec.**
Species: ***Salix uva-ursi.***
Application: **Tree growth and development.**
Techniques: **Ring count, ring width.**
Comments:
- Tree-ring analysis is one of many techniques used to interpret the age and relative growth rate of *Salix uva-ursi* for the purpose of analyzing its response and adaptations to stressful conditions in the arctic.

36. BLACK, R.A. and L.C. BLISS. 1980.

Reproductive ecology of *Picea mariana* (Mill.) B.S.P., at tree-line near Inuvik, Northwest Territories, Canada. Ecological Monographs 50: 331-354.

Scope: **Component.**
Region: **Northwest Territories.**
Species: ***Picea mariana.***
Application: **Stand dynamics (treeline), tree growth and development.**
Techniques: **Ring count, ring width.**
Comments:
- The role of water, seed germination potential, success of seedling establishment, climate, and fire interval on tree growth at treeline are investigated.

37. BLAIS, J.R. 1954.

The recurrence of spruce budworm infestations in the past century in the Lac Seule area of northwestern Ontario. Ecology 35: 62-71.

Scope: **Focus.**
Region: **Sioux Lookout, Ontario.**
Species: ***Abies balsamea, Picea glauca, Pinus resinosa, Pinus strobus.***
Application: **Damage effects (insect).**
Techniques: **Ring count, ring width.**
Comments:
- Study examines the conditions of the forests in northwestern Ontario, before and after budworm infestation.
- The area of infestation origin, spread, and geographical relationships between past and present infestations are also examined.

38. BLAIS, J.R. 1958.

Effects of defoliation by Spruce Budworm (*Choristoneura fumiferana* Clem.) on radial growth at breast height of balsam fir (*Abies balsamea* (L.) Mill.) and white spruce (*Picea glauca* (Moench) Voss.). Forestry Chronicle 34: 39-47.

Scope: **Focus.**
Region: **Northwestern Ontario.**
Species: ***Abies balsamea, Picea glauca, Pinus banksiana, Pinus resinosa.***
Application: **Tree growth and development.**
Techniques: **Ring width.**
Comments:
- Relationship between spruce budworm defoliation and radial growth at breast height for balsam fir and white spruce trees of merchantable size.
- Defoliation was recorded yearly in stands from the beginning of the infestation and radial growth measurements were obtained from increment cores.
- The first year of radial growth suppression was calculated by comparing the growth of the affected species with that of unaffected jack pine and red pine trees by means of a growth-ratio technique.

39. **BLAIS, J.R.** 1962.
Collection and analysis of radial-growth data from trees for evidence of past spruce budworm outbreaks. Forestry Chronicle 38: 474-484.
Scope: **Focus.**
Region: **Ontario, Québec.**
Species: ***Abies balsamea, Picea glauca, Picea mariana, Picea rubens, Pinus resinosa, Pinus strobus.***
Application: **Damage effects (insect).**
Techniques: **Ring count, ring width.**
Comments:
- Methods used in the collection of radial-growth data from host and non-host trees of the spruce budworm, for the purpose of establishing evidence of past spruce budworm outbreaks are described.
- Involves preparation and examination of material gathered from widely-separated regions in Ontario and Québec over a period of several years.
- Increment cores and discs are analyzed for growth suppression leading to the delimitation of time of occurrence, geographic extent, intensity and duration of outbreaks for up to 300 years in parts of Ontario and Québec.

40. **BLAIS, J.R.** 1968.
Regional variation in susceptibility of eastern North American forests to budworm attack based on history of outbreaks. Forestry Chronicle 44: 17-23.
Scope: **Focus.**
Region: **New Brunswick, Ontario, Québec, Maine.**
Species: ***Abies balsamea.***
Application: **Damage effects (insect).**
Techniques: **Ring width.**
Comments:
- History of spruce budworm outbreaks based on radial growth studies of host and non-host trees from five main regions and eight subregions in eastern North America.

41. **BLAKE, W., Jr.** 1972.
Climatic implications of radiocarbon-dated driftwood in the Queen Elizabeth Islands, Arctic Canada. Climatic changes in arctic areas during the last ten thousand years. Acta Universitatis Ouluensis, Ser. A., No. 3, Geol. No. 1: 77-104.
Region: **Canada.**
Species: **Driftwood.**
Application: **Dendroclimatology.**

42. **BLASING, T.J., and H.C. FRITTS.** 1976.
Reconstructing past climatic anomalies in North America from tree-ring data. Quaternary Research 6: 563-579.
Scope: **Focus.**
Region: **Western North America.**
Species: **Hardwoods, softwoods.**
Application: **Dendroclimatology.**
Techniques: **Ring width, statistical methods.**

Comments: - Winter climatic anomalies in the North Pacific sector and Western North America are statistically calibrated and reconstructed back to A.D. 1700 with tree-ring data from Western North America.
- Climatic conditions for the 18th and 19th century are then compared with 20th century records.

43. **BLASING, T.J. and D.N. DUVICK.** 1984.
Reconstruction of precipitation history in North America corn belt using tree-rings. Nature 307: 143-145.
Scope: **Focus.**
Region: **Iowa, Illinois, Missouri.**
Species: ***Quercus alba.***
Application: **Dendroclimatology, dendrohydrology.**
Techniques: **Ring width.**
Comments: - 15 tree-ring chronologies from drought sensitive oak are used to construct reliable reconstructions of annual precipitation to 1680.
- This work extends the network of chronologies in North America into the central United States.

44. **BLASING, T.J., D.N. DUVICK, and D.C. WEST.** 1981.
Dendroclimatic calibration and verification using regionally averaged and single stations precipitation data. Tree-Ring Bulletin 41: 37-43.
Application: **Dendroclimatology.**

45. **BLASING, T.J. and H.C. FRITTS.** 1975.
Past climate of Alaska and northwestern Canada as reconstructed from tree-rings; in Climate of the Arctic: Proceedings of the 24th Alaska Science Conference, August, 1973, Fairbanks. Geophysical Institute, University of Alaska. pp.48-58
Scope: **Focus.**
Region: **Alaska, Yukon.**
Application: **Dendroclimatology, dendrochronology.**
Techniques: **Ring width.**
Comments: - Tree growth anomaly patterns in Alaska and northwestern Canada between 1800 and 1939 are identified.
- Chronologies from southern Canada and the United States are compared with northern chronologies.

46. **BONDIETTI, E.A., C.F. BAIS III and S.B. MCLAUGHLIN.** 1989.
Radial trends in cation ratios in tree-rings as indicators of the impact of atmospheric deposition on forests. Canadian Journal of Forest Research 19: 586-594.
Scope: **Focus.**
Region: **Great Smokey Mountains National Park, Tennessee; North Carolina.**
Species: ***Picea rubens, Tsuga canadensis***
Application: **Dendrochemistry.**
Techniques: **Damage effects (pollution).**

Comments:
- Concentrations of aluminum, calcium, magnesium and of divalent cations obtained from red spruce and eastern hemlock are observed to have increased over the last 15-40 years.
- The increase in ratios may be the result of increased regional sulphur emissions.

47. BONKOUNGOU, E.G. 1986.
Impact of epidemic outbreaks of forest insects analyzed from tree-rings. Commonwealth For. Rev. 65: 172-175.
Application: **Dendroecology, stand dynamics.**
Techniques: **Damage effects (insect).**

48. BORDAGE, G. et L. FILION. 1989.
Analyse dendroecologique d'un milieu riverain frequenté par le castor (*Castor canadensis*) au mont du Lac-des-Cygnes (Charlevoix, Québec). Naturaliste canadien 115: 117-124.
Region: **Charlevoix, Québec.**
Application: **Dendroecology.**
Techniques: **Damage effects (animal).**

49. BORNS, H.W. and R.P. GOLDTHWAIT. 1966.
Late-pleistocene fluctuations of Kaskawulsh Glacier, Southwestern Yukon Territory, Canada. American Journal of Science 264: 600-619.
Scope: **Component.**
Region: **Yukon.**
Species: ***Picea glauca.***
Application: **Dendroclimatology, dendrogeomorphology, glacier fluctuation.**
Techniques: **Ring count.**
Comments:
- The position of the Kaskawulsh Glacier terminus is dated from a bent-over spruce tree with countable rings, and radiocarbon dates.

50. BRACE, L.G. 1966.
Radial shrinkage and swelling of increment cores. Forestry Chronicle 42: 387-389.
Scope: **Component.**
Region: **Ontario.**
Species: ***Populus grandidentata, Pinus strobus.***
Application: **Analytical techniques and data acquisition.**
Techniques: **Increment coring, sample preparation and laboratory techniques.**
Comments:
- A study at the Petawawa Forest Experiment Station to determine how much core shrinkage may occur between collection and office measurement, to evaluate its significance to growth estimates based on precision measurements, and to determine a method of overcoming shrinkage.
- Most shrinkage was found to occur within 24 hours of office exposure.
- Core shrinkage was shown to significantly reduce growth estimates, especially for short increment periods.
- Shrinkage was overcome with water-soaking which has the added advantages of making the cores less brittle and rendering rings more visible.

51. BRACE, L.G. and K.M. MAGAR. 1968.
Automated computation and plotting of stem-analysis data. Forestry Branch Publication No. 1209, Ottawa, 8p.
Region: **Canada.**
Application: **Analytical techniques and data acquisition.**
Techniques: **Computing.**

52. BRAMHALL, A.E. 1977.
An improved scribe for dendrochronological annotations. Tree-Ring Bulletin 37: 45-46.
Scope: **Focus.**
Region: **Canada.**
Application: **Analytical techniques and data acquisition.**
Techniques: **Sample preparation and laboratory techniques.**
Comments:
- A pin capsule adaptor was devised that covered the end of a ball-point pen that aided both in marking the annual rings on wood and X-ray film, and making notes of observations.

53. BRAY, J.R. 1964.
Chronology of a small glacier in eastern British Columbia, Canada. Science 144: 287-288.
Scope: **Component.**
Region: **Yoho National Park, eastern British Columbia.**
Species: ***Abies lasiocarpa, Picea engelmannii.***
Application: **Dendrogeomorphology, glacier fluctuation.**
Techniques: **Ring count.**
Comments:
- The age of cored trees growing on the moraines of a small, high-altitude glacier in the Canadian Rockies, suggests that the date of the maximum most-Pleistocene ice advance was around A.D. 1714, with another later advance about 1832.
- These two dates are synchronous with the two major periods of recent glacial advance in the area.

54. BRAY, J.R. 1965.
Forest growth and glacier chronology in Northwest North America in relation to solar activity. Nature 205: 440-443.
Scope: **Incidental.**
Region: **Yoho River Valley, British Columbia.**
Species: ***Picea engelmannii.***
Application: **Dendrochronology, dendroclimatology.**
Techniques: **Ring width.**
Comments:
- The growth of *Picea engelmannii* is analyzed in relation to sunspot activity and glacier fluctuation in northwest North America.

55. BRAY, J.R. 1966.
Similarity of tree growth in Northern Scandinavia, Polar Urals and the Canadian Rockies. Journal of Glaciology 6: 321-322.

Scope: **Focus.**
Region: **Alberta, British Columbia, Northern Scandinavia.**
Species: ***Larix sibirica, Picea engelmannii.***
Application: **Dendrochronology, dendroclimatology.**
Techniques: **Ring pattern.**
Comments:
- Growth patterns for coniferous trees in three different regions are observed.
- Similar growth patterns for a 250-year period beginning in the mid-17th century were discovered.
- This suggests trees respond similarly to climatic change in the three different regions.

56. BRAY, J.R. 1971.
Vegetational distribution, tree growth and crop success in relation to recent climatic change. Advances in Ecological Research 7: 177-233.

Scope: **Component.**
Region: **Northern Hemisphere.**
Species: ***Larix europea, Larix sibirica, Picea abies, Picea glauca, Picea engelmannii, Pinus silvestris.***
Application: **Dendrochronology, dendroclimatology.**
Techniques: **Frost rings, ring width.**
Comments:
- Tree-rings are used as one component to analyse recent climatic change in the Northern Hemisphere.
- Dendrochronologies from British Columbia and the Yukon are discussed along with data from other countries.

57. BRAY, J.R. and G.J. STRUIK. 1963.
Forest growth and glacial chronology in eastern British Columbia, and their relation to recent climatic trends. Canadian Journal of Botany 41: 1245-1271.

Scope: **Focus.**
Region: **Eastern British Columbia.**
Species: ***Picea engelmannii.***
Application: **Dendrogeomorphology, glacier fluctuation, tree growth and development.**
Techniques: **Ring count, ring width.**

58. BRINK, V.C. 1959.
A directional change in the subalpine forest-heath ecotone in Garibaldi Park, British Columbia. Ecology 40: 10-16.

Scope: **Incidental**
Region: **Garibaldi Park, British Columbia**
Species: **Softwoods**
Application: **Tree growth and development**
Techniques: **Ring count**
Comments:
- Ring counts were used to age trees growing in subalpine conditions in order to investigate timing of regeneration establishment.

59. BRINKMANN, W.A.R. 1987.
Water supplies to the Great Lakes--Reconstructed from tree-rings. Journal of Climate and Applied Meteorology 26: 530-538.

Scope: **Focus.**
Region: **Great Lakes, Canada.**
Species: ***Pinus resinosa, Pinus strobus, Pinus rigida, Quercus muehlenbergii, Tsuga* sp.**
Application: **Dendrohydrology.**
Techniques: **Ring width, statistical methods.**
Comments:
- Estimates variation in water supplies to the Great Lakes prior to the beginning of the observed record.
- Tree-ring data consisting of chronologies from 16 sites around the Great Lakes in Canada and the United States were used.
- None of the raw data for chronologies are presented.

60. BRINKMANN, W.A.R. 1989.
Comparison of two indicators of climatic change: tree growth and lake Superior water supplies. Quaternary Research 32: 51-59.

Scope: **Focus.**
Region: **Ontario, Michigan, Minnesota.**
Species: ***Pinus resinosa.***
Application: **Dendrohydrology.**
Techniques: **Ring width, statistical methods.**
Comments:
- A study of the response of tree growth around Lake Superior and the water supplies to that lake to summer climate shows differences and similarities in response.
- Tree-ring data were obtained from the Laboratory of Tree-Ring Research at the University of Arizona (3), M.E. Alexander, M.L. Parker, and L.A. Jozsa (3) and by the author (2).
- Tree growth is positively correlated with precipitation (although the response is reduced when conditions are very wet) and negatively correlated with temperature.
- In contrast, the water supplies to the lake are positively correlated with both precipitation and temperature; the correlation with temperature is, however, not very strong.

61. BRIX, H. 1972.
Nitrogen fertilization and water effects on photosynthesis and earlywood-latewood production in Douglas fir. Canadian Journal of Forest Research 2: 467-478.

Scope: **Component.**
Species: ***Pseudotsuga menziesii.***
Application: **Ring characteristics, tree growth and development.**
Techniques: **Earlywood, latewood.**

62. BRIX, H. and A.K. MITCHELL. 1980.
Effects of thinning and nitrogen fertilization on xylem development in Douglas fir. Canadian Journal of Forest Research 10: 121-128.
Scope: **Component.**
Region: **Shawnigan Lake, Vancouver Island, British Columbia.**
Species: ***Pseudotsuga menziesii.***
Application: **Ring characteristics.**
Techniques: **Earlywood, latewood, ring width.**
Comments:
- Thinning and fertilization effects on stem diameter growth and seasonal duration of tree growth are investigated.
- Special attention is given to variation in earlywood and latewood accumulation which affects wood quality.

63. BRUBAKER, L.B. 1980.
Spatial patterns of tree growth anomalies in the Pacific Northwest. Ecology 61: 798-807.
Scope: **Focus.**
Region: **Washington, Idaho, Oregon.**
Species: ***Abies lasiocarpa, Pinus engelmannii, Pseudotsuga menziesii,* and noble fir.**
Application: **Dendroclimatology.**
Techniques: **Ring width.**
Comments:
- Large scale spatial patterns in radial growth and macroclimatic factors determining growth of conifers in the Pacific Northwest are investigated.

64. BRUBAKER, L.B. 1982.
Western North America; in Climate from Tree-rings. M.K. Hughes, P.M. Kelly, J.R. Pilcher and V. LaMarche (Eds.). Cambridge University Press, Cambridge. pp. 118-126.
Scope: **Focus.**
Region: **Western North America.**
Application: **Dendroclimatology.**
Techniques: **Review.**
Comments:
- Tree-ring collections and dendroclimatic research in western North America are reviewed.
- Future prospects and needs in dendroclimatic research are also discussed.

65. BURBANK, D.W. 1981.
A chronology of late Holocene glacier fluctuations at Mount Rainier, Washington. Arctic and Alpine Research 13: 369-386.
Scope: **Component.**
Region: **Washington.**
Application: **Dendroclimatology, dendrogeomorphology, glacier fluctuation.**
Techniques: **Ring count.**
Comments:
- Tree-ring counts are used to determine ages of glacial moraines which are in turn used to interpret late Holocene glacier fluctuations on Mount Rainier, Washington.

66. **BURK, R.L.** 1979.
Factors affecting $^{18}O/^{16}O$ ratios in cellulose. Ph.D. Dissertation, University of Washington, Seattle.
Region: **Seattle, Washington.**
Application: **Dendrochemistry, dendroclimatology.**
Techniques: **Isotopes (oxygen).**
Comments:
- Thesis examines the possible use of hydrogen and oxygen isotopes preserved in tree-rings as paleo-temperature indicators.
- A new method of measuring isotopic ratios in organic compounds is presented.
- Isotopic concentrations are correlated with winter temperatures and negatively correlated with the amount of precipitation; the isotopic composition of soil water is the primary factor controlling isotopic compositions of tree-rings.
- Hydrogen isotope concentrations were found to be most representative of climatic temperatures during the life of the tree.

67. **BURK, R.L. and M. STUIVER.** 1981.
Oxygen isotope ratios in trees reflect mean annual temperature and humidity. Science 211: 1417-1419.
Scope: **Focus.**
Region: **Mt. Rainier, Washington.**
Species: ***Picea glauca, Picea sitchensis, Pinus torreyana, Pseudotsuga menziesii.***
Application: **Dendrochemistry, dendroclimatology.**
Techniques: **Isotopes (oxygen).**
Comments:
- Oxygen-eighteen isotope composition of plant cellulose is related to the availability of water and humidity.
- Investigates the possibility that temperature dependence for ^{18}O in precipitation is also reflected in the ^{18}O values of tree-rings in wood cellulose.

68. **BURN, C.R. and P.A. FRIELE.** 1989.
Geomorphology, vegetational succession, soil characteristics and permafrost in retrogressive thaw slumps near Mayo, Yukon Territory. Arctic 33: 31-40.
Scope: **Incidental.**
Region: **Mayo, Yukon Territory.**
Application: **Dendrogeomorphology.**
Techniques: **Ring count.**
Comments:
- Dates of colonization of the slump by different vegetational units were determined by ring counts and by dating reaction wood series from trees that survived collapse into the slump.

69. **BURN, C.R. and M.W. SMITH.** 1988.
Thermokarst lakes at Mayo, Yukon Territory, Canada; in Proceedings of the 5th International Permafrost Conference, Trondheim, Tapir Publishers, Trondheim, Pp 700-705.
Scope: **Incidental.**
Region: **Mayo, Yukon Territory.**
Application: **Dendrogeomorphology.**
Techniques: **Ring width.**

Comments: - Crossdating of ring width series from submerged trees is used to date the initiation of thaw lakes in the period between 1880-1900.

70. **BURROWS, C.J. and V.L. BURROWS.** 1976.
Procedures for the study of snow avalanche chronology using growth layers of woody plants. Arctic and Alpine Research Occasional Paper 23: 1-54.
Scope: **Focus.**
Region: **Colorado.**
Species: **Hardwoods, softwoods.**
Application: **Analytical techniques and data acquisition, dendrochronology, dendrogeomorphology, tree growth and development.**
Techniques: **Damage effects (geomorphic), ring count, ring width, sample preparation and laboratory techniques, scars.**
Comments:
- This handbook is a brief description of the background to, and procedures for the use of annual growth layers of woody plants for dating snow avalanche events.
- Some attention is given to the biological, anatomical, growth and ecological characteristics of plants.
- Relevant to the forests and mountains of Colorado, but it could be adapted for use in other areas.

71. **BUTLER, D.R.** 1979a.
Dendrogeomorphological analysis of flooding and mass movement, Ram Plateau, Mackenzie Mountains, Northwest Territories. The Canadian Geographer 23: 62-65.
Scope: **Focus.**
Region: **Ram Plateau, Mackenzie Mountains, Northwest Territories.**
Species: ***Populus* sp., softwoods.**
Application: **Dendrogeomorphology.**
Techniques: **Reaction wood, ring pattern, scarring.**
Comments:
- 60 tree-ring cross-sections were utilized to determine the flood history of Ram River and its tributaries.
- Involved analysis of movement of slumps and debris avalanches along tributary streams.
- Established relationships between flooding and mass wasting.
- The flood of 1972, judged by size and height above beach level of corrasion scars, was determined to be of considerable magnitude.

72. **BUTLER, D.R.** 1979b.
Snow avalanche path terrain and vegetation of Glacier National Park, Montana. Arctic and Alpine Research 11: 17-32.
Scope: **Component.**
Region: **Glacier National Park, Montana.**
Species: ***Abies lasiocarpa, Pseudotsuga menziesii.***
Application: **Dendrogeomorphology.**
Techniques: **Reaction wood, ring count, ring pattern, scarring.**
Comments:
- Avalanche frequencies of 12 sites in the Rocky Mountains of Glacier National Park, Montana are analyzed using dendrochronology.

73. **BUTLER, D.R., G.P. MALANSON and J.O. OELFKE.** 1987.
Tree-ring analysis and natural hazard chronologies: Minimum sample sizes and index values. Professional Geographer 39: 41-47.
Application: **Analytical techniques and data acquisition, dendrogeomorphology.**
Techniques: **Ring width.**

74. **CARRARA, P.E.** 1979.
The determination of snow avalanche frequency through tree-ring analysis and historical records at Ophir, Colorado. Geological Society of America Bulletin 90: 773-780.
Scope: **Focus.**
Region: **Ophir, Colorado.**
Species: ***Abies lasiocarpa, Picea engelmannii, Populus tremuloides.***
Application: **Dendrogeomorphology, tree growth and development.**
Techniques: **Reaction wood, ring count, scarring.**
Comments:
- A recurrence interval of 20 years is assigned to avalanches in this area based on dendrological examination of trees growing in avalanche tracks.
- Historically, 4 avalanches occurred in this area, tree-ring analysis suggested one more event.
- Limitations of tree-ring analysis encountered in this study are discussed.

75. **CARRARA, P.E.** 1987.
Holocene and latest Pleistocene chronology, Glacier National Park, Montana. Canadian Journal of Earth Sciences 24: 387-395.
Scope: **Incidental.**
Region: **Glacier National Park, Montana.**
Application: **Dendrogeomorphology, dendroclimatology, glacier fluctuation.**
Techniques: **Ring count.**
Comments:
- Tree-ring counts are used to identify two different age-groups of moraines that front present-day glaciers and snowfields.

76. **CARRARA, P.E. and R.G. MCGIMSEY.** 1981.
The late neoglacial histories of the Agassiz and Jackson Glaciers, Glacier National Park, Montana. Arctic and Alpine Research 13: 183-196.
Scope: **Focus.**
Region: **Glacier National Park, Montana.**
Species: ***Abies lasiocarpa, Larix lyallii, Picea engelmannii, Pinus albicaulis, Populus trichocarpa.***
Application: **Dendrogeomorphology, dendroclimatology, glacier fluctuation.**
Techniques: **Ring count.**
Comments:
- Tree-ring counts are used to estimate periods of glacial advance and retreat in Montana.

77. **CATCHPOLE, A.J.W.** 1985.
Evidence from Hudson Bay region of severe cold in the summer of 1816. Syllogeus 55: 121-146.
Scope: **Component.**
Region: **Hudson Bay Region, Québec, Ontario, Manitoba, Northwest Territories.**
Species: ***Picea glauca.***
Application: **Dendroclimatology.**
Techniques: **Densitometry, ring width.**
Comments:
- Available historical evidence is used to analyse aspects of the weather anomaly pattern in the Hudson Bay region and to provide insight into certain aspects of summer weather in this area.
- Treerings are used as one of the methods to interpret summer cooling.

78. **CLAGUE, J.J., L.A. JOZSA and M.L. PARKER.** 1982.
Dendrochronological dating of glacier-dammed lakes: An example from Yukon Territory, Canada. Arctic and Alpine Research 14: 301-310.
Scope: **Focus.**
Region: **Lake Alsek, Yukon.**
Species: **Driftwood, *Picea glauca.***
Application: **Dendroclimatology, dendrogeomorphology, dendrohydrology, glacier fluctuation.**
Techniques: **Densitometry, earlywood, latewood, ring pattern, ring width.**
Comments:
- Dendrochronology is used to date past history of glacier-dammed lakes in the Yukon Territory.

79. **CLAGUE, J.J. and V.N. RAMPTON.** 1982.
Neoglacial Lake Alsek. Canadian Journal of Earth Sciences 19: 94-117.
Scope: **Component.**
Region: **Yukon.**
Species: ***Picea glauca.***
Application: **Dendroclimatology, dendrogeomorphology, glacier fluctuation.**
Techniques: **Ring count, ring pattern, ring width.**
Comments:
- Tree-ring analysis is one of several techniques used to reconstruct the past history of Neoglacial Lake Alsek.

80. **CLAGUE, J.J. and J.G. SOUTHER.** 1982.
The Dusty Creek landslide on Mount Cayley, British Columbia. Canadian Journal of Earth Sciences 19: 524-539.
Scope: **Component.**
Region: **Mount Cayley, British Columbia.**
Species: ***Alnus rubra, Populus trichocarpa.***
Application: **Dendrogeomorphology.**
Techniques: **Compression wood, damage effects (geomorphic), ring width, scarring.**
Comments:
- Annual rings of slide-damaged trees were used to determine that the Dusty Creek landslide occurred in July of 1963.

81. **CLYDE, M.A. and S.J. TITUS.** 1987a.
Radial and longitudinal variation in stem diameter increment of lodgepole pine, white spruce and black spruce: species and crown class differences. Canadian Journal of Forest Research 17: 1223-1227.
Scope: **Focus.**
Region: **Alberta.**
Species: ***Picea glauca, Picea mariana, Pinus contorta.***
Application: **Tree growth and development.**
Techniques: **Ring width.**
Comments:
- Differences in stem form and the distribution of diameter increment along tree stem over time are investigated.

82. **CLYDE, M.A. and S.J. TITUS.** 1987b.
A new computerized system for tree-ring measurement and analysis. The Forestry Chronicle 63: 23-27.
Scope: **Focus.**
Region: **Canada.**
Application: **Analytical techniques and data acquisition.**
Techniques: **Computing.**
Comments:
- A new computerized system for tree-ring measurement and analysis is described.
- System displays diameter increments during data acquisition and allows data to be plotted, edited, displayed and remeasured.

83. **COGBILL, C.V.** 1985.
Dynamics of the boreal forests of the Laurentian Highlands, Canada. Canadian Journal of Forest Research 15: 252-261.
Scope: **Component.**
Region: **Central Québec.**
Species: ***Abies balsamifera, Betula papyrifera, Larix laricina, Picea mariana.***
Application: **Dendrochronology, stand dynamics (fire history).**
Techniques: **Ring count, ring pattern, ring width.**
Comments:
- 1785 tree cores from central Québec forests are examined to document development and changes in eastern Canadian forests.
- Particular emphasis is placed on the reconstruction of fire history.

84. **COLENUTT, M.E.** 1988.
Dendrochronological Studies at Larch Valley, Banff National Park. B.Sc. Thesis, Department of Geography, University of Western Ontario, London, Ontario. 122p.
Scope: **Focus.**
Region: **Alberta.**
Species: ***Abies lasiocarpa, Larix lyallii, Picea engelmannii.***
Application: **Dendrochronology, dendroclimatology.**
Techniques: **Ring width.**

Comments:
- Tree-ring chronologies are developed for a site at treeline in Larch Valley, Banff National Park.
- First dendrochronological study of larch and fir in the Canadian Rockies.
- Chronologies developed for each tree species are analyzed for potential use in deriving proxy climatic data from treeline species in the Canadian Rockies.

85. CONKEY, L.E. 1979a.
Response of tree-ring density to climate in Maine, U.S.A. Tree-Ring Bulletin 39: 29-38.
Scope: **Focus.**
Region: **Maine.**
Species: ***Picea rubens.***
Application: **Dendroclimatology.**
Techniques: **Densitometry, earlywood, latewood, ring width.**
Comments:
- Tree-ring sequences from three upper-elevation sites in Maine were analyzed.
- Climatic signals from maximum densities were found to be stronger and more season-specific than ring widths and to exhibit exceptional inter-site similarity. 34% of ring width variation and 67% of maximum density variation were explained by climate suggesting that the climatic signal from maximum densities is stronger and potentially more season-specific than that of ring widths.

86. CONKEY, L.E. 1979b.
Dendroclimatology in the northeastern United States. M.S. Thesis. University of Arizona.
Scope: **United States.**
Application: **Dendroclimatology.**

87. CONKEY, L.E. 1982a.
Eastern U.S. tree-ring widths and densities as indicators of past climate. Ph.D. dissertation, University of Arizona, Tucson.
Application: **Dendroclimatology.**
Techniques: **Densitometry, ring width.**

88. CONKEY, L.E. 1982b.
Tree-ring density as an indicator of past climatological and forest hydrological events in eastern North America; in Canadian Hydrology Symposium, 14-15 June, 1982. Fredericton, New Brunswick, pp. 289-299.
Scope: **Focus.**
Region: **Maine.**
Species: ***Picea rubens.***
Application: **Dendroclimatology, dendrohydrology.**
Techniques: **Densitometry, statistical methods.**
Comments:
- 310 years of past summer stream runoff at Elephant Mt., Maine, is reconstructed and tested against instrument and historical climatic data.

89. CONKEY, L.E. 1982c.
Temperature reconstructions in the Northeastern U.S; in Climate from Tree-rings. M.K. Hughes, P.M. Kelley, J.R. Pilcher, and V.C. LaMarche, Jr. (Eds.) Cambridge University Press, Cambridge. p. 165-168.

Scope: **Focus.**
Region: **New England, Vermont, New Hampshire, Maine, Conneticut, Massachusetts, Rhode Island.**
Species: ***Picea rubens.***
Application: **Dendroclimatology.**
Techniques: **Densitometry, ring width, statistical methods**
Comments:
- Reviews temperature reconstructions using eastern tree species tree-rings.
- Two reconstructions are presented, the first one derived from a spatial array of tree-ring width index chronologies and the second using wood density data from densitometric analysis.
- Results show that values of maximum latewood density provide a means to increase the climate information obtainable over that from ring widths alone.

90. CONKEY, L.E. 1986.
Red spruce tree-ring widths and densities in eastern North America as indicators of past climate. Quaternary Research 26: 232-243.

Scope: **Focus.**
Region: **Maine, Eastern North America.**
Species: ***Picea rubens.***
Application: **Dendroclimatology.**
Techniques: **Densitometry, earlywood, latewood, ring width.**
Comments:
- Documents a relationship between red spruce wood-density and spring temperatures using X-ray densitometry.
- Tree-ring densities show higher correlation from tree to tree and site to site than do ring-width measurements from the same trees.
- 310 years of past spring temperatures at nearby climate stations are reconstructed from the strongly related maximum density of tree-rings.

91. COOK, E.R. 1987.
The decomposition of tree-ring series for environmental studies. Tree-Ring Bulletin 47: 37-59.

Application: **Dendroclimatology.**

92. COOK, E.R. and G.C. JACOBY, Jr. 1977.
Tree-ring -- drought relationships in the Hudson Valley, New York. Science 198: 399-401.

Scope: **Focus.**
Region: **Hudson Valley, New York.**
Species: ***Pinus rigida, Pinus strobus, Quercus prinus, Tsuga canadensis.***
Application: **Dendroclimatology.**
Techniques: **Ring width.**

Comments: - Annual tree-ring chronologies from well-drained sites in the Hudson Valley of New York State record past changes in temperature and precipitation.
- This information accounts for much of the July variation in Palmer drought severity indices during the period 1931 to 1970.
- A preliminary reconstruction of drought to 1728 is presented.

93. **COOK, E.R. and G.C. JACOBY, Jr.** 1983.
Potomac River streamflow since 1730 as reconstructed by tree-rings. Journal of Climatology and Applied Meteorology 22: 1659-1672.
Scope: **Focus.**
Region: **Point of Rocks, Maryland.**
Species: ***Pinus rigida, Quercus alba, Quercus prinus, Tsuga canadensis.***
Application: **Dendrochronology, dendrohydrology.**
Techniques: **Ring width.**
Comments: - The Potomac River streamflow at Point of Rocks, Maryland was reconstructed by using tree-ring chronologies from sites, in and near the river basin.
- Canonical regression analysis was used to reconstruct summer discharge after screening the tree-ring predictors.
- The 248-year reconstruction of the low flow period of the Potomac River indicates that the prolonged drought of the 1960's may have been the most severe since 1730.

94. **CORNS, I.G.W.** 1983.
Forest community types of west-central Alberta in relation to selected environmental factors. Canadian Journal of Forest Research 13: 995-1010.
Scope: **Component.**
Region: **Wapiti, Alberta.**
Species: ***Picea glauca, Picea mariana, Pinus contorta, Populus tremuloides.***
Application: **Tree growth and development.**
Techniques: **Ring width.**
Comments: - Environmental factors affecting forest growth and stand dynamics are investigated.

95. **CORRIVEAU, A., J. BEAULIEU and F. MOTHE.** 1987.
Wood density of natural white spruce populations in Québec. Canadian Journal of Forest Research 17: 675-682.
Scope: **Focus.**
Region: **Québec.**
Species: ***Picea glauca.***
Application: **Tree growth and development.**
Techniques: **Densitometry, ring count, ring width.**
Comments: - Variations in wood density between different tree populations is analyzed in relation to variations in the width of tree growth.

96. **COWIN, D.J.** 1976.
Densitometric studies on the wood of Douglas fir. Ph.D. Thesis, University of British Columbia

Scope: **Focus.**
Region: **British Columbia.**
Species: ***Pseudotsuga menziesii.***
Application: **Analytical techniques and data acquisition.**
Techniques: **Densitometry.**

97. **COWIN, D.J. and M.L. PARKER.** 1978.
Comparison of annual ring density profiles in hardwood and softwoods by X-ray densitometry. Canadian Journal of Forest Research 8: 442-449.

Scope: **Component.**
Region: **British Columbia.**
Species: **Hardwoods (21), softwoods (15).**
Application: **Analytical techniques and data acquisition, ring characteristics.**
Techniques: **Densitometry, earlywood, latewood, ring width, sample preparation and laboratory techniques.**
Comments:
- Researches the wood density characteristics of several different tree species grown in same area.
- Techniques of sample preparation and dendrological analysis appropriate for hardwoods are discussed.

98. **COWIN, D.J. and M.L. PARKER.** 1979.
Densitometric analysis of wood from five Douglas fir provenances. Silvae Genetica 28: 2-3.

Scope: **Focus.**
Region: **British Columbia, Washington, Oregon.**
Species: ***Pseudotsuga menziesii.***
Application: **Tree growth and development, wood characteristics.**
Techniques: **Densitometry.**
Comments:
- Increment cores from 5 sites in the Pacific Northwest were subjected to growth rate and wood density analyses.
- Geographic location was found to significantly influence growth rate and wood density.
- No differences in wood properties were found between the tree provenances.

99. **CRAIGHEAD, F.E.** 1925.
Relation between mortality of trees attacked by the spruce budworm and previous growth. Journal of Agricultural Research 30: 542-555.

Scope: **Component.**
Region: **New Brunswick, Québec.**
Species: ***Abies balsamea, hardwoods, Picea glauca, Picea rubens.***
Application: **Tree growth and development.**
Techniques: **Ring width.**

Comments:
- Establishes correlation between mortality and rate of growth of trees before spruce budworm infestation.
- Diameter increment study show that increment following attack decreases by one-half that of increments before infestation.
- Immunity of softwoods to attack is related to the degree of hardwood canopy cover near the tree.

100. **CROPPER, J.P.** 1981.
Reconstruction of North Pacific Surface Pressure Anomaly Types from Alaskan and Western Canadian Tree-Ring Data. M.S. Thesis, University of Arizona, Tucson.
Region: **Alberta, Alaska, British Columbia.**
Application: **Dendroclimatology.**

101. **CROPPER, J.P.** 1982.
Climatic reconstruction (1801-1938) inferred from tree-ring width chronologies of the North American Arctic. Arctic and Alpine Research 14: 223-241.
Scope: **Focus.**
Region: **Alaska and northwestern Canada.**
Species: **Hardwoods, softwoods.**
Application: **Dendroclimatology.**
Techniques: **Ring width, statistical methods.**
Comments:
- Fifty-six tree-ring width chronologies are reduced using principle components statistical analysis and tested for quality by comparison with independent temperature reconstructions.
- Comparisons between chronologies and seasonal spatial anomaly patterns in sea-level pressure over North America are carried out to test the usefulness of tree-ring chronologies in the interpretation of past climatic events.
- Results indicate a period in the mid-19th century when temperatures were three degrees celsius less than the 20th century, additionally, the widespread warming of the 19th century did not occur in central Alaska.

102. **CROPPER, J.P.** 1984a.
Relationships among tree-ring width chronologies from Alaska and the Yukon. Arctic and Alpine Research 16: 245-254.
Scope: **Focus.**
Region: **Alaska, Yukon.**
Species: **Hardwoods, softwoods.**
Application: **Dendroclimatology.**
Techniques: **Ring width, statistical methods.**
Comments:
- Clear annual growth rings and high year-to-year variability in ring width of *Populus balsamifera* allows for ready cross-dating of tree-ring chronologies.
- Chronologies correlated much stronger with climate that chronologies from the Arctic.

103. **CROPPER, J.P.** 1984b.
Multicollinearity within selected western North American temperature and precipitation data sets. Tree-Ring Bulletin 44: 1984.
Scope: **Focus.**
Region: **North America.**
Species: **Hardwoods, softwoods.**
Application: **Dendroclimatology.**
Techniques: **Statistical methods.**
Comments:
- Investigates the extent of correlation among climatic variables from western North America meteorological stations and hypothesizes how this may affect the results of any subsequent multivariate analysis with tree-rings.

104. **CROPPER, J.P. and H.C. FRITTS.** 1981.
Tree-ring width chronologies from the North American Arctic. Arctic and Alpine Research 13: 245-260.
Scope: **Focus.**
Region: **North American Arctic.**
Species: **Hardwoods, softwoods.**
Application: **Dendroclimatology.**
Techniques: **Statistical methods.**
Comments:
- A literature search was made of the holdings in the Laboratory of Tree-Ring Research, University of Arizona.
- Arctic chronologies were analyzed for potential use in climatic analysis.

105. **CROPPER, J.P. and H.C. FRITTS.** 1982.
Density of tree-ring grids in Western North America. Tree-Ring Bulletin 42: 3-9.
Scope: **Focus.**
Region: **Western North America.**
Species: **Hardwoods, softwoods.**
Application: **Analytical techniques and data acquisition, dendrochronology, dendroclimatology.**
Techniques: **Sample preparation and laboratory techniques, statistical methods.**
Comments:
- The separating distance over which tree-ring chronologies are significantly correlated is investigated.
- Any chronology occurring within a radius of 161 km of another is estimated to contain at least half of the common variance occurring at zero separating distance.
- The density of chronologies was calculated in three different ways yielding estimates of five, seven and eight sites per million square kilometres as adequate sampling densities.

106. **CROSSLEY, D.I.** 1976.
Growth response of spruce and fir to release from suppression. Forestry Chronicle 52: 189-193.

Scope: **Component.**
Region: **Alberta.**
Species: ***Abies lasiocarpa, Picea glauca, Picea mariana.***
Application: **Tree growth and development.**
Techniques: **Ring width, ring count.**
Comments:
- The response of trees to release from suppression is investigated.
- Trees that are below merchantable size in climax stands in Alberta are generally of advanced age and are reduced in growth due to the result of long periods of suppression.

107. **DANG, Q.L. and V.H. LIEFFERS.** 1989.
Climate and annual ring growth of black spruce in some Alberta peatlands. Canadian Journal of Botany 67: 1885-1889.

Scope: **Focus.**
Region: **Slave Lake, Alberta.**
Species: ***Picea mariana.***
Application: **Dendrochronology, dendroclimatology.**
Techniques: **Ring width, statistical methods.**
Comments:
- Long-term relationships between climate and tree-ring growth of black spruce were determined in 2 peatland sites near Slave Lake, Alberta.
- Ring width indices were positively correlated with June-August precipitation of the current and previous 1-2 years, negatively correlated with June-August maximum temperatures and negatively correlated with June-August minimum temperatures.
- Summer precipitation greater than 325 mm negatively affected tree growth.

108. **DAUBENMIRE, R.F.** 1955.
Xylem layers of trees as related to weather and altitude in the northern Rocky Mountains. Ecology 36: 456-463.

Scope: **Focus.**
Region: **Idaho.**
Species: ***Abies grandifolia, Pinus ponderosa, Pseudotsuga taxifolia, Thuja plicata.***
Application: **Dendroclimatology.**
Techniques: **Ring width.**
Comments:
- Investigation into total growth studies in relation to climatic factors especially July temperature.
- No relationships were found between xylem formation and climate even though it was hypothesised that the trees would respond to the drought during the dry season.

109. **DE CUYPERE, C.A.** 1987.
Testing the assumptions of dendroclimatology: variations in the growth of white spruce from Mayo, Yukon Territory. Unpublished B.A. Thesis, Department of Geography, Carleton University, Ottawa, Canada.

Scope: **Focus.**
Region: **Mayo, Yukon Territory.**
Species: ***Picea glauca.***
Application: **Dendroclimatology.**
Techniques: **Ring width, earlywood, latewood.**
Comments:
- Spatial and temporal variations in tree growth patterns with respect to dendroclimatic applications.
- 230 radial increment cores from 131 trees were used.
- It is concluded that climate plays a secondary role to physiological and microsite complexity of growth patterns through space and time, dendroclimatologists are cautioned that obtaining meaningful climatic reconstructions from specimens collected in mesic region, closed-canopy forests is a difficult task.

110. **DELWAIDE, A. and L. FILION.** 1987a.
Tree-ring reconstruction of Indian-Cree tree harvesting in the Poste-de-la-Baleine area, Québec; in Proceedings of the International Symposium on Ecological Aspects of Tree-Ring Analysis. G.C. Jacoby and J.W. Hornbeck (Eds.).

Scope: **Component.**
Region: **Poste-de-la-Baleine Québec.**
Species: ***Picea glauca.***
Application: **Archaeology, dendroecology, tree growth and development.**
Techniques: **Damage effects (human), ring count, ring width.**
Comments:
- 200 Indian campsites and cutting areas were dendrochronologically dated and mapped.
- 3 major periods of forest use were defined.
- The ecological impacts of cutting on growth-form, and regeneration in relation to climate, clearing intensity, and physical condition of ground vegetation following cutting were examined.

111. **DELWAIDE, A. and L. FILION.** 1987b.
Coupes forestières effectuées par les indiens et par la compagnie de la Baie d'Hudson à Poste-de-la-Baleine, Québec subarctique. Géographie physique et Quaternaire 61: 87-96.

Scope: **Component.**
Region: **Poste-de-la-Baleine, Québec.**
Species: ***Picea glauca, Picea mariana.***
Application: **Archaeology, dendrochronology, tree growth and development.**
Techniques: **Damage effects (human), ring count, ring width, scarring.**
Comments:
- Dating of forest harvesting of Cree Indians and Hudson Bay staff from 1865 to present was investigated using dendrochronological techniques in evaluation the radial growth of survivors, timing of apical dominance reiteration and dating of hack marks on trees.
- Results show Cree Indians used the area only in the summer prior to 1954, use the area extensively from 1954-1973, and then decreased use significantly after 1973 due to the use of other fuels for domestic heating.

112. **DELWAIDE, A. et L. FILION.** 1988.
Les coupes forestières dans les pessières à lichens: effets sur la croissance et la régéneration des conifères (Whapmagoostui, Québec subarctique). Canadian Journal of Botany 66: 1013-1020.
Scope: **Component.**
Region: **Whapmagoostui, Québec.**
Species: ***Picea glauca, Picea mariana.***
Application: **Tree growth and development.**
Techniques: **Ring count, ring width.**
Comments:
- The growth forms of white and black spruce were analyzed following pruning that simulated the effects of harvesting by Cree Indians in lichen woodlands.
- After several years the reduced annual growth of affected trees returned to normal and the growth of remaining trees increased 440-700 per cent.

113. **DENIRO, M. and S. EPSTEIN.** 1979.
$^{18}O/^{16}O$ ratios of terrestrial plant cellulose are independent of the $^{18}O/^{16}O$ ratio of atmospheric carbon dioxide. Science 204: 51-54.
Techniques: **Isotopes (oxygen).**

114. **DERRICK, D.N.** 1978a.
The Spruce Creek, Yukon, *Picea glauca* chronology. University of Arizona, Laboratory of Tree-Ring Research, Northern Hemisphere Climatic Reconstruction Group. Technical Note No. 11. pp.9
Scope: **Focus.**
Region: **Yukon.**
Species: ***Picea glauca.***
Application: **Dendrochronology.**
Techniques: **Ring width.**

115. **DERRICK, D.N.** 1978b.
The Border Beacon, Labrador, *Picea glauca* chronology. University of Arizona, Laboratory of Tree-Ring Research, Northern Hemisphere Climatic Reconstruction Group. Technical Note No. 12. 8 p.
Scope: **Focus.**
Region: **Newfoundland.**
Species: ***Picea glauca.***
Application: **Dendrochronology.**
Techniques: **Ring width.**

116. **DESLOGES, J.R.** 1987.
Paleohydrology of the Bella Coola River Basin: An Assessment of Environmental Reconstruction. Ph.D. Thesis, University of British Columbia. 363 p.
Scope: **Focus.**
Region: **Bella Coola River Basin, British Columbia.**
Species: ***Abies lasiocarpa, Pinus ponderosa, Pseudotsuga menziesii.***
Application: **Dendrohydrology.**
Techniques: **Ring width.**

117. DESLOGES, J.R. 1987.
High resolution biogeophysical evidence of Little Ice Age environments on the Bella Coola River Basin, British Columbia; in Palaeohydrological changes in the temperate zone in the last 15 000 years. International Geological Correlation Program Project 158. Abstracts of Papers Presented at XIIth INQUA, Ottawa, Ontario. August, 1987. Pp 36-42.
Scope: **Focus.**
Region: **British Columbia.**
Species: ***Abies lasiocarpa, Pseudotsuga menziesii.***
Application: **Dendrochronology, dendroclimatology.**
Techniques: **Ring width.**
Comments:
- Examines biological and geophysical attributes of a partly glacier-covered catchment of coastal British Columbia as possible sources for evidence of environmental change during the Little Ice Age.
- Investigations produced a 330 year record of Douglas fir growth and a 240 year record of alpine fir growth in addition to a 140 year record of lake sedimentation rates.

118. DEWITT, E. and M. AMES (Eds.). 1978.
Tree-ring chronologies of eastern North America. Laboratory of Tree-Ring Research, Chronology Series 4 Vol. 1.
Region: **North America.**
Application: **Dendrochronology.**

119. DIAZ, H.F. 1985.
A comparison of twentieth century climatic anomalies in northern North America with reconstructed patterns of temperature and precipitation based on pollen and tree-ring data. Ph.D. Thesis, University of Colorado, Boulder. 234p.
Scope: **Component.**
Region: **Arctic, north of 50° Latitude from Greenland to Alaska.**
Application: **Dendroclimatology.**
Techniques: **Statistical methods.**
Comments:
- Morphology of climatic variations over North America are explored.
- Patterns of temperature and precipitation over the past few centuries are mapped.

120. DIAZ, H.F., J.T. ANDREWS and S.K. SHORT. 1989.
Climate variations in northern North America (6000 BP to present) reconstructed from pollen and tree-ring data. Arctic and Alpine Research 21: 45-59.
Scope: **Component.**
Region: **Northern North America.**
Species: **Hardwoods, softwoods.**
Application: **Dendroclimatology.**
Techniques: **Statistical methods.**
Comments:
- The characteristic anomaly patterns of modern surface temperature and precipitation are compared to tree-ring indices and fossil pollen variations in northern North America.
- Tree-ring chronologies, with the growth trend removed, were obtained from the University of Arizona Tree-ring Laboratory data base.

121. DIOTTE, M. and Y. BERGERON. 1989.
Fire and the distribution of *Juniperus communis* L. in the boreal forest of Québec, Canada. Journal of Biogeography 16: 91-96.

Scope: **Component.**
Region: **Northwestern Québec.**
Species: ***Juniperus communis.***
Application: **Tree growth and development, stand dynamics (fire history).**
Techniques: **Damage effects, ring count, scarring (fire).**
Comments:
- Evaluates the abiotic and historical factors that could be responsible for the limited distribution of *Juniperus communis* populations.
- Minimum age of populations was determined by ring counts of cross-sectional tree cuts. The maximum age of the forest was determined to be the date of the last fire in the absence of fire scars.

122. DIX, R.L. and J.M.A. SWAN. 1971.
The roles of disturbance and succession in upland forest at Candle Lake, Saskatchewan. Canadian Journal of Botany 49: 657-676.

Scope: **Incidental**
Region: **Candle Lake, Saskatchewan**
Species: **Hardwoods, softwoods**
Application: **Stand dynamics**
Techniques: **Ring count**
Comments:
- Eighty-nine upland forest stands were selected to cover the ranges of tree species composition, stands ages, understorey composition, and site in the area.
- The role of each tree species as a pioneer, transient, or self-maintaining component of the forest was determined from the number of stems, their vigour, and distribution in the tree, sapling, and seedling strata among all stands and from growth increment cores of trees and saplings in 39 stands.
- Conclusions are drawn regarding the species likely to dominate after disturbance.

123. DOUGLAS, A.V. and C.W. STOCKTON. 1975.
Long-term reconstruction of seasonal temperature and precipitation in the Yellowstone National Park region using dendroclimatic techniques. Report prepared for the National Park Service, Yellowstone, Wyoming.

Region: **Yellowstone National Park, Wyoming.**
Application: **Dendrochronology, dendroclimatology.**

124. DOUGLASS, A.E. 1941.
Cross-dating in dendrochronology. Journal of Forestry 39: 825-831.

Scope: **Focus.**
Region: **United States.**
Application: **Analytical techniques and data acquisition.**
Techniques: **Crossdating, ring width.**
Comments:
- Defines and illustrates cross-dating which produces accurate tree-ring chronologies for dating purposes for climatic information and ecological purposes.

125. **DOYLE, T.W., F.G. TAYLOR, M.L. PARKER, C.F. COOPER and D.C. WEST.** 1985.
Preliminary Ring-width and ring density data for deriving wood mass chronologies of coniferous species from the Northwest U.S. and Canada: Response of vegetation to carbon dioxide. Oak Ridge National Laboratory Report, Prepared for the United States Department of Energy. 22p.

Region: **Canada, United States.**
Species: **Softwoods.**
Techniques: **Damage effects (pollution), densitometry, ring width.**

126. **DREW, L.G.** (Ed.). 1975.
Tree-ring chronologies of Western America, VI. Western Canada and Mexico. Laboratory of Tree-ring Research. Chronology Series 1. University of Arizona, Tucson.

Scope: **Focus.**
Region: **Western North America.**
Species: **Hardwoods, softwoods.**
Application: **Dendrochronology.**
Techniques: **Ring width.**
Comments:
- Collection of many tree-ring width chronologies developed for western Canada and the western United States.
- Raw chronologies are printed with simple statistics including sample numbers, serial correlation, standard deviation and mean sensitivity.

127. **DREW, L.G.** (Ed.). 1976.
Tree-ring chronologies for dendroclimatic analysis: an expanded western North American grid. Chronology Series II. Laboratory of Tree-Ring Research. The University of Arizona.

Region: **North America.**
Application: **Dendrochronology.**

128. **DUFF, G.H. and N.J. NOLAN.** 1953.
Growth and morphogenesis in the Canadian Forest Species I: The controls of cambial and apical activity in *Pinus resinosa*. Canadian Journal of Botany 31: 471-513.

Scope: **Focus.**
Region: **Ontario.**
Species: ***Pinus resinosa.***
Application: **Ring characteristics, tree growth and development.**
Techniques: **Ring width.**
Comments:
- The cambial and apical growth of Ontario red pine is analyzed.

129. **DUFF, G.H. and N.J. NOLAN.** 1957.
Growth and morphogenesis of the Canadian Forest Species II. Specific increments and their relation to the quality and activity of growth in *Pinus resinosa* Ait. Canadian Journal of Botany 35: 527-572.

Scope: **Incidental.**
Region: **Ontario.**
Species: ***Pinus resinosa.***
Application: **Tree growth and development.**
Techniques: **Ring width.**

Comments: - The use of ring-width for interpretation of the growth and development of *Pinus resinosa* in past research by the same authors is discussed.

130. **DUNWIDDIE, P.W. and M.E. EDWARDS.** 1984.
The dendrochronological potential of *Populus balsamifera* in northern Alaska. Tree-Ring Bulletin 44: 45-52.
Scope: **Alaska.**
Region: **Northern Alaska.**
Species: ***Populus balsamifera.***
Application: **Dendrochronology, dendroclimatology.**
Techniques: **Ring width.**
Comments:
- Clear annual growth rings and high year-to-year variability in ring-width of *Populus balsamifera* allow for ready cross-dating.
- Chronologies correlated much stronger with climate than chronologies from other softwoods from the Arctic.
- Strong correlations between chronologies and June temperature suggest balsam poplar may provide a good record of growing season temperature.

131. **ECKSTEIN, D. and J.R. PILCHER.** 1982.
Europe in Climate From Tree-rings. Hughes, M.K. et al. (Eds.), Cambridge University Press, Cambridge, p. 142-148.
Scope: **Focus.**
Region: **Europe.**
Species: ***Abies alba, Fagus sylvatica, Picea abies, Pinus sylvestrus, Quercus petraea, Quercus robur.***
Application: **Dendrochronology, dendroclimatology, dendrogeomorphology.**
Techniques: **Review**
Comments:
- Review of dendrochronological work carried out in Europe which is deemed to have the best climate data base in the world.

132. **EDWARDS, M.E. and P.W. DUNWIDDIE.** 1985.
Dendrochronological and palynological observations on *Populus balsamifera* in Northern Alaska, U.S.A. Arctic and Alpine Research 17: 271-278.
Scope: **Component.**
Region: **Northern Alaska.**
Species: ***Populus balsamifera.***
Application: **Dendrochronology, dendroclimatology, tree growth and development.**
Techniques: **Ring width.**
Comments:
- Variation in age, growth and reproductive status of balsam poplar in the far north.

133. **EDWARDS, T.W.D., R.O. ARAVENA, P. FRITZ and A.V. MORGAN.** 1985.
Interpreting paleoclimate from ^{18}O and ^{2}H in plant cellulose: comparison with evidence from fossil insects and relict permafrost in southwestern Ontario. Canadian Journal of Earth Sciences 22: 1720-1726.
Scope: **Component.**
Region: **Southwestern Ontario.**
Species: ***Picea glauca.***
Application: **Dendroclimatology.**
Techniques: **Isotopes (oxygen).**
Comments:
- Oxygen isotope content of terrestrial vegetation is related to that of source waters.
- Use of oxygen isotopes as climatic indicators is discussed.

134. **EGGINTON, P.A.** 1980.
Determining river ice frequency from the tree record. Current Research Part A, Geological Survey of Canada Paper 80-1A: p. 265-270.
Scope: **Component.**
Region: **Fort Simpson and Norman Wells, Northwest Territories.**
Application: **Dendroclimatology, dendrogeomorphology, dendrohydrology.**
Techniques: **Ring width.**
Comments:
- River-ice frequency along the Mackenzie River is determined through dendrochronological examination of uprooted trees along the river's banks.
- Tree age is limited by the thrusting of ice blocks onto the shore during breakup.

135. **EGGINTON, P.A. and T.J. DAY.** 1977.
Dendrochronologic investigation of high water along Hodgson Creek, District of Mackenzie. Geological Survey of Canada, Report of Activities, Part A, Paper 77-1A, p. 381-384.
Scope: **Focus.**
Region: **Hodgson Creek, District of Mackenzie, Northwest Territories.**
Application: **Dendrohydrology.**
Techniques: **Reaction wood, ring count, scarring.**
Comments:
- Investigates the available indirect evidence to establish the existence of relationships between the age and height of trees and water events along Hodgson Creek.

136. **EIS, S.** 1962.
Statistical analysis of several methods for estimation of forest habitats and tree growth near Vancouver, British Columbia. University of British Columbia, Faculty of Forestry Bulletin No. 4., 76p.
Region: **Vancouver, British Columbia.**
Application: **Analytical techniques and data acquisition, tree growth and development.**
Techniques: **Statistical methods.**

137. EIS, S. 1970.

Natural root grafts in conifers and the effect of grafting on tree growth; in Tree-Ring Analysis With Special Reference to Northwest America. J.H.G. Smith and J. Worrall (Eds.). University of British Columbia, Faculty of Forestry Bulletin No. 7.

Scope: **Incidental.**
Region: **Vancouver Island, British Columbia.**
Species: ***Pseudotsuga menziesii, Thuja heterophylla, Thuja plicata.***
Application: **Tree growth and development.**
Techniques: **Ring width.**
Comments:
- Ring widths were used to analyse growth of living trees and 'living stumps'.
- Growth of tree stumps suggest that some root systems may function after the bole is remove by supplying water and minerals to other trees and using the carbohydrates of living trees.

138. EIS, S., GARMAN, E.H. and L.F. EBELL. 1965.

Relation between cone production and diameter increment of Douglas fir, grand fir, and western white pine. Canadian Journal of Botany 43: 1553-1559.

Scope: **Component.**
Region: **British Columbia.**
Species: ***Abies grandis, Pinus monticola, Pseudotsuga menziesii.***
Application: **Tree growth and development.**
Techniques: **Ring width.**
Comments:
- Cone count records for a 28 year period on 80 Douglas fir, 14 grand fir and 9 western white pine were statistically analyzed with the annual diameter increment to evaluate the relationship between cone and wood production.
- Ring widths were found to be depressed only during years of high cone production suggesting that carbohydrates used for cone development were supplied from current photosynthesis rather than reserve supplies.

139. ELLIOTT, D.L. 1979a.

The current regenerative capacity of the northern Canadian trees, Keewatin, N.W.T., Canada: some preliminary observations. Arctic and Alpine Research 11: 243-251.

Region: **Keewatin, Northwest Territories.**
Application: **Stand dynamics (treeline).**

140. ELLIOTT, D.L. 1979b.

The stability of the northern Canadian tree limit: current regenerative capacity. Ph.D. dissertation. Department of Geography, University of Colorado, Boulder.

Region: **Canada.**
Application: **Stand dynamics (treeline).**

141. **ELLIOTT-FISK, D.L.** 1983.
The stability of the northern Canadian tree limit. Annals of the Association of American Geographers 73: 560-576.
Scope: **Component.**
Region: **Northern Canada.**
Species: ***Larix laricina, Picea glauca, Picea mariana.***
Application: **Tree growth and development.**
Techniques: **Ring width.**
Comments:
- Presents data on and discusses the degree of postglacial stability of northern Canadian tree limit.
- Tree limit responds to northern hemisphere climatic changes synchronously and directionally although lags are recognizable from western to eastern Canada.
- Tree-ring chronologies are suggested as useful for climatic inference and are especially reflective of the Little Ice Age event and Northern Hemisphere warming of the 20th century.
- Four chronologies are presented graphically in this paper: Lupus Lake (white spruce), Okak Lake (white spruce), Desulo Lake (white spruce and larch).

142. **EPSTEIN, S., P. THOMPSON, and C.J. YAPP.** 1977.
Oxygen and hydrogen isotopic ratios in plant cellulose. Science 198: 1209.
Scope: **Component.**
Region: **North America.**
Species: **Hardwoods, softwoods.**
Application: **Dendroclimatology.**
Techniques: **Isotopes (oxygen and hydrogen).**
Comments:
- Several experiments done to ascertain the relationships between climate and the ^{18}O values of cellulose in aquatic and terrestrial plants are described.
- Systemic differences were observed in the isotope concentrations between terrestrial and aquatic plants.

143. **EPSTEIN, S. and C. YAPP.** 1977.
Isotope tree thermometers. Science 266: 477-478.
Application: **Dendroclimatology.**
Techniques: **Isotopes.**

144. **EPSTEIN, S. and C.J. YAPP.** 1976.
Climatic implications of the D/H ratio of hydrogen in C-H groups in tree cellulose. Earth and Planetary Science Letters 30: 252-261.
Application: **Dendroclimatology.**
Techniques: **Isotopes (hydrogen).**

145. **EPSTEIN, S., C.J. YAPP and J.H. HALL.** 1976.
The determination of the D/H ratio of non-exchangeable hydrogen in cellulose extracted from aquatic and land plants. Earth and Planetary Science Letters 30: 241-251.
Application: **Dendroclimatology.**
Techniques: **Isotopes (hydrogen).**

146. FARMER, J.G. 1979.
Problems in interpreting tree-ring ^{13}C records. Nature 279: 229-231.
Application: **Dendroclimatology.**
Techniques: **Isotopes (carbon).**

147. FAYLE, D.C.F. 1973.
Patterns of annual xylem increment integrated by contour presentation. Canadian Journal of Forest Research 3: 105-111.
Scope: **Focus.**
Region: **Ontario.**
Application: **Analytical techniques and data acquisition.**
Techniques: **Computing, ring width.**
Comments:
- Describes a contour presentation of the annual increment of wood in a tree during growth.
- Contour presentation provides a good visual construction useful for comparative purposes of the space-time relationships of the growth layer during tree development.

148. FAYLE, D.C.F. 1981.
Frost rings formed in 14 m tall Red Pine. The Forestry Chronicle 57: 123.
Scope: **Focus.**
Region: **Simcoe County, Ontario.**
Species: ***Pinus resinosa.***
Application: **Ring characteristics.**
Techniques: **Frost rings.**
Comments:
- Examination and measurement of annual rings on cross-sections and from the middle of every internode of codominant and suppressed trees.
- Frost rings were observed to be an almost annual occurrence for 30-35 years, however, frost effects did not apparently affect shoot elongation or cause visible stem lesions.

149. FAYLE, D.C.F. 1985.
Longitudinal changes in the stem growth layer associated with debudding and branch development in Red Pine. Canadian Journal of Forest Research 15: 461-464.
Scope: **Focus.**
Region: **Ontario.**
Species: ***Pinus resinosa.***
Application: **Tree growth and development.**
Techniques: **Damage effects, ring width.**
Comments:
- Effects of branches on the annual distribution of wood along the stems of red pine are examined by comparing growth both during, and after 8 years of debudding.

150. **FAYLE, D.C.F. and C.V. BENTLEY.** 1989.
Growth and development of a natural jack pine stand; in Climate Applications in Forest Renewal and Forest Production. D.C. MacIver, R.B. Street and A.N. Auclair (Eds.). Proceedings of Forest Climate '86, November 17-20, 1986, Geneva Park, Orillia, Ontario.

Scope: **Focus**
Region: **Sault Ste. Marie and Turbine, Ontario**
Species: ***Pinus banksiana***
Application: **Tree growth and development**
Techniques: **Ring width**
Comments:
- Growth layer analysis was used to reconstruct and examine patterns of tree growth and development that occurred during the evolution of a 48-year-old jack pine stand.
- During the first three decades of development annual fluctuations in growth parameters suggest a response to favourable and unfavourable climatic conditions.
- Growth reduction in the fourth decade was attributed to competitive stress and defoliation.

151. **FAYLE, D.C.F., C.V. BENTLEY and P.A. SCOTT.** 1988.
How did treeline white spruce at Churchill, Manitoba respond to conditions around 1816. Abstract from Proceedings of the Year Without a Summer: Climate in 1816. International Meeting National Museum of Natural Science, June 25-28, 1988. p.24-25.

Scope: **Focus.**
Region: **Churchill, Manitoba.**
Species: ***Picea glauca.***
Application: **Dendroclimatology.**
Techniques: **Ring width.**
Comments:
- Annual radial increment and height increment from white spruce were measured from trees growing at Churchill, Manitoba and interpreted for growth response during the period around the eruption of Tambora about 1816 using ring width data.
- Although growth of trees was generally declining prior to the volcanic eruption growth was markedly decreased during the first two years following the Tambora eruption.

152. **FAYLE, D.C.F. and G.B. MACDONALD.** 1977.
Growth and development of sugar maple as revealed by stem analysis. Canadian Journal of Forest Research 7: 526-536.

Scope: **Focus.**
Region: **Central Ontario.**
Species: ***Acer saccharum.***
Application: **Ring characteristics, tree growth and development.**
Techniques: **Ring area, ring volume, ring width.**
Comments:
- Patterns of annual height and radial growths in sugar maple over a 50-60 year period sample in 1972 and 1973 are analyzed.
- Definitive changes in height and increment in response to changes in environmental conditions were observed.

153. **FAYLE, D.C.F., D. MACIVER and C.V. BENTLEY.** 1983.

Computer-graphing of annual ring widths during measurement. The Forestry Chronicle 59: 291-293.

Scope: **Focus.**
Region: **Canada.**
Application: **Analytical techniques and data acquisition.**
Techniques: **Computing, ring width.**
Comments:
- Annual ring-width data produced by the DIGI-MIC tree-ring measurer are transmitted to an APPLE II Plus microcomputer providing immediate graphical display of the radial growth pattern of the tree.
- Line graphs of ring-widths along the radii of a stem cross-section and/or the average for successive stem sections can be compared visually, verified and edited if necessary.

154. **FIELD, W.O., Jr. and C.J. HEUSSER.** 1954.
Glacier and botanical studies in the Canadian Rockies, 1953. Canadian Alpine Journal 37: 128-140.

Region: **Alberta, British Columbia.**
Application: **Dendrogeomorphology, glacier fluctuation.**

155. **FILION, L.** 1983.
Dynamique holocène des systèmes éoliens et signification paléoclimatique (Québec nordique). These Ph.D. Université Laval, Québec. 123p.

Application: **Dendroclimatology.**

156. **FILION, L. and P. MARIN.** 1988.
Modifications morphologiques de l'épinette blanche soumise à la sedimentation éolienne en milieu dunaire, Québec subarctique. Canadian Journal of Botany 66: 1862-1869.

Scope: **Component.**
Region: **Québec.**
Species: ***Picea glauca.***
Application: **Dendrogeomorphology, tree growth and development.**
Techniques: **Ring pattern, ring width.**
Comments:
- White spruce growth-forms on sand dunes in Whapmagoostui, Québec were examined.
- Growth of trees decreased with increased accumulation of sand over tree base with trees eventually dying as a result of dune displacement.

157. **FILION, L. and S. PAYETTE.** 1986.
La formation de cernes pâles chez l'épinette noire (*Picea mariana* (Mill.) BSP) à la limite latitudinale des forêts (Québec nordique). Naturalia Monspeliensia-Colleque International sur l'Arbre p. 26-33.

Scope: **Focus.**
Region: **Québec.**
Species: ***Picea mariana.***
Application: **Dendroclimatology, ring characteristics.**
Techniques: **Light rings.**

Comments:
- Examines light rings found in black spruce and krummholz at the latitudinal treeline in Québec.
- Light rings were correlated with low temperatures at the end of the growing season; 66% of light rings occurred in years of known volcanic eruptions.

158. **FILION, L.and S. PAYETTE.** 1987.
Spatial distribution of light-ring years in subarctic Québec; in Proceedings of the International Symposium on Ecological Aspects of Tree-ring Analysis. G.C. Jacoby and J.W. Hornbeck (Eds.). p. 79.
Scope: **Focus.**
Region: **Subarctic Québec.**
Application: **Dendroclimatology, ring characteristics.**
Techniques: **Light rings, latewood.**
Comments:
- Light ring distribution in subarctic conifers near Bush Lake, Québec show a decreasing incidence of frequency from north-to-south.
- Diagnostic light rings useful for cross-dating are identified.

159. **FILION, L., S. PAYETTE, L. and Y. BÉGIN.** 1988.
Botanical and geomorphic evidence of cold and humid climate in the early nineteenth century in the Hudson Bay Area, Québec. Abstract from the International Meeting The Year Without a Summer? Climate in 1816. National Museum of Natural Sciences Ottawa, Canada. June 25-28, 1988. p.p. 26-27.
Scope: **Focus.**
Region: **Subarctic Québec.**
Species: ***Larix laricina, Picea glauca, Picea mariana.***
Application: **Dendrochronology, dendroclimatology, dendrogeomorphology, dendrohydrology.**
Techniques: **Light rings, ring width.**
Comments:
- Discussion of the tree-ring chronologies compiled for subarctic Québec by numerous researchers.

160. **FILION, L., S. PAYETTE and L. GAUTHIER.** 1985.
Analyse dendroclimatique d'un krummholz à la limite des arbres, Lac Bush, Québec nordique. Géographie physique et Quaternaire : 221-226.
Scope: **Focus.**
Region: **Lac Bush, northern Québec.**
Species: ***Picea mariana.***
Application: **Dendroclimatology.**
Techniques: **Crossdating, reaction wood, ring width.**
Comments:
- Cross-dating of living and dead krummholtz tree-ring chronologies was carried out to reconstruct 500 years of climate.
- Most trees died before the 20th century but branches of the dying spruce growing near the ground established vegetatively.
- Sexual reproduction was absent in the 20th century due to a lack of spruce able to produce seeds.

161. **FILION, L., S. PAYETTE, L. GAUTHIER and Y. BOUTIN.** 1986.

Light rings in subarctic conifers as a dendrochronological tool. Quaternary Research 26: 272-279.

Scope: **Focus.**
Region: **Bush Lake, Québec.**
Species: ***Picea mariana.***
Application: **Dendrochronology, dendroclimatology, dendroecology.**
Techniques: **Crossdating, earlywood, latewood, light rings, ring width.**
Comments:
- Light rings in black spruce are evaluated as diagnostic tools for effective establishment of cross-dates in tree-ring studies.
- A master chronology of the years of light-ring formation was superimposed on the tree growth curve for Bush Lake presented in Payette et al. (1985) for the years 1398 to 1982.
- Causes of light-ring formation are discussed.

162. FLETCHER, J.W. and J.F. HUGHES. 1970.
Uses of X-rays for density determinations and dendrochronology; in Tree-Ring Analysis with Spatial Reference to North America (Smith and Worral Eds.) University of British Columbia, Faculty of Forestry Bulletin 7: 41-54.

Region: **North America.**
Application: **Analytical techniques and data acquisition, dendrochronology.**
Techniques: **Densitometry.**

163. FORWARD, D.F. and N.J. NOLAN. 1961.
Growth and morphogenesis in the Canadian Forest Species. IV. Radial growth in branches and main axis of *Pinus resinosa* Ait. Canadian Journal of Botany 39: 385-409.

Scope: **Focus.**
Region: **Chalk River, Ontario.**
Species: ***Pinus resinosa.***
Application: **Tree growth and development.**
Techniques: **Ring width.**
Comments:
- Analysis of variation in red pine radial growth using tree-rings is extended to include the primary branches.
- Reports on variations in radial growth in branches as interpreted through tree-rings.
- Branches provide information of potential value in diagnosing biological controls of growth.

164. FORWARD, D.F. and N.J. NOLAN. 1961.
Growth and morphogenesis in the Canadian Forest species. V. Further studies of wood growth in branches and main axis of *Pinus resinosa* Ait. Canadian Journal of Botany 39: 411-436.

Scope: **Component.**
Region: **Ontario.**
Species: ***Pinus resinosa.***
Application: **Tree growth and development.**
Techniques: **Ring width.**

Comments: - Specific growth of cambial area and volume increment are examined.
- Completes the analysis of the linear components of growth and the distribution of integrated growth in terms of wood volume increment.

165. **FOX, C.A., W.B. KINCAID, T.H. NASHILL, D.L. YOUNG and H.C. FRITTS.** 1986.
Tree-ring variation in western larch (*Larix occidentalis*) exposed to sulphur dioxide emissions. Canadian Journal of Forest Research 16: 283-292.
Scope: **Focus.**
Region: **Trail, British Columbia.**
Species: ***Larix occidentalis.***
Application: **Dendroclimatology.**
Techniques: **Damage effects (pollution), ring width, statistical methods.**
Comments: - Investigation of the growth response of larch growing near a smelter at Trail, British Columbia.

166. **FRASER, D.A.** 1952.
Initiation of cambial activity in some forest trees in Ontario. Ecology 33: 259-273.
Scope: **Focus.**
Region: **Ontario.**
Species: ***Betula populifolia, Pinus strobus.***
Application: **Tree growth and development.**
Techniques: **Ring width.**
Comments: - Factors affecting the initial cambial activity of two conifers.
- Ages of trees are determined from ring counts of tree cores.

167. **FRASER, D.A.** 1956.
Ecological studies of forest trees at Chalk River, Ontario, Canada: II. Ecological conditions and radial increment. Ecology 37: 777-789.
Scope: **Component.**
Region: **Chalk River, Ontario.**
Species: ***Acer saccharum, Betula alleghaniensis, Betula papyrifera, Fraxina nigra, Fagus grandifolia, Picea glauca, Tilia americana, Tsuga* sp.**
Application: **Ring characteristics.**
Techniques: **Ring width.**
Comments: - Eight tree species were analyzed for correlations between canopy, air and soil temperatures, rainfall and soil moisture, and the radial growth.
- Growth start was controlled by late winter and early spring soil temperatures.
- Wet sites warmed up slowly due to a thick organic horizon, thereby causing a retardation of growth.
- Cambial activity ceased by early September even on wet and warm sites.

168. **FRASER, D.A.** 1962.
Growth of spruce under long photoperiods. Department of Forestry, Canada, Forest Research Branch, Technical Note No. 114.
Region: **Canada.**
Species: ***Picea glauca, Picea mariana.***
Application: **Tree growth and development.**

169. **FRAZER, G.W.** 1985.
Dendrogeomorphic evaluation of snow avalanche history at two sites in Banff National Park. M.Sc. Thesis, Department of Geography, University of Western Ontario, London, Ontario, Canada.

Scope: **Focus.**
Region: **Alberta.**
Species: ***Abies lasiocarpa, Picea engelmannii, Picea glauca, Pinus contorta.***
Application: **Dendrogeomorphology.**
Techniques: **Partial rings, reaction wood, scarring.**
Comments:
- Analytical method of extracting snow avalanche magnitude and frequency information from tree-ring data is presented for two sites in the Canadian Rockies where long-term snow avalanche hazard on a new stretch of highway is unknown.

170. **FRELICH, L.E., L.G. BOCKHEIM and J.E. LEIDE.** 1989.
Historical trends in tree-ring growth and chemistry across an air-quality gradient in Wisconsin. Canadian Journal of Forest Research 19: 113-121.

Scope: **Focus.**
Region: **Wisconsin.**
Species: ***Acer saccharum, Pinus strobus.***
Application: **Dendrochemistry.**
Techniques: **Ring width.**
Comments:
- Basal-area increment and chemical composition of xylem wood were measured in three old-growth white pine and three sugar maple stands across a pH and SO_4 gradient in precipitation in Wisconsin.
- Although additional research is needed to determine the potential of dendrochemistry in evaluating the consequences of environmental pollutions, the age- and site-related trends in chemical composition of xylem wood of white pine and sugar maple appear to be related to vehicular emissions, air pollution, migration along ray paths during conversion of sapwood into heartwood, and possibly reallocation of nutrients from the labile soil pool to perennial tree tissues during stand development.

171. **FRITTS, H.C.** 1962.
The relations of growth ring widths in American Beech and White Oak to variations in climate. Tree-Ring Bulletin 25: 2-10.

Scope: **Focus.**
Region: **Ohio, Illinois.**
Species: ***Fagus grandifolia, Quercus alba.***
Application: **Dendroclimatology.**
Techniques: **Earlywood, latewood, ring width.**

Comments: - Beech and white oak are evaluated for ring growth and climatic relationships; growth rings of beech are determined to be difficult to use in dendroclimatic evaluation as the effects of the preceding growing season are hard to isolate from effects of the current growing season.
- White oak tree-rings can be divided into earlywood and latewood; latewood in this tree species is of variable thickness and can be related to summer drought, and therefore, has possibilities as a good indicator of climatic conditions, especially as an estimator of the severity of summer drought.

172. **FRITTS, H.C.** 1963.
Computer programs for tree-ring research. Tree-Ring Bulletin 25: 2-7.
Scope: **Focus.**
Region: **United States.**
Application: **Analytical techniques and data acquisition**
Techniques: **Computing, crossdating, statistical methods**
Comments: - Computer programs are described for derivation of tree-ring indices, simple statistics, cross-dating, correlation and estimations of variance in tree-ring data.
- This paper resulted in a new phase of thinking in tree-ring research as a result of the advent of methods described in this article that allowed for rapid processing and computing of data from tree-ring series.

173. **FRITTS, H.C.** 1965.
Tree-ring evidence for climatic changes in western North America. Monthly Weather Review 93: 421-443.
Scope: **Focus.**
Region: **Western North America.**
Species: ***Pseudotsuga menziesii.***
Application: **Dendroclimatology.**
Techniques: **Statistical methods.**
Comments: - Climatic factors and fluctuations in dated tree-ring widths in southwestern Canada and the western United States are statistically evaluated; chronologies were found to exhibit a close relationship with autumn, winter, and spring moistures.
- Periods of widespread drought and above average moisture are identified.

174. **FRITTS, H.C.** 1971.
Dendroclimatology and Dendroecology. Quaternary Research 1: 419-449.
Scope: **Focus.**
Region: **North America.**
Application: **Dendroecology, dendroclimatology.**
Techniques: **Review.**
Comments: - Summary of all aspects of dendroclimatology and dendroecology.

175. **FRITTS, H.C.** 1976a.
Tree-rings and Climate. Academic Press, London and New York. 568p.
Scope: **Focus.**
Region: **North America.**
Species: **Hardwood, softwood.**
Application: **Dendroclimatology.**
Techniques: **Review.**
Comments: - Summary of dendroclimatology and analytical techniques.

176. **FRITTS, H.C.** 1976b.
Reconstruction of past climatic variability. Laboratory of Tree-Ring Research, University of Arizona, Tucson, 64p.
Application: **Dendroclimatology.**

177. **FRITTS, H.C.** 1981.
Regionally averaged climatic variation over North America reconstructed by tree-ring analysis; in First Conference on Climatic Variations of the American Meteorological Society, January 19-23, San Diego, Abstracts. p. 24.
Region: **North America.**
Application: **Dendroclimatology.**

178. **FRITTS, H.C.** 1974.
Relationships of ring widths in arid-site conifers to variations in monthly temperatures and precipitation. Ecological Monographs 44: 411-440.
Scope: **Focus.**
Region: **Western North America.**
Species: **Softwood.**
Application: **Dendroclimatology.**
Techniques: **Ring width.**
Comments:
- Two multivariate techniques for evaluating the relationships between ring width and climatic factors are described.
- Relationships are established for 127 tree-ring chronologies from western North America.
- 60-65% of variation in tree growth is a function of climate.
- Topographical factors especially aspect are shown to influence growth response.

179. **FRITTS, H.C. and J.M. LOUGH.** 1985.
An estimate of the average annual temperature variations for North America, 1602 to 1961. Climatic Change 7: 203-224.
Scope: **Focus.**
Region: **North America.**
Species: **Hardwoods, softwoods.**
Application: **Dendroclimatology.**
Techniques: **Statistical methods.**

Comments: - Annual surface temperature variations, 1602 to 1961, averaged over 77 United States and southwestern Canadian weather stations are reconstructed from 65 arid-site tree-ring chronologies.
- Annual sea-level pressure reconstructions averaged over the North Pacific sector including North America and eastern Asia are inversely related to the temperature variations.

180. **FRITTS, H.C., T.J. BLASING, E. DEWITT, G.R. LOFGREN and K.B. MCDOUGALL.** 1976.
Reconstructions of past climatic variability. Final Report, University of Arizona, Laboratory of Tree-Ring Research, Tucson, 71p.
Application: **Dendroclimatology.**

181. **FRITTS, H.C., T.J. BLASING, B.P. HAYDEN and J.E. KUTZBACH.** 1971.
Multivariate techniques for specifying tree-growth and climate relationships and for reconstructing anomalies in paleoclimate. Journal of Applied Meteorology 10: 845-864.
Scope: **Focus.**
Region: **North America.**
Application: **Dendroclimatology.**
Techniques: **Ring width, statistical methods.**
Comments: - Multivariate analysis of tree-ring chronologies from western North America are used to derive response functions which allow estimations of anomalous climatic variations.
- Anomalies are dated back to 1700 A.D. using tree-rings where climatic data are not available.

182. **FRITTS, H.C. and G.R. LOFGREN.** 1978.
Patterns of climatic change revealed through dendroclimatology. U.S. Army Coastal Engineering Research Centre, Fort Beluoir, Virginia.
Region: **North America.**
Application: **Dendroclimatology.**

183. **FRITTS, H.C., G.R. LOFGREN and G.A. GORDON.** 1979a.
Reconstructing seasonal to centenary variations in climate from tree-ring evidence; in International Conference on Climate and History. University of East Anglia, Norwich, July 8-14, Review Papers. p. 29-58.
Scope: **Focus.**
Region: **Canada.**
Species: ***Abies concolor, Pinus edulis, Pinus flexilis, Pinus jeffreyi, Pinus longaeva, Pinus ponderosa, Pseudotsuga menziesii, Pseudotsuga macrocarpa.***
Application: **Dendroclimatology.**
Techniques: **Statistical methods.**
Comments: - Discusses the use of tree-rings as proxies for climatic variation and spatial aspects of climatic variation.

184. **FRITTS, H.C., G.R. LOFGREN and G.A. GORDON.** 1979b.
Variations in climate since 1602 as reconstructed from tree-rings. Quaternary Research 12: 18-46.

Scope: **Focus.**
Region: **United States and Southwestern Canada.**
Species: ***Abies concolor, Pinus edulis, Pinus flexilis, Pinus jeffreyi, Pinus longaeva, Pinus ponderosa, Pseudotsuga macrocarpa, Pseudotsuga menziesii.***
Application: **Dendroclimatology.**
Techniques: **Ring width, statistical methods.**
Comments:
- Progress report on calibration procedures and verification techniques needed to test tree-ring results against independent data.

185. **FRITTS, H.C. and D.J. SHATZ.** 1975.
Selecting and characterizing tree-ring chronologies for dendroclimatic analysis. Tree-Ring Bulletin 35: 31-40.

Scope: **Focus.**
Region: **North America.**
Species: **Hardwoods, softwoods.**
Application: **Analytical techniques and data acquisition, dendroclimatology.**
Techniques: **Sample preparation and laboratory techniques, statistical methods.**
Comments:
- Procedures for selecting chronologies for climatic analysis are identified with the hope that quality tree-ring data will be then used for research.
- Common selection criteria allows for comparison of the statistics in new chronologies to statistics in established data sets.
- 102 Chronologies were selected based on the sample numbers, chronology length, site locations, statistical characteristics, and correlation of chronologies with those on neighbouring sites.
- The site name, collector, identification number, species, location, elevation, and the most important statistical characteristics are published in Table I of Drew (1976) with complete data on 41 chronologies that were previously unpublished.

186. **GAGNON, D.** 1961.
Rainfall and the width of annual rings in planted white spruce. Forestry Chronicle 37: 96-101.

Scope: **Focus.**
Region: **Grand'Mere, Québec.**
Species: ***Picea glauca.***
Application: **Dendroclimatology, tree growth and development.**
Techniques: **Ring width.**
Comments:
- Test to what degree rain of previous growing season could affect current ring width increment.
- Influence of monthly precipitation on mean annual ring width in a 31-year-old plantation of white spruce on sandy soils.
- Mean annual ring width was found to be proportional to the mean monthly precipitation of June, July and August of the preceding year.

187. **GARDNER, J.S.** 1980.
Dendrochronological evidence for flood/debris flow frequency in the Canadian Rockies. Abstract of Papers, Canadian Association of Geographers, p. 13.
Region: **Alberta, British Columbia.**
Application: **Dendrochronology, dendrohydrology.**

188. **GARDNER, J.S.** 1982.
Alpine mass-wasting in contemporary time: Some examples from the Canadian Rocky Mountains; in Space and Time in Geomorphology. C.E. Thorn (Ed.). George Allen and Unwin, London. p 171-192.
Scope: **Incidental.**
Region: **Field, British Columbia.**
Application: **Dendrogeomorphology, dendrohydrology.**
Techniques: **Reaction wood, ring width, scarring (ice).**
Comments: - Dendrochronology mentioned as useful for dating of geomorphic events.

189. **GARDNER, J.S., D.J. SMITH and J.R. DESLOGES.** 1983.
The Dynamic Geomorphology of the Mt. Rae Area: A high mountain region in southwestern Alberta. University of Waterloo, Department of Geography Publication Series No. 19.
Scope: **Incidental.**
Region: **Alberta.**
Species: **Softwoods.**
Application: **Dendrogeomorphology, stand dynamics (fire history).**
Techniques: **Ring count, scarring.**
Comments: - Tree-rings are mentioned as just one of several techniques used for interpretation of glacial fluctuation, climatic change and fire history of the mountain regions of Alberta.

190. **GARFINKEL, H.L. and L.B. BRUBAKER.** 1980.
Modern climate-tree-growth relationships and climatic reconstruction in sub-arctic Alaska. Nature 286: 872-874.
Scope: **Focus.**
Region: **Fairbanks, Alaska.**
Species: ***Picea glauca.***
Application: **Dendroclimatology, tree growth and development.**
Techniques: **Ring width, statistical methods.**
Comments:
- Tree-ring sequences are used to define climatic limitations on the radial growth of trees at tree line and to reconstruct past climatic variables.
- Statistical comparisons are made between tree-ring width sequences and climatic variables.

191. **GERARD, R.** 1981.
Ice scars: Are they reliable indicators of past ice breakup water levels; in Proceedings of the International Association for Hydraulic Research Ice Symposium, Québec City, July 1981. p. 847-859.
Application: **Dendrohydrology.**
Techniques: **Scarring (ice).**

192. GHENT, A.W. 1952.
A technique for determining the year of the outside ring of dead trees. Forestry Chronicle 28: 85-93.

Scope: **Focus.**
Region: **Black Sturgeon Lake, Ontario.**
Species: ***Populus tremuloides.***
Application: **Analytical techniques and data acquisition.**
Techniques: **Crossdating, ring count, ring width, statistical methods.**
Comments:
- A method is proposed whereby the year of the outside ring of dead trees can be determined by visual inspection of the agreement between plotted ring measurements from living and dead trees.
- Methods are suggested for statistically checking the accuracy of tree-ring cross-dates.
- Techniques proposed allowed for the determination of the year of the outside ring on dead trembling-aspen trees to a low probability of error 25 years after this last ring was laid down.

193. GHENT, A.W. 1954.
The treatment of decayed wood from dead trembling aspen trees for growth-ring analysis. Forestry Chronicle 30: 280-283.

Scope: **Focus.**
Region: **Ontario.**
Species: ***Populus tremuloides.***
Application: **Analytical techniques and data acquisition.**
Techniques: **Sample preparation.**
Comments:
- Refinements to procedures described in an earlier paper for the preparation of study material from badly deteriorated trembling aspen are presented.
- Sample collection, preliminary preparation, impregnation with paraffin, slide preparation, ring measurement and analysis are discussed.

194. GHENT. A.W. 1955.
A guide for the re-alignment of off-centre increment borings. Forestry Chronicle 31: 353-355.

Scope: **Component.**
Region: **Canada.**
Application: **Analytical techniques and data acquisition.**
Techniques: **Increment coring, sample preparation and laboratory techniques.**
Comments:
- A guide for the re-alignment of off-centre increment borings is described that should guarantee that a second boring will be successful if a first has failed to include the centre ring.
- Off-centre cores are held beneath the guide and move to right or left until the best agreement is obtained between the curvature of the growth rings and the curvature of the inscribed arcs.

195. GIARDINO, J.R., J.F. SHRODER, Jr. and M.P. LAWSON. 1984.
Tree-ring analysis of movement of a rock-glacier complex on Mount Mestas, Colorado, U.S.A. Arctic and Alpine Research 16: 299-309.
Scope: **Focus.**
Region: **Colorado.**
Species: ***Picea engelmannii, Pinus ponderosa.***
Application: **Dendrochronology, dendrogeomorphology.**
Techniques: **Reaction wood, ring pattern, ring width, scarring.**
Comments:
- 238 trees were sampled to determine the movement of a rock-glacier along two main axis since the 15th century.

196. GIDDINGS, J.L., Jr. 1938.
Recent tree-ring work in Alaska. Tree-Ring Bulletin 5: 16.
Application: **Dendrochronology.**
Techniques: **Ring count.**

197. GIDDINGS, J.L., Jr. 1940.
The application of tree-ring dates to arctic sites. Tree-Ring Bulletin 7: 10-14.
Scope: **Focus.**
Region: **Mackenzie Region, Northwest Territories, Alaska.**
Species: **Driftwood.**
Application: **Archeology, dendrochronology.**
Techniques: **Ring width.**
Comments:
- Driftwood in the Canadian and American Arctic is used to date Eskimo settlement and to create floating chronologies.

198. GIDDINGS, J.L., Jr. 1941.
Dendrochronology in northern Alaska. University of Arizona Bulletin 12(4), Laboratory of Tree-Ring Research Bulletin I. 107p.
Scope: **Focus.**
Region: **Alaska.**
Species: ***Larix alaskensis, Picea canadensis, Picea mariana.***
Application: **Archeology, dendrochronology, dendroclimatology.**
Techniques: **Crossdating, ring width.**
Comments:
- Presents climatological and archeological results achieved by cross-dating the trees of Alaska sampled between 1938 and 1941.
- Discusses the application of tree-ring work to other branches of science.
- Suggests that the record in living trees may be closely related to the mean temperature in June.

199. GIDDINGS, J.L., Jr. 1942.
Dated sites on the Kobuk River, Alaska. Tree-Ring Bulletin 9: 3-8.
Scope: **Focus.**
Region: **Alaska.**
Species: ***Betula* sp., *Picea* sp., *Populus* sp.**
Application: **Archeology, dendrochronology.**
Techniques: **Ring count.**

Comments: - Tree-ring dating is used to establish the date of existence of five main Eskimo village sites near Kobuk River, northwestern Alaska.
- Focuses on the problems involved in the use of old tree-ring material within a forested zone in Alaska.

200. **GIDDINGS, J.L., Jr.** 1943.
Some climatic aspects of tree growth in Alaska. Tree-Ring Bulletin 9: 26-32.
Scope: **Focus.**
Region: **Alaska.**
Species: **Driftwood, *Picea glauca.***
Application: **Dendrochronology, dendroclimatology.**
Techniques: **Ring width.**
Comments:
- Tree-ring data collected at timberline in the interior of Alaska and at latitude timberline or tree-line near the northern coasts show that widespread climatic stress acts similarly on all spruce trees near the limits of tree growth.
- Tree-rings are found to correlate strongly with the mean temperature of the growing season.

201. **GIDDINGS, J.L., Jr.** 1947.
Mackenzie River Delta Chronology. Tree-Ring Bulletin 13: 26-29.
Scope: **Focus.**
Region: **Yukon.**
Species: ***Picea glauca.***
Application: **Dendrochronology, dendroclimatology.**
Techniques: **Ring width.**
Comments:
- Chronologies from the Mackenzie River Delta area are compared with weather records from Aklavik and with Alaskan chronologies.
- No strong correlations were found to agree with precipitation but good agreement with July temperatures was found.
- Results were different from northwestern Alaska which show best agreement with June-July temperatures.
- The temperature of the growing season forms the principle control over cross-dating quality.

202. **GIDDINGS, J.L., Jr.** 1948.
Chronology of the Kobuk-Kotzebue sites. Tree-Ring Bulletin 14: 26-32.
Scope: **Focus.**
Region: **Alaska.**
Species: ***Betula* sp., *Picea* sp., *Populus* sp.**
Application: **Archeology, dendrochronology.**
Techniques: **Crossdating, ring count, ring width.**
Comments:
- Continuing research presented in 1942 is discussed.
- Tree-ring data from driftwood in the arctic is used to date Eskimo settlements and to create a 970-year long master chronology.

203. **GIDDINGS, J.L., Jr.** 1951.
The forest edge at Norton Bay, Alaska. Tree-Ring Bulletin 18: 2-6.
Scope: **Focus.**
Region: **Cape Darby, Alaska.**
Species: ***Picea.***
Application: **Dendroclimatology.**
Techniques: **Ring width.**
Comments:
- Growth of forests bordering Norton Bay is shown to be largely related to temperature stress during the growing season.

204. **GIDDINGS, J.L., Jr.** 1953.
Yukon River spruce growth. Tree-Ring Bulletin 20: 2-5.
Scope: **Focus.**
Region: **Alaska.**
Species: ***Picea glauca.***
Application: **Dendrochronology, dendroclimatology, tree growth and development.**
Techniques: **Ring width.**
Comments:
- Spruce growth patterns along the Yukon River are suggested to change in form with the mean temperature of the growing season.

205. **GIDDINGS, J.L., Jr. 1954.**
Tree-ring dating in the American Arctic. Tree-Ring Bulletin 20: 23-25.
Scope: **Focus.**
Region: **Northern Canada, Alaska.**
Species: ***Picea glauca.***
Application: **Dendrochronology, dendroclimatology.**
Techniques: **Ring width.**
Comments:
- Summary of the uses to which tree-ring collections have been put in the arctic and discusses some positive results and difficulties encountered in tree-ring research.

206. **GILL, C.B. 1930.**
Cyclic forest phenomena. Forestry Chronicle 6(4): 42-56.
Scope: **Focus.**
Region: **Manitoba.**
Species: ***Pinus banksiana.***
Application: **Dendrochronology, dendroclimatology, stand dynamics (fire history).**
Techniques: **Damage effects (insect), ring count, ring width, scarring (fire).**
Comments:
- Gill was one of the first researchers to use tree-ring analysis in Canada.
- In this article he analyzed periodicity in growth in forests as they related to drought, fire, logging effects, sunspot activity and rabbit damage.
- Five groups of jack pine in Manitoba were analyzed; standardized and unstandardized growth curves were plotted.
- It was established that is was possible to prepare a tree-ring chronology for any area, and that these chronologies may be useful for the study of future yields in nursery planning, and in building up fire organization.

207. **GLEN, D.M. 1974.**
Tree-ring dating of snow avalanches (Abstract). Journal of the Colorado-Wyoming Academy of Sciences 12: 46.
Application: **Dendrogeomorphology.**

208. **GLERUM, C. and J.L. FARRAR.** 1966.
Frost-ring formation in the stems of some coniferous species. Canadian Journal of Botany 44: 879-886.
Scope: **Focus.**
Region: **Ontario.**
Species: ***Larix laricina, Picea glauca, Picea mariana, Pinus banksiana, Pinus strobus, Pinus resinosa.***
Application: **Ring characteristics.**
Techniques: **Frost rings.**
Comments:
- Seedlings of several conifer species were artificially subjected to freezing temperatures.
- Microscopic examination of sections, taken at intervals after the frost, revealed the way in which frost rings developed.

209. **GLERUM, C. and J.M. PATERSON.** 1989.
Climatic influences on jack pine and black spruce during eight growing seasons since planting on a dry and a fresh site in northern Ontario; in Climate Applications in Forest Renewal and Forest Production. D.C. MacIver, R.B. Street and A.N. Auclair (Eds.). Proceedings of Forest Climate '86, November 17-20, 1986, Geneva Park, Orillia, Ontario.
Scope: **Component**
Region: **Wawa, Ontario**
Species: ***Picea banksiana, Picea mariana***
Application: **Tree growth and development**
Techniques: **Earlywood, latewood, ring width**
Comments:
- Black spruce height growth was significantly reduced by frequent spring frosts on fresh sites.
- Ring width and cumulative volume were more reliable indicators of productivity for both species than height indicators on frost prone sites.
- Differences in frost hardiness between black spruce and jack pine were observed; both species had similar numbers of frost rings, however, jack pine unlike black spruce, had no measurable loss in leader growth.

210. **GOLDSTEIN, G.H.** 1981.
Ecophysiological and demographic studies of white spruce (*Picea glauca* [Moench] Voss.) at treeline in the Central Brooks Range of Alaska. Ph.D. Thesis, University of Washington, Seattle.
Scope: **Component.**
Region: **Walker Lake, Central Brooks Range, Alaska.**
Species: ***Betula papyrifera, Picea glauca, Picea mariana.***
Application: **Stand dynamics (treeline).**
Techniques: **Ring count.**

Comments:
- Ring counts were used to determine that the forest of this area contained two distinct age classes.
- Data suggest that from 1900 to present, high levels of seedling establishment, and, from 1775-1900, sporadic recruitment and/or high mortality of seedlings.
- Study suggests that ability to regulate water stress and to respond to conditions that lead to water stress are important in determining the success of white spruce at arctic treeline in Alaska.

211. **GORE, A.P., E.A. JOHNSON and H.P. LO.** 1985.
Estimating the time a dead tree has been on the ground.
Ecology 66: 1981-1983.
Scope: **Component.**
Application: **Analytical techniques and data acquisition.**
Techniques: **Statistical methods.**
Comments:
- Statistical methods are proposed for estimating the time a drowned bole has been on the ground.

212. **GRAUMLICH, L.J.** 1985.
Long-term records of temperature and precipitation in the Pacific Northwest derived from tree-rings. Ph.D. Dissertation, Department of Forest Resources, University of Washington, Seattle.
Region: **North America.**
Application: **Dendroclimatology.**

213. **GRAUMLICH, L.J.** 1987.
Precipitation variation in the Pacific Northwest (1675-1975) as reconstructed from tree-rings. Annals of the Association of American Geographers 77: 19-29.
Scope: **Focus.**
Region: **Pacific Northwest (California, Washington).**
Species: ***Larix lyallii, Larix occidentalis, Pinus albicaulis, Pinus jeffreyi, Pinus lambertiana, Pinus ponderosa, Pseudotsuga menziesii.***
Application: **Dendrochronology, dendroclimatology.**
Techniques: **Crossdating, ring width, statistical methods.**
Comments:
- Long-term records of precipitation variation are reconstructed using ring width data from drought sensitive conifers.
- Reconstructions indicate droughts similar to those of the 1920's and 1930's have occurred frequently, at least once per century, in the past.

214. **GRAUMLICH, L.J. and L.B. BRUBAKER.** 1986.
Reconstruction of annual temperature (1590-1979) for Longmire, Washington, derived from tree-rings. Quaternary Research 25: 223-234.
Scope: **Focus.**
Region: **Longmire, Washington.**
Species: ***Larix lyallii, Tsuga mertensiana.***
Application: **Dendrochronology, dendroclimatology.**
Techniques: **Crossdating, ring width, statistical methods.**

Comments: - Annual growth records from trees at timberline are correlated with variations in temperature and snow depth and are used to reconstruct past climatic variation.
- Response surfaces indicate growth of trees are positively correlated with July-September temperature and negatively correlated with spring (March) snow depth when depth is at or below average.
- Temperature reconstructions suggest that between 1590 and 1900 temperatures were one degree celsius lower than the 20th century values.

215. **GRAY, J.** 81/82.
The use of stable-isotope data in climate reconstruction; in Climate and History. T.M.L. Wigley, M.J. Ingram and G. Farmer (Eds.). Cambridge University Press, Cambridge. Pp 53-81.

Scope: **Component.**
Region: **North America.**
Application: **Dendroclimatology.**
Techniques: **Isotopes.**
Comments: - Review of isotopic methods which reflect past climatic conditions including meteoric water variations, calcium carbonate deposits, and biological indicators which include tree-rings.

216. **GRAY, J. and S.J. SONG.** 1984.
Climatic implications of the natural variations of D/H ratios in tree-ring cellulose. Earth and Planetary Science Letters 70: 129-138.

Scope: **Focus.**
Region: **Edmonton, Alberta; North America .**
Species: ***Picea glauca.***
Application: **Dendroclimatology.**
Techniques: **Isotopes (hydrogen).**
Comments: - Two methods of nitration were used to derive deuterium/hydrogen ratios on 5-year groups of rings from three white spruce from Edmonton, Alberta and wood samples from other parts of North America.
- Isotope ratios from 5-year groups of rings correlated strongly with mean annual temperature at the growth site; isotopic composition is related to the isotopic composition of soil water used during photosynthesis which is in turn related to meteoric water on a site which is affected by mean annual temperature.
- The importance of proper site selection for trees subjected to isotopic analysis is discussed.

217. **GRAY, J. and P. THOMPSON.** 1976.
Climatic information from $^{18}O/^{16}O$ ratios of cellulose in tree-rings. Nature 262: 481-482.

Scope: **Focus.**
Region: **Edmonton, Alberta.**
Species: ***Picea glauca.***
Application: **Dendroclimatology, dendrochemistry.**
Techniques: **Isotopes (oxygen).**

Comments:
- The ^{18}O content of cellulose in white spruce is compared with temperature records in Edmonton from 1882-1969 to determine the acceptability of oxygen isotope ratios as a palaeothermometer.
- Results suggest that temperatures can be measured using isotopes with a precision of approximately +/- 0.15 C when averaged over a five year period.

218. GRAY, J. and P. THOMPSON. 1977.
Climatic information from 18O/16O analysis of cellulose, lignin and whole wood from tree-rings. Nature 270: 708-709.

Scope: **Focus.**
Region: **Edmonton, Alberta.**
Species: ***Picea glauca.***
Application: **Dendroclimatology, dendrochemistry.**
Techniques: **Isotopes (oxygen).**
Comments:
- Oxygen isotope composition of cellulose, whole wood and lignin from tree-rings in white spruce growing in the Edmonton area.
- Results compared three components of tree-rings to seasonal temperatures.
- Highest correlations with temperature were found with cellulose oxygen ratios followed by wholewood.
- Insignificant correlations were found between lignin isotope ratios and mean annual temperatures.

219. GRAY, J. and P. THOMPSON. 1978.
Climatic interpretation of 18O and D in tree-rings (Reply to Wigley et al.). Nature 271: 93-94.

Scope: **Focus.**
Region: **Edmonton, Alberta.**
Species: ***Picea glauca.***
Application: **Dendroclimatology.**
Techniques: **Isotopes (oxygen and hydrogen).**
Comments:
- Possibility of variation in oxygen isotope ratios due to varied amounts of earlywood and latewood sampled and due to error when using 5 years groupings of rings is analyzed.

220. GRAY, J. and P. THOMPSON. 1977.
Climatic significance of the oxygen isotopic composition of cellulose from tree-rings. Advances in Mass Spectroscopy, 7: 509-513.

Scope: **Focus.**
Region: **Edmonton, Alberta.**
Species: ***Picea glauca.***
Application: **Dendroclimatology.**
Techniques: **Isotopes (oxygen).**
Comments:
- White spruce trees from Alberta were analyzed forvariation in 18O content of cellulose with temperature and compared with climatic records kept from 1880.
- Results of study show the temperature dependence of the oxygen isotopic fractionation occurring during photosynthesis can be measured and that the climatic record is retained for up to 90 years.

221. **GRAY, J. and P. THOMPSON. 1979.**
Natural variations in the 18O content of cellulose; in Proceedings of the Stable Isotopes in Tree-Ring Research Conference. University of British Columbia. May 22, 1979.
Scope: **Focus.**
Region: **Edmonton, Alberta.**
Application: **Dendrochemistry, dendroclimatology.**
Techniques: **Isotopes (oxygen).**
Comments:
- Oxygen isotope measurements on tree-rings from various climates in North America were compared empirically with climate records obtained from appropriate meteorological stations to determine correlations between isotopes and climate variables.
- Natural variations in 18O content of cellulose produced in plant materials are shown to be useful indicators of climatic variables.

222. **GREEN, H.V.** 1965.
Wood characteristics IV: The study of wood characteristics by means of a photometric technique. Pulp and Paper Research Institute of Canada Technical Report 419. 18p.
Application: **Analytical techniques and data acquisition, ring characteristics, wood characteristics.**
Techniques: **Computing.**

223. **GREEN, H.V. and J.V. WORALL.** 1963.
A scanning microphotometer for automatically measuring and recording certain wood characteristics. Pulp and Paper Research Institute of Canada Technical Report 331. 37p.
Region: **Canada.**
Application: **Analytical techniques and data acquisition, ring characteristics, wood characteristics.**
Techniques: **Computing.**

224. **GREEN, H.V. and J. WORRALL.** 1964.
Wood quality studies, I. A scanning microphotometer for automatically measuring and recording certain wood characteristics. Tappi 47: 419-427.
Application: **Analytical techniques and data acquisition, ring characteristics.**
Techniques: **Densitometry.**

225. **GREEN, K.G.** 1961.
Some factors affecting summerwood percentage in the bole of a young Douglas fir tree. B.S.F. Thesis, Faculty of Forestry, University of British Columbia.
Region: **British Columbia.**
Species: ***Pseudotsuga menziesii.***
Techniques: **Earlywood.**

226. **GREGORY, R.A. and B.F. WILSON.** 1968.
A comparison of cambial activity of white spruce in Alaska and New England. Canadian Journal of Botany 46: 733-734.
Scope: **Focus.**
Region: **Alaska, New England.**
Species: ***Picea glauca.***
Application: **Ring characteristics, tree growth and development.**
Techniques: **Ring width.**
Comments:
- White spruce trees produce annually the same number of tracheids in both Alaska and New England although a much shorter season for cambial activity exists in Alaska.
- Trees in Alaska adapted to the shorter growing season by doubling their rate of cell division.

227. **GRIFFIN, H. and C.W. YEATMAN.** 1970.
An Addo-X tape-punch program for automated tree stem analysis. Canadian Forestry Service, Ottawa, PS-X-14, 6p.
Region: **Canada.**
Application: **Analytical techniques and data acquisition.**
Techniques: **Computing.**

228. **GRIFFITH, B.G.** 1960.
Seasonal variations in radial growth at breast height of some western hemlock and Douglas fir trees, 1953-1957. Forestry Chronicle 36: 391-400.
Scope: **Incidental.**
Region: **British Columbia.**
Species: ***Pseudotsuga menziesii, Tsuga heterophylla.***
Application: **Tree growth and development.**
Techniques: **Ring width.**
Comments:
- Radial increment was recorded at weekly intervals for 68 Douglas fir and 14 western hemlock trees throughout the growing season for the years 1953-1957 inclusive.
- Growth for both species generally began during the first week of May; the average length of the growing season for Douglas fir was 146 days and for western hemlock 156 days.
- Douglas fir completed a greater percentage of its total growth earlier in the season than did western hemlock, 83% of basal area growth in Douglas fir was completed by July 31 as opposed to a 68% completion of basal area growth for western hemlock.
- Growth of each species, in both 1956 and 1957, was considerably below that of each of the preceding three years.

229. **GRIFFITH, B.G.** 1960.
Growth of Douglas fir at the University of British Columbia Research Forest as related to climate and soil. University of British Columbia, Forestry Bulletin No.2. 64p.
Region: **British Columbia.**
Species: ***Pseudotsuga menziesii.***
Application: **Dendroclimatology.**

230. **GRIFFITH, B.G.** 1968.
Phenology, growth, and flower and cone production of 154 Douglas fir trees on the University Research Forest as influenced by climate and fertilizer, 1957-1967. University of British Columbia, Faculty of Forestry Bulletin, No. 6, 70p.
Region: **British Columbia.**
Species: ***Pseudotsuga menziesii.***
Application: **Dendroclimatology, tree growth and development.**

231. **GROVEMAN, B.S. and H.E. LANDSBERG.** 1979.
Reconstruction of Northern Hemisphere Temperature: 1579-1880. Meteorol. Program, Div. Math. Phys. Sci. Eng., University of Maryland, College Park, Maryland. Publication 79-181. 46p.
Region: **North America.**
Application: **Dendroclimatology.**

232. **GRULKE, N.** 1978.
Vegetational regeneration fifty years after fire near timberline in the Front Range, Colorado. B.S. Thesis, Department of Botany, Duke University, Durham, North Carolina.
Region: **Colorado.**
Application: **Stand dynamics (treeline).**

233. **GUIOT, J.** 1985.
Reconstruction of seasonal temperatures and sea-level pressures in the Hudson Bay area back to 1700. Climatological Bulletin 19: 11-59.
Scope: **Component.**
Region: **Hudson Bay, Québec, Ontario, Manitoba, Northwest Territories.**
Species: ***Larix* sp., *Picea glauca.***
Application: **Dendroclimatology.**
Techniques: **Ring density, ring width, statistical methods.**
Comments:
- Systematical use of both meteorological and tree-ring data to produce a reliable climatic series.
- Transfer functions which involve calibration of a regression between climatic and tree-ring series are utilized and climatic data series are extrapolated using treerings.

234. **GUIOT, J.** 1986.
Reconstruction of temperature and pressure for the Hudson Bay region from 1700 to the present. Atmospheric Environment Service, Unpublished Manuscript, Canadian Climate Centre Report No. 86-11.
Scope: **Component.**
Region: **Manitoba, Ontario, Québec.**
Application: **Dendroclimatology.**
Techniques: **Ring width.**
Comments:
- Temperature and pressure reconstructions in the Hudson Bay region are estimated using proxy data sources including tree-rings.
- Statistical techniques for data manipulation and interpretation are also presented.

235. **GUIOT, J.** 1987.
Reconstruction of seasonal temperatures in central Canada since A.D. 1700 and detection of 18.6 and 22 year signals. Climatic Change 10: 249-268.

Scope: **Focus.**
Region: **Manitoba, Newfoundland, Québec.**
Species: **Hardwoods, softwoods.**
Application: **Dendroclimatology.**
Techniques: **Statistical methods.**
Comments:
- This paper summarizes various sparse proxy series from freeze-up and break-up dates, early meteorological records and tree-ring data and attempts to create a complete climatic reconstruction for the Hudson Bay region.
- Climatic warming is evidenced at the end of the 19th century and evidence for a beat wave resulting from 22-year solar and 18.6-year lunar nodal tidal cycles is presented.

236. **GUIOT, J.** 1988.
The climate of central Canada and southwestern Europe reconstructed by combining various types of proxy data: A detailed analysis of the 1810-1820 period; in Proceedings of The Year Without a Summer? Climate in 1816. Programs and Abstracts. An International Meeting sponsored by the National Museum of Natural Sciences, Ottawa, Canada, June 25-28, 1988.

Scope: **Component.**
Region: **Canada.**
Application: **Dendroclimatology.**
Techniques: **Statistical methods.**
Comments:
- Tree-ring series and historical climatic records are used to reconstruct complete climate series.

237. **HALE, J.D. and K.G. FENSOM.** 1931.
The rate of growth and density of the wood of white spruce. Canadian Department of the Interior, Forestry Service Circulation No. 30.

Region: **Canada.**
Species: ***Picea glauca.***
Application: **Tree growth and development, wood characteristics.**
Techniques: **Ring width.**

238. **HALL, G.S.** 1962.
Relationship between Douglas fir latewood and some environmental factors. M.S.F. Thesis, Faculty of Forestry, University of British Columbia. 142p.

Region: **British Columbia.**
Species: ***Pseudotsuga menziesii.***
Application: **Dendroclimatology.**
Techniques: **Latewood.**

239. **HAMILTON, J.P.** 1984.
The use of densitometric tree-ring data as proxy for climate at Lake Louise, Alberta. B.A. Thesis, Department of Geography, University of Western Ontario, London, Ontario. 116p.

Scope: **Focus.**
Region: **Lake Louise, Alberta.**
Species: ***Picea engelmannii.***
Application: **Dendrochronology, dendroclimatology.**
Techniques: **Densitometry, earlywood, latewood.**
Comments:
- 15 ring density derived tree-ring variables were used to examine tree-ring -- climate relationships at Lake Louise, Alberta.
- Whole ring and earlywood variables were found to correlate most highly with spring temperatures (April-June), latewood variables correlated well with summer temperatures (August) and earlywood density variations correlated well with summer precipitation.

240. **HAMILTON, J.P.** 1987.
Densitometric tree-ring investigations at the Columbia Icefield, Jasper National Park. M.Sc. Thesis, Department of Geography, University of Western Ontario, London, Ontario. 254p.

Scope: **Focus.**
Region: **Columbia Icefield, Alberta.**
Species: ***Picea engelmannii.***
Application: **Dendrochronology, dendroclimatology.**
Techniques: **Crossdating, densitometry, statistical methods.**
Comments:
- Problems of crossdating and chronology building encountered in the analysis of a stand of Engelmann spruce growing adjacent to the Athabasca Glacier.
- Living trees and snags were crossdated to produce a long tree-ring chronology.
- The nature of climate growth response was assessed and attempts were made to reconstruct climate using the tree-ring record.

241. **HAMILTON, J.P. and B.H. LUCKMAN.** 1985.
Evaluation of the relationship between tree-ring variables and the instrumental climatological record at Lake Louise, Alberta. Unpublished Final Report of D.S.S. Contract # 01SE KM147-4-0617.

Scope: **Focus.**
Region: **Alberta.**
Species: ***Picea engelmannii.***
Application: **Dendrochronology, dendroclimatology.**
Techniques: **Densitometry, ring width.**
Comments:
- Exploration of the application of X-ray densitometry and more conventional data to the generation of proxy climatic data for a site in the Canadian Rockies.

242. **HANSELL, R.** (Ed.). 1984.
Study on temporal development of subarctic ecosystems-determination of the relationship between tree-ring increments and climate. Unpublished Report to Environment Canada, AES, Canadian Climate Centre (Department of Supply and Services, Contract No. OSU84-00041).
Region: **Canada.**
Application: **Dendroclimatology.**

243. **HANSEN-BRISTOW, K.J., J.D. IVES and J.P. WILSON.** 1988.
Climatic variability and tree response within the forest-alpine tundra ecotone. Annals of the Association of American Geographers 78: 505-519.
Scope: **Focus.**
Region: **Niwot Ridge, Colorado Front Range, Colorado.**
Species: ***Picea englemannii.***
Application: **Dendroclimatology.**
Techniques: **Crossdating, ring width.**

244. **HARDER, L.D.** 1980.
Winter use of montane forests by porcupines in southwestern Alberta: preferences, density effects, and temporal changes. Canadian Journal of Zoology 58: 13-19.
Scope: **Incidental.**
Region: **Alberta.**
Species: ***Picea glauca, Pinus flexilis, Pseudotsuga menziesii.***
Application: **Dendroecology.**
Techniques: **Damage effects (feeding scars).**
Comments:
- The pattern of winter use of montane forest by porcupines (*Erithizon dorsatum*) during a 40 year period in southwestern Alberta was examined using feeding scars.
- The number of porcupines peaked and declined in relation to average age of the forests.
- Low density stands were fed in more than denser stands; denser stands used when porcupine populations were abundant.
- Porcupines were found to feed mainly in Douglas fir stands.

245. **HARE, F.K.** 1951.
Some notes on post-glacial climatic change in eastern Canada. Royal Meteorological Society, Canadian Branch 2: 8-18.
Region: **Eastern Canada.**
Application: **Dendroclimatology.**

246. **HARRINGTON, J.B.** 1987.
Climatic change: a review of causes. Canadian Journal of Forest Research 17: 1313-1339.
Scope: **Incidental.**
Region: **North America.**
Application: **Analytical techniques and data acquisition, dendroclimatology.**
Techniques: **Review.**
Comments:
- Tree rings are mentioned as one of many possible techniques available for interpretation of past climatic change.

247. **HAUGEN, R.K.** 1967.
Tree-ring indices: A circumpolar comparison. Science 158: 773-775.
Scope: **Focus.**
Region: **Northern Hemisphere.**
Species: ***Picea glauca.***
Application: **Dendrochronology, dendroclimatology.**
Techniques: **Ring width, statistical methods.**
Comments:
- Tree-ring indices from the northern treeline are analyzed for usefulness as indicators of climatic change.
- Canadian tree-ring chronologies are utilized from Labrador and British Columbia.

248. **HAUGEN, R.K. and J. BROWN.** 1978.
Climatic and dendroclimatic indices in the discontinuous permafrost zone of the central Alaskan Uplands; in Proceedings of the Third International Conference on Permafrost, Edmonton, 10-13 July, 1978. Ottawa, National Research Council of Canada. p 392-398.
Scope: **Focus.**
Region: **Alaska.**
Species: ***Picea glauca.***
Application: **Dendrochronology, dendroclimatology.**
Techniques: **Ring width.**
Comments:
- Correlations between the radial growth of timberline white spruce and June-July temperatures are established in the Yukon-Tanana Upland of Alaska.
- A 300-year chronology of warm and cool growing seasons in this region was developed.

249. **HAUGEN, R.K., M.H. LYNCH, and T.C. ROBERTS.** 1971.
Summer Temperatures in Interior Alaska. Research Report 244. U.S. Army Corps of Engineers, Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire.
Region: **Alaska.**
Application: **Dendroclimatology.**

250. **HEGER, L.** 1965.
Morphogenesis of stems of Douglas fir (*Pseudotsuga menziesii* (Mirb.) Franco.). Ph.D. Thesis, Faculty of Forestry, University of British Columbia. 176 p. plus appendices.
Region: **British Columbia.**
Species: ***Pseudotsuga menziesii.***
Application: **Tree growth and development.**

251. **HEIKKINEN, O.** 1984.
Dendrochronological evidence of variations of Coleman Glacier, Mount Baker, Washington, U.S.A. Arctic and Alpine Research 16: 53-64.
Scope: **Focus.**
Region: **Coleman Glacier, Washington.**
Species: ***Abies amabilis, Pseudotsuga menziesii, Tsuga mertensiana,* mountain hemlock.**
Application: **Damage effects (geomorphic), dendrogeomorphology, glacier fluctuation.**
Techniques: **Ring count, ring width.**

Comments:
- Chronologies from various conifers just south of British Columbia provide evidence of variations in glacier fluctuation.
- Considers on a general level the applicability and limitations of dendrochronological dating methods for dating of glacial fluctuations and climatic changes related to them.
- Mapping and dating of lateral and end moraines younger than 500 years fronting the Coleman glacier was accomplished.
- The minimum dates for moraines were obtained using tree-ring counts.

252. HEINSELMAN, M.L. 1973.
Fire in the virgin forests of the Boundary Waters Canoe Area, Minnesota. Quaternary Research 3: 329-382.
Scope: **Component.**
Region: **Minnesota.**
Species: ***Pinus resinosa, Pinus banksiana,* northern black cedar.**
Application: **Stand dynamics (fire history).**
Techniques: **Ring count, scarring (fire).**
Comments:
- Tree rings are one of four techniques used to document dates and areas covered by past fires in the virgin forests of the Boundary Waters Canoe Area, just south of the Canadian border.

253. HELFRICH, R.L. 1970.
Tree-ring analysis as a method of determining forest fire history. B.S.F. Thesis, Faculty of Forestry, University of British Columbia, 45p.
Region: **British Columbia.**
Application: **Stand dynamics (fire history).**

254. HENOCH, W.E.S. 1973.
Height, frequency of floods, ice jamming and tree-ring studies; in Hydrological aspects of northern pipeline development. Glaciology Division, Water Resources Branch, Report No. 73-3, p. 153-190.
Scope: **Focus.**
Region: **Mackenzie Basin, Northwest Territories.**
Species: ***Picea glauca, Populus* sp., birch, driftwood.**
Application: **Dendrochronology, dendroclimatology, dendrogeomorphology.**
Techniques: **Ring density, ring width, scarring (ice).**
Comments:
- Proposed pipeline development along the Mackenzie River requires data on hydrological activity in the area.
- Tree cores were collected from July 19-August 6, 1971, to examine the potential of tree-rings for temperature and spatial extension of hydrometric and climatic data.

255. HEUSSER, C.J. 1956.
Post-glacial environments in the Canadian Rocky Mountains. Ecological Monographs 26: 253-302.

Scope: **Component.**
Region: **Rocky Mountains.**
Species: ***Abies lasiocarpa, Picea engelmannii, Pinus contorta, Salix reticulata, Pinus abicaulis.***
Application: **Dendrogeomorphology.**
Techniques: **Ring count.**
Comments:
- Tree rings are used as one technique for dating glacial moraines.

256. HEUSSER, C.J. 1964.
Historical variations of Lemon Creek Glacier, Alaska, and their relationships to the climatic record. Journal of Glaciology 5: 77-86.

Scope: **Component.**
Region: **Alaska.**
Species: ***Picea sitchensis.***
Application: **Dendroclimatology, dendrogeomorphology, glacier fluctuations.**
Techniques: **Ring count.**
Comments:
- Tree-ring counts were used to date glacial moraines for use in interpretation of glacial fluctuation.

257. HICKIN, E.J. and G.C. NANSON. 1975.
The character of channel migration on the Beaton River, northeast of British Columbia, Canada. Geological Society of America Bulletin 86: 487-494.

Scope: **Component.**
Region: **Beatton River, British Columbia.**
Species: **none mentioned.**
Application: **Dendrogeomorphology, dendrohydrology.**
Techniques: **Ring count.**
Comments:
- Dendrochronological surveys provide basis for measuring of lateral channel migration and incision over 250 years.
- Point bar ages were determined by the tree-ring counts of the 10 oldest trees.

258. HOELLER, A.E. 1982.
The role of environmental and historical evidence in climate reconstruction: a preliminary review and appraisal. Environment Canada, AES, Canadian Climate Centre, Report 82-3, 113p.

Application: **Dendroclimatology.**

259. HORNBECK, J.W. and R.B. SMITH. 1985.
Documentation of red spruce growth decline. Canadian Journal of Forest Research 15: 1199-1201.

Scope: **Component**
Region: **Maine, New Hampshire, New York, Vermont.**
Application: **Dendrochronology, dendroclimatology, dendroecology, tree growth and development.**
Techniques: **Ring width.**

Comments:
- Data from a study of 3001 dominant or codominant red spruce across New England and the Adirondacks showed their annual growth in basal area increasing consistently from 1910-1920 to about 1960.
- It then fluctuated around a generally declining trend and by the arly 1980's was 13 to 40% below its peak.
- Defoliation by spruce budworm, climate change, maturation of the forest and acid deposition are all possible explanations.

260. **HUSTICH, I.** 1950.
Notes on the forests on the east coast of Hudson Bay and James Bay. Acta Geographica 11: 1-83.
Region: **Québec.**
Application: **Stand dynamics.**

261. **HUSTICH, I.** 1954.
On forests and tree growth in the Knob Lake Area, Québec-Labrador Peninsula. Acta Geographica 13: 1-25.
Region: **Newfoundland (Labrador), Québec.**
Application: **Stand dynamics.**

262. **HUSTICH, I.** 1955.
Forest-botanical notes from the Moose River area, Ontario, Canada. Acta Geographica 14: 1-50.
Region: **Moose River, Ontario.**
Application: **Stand dynamics.**

263. **HUSTICH, I.** 1956.
Correlation of tree-ring chronologies of Alaska, Labrador and Northern Europe. Acta Geographica 15: 1-26.
Region: **Europe, Newfoundland, Alaska.**
Application: **Dendrochronology.**
Techniques: **Statistical methods.**

264. **HUSTICH, I.** 1983.
Treeline and tree growth studies during 50 years: some subjective observations; in Tree-line Ecology. Proceedings of the Northern Québec Tree-line Conference. P. Morisset and S. Payette (Eds.) Nordicana 47: 181-188.
Scope: **Focus.**
Region: **Labrador, Newfoundland, Québec.**
Species: ***Picea glauca, Picea mariana.***
Application: **Dendroclimatology, stand dynamics, tree growth and development.**
Techniques: **Ring width.**
Comments:
- Tree growth studies by the author over the past 50 years are discussed.
- Summer studies in Labrador by the author involved studying forest limit conditions and ecology.

265. INNES, J.L. and E.R. COOK. 1989.
Tree-ring analysis as an aid to evaluating the effects of pollution on tree growth. Canadian Journal of Forest Research 19: 1174-1189.
Scope: **Focus.**
Species: ***Abies balsamea, Picea rubens.***
Application: **Dendroclimatology.**
Techniques: **Damage effects (pollution).**
Comments:
- The use of tree-ring analysis to assess the impact of air pollution on a regional scale is discussed.
- This review focuses on the controversy surrounding the relationships between climatic variables and tree growth.

266. IVANCIU, I.S. and G.C. JACOBY. 1988.
An abrupt climate cooling in the early 1800's as evidence by high-latitude tree-ring data; in Proceedings of the International Meeting of The Year Without a Summer? Climate in 1816. Program and Abstracts. National Museum of Natural Sciences, Ottawa, Canada, June 25-28, 1988.
Scope: **Focus.**
Region: **Northern North America.**
Application: **Dendroclimatology.**
Techniques: **Latewood, ring width.**
Comments:
- Chronologies were developed along an east-west transect near the northern treeline of North America.

267. JACOBY, G.C. 1979.
Tree-ring analysis to date terrace events at Ice Bay, Alaska. Crustal Deformation Measurement Near Yakatuga, Gulf of Alaska, Summary of Semi-annual Report for U.S.G.S. 14-08-0001-18272. U.S. Geological Survey. p. 22-27.
Region: **Ice Bay, Alaska.**
Application: **Dendrogeomorphology.**
Techniques: **Ring count.**

268. JACOBY, G.C. 1980a.
X-ray densitometry in tree-ring studies. Dendrology in the Eastern Deciduous Forest Biome. P.P. Feret and T.L. Sharik (Eds.). Virginia Polytechnic Institute and State University, School of Forestry and Wildlife Resources Publication. FWS-2-80 p. 125-132.
Techniques: **Densitometry.**

269. JACOBY, G.C. 1980b.
Global dendroclimatic data base: Arctic. Lamont-Doherty Geological Observatory, Palisades, New York, Contribution No. 3053, unpaged paper prepared for Dendroclimatology Workshop, Norwich, England, 7-11 July, 1980.
Scope: **Focus.**
Region: **Northern Hemisphere.**
Species: ***Picea glauca.***
Application: **Dendroclimatology.**

270. **JACOBY, G.C.** 1982.
The Arctic; in Climate From Tree-rings. M.K. Hughes, P.M. Kelly, J. Pilcher and V.C. LaMarche Jr. (Eds.). Cambridge University Press, Cambridge, p. 107-114.

Scope: **Focus.**
Region: **Arctic.**
Species: ***Larix laricina, Picea glauca, Picea mariana.***
Application: **Dendroclimatology.**
Comments:
- The importance of the Arctic as a source of trees for climatic reconstruction is discussed.
- Trees in the Arctic are believed to contain both temperature and precipitation signals.
- The species useful for dendroclimatic research in the Arctic are discussed along with methods of analysis and future prospects.

271. **JACOBY, G.C.** 1983.
A dendroclimatic study in the forest-tundra ecotone on the east shore of Hudson Bay. Tree-line Ecology, Proceedings of the Northern Québec Tree-Line Conference, P. Morisset and S. Payette (Eds.) Nordicana 47: 95-101.

Scope: **Focus.**
Region: **Richmond Gulf, Québec.**
Species: ***Picea glauca.***
Application: **Dendroclimatology.**
Techniques: **Crossdating, ring width, statistical methods.**
Comments:
- Increment cores from white spruce in the forest-tundra ecotone were used to obtain precisely dated ring width data.
- A 295-year chronology was developed for the area and compared to climatic data from Kujjuarapik.
- Trees were found to respond to a complex set of temperature and moisture variables; radial growth correlated positively with July temperatures of the same year, and the temperature of the previous fall.
- Warming and cooling trends in this chronology agree with trends in other chronologies from northern Québec.
- Pronounced global warming since the late 1800's is not strongly visible in eastern Canadian tree-ring chronologies because they are significantly shorter by several centuries than chronologies from western Canada and Alaska.
- Suggests more collection and analyses are needed for a thorough dendroclimatic understanding of this region.

272. **JACOBY, G.C.** 1985.
An abrupt temperature decline in the early 1800's (as evidenced by high latitude tree growth). NATO/NASA Conference on Abrupt Climate Change, Grenoble, 5 September, 1985. Reidel, Dordrecht (Abstract).

Application: **Dendroclimatology.**

273. **JACOBY, G.C. and E.R. COOK.** 1981.
Past temperature variations inferred from a 400-year tree-ring chronology from Yukon Territory, Canada. Arctic and Alpine Research 13: 409-418.

Scope: **Focus.**
Region: **Yukon Territory.**
Species: ***Picea glauca.***
Application: **Dendrochronology, dendroclimatology.**
Techniques: **Crossdating, ring width.**
Comments:
- 400-year time-series of ring-width indices from 27 cores, of 13 white spruce trees from the Yukon Territory, show significant growth response to summer temperatures and other climatic variables.
- Moisture stress can be detected in trees at the end of the growing season.

274. **JACOBY, G.C., E.R. COOK and L.D. ULAN.** 1985.
Reconstructed summer degree days in central Alaska and northwestern Canada since 1524. Quaternary Research 23: 18-26.

Scope: **Focus.**
Region: **Central Alaska and Northwestern Canada.**
Species: ***Picea glauca.***
Application: **Dendrochronology, dendroclimatology.**
Techniques: **Statistical methods.**
Comments:
- Describes the reconstruction of a 452-year record of total degree days above ten degrees celsius for June and July for Central Alaska and Northwestern Canada using recent chronologies and published degree-day data from Haugen et al. (1971).

275. **JACOBY, G.C. and J.W. HORNBECK** (compilers). 1987.
Proceedings of the International Symposium on Ecological Aspects of Tree-Ring Analysis, 17-21 August, 1986. Marymount College, Tarrytown, New York. 700p. National Technical Information Service, U.S. Department of Commerce, Springfield, Virginia 221

Scope: **Focus.**
Region: **North America.**
Application: **Dendroecology.**

276. **JACOBY, G.C., I.S. IVANCIU and L.D. ULAN.** 1988.
A 263-year record of summer temperature for northern Québec reconstructed from tree-ring data and evidence of a major climatic shift in the early 1800's. Palaeogeography, Palaeoclimatology, Palaeoecology 64: 69-78.

Scope: **Focus.**
Region: **Cri Lake, central western Québec.**
Species: ***Picea glauca.***
Application: **Dendrochronology, dendroclimatology.**
Techniques: **Densitometry, ring width.**

Comments:
- Reconstruction of 263 years of summer temperatures at a site located near the northern tree line, in central western Québec.
- A chronology comprising 20 ring-density time series is used in conjunction with a chronology comprising 20 ring-width time series in the regression analysis.
- Results are considerably improved over the use of either tree-ring parameter alone.
- Temperature reconstructions reflect a major cooling event in the early nineteenth century.

277. **JACOBY, G.C., P.R. SHEPPARD and K.E. SIEH.** 1988.
Irregulary recurrence of large earthquakes along the San Andreas fault: Evidence from trees. Science 241: 196-199.
Region: **California**
Application: **Dendrogeomorphology.**

278. **JACOBY, G.C. and L.D. ULAN.** 1981.
Review of dendroclimatology in the forest-tundra ecotone of Alaska and Canada; in Climatic Change in Canada 2. Syllogeus 33: 97-128. National Museum of Natural Sciences. C.R. Harington (Ed.)
Scope: **Focus.**
Region: **Yukon.**
Species: ***Abies balsamea, Abies lasiocarpa, Betula papyrifera, Larix laricina, Picea glauca, Picea mariana, Pinus banksiana, Populus balsamifera, Populus tremuloides.***
Application: **Dendrochronology, dendroclimatology.**
Techniques: **Densitometry, ring width.**
Comments:
- Review of past and recent tree-ring research in northern coniferous forests of the forest-tundra ecotone, problems encountered during tree-ring research and potential use of studies in the future.

279. **JACOBY, G.C. and L.D. ULAN.** 1982.
Reconstruction of past ice conditions in a Hudson Bay estuary using tree rings. Nature 298: 637-639.
Scope: **Focus.**
Region: **Churchill, Manitoba.**
Species: ***Picea glauca.***
Application: **Dendrochronology, dendrogeomorphology, dendrohydrology.**
Techniques: **Crossdating, ring width.**
Comments:
- Tree-ring data are used as a proxy series for past ice conditions, and freezing, of the Churchill River Estuary on Hudson Bay for 1680-1977.

280. **JACOBY, G.C. and L.D. ULAN.** 1983.
Tree-ring indications of uplift at Icy Cape, Alaska, related to 1899 earthquakes. Journal of Geophysical Research 88: 9305-9313.
Region: **Icy Cape, Alaska.**
Application: **Dendrogeomorphology.**

281. **JACOBY, G.C., Jr., L.D. ULAN and E.R. COOK.** 1985.
Summer degree-days since 1574 in northwestern Canada and Alaska (Abstract). Syllogeus 55: 265.
Scope: **Focus.**
Region: **Northwestern Canada and Alaska.**
Application: **Dendroclimatology.**
Techniques: **Ring width.**
Comments:
- Annual increments of tree growth are used to reconstruct degree-days from three stations in northwestern Canada and Alaska.
- Reconstructions verify and also correspond with subarctic glacial and ice-core data.

282. **JACOBY, G.C., Jr. and R. D'ARRIGO.** 1989.
Reconstructed northern hemisphere annual temperature since 1671 based on high-latitude tree-ring data from North America. Climatic Change 14:39-49.
Scope: **Focus.**
Region: **Canada, Alaska.**
Species: ***Larix laricina, Picea glauca, Thuja occidentalis.***
Application: **Dendrochronology, dendroclimatology.**
Techniques: **Ring width.**
Comments:
- Annual northern hemisphere surface temperature departures for the past 300 years were reconstructed using 11 tree-ring chronologies from high-latitude, boreal sites in Canada and Alaska.
- The sites spanned 90 degrees of longitude and this coverage was believed to be adequate for useful representation of temperature trends throughout the northern hemisphere.
- Temperature reconstructions for northern hemisphere annual temperature departures and for Arctic annual temperature departures were constructed each extending from 1671 to 1973.
- The reconstructions support evidence for a global warming trend over the last century.

283. **JOHNSON, C.M.** 1962.
An evaluation of crown widths of open-grown Engelmann spruce and interior Douglas fir as an aid to the prediction of yield and growth. B.S.F. Thesis, Faculty of Forestry, University of British Columbia.
Species: ***Picea engelmannii, Pseudotsuga menziesii.***
Application: **Tree growth and development.**

284. **JOHNSON, E.A.** 1987.
The relative importance of snow avalanche disturbance and thinning on tree populations (Abstract); in International Symposium on the Ecological Aspects of Tree ring Analysis. G.C. Jacoby and J.W. Hornbeck (Eds.).
Scope: **Focus.**
Region: **Southern Canadian Rocky Mountains, Alberta, British Columbia.**
Species: ***Betula glandulosa, Picea engelmannii, Pinus contorta, Salix glauca.***
Application: **Dendrogeomorphology, tree growth and development.**
Techniques: **Damage effects, reaction wood, scarring.**

Comments: - Traditional dendrochronological techniques are coupled with studies of population ecology and biomechanics to analyse the effects of natural disturbances on vegetated avalanche tracks.
- The shift from shrub to tree-dominated avalanche tracks occurs when the avalanche frequency interval is greater than 15-20 years.

285. JOHNSON, M.I. 1981.
A dendroclimatological study at the Columbia Icefields, Jasper National Park. B.A. Thesis, Department of Geography, University of Western Ontario, London, Ontario. 76p.
Scope: **Focus.**
Region: **Alberta.**
Species: ***Abies lasiocarpa, Picea englemannii.***
Application: **Dendrochronology, dendroclimatology.**
Techniques: **Ring width.**
Comments: - Variation in ring-width patterns of twenty-nine trees is examined in an attempt to provide a paleoclimatic record of the Little Ice Age for the Athabasca Glacier-Sunwapta Pass area of Jasper National Park.

286. JONES, F.W. and M.L. PARKER. 1970.
G.S.C. tree-ring scanning densitometer and data acquisition system. Tree-Ring Bulletin 30: 23-31.
Scope: **Focus.**
Region: **Canada.**
Species: ***Larix laricina, Picea engelmannii, Picea glauca, Picea mariana, Pinus strobus, Pseudotsuga menziesii, Thuja occidentalis, Tsuga canadensis.***
Application: **Analytical techniques and data acquisition.**
Techniques: **Densitometry.**
Comments: - A tree-ring scanning densitometer and data acquisition system, built by the Geological Survey of Canada to extract tree-ring density and tree-ring width data, from dendrochronological specimens and X-ray negatives of specimens, is presented (see also Clague and Souther 1982).

287. JORDAN, G.A. and R.H. BALLANCE. 1983.
A micro-computer-based annual ring measurement system. The Forestry Chronicle 59: 21-25.
Scope: **Focus.**
Region: **Canada.**
Application: **Analytical techniques and data acquisition.**
Techniques: **Computing, earlywood, latewood, ring width.**
Comments: - Discusses interfacing and programming of a Radio Shack TRS-80 Model III microcomputer and DIGI-MIC.
- Equipment allows rapid, easy measurement of tree-rings, with storage, reviewing and editing capabilities.
- Hardware, software and procedures are reviewed.
- The questions of reliability, quality, and manufacturer support are addressed.

288. **JOZSA, L.A.** 1981.
Dating a landslide in the Mt. Cayley area by analysis of tree-rings. Report to the Geological Society of Canada by Forintek Canada Corporation (Western Laboratory). 5p.

Scope: **Focus.**
Region: **Mount Cayley, British Columbia.**
Species: ***Chameacyparis nootkatensis, Thuja plicata, Tsuga heterophylla.***
Application: **Dendrochronology, dendrogeomorphology.**
Techniques: **Crossdating, earlywood, latewood, ring pattern.**
Comments:
- Seven cross-sectional tree-ring samples were examined from the Mt. Cayley area, in southwestern British Columbia, to document the time of landsliding that damaged trees.
- Landslide dating was most accurate with western hemlock (*Tsuga heterophylla*) and yellow cedar (*Chamaecyparis nootkatensis*).

289. **JOZSA, L.A.** 1982.
What Can Dendrochronology Do For You? Information Bulletin (IB)-1003, 8 p. Forintek Canada Corp.

Scope: **Focus.**
Region: **Canada.**
Application: **Dendroclimatology, dendrogeomorphology, forestry, geology, archeology, criminology.**
Techniques: **Crossdating, densitometry, ring width, earlywood, latewood, scarring.**
Comments:
- Presents a basic description of tree-ring analysis (crossdating, densitometry, and chronology building).
- Discusses the application of dendrochronology in various scientific fields.

290. **JOZSA, L.A.** 1985.
Contribution of tree-ring dating and wood structure analysis to the forensic sciences. Canadian Society of Forensic Science Journal 18: 200-210.

Scope: **Component.**
Region: **North America.**
Species: ***Pinus ponderosa*, Carolina Pine, birch, and fir.**
Application: **Wood characteristics.**
Techniques: **Ring pattern.**
Comments:
- Specific examples of forensic tree-ring dating used in criminal investigations.

291. **JOZSA, L.A.** 1988a.
Dendroclimatic Research at Forintek Canada Corp. Prepared for Climate Change and Forestry in British Columbia, Meeting of the University of British Columbia, Oct. 13, 1988.

Scope: **Focus.**
Region: **Canada.**
Application: **Dendroclimatology.**
Techniques: **Densitometry.**
Comments:
- History of dendroclimatic research at Forintek began with a conference on the biology of tree-ring formation in 1970 (Smith and Worrall, 1970).
- Current and planned dendroclimatic research of interest to Forintek are discussed.

292. **JOZSA, L.A.** 1988b.
Increment core sampling techniques for high quality cores. Prepared for the Canadian Forestry Service. Report No. 88-04-55-15X-202. 27 p.
Scope: **Focus.**
Region: **Canada.**
Application: **Analytical techniques and data acquisition.**
Techniques: **Increment cores, sample preparation and laboratory techniques.**
Comments:
- Manual providing the reader with a number of increment core collection "tricks-of-the-trade".
- Detailed information is provided on how to obtain tree core, what to do with a core in the field, how to minimize damage to trees and increment borer maintenance.

293. **JOZSA, L.A.** 1988c.
Wood productivity and soil moisture deficit in coastal British Columbia: Their relevance to climate in 1816. in: International Meeting of The Year Without a Summer? Climate in 1816. Program and Abstracts. National Museum of Natural Science, Ottawa, Canada, June 25-28, 1988.
Scope: **Focus.**
Region: **Northern North America.**
Species: ***Pseudotsuga menziesii.***
Application: **Dendroclimatology.**
Techniques: **Ring density, ring pattern, ring width.**
Comments:
- Douglas fir on xeric, submesic and subhygric sites on Vancouver Island are shown to have a good relationship between soil-moisture deficits and tree radial growth.
- Fifty per cent of variation in annual rings is the result of transpiration stresses.

294. **JOZSA, L.A.** 1989.
The impact of climate change and variability on wood quality; in Proceedings of Forest Climate '86. D.C. MacIver, R.B. Street, and A. Auclair (Eds.). Atmospheric Environment Service, Downsview, Ontario. 16p.
Application: **Dendroclimatology.**
Techniques: **Wood characteristics.**

295. **JOZSA, L.A., P.A. BRAMHALL, J.A. COOK, and S.G. JOHNSON.** 1985.
The effect of thinning and fertilization on wood quality. Prepared for the Canadian Forestry Service. Report No. 02-80-10-016. 42p.
Region: **Canada.**
Application: **Tree growth and development, wood characteristics.**
Techniques: **Earlywood, latewood.**

296. **JOZSA, L.A., P.A. BRAMHALL and S.G. JOHNSON.** 1984.
Biomass productivity of white spruce in Alberta and Manitoba. Canadian Forestry Service Contract Report No. 27. 27p.
Region: **Alberta, Manitoba.**
Species: ***Picea glauca.***
Application: **Tree growth and development.**

297. **JOZSA, L.A., P.A. BRAMHALL and S.G. JOHNSON.** 1985.
Biomass productivity and wood quality of white spruce. Prepared for the Canadian Forestry Service. Report No. 02-80-12-011. 41p.
Species: ***Picea glauca.***
Application: **Tree growth and development.**

298. **JOZSA, L.A., S.G. JOHNSON and P.A. BRAMHALL.** 1984.
X-ray densitometric analysis of an old Douglas fir stand from Banff, Alberta. Forintek Canada Corp. Report to University of Alberta, Edmonton, Alberta 02-80-82-604.
Scope: **Focus.**
Region: **Banff, Alberta.**
Species: ***Pseudotsuga menziesii.***
Application: **Dendroclimatology.**
Techniques: **Densitometry.**
Comments:
- Douglas fir from Banff were determined to be about 500-years-old with one tree 676 years of age.
- X-ray densitometric data was obtained for two increment cores from each of ten Douglas fir trees.
- 15 tree-ring variables were measured and standardized for the 20 core samples.
- Tree-ring data were compared and calibrated against instrumental climatic records from Banff, one of the longest functioning monitoring stations of temperature and precipitation in Canada.

299. **JOZSA, L.A. and R.M. KELLOGG.** 1986.
An exploratory study of the density and annual ring weight trends in fast-growth coniferous woods in British Columbia. Prepared for the Canadian Forestry Service. Report Nos. 02-80-12-017 and 02-80055-010. 43p.
Region: **British Columbia.**
Species: **Softwoods.**
Application: **Tree growth and development.**
Techniques: **Densitometry.**

300. **JOZSA, L.A. and R.S. MYRONUK.** 1986.
Direct reading X-ray densitometer. Prepared for the Canadian Forestry Service. Report No. 21, 55-12-001. 15p.
Region: **Canada.**
Application: **Analytical techniques and data acquisition.**
Techniques: **Densitometry.**

301. **JOZSA, L.A. and R.S. MYRONUK.** 1987.
Direct reading X-ray densitometer. Proceedings of the International Symposium on Ecological Aspects of Tree-Ring Analysis. G.C. Jacoby and J.W. Hornbeck (Eds.). National Technical Information Service, U.S. Department of Commerce, Springfield, Virgina, 22161. p. 647-650.
Scope: **Focus.**
Region: **Canada.**
Application: **Analytical techniques and data acquisition.**
Techniques: **Densitometry.**

Comments: - New Direct Reading X-ray Densitometry (DRXRD) system, designed in conjunction with a special sample preparation saw capable of cutting unmounted 5 mm diameter increment cores.

302. **JOZSA, L.A. and R.S. MYRONUK.** 1988.
Light densitometer design stage. Prepared for the Canadian Forestry Service. Report No. 88-04-55-12A-203. 10 p.
Region: **Canada.**
Application: **Analytical techniques and data acquisition.**
Techniques: **Densitometry.**

303. **JOZSA, L.A. and E. OGUSS.** 1985.
Climatic reconstruction from tree-rings. Forintek Canada Corp. Report to Canadian Forestry Service, Hull, Québec, 02-80-12-018. 30p.
Scope: **Focus.**
Region: **Banff, Alberta.**
Species: ***Pseudotsuga menziesii.***
Application: **Dendrochronology, dendroclimatology.**
Techniques: **Densitometry, ring width, statistical methods.**
Comments:
- Utilization of X-ray densitometric tree-ring data from Douglas fir for climatic reconstruction.
- Explores methods of chronology development when dealing with high non-climatic variability in tree-ring data.
- Examines the validity of using non-filtered density data in chronology development.
- Instrumental climate records from 1917 to 1978 are used for response and transfer function development and for verifying.
- 676-year old Douglas fir, 83.8 cm in diameter and 13.7 m tall was identified and nominated to the "Oldest Tree of Its Kind" Category in March, 1984 to the Alberta Forestry Association (see also Robertson and Jozsa, 1988).

304. **JOZSA, L.A., E. OGUSS, P.A. BRAMHALL and S.G. JOHNSON.** 1983.
Climatic studies based on tree-ring data. Forintek Canada Corp. Report to Canadian Forestry Service, Hull, Québec. 02-80-55-005. 62p.
Scope: **Focus.**
Region: **Jasper National Park, Alberta.**
Species: ***Picea engelmannii.***
Application: **Dendroclimatology.**
Techniques: **Crossdating, densitometry, latewood, ring density, ring width.**
Comments:
- Develops a basis for relating incremental tree-ring growth, as determined by Forintek's computerized X-ray densitometry system, with climatic variations.
- Estimates proxy climatic data from tree-ring measurements for time periods that precede available instrumental climate data.

305. **JOZSA, L.A., E. OGUSS, P.A. BRAMHALL and S.G. JOHNSON.** 1984.
Dendroclimatological analysis of white spruce from five tree-ring sites in the Yukon Territory. Forintek Canada Corp. Report to National Hydrology Research Institute, Calgary, Alberta. 02-80-68-618.
Scope: **Focus.**
Region: **Yukon.**
Species: ***Picea glauca.***
Application: **Dendroclimatology.**

306. **JOZSA, L.A., M.L. PARKER, P.A. BRAMHALL, and S.G. JOHNSON.** 1982.
Impact of climatic variation on boreal forest biomass through the use of tree-ring analysis. Canadian Forestry Service Publication (NFRC), ENFOR Project No. P-149. 50p.
Scope: **Focus.**
Region: **Canada.**
Species: **Softwoods.**
Application: **Dendroclimatology, tree growth and development.**
Techniques: **Densitometry, ring density, ring width.**
Comments: - Investigates temperature/tree-ring correlations along latitudinal gradients in the Boreal Forest zone of Canada.

307. **JOZSA, L.A., M.L. PARKER, P.A. BRAMHALL, and S.G. JOHNSON.** 1982.
Wood production of spruce in Manitoba as a function of climate; in Proceedings of Fourth Bioenergy R & D Seminar, Winnipeg, Manitoba. March 29-31, 1982. p.114-119.
Region: **Manitoba.**
Species: ***Picea glauca.***
Application: **Dendroclimatology.**

308. **JOZSA, L.A., M.L. PARKER, P.A. BRAMHALL, and S.G. JOHNSON.** 1984.
How climate affects tree growth in the boreal forest. Environment Canada, Canadian Forestry Service, Northern Forest Research Centre, Edmonton, Alberta. Information Report NOR-X-255.
Application: **Dendroclimatology, tree growth and development.**

309. **JOZSA, L.A. and J.M. POWELL.** 1987.
Some climatic aspects of biomass productivity of white spruce stem wood. Canadian Journal of Forest Research 17: 1075-1079.
Scope: **Focus.**
Region: **Alberta, Manitoba, Northwest Territories.**
Species: ***Picea glauca.***
Application: **Dendroclimatology, tree growth and development.**
Techniques: **Densitometry, ring width.**
Comments: - Growth response of white spruce in relation to climatic factors is interpreted through tree rings.

310. **JOZSA, L.A., J.E. RICHARDS and S.G. JOHNSON.** 1987.
Calibration of Forintek's Direct Reading Densitometer. Prepared for the Canadian Forestry Service. Report No. 877-04-55-12-104. 33 p.
Region: **Canada.**
Application: **Analytical techniques and data acquisition.**
Techniques: **Densitometry.**

311. **JOZSA, L.A. and E.O. ROBERTSON.** 1986.
Impact of climate on tree growth: estimating tree growth from climate data. Prepared for the Canadian Forestry Service. Report No. 55-12-003. 13p.
Region: **Canada.**
Application: **Dendroclimatology, tree growth and development.**

312. **JOZSA, L.A. and E.O. ROBERTSON.** 1987.
Estimating tree growth from climate data for Douglas fir on Vancouver Island. Prepared for the Canadian Forestry Service. Report No. 877-04-55-12-003. 17 p.
Region: **Vancouver Island, British Columbia.**
Species: ***Pseudotsuga menziesii.***
Application: **Tree growth and development.**

313. **JOZSA, L.A. and E.P. SWAN.** 1986.
Basic wood property variation in second-growth Douglas fir; An extended abstract. Presented at Sept. 29, 1986 Seminar at PAPRICAN. 4 p.
Species: ***Pseudotsuga menziesii.***
Techniques: **Wood characteristics.**

314. **KAISER, K.F. and C. KAISER-BERNHARD.** 1987.
The Katmai eruption of 1912 and the Alaska earthquake of 1964 as reflected in the annual rings of sitka spruces on Kodiac Island. Dendrochronologia 5: 111-124.
Scope: **Focus.**
Region: **Kodiac Island, Alaska.**
Species: ***Picea sitchensis.***
Application: **Dendroclimatology.**
Techniques: **Disturbance effects (geomorphic), latewood, ring width.**
Comments:
- Tree rings were used to investigate growth reduction and growth recovery in spruces growing near the site of the Katmai eruption of 1912 and the Alaska earthquake of 1964.
- Ring sequences from trees growing near sites of volcanic activity are shown to be good indicators of earlier activity.
- Growth reduction in trees following the earthquake was also evidenced as a result of subsidence causing tree roots to become submerged in brackish to salty water.
- The influence of seismic sea waves and seismic shock on tree growth is also discussed.

315. **KARL, T.R.** 1985.
Perspective on climate in North America during the twentieth century. Physical Geography 6: 207-229.
Scope: **Incidental.**
Region: **North America.**
Application: **Dendroclimatology.**
Techniques: **Ring width.**
Comments:
- Changes in North American climate and climatic change.
- American studies using tree-ring interpretation are mentioned as being useful for examining fluctuations, oscillations and periods of climatic change.

316. **KAY, P.A.** 1976.
Post-glacial history of vegetation and climate in the forest-tundra transition zone, Dubawnt Lake Region, Northwest Territories, Canada. Ph.D. Dissertation , Department of Geography, University of Wisconsin, Madison.
Scope: **Component.**
Region: **Dubawut Lake, Northwest Territories.**
Species: ***Pinus banksiana.***
Application: **Dendrochronology, dendroclimatology.**
Techniques: **Ring width.**

317. **KAY, P.A.** 1978.
Dendroecology in Canada's forest-tundra transition zone. Arctic and Alpine Research 10: 133-138.
Scope: **Focus.**
Region: **Northwest Territories.**
Species: ***Picea mariana.***
Application: **Dendroecology.**
Techniques: **Ring width.**
Comments:
- The growth rings of black spruce growing at and beyond treeline in the eastern Northwest Territories are analyzed.
- Trees growing at treeline showed less high frequency variation in ring width than those located north of treeline.
- Variance in ring width as a result of climate was more pronounced in trees at treeline than those north of treeline because the trees growing north of treeline generally only grow in favourable microclimates.
- Results suggest that growth in this zone is in delicate balance with the regional climate.

318. **KEARNEY, M.S.** 1982.
Recent seedling establishment at timberline in Jasper National Park. Canadian Journal of Botany 60: 2283-2287.
Scope: **Component.**
Region: **Alberta.**
Species: ***Abies lasiocarpa, Picea engelmannii, Pinus albicaulis.***
Application: **Dendrochronology, tree growth and development.**
Techniques: **Ring width.**

Comments: - Age structure of timberline seedlings and their associated morphological changes due to local changes in climate are investigated.

319. KEARNEY, M.S. and B.H. LUCKMAN. 1981.
Evidence for late Wisconsin-early holocene climatic/vegetation change in Jasper National Park, Alberta. Quaternary Paleoclimates. W.C. Maheney (Ed.). Geoabstracts, Norwich. p. 85-105.
Region: **Jasper National Park, Alberta.**
Application: **Treeline fluctuations.**

320. KEARNEY, M.S. and B.H. LUCKMAN. 1983.
Holocene timberline fluctuations in Jasper National Park, Alberta. Science 221: 261-263.
Scope: **Incidental.**
Region: **Jasper National Park, Alberta.**
Species: ***Abies lasiocarpa, Picea englemannii.***
Application: **Treeline fluctuation.**

321. KELLY, P.E. 1985.
Problems associated with the dendrochronological dating: two cases from the Premier Range, British Columbia. B.Sc. Thesis, University of Western Ontario, London, Ontario. 99p.
Scope: **Focus.**
Region: **Premier Range, British Columbia.**
Species: ***Picea engelmannii, Abies lasiocarpa.***
Application: **Dendrochronology.**
Techniques: **Ring count.**
Comments:
- Dendrochronological investigations carried out in the forefields of the Tete and Penny Glaciers in the Premier Range, British Columbia.
- Problems of using dendrochronology to date glacial deposits are discussed.

322. KENNEDY, R.W. 1961.
Variation and periodicity of summerwood in some second growth Douglas fir. Tappi 44: 161-166.
Species: ***Pseudotsuga menziesii.***
Techniques: **Earlywood.**

323. KENNEDY, R.W. and G.W. SWANN. 1969.
Comparative specific gravity and strength of amabilis fir and western hemlock. Vancouver Forest Products Laboratory, Department of Fisheries and Forestry, VP-X-50, 16p.
Region: **British Columbia.**
Species: ***Abies amabilis, Tsuga heterophylla.***
Application: **Wood characteristics.**
Techniques: **Earlywood, latewood.**

324. **KING, R.H., K.B. CAWKER, M.S. KEARNEY, A. BEAUDOIN and K. HOLLAND.** 1980.
Holocene environmental change in Jasper National Park: Third interim report. Progress Report Submitted to Parks Canada

Scope: **Incidental.**
Region: **Sunwapta Pass, Watchtower Basin, Jasper National Park, Alberta.**
Species: ***Abies lasiocarpa, Picea engelmannii.***
Application: **Stand dynamics.**
Techniques: **Ring count.**
Comments:
- Oldest trees at timberline were found to be between 180-210 years old, with the majority of trees becoming established since the middle of the last century.
- Timberline seedling establishment of both species displayed a synchroneity with two main establishment periods in the early 1940's and the late 1960's and the mean minimum summer temperature during that period.
- Conclusions are that timberline advances occur during marked periods of warmer temperatures and are sychronous over wide areas.

325. **KIRBY, C.L.** 1953.
Accuracy of ring counts in poplar. Canadian Department of Resources and Development, Forestry Branch, Division of Forest Research. Silvicultural Leaflet 85. 2p.

Scope: **Focus.**
Region: **Canada.**
Species: ***Populus* sp.**
Application: **Analytical techniques and data acquisition.**
Techniques: **Ring count.**

326. **KOEHLER, A.** 1957.
Compression wood -- detriment to softwood timber. British Columbia Lumberman, May.

Scope: **Focus.**
Region: **Canada.**
Species: ***Picea glauca, Pinus* sp.**
Application: **Tree growth and development, wood characteristics.**
Techniques: **Compression wood.**
Comments:
- Compression wood has undesirable characteristics which can have detrimental effects on wood quality making some timber unfit for use.
- Cause of compression wood formation is not because of the greater compression stress in wood on the lower side of leaning trunks and branches as was formerly supposed.

327. **LAMARCHE, V.C., Jr.** 1970.

Frost damage rings in sub-alpine conifers and applications to tree-ring dating problems; in Tree-Ring Analysis with Special Reference to Northwest America, J.H.G. Smith and J. Worral (Eds.). University of British Columbia, Faculty of Forestry Bulletin, No. 7, p. 99-100.

Scope: **Focus.**
Region: **Nevada.**
Species: ***Pinus aristata.***
Application: **Dendroclimatology.**
Techniques: **Frost rings.**
Comments:
- The highest incidence of late-season frost damage is found in young trees at the upper treeline; phenological differences, stem size, bark thickness and meteorological factors may be important in frost ring formation.
- Frost rings are used as another independent source of variation in tree rings that can be used for cross-dating.

328. **LAMARCHE, V.C., Jr.** 1974.

Paleoclimatic inferences from long tree-ring records. Science 183: 1043-1048.

Scope: **Focus.**
Region: **White Mountains, California.**
Species: ***Pinus aristata, Pinus longaeva.***
Application: **Dendrochronology, dendroclimatology.**
Techniques: **Statistical methods.**
Comments:
- This study uses one of the longest tree-ring chronologies in existence.

329. **LAMARCHE, V.C., Jr.** 1975.

Climatic clues from tree-rings. New Scientist 66: 8-11.

Scope: **Focus.**
Application: **Dendroclimatology.**
Techniques: **Densitometry, isotopes.**
Comments:
- Accounts recent developments in dendroclimatology with special emphasis and densitometry and isotopes.

330. **LAMARCHE, V.C., Jr.** 1978.

Tree-ring evidence of past climatic variability. Nature 276:334-338.

Scope: **Focus.**
Region: **Canada.**
Species: **Hardwoods, softwoods.**
Application: **Dendroclimatology, dendrohydrology.**
Techniques: **Ring width.**
Comments:
- Brief overview of various aspects of tree-ring research.
- Discusses the use of tree-rings as climatic proxy data, ring width variability, data collection, paleoclimatic reconstruction, dendrohydrology and future directions of tree-ring research.

331. **LAMARCHE, V.C., Jr. and H.C. FRITTS.** 1971.
Anomaly patterns of climate over the western United States, 1700-1930, derived from principal components analysis of tree-ring data. Monthly Weather Review 99: 138-142.
Region: **United States.**
Application: **Dendroclimatology.**
Techniques: **Statistical methods.**

332. **LAMARCHE, V.C., Jr. and H.C. FRITTS.** 1972.
Tree-rings and sunspot numbers. Tree-Ring Bulletin 32: 19-33.
Scope: **Focus.**
Region: **North America.**
Species: **Hardwoods, softwoods.**
Application: **Dendroclimatology.**
Techniques: **Statistical methods.**
Comments:
- Spectral analysis, harmonic dial analysis, digital filtering, cross-correlation and principal component analysis were used separately and in combination in an attempt to detect relationships between the annual Wolf sunspot numbers and ring width indices from western North America.
- Results show no correlation between sunspot numbers and tree-ring indices.

333. **LAMARCHE, V.C., Jr., D.A. GRAYBILL, H.C. FRITTS and M.R. ROSE.** 1984.
Tree-ring evidence of growth enhancement in natural vegetation. Science 225: 1019-1021.
Scope: **Focus.**
Region: **United States.**
Species: ***Abies alba, Pinus aristata, Pinus flexis, Pinus longaeva.***
Application: **Tree growth and development.**
Techniques: **Ring width.**
Comments:
- Suggest this is the first direct evidence of carbon dioxide-related growth enhancement of natural vegetation.
- Results were derived from ring-widths of trees in subalpine environments in the western United States of recent decades.

334. **LAMARCHE, V.C., Jr. and K. HIRSCHBOECK.** 1984.
Frost rings in trees as records of major volcanic eruptions. Nature 307: 121-126.
Scope: **Focus.**
Region: **Western United States.**
Species: **Bristlecone pine.**
Application: **Dendroclimatology.**
Techniques: **Frost rings.**
Comments:
- Proposes that the occurrence of frost damage zones in accurately dated tree-ring sequences, from subalpine bristlecone pines, in the western United States, are linked to the climatic effects of major volcanic eruptions, and that frost rings can be representative, independent, proxy records of climatically effective eruptions over past several thousand years.

335. LAPRISE, D. and S. PAYETTE. 1988.
Evolution recente d'une tourbiere a palses (Québec subarctique): analyse cartographique et dendrochronologique. Canadian Journal of Botany 66: 2217-2227.
Scope: **Component.**
Region: **Ouiatchouan, Québec.**
Species: ***Picea mariana.***
Application: **Dendrochronology, dendroclimatology, dendrogeomorphology.**
Techniques: **Reaction wood, ring count, ring width**
Comments:
- Recent main development stage of palsas, collapse scars, and thermokarstic pools on the eastern coast of Hudson Bay are reconstructed within a permafrost peatland in the tundra using detailed mapping and tree-ring analysis.
- Variation in reaction wood indicates permafrost degradation in 1880 and increased degradation between 1930-1965.

336. LARSEN, J.A. 1965.
The vegetation of Ennadai Lake area, N.W.T.: Studies in subarctic and arctic bioclimatology. Ecological Monographs 35: 37-39.
Scope: **Incidental.**
Region: **Ennadai Lake, Northwest Territories.**
Species: ***Pinus banksiana.***
Application: **Stand dynamics, tree growth and development.**
Techniques: **Ring count.**
Comments:
- Vegetation and ecology of Ennadai Lake area are investigated along with factors of the environment which affect distribution of plants in communities.
- One tree per sample quadrat was cored to determine age.

337. LATHE, F.E. and A.W. MCCALLUM. 1939.
The effect of carbon dioxide on the diameter increment of conifers. Effect of Carbon Dioxide on Vegetation. M. Katz (Ed.). National Research Council of Canada, Ottawa, Ontario. p. 174-206.
Region: **Canada.**
Species: **Softwoods.**
Techniques: **Damage effects (pollution), ring width.**

338. LAWRENCE, D.B. 1946.
The technique of dating recent prehistoric glacial fluctuations from tree data. Mazama 28: 57-59.
Application: **Dendrogeomorphology, glacier fluctuation.**

339. LAWRENCE, D.B. 1950.
Glacier fluctuation for six centuries in southeastern Alaska and its relation to solar activity. Geographical Review 40: 191-223.
Scope: **Component.**
Region: **Southeastern Alaska.**
Species: ***Alnus* sp., *Picea sitchensis, Picea* sp., *Populus* sp., *Salix* sp., *Tsuga* sp.**
Application: **Dendroclimatology, dendrogeomorphology, glacier fluctuation.**
Techniques: **Ring count.**

Comments: - Age of glacial moraines for 7 glaciers in the Juneau Icefield and Taku Valley, are determined using ring counts from trees growing on the moraines.

340. **LAWRENCE, D.B.** 1950.
Estimating dates of recent glacier advances and recession rates by studying tree growth layers. Transactions, American Geophysical Union 31: 243-248.
Application: **Dendrogeomorphology, glacier fluctuation.**
Techniques: **Ring count.**

341. **LEDIG, F.T., B.J. ZOBEL and M.F. MATTHIAS.** 1975.
Geoclimatic patterns in specific gravity and tracheid length in wood of pitch pine. Canadian Journal of Forest Research 5: 318-329.
Scope: **Incidental.**
Region: **Northeastern United States.**
Species: ***Pinus rigida.***
Application: **Ring characteristics.**
Techniques: **Ring width.**
Comments: - Geographical variation in tracheid length in the northeastern United States is examined.

342. **LEV, D.J.** 1987.
Biological inference from growth-climate correlations in balsam poplar in Alaska; in Proceedings of the International Symposium on Ecological Aspects of Tree-Ring Analysis. G.C. Jacoby and J.W. Hornbeck (Eds.) p. 80-89
Scope: **Focus.**
Region: **Alaska.**
Species: ***Populus balsamifera.***
Application: **Dendroclimatology, tree growth and development.**
Techniques: **Ring width.**
Comments:
- Growth-climate relationships are identified from cores of balsam poplar at three locations in Alaska.
- Data are analyzed for the possibility of using these relationships to infer phenology and compare the growth periods of ecotypes from differing locations where long term detailed studies may be impractical.

343. **LIBBY, L.M. and L.J. PANDOLFI.** 1974.
Temperature dependence of isotopic ratios in tree-rings. Proc. Natl. Acad. Sci. U.S.A. 71: 2482.
Application: **Dendroclimatology.**
Techniques: **Isotopes.**

344. LOUGH, J.M. and H.C. FRITTS. 1987.
An assessment of the possible effects of volcanic eruptions on North American climate using tree-ring data, 1602-1900 A.D. Climatic Change 10: 219-239.

Scope: **Focus.**
Region: **North America.**
Species: **Hardwoods, softwoods.**
Application: **Dendroclimatology.**
Techniques: **Ring width, statistical methods.**
Comments:
- Seasonal and annual temperature reconstructions derived from western North American semi-arid tree-ring chronologies are used to examine possible spatial responses of North American climatic to volcanic eruptions between 1602-1900.
- Low latitude eruptions created the most noticeable response; central and western States and southwestern Canada warmed variably depending on the season.
- Results were supported by tree-ring series outside of the area covered by the tree-ring chronologies.

345. LUCKMAN, B.H. 1976.
Glacial Geomorphology at Mount Edith Cavell. Report to Parks Canada, Calgary.

Scope: **Component.**
Region: **Jasper National Park, Alberta.**
Species: ***Abies lasiocarpa, Picea engelmannii.***
Application: **Dendrogeomorphology.**
Techniques: **Ring count.**
Comments:
- Discussion of lichenometric dating of glacial fluctuation in which tree-ring dates were used to establish control dates (see also Luckman, 1977).

346. LUCKMAN, B.H. 1977.
Lichenometric dating of Holocene moraines at Mount Edith Cavell, Jasper, Alberta. Canadian Journal of Earth Sciences 14: 1809-1822.

Scope: **Component.**
Region: **Jasper National Park, Alberta.**
Species: ***Abies lasiocarpa, Picea englemannii.***
Application: **Dendrogeomorphology.**
Techniques: **Ring count.**
Comments:
- Presents a preliminary growth curve for the lichen *Rhizocarpon geographicum* on glacial moraines in Jasper National Park.
- Control dates for the lichen study were based on dendrochronological dating of conifers on the moraines of two glaciers.

347. LUCKMAN, B.H. 1981.
Little Ice Age and oxygen isotope studies in Jasper National Park. Report to Parks Canada

Scope: **Component.**
Region: **Jasper National Park, Alberta.**
Species: ***Abies lasiocarpa, Picea engelmannii, Pinus albicaulis.***
Application: **Dendroclimatology.**
Techniques: **Densitometry, isotopes (oxygen).**

Comments: - Sample sites at Mount Robson, Watchtower Basin and Maligne were described along with the coring activities during the summer of 1980.

348. **LUCKMAN, B.H.** 1982.
The Little Ice Age and oxygen isotope studies in the middle Canadian Rockies. Report to Parks Canada. 31p.
Scope: **Focus.**
Region: **Jasper and Banff National Parks, Mount Robson Provincial Park, British Columbia and Alberta.**
Species: ***Abies lasiocarpa, Picea engelmannii.***
Application: **Dendrochronology, dendroclimatology, glacier fluctuation.**
Techniques: **Densitometry, isotopes (oxygen).**
Comments:
- This reports aims to evaluate and use the tree-ring record preserved in samples to build a more precise and detailed picture of changing Holocene environments in this area by calibration of relationships between ^{18}O, maximum tree-ring density and temperature variables from living trees at Lake Louise, building tree-ring chronologies at several sites and locating and sampling older logs preserved in bog sites to evaluate the Hypsithermal record.
- Initial results from isotope analyses indicate good relationships between isotope content in tree-rings and present temperatures.

349. **LUCKMAN, B.H.** 1983.
Field investigations in the Canadian Rockies during 1982. Report to Parks Canada and British Columbia Parks, April, 1983.
Scope: **Focus.**
Region: **Mount Robson Provincial Park, British Columbia.**
Species: ***Picea engelmannii, Pinus albicaulis.***
Application: **Dendroclimatology, dendrogeomorphology.**
Techniques: **Densitometry, ring count, ring width.**
Comments:
- Sampling design and sample preparation are described.
- Studies were undertaken at several sites to document the extent and character of snow avalanche activity; many avalanche damage effects (scars, reaction wood, growth abberations, etc.) were identified.
- Probably the most immediate significant achievement of this publication was the discovery and documentation of several living trees over 600 years old; it is believed that the 680 year-old Engelmann spruce and the 699 year-old whitebark pine are the oldest living trees of these species so far sampled in the Rockies.

350. **LUCKMAN, B.H.** 1985.
Field Activities in Jasper National Park in 1984. Report to Parks Canada. 6p.
Region: **Jasper National Park, Alberta.**

351. **LUCKMAN, B.H.** 1986a.
Field investigations in the Canadian Rockies in 1985. Report to Parks Canada, April, 1986. 16 p.
Region: **Banff and Jasper National Parks, British Columbia and Alberta.**
Species: ***Larix lyallii.***

Comments: - Description of initial tree-ring sampling at Larch Valley site.

352. **LUCKMAN, B.H.** 1986b.
Reconstruction of Little Ice Age Events in the Canadian Rocky Mountains. Géographie physique et Quaternaire 40: 17-28.
Scope: **Component.**
Region: **Canadian Rocky Mountains, Alberta.**
Species: ***Larix* sp., *Picea engelmannii.***
Application: **Dendroclimatology, dendrogeomorphology.**
Techniques: **Crossdating, ring density, ring width.**
Comments:
- Three main periods of moraine development are identified using dendrochronology, lichenometry and radiocarbon dating.
- A summary of the results for 33 glaciers in the area is presented.

353. **LUCKMAN, B.H.** 1988a.
Dating the moraines and recession of the Athabasca and Dome Glaciers, Alberta, Canada. Arctic and Alpine Research 20: 40-54.
Scope: **Component.**
Region: **Athabasca and Dome Glaciers, Alberta.**
Species: ***Abies* sp., *Picea* sp.**
Application: **Dendrogeomorphology.**
Techniques: **Crossdating, densitometry, reaction wood, ring count, ring width.**
Comments:
- Little Ice Age moraines at Athabasca and Dome glaciers, Alberta, Canada, were dated using dendrogeomorphic techniques and old photographs.
- Ecesis periods on these moraines are between 40 and 60 years.
- Most trees colonizing these moraines date from periods of warmer summers in the present century.

354. **LUCKMAN, B.H.** 1988b.
8000 year-old wood from the Athabasca Glacier. Canadian Journal of Earth Sciences 25: 148-151.
Scope: **Component.**
Region: **Athabasca Glacier, Alberta.**
Species: ***Abies* sp., *Pinus* sp.**
Application: **Dendrogeomorphology, dendroclimatology.**
Techniques: **Ring width.**
Comments:
- Several wood fragments of *Pinus* sp. and *Abies* sp. were recovered from the snout of the Athabasca Glacier.
- Wood was derived from an unknown source up valley, indicating that the glacier was less extensive than at present during the Hypsithermal, and that an area up valley of the present snout was tree covered ca. 8000-8300 years B.P.

355. **LUCKMAN, B.H.** 1989.
Global change and the record of the past. Geos 18 (3): 1-8.
Scope: **Component.**
Region: **Canada.**
Species: ***Picea engelmannii, Picea glauca, Pinus albicaulis.***
Application: **Dendroclimatology.**
Techniques: **Isotopes (carbon, hydrogen, oxygen), ring width.**
Comments:
- The problems of global climatic change are discussed.
- The response of the scientific community to climatic change is suggested to be an increase in investigation of past climates using tree-ring analysis, palynology, stratigraphy and geomorphology.
- The author emphasizes that a thorough understanding of the global climate is necessary because that knowledge may provide critical insight to the preservation of the global future.

356. **LUCKMAN, B.H. and M.E. COLENUTT.** 1988.
Early nineteenth century tree-ring series from treeline sites in the middle Canadian Rockies; in International Meeting of The Year Without a Summer? Climate in 1816. Program and Abstracts. National Museum of Natural Sciences, Ottawa, Canada, June 25-28, 1988.
Scope: **Focus.**
Region: **Canadian Rockies, Alberta, British Columbia.**
Species: ***Abies lasiocarpa, Larix lyallii, Picea engelmannii, Pinus albicaulis.***
Application: **Dendrochronology, dendroclimatology.**
Techniques: **Densitometry, latewood, ring width.**
Comments:
- Preliminary tree-ring chronologies for the 1760-1890 period for several treeline sites Banff and Jasper National Parks are reviewed.
- No signal for 1815 Tambora eruption was detected.

357. **LUCKMAN, B.H. and M.E. COLENUTT.** 1989.
Field investigations in the Canadian Rockies during 1988. Report to Parks Canada, British Columbia Parks Branch and Alberta Parks.
Scope: **Focus.**
Region: **British Columbia, Alberta.**
Species: ***Abies lasiocarpa, Larix lyallii, Picea engelmannii, Pinus albicaulis.***
Application: **Dendrochronology, dendroclimatology.**
Techniques: **Crossdating, latewood, light rings, ring width**
Comments:
- Preliminary analysis of data for the extension of dendrochronological investigations of larch in the southern part of the Kananaskis area.

358. **LUCKMAN, B.H., M.E. COLENUTT and R.R. HEIPEL.** 1988.
Field investigations in the Canadian Rockies during 1987. Report to Parks Canada and British Columbia Parks Branch, March 1988. 32p.
Scope: **Focus.**
Region: **British Columbia, Alberta, Canadian Rockies.**
Species: ***Abies lasiocarpa, Larix lyallii, Picea engelmannii, Pinus albicaulis.***
Application: **Dendrochronology, dendroclimatology.**
Techniques: **Crossdating, densitometry, latewood, ring width.**

Comments: - Tree-ring chronologies for use in dendrochronological and dendroclimatological analysis collected from 8 sites in Mount Robson Provincial Park and the National Parks of Jasper and Banff.

359. **LUCKMAN, B.H., G.W. FRAZER, J.P HAMILTON and D.G. HARRY.** 1984.
Field activities in the Canadian Rockies in 1983. Report to Parks Canada, Department of Geography, University of Western Ontario. 26p.
Scope: **Component.**
Region: **Alberta, British Columbia.**
Species: ***Picea engelmannii, Pinus albicaulis.***
Application: **Dendroclimatology, dendrogeomorphology.**
Techniques: **Densitometry, isotopes (oxygen), ring count.**

360. **LUCKMAN, B.H. and J. GRAY.** 1990.
Oxygen isotope ratios from tree-rings containing compression wood. Quaternary Research 33: 117-121.
Scope: **Focus.**
Region: **Alberta.**
Species: ***Picea engelmannii.***
Application: **Dendroclimatology.**
Techniques: **Isotopes (oxygen).**
Comments:
- Oxygen isotope determinations from two leaning *Picea engelmannii* reveal significant differences between normal and compression wood radii.
- Differences are of similar magnitude to differences between samples taken from the sample radius.
- The magnitude of the differences appears to be related to the amount of reaction wood in the ring.

361. **LUCKMAN, B.H., J.P. HAMILTON, L.A. JOZSA and J. GRAY.** 1985.
Proxy climatic data from tree-rings at Lake Louise, Alberta: A preliminary report. Géographie physique et Quaternaire 39: 127-140.
Scope: **Focus.**
Region: **Lake Louise, Alberta.**
Species: ***Abies lasiocarpa, Picea engelmannii.***
Application: **Dendroclimatology.**
Techniques: **Densitometry, isotopes (oxygen), ring width.**
Comments:
- Preliminary results of studies using oxygen isotopes and tree-ring densitometry to derive proxy climatic data from Engelmann spruce and *Abies lasiocarpa* in the Canadian Rockies.
- Significant correlations were found between mean annual temperatures and oxygen isotope determinations from five-year groups of tree-rings from three trees.

362. LUCKMAN, B.H., K.A. HARDING and P.J. HAMILTON. 1987.
Recent glacier advances in the Premier Range, British Columbia. Canadian Journal of Earth Sciences 24: 1149-1161.

Scope: **Incidental.**
Region: **British Columbia.**
Application: **Dendrogeomorphology, glacier fluctuation.**
Techniques: **Ring count.**
Comments:
- Aerial photography and field investigations are used to reconstruct recent ice-front fluctuations for 27 glaciers.
- Tree-ring counts are used to date glacial moraines.

363. LUCKMAN, B.H., L.A. JOZSA and P.J. MURPHY. 1984.
Living seven-hundred-year old *Picea engelmannii* and *Pinus albicaulis* in the Canadian Rockies. Arctic and Alpine Research 16: 419-422.

Scope: **Focus.**
Region: **Alberta.**
Species: ***Picea engelmannii, Pinus abicaulis.***
Application: **Dendrochronology, dendroclimatology.**
Techniques: **Densitometry, ring width.**
Comments:
- The oldest reported living specimens of Engelmann spruce and whitebark pine, with ring series of 680 and 713 years, are presented in this article from the Canadian Rockies.
- Ring series in these trees were densitometrically analyzed; ring width and maximum ring density variables were cross-dated with *Picea engelmannii* trees used in the 659-year Icefield Chronology developed by Jozsa et al. (1983).

364. LUCKMAN, B.H. and M.S. KEARNEY. 1986.
Reconstruction of Holocene changes in alpine vegetation and climate in the Maligne Range, Jasper National Park, Alberta. Quaternary Research 26: 244-261.

Scope: **Component.**
Region: **Alberta.**
Species: ***Picea engelmannii.***
Application: **Dendroclimatology.**
Techniques: **Isotopes (oxygen).**
Comments:
- Pollen, macrofossil and oxygen isotope data from tree-rings are used to infer past climatic conditions.
- Calibration data for $^{18}O/^{16}O$ temperature relationships presented for living trees at two treeline sites.

365. LUCKMAN, B.H., M.S. KEARNEY, A. BOWYER-BEAUDOIN and K. HOLLAND. 1979.
Holocene environmental change in Jasper National Park: Second interim report. Progress Report Submitted to Parks Canada.

Scope: **Incidental.**
Region: **Sunwapta Pass/Athabasca Glacier and Maligne Valley, Alberta.**
Application: **Dendroclimatology, glacier fluctuation, stand dynamics.**
Techniques: **Ring width.**

Comments: - The relative size and tree-ring thickness of snags and roots in bedrock knolls, above treeline in Sunwapta Pass, suggest that trees much larger than those of present previously occupied higher elevations.

366. **LUCKMAN, B.H., M.S. KEARNEY and D.K. HOLLAND.** 1977.
Holocene environmental change in Jasper National Park. Progress Report Submitted to Parks Canada. 17 p.
Scope: **Incidental.**
Region: **Jasper National Park, Alberta.**
Application: **Dendrogeomorphology, glacier fluctuation.**
Techniques: **Ring count.**
Comments: - Ring counts were used to determine the ages of Little Ice Age terminal moraines.

367. **LUCKMAN, B.H. and D.P. McCARTHY.** 1987.
Field investigations in the Canadian Cordillera in 1986. Report to Parks Canada, and British Columbia Parks Branch, February, 1987. 50 p.
Application: **Dendroclimatology, dendrogeomorphology.**
Comments: - Reports that the oldest known whitebark pine found near the Bennington Glacier, Mt. Robson Provincial Park, British Columbia is more than 873 years old.
- Also reports on lichenometric investigations at Illecillewaet Glacier, British Columbia

368. **LUCKMAN, B.H. and G.D. OSBORN.** 1979.
Holocene glacier fluctuations in the middle Canadian Rocky Mountains. Quaternary Research 11: 52-77.
Scope: **Component.**
Region: **Middle Canadian Rocky Mountains, Alberta, British Columbia.**
Species: ***Abies lasiocarpa, Picea engelmannii.***
Application: **Dendrogeomorphology, glacier fluctuation.**
Techniques: **Ring count.**
Comments: - Examination of Holocene glacier fluctuation using tree-ring analysis, lichenometry, tephrochronology and radiocarbon dating.

369. **LUTZ, H.J.** 1930.
Observations on the invasion of newly formed glacial moraines by trees. Ecology 11: 562-567.
Scope: **Incidental.**
Region: **Prince William Sound, Alaska.**
Species: ***Alnus sinuata, Pinus sitchensis, Populus tacamahaca, Tsuga mertensiana.***
Application: **Dendrogeomorphology, glacial fluctuation, tree growth and establishment.**
Techniques: **Ring count.**
Comments: - Vegetational development on new glacier moraines.
- 70-90 year old Sitka spruce were established 1100 feet back from the glacier.
- Ages of moraines are determined using trees but no method for determining age was mentioned.

370. **LYON, C.J. and J.W. GOLDTHWAIT.** 1934.
An attempt to cross-date trees in drowned forests. Geographical Review 24: 605-614.
Scope: **Focus.**
Region: **New England, Nova Scotia.**
Species: ***Pinus strobus,* hemlock, pitch pine.**
Application: **Analytical techniques and data acquisition.**
Techniques: **Crossdating, ring width.**
Comments:
- Cross-dating of drowned trees was attempted but deemed not possible.
- It is believed that submergence of trees occurs at such a slow rate that the trees as a group did not fall within a similar time span.
- If trees did live at the same time their growth periods overlapped for too short a time to allow for cross-dating.

371. **McCARTHY, D.P.** 1985.
Dating Holocene geomorphic activity of selected landforms in the Geikie Creek Valley, Mount Robson Provincial Park. M.Sc. Thesis, University of Western Ontario, Department of Geography. 304 p.
Application: **Dendrogeomorphology.**
Comments:
- Tree rings are used to date Holocene moraines.
- Includes extensive discussion of problems in determination of ecesis.

372. **MacIVER, D.C., F.L. RAYMOND and S.J. MASAROVICH.** 1989.
Physio-climate detection and modelling with the computerized tree ring increment measuring (TRIM) system; in Climate Applications in Forest Renewal and Forest Production. D.C. MacIver, R.B. Street and A.M. Auclair (Eds.). Proceedings of Forest Climate '86, November 17-20, 1986, Geneva Park, Orillia, Ontario.
Focus: **Ontario.**
Application: **Analytical techniques and data analysis.**
Techniques: **Ring width.**
Comments:
- Physiological growth and development profiles of individual trees and unit area plots are demonstrated with the Ontario Ministry of Natural Resources Tree-ring Measuring System (TRIM).
- In addition, climatograms by soil type provide interpretive support for the analytical growth layer procedures.

373. **MacIVER, D.C. and H. SALLANS.** 1988.
Tree-ring interpretation manual for selected softwoods. Forest Resources Group, Ontario Ministry of Natural Resources, Toronto, Ontario.
Scope: **Focus.**
Region: **Canada.**
Species: ***Picea glauca, Picea mariana, Pinus banksiana.***
Application: **Analytical techniques and data acquisition, ring characteristics.**
Techniques: **Compression wood, crossdating, drought rings, frost rings.**
Comments:
- A manual prepared to reduce uncertainty in tree-ring (increment) interpretation and to provide sound direction to correct identification of ring boundaries.
- It is a ready reference for identifying aberrant rings and documents standard procedures for measuring unusual tree disks.

374. **MacKAY, D.K., S. FOGARASI and M. SPITZER.** 1973.
Documentation of an extreme summer storm in the Mackenzie Mountains, N.W.T; in Hydrologic Aspects of Northern Pipeline Development. Environmental Social Program, Northern Pipelines Report 73-30, Information Canada Catalogue R-27-172. p. 191-221.
Scope: **Component.**
Region: **Mackenzie Mountains, Northwest Territories.**
Species: ***Picea* sp., *Populus balsamifera.***
Application: **Dendrohydrology.**
Techniques: **Damage effects, ring count.**
Comments:
- Documentation of a severe summer rainstorm in the Mackenzie Mountains during July, 1970 is presented on the basis of limited data.
- Tree-ring data suggest that a storm of similar intensity and magnitude has less than 1% chance of happening in any given year.

375. **MAINI, J.S. and R.T. COUPLAND.** 1940.
A simple technique for age determination in trembling aspen. Forestry Chronicle 40: 219-220.
Scope: **Focus.**
Region: **Canada.**
Species: ***Populus tremuloides.***
Application: **Analytical techniques and data acquisition.**
Techniques: **False rings, ring count.**
Comments:
- Efforts to overcome the difficulties encountered when counting annual rings of trembling aspen as a result of the porous nature of the wood, and due to the presence of false rings are described.

376. **MALHOTRA, S.S. and R.A. BLAUEL.** 1980.
Diagnosis of air pollutant and natural stress symptoms on forest vegetation in western Canada. Environment Canada, Canadian Forestry Service, Northern Forest Research Centre, Edmonton, Alberta. Information Report NOR-X-228.
Region: **Alberta.**
Application: **Tree growth and development.**
Techniques: **Damage effects (pollution).**

377. **MARR, J.W.** 1948.
Ecology of the forest-tundra ecotone on the east coast of Hudson Bay. Ecological Monographs 18: 117-144.
Scope: **Component.**
Region: **Great Whale River, Gulf Hazard, Québec.**
Species: ***Larix laricina, Picea glauca, Picea mariana.***
Application: **Dendroclimatology, tree growth and development.**
Techniques: **Ring width.**

Comments:
- Deals with the forest-tundra ecotone, its nature and relation to present and past environments.
- Preliminary studies suggest that larch tree rings are more responsive to climate and better suited to tree-ring analysis.
- Tree rings proved tree growth on good soils has not been critically limited in 250 years.
- Growth and reproductive activities of *Larix laricina* indicate that climate is above the minimum for its existence.

378. MASON, B.K. 1960.
Patterns of growth in height and diameter increment of some young Douglas fir. B.S.F. Thesis, Faculty of Forestry, University of British Columbia.
Region: **British Columbia.**
Species: ***Pseudotsuga menziesii.***
Application: **Tree growth and development.**

379. MAZANY, T., J.C. LERMAN and A. LONG. 1980.
Carbon-13 in tree-ring cellulose as an indicator of past climates. Nature 287: 432-435.
Application: **Dendroclimatology.**
Techniques: **Isotopes (carbon).**

380. McCARTHY, E.F. and W.M. ROBERTSON. 1921.
Volume increment on cut-over pulpwood lands. Journal of Forestry 19: 611-617.
Scope: **Component.**
Region: **Algoma District, Ontario.**
Species: **Softwoods.**
Application: **Tree growth and development.**
Techniques: **Increment boring.**
Comments:
- Borings were used to determine diameter of tree growth; measurements of growth are interpreted by the number of growth rings within the last inch or one-half-inch radius.

381. McCAW, P.E. and J.E. ECKENWALDER. 1987.
Dendroecological analysis of a population of black gum (*Nyssa sylvatica* Marsh.) in southern Ontario, Canada. in Proceedings of the International Symposium on Ecological Aspects of Tree-Ring Analysis, Aug. 17-21, 1986. Marymount College, Tarrytown, New York. G.C. Jacoby and J.W. Hornbeck (Eds.) p. 70-78.
Scope: **Focus.**
Region: **Southern Ontario.**
Species: ***Nyssa sylvatica.***
Application: **Dendrochronology, dendroclimatology, stand dynamics, tree growth and development.**
Techniques: **Ring count, ring width.**

Comments:
- Regeneration and growth dynamics of black gum.
- High variation of ring-width distribution among individual trees reflected a complex of environmental and inherent controlling variables that could not be satisfactorily analyzed with any of the standard dendrochronological methods used and therefore environmental conditions that favoured the establishment of the mature trees in this population could not be reconstructed.
- Increment cores were shown to have little relation to climatic history or life-long endogenous growth trends.

382. **McCLEAN, A.** 1969.
Plant communities of the Similkameen Valley, British Columbia and their relationship to soils. Washington State University, Department of Botany, Ph.D. Thesis, 133p.
Region: **British Columbia.**
Application: **Stand dynamics.**

383. **McLEAN, A. and J.H.G. SMITH.** 1973.
Effects of climate on forage yields and tree-ring widths in British Columbia. Journal of Range Management 26: 416-419.
Scope: **Component.**
Region: **British Columbia.**
Species: ***Pinus ponderosa, Pseudotsuga menziesii.***
Application: **Dendroclimatology.**
Techniques: **Earlywood width, latewood width, ring width.**
Comments:
- The possibility of relating variations in local climate and forage yields to variation in ring width is investigated.

384. **McMINN, R.G. and M.A. GRISMER.** 1969.
Chronology of pole blight lesions of western white pine in British Columbia. Bi-Monthly Research Notes 23: 26.
Region: **British Columbia.**
Species: ***Pinus strobus.***
Application: **Tree growth and development.**
Techniques: **Damage effects (insect).**

385. **MEARS, A.I.** 1975.
Dynamics of dense snow avalanches interpreted from broken trees. Geology 9: 521-523.
Application: **Dendrogeomorphology.**
Techniques: **Damage effects (geomorphic).**

386. **MILLET, J.** 1985.
Histoire des feux et dégradation du couvert coniferien au Lac à l'Eau Claire, Nouveau-Québec. B.Sc. Thèse, Université Laval, Sainte Foy, Québec 35p.
Scope: **Component.**
Region: **Québec.**
Species: ***Picea mariana.***
Application: **Stand dynamics (fire history).**
Techniques: **Ring count.**

Comments: - The ages of the most recent fires were determined by the age of the oldest tree in a location.
- Older fires were dated using aerial photos.

387. **MITCHELL, V.L.** 1967.
An investigation of certain aspects of tree growth rates in relation to climate in Central Canadian Boreal forests. Technical Report No. 33, University of Wisconsin, 62p.
Region: **Canada.**
Application: **Dendroclimatology, tree growth and development.**

388. **MONSERUD, R.A.** 1986.
Time series analyses of tree-ring chronologies. Forest Science: 349-372.
Scope: **Focus.**
Region: **Alaska, British Columbia, California, Colorado, Utah.**
Species: ***Picea* sp., *Pinus longaeva, Pseudotsuga mensiezii,* pinyon pine.**
Application: **Analytical techniques and data acquisition.**
Techniques: **Statistical methods.**
Comments: - The stochastic time-dependent structure of 33 tree-ring series from the dendrochronological literature was analyzed using autoregressive moving average (ARMA) models.

389. **MOORE, D.P. and W.H. MATHEWS.** 1978.
The Rubble Creek landslide, southwestern British Columbia. Canadian Journal of Earth Sciences 15: 1039-1052.
Scope: **Component.**
Region: **British Columbia.**
Species: **Softwoods.**
Application: **Dendrogeomorphology.**
Techniques: **Ring count, scarring.**
Comments: - Tree-ring data indicate the Rubble Creek landslide occurrence to have happened in the fall or winter of 1855-1856.

390. **MORIN, H. and S. PAYETTE.** 1986.
La dynamique recente des combes a neiges du golfe de Richmond (Québec nordique): Une analyse dendrochronologique. Canadian Journal of Botany 64: 2113-2119.
Scope: **Focus.**
Region: **Richmond Gulf, northern Québec.**
Species: ***Picea glauca, Picea mariana.***
Application: **Dendroclimatology, dendrogeomorphology.**
Techniques: **Damage effects (geomorphic), reaction wood, ring width.**
Comments: - Recent trends of variation in snowfall and duration of the clearing of snow patches in Richmond Gulf, northern Québec.

391. **MORIN, H.** 1985.
La dynamique holocene des combes a neige du golfe de Richmond (Québec nordique). M.S. Thesis, Department of phytologie, Université Laval, 123p.
Scope: **Focus.**
Region: **Richmond Gulf, Québec.**
Species: ***Picea glauca, Picea mariana.***
Application: **Dendroclimatology, dendrogeomorphology.**
Techniques: **Ring width, scarring (ice).**
Comments:
- Dendrogeomorphic and dendroclimatic tree-ring curves are presented from the 1890's to the 1980's.

392. **MORIN, H. and D. LAPRISE.** 1989.
Histoire recente des epidemies de la tordeuse des bourgeons de l'epinette au nord du Lac St-Jean, Québec: une analyse dendrochronologique. Canadian Journal of Forest Research IN PRESS.
Scope: **Focus.**
Region: **Lac Saint-Jean, Québec.**
Species: ***Abies balsamea, Picea glauca.***
Application: **Damage effects (insect).**
Techniques: **Ring width.**
Comments:
- Spruce budworm (*Choristonerua fumiferana* (Clem.)) outbreaks are reconstructed using dendrochronological analysis of balsam fir and white spruce from the late 1700's.
- Outbreaks in the Lac Saint-Jean area that began around 1832, 1909, 1944, and 1974 are similar in timing to outbreaks in more southern forests.

393. **MORRIS, R.F.** 1948.
How old is a balsam tree? Forestry Chronicle 24: 106-110.
Scope: **Focus.**
Region: **New Brunswick.**
Species: ***Abies balsamea.***
Application: **Analytical techniques and data acquisition tree growth and development.**
Techniques: **Ring count.**
Comments:
- Results suggest physiological age of balsam as indicated by sexual maturity, susceptibility to butt rot, and rate of growth, are not influenced by length of initial suppression period.
- Therefore, for forestry and entomology, age since initial release is more reliable criterion than total age of trees or stands.
- Determines whether true age determined by rings is a fair estimate of physiological age.

394. **MOTT, D.G., L.D. NAIRN and J.A. COOK.** 1957.
Radial growth in forest trees and effects of insect defoliation. Forestry Science 5: 286-304.
Species: **Hardwoods, softwoods.**
Application: **Tree growth and development.**
Techniques: **Damage effects (insect), ring width.**

395. **MULLER, H-N.** 1982.
Climatic factors and radial growth in conifers near timberline and their application to reforestation problems. Mountain Research and Development 12: 373-384.
Species: **Softwoods.**
Application: **Dendroclimatology, stand dynamics (treeline), tree growth and development.**
Techniques: **Ring width.**

396. **MULLOY, G.A.** 1931.
Increment boring. Forestry Chronicle 7: 100-104.
Scope: **Focus.**
Region: **Nova Scotia.**
Application: **Analytical techniques and data acquisition, tree growth and development.**
Techniques: **Sample preparation and laboratory techniques.**
Comments:
- Recommendations are made that, for all rate-of-growth studies where basis of calculating increment is a diameter-increment curve, that 2 borings per tree be made directly opposite each other.
- Data were shown to be biassed if only one core was used as workers naturally favoured the part of the bole which could most easily be cored.

397. **NAIRN, L.D., REEKS, W.A., F.E. WEBB and V. HILDAHL.** 1962.
History of larch sawfly outbreaks and their effect on tamarack stands in Manitoba and Saskatchewan. Can. Entom. 94: 242-256.
Region: **Manitoba, Saskatchewan.**
Species: ***Larix* sp.**
Application: **Stand dynamics.**
Techniques: **Damage effects (insect).**

398. **NEIMANN, K.O.**
Observations of snow avalanche activity in the Kananaskis region, Alberta. Albertan Geographer 18: 29-42.
Techniques: **Ring count.**
Application: **Dendrogeomorphology**

399. **NICHOLS, H.** 1976.
Historical aspects of the northern Canadian treeline. Arctic 29: 38-47.
Application: **Stand dynamics (treeline).**

400. **NICKERSON, D.E.** 1948.
Age determination in growth and yield. Forestry Chronicle 24: 176-178.
Scope: **Component.**
Region: **Ontario.**
Species: ***Abies balsamea.***
Application: **Tree growth and development.**
Techniques: **Ring count, ring width.**

Comments: - Investigation in the Green River Management Area to show the relationship of the first flowering of balsam fir and of maturity due to butt rot are independent of true age.
- Physiological age deemed more important in the development of this species than true age.
- Rings are used to determine age and rate of tree growth.

401. **O'NEIL, L.C.** 1963.
The suppression of growth rings in jack pine in relation to defoliation by the Swaine Jack-pine sawfly. Canadian Journal of Botany 41: 227-235.
Species: ***Pinus banksiana.***
Application: **Dendroecology.**
Techniques: **Ring width.**

402. **OSBORN, G.D.** 1982.
Holocene glacier and climate fluctuations in the southern Canadian rocky Mountains: A Review. Striae 18: 15-25.
Region: **Southern Rocky Mountains, Canada.**
Application: **glacier fluctuation.**

403. **OSBORN, G.D. and B.H. LUCKMAN.** 1988.
Holocene glacier fluctuations in the Canadian Cordillera (Alberta and British Columbia). Quaternary Science Reviews 7: 115-128.
Scope: **Component.**
Region: **Alberta, British Columbia.**
Application: **Glacial fluctuation, dendrogeomorphology.**
Techniques: **Ring count.**
Comments: - Tree-ring and lichenometric techniques date most Little Ice Age maximum moraines from the seventeenth to nineteenth centuries.

404. **OSWALT, W.H.** 1950.
Spruce borings from the lower Yukon River, Alaska. Tree-Ring Bulletin 16: 26-30.
Scope: **Focus.**
Region: **Alaska.**
Species: ***Picea* sp.**
Application: **Archeology, dendrochronology, dendroclimatology.**
Techniques: **Latewood, ring width.**
Comments: - Spruce borings collected during the summer of 1948 along the Yukon River were analyzed to determine their position within the northern Alaskan chronologies and to serve as material for future archaeological and climatic studies.

405. **OSWALT, W.H.** 1951.
The origin of driftwood at Hooper Bay, Alaska. Tree-Ring Bulletin 18: 6-8.
Scope: **Focus.**
Region: **Hooper Bay Village, Alaska.**
Species: **Driftwood, *Picea* sp.**
Application: **Dendrochronology, dendrohydrology.**
Techniques: **Latewood, ring count.**

Comments: - Determines the origin of spruce which have drifted ashore along a 3 mile section of the Bering Sea coast.
- Cross-dating of driftwood with living trees was attempted to trace the origin of trees but problems were encountered because of i) a lack of samples from interior Alaska that contribute driftwood to the supply, ii) a limited number of samples, and iii) the existence of trees that did not allow for ready tracing.

406. **OSWALT, W.H.** 1952.
Spruce samples from the Copper River Drainage, Alaska. Tree-Ring Bulletin 19: 5-10.
Scope: **Focus.**
Region: **Alaska.**
Species: ***Picea* sp.**
Application: **Archeology, dendrochronology, dendroclimatology.**
Techniques: **Ring pattern, ring width.**
Comments: - Copper River drainage area was sampled for spruce to determine the type of ring record for the region, to analyze the ring records with reference to climatic data, and to serve as a time scale for the dating of recent archeological wood that may be discovered in this locality.

407. **OSWALT, W.H.** 1954.
Regional chronologies in spruce of the Kuskokwim River, Alaska. Anthropological Papers of the University of Alaska 2: 203-214.
Region: **Kuskokwim River, Alaska.**
Application: **Dendrochronology.**

408. **OSWALT, W.H.** 1957.
Volcanic activity and Alaskan spruce growth in A.D. 1783. Science 126: 928-929.
Scope: **Component.**
Region: **Alaska.**
Species: ***Picea glauca.***
Application: **Dendroclimatology.**
Techniques: **Ring width.**
Comments: - Explores the association between climatic phenomenon, volcanic eruptions and anomalies in Alaskan tree-ring patterns for the year 1783 A.D.
- Oswalt suggests that Giddings (1941) was probably the first to recognize a distinctive layer of wood now called "faint latewood" in spruce growing at treeline or their biological limits.
- This wood was common to many but not all white spruce that grew at the time and its creation was related to major volcanic activity in Iceland and Japan.

409. **OSWALT, W.H.** 1958.
Tree-ring chronologies in south-central Alaska. Tree-Ring Bulletin 22: 16-22.
Scope: **Focus.**
Region: **South-central Alaska.**
Species: ***Picea glauca.***
Application: **Archeology, dendrochronology, dendroclimatology**
Techniques: **Ring width.**

Comments: - Defines the characteristic ring features of living trees in previously unsampled areas in south-central Alaska and relates the findings to past ring chronologies.

410. **PARKER, M.L.** 1969a.
Tree-ring chronology building in eastern Canada and Alberta. Report of Activities, Part A: April to October, 1968. Geological Survey of Canada Paper 69-1, Part A pp. 121-122.
Scope: **Focus.**
Region: **Alberta, New Brunswick, Ontario, Prince Edward Island, Québec.**
Species: ***Larix laricina, Picea glauca, Picea engelmannii, Picea mariana, Pinus albicaulis, Pinus contorta, Pseudotsuga menziesii, Thuja occidentalis, Tsuga canadensis.***
Application: **Dendrochronology, dendroclimatology.**
Techniques: **Ring width.**
Comments:
- Statement of the areas and trees sampled in Alberta and eastern Canada for the purpose of creating tree-ring chronologies.
- This was the first intense tree-ring investigation by a Canadian government department.

411. **PARKER, M.L.** 1969b.
Dendrochronological Investigations in Canada. Report of Activities, Part B: November 1968 to March 1969, Geological Survey of Canada Paper 69-1, Part B. pp. 67-68.
Scope: **Focus.**
Region: **Alberta, New Brunswick, Ontario, Prince Edward Island, Québec.**
Species: ***Larix laricina, Picea glauca, Picea engelmannii, Picea mariana, Pinus albicaulis, Pinus contorta, Pseudotsuga menziesii, Thuja occidentalis, Tsuga canadensis.***
Application: **Dendrochronology.**
Techniques: **Ring width.**
Comments:
- Announces the establishment of a dendrochronology laboratory for the purposes of providing chronological and climatological information on postglacial events thorough analysis of tree-ring chronologies.
- Discusses the areas of research emphasis which include analysis of ring width measurement, and analysis using intra-ring density measurements.
- The time spans of chronologies developed from sampling programs earlier in the year are given (Parker, 1969a).

412. **PARKER, M.L.** 1970.
Some new techniques used in dendrochronological investigations in Canada. Report of Activities, Part B, November 1969 to March 1970. Geological Survey of Canada Paper 70-1, Part B. pp. 73-74.
Scope: **Focus.**
Region: **Canada.**
Application: **Analytical techniques and data acquisition.**
Techniques: **Densitometry, sample preparation and laboratory techniques.**
Comments:
- New techniques for processing dendrochronological material are announced; stationary and in-motion X-raying techniques were developed along with special preparation techniques and a method of X-raying charcoal has been devised.

413. PARKER, M.L. 1971.
Dendrochronological techniques used by the Geological Survey of Canada. Geological Survey of Canada Research Paper 71-75, p. 1-30.

Scope: **Focus.**
Region: **Canada.**
Species: **Softwoods.**
Application: **Analytical techniques and data acquisition.**
Techniques: **Densitometry, ring width, sample preparation and laboratory techniques.**
Comments:
- Reports on the techniques and instruments used, or developed by the Geological Survey of Canada, for building and evaluating tree-ring chronologies from softwood sample sites throughout Canada.
- Covers densitometry, data acquisition systems, methods for producing X-ray negatives of tree-ring specimens, specimen preparation techniques, power-driven increment boring, and data processing.

414. PARKER, M.L. 1976.
Improving tree-ring dating in northern Canada by X-ray densitometry. Syesis 9: 163-172.

Scope: **Focus.**
Region: **Yukon, Northwest Territories.**
Species: ***Picea glauca.***
Application: **Analytical techniques and data acquisition.**
Techniques: **Densitometry, ring width.**
Comments:
- Ring width and ring density chronologies were built from increment cores, taken from white spruce trees growing in two areas near Inuvik, Yukon Territory and Nahanni Butte, Northwest Territories.
- Ring parameters were related to temperature and precipitation records.

415. PARKER, M.L. 1980.
Tree-ring data for Douglas fir trees from Kananaskis, Alberta. Contract Report to the Atmospheric Environment Service. 14p.

Region: **Kananaskis, Alberta.**
Species: ***Pseudotsuga menziesii.***

416. PARKER, M.L. 1985.
Investigation the possibility of a relationship between volcanic eruptions and tree growth in Canada (1800-1899). Syllogeus 55: 249-264.

Scope: **Focus.**
Region: **Canada.**
Species: ***Picea glauca, Picea mariana, Pseudotsuga menziesii, Thuja plicata.***
Application: **Dendroclimatology, dendrogeomorphology.**
Techniques: **Densitometry, ring width.**
Comments:
- Examines tree-ring width and ring-density data to determine if the expected drop in temperature, following the eruptions of Tambora in 1815 and Krakatau in 1883, were reflected in the tree-ring record.

417. **PARKER, M.L.** 1987.
Recent abnormal increase in tree-ring widths: A possible effect of elevated atmospheric carbon dioxide; in Proceedings of the International Symposium on Ecological Aspects of Tree-Ring Analysis. G.C. Jacoby and J.W. Hornbeck (Eds.). p. 511

Scope: **Focus.**
Region: **British Columbia.**
Species: ***Pseudotsuga menziesii.***
Application: **Dendroclimatology.**
Techniques: **Damage effects (pollution), ring width.**
Comments:
- Ring width values for individual radii of trees from 17 sites in Canada and the northwest United States are examined.
- Results suggest that increased atmospheric carbon dioxide as well as other environmental factors can affect forest growth.
- Douglas fir growing in moist sites in British Columbia show marked increases in growth that cannot be explained by environmental influences other than increased carbon dioxide.

418. **PARKER, M.L., G.M. BARTON and L.A. JOZSA.** 1974.
Detection of lignans in western hemlock by radiography. Wood Science and Technology 8: 229-232.

Scope: **Component.**
Region: **British Columbia.**
Species: ***Tsuga heterophylla.***
Application: **Ring characteristics.**
Techniques: **Densitometry, ring density.**
Comments:
- Radiography is used to detect major lignans in western hemlock wood and to investigate the effects of these materials on tree-ring density measurements using X-ray densitometry.

419. **PARKER, M.L., G.M. BARTON and J.H.G. SMITH.** 1976.
Annual ring contrast enhancement without affecting X-ray densitometry studies. Tree-Ring Bulletin 36: 29-31.

Scope: **Focus.**
Region: **Canada.**
Application: **Analytical techniques and data acquisition.**
Techniques: **Densitometry.**
Comments:
- A method to increase the contrast between earlywood and latewood in core samples is proposed; this method does not affect densitometric analysis.
- Cores were coated with zinc-oxide and then submerged in 10% acetic acid.

420. **PARKER, M.L., P.A. BRAMHALL and S.G. JOHNSON.** 1982.
Tree-ring dating of driftwood from raised beaches on the Hudson Bay coast. Canadian Forestry Service Project No. 32 Report, May 1982. Contract Report submitted to the Canadian Forestry Service, Ottawa, Ontario.

Region: **Ontario, Manitoba, Northwest Territories.**
Species: **Driftwood.**
Techniques: **Crossdating.**

421. **PARKER, M.L., R.D. BRUCE and L.A. JOZSA.** 1977.
Calibration, data acquisition and processing procedures used with online tree-ring scanning densitometer. IUFRO Group P4.01.05. Instruments Meeting, Corvallis, Oregon, Sept. 8-9, 1977. 20p.
Application: **Analytical techniques and data acquisition.**
Techniques: **Computing, densitometry.**

422. **PARKER, M.L., R.D. BRUCE and L.A. JOZSA.** 1980.
X-ray densitometry of wood at the WFPL. Forintek Canada Corporation (Western Laboratory) Technical Report 10. 18p.
Scope: **Focus.**
Region: **Canada.**
Application: **Analytical techniques and data acquisition.**
Techniques: **Densitometry, ring width.**
Comments: - Presents data on calibration procedures, data acquisition, and data processing for a computerized X-ray densitometric system at Western Forest Products Laboratory.

423. **PARKER, M.L., H.W.F. BUNCE and J.H.G. SMITH.** 1975.
The use of X-ray densitometry to measure the effects of air pollution on tree growth near Kitimat, British Columbia; in Proceedings of the International Conference on Air Pollution and Forestry, Marianske Lazne, Czechoslovakia, p. 185-204.
Region: **Kitimat, British Columbia.**
Application: **Tree growth and development.**
Techniques: **Damage effects (pollution), densitometry.**

424. **PARKER, M.L. and M. GEAST.** 1988.
August temperatures in central Canada estimated from tree-rings: Implications for the year without a summer; in International Meeting of The Year Without a Summer? Climate in 1816. Proceedings and Abstracts. National Museum of Natural Sciences, Ottawa, Canada, June 25-28, 1988.
Scope: **Focus.**
Region: **Central Canada.**
Species: **Softwoods, hardwoods.**
Application: **Dendroclimatology.**
Techniques: **Ring density.**
Comments: - Maximum tree-ring density was compared with August temperature for six regions in Canada, from the United States border to the northern treeline, and from the Rocky Mountains to the eastern shore of Hudson Bay.

425. **PARKER, M.L. and W. HENOCH.** 1969.
Preliminary report on dendrochronological investigations at Peyto Glacier, Alberta. Paper presented at the North Saskatchewan Headwaters Meeting, December 5, 1969, Ottawa.
Region: **Alberta.**
Application: **Dendrochronology, dendrogeomorphology.**

426. **PARKER, M.L. and W.E.S. HENOCH.** 1971.
The use of Engelmann Spruce latewood density for dendrochronological purposes. Canadian Journal of Forest Research 1: 90-98.
Scope: **Focus.**
Region: **Peyto Lake, Alberta.**
Species: ***Picea engelmannii.***
Application: **Dendrochronology, dendroclimatology.**
Techniques: **Crossdating, densitometry, ring width.**
Comments:
- Latewood density and ring width parameters are compared for their usefulness in dendrochronological and climatic studies.
- Maximum latewood density proved to be more useful for dendrochronological studies than ring width; latewood density was significantly correlated with mean maximum air temperature and monthly runoff during August for three rivers in the region near Peyto lake.

427. **PARKER, M.L., W.E.S. HENOCH and P.A. BRAMHALL.** 1977.
Tree-ring width and density related to climatic factors in the Yukon Territory. Canadian Forestry Service, Western Forest Products File Report.
Region: **Yukon.**
Application: **Dendroclimatology.**
Techniques: **Ring width, ring density.**

428. **PARKER, M.L., K. HUNT, W.G. WARREN and R.W. KENNEDY.** 1976.
Effect of thinning and fertilization on intra-ring characteristics and draft pulp yield of Douglas fir. Applied Polymer Symposium No. 28: 1075-1086.
Scope: **Component.**
Region: **Victoria, British Columbia.**
Species: ***Pseudotsuga menziesii.***
Application: **Ring characteristics, tree growth and development.**
Techniques: **Ring density, earlywood, latewood, ring width.**
Comments:
- Response of Douglas fir to urea fertilization and thinning were measured four years after treatment.
- Wood density was adversely affected by fertilization but not by thinning.
- Combined treatments exerted a partially additive effect on growth increment.
- Thinning effects alone resulted in increased increment although trees took longer to exhibit increased growth.

429. **PARKER, M.L. and L.A. JOZSA.** 1971.
Dendrochronological investigations along the Mackenzie, Liard and South Nahanni Rivers, Northwest Territories. Part I: Using tree damage to date landslides, ice jamming, and flooding; in Hydrologic Aspects of Northern Pipeline Development. Environmental-Social Committee, Northern Pipelines, Task Force on Northern Oil Development, Report No. 73-3. Technical Report 10: 313-324.
Scope: **Focus.**
Region: **Northwest Territories.**
Species: ***Picea glauca.***
Application: **Dendroclimatology, dendrogeomorphology.**
Techniques: **Crossdating, reaction wood, ring count, scarring.**

Comments: - Purpose of study is to provide data useful in planning of a proposed pipeline as weather records and other documents provide only short history of climate and geomorphic events.
- Wood samples are used to develop chronologies longer than one hundred years that are useful for determining the height and frequency of flooding, ice-jamming and slumping.

430. **PARKER, M.L. and L.A. JOZSA.** 1973.
X-ray scanning machine for tree-ring width and density analysis. Wood and Fiber 5: 192-197.
Region: **Canada.**
Application: **Analytical techniques and data acquisition.**
Techniques: **Densitometry, ring width.**

431. **PARKER, M.L. and L.A. JOZSA.** 1974.
Width and density chronologies of 1289 annual rings of a British Columbia Douglas fir tree. Unpublished report submitted to the Faculty of Forestry, University of British Columbia, 27p. Grant to Dr. J.H.G. Smith by British Columbia Forest Service 27p.
Region: **Vancouver, British Columbia.**
Species: ***Pseudotsuga menziesii.***
Application: **Dendrochronology.**
Techniques: **Densitometry, ring width.**

432. **PARKER, M.L. and L.A. JOZSA.** 1977.
What tree-rings tell us. Canadian Forestry Service, Forest Fact Sheet. 4 p.
Scope: **Focus.**
Region: **Canada.**
Application: **Dendrochronology, ring characteristics.**
Techniques: **Crossdating, damage effects, densitometry, increment coring, ring count, ring pattern, ring width.**
Comments: - Basic information on the structure of tree-rings, matching ring patterns, the development of dendrochronology, new methods and the uses of dendrochronology.

433. **PARKER, M.L. and L.A. JOZSA.** 1977.
Use of the on-line computer densitometer system to rapidly produce summary density profiles. Bi-Monthly Research Notes 33:13.
Application: **Analytical techniques and data acquisition.**
Techniques: **Computing, densitometry.**

434. **PARKER, M.L. and L.A. JOZSA.** 1980.
Talkative Tree-rings. News for you. Report No. SS-1004, 2p. Forintek Canada Corporation.
Region: **Canada.**
Techniques: **Review**

435. **PARKER, M.L., L.A. JOZSA, P.A. BRAMHALL, and S.G. JOHNSON.** 1981.
The effect of climatic variation in tree-rings of spruce from the western Canadian Boreal Forest; in Proceedings of Third Bioenergy R & D Seminar, Ottawa. March 24-25, 1981. p. 36-40.
Region: **Canada.**
Species: ***Picea* sp.**
Application: **Dendroclimatology.**

436. **PARKER, M.L., L.A. JOZSA and R.D. BRUCE.** 1973.
Dendrochronological investigations along the Mackenzie, Liard and South Nahanni Rivers, N.W.T. Part II: Using tree-ring analysis to reconstruct geomorphic and climatic history. Technical Report to Glaciology Division, Water Resources Branch, Department of the Environment, Under the Environmental-Social Program, Northern Pipelines. 104p.
Scope: **Focus.**
Region: **Northwest Territories.**
Species: ***Picea glauca.***
Application: **Dendroclimatology, dendrogeomorphology.**
Techniques: **Crossdating, densitometry, earlywood, latewood.**
Comments: - Part II of this study deals with climatic and geomorphic reconstruction.

437. **PARKER, M.L., L.A. JOZSA, S.G. JOHNSON, P.A. BRAMHALL and R.H. PARKER.** 1978.
1286-Year-Old Douglas fir wood from Vancouver Island submitted for radioscope analysis. File Report, Western Forest Products Laboratory, Vancouver, British Columbia 12 p.
Region: **Vancouver Island, British Columbia.**
Species: ***Pseudotsuga menziesii.***
Application: **Analytical techniques and data acquisition.**
Techniques: **Densitometry.**

438. **PARKER, M.L., L.A. JOZSA, S.G. JOHNSON and P.A. BRAMHALL.** 1981.
Dendrochronological studies on the coasts of James Bay and Hudson Bay. Part II: White spruce annual ring width and density chronologies from Great Whale River (Cri Lake). Syllogeus 33: 154-188.
Scope: **Focus.**
Region: **Great Whale River, Québec.**
Species: ***Picea glauca.***
Application: **Dendrochronology, dendroclimatology.**
Techniques: **Densitometry, ring width.**
Comments:
- Summary chronologies that can be compared with other forms of proxy data for purposes of reconstructing past climate.
- Information is given about the site and nature of the collection and about processing techniques used to obtain the data.

439. **PARKER, M.L., L.A. JOZSA, S.G. JOHNSON and P.A. BRAMHALL.** 1984.
Tree-ring dating in Canada and the northwest United States. Quaternary Dating Methods. W.C. Mahaney (Ed.). A.M. Dowden. 28 p.
Techniques: **Review.**

440. **PARKER, M.L. and K.R. MELESKIE.** 1970.
Preparation of X-ray negatives of tree-ring specimens for dendrochronological analysis. Tree-Ring Bulletin 30: 11-21.
Scope: **Focus.**
Region: **Canada.**
Application: **Analytical techniques and data acquisition.**
Techniques: **Densitometry, sample preparation and laboratory techniques.**
Comments:
- Techniques for producing X-ray negatives which enhance the quality of dendrochronological specimens have been developed at the Geological Survey of Canada and the Nondestructive Testing Laboratory, Mines Branch.
- The radiographs are produced to provide tree-ring density data to supplement ring-width measurements for dating and climatic studies.
- New specimen preparation techniques and X-ray methods are discussed.

441. **PARKER, M.L., J. SCHOORLEMMER and L.J. CARVER.** 1973.
A computerized scanning densitometer for automatic recording of tree-ring width and density data from X-ray negatives. Wood and Fiber 5: 237-248.
Application: **Analytical techniques and data acquisition.**
Techniques: **Densitometry, ring width.**

442. **PAYETTE, S.** 1976.
Succession écologique des forêts d'épinette blanche et fluctuations climatiques, Post-de-la-Baleine, Nouveau Québec. Canadian Journal of Botany 54: 1394-1402.
Scope: **Component.**
Region: **Post-de-la-Baleine, Québec.**
Species: ***Picea glauca.***
Application: **Dendrochronology, dendroclimatology, stand dynamics.**
Techniques: **Ring count, ring width.**
Comments:
- Stand structure of 3 white spruce climax forests is described.
- Forests were found to have similar structural patterns as shown by irregular variations in the number of individuals in specific age, diameter, and height classes.
- Sychronous variations between a 300-year dendrochronology and stand age-structure suggest that climate has strong influences on regeneration.

443. **PAYETTE, S.** 1980.
Les grandes crues glacielles de la riviére aux Feuilles (Nouveau-Québec): Une analyse dendrochronologique. Le Naturaliste canadien 107: 215-225.
Scope: **Component.**
Region: **Québec.**
Species: ***Larix* sp., *Picea mariana.***
Application: **Dendrochronology, dendroclimatology, dendrogeomorphology.**
Techniques: **Damage effects (geomorphic), ring width, scarring.**
Comments:
- Dendrochronological analysis of black spruce and tamarack populations yield information about the dates of major ice-flood events along the Leaf River from 1850.

444. **PAYETTE, S.** 1980.
Fire history at the treeline in Northern Québec: A paleoclimatic tool; in Proceedings of the Fire History Workshop, General Technical Report RM-81. Rocky Mountains Forest and Range Experimental Station Forest Service U.S. Department of Agriculture, Tucson, Arizona. p. 126-131.
Region: **Québec.**
Application: **Stand dynamics (fire history).**
Techniques: **Ring count.**

445. **PAYETTE, S.** 1987.
Recent porcupine expansion at tree line: a dendroecological analysis. Canadian Journal of Zoology 65: 551-557.
Scope: **Component.**
Region: **Richmond Gulf, Hudson Bay, Québec.**
Species: ***Picea glauca.***
Application: **Dendroclimatology, dendroecology.**
Techniques: **Damage effects (feeding scars).**
Comments:
- Presence and variation of porcupine populations was traced over the last century using dendrochronological dating of feeding scars found on trees and erect shrubs.

446. **PAYETTE, S. and L. FILION.** 1975.
Ecologie de la limite septentrionale des forêts maritimes, Baie d'Hudson, Nouveau-Québec. Le naturaliste canadien 102: 783-802.
Scope: **Component.**
Region: **Québec.**
Species: ***Picea glauca, Picea mariana.***
Application: **Stand dynamics (treeline), tree growth and development.**
Techniques: **Ring count, ring width.**
Comments:
- White spruce and black spruce stands and growth forms were mapped in detail; the ages of trees were determined through ring counts.
- Black spruce forms were found to be prostrated due to climatic exposure and excessive atmospheric moisture.
- Variation in percent cover, grouping and growth forms occurred over climatic gradients; white spruce disappeared with decreased temperatures.

447. **PAYETTE, S. and L. FILION.** 1985.
White spruce expansion at the tree line and recent climatic change. Canadian Journal of Forest Research 15: 241-251.
Scope: **Component.**
Region: **East coast of Hudson Bay, Québec.**
Species: ***Picea glauca.***
Application: **Dendroclimatology, stand dynamics, tree growth and development.**
Techniques: **Ring count, ring width.**
Comments:
- Short term dynamics of treeline and forest limit in relation to climatic change through altitudinal and latitudinal displacements.
- Investigates changes in population density of white spruce in relation to climatic variables.

448. **PAYETTE, S. and L. FILION.**
Analyse dendroclimatique d'un krummholz à la limite des arbres. Undated manuscript, Centre d'études nordiques, Université Laval, Sainte-Foy, Québec. (See Reference 160?)

Scope: **Focus.**
Region: **Québec.**
Species: ***Picea mariana.***
Application: **Dendrochronology, dendroclimatology.**
Techniques: **Crossdating, reaction wood, ring width.**
Comments:
- Using cross-dating and ring characteristics of living and dead spruce krummholz, a 500-year krummholz dendrochronological curve was constructed.
- Although most spruce died before the 20th century climatic warming, growth was perpetuated by vegetative reproduction in low lying branches of dying spruce.

449. **PAYETTE, S., L. FILION, A. DELWAIDE and C. BÉGIN.** 1989.
Reconstruction of tree-line vegetation response to long-term climatic change. Nature 341: 429-432.

Scope: **Component.**
Region: **Boniface River-Bush Lake area, Québec.**
Species: ***Picea mariana.***
Application: **Dendrochronology, dendroclimatology.**
Techniques: **Ring width.**
Comments:
- Reconstruction of wind-exposed, tree-line vegetation associated with long-term climate change in northern Canada, using tree-ring and growth-form analysis of spruce subfossils.
- Results suggest present development of low krummholz vegetation at sites is out of phase with 20th century warming trend and that vegetation response to global warming is not as straightforward as once thought.
- No evidence of positive vegetation response to present climatic warming is evident at exposed treeline sites.

450. **PAYETTE, S., L. FILION, L. GAUTHIER and Y. BOUTIN.** 1985.
Secular climate change in old-growth tree-line vegetation of northern Québec. Nature 315: 135-138.

Scope: **Component.**
Region: **Hudson Bay, northern Québec.**
Species: ***Picea mariana.***
Application: **Dendrochronology, dendroclimatology.**
Techniques: **Ring width.**
Comments:
- Evidence that marginal northern forests can persist through time and that successional processes in the absence of fire perpetuate lichen-spruce facies.
- This study developed the longest tree-ring chronology in eastern North America.

451. PAYETTE, S. and R. GAGNON. 1979.
Tree-line dynamics in Ungava Peninsula, northern Québec. Holarctic Ecology 2: 239-248.
Scope: **Incidental.**
Region: **Leaf River, Lake Minto, Québec.**
Species: ***Larix laricina, Picea mariana.***
Application: **Dendroclimatology, stand dynamics (treeline).**
Techniques: **Ring count.**
Comments:
- Preliminary interpretation of late Holocene tree-line fluctuations in continental Northern Québec based on radiocarbon dating of fossil trees, and on the age structure of tree populations.
- The northern limit of larch was found to coincide with natural limit of seed regeneration.
- Black spruce northern limit was probably determined by the limit of black spruce in a warmer period.

452. PEARCE, C.M., D. McLENNAN and L.D. CORDES. 1988.
The evolution and maintenance of white spruce woodlands on the Mackenzie Delta, N.W.T., Canada. Holarctic Ecology 11: 248-258.
Scope: **Component.**
Region: **Northwest Territories.**
Species: ***Picea glauca.***
Application: **Stand dynamics.**
Techniques: **Ring count.**
Comments:
- White spruce-tamarack/sphagnum (*Picea-Larix/Sphagnum*) woodlands on poorly-drained sites between elevated inactive point bar levees and white spruce/lichen-crowberry (*Picea/Clandina-Empetrum*) woodlands on the highest, most xeric sites of the delta plain are described.
- The ages of trees and shrubs were determined by coring of 525 trees and seedlings.

453. PEARMAN, G.I., R.J. FRANCEY and P.J.B. FRASER. 1976.
Climatic implications of stable carbon isotopes in tree-rings. Nature 260: 771-773.
Application: **Dendroclimatology.**
Techniques: **Isotopes (carbon).**

454. PERRY, D.A. 1977.
Oxygen isotope ratios in spruce cellulose. Science 266: 476-477.
Application: **Dendroclimatology.**
Techniques: **Isotopes (oxygen).**

455. PETERS, K., G.C. JACOBY and E.R. COOK. 1981.
Principal components analysis of tree-ring sites. Tree-Ring Bulletin 41: 1-19.
Application: **Analytical techniques and data acquisition.**
Techniques: **Computing.**

456. **PETERSON. E.B.** 1964.

Growth of Douglas fir planted on Prince Edward Island. Forestry Chronicle 40: 332-333.

Scope: **Component.**
Region: **Prince Edward Island.**
Species: ***Pseudotsuga menziesii.***
Application: **Tree growth and development.**
Techniques: **Ring width, ring count.**
Comments:
- Douglas fir seedlings from British Columbia placed in a Prince Edward island tree nursery transplant bed are examined after 24 years of growth in 1963.
- Growth of trees varied due to spacing arrangement at time of planting. Trees with the largest diameters have growth rings with a very thin and indistinct summerwood zone, in contrast to the normal marked summerwood band in mature wood of this species.
- Generally tree growth was favourable indicating adaptability of Douglas fir to an eastern Maritime climate.

457. **PETERSON, E.B., N.M. PETERSON and R.D. KABZEMS.** 1983.

Impact of climatic variation on biomass accumulation in the boreal forest zone: Selected references. Environment Canada, Canadian Forestry Service, Northern Forest Research Centre, Edmonton, Alberta. Information Report NOR-X-254.

Region: **Canada.**
Application: **Stand dynamics, tree growth and development.**

458. **PHIPPS, R.L.** 1967.

Annual growth of suppressed chestnut oak and red maple, a basis for hydrologic inference. United States Geological Survey, Professional Paper 485C p. 1-27.

Scope: **Focus.**
Region: **Neotoma, Ohio.**
Species: ***Acer rubra, Quercus prinus.***
Application: **Dendrohydrology.**
Techniques: **Ring width.**
Comments:
- Describes ring growth of 2 deciduous species from several positions along river.
- From data hypotheses are presented concerning various influences of hydrological environment on ring form and size.
- Ultimate objective is to establish hydrological conditions from tree growth record.

459. **PHIPPS, R.L.** 1972.

Tree-rings, stream runoff, and precipitation in central New York: A re-evaluation. United States Geological Survey, Professional Paper 800B, p. 259-264.

Region: **New York.**
Application: **Dendroclimatology, dendrohydrology.**

460. **PHIPPS, R.L. and G.C. WHITON.** 1988.
Decline in long-term growth trends of white oak. Canadian Journal of Forest Research 18: 24-32.
Scope: **Focus.**
Region: **Iowa, Missouri, Arkansas, Illinois, North Carolina, Ohio, Pennsylvania, New York, Conneticut, Kentucky, Tennessee.**
Species: ***Quercus alba.***
Application: **Dendrochronology, dendroclimatology.**
Techniques: **Damage effects (pollution) ring width.**
Comments:
- White oak growing in 89 locations in the United States were examined for growth decline initiated in the 1950's.
- Growth decline (defined as departure of actual growth below that expected) was identified in 40-60 of the sample sites from which the effects of site history were deemed insignificant.
- None of the growth decline which was expressed in terms of annual increments of cross-sectional area (BAI) could be related to tree age, geographic location, site characteristics, climatic trends or emissions of sulphur or nitrogen oxide.
- Concludes that there must have been events/conditions unique to the 1950's that initiated a growth rate change in about two-thirds of the white oak sampled.

461. **POLGE, H.** 1965.
Study of wood density variations by densitometric analysis of X-ray negatives of samples taken with a Pressler Auger. Paper presented to a meeting of I.U.F.R.O. (Section 41), Melbourne, 1965.
Scope: **Focus.**
Region: **France.**
Techniques: **Densitometry.**

462. **POLUNIN, N.** 1955.
Attempted dendrochronological dating of ice island T-3. Science 122: 1184-1186.
Scope: **Component.**
Region: **Ellesmere Island, Northwest Territories, Greenland.**
Species: ***Salix arctica.***
Application: **Dendrochronology, dendrogeomorphology.**
Techniques: **Ring count, ring width.**
Comments:
- Ice islands floating in the Arctic Ocean are dated using portions of arctic willow that probably washed down from the land when the ice island was attached as part of the shelf ice.
- Three studies were undertaken to determine the date of the most recent growth ring laid down among the material recovered on a floating ice island called T-3.

463. **POTTER, N., Jr.** 1969.
Tree-ring dating of snow avalanche tracks and the geomorphic activity of avalanches, Northern Absaroka Mountain, Wyoming. Geological Society of America Special Paper 123. p. 141-165.
Region: **Wyoming.**
Application: **Dendrogeomorphology.**

464. **POWELL, J.M.** 1981.
Impact of climatic variation on boreal forest biomass production. Syllogeus 33: 189-194.
Scope: **Component.**
Region: **North America.**
Species: ***Picea glauca.***
Application: **Dendroclimatology, tree growth and development.**
Techniques: **Densitometry, ring width.**
Comments:
- Determines the extent and degree of past short- and long-term climatic variation in selected regions of the Boreal Forest to assess impact of climatic change upon tree and forest growth.
- Establishes quantitative and qualitative relationships between key climatic parameters / climatic variations and measures of forest biomass growth and production in selected regions of the Boreal Forest.

465. **POWELL, L.B.** 1932.
Tree-rings and wheat yields in southern Saskatchewan. Monthly Weather Review 60: 220-221.
Region: **Saskatchewan.**
Application: **Dendroclimatology, tree growth and development.**

466. **PRESCOTT, C.E., J.P. CORBIN and D. PARKINSON.** 1989.
Biomass, productivity, and nutrient-use efficiency of above ground vegetation in four Rocky Mountain coniferous forests. Canadian Journal of Forest Research 19: 309-317.
Scope: **Component.**
Region: **Alberta.**
Species: ***Abies lasiocarpa, Picea contorta, Picea engelmannii, Picea glauca.***
Application: **Tree growth and development.**
Techniques: **Ring width.**
Comments:
- Above ground biomass, annual production, and internal nitrogen and phosphorus dynamics of vegetation were compared among four forests of different species and ages.
- Annual wood increment was taken for each species at each site and the mass of wood increment determined and use for biomass accumulation interpretation.

467. **PRUDEN, M.A., G.I. FRYER and E.A. JOHNSON.** 1987.
Fire frequency and old trees in the southern Canadian Rockies; in Proceedings of the International Symposium of Ecological Aspects of Tree-ring Analysis.August 17-21, 1986, Marymount College, Tarrytown, New York. G.C. Jacoby and J.W. Hornbeck (Eds.). p. 175-179.
Scope: **Focus.**
Region: **Kannanaskis Valley, Alberta.**
Species: ***Pinus contorta* var latifolia, *Pinus flexilis*.**
Application: **Stand dynamics (fire history).**
Techniques: **Ring count, scarring.**
Comments:
- Fire frequency data in the Kananaskis Valley area was collected from aerial photos, growth rings and fire scars.
- Problems with cross-dating decomposing wood limited the reconstruction of a master chronology back to 1730.

468. **PURCHASE, J.E. and G.H. LA ROI.** 1983.
Pinus banksiana forests of the Fort Vermillion area, northern Alberta. Canadian Journal of Botany 61: 804-824.
Scope: **Incidental.**
Region: **Fort Vermillion, Alberta.**
Species: ***Pinus banksiana*.**
Application: **Stand dynamics (fire history)**
Techniques: **Ring counts.**
Comments:
- Thirteen undisturbed *Pinus banksiana* forests on eutric brunisols, derived from dune sands in the Lower Peace River valley, were analyzed quantitatively for cover, succession, and dominance.
- Tree-ring counts established the age of forest stands.

469. **RAMPTON, V.** 1971.
Quaternary vegetational and climatic history of the Snag-Klutlan area, southwestern Yukon Territory, Canada. Geological Society of America Bulletin 82, p. 959-978
Scope: **Component.**
Region: **Yukon Territory.**
Species: ***Betula papyrifera, Picea glauca, Picea mariana, Populus tremuloides*.**
Application: **Dendroclimatology.**
Techniques: **Ring width.**
Comments:
- Characteristics of historical and present day vegetation in the Snag-Klutlan area include aging of forests useful for dendroclimatic interpretation.

470. **REEKS, W.A. and G.W. BARTER.** 1953.
Growth reduction and mortality of spruce caused by the European spruce sawfly. The Forestry Chronicle 27: 140-156.
Scope: **Component.**
Region: **New Brunswick, Québec.**
Species: ***Picea glauca, Picea mariana*.**
Application: **Tree growth and development.**
Techniques: **Damage effects (insect), ring width**

Comments:
- The characteristics and effects of defoliation of spruce by the sawfly are described and compared with those of the spruce budworm.
- Defoliation caused a gradual reduction in the width of the annual ring throughout the stem; the effect of feeding in one year was shown in the ring of the following year.
- Surviving trees showed as many as four completely missing rings in the lower stem as well as several partial rings. No rings were missing in the top part of the tree.

471. **REUDKEMA, D.L.** 1959.
Missing annual rings in branches of young-growth Douglas fir. Ecology 40: 480-482.
Scope: **Focus.**
Region: **McCleary, Washington.**
Species: ***Pseudotsuga menziesii.***
Application: **Ring characteristics, tree growth and development.**
Techniques: **Ring count.**
Comments:
- Lack of agreement between number of tree-rings in bases of live branches and in the stems during study of normal crown die-off in young-growth Douglas fir in summer and fall of 1956 is investigated.

472. **REYNOLDS, D.M.** 1976.
Determining frequency and magnitude of river ice jams and drives from botanical evidence. M.Sc. Thesis, Department of Geography, University of Calgary.
Application: **Dendrogeomorphology, dendrohydrology.**

473. **RICHARDS, J.H.** 1981.
Ecophysiology of a deciduous timberline tree, *Larix lyallii* Parl. Ph.D. Thesis, Department of Botany, University of Alberta, Edmonton, Alberta.
Scope: **Incidental.**
Region: **Marmot Creek Basin, Kananaskis Valley, Alberta.**
Species: ***Larix lyallii.***
Application: **Tree growth and development.**
Techniques: **Ring count.**

474. **RICHARDSON, R.J.** 1972.
A preliminary dendroclimatological study of the Inuvik area, Northwest Territories. B.Sc. Thesis, Department of Geological Sciences, Brock University, St. Catharines.
Scope: **Focus.**
Region: **Northwest Territories.**
Species: ***Larix laricina, Picea glauca, Picea mariana.***
Application: **Dendroclimatology.**
Techniques: **Densitometry, ring width, statistical methods.**
Comments:
- A 281 year chronological record from 1686-1967 was developed for the Inuvik area.
- Trees growing on bedrock produce the best climatic representation.

475. **RITTERS, R.H.** 1990.
A comparison of chronologies from tree-rings. Canadian Journal of Forest Research 20: 76-83.
Scope: **Focus.**
Region: **Fort Smith, Northwest Territories.**
Species: ***Pinus banksiana.***
Application: **Analytical techniques and data acquisition, dendrochronology.**
Techniques: **Ring width, statistical methods.**
Comments:
- 45-year ring width index chronologies were estimated by 5 mean-value functions applied to 183 ring width series from four similar sites near Fort Smith, Northwest Territories (see Sweda and Umemura, 1979).
- Effects of autocorrelation on the comparisons among mean-value functions were explored by fitting Box-Jenkins models to individual tree index series prior to pooling (prewhitening) and to the pooled chronologies obtained from mean value functions (postwhitening).

476. **RITCHIE, J.C. and F.K. HARE.** 1971.
Late Quaternary vegetation and climate near the Arctic tree line of northwestern North America. Quaternary Research 1: 331-342.
Scope: **Incidental.**
Region: **Northwestern Arctic.**
Species: ***Picea glauca.***
Application: **Dendroclimatology, stand dynamics (treeline).**
Techniques: **Ring width.**
Comments:
- Review of megafossil and palynological evidence from Alaska and Canada.
- New evidence of prolonged northward extension of the Boreal Forest into the Mackenzie Delta possibly resulting from changes in the atmospheric circulation causing warming.

477. **ROBERTSON, E.O. and L.A. JOZSA.** 1987.
Estimating tree growth from climate data for Douglas fir on Vancouver Island. Prepared for the Canadian Forestry Service. Report No. 87-04-55-12-003. 17p.
Region: **Vancouver Island, British Columbia.**
Species: ***Pseudotsuga menziesii.***
Application: **Dendroclimatology, tree growth and development.**

478. **ROBERTSON, E.O. and L.A. JOZSA.** 1988.
Climate reconstruction from tree-rings at Banff. Canadian Journal of Forest Research 18: 888-900.
Scope: **Focus.**
Region: **Alberta.**
Species: ***Pseudotsuga menziesii.***
Application: **Dendroclimatology.**
Techniques: **Densitometry, earlywood, latewood, ring width, statistical methods.**
Comments:
- Describes new techniques of tree-ring data preparation and data analysis for deriving proxy climate data from Douglas fir trees from the Canadian Rockies near Banff, Alberta.
- Twelve increment cores were used to develop a 429-year chronology from 1550 A.D.

479. **ROBERTSON, E.O., L.A. JOZSA and J.E. RICHARDS.** 1988.
Estimating Douglas fir wood production from soil and climate data. Prepared for the Canadian Forestry Service, Forintek Canada Corporation, Vancouver, British Columbia Report No. 55-12X-003. 33p.

Scope: **Focus.**
Region: **British Columbia.**
Species: ***Pseudotsuga menziesii.***
Application: **Dendroclimatology.**
Techniques: **Densitometry, earlywood, latewood, ring weight, ring width.**
Comments:
- Success of predicting tree growth from a water balance model for young forest-interior trees was examined.
- Wood productivity was analyzed through radial growth and wood quality was expressed through relative density and density range in the annual rings.
- Multiple regression equations derived for 70 year-old Douglas fir on xeric, submesic and subhygric sites on Vancouver Island, have linked individual tree-ring width and density variables directly to temperature and precipitation records to a highly significant degree.
- Excellent relationships were found between soil moisture deficits and tree radial growth; 50 per cent of the variance in annual ring weight of coastal Douglas fir is predictable from annual transpiration stresses.

480. **ROBERTSON, W.M.** 1926.
A simple incremeter. Forestry Chronicle 2: 16.

Scope: **Component.**
Region: **Canada.**
Species: **Softwoods.**
Application: **Analytical techniques and data acquisition, sampling techniques.**
Techniques: **Increment coring, ring count.**
Comments:
- Description of machine designed to remove large, solid, unbroken cores from large diameter trees for use in determining age and rate of growth.

481. **ROBERTSON, W.M.** 1927.
Investigation of rate of growth. Forestry Chronicle 3 (2): 1-2.

Scope: **Component.**
Region: **Canada.**
Application: **Analytical techniques and data acquisition, tree growth and development.**
Techniques: **Increment coring, ring width.**
Comments:
- Directs attention to methods of treatment required to produce optimum rate of growth.
- Increment borings are used for determining the future rate of tree growth from the width of the last 10-20 years growth increment.

482. ROBERTSON, W.M. 1928.
Methods for study of rate of growth. Forestry Chronicle 4.

Scope: **Component.**
Region: **Canada.**
Species: ***Picea* sp., *Populus* sp., *Picea rubens.***
Application: **Tree growth and development.**
Techniques: **Ring count, ring width.**
Comments:
- Tree-rings can be can be used to predict next decade of growth providing there is constant growth and mortality.
- Discusses Research Division of Forest Service of Canada survey into information on the growth conditions of timbered lands Canada.
- Periodic growth of boreal species for past 10 years was analyzed from increment measures and used to predict their future growth.

483. ROBERTSON, W.M. 1931.
Studying the growth of Canada's forests. Forestry Chronicle 7: 21-28.

Scope: **Component.**
Region: **Nova Scotia, New Brunswick, Québec, Ontario, Manitoba, Saskatchewan, Alberta, British Columbia.**
Species: ***Abies balsamea, Betula papyrifera, Balsam spruce, Picea mariana, Populus* sp.**
Application: **Tree growth and development.**
Techniques: **Ring count, ring width.**
Comments:
- A core holder improvised from a stick of hardwood about one-half-inch square by 3 inches long is presented.
- Devised as a convenient medium for reading growth rings for periods of 10 or 20 years.

484. ROSE, A.H. 1957.
A technique for differentiating annual rings in increment cores from diffuse porous woods. Forestry Chronicle 33: 139-140.

Scope: **Focus.**
Region: **Sault Ste. Marie, Ontario.**
Species: ***Populus tremuloides.***
Application: **Analytical techniques and data acquisition, sample preparation, sampling techniques.**
Techniques: **Ring width.**
Comments:
- Cores of porous wood like trembling aspen are rendered translucent by replacing air in wood with light oil.
- Samples are then examined immersed in oil under a low power microscope.
- This technique enhances the colour of latewood making the tree-ring sequences more distinguishable in the porous wood.
- An advantage of this sample preparation are that several cores can be treated at one time.

485. **ROSE, M.R.** 1983.
Time domain characteristics of tree-ring chronologies and eigenvector amplitude series from western North America. Technical Note Number 25. Laboratory of Tree-Ring Research, The University of Arizona, Tucson.
Region: **North America.**
Application: **Dendroclimatology.**

486. **RYDER, J.M. and B. THOMSON.** 1986.
Neoglaciation in the southern Coast Mountains of British Columbia: chronology prior to the late Neoglacial maximum. Canadian Journal of Earth Sciences 23: 273-287.
Scope: **Incidental.**
Region: **Coast Mountains, British Columbia.**
Species: ***Abies* sp., *Larix* sp., *Picea* sp., *Pinus albicaulis, Thuja plicata.***
Application: **Dendrogeomorphology.**
Techniques: **Isotopes (carbon).**
Comments:
- Moraine stratigraphy, morphology and radiocarbon dates of wood were used to construct a chronology of glacial fluctuation for the Coast Mountains area in British Columbia.

487. **SAUCHYN, M., J.S. GARDNER and R. SUFFLING.** 1983.
Evaluation of botanical methods of dating debris flows and debris flow hazard in the Canadian Rocky Mountains. Physical Geography 2: 182-201.
Scope: **Component.**
Region: **Canadian Rocky Mountains, British Columbia and Alberta.**
Species: ***Picea engelmannii, Picea glauca.***
Application: **Dendrogeomorphology.**
Techniques: **Scarring.**
Comments:
- Vegetation on debris flow deposits at several sites in the Rockies are examined.
- Spruce were aged by terminal bud scars.
- Older trees which required coring or disking were not used because it becomes increasingly difficult as trees grow larger to determine whether they actually colonized a deposit or were inundated by a shallow layer of debris and subsequently showed no evidence of damage.

488. **SCHAERER, P.A.** 1972.
Terrain and vegetation of snow avalanche sites at Rodger's Pass, British Columbia; in Mountain Geomorphology. O. Slaymaker and H.J. McPherson (Eds.). British Columbia Geographical Series, No. 14, p. 215-222.
Scope: **Component.**
Region: **Selkirk Mountains, British Columbia.**
Species: *Picea engelmannii, Thuja plicata, Tsuga heterophylla.*
Application: **Dendrogeomorphology.**
Techniques: **Damage effects (geomorphic), ring count.**

Comments: - Avalanche sites were found to be capable of being identified from features of terrain and vegetation.
- Frequency of avalanches were obtained from the inclination of the avalanche track, and the type and height of vegetation in the outrun zone.
- It is suggested that it may be possible to create general classifications of avalanche frequency, based this study's findings at Rogers Pass, that could be extended to Canada.

489. **SCHMIDT, R.L.** 1970.
A history of pre-settlement fires on Vancouver Island as determined from Douglas fir ages; in Tree-Ring Analysis with Special Reference to Northwest America, The University of British Columbia, Faculty of Forestry Bulletin No. 7, J.H.G. Smith and J. Worrall (Eds.)
Scope: **Focus.**
Region: **Vancouver Island, British Columbia.**
Species: ***Pseudotsuga menziesii.***
Application: **Stand dynamics (fire history).**
Techniques: **Ring count, ring pattern, scarring (fire).**
Comments: - Data on pre-settlement fires were obtained in connection with an ecological study in old-growth stands of coastal Douglas fir.
- Special emphasis was placed on investigating the date of stand origin and variations in spacial and temporal stand characteristics.
- Age of trees and fires was determined from fire scars and ring counts.

490. **SCHULMAN, E.** 1945.
Runoff histories in tree-rings on the Pacific Slope. Geographical Review 35: 59-73.
Scope: **Focus.**
Region: **British Columbia, Washington.**
Species: ***Pseudotsuga macrocarpa, Pseudotsuga menziesii.***
Application: **Dendrohydrology.**
Techniques: **Statistical methods.**
Comments: - The possibility of using ring width fluctuations to investigate fluctuations in past history of river runoff.
- 475-year index of trees in the Sierra Nevada and the Coast Ranges of California was developed.

491. **SCHULMAN, E.** 1947.
Dendrochronologies in southwestern Canada. Tree-Ring Bulletin 13: 7-15.
Scope: **Focus.**
Region: **Alberta, British Columbia.**
Species: ***Picea canadensis, Pinus contorta, Pinus ponderosa, Pseudotsuga taxifolia.***
Application: **Dendrochronology, dendroclimatology.**
Techniques: **Ring width.**
Comments: - Tree-ring collections for British Columbia and Alberta.
- Problems of locally absent ring, false annual rings and growth anomalies in tree-ring analysis are discussed.

492. **SCHULMAN, E.** 1956.
Dendroclimatic changes in semi-arid America. University of Arizona Press. 142p.
Application: **Dendroclimatology.**

493. **SCOTT, P.A., D.C.F. FAYLE, C.V. BENTLEY and R.I.C. HANSELL.** 1988.
Large-scale changes in atmospheric circulation interpreted from patterns of tree growth at Churchill, Manitoba, Canada. Arctic and Alpine Research 20: 199-211.

Scope: **Component.**
Region: **Churchill, Manitoba.**
Species: ***Larix laricina, Picea glauca.***
Application: **Dendroclimatology, dendrochronology.**
Techniques: **Ring width.**
Comments:
- The purposes of this Churchill, Manitoba study were:
  1. To develop a subset of breast height chronologies and compute a tree-ring index,
  2. To use the methods applied to the breast height chronologies to synthesize a growth index that would reflect changes of energy availability in the region on a large scale, and,
  3. To compare how both indices relate to possible fluctuations in the July position of the Arctic Front.
- The summer position of the Arctic Front was found to be close to the treeline; the Arctic air mass during July caused suppressed tree growth.
- Arctic Front dynamics result in a constant onshore wind that affects tree growth perpendicular to the coast.

494. **SCOTT, P.A., R.I.C. HANSELL and D.C.F. FAYLE.** 1987.
Establishment of white spruce populations and responses to climatic change at the treeline, Churchill, Manitoba, Canada. Arctic and Alpine Research 19: 45-51.

Scope: **Component.**
Region: **Churchill, Manitoba.**
Species: ***Picea glauca.***
Application: **Dendroclimatology, stand dynamics (treeline).**
Techniques: **Ring width.**
Comments:
- Development of open-forest and forest-tundra populations near Beech Bay, Manitoba.
- Examination of the initiation of treeline and the response of treeline to climatic changes during different stages of tree growth and development.

495. **SHARPE, J.F. and J.A. BRODIE.** 1927.
Regional growth and yield of spruce and jack pine stands in Ontario. Forestry Chronicle 3: 17.

Scope: **Component.**
Region: **Ontario.**
Species: ***Picea glauca, Picea mariana, Pinus banksiana.***
Application: **Stand dynamics.**
Techniques: **Ring count.**
Comments:
- Tree-ring groupings of 10 and 20 years are used to develop growth tables in different diameter classes of trees.
- Complete stem analysis of representative trees in each diameter class.

496. SHEA, S.R. and K.R. ARMSON. 1972.
Stem analysis of jack pine (*Pinus banksiana* Lamb.): Techniques and concepts. Canadian Journal of Forest Research 2: 392-406.
Scope: **Component.**
Region: **Ontario.**
Species: ***Pinus banksiana.***
Application: **Tree growth and development.**
Techniques: **Ring width.**
Comments:
- Stem analysis and volume increment parameters are analyzed with respect to the relationship of the amount of raw materials available to the tree for growth.

497. SHEPPARD, P.R. and G.C. JACOBY. 1989.
Application of tree-ring analysis to paleoseismology: Two case studies. Geology 17: 226-229.
Scope: **Focus.**
Region: **Cape Suckling, Alaska; Wrightwood, California.**
Species: **Softwoods.**
Application: **Dendrogeomorphology.**
Techniques: **Ring width.**
Comments:
- Two case studies show the impact of the 1964 Alaska earthquake on shoreline trees and how a previously unknown southern San Andreas fault earthquake was recorded in tree-rings.
- Growth reductions in Alaska were observed in trees following seismic activity; after the period of initial growth reduction trees responded with wider rings of reaction wood on their south sides in order to regain upright positions that were altered during the earthquake.
- Trees in California experiences drastic growth reductions in 1813; it took many years before the growth returned to normal.
- It is suggested that comparing species-specific chronologies between disturbed and undisturbed sites may yield useful paleoseismological data.

498. SHRIMPTON, D.M. and A.J. THOMSON. 1983.
Growth characteristics of lodgepole pine associated with the start of mountain pine beetle outbreaks. Canadian Journal of Forest Research 13: 137-144.
Scope: **Component.**
Region: **British Columbia.**
Species: ***Pinus contorta.***
Application: **Tree growth and development.**
Techniques: **Damage effects (insect), ring width.**
Comments:
- Growth characteristics and dynamics of tree and stand growth in response to infestation by mountain pine beetles.

499. SHRODER, J.F., Jr. 1980.
Dendrogeomorphology: review and new techniques of tree-ring dating. Progress in Physical Geography 4: 161-188.
Scope: **Focus.**
Region: **North America.**
Species: **Hardwoods, softwoods.**
Application: **Dendrogeomorphology.**
Techniques: **Sample preparation and laboratory techniques.**
Comments:
- Review of the use of tree-rings for dating of dendrogeomorphological processes.
- New techniques are discussed.

500. SINGH, T. 1985.
Recent climatic trends in the boreal forest. Natural Woodlands 8: 15.
Region: **Canada.**
Application: **Dendroclimatology.**

501. SINGH, T. and K.O. HIGGINBOTHAM. 1988.
An overview of the effects of climatic change and climatic variability on forest vegetation in western Canada; in The Impact of Climate Variability and Change on the Canadian Prairies: Symposium/Workshop Proceedings, Sept. 9-11, 1987. B.L. Magill and F. Geddes (Eds.). Alberta Environment, Edmonton, Alberta. p. 255-273.
Region: **Canada.**
Application: **Dendroclimatology.**

502. SINGH, T. and J.M. POWELL. 1986.
Climatic variation and trends in the boreal forest region of western Canada. Climatic Change 8: 267-278.
Application: **Dendroclimatology.**

503. SITNIKAITE, A. 1978.
[Dendroclimatochronology 1900-1970: a bibliography]. Dendroklimatokhronologiya 1900-1970: bibliograficheskii ukazetel. Vil'nyus, Lithuanian SSR; Tsentral'naya Biblioteka Akademii Nauk Litovskoi SSR. 284 p.
Scope: **Focus.**
Region: **Canada, World.**
Species: **Hardwood, softwood.**
Application: **Dendrochronology, dendroclimatology.**
Techniques: **Review.**
Comments:
- This report is a bibliography covering much of the literature produced from 1900-1970 on the topic of dendrochronology and dendroclimatology.
- Citations are classified under 17 subject headings with indices to author, general and geographical names.

504. **SMITH, J.H.G.** 1970.
Review of tree-ring analyses in British Columbia and "Where do we go from here?"; in Tree-Ring Analysis with Special Reference to Northwest America. University of British Columbia, Faculty of Forestry Bulletin 7, p. 109-125.
Scope: **Focus.**
Region: **British Columbia.**
Species: ***Abies grandis, Larix occidentalis, Picea engelmannii, Pinus contorta, Pinus monticola, Pinus ponderosa, Pinus strobus, Pseudotsuga menziesii, Thuja plicata, Tsuga heterophylla.***
Application: **Dendrochronology, dendroclimatology, tree growth and development.**
Techniques: **Densitometry, earlywood, latewood, ring count, ring width.**
Comments:
- Review of the background of tree-ring research carried out by the University of British Columbia since the early 1900's, covering aspects of climate, drought, geomorphology, fertilization effects, genetic variation, stocking, annual productivity of grasses and agricultural crops.
- The possibilities of future research into tree-rings are discussed.

505. **SMITH, J.H.G.** 1977.
Tree-ring analyses can be improved by measurement of component widths and densities. The Forestry Chronicle 53: 91-95.
Scope: **Focus.**
Region: **British Columbia, Canada.**
Application: **Analytical techniques and data acquisition.**
Techniques: **Densitometry, ring width.**
Comments:
- Measurement of component widths of annual rings by binocular microscope and of densities by X-ray methods have increased the accuracy of estimation of effects of various factors on tree growth.
- Sources of information and examples of uses of tree-ring analyses are discussed.
- Latewood and earlywood components of tree-rings are used to illustrate longterm trends and annual variations about them.

506. **SMITH, J.H.G.** 1980.
Influences of spacing on radial growth and percentage latewood of Douglas fir, western hemlock, and western red cedar. Canadian Journal of Forest Research 10: 169-175.
Scope: **Focus.**
Region: **Canada.**
Species: ***Pseudotsuga menziesii, Thuja plicata, Tsuga heterophylla.***
Application: **Tree growth and development.**
Techniques: **Earlywood, latewood, ring width.**
Comments:
- Variations in tree growth response and wood quality due to differential spacing.

507. **SMITH, J.H.G and M.B. CLARK.** 1974.
Results of methods of cutting and related studies initiated in Engelmann spruce subalpine fir forests near Bolean Lake, British Columbia in 1950. University of British Columbia Faculty of Forestry, Program Report E, p. 371.
Region: **British Columbia.**
Species: ***Picea engelmannii.***

508. **SMITH, J.H.G., D.J. COWN and M.L. PARKER.** 1976.
A comparison of X-ray densitometry and binocular microscope methods for measuring tree-ring components of Douglas fir. Faculty of Forestry, University of British Columbia, Vancouver, British Columbia.
Region: **British Columbia.**
Species: ***Pseudotsuga menziesii.***
Application: **Analytical techniques and data acquisition, ring characteristics.**
Techniques: **Densitometry.**

509. **SMITH, J.H.G., L. HEGER and J. HEJJAS.** 1966.
Patterns in growth of earlywood, latewood and percentage latewood determined by complete analysis of 18 Douglas fir trees. Canadian Journal of Botany 44: 453-466.
Scope: **Focus.**
Region: **British Columbia.**
Species: ***Pseudotsuga menziesii.***
Application: **Analytical techniques and data acquisition, ring characteristics.**
Techniques: **Earlywood, latewood,ring width, statistical methods.**
Comments:
- Analysis of width variation in early and latewood of 18 Douglas fir trees.
- Number of tree-rings from pith influences thickness of earlywood and latewood more than climatic differences in the same year.
- Earlywood and latewood controlled by different factors and should therefore be studied separately within annual ring.
- Statistical methods used provide simple, quick, and comprehensive basis for thorough description of growth patterns and for objective analysis of factors affecting growth.

510. **SMITH, D.G. and D.M. REYNOLDS.** 1983.
Tree scars to determine the frequency and stage of high magnitude river ice drives and jams, Red Deer, Alberta. Canadian Water Resources Journal 8: 77-94.
Scope: **Component.**
Region: **Red Deer, Alberta.**
Species: ***Picea* sp., *Populus* sp., *Salix* sp.**
Application: **Dendrogeomorphology, dendrohydrology.**
Techniques: **Ring count, scarring (ice).**
Comments:
- Age and heights of ice scars on river bank tree trunks were used to date the stage and frequency of ice drives and jams.
- Some trees had many scars at different heights therefore recording multiple events.
- Height and age data were then compared to hydrometric and historical record of ice drives and jams.
- Comparison suggests that by applying a correction factor using trees scars for this purpose has promise especially for ungauged rivers and for rivers without a long hydrologic record.

511. **SMITH, J.H.G. and J. WORRALL (Eds.).** 1970.
Tree-ring analysis with special reference to Northwest America. The University of British Columbia, Faculty of Forestry Bulletin No. 7.
Region: **North America.**
Techniques: **Review.**

512. **SMITH, M.W.** 1985.
Obtaining climatic information from tree-rings; in Our Geographic Mosaic: Research essays in honour of G.C. Merrill. D. Knight (Ed.), Carleton University Press. Ottawa, Ontario, Canada. p. 158-170.
Scope: **Focus.**
Region: **Mayo, Yukon.**
Species: ***Picea glauca, Picea mariana.***
Application: **Dendroclimatology.**
Techniques: **Ring density, ring width.**
Comments:
- Evaluation of relationships of ring width and density parameters with climate dates from meteorological sites.
- Results suggest that water stress may be important in this environment and that climate-tree growth relationships may vary spatially and over time.

513. **SONG, S.J.** 1982.
Climatic significance of hydrogen and oxygen isotopic ratios in tree-rings. Ph.D. Thesis, Department of Physics, University of Alberta, Edmonton, Alberta. 218 p.
Scope: **Focus.**
Region: **Alberta.**
Species: ***Picea glauca.***
Application: **Dendrochemistry, dendroclimatology.**
Techniques: **Isotopes (oxygen, and hydrogen).**
Comments:
- Thesis examines the possible use of hydrogen and oxygen isotopes preserved in tree-rings as paleo-temperature indicators.
- A new method of measuring isotopic ratios in organic compounds is presented.
- Isotopic concentrations are correlated with winter temperatures and negatively correlated with the amount of precipitation; the isotopic composition of soil water is the primary factor controlling isotopic compositions of tree-rings.
- Hydrogen isotope concentrations were found to be most representative of climatic temperatures during the life of the tree.

514. **SPITTLEHOUSE, D.L., T.A. BLACK and D.G. GILES.** 1988.
Year-to-year variation in water availability and tree growth; in Proceedings of IUFRO Workshop on Woody Plant Growth in a Changing Physical and Chemical Environment. D.P. Lavender, (Eds.), University of British Columbia, Faculty of Forestry.
Region: **Canada.**
Application: **Tree growth and development.**

515. **STENEKER, G.A.** 1967.
Growth of white spruce following release from trembling aspen. Canadian Forestry Branch Department Publication No. 1183.
Region: **Canada.**
Species: ***Picea glauca, Populus tremuloides.***
Application: **Tree growth and development.**

516. **STEUCEK, G.L. and R.M. KELLOGG.** 1972.
The influence of a stem discontinuity on xylem development in Norway Spruce, *Picea abies*. Canadian Journal of Forest Research 2: 217-222.
Scope: **Focus.**
Region: **Ontario.**
Species: ***Picea abies.***
Application: **Tree growth and development.**
Techniques: **Earlywood, latewood, ring width.**
Comments:
- Xylem development about a discontinuity in relation to the mechanistic hypothesis of stem form development.

517. **STOCKTON, C.W., W.R. BOGGESS and D.M. MEKO.** 1985.
Climate and Tree Rings; in Paleoclimate Analysis and Modelling. A.D. Hecht (Ed.). John Wiley and Sons, New York, p. 71-150.
Scope: **Focus.**
Region: **North America, World.**
Species: **Hardwoods, softwoods.**
Application: **Dendrochronology, dendroclimatology, dendrohydrology.**
Techniques: **Densitometry, earlywood, isotopes (carbon, hydrogen, oxygen) latewood, sample preparation and laboratory techniques.**
Comments:
- A review article that included input from researchers in addition to the compilers of the whole review that discusses worldwide tree-ring coverage and especially coverage in North America.
- Discusses site selection, sampling, dating, measuring, statistical treatment, standardization, chronology building, and the requirements for an adequate data base.

518. **STOCKTON, C.W. and W.R. BOGGS.** 1980.
Augmentation of hydraulic records using tree-ring improved hydrologic forecasting: Why and how; in Proceedings of the Engineering Foundation Conference, Pacific Grove, CAASCE. p. 239-265.
Application: **Dendrohydrology.**

519. **STOCKTON, C.W. and H.C. FRITTS.** 1971.
An empirical reconstruction of water levels for Lake Athabasca (1810-1967) by analysis of tree-rings. Laboratory of Tree-Ring Research, The University of Arizona. Tucson.
Region: **Alberta.**
Application: **Dendrohydrology.**

520. **STOCKTON, C.W. and H.C. FRITTS.** 1973.
Long-term reconstruction of water levels for Lake Athabasca by analysis of tree-rings. Water Resources Bulletin 9: 1006-1027.
Scope: **Focus.**
Region: **Lake Athabasca, Alberta.**
Species: ***Picea glauca.***
Application: **Dendroclimatology, dendrohydrology.**
Techniques: **Ring width.**

Comments: - Ring width chronologies for white spruce were calibrated with existing records of water levels from Lake Athabasca in hope that high calibrations would allow for the extrapolation of estimated water levels prior to existing records.

521. **STOCKTON, C.W. and G.C. JACOBY.** 1976.
Long-term surface water supply and streamflow levels in the upper Colorado River Basin. Lake Powell Research Project Bulletin, No. 18, Institute of Geophysics and Planetary Sciences, University of California at Los Angeles.
Region: **Colorado.**
Application: **Dendrohydrology.**

522. **STOKES, M.A., L.G. DREW and C.W. STOCKTON** (Eds.). 1973.
Tree-ring chronologies of western America I. Selected tree-ring stations. Chronology Series I. Laboratory of Tree-Ring Research, The University of Arizona.
Region: **North America.**

523. **STUDHALTER, R.A.** 1955.
Tree growth: some historical chapters. Botanical Review 21: 1-72.
Application: **Tree growth and development.**

524. **STUIVER, M. and R.L. BURK.** 1985.
Paleoclimatic studies using isotopes in trees; in Paleoclimate Analysis and Modelling. A.D. Hecht (Ed.). John Wiley and Sons, New York. p. 151-161.
Scope: **Focus.**
Region: **North America.**
Species: ***Pinus radiata.***
Application: **Dendroclimatology.**
Techniques: **Isotopes (carbon, hydrogen, oxygen).**
Comments:
- A summary of the relationships between carbon, hydrogen and oxygen isotopes and climate.
- Discusses the findings of numerous researchers from Tasmania, New Zealand, United States and Canada.
- Analytical methods of preparation for each isotope are presented.

525. **SWAINE, J.M., F.C. CRAIGHEAD and J.W. BAILEY.** 1924.
Studies on the spruce budworm *Cacoecia fumiferana* Clem. Canadian Department of Agriculture Technical Bulletin 37 (N.S.).
Application: **Dendroecology.**
Techniques: **Damage effects (insect).**

526. **SWEDA, T. and T. UMERMURA.** 1979.
Growth of even-aged jack pine stands. Department of Forestry, Nagoya University, Nagoya, Japan.
Scope: **Component.**
Region: **Fort Smith, Northwest Territories.**
Species: ***Pinus banksiana.***
Application: **Tree growth and development.**
Techniques: **Ring width.**

527. **SYLANDER, R.L.B. and J.H.G. SMITH.** 1973.
Widths and specific gravity of earlywood and latewood components of annual rings from Interior British Columbia lodgepole pine. University of British Columbia, Faculty of Forestry.
Region: **British Columbia.**
Species: ***Pinus contorta.***
Application: **Tree growth and development.**
Techniques: **Earlywood, latewood, ring width.**

528. **TANDE, G.F.** 1979.
Fire history and vegetation pattern of coniferous forests in Jasper National Park, Alberta. Canadian Journal of Botany 57: 1912-1931.
Scope: **Component.**
Region: **Jasper National Park, Alberta.**
Species: **Softwoods.**
Application: **Stand dynamics (fire history).**
Techniques: **Ring counts, scarring.**
Comments:
- Dated fire scars to identify the frequency of forest fires in Jasper National Park.

529. **TANS, P.O.** 1978.
Carbon 13 and carbon 14 in trees and the atmospheric CO_2 increase. Tellus 32: 268-283.
Techniques: **Isotopes (carbon).**

530. **TERASMAE, J.** 1970.
Review of tree-ring studies in Canada -- climatic changes, geological applications and future prospects; in Tree-Ring Analysis with Special Reference to Northwest America. J.H.G. Smith and J. Worrall (Eds.). The University of British Columbia, Faculty of Forestry, Bulletin No. 7, p. 82-85.
Scope: **Focus.**
Region: **Canada.**
Species: **Softwoods.**
Application: **Archeology, dendrochronology, dendroclimatology, dendrogeomorphology.**
Techniques: **Computing, crossdating, densitometry, ring pattern, ring width.**
Comments:
- Summary of the different tree-ring research carried out in Canada prior to 1970.
- The potential of tree-ring research as proxy climatic data inferences are discussed along with references to data gaps.

531. **TERASMAE, J.** 1975.
Dating of landslides in the Ottawa River Valley by dendrochronology - A brief comment; in Mass Wasting, 4th Guelph Symposium on Geomorphology. E. Yatsue, A.J. Ward and F. Dahms (Eds.). Geoabstracts, Norwich, p. 153-158.
Scope: **Focus.**
Region: **Ontario.**
Species: ***Pinus* sp., *Populus* sp.**
Application: **Dendrogeomorphology.**
Techniques: **Ring width.**

Comments: - General principles of using dendrochronology to date landslides are discussed using the 1957 Hawkesbury landslide as an example.

532. THOMAS, K.I. and R.E. WALL. 1986.
Stem pitting and annual ring discoloration in yellow birch. Canadian Journal of Botany 64: 2165-2167.
Scope: **Component.**
Region: **Fredericton, New Brunswick.**
Species: ***Betula alleghaniensis.***
Application: **Ring characteristics, tree growth and development.**
Comments: - Microscopic features of stem pitting and stained growth rings are described.

533. THOMPSON, D.C. 1989.
The effect of stand structure and stand density on the leaf area-sapwood area relationship of lodgepole pine. Canadian Journal of Forest Research 19: 392-396.
Scope: **Component.**
Region: **Northwest Montana.**
Species: ***Pinus contorta.***
Application: **Stand dynamics, tree growth and development.**
Techniques: **Ring area, ring width.**
Comments:
- Relationship of sapwood area to leaf area in lodgepole pine was examined across a variety of habitat types and stand densities in northwest Montana.
- No statistical differences were found between plots with regard to either habitat type or stand density. A nonlinear relationship was found between leaf area and sapwood area.
- Differences between dominant and subdominant trees appear to be related to ring width and its associated permeability.
- Differences in sapwood area-leaf area equations among different studies may be due in part to differences in stand structure.

534. THOMPSON, P. and J. GRAY. 1977.
Determination of $^{18}O/^{16}O$ ratios in compounds containing C, H and O. International Journal of Applied Radiation and Isotopes 28: 411-415.
Scope: **Incidental.**
Application: **Analytical techniques and data acquisition, dendrochemistry.**
Techniques: **Isotopes (oxygen), sample preparation and laboratory techniques.**
Comments: - A new, accurate, pyrolysis method of measuring oxygen isotopes in organic compounds is presented.

535. TIMMER, V.R. and B.R. VERCH. 1983.
SAPP: A computer program for plotting stem analysis. Forestry Chronicle 59: 298-303.
Scope: **Focus.**
Region: **Ontario, Canada.**
Species: ***Picea mariana.***
Application: **Analytical techniques and data acquisition, ring characteristics.**
Techniques: **Computing.**
Comments: - A report on a stem analysis plotting program (SAPP) specifically designed for automated tree-ring measurement and computer graphing facilities.

536. **VAN DEUSEN, P.C.** 1990.
A dynamic program for cross-dating tree-rings. Canadian Journal of Forest Research 20: (in press).
Scope: **Focus.**
Application: **Analytical techniques and data acquisition.**
Techniques: **Statistical methods.**

537. **VAN STONE, J.W.** 1958.
The origin of driftwood on Nunivak Island, Alaska. Tree-Ring Bulletin 22: 2-16.
Scope: **Focus.**
Region: **Alaska.**
Species: **Driftwood, *Picea* sp.**
Application: **Dendrohydrology.**
Techniques: Ring count.
Comments: - Driftwood logs were sampled in 1952 to determine the source of the spruce logs which have drifted ashore on Nunivak Island and to provide information to aid in the study of northern ocean currents.

538. **van EVERDINGEN, R.O. and H.D. ALLEN.** 1983.
Ground movements and dendrogeomorphology in a small icing area on the Alaska highway, Yukon, Canada; in Proceedings, Permafrost Fourth International Conference, National Academy of Sciences, Washington, p. 1292-1297.
Application: **Dendrogeomorphology.**

539. **VIERECK, L.A.** 1967.
Botanical dating of recent glacial activity in western North America; in Arctic and Alpine Environments 10, Proceedings VII INQUA Congress, Bloomington, Indiana University Press: 189-204.
Scope: **Component.**
Region: **Western North America, British Columbia, Alaska.**
Species: ***Picea glauca, Picea mariana, Picea sitchensis, Populus balsamifera.***
Application: **Dendroclimatology, dendrogeomorphology, glacier fluctuation.**
Techniques: **Ring counts, scarring.**
Comments: - Tree-ring analysis and lichen growth rates provide useful tools for dating glacial events during the past five centuries.

540. **VILLENEUVE, M., E.K. MORGENSTERN and L.P. SEBASTIAN.** 1987.
Variation patterns and age relationships of wood density in families of jack pine and black spruce. Canadian Journal of Forest Research 17: 1219-1222.
Scope: **Focus.**
Region: **Ontario.**
Species: ***Picea mariana, Pinus banksiana.***
Application: **Tree growth and development.**
Techniques: **Densitometry, ring width.**
Comments: - Variation in the wood density of black spruce and jack pine from pith to bark is analyzed.

541. **WALKER, D.A.** 1987.
Height and growth rings of *Salix lanata* ssp. *richardsonii* along the coastal temperature gradient of northern Alaska. Canadian Journal of Botany 65: 988-993.
Scope: **Component.**
Region: **Northern Alaska.**
Species: ***Salix lanata.***
Application: **Dendroclimatology, tree growth and development.**
Techniques: **Ring width.**
Comments:
- Height and growth rings of *Salix lanata* are measured along coastal temperature gradients.
- Results are related to recognizable vegetation zones along the coastal plain.

542. **WALTERS, J.** 1954.
A system of indirect control of the Douglas fir beetle. University of British Columbia, Faculty of Forestry, Research Paper No. 50, 15p.
Species: ***Pseudotsuga menziesii.***
Application: **Tree growth and development.**
Techniques: **Damage effects (insect).**

543. **WALTERS, J. and J. SOOS.** 1962.
The vertical and horizontal organization of growth in some conifers of British Columbia. University of British Columbia, Faculty of Forestry, Research Paper No. 51.
Region: **British Columbia.**
Species: **Softwoods.**
Application: **Tree growth and development.**

544. **WANG, E.I.C. and M.M. MICKO.** 1984.
Wood quality of white spruce from north-central Alberta. Canadian Journal of Forest Research 14: 181-185.
Scope: **Component.**
Region: **North-central Alberta.**
Species: ***Picea glauca.***
Application: **Tree growth and development.**
Techniques: **Ring width.**
Comments:
- Specific gravity and tracheid length of white spruce wood is investigated to establish trends of variation in these factors within individual trees from the ground to the crown, and from the pith to the periphery.

545. **WARREN, W.G.** 1980.
On removing the growth trend from dendrochronological data. Tree-Ring Bulletin 40: 35-44.
Scope: **Focus.**
Region: **Canada.**
Application: **Analytical techniques and data acquisition.**
Techniques: **Statistical methods.**

Comments:
- A new approach to removing the growth trend from dendrochronological data is described based on the assumption that the growth trend can be described by an expression of an exponential function.
- The function has the attributes of an increment function to which other components can be added to satisfy changes in growth due to release during the tree's history.
- It is suggested that this method may be superior to other alternative methods.

546. **WATSON, H.M.** 1983
A dendrochronological study of two sites in Mount Robson Provincial Park. B.A. Thesis, Department of Geography, University of Western Ontario, London. 147 p.

Scope: **Focus.**
Region: **Mount Robson Provincial Park, British Columbia.**
Species: ***Picea engelmannii.***
Application: **Dendrochronology, dendroclimatology**
Techniques: **Ring width**
Comments:
- Variation in ring width patterns of 60 cores from two sites in Mount Robson Provincial Park are examined and mean chronologies are developed.
- Periods of low growth are identified in the late 1600's and improved growth in the 1700's were observed for both sample sites.
- Data are compared and analyzed for use in interpretation of proxy climatic data.
- Results suggest that these chronologies have potential for environmental reconstruction but that their climatic signal is not as straightforward as that observed in dry climate sites.

547. **WATSON, H.M.** 1986.
Little Ice Age glacial fluctuations at five sites in the Premier Range, British Columbia. M.Sc. Thesis, Department of Geography, University of Western Ontario, London.

Scope: **Component.**
Region: **Premier Range, British Columbia.**
Application: **Dendroclimatology.**
Techniques: **Ring count.**
Comments:
- Dendrochronological and lichenometric techniques are utilized to construct a Holocene glacial chronology for five sites in the Premier Range, British Columbia.
- Minimum dates for moraines were established using tree-ring counts and a 15 year ecesis period.

548. **WELLWOOD, R.W. and J.H.G. SMITH.** 1962.
Variation in some important qualities of wood from young Douglas fir and hemlock trees. University of British Columbia, Faculty of Forestry, Research Paper No. 50.

Species: ***Pseudotsuga menziesii, Tsuga* sp.**
Techniques: **Wood characteristics.**

549. **WENDLAND, W.M.** 1975.
An objective method to identify missing or false rings. Tree-Ring Bulletin 35: 41-47.
Scope: **Focus.**
Comments:
- Describes a FORTRAN program which can identify false or missing rings from correlations between sequences of 10 or 20 rings.

550. **WEST, P.W.** 1980.
Use of diameter increment and basal area increment in tree growth studies. Canadian Journal of Forest Research 10: 71-77.
Scope: **Component.**
Region: **Southern Ontario, Tasmania.**
Species: ***Acer saccharum, Fraxinus americana, Prunus serotina.***
Application: **Tree growth and development.**
Techniques: **Ring width**
Comments:
- Methods for prediction of the future diameter of individual trees and regression relationships using diameter increment and basal area increment as dependent variables.
- The merits of using diameter increment and basal area increment in tree growth studies is discussed.

551. **WILSON, J.W.** 1964.
Annual growth of *Salix arctica* in the high Arctic. Annals of Botany 28: 71-76.
Scope: **Focus.**
Region: **Resolute, Cornwallis Island, Northwest Territories.**
Species: ***Salix arctica.***
Application: **Tree growth and development.**
Techniques: **Ring count.**
Comments:
- Study of dry weights and ages of 57 *Salix arctica* growing in high arctic.
- Results show that annual relative growth rate, which decreases with age, is about one-fifth of the annual relative growth rate of comparable plants under temperate temperature conditions.
- Data on thickness of annual rings indicate that there is a large and progressive increase in annual growth of *Salix* from the high Arctic to subarctic regions.

552. **WISEMAN, M.A., H.C. FRITTS and J. TERASMAE.** 1976.
Dendroclimatic inferences from Fort Chimo, northeastern Canada. American Quaternary Association, National Conference Abstracts 4: 165.
Region: **Fort Chimo, Canada.**
Application: **Dendroclimatology.**

553. **WILSON, A.T. and M.J. GRINSTED.** 1977.
$^{12}C/^{13}C$ in cellulose and lignin as palaeothermometers. Nature 265: 133-135.
Application: **Dendroclimatology.**

554. **WORRALL, J.** 1970.

Growth-ring analysis and dendrochronology; in Tree-Ring Analysis with Special Reference to Northwest America. University of British Columbia, Faculty of Forestry Bulletin No. 7. J.H.G. Smith and J. Worrall (Eds.)

Scope: **Focus.**
Region: **British Columbia.**
Species: ***Pseudotsuga menziesii, Thuja plicata.***
Application: **Ring characteristics**
Techniques: **Densitometry.**
Comments: - Review of the literature that develops methods for interpretation of intra-increment wood density measurements of hardness, surface texture and resistance to etching.

555. **YAMAGUCHI, D.K.** 1983.

New tree-ring dates for recent eruptions of Mount St. Helens. Quaternary Research 20: 246-250.

Scope: **Focus.**
Region: **Washington.**
Species: ***Psuedotsuga menziesii.***
Application: **Dendrochronology, dendroclimatology.**
Techniques: **Ring pattern, ring width.**
Comments: - Examines tree-rings and their usefulness in dating volcanic eruptions.

556. **YANG, K.C., C. BENSON and J. WONG.** 1986.

Distribution of juvenile wood in two stems of *Larix laricina*. Canadian Journal of Forest Research 16: 1041-1049.

Scope: **Focus.**
Region: **Thunder Bay, Ontario.**
Species: ***Larix laricina.***
Application: **Tree growth and development.**
Techniques: **Ring width.**
Comments: - Examines quantitative demarcations between juvenile and mature wood, vertical variation in the juvenile wood zone, and relationships between initial cambial age and the width of the juvenile wood zone.

557. **YANG, K.C. and G. HAZENBERG.** 1987.

Geographical variation in wood properties of *Larix laricina* juvenile wood in northern Ontario. Canadian Journal of Forest Research 17: 648-653.

Scope: **Component.**
Region: **Northern Ontario.**
Species: ***Larix laricina.***
Application: **Tree growth and development.**
Techniques: **Latewood, ring width.**
Comments: - Evaluation of the range of phenotypic variation of juvenile wood properties in *Larix laricina* as influenced by geographic locations, stands within locations, and individual trees in northern Ontario.

558. **YANOSKY, T.M. and C.J. ROBINOVE.** 1986.
Digital image measurement of the area and anatomical structure of tree rings. Canadian Journal of Botany 64: 2896-2902.
Scope: **Focus.**
Region: **Great Dismal Swamp, Virginia; Potomac River, Maryland.**
Species: ***Fraxinus pennsylvanica, Pinus taeda.***
Application: **Analytical techniques and data analysis, ring characteristics.**
Techniques: **Computing.**

559. **YAPP, C.J. and S. EPSTEIN.** 1977.
Climatic implications of D/H ratios of meteoric water over North America (9500-22 000 B.P.) as inferred from ancient wood cellulose C-H hydrogen. Earth and Planetary Science Letters 34: 333-350.
Application: **Dendroclimatology.**
Techniques: **Isotopes (hydrogen).**

560. **ZAHNER, R.** 1988.
A model for tree-ring time series to detect regional growth changes in young, even-aged forest stands. Tree-Ring Bulletin 48: 13-20.
Application: **Stand dynamics.**

561. **ZAHNER, R., J.R. SAUCIER and R.K. MYERS.** 1989.
Tree-ring model interprets growth decline in natural stands of loblolly pine in the southeastern United States. Canadian Journal of Forest Research 19: 612-621.
Scope: **Focus.**
Region: **Georgia, North Carolina, South Carolina.**
Species: ***Pinus taeda.***
Application: **Tree growth and development.**
Techniques: **Ring area, ring width.**
Comments:
- 131 stands of *Pinus taeda* were analyzed to reveal the cause of previously reported declines in radial growth using ring widths and ring area.
- Decreased growth was attributed to increased competition, regional drought and possibly atmospheric deposition.

SPECIES INDEX

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SECTION VI
CHRONOLOGY DATA BASE LISTING AND DATA BASE INDICES

CHRONOLOGY DATA BASE

1. Site name: 412-NOATAK.
   Province: Alaska.
   Latitude: 67° 56'N.
   Longitude: 162° 18'W.
   Species: *Picea glauca.*
   Collector: G. Jacoby.
   Chronology coverage: 1515-1977.
   Reference: Diaz (1985), L-DGO.

2. Site name: AKLAVIK.
   Province: Northwest Territories.
   Number of cores used: 12.
   Techniques: Maximum ring density, ring width.
   Form of data in publication: Binary tape.
   Reference: Forintek, National Archives.

3. Site name: ALASKA RANGE.
   Province: Alaska.
   Latitude: 64°N.
   Longitude: 146°-149°W.
   Species: *Picea* sp.
   Chronology coverage: 1540-1938.
   Reference: Giddings (1941).

4. Site name: ALASKAN NORTH SLOPE.
   Province: Alaska.
   Species: *Populus balsamifera.*
   Number of trees sampled: 16.
   Application: Dendroclimatology.
   Techniques: Ring width.
   Reference: Edwards and Dunwiddie (1985).

5. Site name: ALSEK DRIFTWOOD.
   Province: Yukon.
   Number of cores used: 33.
   Techniques: Maximum ring density, ring width.
   Form of data in publication: Binary tape.
   Reference: Clague et al. (1982), Forintek, National Archives.

6. Site name: ANNIE LAKE.
   Province: Yukon.
   Species: *Pinus contorta.*
   Latitude: 60° 19'N.
   Longitude: 134° 48'W.
   Collector: W.E.S. Henoch.
   Chronology coverage: 1750-1975.
   Reference: ITRDB No. 224.

7.	Site name:	ANVIK.
	Province:	Alaska.
	Latitude:	ca. 63°N.
	Longitude:	ca. 160°W.
	Species:	*Picea* sp.
	Date of sample collection:	Summer, 1948.
	Number of trees sampled:	6.
	Application:	Archaeology, dendroclimatology.
	Techniques:	Ring width.
	Chronology coverage:	1733-1947.
	Form of data in publication:	Table 2 (ring width).
	Reference:	Oswalt (1950).
8.	Site name:	APE LAKE.
	Province:	British Columbia.
	Latitude:	52° 05'N.
	Longitude:	128° 10'W.
	Elevation:	1400 m.
	Species:	*Abies lasiocarpa.*
	Collector:	J. Desloges and T. Millard.
	Chronology coverage:	1740-1983.
	Reference:	Desloges (1987).
9.	Site name:	ARCTIC RED RIVER.
	Province:	Yukon.
	Reference:	Forintek.
10.	Site name:	ARRIGETCH.
	Province:	Alaska.
	Latitude:	67° 27'N.
	Longitude:	154° 03'W.
	Species:	*Picea glauca.*
	Collector:	E. Cook.
	Chronology coverage:	1586-1975.
	Form of data in publication:	
	Reference:	LTRR, L-DGO.
11.	Site name:	ATHABASCA RIVER.
	Province:	Alberta.
	Latitude:	58° 22'N.
	Longitude:	111° 32'W.
	Elevation:	229 m.
	Species:	*Picea glauca.*
	Collector:	C. Stockton and T. Knowles.
	Techniques:	Ring width.
	Chronology coverage:	1708-1970.
	Form of data in publication:	Raw data in Drew (1975).
	Reference:	Diaz (1985), Drew (1975), TRL No. 120.
12.	Site name:	ATHABASCA RIVER.
	Province:	Alberta.
	Latitude:	58° 22'N.
	Longitude:	111° 32'W.
	Species:	*Picea glauca.*
	Collector:	T. Knowles.
	Chronology coverage:	1716-1970.
	Reference:	LTRR No. 119.

13. Site name: ATHADOME.
Province: Alberta.
Latitude: 52° 12'N.
Longitude: 117° 15'W.
Elevation: 2000 m.
Species: *Picea engelmannii.*
Collector: B.H. Luckman.
Date of sample collection: 1980-81.
Number of cores used: 20.
Techniques: Ring width.
Chronology coverage: 260 years.
Form of data in publication: Graph in Luckman (1989).
Reference: Colenutt (1988), Luckman et al. (1988).

14. Site name: BACKUS WOODS.
Province: Ontario.
Species: *Nyssa sylvatica.*
Number of trees sampled: 150.
Number of cores used: 146.
Application: Dendroclimatology, stand dynamics, tree growth and development.
Techniques: Ring width.
Chronology coverage: ca. 1705 - ca. 1982.
Reference: McCaw and Eckenwalder (1987).

15. Site name: BANFF.
Province: Alberta.
Latitude: 51° 11' 42"N.
Longitude: 115° 29' 32"W.
Elevation: 1430 m.
Species: *Pseudotsuga menziesii.*
Collector: L.A. Jozsa and N.B. Schultz.
Date of sample collection: September, 1979.
Number of trees sampled: 10.
Number of cores used: 20.
Application: Dendroclimatology.
Techniques: Ring width, density, volume; earlywood width, density and volume, latewood width, density and volume, maximum and minimum density.
Chronology coverage: 1550.-1978.
Reference: Jozsa and Oguss (1985), Robertson and Jozsa (1988).

16. Site name: BANFF.
Province: Alberta.
Latitude: 51° 12'N.
Longitude: 115° 30'W.
Species: *Pseudotsuga menziesii.*
Collector: E. Schulman.
Number of cores used: 33.
Chronology coverage: 1460-1950.
Reference: LTRR No. 132, Schulman (1952)

17. Site name: BARLOW DOME.
Province: Northwest Territories.
Latitude: 63° 49'N.
Longitude: 137° 32'W.
Elevation: 4100 m.
Species: *Picea glauca.*
Collector: M.L. Parker and H.C. Fritts.
Techniques: Ring width.
Chronology coverage: 1820-1966.
Form of data in publication: Raw data in Drew (1975).
Reference: Drew (1975), TRL No. 1688-1689.

18. Site name: BEAR LAKE.
Province: British Columbia.
Latitude: 54° 30'N.
Longitude: 122° 30'W.
Elevation: 990 m.
Species: *Picea glauca.*
Collector: F.H. Schweingruber.
Date of sample collection: 1984.
Techniques: Ring density, ring width.
Chronology coverage: 1794-1983.
Reference: K. Briffa, 1990, pers. comm..

19. Site name: BEAUTIFUL LAKE.
Species: *Picea glauca.*
Number of cores used: 24.
Techniques: Maximum ring density, ring width.
Chronology coverage: 1793-1981.
Form of data in publication: Binary tape.
Reference: Forintek, National Archives.

20. Site name: BEAVER GROUPS.
Province: Alaska
Latitude: 67°N.
Longitude: 147°W.
Species: *Picea* sp.
Chronology coverage: 1802-1941.
Reference: Giddings (1943).

21. Site name: BELL MOUNTAI'N.
Province: British Columbia.
Latitude: 53° 20'N.
Longitude: 120° 40'W.
Elevation: 1530 m.
Species: *Picea engelmannii.*
Collector: F.H. Schweingruber.
Date of sample collection: 1984.
Techniques: Ring density, ring width.
Chronology coverage: 1714-1983.
Reference: K. Briffa, 1990, pers. comm..

22.	Site name:	BENNINGTO'N.
	Province:	Alberta.
	Latitude:	52° 04' 20"N.
	Longitude:	118° 20' 05"W.
	Elevation:	1830-1990m
	Species:	*Pinus albicaulis.*
	Collector:	A. Beaudoin, B.H. Luckman, D.C. Luckman, D.P. McCarthy.
	Date of sample collection:	1982, 1986.
	Number of cores used:	(36 trees).
	Application:	Dendrochronology.
	Techniques:	Maximum ring density, ring width.
	Chronology coverage:	1112-1985.
	Reference:	Luckman et al. (1988).
23.	Site name:	BENNINGTO'N.
	Province:	Alberta.
	Latitude:	52° 42' 00"N.
	Longitude:	118° 20' 05"W.
	Elevation:	1765 m.
	Species:	*Picea engelmannii.*
	Collector:	B.H. Luckman and A. Beaudoin.
	Date of sample collection:	July 10, 19, 1982.
	Number of trees sampled:	20.
	Number of cores used:	34.
	Application:	Dendrochronology, dendroclimatology.
	Techniques:	Ring width.
	Chronology coverage:	1662-1981.
	Reference:	Colenutt (1988), Luckman et al. (1988), Watson (1983).
24.	Site name:	BIG BEND.
	Province:	Northwest Territories.
	Latitude:	66° 49'N.
	Longitude:	116° 04'W.
	Species:	*Picea glauca.*
	Chronology coverage:	1525-1977.
	Reference:	L-DGO.
25.	Site name:	BIRCHES GROUP.
	Province:	Alaska
	Latitude:	65'N.
	Longitude:	153'W.
	Species:	*Picea* sp.
	Chronology coverage:	1700-1941.
	Reference:	Giddings (1943).
26.	Site name:	BONIFACE RIVER-BUSH LAKE.
	Province:	Québec.
	Latitude:	57° 50'N.
	Longitude:	076° 00'W.
	Species:	*Picea mariana.*
	Techniques:	Ring width.
	Chronology coverage:	1305-1803.
	Reference:	Payette et al. (1989) Paper submitted to Nature.

27. Site name: BORDER BEACO'N.
Province: Newfoundland (Labrador).
Latitude: 55° 20'N.
Longitude: 063° 15'W.
Species: *Picea glauca.*
Collector: H.C. Fritts and H.E. Wright.
Chronology coverage: 1660-1974.
Reference: LTRR No. 939, Cropper and Fritts (1981), Hecht (1985), ITRDB No. 796.

28. Site name: BUGABOO GLACIER.
Province: British Columbia.
Latitude: 50° 54'N.
Longitude: 117° 47'W.
Species: *Picea engelmannii.*
Number of cores used: 21.
Techniques: Maximum ring density, ring width.
Chronology coverage: 1580-1976.
Form of data in publication: Binary tape.
Reference: Forintek, National Archives.

29. Site name: BULL CANYO'N.
Province: British Columbia.
Latitude: 52° 06'N.
Longitude: 123° 13'W.
Elevation: 750 m.
Species: *Pseudotsuga menziesii.*
Collector: J. Desloges and L. Davies.
Chronology coverage: 1650-1985.
Reference: Desloges (1987).

30. Site name: BULLION CREEK FILTER.
Province: Yukon.
Latitude: 61° 01'N.
Longitude: 138° 37'W.
Collector: H.C. Fritts, J. Look and M.L. Parker.
Chronology coverage: 1690-1966.
Reference: LTRR No. 1711.

31. Site name: BULLION CREEK.
Province: Yukon.
Latitude: 61° 01'N.
Longitude: 138° 37'W.
Elevation: 4850 m.
Species: *Picea glauca.*
Collector: M.L. Parker, H.C. Fritts and J. Look.
Techniques: Ring width.
Chronology coverage: 1690-1966.
Form of data in publication: Raw data in Drew (1975).
Reference: Diaz (1985), Drew (1975), TRL No. 1686-1687.

32. Site name: BURNT BRIDGE SLOPE.
Province: British Columbia.
Latitude: 52° 25'N.
Longitude: 128° 05'W.
Elevation: 155 m.
Species: *Pseudotsuga menziesii.*
Collector: J. Desloges and J. Wieniger.
Chronology coverage: 1705-1983.
Reference: Desloges (1987).

33. Site name: BURNT BRIDGE TERRACE.
Province: British Columbia.
Latitude: 52° 25'N.
Longitude: 128° 05'W.
Elevation: 150 m.
Species: *Pseudotsuga menziesii.*
Collector: J. Desloges and J. Wieniger.
Chronology coverage: 1704-1983.
Reference: Desloges (1987).

34. Site name: BUSH LAKE.
Province: Québec.
Latitude: 57° 47'N.
Longitude: 075° 45'W.
Species: *Picea mariana.*
Number of trees sampled: 26.
Number of cores used: 39.
Application: Dendroclimatology.
Techniques: Ring width.
Chronology coverage: 1398-1982.
Form of data in publication: Figure 4 (graph of mean ring width).
Reference: Payette et al. (1985).

35. Site name: BUSH LAKE.
Province: Québec.
Latitude: 57° 47'N.
Longitude: 75° 45'W.
Species: *Picea mariana.*
Number of trees sampled: 160.
Application: Dendroclimatology.
Techniques: Light rings.
Chronology coverage: 1398-1982.
Form of data in publication: Figure 3 (master chronology skeleton plot presenting critical years of light ring formation).
Reference: Filion et al. (1986).

36. Site name: CACHE CREEK.
Province: Alaska.
Species: *Populus balsamifera.*
Date of sample collection: July, 1983.
Number of trees sampled: 16.
Number of cores used: 36.
Application: Dendroclimatology.
Techniques: Ring width.
Chronology coverage: 1750-1982.
Reference: Dunwiddie and Edwards (1984).

37.	Site name:	CALLING LAKE.
	Province:	Alberta.
	Latitude:	55° 15'N.
	Longitude:	113° 30'W.
	Species:	*Picea glauca.*
	Collector:	M.L. Parker.
	Chronology coverage:	1801-1967.
	Reference:	LTRR No. 128.
38.	Site name:	CAMBRIDGE CREEK.
	Province:	British Columbia.
	Latitude:	49° 04'N.
	Longitude:	117° 45'W.
	Species:	*Larix occidentalis.*
	Collector:	C.A. Fox.
	Chronology coverage:	1849-1977.
	Reference:	LTRR No. 392.
39.	Site name:	CANTWELL.
	Province:	Alaska.
	Latitude:	63°N.
	Longitude:	149°W.
	Species:	*Picea glauca.*
	Chronology coverage:	1762-1952.
	Reference:	Oswalt (1958).
40.	Site name:	CANYON MOUNTAIN.
	Province:	Yukon.
	Latitude:	60° 40'N.
	Longitude:	136° 54'W.
	Species:	*Picea glauca.*
	Collector:	W.E.S. Henoch.
	Chronology coverage:	1750-1975.
	Reference:	Forintek, ITRDB No. 221.
41.	Site name:	CAPE DARBY.
	Province:	Alaska.
	Latitude:	ca. 64° 30'N.
	Longitude:	ca. 162° 30'W.
	Species:	*Picea glauca.*
	Date of sample collection:	July, 1950.
	Number of trees sampled:	8.
	Application:	Dendroclimatology.
	Techniques:	Ring width.
	Chronology coverage:	1718-1949.
	Form of data in publication:	Table 11 (ring width).
	Reference:	Giddings (1951).
42.	Site name:	CAPE DARBY.
	Province:	Alaska.
	Latitude:	65°N.
	Longitude:	163°W.
	Species:	*Picea* sp.
	Collector:	J. Giddings.
	Chronology coverage:	1527-1949.
	Reference:	LTRR, Giddings (1951).

43. Site name: CARIBOU HILLS.
Province: Northwest Territories.
Number of cores used: 22.
Techniques: Ring density, ring width.
Form of data in publication: Binary tape.
Reference: Forintek, National Archives.

44. Site name: CASSIAR HIGHWAY.
Province: British Columbia.
Latitude: 59° 05'N.
Longitude: 129° 55'W.
Elevation: 900 m.
Species: *Picea glauca.*
Collector: F. Schweingruber.
Date of sample collection: 1984.
Techniques: Ring density, ring width.
Chronology coverage: 1821-1983.
Reference: K. Briffa, 1990, pers. comm..

45. Site name: CAT TRACK.
Province: Yukon.
Latitude: 65° 57'N.
Longitude: 137° 15'W.
Species: *Picea glauca.*
Collector: E. Cook.
Chronology coverage: 1696-1975.
Reference: L-DGO, LTRR No. 1706.

46. Site name: CATHEDRAL MASSIF.
Province: British Columbia.
Latitude: 59° 20'N.
Longitude: 134° 04'W.
Species: *Abies lasiocarpa.*
Collector: J.B. Price.
Reference: LTRR No. 388.

47. Site name: CHANDALAR LAKE.
Province: Alaska.
Latitude: 67° 30'N.
Longitude: 148° 30'W.
Species: *Picea glauca.*
Chronology coverage: 1785-1962.
Reference: Blasing and Fritts (1975).

48. Site name: CHAPMAN LAKE FILTER.
Province: Yukon.
Latitude: 64° 51'N.
Longitude: 138° 19'W.
Species: *Picea glauca.*
Collector: H.C. Fritts, J. Look and M.L. Parker.
Chronology coverage: 1710-1966.
Reference: LTRR No. 1713.

49. Site name: CHAPMAN LAKE.
Province: Yukon.
Latitude: 64° 51'N.
Longitude: 138° 19'W.
Elevation: 1036 m.
Species: *Picea glauca.*
Collector: M.L. Parker and H.C. Fritts.
Techniques: Ring width.
Chronology coverage: 1710-1966.
Form of data in publication: Raw data in Drew (1975).
Reference: Drew (1975), LTRR No. 1699-1702.

50 .Site name: CHENAL DES QUATRE FOURCHES.
Province: Alberta.
Latitude: 58° 47'N.
Longitude: 111° 27'W.
Elevation: 700 m.
Species: *Picea glauca.*
Techniques: Ring width.
Chronology coverage: 1765-1970.
Form of data in publication: Raw data in Drew (1975).
Reference: LTRR No. 115-116, Drew (1975).

51. Site name: CHILKAT PASS.
Province: British Columbia.
Latitude: 59° 53'N.
Longitude: 136° 50'W.
Elevation: 780 m.
Species: *Picea glauca.*
Collector: F.H. Schweingruber.
Date of sample collection: 1984.
Techniques: Ring width, ring density.
Chronology coverage: 1807-1983.
Reference: K. Briffa, 1990, pers. comm..

52. Site name: CHITINA.
Province: Alaska.
Latitude: 61° 63'N.
Longitude: 144° 52'W.
Elevation: 610 m.
Species: *Picea* sp.
Collector: W.H. Oswalt.
Number of trees sampled: 10.
Application: Archaeology, dendroclimatology.
Techniques: Ring width.
Chronology coverage: 1723-1950.
Form of data in publication: Table 1 (raw data).
Reference: Oswalt (1952).

53. Site name: CHULITNA.
Province: Alaska.
Latitude: 63°N.
Longitude: 149°W.
Species: *Picea glauca.*
Chronology coverage: 1861-1952.
Reference: Oswalt (1958).

54. Site name: CHURCHILL RIVER.
Province: Manitoba.
Species: *Picea mariana.*
Number of cores used: 22.
Techniques: Maximum ring density, ring width.
Chronology coverage: 1870-1971.
Form of data in publication: Binary tape.
Reference: Forintek, National Archives.

55. Site name: CHURCHILL RIVER.
Province: Manitoba.
Species: *Picea glauca.*
Number of trees sampled: 7.
Number of cores used: 15.
Application: Dendrohydrology.
Techniques: Ring width.
Chronology coverage: 1680-1978.
Reference: Jacoby and Ulan (1982).

56. Site name: CHURCHILL.
Province: Manitoba.
Latitude: 58° 45'N.
Longitude: 94° 00'W.
Species: *Picea glauca.*
Number of trees sampled: 7.
Number of cores used: 15.
Techniques: Ring width.
Chronology coverage: 1680-1977.
Reference: Morin (1985).

57. Site name: CHURCHILL.
Province: Manitoba.
Species: *Larix laricina* (2), *Picea glauca* (11).
Date of sample collection: 1982, 1983.
Number of trees sampled: 13.
Application: Dendroclimatology.
Techniques: Ring width.
Chronology coverage: 1740-1982.
Form of data in publication: Raw data in the appendix of Scott et al. (1988).
Reference: Scott et al. (1988).

58. Site name: CHURCHILL.
Province: Manitoba.
Latitude: 58° 43'N.
Longitude: 94° 04'W.
Species: *Picea glauca.*
Chronology coverage: 1650-1978.
Reference: LTRR, L-DGO.

59. Site name: CIRCLE GROUP.
Province: Alaska.
Latitude: 66°N.
Longitude: 144°W.
Species: *Picea* sp.
Chronology coverage: 1740-1941.
Reference: Giddings (1943, 1953).

60.	Site name:	CLAIRE RIVER.
	Province:	Alberta.
	Latitude:	58° 53'N.
	Longitude:	111° 53'W.
	Elevation:	213 m.
	Species:	*Picea glauca.*
	Collector:	C.W. Stockton and T. Knowles.
	Techniques:	Ring width.
	Chronology coverage:	1760-1970.
	Form of data in publication:	Raw data in Drew (1975).
	Reference:	LTRR No. 117-118, Drew (1975), Stockton and Fritts (1971, 1973).
61.	Site name:	CLEARWATER LAKE.
	Province:	Québec.
	Latitude:	56° 30'N.
	Longitude:	75° 30'W.
	Species:	*Picea mariana.*
	Techniques:	Ring width.
	Chronology coverage:	1720-1982.
	Reference:	Begin et Payette (1988).
62.	Site name:	CLEARWATER LAKE.
	Province:	Québec.
	Latitude:	56° 30'N.
	Longitude:	75° 30'W.
	Species:	*Picea mariana.*
	Number of trees sampled:	19.
	Application:	Dendrohydrology.
	Techniques:	Ring width, scars (ice).
	Chronology coverage:	ca. 1630-1982.
	Form of data in publication:	Figure 2 (mean ring width), Figure 5 (ice scar occurrences).
	Reference:	Begin et Payette (1988).
63.	Site name:	CLEARY SUMMIT.
	Province:	Alaska.
	Latitude:	65°N.
	Longitude:	147°W.
	Species:	*Picea* sp.
	Chronology coverage:	1790-1938.
	Reference:	Giddings (1941).
64.	Site name:	COLUMBIA ICEFIELD.
	Province:	Alberta.
	Latitude:	52° 13' 30"N.
	Longitude:	117° 14' 12"W.
	Elevation:	1500-2075 m.
	Species:	*Picea engelmannii.*
	Collector:	L.A. Jozsa, S. Ulanski, B.H. Luckman.
	Date of sample collection:	July 21-28, 1982.
	Number of cores used:	36.
	Application:	Dendroclimatology.
	Techniques:	Ring density, ring width.
	Chronology coverage:	1323-1981.
	Form of data in publication:	Binary tape.
	Reference:	Forintek, Jozsa et al. (1983), National Archives.

65. Site name: COPPERMINE MTS.
Province: Northwest Territories.
Latitude: 67° 00'N.
Longitude: 115° 50'W.
Species: *Picea glauca.*
Collector: G. Jacoby.
Chronology coverage: 1433-1977.
Reference: LTRR.

66. Site name: COPPERMINE RIVER (several sites).
Province: Northwest Territories.
Latitude: 66°-68°N.
Longitude: 114°-117°W.
Species: *Picea glauca.*
Chronology coverage: 1340-1977.
Reference: L-DGO.

67. Site name: CORNWALL RIVER.
Province: Yukon.
Latitude: 66° 48'N.
Longitude: 136° 22'W.
Species: *Picea glauca.*
Chronology coverage: 1568-1987.
Reference: L-DGO.

68. Site name: CRI LAKE.
Province: Québec.
Latitude: 55° 20'N.
Longitude: 77° 40'W.
Species: *Picea glauca.*
Collector: M.L. Parker, L.A. Jozsa.
Number of cores used: 17.
Techniques: Maximum ring density, ring width.
Chronology coverage: 1700-1977.
Form of data in publication: Binary tape.
Reference: Forintek, National Archives, Parker et al. (1981).

69. Site name: CRI LAKE.
Province: Québec.
Latitude: ca. 55° 00'N.
Longitude: ca. 75° 50'W.
Species: *Picea glauca.*
Number of trees sampled: 32.
Number of cores used: 73.
Application: Dendroclimatology.
Techniques: Ring width, latewood density.
Chronology coverage: 1720-1982.
Reference: Jacoby et al (1988).

70. Site name: CRYSTALLINE CREEK.
Number of cores used: 26.
Techniques: Ring density, ring width.
Chronology coverage: 1750-1976.
Form of data in publication: Binary tape.
Reference: Forintek, National Archives.

71.	Site name:	CYPRESS HILLS.
	Province:	Alberta.
	Latitude:	51° 00'N.
	Longitude:	111° 00'W.
	Species:	*Picea glauca.*
	Collector:	M.L. Parker.
	Chronology coverage:	1870-1967.
	Reference:	TRL No. 129.
72.	Site name:	CYPRUS PROVINCIAL PARK.
	Province:	British Columbia.
	Latitude:	49° 25'N.
	Longitude:	123° 05'W.
	Elevation:	1110 m.
	Species:	*Tsuga heterophylla.*
	Collector:	F.H. Schweingruber.
	Date of sample collection:	1984.
	Techniques:	Ring density, ring width.
	Reference:	K. Briffa, 1990, pers. comm..
73.	Site name:	DAHL CREEK.
	Province:	Alaska.
	Latitude:	67°N.
	Longitude:	157°W.
	Species:	*Picea* sp.
	Chronology coverage:	1590-1940.
	Reference:	Giddings (1941).
74.	Site name:	DAWSON FIRE LOOKOUT.
	Province:	Yukon.
	Latitude:	64° 08'N.
	Longitude:	140° 35'W.
	Species:	*Picea glauca.*
	Collector:	M.L. Parker, H.C. Fritts and J. Look.
	Chronology coverage:	1790-1960.
	Reference:	Drew (1975).
75.	Site name:	DAWSON FIRE LOOKOUT.
	Province:	Yukon.
	Latitude:	64° 04'N.
	Longitude:	139° 20'W.
	Elevation:	1036 m.
	Species:	*Picea glauca.*
	Collector:	M.L. Parker and H.C. Fritts.
	Techniques:	Ring width.
	Chronology coverage:	1870-1966.
	Form of data in publication:	Raw data in Drew (1975).
	Reference:	LTRR No. 1692, Drew (1975).
76.	Site name:	DAWSON JUNCTION.
	Province:	Alaska.
	Latitude:	64° 10'N.
	Longitude:	141° 30'W.
	Species:	*Picea glauca.*
	Collector:	R.K. Haugen.
	Chronology coverage:	1443-1962.
	Reference:	Blasing and Fritts (1975).

77.	Site name:	DAWSON.
	Province:	Yukon.
	Species:	*Picea glauca.*
	Number of cores used:	8.
	Techniques:	Ring density, ring width.
	Form of data in publication:	Binary tape.
	Reference:	Forintek, National Archives.
78.	Site name:	DECOELI MOUNTAIN.
	Province:	Yukon.
	Latitude:	60° 50'N.
	Longitude:	137° 48'W.
	Species:	*Picea glauca.*
	Collector:	W.E.S. Henoch.
	Chronology coverage:	1860-1975.
	Reference:	ITRDB No. 225.
79.	Site name:	DECOELI MOUNTAIN.
	Province:	Yukon.
	Number of cores used:	21.
	Techniques:	Ring density, ring width.
	Form of data in publication:	Binary tape.
	Reference:	Forintek, National Archives.
80.	Site name:	DESULO LAKE.
	Province:	Newfoundland.
	Latitude:	56° 03'N.
	Longitude:	63° 48'W.
	Species:	*Picea glauca.*
	Reference:	in Hughes et al. (1982).
81.	Site name:	DOLOMITE LAKE.
	Province:	Northwest Territories.
	Species:	*Picea glauca.*
	Number of cores used:	21.
	Techniques:	Ring density, ring width.
	Form of data in publication:	Binary tape.
	Reference:	Forintek, National Archives.
82.	Site name:	DOLOMITE LAKE.
	Province:	Northwest Territories.
	Species:	*Larix laricina, Picea glauca, Picea mariana.*
	Collector:	R.J. Richardson.
	Application:	Dendroclimatology.
	Techniques:	Ring density, ring width.
	Chronology coverage:	1686-1967.
	Form of data in publication:	Graph in Richardson (1972).
	Reference:	Richardson (1972).

83. Site name: DONJEK RIVER BRIDGE.
Province: Yukon, Alaska.
Latitude: 61° 40'N.
Longitude: 139° 40'W.
Elevation: 750 m.
Species: *Picea glauca.*
Collector: F.H. Schweingruber.
Date of sample collection: 1984.
Techniques: Ring density, ring width.
Chronology coverage: 1768-1983.
Reference: K. Briffa, 1990, pers. comm..

84. Site name: DRIFTWOOD SERIES A.
Species: *Picea* sp.
Chronology coverage: 1500-1860.
Reference: Giddings (1941).

85. Site name: DRIFTWOOD SERIES B.
Species: *Picea* sp.
Chronology coverage: 1550-1849.
Reference: Giddings (1941).

86. Site name: DUBWANT LAKE.
Province: Northwest Territories.
Latitude: 63° 02'N.
Longitude: 100° 47'W.
Species: *Picea mariana.*
Number of trees sampled: 30.
Number of cores used: 60.
Application: Dendroclimatology.
Techniques: Ring width.
Chronology coverage: 1810-1974.
Form of data in publication: Figure 2 (graph of ring width).
Reference: Kay (1978).

87. Site name: DUBWANT RIVER.
Province: Northwest Territories.
Latitude: 62° 37'N.
Longitude: 101° 17'W.
Species: *Picea mariana.*
Chronology coverage: 1740-1974.
Reference: Kay (1978).

88. Site name: DWARF TREES (ICY BAY).
Province: Alaska.
Latitude: 60° 01'N.
Longitude: 141° 49'W.
Species: *Tsuga mertensiana, Tsuga heterophylla.*
Chronology coverage: 1100-1979.
Reference: Hughes et al (1982), L-DGO.

89. Site name: EAST NUSATSUM.
Province: British Columbia.
Latitude: 52° 13'N.
Longitude: 128° 17'W.
Species: *Abies lasiocarpa.*
Collector: J. Desloges and J. Wieniger.
Chronology coverage: 1711-1983.
Reference: Desloges (1987).

90. Site name: EDMONTON.
Province: Alberta.
Latitude: ca. 53° 00'N.
Longitude: ca. 113° 00'W.
Species: *Picea glauca.*
Number of trees sampled: 1.
Application: Dendroclimatology.
Techniques: Isotopes (oxygen).
Chronology coverage: 1882-1969.
Form of data in publication: Figure 2 (presents oxygen isotope ratios compared to mean annual temperature).
Reference: Gray and Thompson (1976).

91. Site name: EDMONTON.
Province: Alberta.
Species: *Picea glauca.*
Collector: J. Gray and P. Thompson.
Number of trees sampled: 1.
Application: Dendroclimatology.
Techniques: Isotopes (oxygen).
Chronology coverage: 1890-1968.
Reference: Gray and Thompson (1977).

92. Site name: ENNADAI LAKE (sev sites).
Province: Northwest Territories.
Latitude: 61° 00'N.
Longitude: 101° 00'W.
Species: *Picea mariana.*
Chronology coverage: 1793-1977.
Reference: Elliott (1979a) in Hughes et al. (1982).

93. Site name: ENNADAI LAKE (sev sites).
Province: Northwest Territories.
Latitude: 61° 00'N.
Longitude: 101° 00'W.
Species: *Picea glauca.*
Chronology coverage: 1814-1977.
Reference: Elliott (1979a) in Hughes et al. (1982).

94. Site name: ENNADAI LAKE (several sites).
Province: Northwest Territories.
Latitude: 61° 00'N.
Longitude: 101° 00'W.
Species: *Larix laricina.*
Chronology coverage: 1638-1977.
Reference: Elliott (1979a) in Hughes et al. (1982).

95. Site name: EUREKA.
Latitude: 62°N.
Longitude: 147°W.
Species: *Picea glauca.*
Chronology coverage: 1791-1952.
Reference: Oswalt (1958).

96. Site name: EXSHAW (merged).
Province: Alberta.
Latitude: 51° 07'N.
Longitude: 115° 22'W.
Species: *Pseudotsuga menziesii.*
Collector: M.L. Parker.
Chronology coverage: 1460-1965.
Reference: LTRR No. 114.

97. Site name: EXSHAW.
Province: Alberta.
Latitude: 51° 04'N.
Longitude: 115° 11'W.
Elevation: 1308 m.
Species: *Pseudotsuga menziesii.*
Collector: C.W. Ferguson and M.L. Parker.
Number of cores used: 20.
Techniques: Ring width.
Chronology coverage: 1560-1965.
Form of data in publication: Raw data in Drew (1975).
Reference: Drew (1975), LTRR No. 111-112.

98. Site name: FINNIE FLATS.
Province: Northwest Territories.
Latitude: 64° 09'N.
Longitude: 102° 35'W.
Species: *Picea glauca.*
Chronology coverage: 1516-1983.
Reference: L-DGO.

99. Site name: FIRST SPRUCE.
Province: Alaska.
Latitude: 68° 00'N.
Longitude: 168° 30'W.
Chronology coverage: 1700-1977.
Reference: LTRR.

100. Site name: FORT CHIMO 1-L.
Province: Québec.
Latitude: 58° 22'N.
Longitude: 68° 23'W.
Species: *Larix laricina.*
Chronology coverage: 1650-1974.
Reference: Cropper and Fritts (1981), Fritts (1976a).

101.	Site name:	FORT CHIMO.
	Province:	Québec.
	Latitude:	58° 22'N.
	Longitude:	68° 23'W.
	Collector:	H.C. Fritts.
	Chronology coverage:	1650-1974.
	Reference:	LTRR.
102.	Site name:	FORT MCPHERSON.
	Province:	Yukon.
	Number of cores used:	19.
	Techniques:	Ring density, ring width.
	Form of data in publication:	Binary tape.
	Reference:	Forintek, National Archives.
103.	Site name:	FORT NELSON.
	Province:	British Columbia.
	Latitude:	58° 20'N.
	Longitude:	122° 50'W.
	Elevation:	690 m.
	Species:	*Picea glauca.*
	Collector:	F.H. Schweingruber.
	Date of sample collection:	1984.
	Techniques:	Ring density, ring width.
	Chronology coverage:	1851-1983.
	Reference:	K. Briffa, 1990, pers. comm..
104.	Site name:	FORT RESOLUTION.
	Number of cores used:	18.
	Techniques:	Ring density, ring width.
	Form of data in publication:	Binary tape.
	Reference:	Forintek, National Archives.
105.	Site name:	FORT SIMPSON.
	Province:	Northwest Territories.
	Latitude:	61° 52'N.
	Longitude:	121° 23'W.
	Species:	*Picea glauca.*
	Number of trees sampled:	5.
	Application:	Dendrochemistry, densitometry.
	Chronology coverage:	1955-1980.
	Reference:	P.A. Eggington, pers. comm., 1989, Terrain Sciences Division, Government of Canada.
106.	Site name:	FORT SIMPSON.
	Province:	Northwest Territories.
	Latitude:	61° 52'N.
	Longitude:	121° 23'W.
	Species:	*Picea glauca.*
	Number of trees sampled:	5.
	Chronology coverage:	1934-1980.
	Reference:	P.A. Eggington, pers. comm., 1989, Terrain Sciences Division, Government of Canada.
107.	Site name:	FORT SIMPSON.
	Province:	Northwest Territories.
	Latitude:	61° 52'N.

	Longitude:	121° 23'W.
	Species:	*Picea glauca.*
	Number of trees sampled:	5.
	Application:	Dendrochemistry, densitometry.
	Chronology coverage:	1950-1980.
	Reference:	P.A. Eggington, pers. comm., 1989, Terrain Sciences Division, Government of Canada.
108.	Site name:	FORT VERMILLION.
	Province:	Alberta.
	Species:	*Picea glauca.*
	Number of cores used:	5.
	Techniques:	Maximum ring density, ring width.
	Chronology coverage:	1740-1979.
	Form of data in publication:	Binary tape.
	Reference:	Forintek, National Archives.
109.	Site name:	FORT YUKON-WHITE EYE.
	Province:	Alaska.
	Latitude:	66° 53'N.
	Longitude:	146° 13'W.
	Collector:	H.C. Fritts.
	Chronology coverage:	1720-1939.
	Reference:	LTRR.
110.	Site name:	FORT YUKON-WHITE EYE.
	Province:	Alaska.
	Latitude:	63-067'N.
	Longitude:	141-148'W.
	Chronology coverage:	1690-1939.
	Reference:	Giddings (1941).
111.	Site name:	FRANKLIN MT.
	Province:	Northwest Territories.
	Latitude:	65° 21'N.
	Longitude:	126° 42'W.
	Species:	*Picea glauca.*
	Chronology coverage:	1615-1983.
	Reference:	L-DGO.
112.	Site name:	FRASER RIVER BASIN.
	Province:	British Columbia.
	Latitude:	52° 00'N.
	Longitude:	122° 00'W.
	Species:	Conifer.
	Collector:	E. Schulman.
	Chronology coverage:	1420-1944.
	Reference:	LTRR No. 376.

113. Site name: FRASER RIVER.
Province: British Columbia.
Latitude: 51° 55'W.
Longitude: 121° 52'N.
Species: *Pinus ponderosa, Pseudotsuga menziesii.*
Number of trees sampled: 41.
Application: Dendroclimatology.
Chronology coverage: 1421-1940.
Reference: Schulman (1956).

114. Site name: FT. CHIMO 1-S.
Province: Québec.
Latitude: 58° 22'N.
Longitude: 68° 23'W.
Species: *Picea mariana.*
Reference: Fritts (1976a) in Hughes et al. (1982).

115. Site name: FT. CHIMO 2-L.
Province: Québec.
Latitude: 58° 22'N.
Longitude: 68° 23'W.
Species: *Larix laricina.*
Chronology coverage: 1753-1974.
Reference: Fritts (1976a), in Hughes et al. (1982).

116. Site name: FT. CHIMO 2-S.
Province: Québec.
Latitude: 58° 22'N.
Longitude: 68° 23'W.
Species: *Picea mariana.*
Chronology coverage: 1700-1974.
Reference: Fritts (1976a) in Hughes et al. (1982).

117. Site name: FT. CHIMO 3-L.
Province: Québec.
Latitude: 58° 22'N.
Longitude: 68° 23'W.
Species: *Larix laricina.*
Chronology coverage: 1677-1974.
Reference: Fritts (1976a), in Hughes et al. (1982).

118. Site name: FT. CHIMO 4-L.
Province: Québec.
Latitude: 58° 22'N.
Longitude: 68° 23'W.
Species: *Larix laricina.*
Chronology coverage: 1641-1974.
Reference: Fritts (1976a) in Hughes et al. (1982).

119. Site name: GAKONA.
Province: Alaska.
Latitude: ca. 62°N.
Longitude: ca. 145°W.
Elevation: 457 m.
Species: *Picea* sp.
Number of trees sampled: 7.
Application: Archaeology, dendroclimatology.
Techniques: Ring width.
Chronology coverage: 1780-1950.
Form of data in publication: Table 1 (raw ring width).
Reference: Oswalt (1952).

120. Site name: GANG RANCH.
Province: British Columbia.
Latitude: 51° 32'N.
Longitude: 122° 16'W.
Species: *Pseudotsuga menziesii.*
Number of cores used: 20.
Techniques: Maximum ring density, ring width.
Chronology coverage: 1590-1968.
Form of data in publication: Binary tape.
Reference: Forintek, National Archives.

121. Site name: GASPE.
Province: Québec.
Latitude: 48° 35'N.
Longitude: 65° 55'W.
Species: *Thuja occidentalis.*
Chronology coverage: 1404-1982.
Reference: L-DGO.

122. Site name: GLOBE CREEK BLUFF.
Province: Alaska.
Latitude: 65°N.
Longitude: 148°W.
Species: *Picea* sp.
Chronology coverage: 1640-1938.
Reference: Giddings (1941).

123. Site name: GNAT PASS.
Province: British Columbia.
Latitude: 58° 20'N.
Longitude: 129° 55'W.
Elevation: 1200 m.
Species: *Picea glauca.*
Collector: F.H. Schweingruber.
Date of sample collection: 1984.
Techniques: Ring density, ring width.
Reference: K. Briffa, 1990, pers. comm..

124. Site name: GOLD CREEK FILTER.
Province: Yukon.
Latitude: 64° 06'N.
Longitude: 140° 49'W.
Species: *Picea glauca.*
Collector: M.L. Parker, H.C. Fritts, J. Look.
Chronology coverage: 1750-1966.
Reference: LTRR No. 1712.

125. Site name: GOLD CREEK.
Province: Yukon.
Latitude: 64° 10'N.
Longitude: 140° 82'W.
Species: *Picea glauca.*
Collector: M.L. Parker, H.C. Fritts, J. Look.
Techniques: Ring width.
Chronology coverage: 1750-1966.
Form of data in publication: Raw data in Drew (1975).
Reference: LTRR, Drew (1975), TRL No. 1697, 1698, Blasing and Fritts (1976).

126. Site name: GORGE CREEK.
Province: British Columbia.
Latitude: 49° 05'N.
Longitude: 117° 43'W.
Species: *Larix occidentalis.*
Collector: C.A. Fox.
Chronology coverage: 1839-1977.
Reference: LTRR No. 395-397.

127. Site name: GOULET.
Province: Québec.
Latitude: ca. 056° 25'N.
Longitude: ca. 076° 25'W.
Species: *Picea glauca.*
Application: Dendroecology.
Techniques: Scars (feeding).
Chronology coverage: ca. 1720 - ca. 1982.
Form of data in publication: Figure 3 (graph of feeding scar frequency).
Reference: Payette (1987).

128. Site name: GRANDE RIVIERE DE LA BALEINE.
Province: Québec.
Latitude: 57° 50'N.
Longitude: 76° 00'W.
Species: *Picea mariana.*
Techniques: Ring width.
Chronology coverage: ca. 1305 - ca. 1803.
Reference: Payette et al. (1989) Submitted to Nature.

129. Site name: GRANDE RIVIERE DE LA BALEINE.
Province: Québec.
Latitude: 55° 17'N.
Longitude: 77° 47'W.
Species: *Picea glauca.*
Number of trees sampled: 305.
Application: Dendrogeomorphology.
Techniques: Reaction wood, ring width.
Chronology coverage: ca. 1640 - ca. 1986.
Reference: Begin and Filion (1988).

130. Site name: GREAT WHALE RIVER, HUDSON BAY.
Province: Québec.
Latitude: 55°N.
Longitude: 77°W.
Species: *Picea glauca* (16) and *Picea mariana* (22).
Collector: I. Hustich.
Date of sample collection: 1947.
Application: Dendroclimatology, stand dynamics, tree growth and development.
Chronology coverage: 1800-1946.
Reference: Hustich (1956).

131. Site name: GREAT WHALE RIVER.
Province: Québec.
Latitude: 55°N.
Longitude: 77°W.
Species: *Picea glauca, Picea mariana.*
Chronology coverage: 1765-1939.
Reference: Marr (1940).

132. Site name: GRONDINES--SAINTE-ANNE-DE-LA-PERADE.
Province: Québec.
Latitude: ca. 45° 07'N.
Longitude: ca. 71° 90'W.
Species: *Fraxinus pennsylvanica.*
Number of trees sampled: 22.
Application: Dendrogeomorphology, dendrohydrology.
Techniques: Ring width.
Chronology coverage: ca. 1916 - ca. 1986.
Form of data in publication: Figure 5 (graph of mean ring width).
Reference: Begin et Lavoie (1988).

133. Site name: GRONDINES--SAINTE-ANNE-DE-LA-PERADE.
Province: Québec.
Latitude: ca. 45° 07'N.
Longitude: ca. 71° 90'W.
Species: *Ulmus americana.*
Number of trees sampled: 6.
Application: Dendrogeomorphology, dendrohydrology.
Techniques: Ring width.
Chronology coverage: ca. 1943 - ca. 1986.
Form of data in publication: Figure 5 (graph of mean ring width).
Reference: Begin et Lavoie (1988).

134.	Site name:	GRONDINES-SAINTE-ANNE-DE-LA-PERADE.
	Province:	Québec.
	Latitude:	ca. 45° 07'N.
	Longitude:	ca. 71° 90'W.
	Species:	*Populus deltoides.*
	Number of trees sampled:	18.
	Application:	Dendrohydrology, dendrogeomorphology.
	Techniques:	Ring width.
	Chronology coverage:	ca. 1913 - ca. 1986.
	Form of data in publication:	Figure 5 (graph of mean ring width).
	Reference:	Begin et Lavoie (1988).
135.	Site name:	GULF HAZARD.
	Province:	Québec.
	Latitude:	56° 10'N.
	Longitude:	76° 34'W.
	Species:	*Picea glauca.*
	Collector:	G. Jacoby.
	Date of sample collection:	1977.
	Number of trees sampled:	13.
	Number of cores used:	27.
	Application:	Dendroclimatology.
	Techniques:	Ring width.
	Chronology coverage:	1681-1976.
	Form of data in publication:	Figure 2 (graph of ring width).
	Reference:	Jacoby (1983), LTRR No. 1409.
136.	Site name:	GULF HAZARD.
	Province:	Québec.
	Latitude:	56°N.
	Longitude:	76°W.
	Species:	*Picea glauca.*
	Chronology coverage:	1700-1939.
	Reference:	Marr (1940).
137.	Site name:	HAINES JUNCTION.
	Province:	Yukon.
	Latitude:	60° 46'N.
	Longitude:	137° 33'W.
	Species:	*Picea glauca.*
	Collector:	W.E.S. Henoch.
	Chronology coverage:	1840-1975.
	Reference:	ITRDB No. 220.
138.	Site name:	HANEY.
	Province:	British Columbia.
	Latitude:	49° 10'N.
	Longitude:	133° 30'W.
	Species:	*Pseudotsuga menziesii.*
	Number of cores used:	20.
	Techniques:	Maximum ring density, ring width.
	Chronology coverage:	1590-1975.
	Form of data in publication:	Binary tape.
	Reference:	Forintek, National Archives.

139. Site name: HANEY.
Province: British Columbia.
Latitude: 49° 10'N.
Longitude: 133° 30'W.
Elevation: 180 m.
Species: *Pseudotsuga menziesii.*
Date of sample collection: 1975-1976.
Number of trees sampled: 5.
Number of cores used: 5.
Application: Tree growth and development.
Techniques: Ring width.
Chronology coverage: 1963-1974.
Form of data in publication: Figure 4 (graph of ring width).
Reference: Cown and Parker (1979).

140. Site name: HAYCOCK.
Province: Alaska.
Latitude: 65° 10'N.
Longitude: 160° 50'W.
Species: *Picea* sp.
Collector: J. Giddings.
Chronology coverage: 1600-1939.
Reference: LTRR, Giddings (1941).

141. Site name: HERMANN'S CABIN.
Province: Alaska.
Latitude: 65° 20'N.
Longitude: 147° 30'W.
Species: *Picea glauca.*
Collector: R.K. Haugen.
Chronology coverage: 1750-1962.
Reference: LTRR, Blasing and Fritts (1975).

142. Site name: HERRING-ALPINE.
Province: Alaska.
Latitude: 60° 26'N.
Longitude: 147° 45'W.
Species: *Tsuga heterophylla.*
Chronology coverage: 1422-1972.
Reference: LTRR No. 42288C, Fritts (1976), Hecht (1985).

143. Site name: HESQUIAT.
Province: British Columbia.
Number of cores used: 19.
Techniques: Ring density, ring width.
Form of data in publication: Binary tape.
Reference: Forintek, National Archives.

144. Site name: HODGSON CREEK.
Province: Northwest Territories.
Number of cores used: 75.
Application: Dendrohydrology.
Techniques: Scars.
Chronology coverage: ca. 1767 - ca. 1977.
Reference: Egginton and Day (1977).

145. Site name: HOGATZA RIVER.
Province: Alaska.
Latitude: 67°N.
Longitude: 154°W.
Species: *Picea* sp.
Chronology coverage: 1640-1938.
Reference: Giddings (1941).

146. Site name: HOLY CROSS.
Province: Alaska.
Latitude: ca. 62°N.
Longitude: ca. 160°W.
Species: *Picea* sp.
Date of sample collection: Summer, 1948.
Number of trees sampled: 6.
Application: Archaeology, dendroclimatology.
Techniques: Ring width.
Chronology coverage: 1622-1947.
Form of data in publication: Table 2 (raw ring widths).
Reference: Oswalt (1950).

147. Site name: HOPE CREEK.
Latitude: 66°N.
Longitude: 146°W.
Species: *Picea* sp.
Chronology coverage: 1590-1939.
Reference: Giddings (1941).

148. Site name: HOPE CREEK.
Province: Alaska.
Latitude: 67°N.
Longitude: 159°W.
Species: *Picea* sp.
Chronology coverage: 1640-1940.
Reference: Giddings (1941).

149. Site name: HOPETOWN.
Province: Ontario.
Latitude: 45° 08'N.
Longitude: 76° 28'W.
Species: *Picea mariana.*
Techniques: Dendrochemistry, densitometry.
Chronology coverage: 1920-1979.
Reference: P.A. Eggington, pers. comm., 1989, Terrain Sciences Division, Government of Canada.

150. Site name: HORNBY CABIN.
Province: Northwest Territories.
Latitude: 64° 02'N.
Longitude: 103° 52'W.
Species: *Picea glauca.*
Chronology coverage: 1491-1983.
Reference: L-DGO.

151. Site name: HUNT RIVER.
Province: Alaska.
Latitude: 67° 15'N.
Longitude: 158° 65'W.
Collector: H.C. Fritts.
Chronology coverage: 1720-1940.
Reference: LTRR.

152. Site name: HUNT RIVER.
Province: Alaska.
Latitude: 67° 15'N.
Longitude: 158° 65'W.
Species: *Picea* sp.
Chronology coverage: 1640-1940.
Reference: Giddings (1941).

153. Site name: IRON LAKE.
Number of cores used: 20.
Techniques: Ring density, ring width.
Chronology coverage: 1710-1977.
Form of data in publication: Binary tape.
Reference: Forintek, National Archives.

154. Site name: JAKES CORNER.
Province: Yukon.
Latitude: 65° 25'N.
Longitude: 133° 45'W.
Elevation: 900 m.
Species: *Pinus contorta.*
Collector: F.H. Schweingruber.
Date of sample collection: 1984.
Techniques: Ring density, ring width.
Reference: K. Briffa, 1990, pers. comm..

155. Site name: JASPER.
Province: Alberta.
Latitude: 52° 54'N.
Longitude: 118° 04'W.
Species: *Pseudotsuga menziesii.*
Collector: E. Schulman.
Chronology coverage: 1537-1947.
Reference: LTRR No. 131.

156. Site name: JASPER.
Province: Alberta.
Latitude: 52° 54'N.
Longitude: 118° 04'W.
Species: *Pseudotsuga menziesii.*
Number of trees sampled: 8.
Application: Dendroclimatology.
Chronology coverage: 1541-1945.
Reference: Schulman (1956).

157. Site name: JUNEAU.
Species: *Tsuga* sp.
Reference: H. Posamentier, pers. comm., 1979, in Hughes et al. (1982).

158.	Site name:	KALTAG.
	Province:	Alaska.
	Latitude:	ca. 64°N.
	Longitude:	ca. 159°W.
	Species:	*Picea* sp.
	Date of sample collection:	Summer, 1948.
	Number of trees sampled:	6.
	Application:	Archaeology, dendroclimatology.
	Techniques:	Ring width.
	Chronology coverage:	1710-1947.
	Form of data in publication:	Table 2 (raw ring width).
	Reference:	Oswalt (1950).
159.	Site name:	KAMLOOPS.
	Province:	British Columbia.
	Latitude:	50° 45'N.
	Longitude:	120° 33'W.
	Elevation:	820 m.
	Species:	*Pseudotsuga menziesii.*
	Collector:	H.C. Fritts.
	Techniques:	Ring width.
	Chronology coverage:	1420-1965.
	Reference:	LTRR No. 387, Desloges (1987), ITRDB No. 343.
160.	Site name:	KAMLOOPS.
	Province:	British Columbia.
	Latitude:	50° 45'N.
	Longitude:	120° 33'W.
	Species:	*Pseudotsuga menziesii.*
	Collector:	H.C. Fritts.
	Chronology coverage:	1590-1965.
	Reference:	ITRDB No. 342.
161.	Site name:	KAMLOOPS.
	Province:	British Columbia.
	Latitude:	50° 45'N.
	Longitude:	120° 33'W.
	Species:	*Pseudotsuga menziesii.*
	Collector:	H.C. Fritts.
	Chronology coverage:	1505-1965.
	Reference:	LTRR No. 379, ITRDB No. 341.
162.	Site name:	KAMLOOPS.
	Province:	British Columbia.
	Latitude:	50° 45'N.
	Longitude:	120° 33'W.
	Elevation:	820 m.
	Species:	*Pseudotsuga menziesii.*
	Collector:	H.C. Fritts.
	Techniques:	Ring width.
	Chronology coverage:	1505-1965.
	Form of data in publication:	Raw data in Drew (1975).
	Reference:	Drew (1975), ITRDB No. 340.

163.	Site name:	KAMLOOPS.
	Province:	British Columbia.
	Latitude:	50° 45'N.
	Longitude:	120° 33'W.
	Species:	*Pinus ponderosa.*
	Chronology coverage:	1590-1960.
	Reference:	LTRR No. 337-338, ITRDB No. 437-438.
164.	Site name:	KAMLOOPS.
	Province:	British Columbia.
	Latitude:	50° 45'N.
	Longitude:	120° 33'W.
	Elevation:	820 m.
	Species:	*Pinus ponderosa.*
	Collector:	H.C. Fritts.
	Techniques:	Ring width.
	Chronology coverage:	1590-1965.
	Form of data in publication:	Raw data in Drew (1975).
	Reference:	Drew (1975).
165.	Site name:	KANANASKIS.
	Province:	Alberta.
	Latitude:	51° 15'N.
	Longitude:	115° 00'W.
	Species:	*Pseudotsuga menziesii.*
	Number of cores used:	16.
	Techniques:	Maximum ring density, ring width.
	Chronology coverage:	1630-1979.
	Form of data in publication:	Binary tape.
	Reference:	Forintek, National Archives.
166.	Site name:	KANANASKIS.
	Province:	Alberta.
	Species:	*Abies lasiocarpa, Picea* sp.
	Techniques:	Ring count.
	Reference:	R.S. Suffling, pers. comm., 1989, Faculty of Environmental Studies, University of Waterloo.
167.	Site name:	KASBA LAKE.
	Province:	Northwest Territories.
	Latitude:	60° 06'N.
	Longitude:	101° 53'W.
	Species:	*Picea mariana.*
	Chronology coverage:	1776-1977.
	Reference:	Elliott (1979).
168.	Site name:	
	Province:	Alaska.
	Latitude:	65°N.
	Longitude:	148°W.
	Species:	*Picea glauca.*
	Chronology coverage:	1768-1977.
	Reference:	Juday, 1979, pers. comm. in Hughes et al. (1982).

169. Site name:
Province: Alaska.
Latitude: 67°N.
Longitude: 144°W.
Species: *Populus balsamifera.*
Reference: Juday, 1979, pers. comm. in Hughes et al. (1982).

170. Site name: KATHLEEN LAKE.
Province: Yukon.
Latitude: 60° 25'N.
Longitude: 137° 10'W.
Elevation: 780 m.
Species: *Picea glauca.*
Collector: F.H. Schweingruber.
Date of sample collection: 1984.
Techniques: Ring density, ring width.
Chronology coverage: 1850-1983.
Reference: K. Briffa, 1990, pers. comm..

171. Site name: KENNEDY RIVER.
Province: British Columbia.
Latitude: 49° 10'N.
Longitude: 125° 15'W.
Elevation: 30 m.
Species: *Abies amabilis.*
Collector: F.H. Schweingruber.
Reference: K. Briffa, 1990, pers. comm..

172. Site name: KITIMAT.
Number of cores used: 30.
Techniques: Ring density, ring width.
Form of data in publication: Binary tape.
Reference: Forintek, National Archives.

173. Site name: KITIMAT.
Number of cores used: 36.
Techniques: Ring density, ring width.
Form of data in publication: Binary tape.
Reference: Forintek, National Archives.

174. Site name: KITWANGA.
Number of cores used: 14.
Techniques: Ring density, ring width.
Form of data in publication: Binary tape.
Reference: Forintek, National Archives.

175. Site name: KNOB LAKE.
Province: Québec.
Latitude: 55°N.
Longitude: 67°W.
Species: *Picea mariana.*
Chronology coverage: 1800-1946.
Reference: Hustich (1956).

176.	Site name:	KNOB LAKE.
	Province:	Québec.
	Latitude:	55°N.
	Longitude:	67°W.
	Species:	*Picea glauca.*
	Chronology coverage:	1800-1946.
	Reference:	Hustich (1956).
177.	Site name:	KOBUK RIVER-AMBER ISLAND.
	Chronology coverage:	1700-1760.
	Reference:	Giddings (1942).
178.	Site name:	KOBUZ-KOTZEBUE SERIES.
	Province:	Alaska.
	Species:	Driftwood, *Picea* sp.
	Date of sample collection:	Summer 1942, 1947.
	Application:	Archaeology.
	Techniques:	Ring width.
	Chronology coverage:	978-1947.
	Form of data in publication:	Table 1 (raw ring width in Giddings (1948)).
	Reference:	Giddings (1948).
179.	Site name:	KOKANEE GLACIER PROVINCIAL PARK.
	Province:	British Columbia.
	Latitude:	49° 47'N.
	Longitude:	117° 10'W.
	Species:	*Picea engelmannii.*
	Collector:	F.H. Schweingruber.
	Date of sample collection:	1984.
	Techniques:	Ring density, ring width.
	Chronology coverage:	1862-1983.
	Reference:	K. Briffa, 1990, pers. comm..
180.	Site name:	KOKRINES GROUP.
	Province:	Alaska.
	Latitude:	65°N.
	Longitude:	155°W.
	Species:	*Picea* sp.
	Chronology coverage:	1720-1941.
	Reference:	Giddings (1943).
181.	Site name:	KOOTENAI PASS.
	Chronology coverage:	1772-1983.
	Reference:	Forintek.
182.	Site name:	KOROC RIVER.
	Province:	Québec.
	Latitude:	58° 04'N.
	Longitude:	68° 02'W.
	Species:	*Picea mariana.*
	Chronology coverage:	1666-1978.
	Reference:	Elliott (1979), Elliot, 1980, pers. comm. in Hughes et al. (1982).

183.	Site name:	KOROC RIVER.
	Province:	Québec.
	Latitude:	58° 04'N.
	Longitude:	68° 02'W.
	Species:	*Larix laricina.*
	Chronology coverage:	1690-1978.
	Reference:	Elliott (1979), Elliot, 1980, pers. comm. in Hughes et al. (1982).
184.	Site name:	KOYUK (NORTON BAY) (comb.).
	Province:	Alaska.
	Latitude:	65°N.
	Longitude:	161°W.
	Species:	*Picea* sp.
	Chronology coverage:	1540-1940.
	Reference:	Giddings (1941).
185.	Site name:	KUUJJUAQ.
	Latitude:	58° 22'N.
	Longitude:	68° 23'W.
	Species:	*Larix laricina.*
	Techniques:	Ring width.
	Chronology coverage:	1650-1974.
	Reference:	Cropper and Fritts (1981).
186.	Site name:	KUUJJUARAPIK.
	Province:	Québec.
	Latitude:	55° 17'N.
	Longitude:	77° 46'W.
	Species:	*Larix laricina.*
	Techniques:	Ring width.
	Chronology coverage:	1710-1987.
	Reference:	Arquillier et al. (1989).
187.	Site name:	KUUJJUARAPIK.
	Province:	Québec.
	Latitude:	56° 17'N.
	Longitude:	77° 47'W.
	Species:	*Picea glauca.*
	Techniques:	Ring width.
	Chronology coverage:	1700-1977.
	Reference:	Parker et al. (1981).
188.	Site name:	KUUJJUARAPIK.
	Province:	Québec.
	Latitude:	56° 17'N.
	Longitude:	77° 47'W.
	Species:	*Picea glauca.*
	Techniques:	Ring width.
	Chronology coverage:	1657-1982.
	Reference:	Jacoby et al. (1988).
189.	Site name:	KWINKAGA.
	Number of cores used:	26.
	Techniques:	Ring density, ring width.
	Chronology coverage:	1846-1977.
	Reference:	Forintek, National Archives.

190. Site name: L'ANSE AUX MEADOWS (National Historical Park and area).
Province: Newfoundland.
Latitude: 51° 35'N.
Longitude: 55° 32'W.
Collector: K. Miller.
Techniques: Ring width.
Chronology coverage: < 200 years.
Reference: K. Miller (pers. comm., 1989).

191. Site name: LAC à L'EAU CLAIRE (Atlanson Island).
Province: Québec.
Latitude: 56° 08'N.
Longitude: 74° 31'W.
Species: *Larix laricina.*
Techniques: Ring width.
Chronology coverage: 1657-1982.
Reference: Jacoby (unpublished).

192. Site name: LAC à L'EAU CLAIRE (Foreurs Island).
Province: Québec.
Latitude: 56° 14'N.
Longitude: 74° 22'W.
Species: *Larix laricina.*
Techniques: Ring width.
Chronology coverage: 1703-1982.
Reference: Jacoby (unpublished).

193. Site name: LAC à L'EAU CLAIRE (Lepage Island).
Province: Québec.
Latitude: 56° 16'N.
Longitude: 74° 27'W.
Species: *Larix laricina.*
Techniques: Ring width.
Chronology coverage: 1670-1982.
Reference: Jacoby (unpublished).

194. Site name: LAC BUSH (Krummholz).
Province: Québec.
Latitude: 57° 47'N.
Longitude: 75° 45'W.
Species: *Picea mariana.*
Techniques: Ring width.
Chronology coverage: 1490-1982.
Form of data in publication: Figure 3 (graph in Filion et al. (1985)).
Reference: Payette et al. (1985).

195. Site name: LAC BUSH (forested site).
Province: Québec.
Latitude: 57° 47'N.
Longitude: 75° 45'W.
Species: *Picea mariana.*
Techniques: Ring width.
Chronology coverage: 1398-1982.
Form of data in publication: Figure 3 (graph in Filion et al. (1985)).
Reference: Payette et al. (1985).

196. Site name: LAKE BENIAH.
Province: Northwest Territories.
Latitude: 63° 29'N.
Longitude: 112° 17'W.
Elevation: 427 m.
Species: *Picea glauca.*
Collector: H.C. Fritts.
Techniques: Ring width.
Chronology coverage: 1747-1970.
Form of data in publication: Raw data in Drew (1975).
Reference: LTRR, Drew (1975).

197. Site name: LAKE DUPARQUET.
Province: Québec.
Latitude: 48° 26' - 48° 30'N.
Longitude: 79° 21' - 79° 13'W.
Species: *Thuja occidentalis.*
Chronology coverage: 802 years.
Form of data in publication: Absolute and indexed chronologies.
Reference: Archambault (1989), Archambault and Bergeron (1988), Bergeron and Archambault (1989).

198. Site name: LAKE LOUISE.
Province: Alberta.
Elevation: 1680 m.
Species: *Picea engelmannii.*
Collector: B.H. Luckman, L. Jozsa, G. Frazer, and J.P. Hamilton.
Date of sample collection: June, 1981.
Number of trees sampled: 3.
Number of cores used: 3.
Application: Dendroclimatology.
Techniques: Isotopes (oxygen).
Chronology coverage: 1921-1976.
Reference: Luckman et al. (1985).

199. Site name: LAKE LOUISE.
Province: Alberta.
Elevation: 1650 m.
Species: *Picea engelmannii.*
Collector: G. Frazer, P.J. Hamilton, L. Jozsa, and B.H. Luckman.
Date of sample collection: 1981, 1983.
Number of trees sampled: 12.
Number of cores used: 16.
Application: Dendroclimatology.
Techniques: Ring width, density and volume, earlywood width, density and volume, latewood width, density and volume.
Chronology coverage: 1690-1982.
Form of data in publication: Binary tape, index chronologies in Hamilton (1985). Ref.Luckman et al. (1985), National Archives.

200. Site name: LAKE SYLVA.
Province: Alaska.
Latitude: 67° 00'N.
Longitude: 148° 00'W.
Collector: L.B. Brubaker.
Chronology coverage: 1634-1977.
Reference: LTRR.

201. Site name: LARCH VALLEY.
Province: Alberta.
Latitude: 51° 20'N.
Longitude: 116° 13'W.
Elevation: 2200 m.
Species: *Larix lyallii.*
Collector: B.H. Luckman and M.E. Colenutt.
Date of sample collection: 1985-1987.
Number of cores used: 35.
Chronology coverage: 1536-1986.
Reference: Colenutt (1988).

202. Site name: LARCH VALLEY.
Province: Alberta.
Latitude: 51° 20'N.
Longitude: 116° 13'W.
Elevation: 2200 m.
Species: *Abies lasiocarpa.*
Collector: B.H. Luckman and M.E. Colenutt.
Date of sample collection: 1987.
Number of cores used: 22.
Chronology coverage: 1724-1986.
Reference: Colenutt (1988).

203. Site name: LARCH VALLEY.
Province: Alberta.
Latitude: 51° 20'N.
Longitude: 116° 13'W.
Elevation: 2200 m.
Species: *Picea engelmannii.*
Collector: B.H. Luckman and M.E. Colenutt.
Date of sample collection: 1987.
Number of cores used: 22.
Chronology coverage: 1638-1986.
Reference: Colenutt (1988).

204. Site name: LEAF RIVER.
Province: Québec.
Latitude: 58° 15'N.
Longitude: 72° 00'W.
Species: *Larix laricina, Picea mariana.*
Number of trees sampled: 150.
Application: Dendrohydrology.
Techniques: Compression wood, reaction wood, scars (ice).
Chronology coverage: 1850-1979.
Reference: Payette (1980).

205.	Site name:	LOWER GOLDSTREAM.
	Province:	Alaska.
	Latitude:	65°N.
	Longitude:	148°W.
	Species:	*Picea* sp.
	Chronology coverage:	1640-1938.
	Reference:	Giddings (1941).
206.	Site name:	MACK MT.
	Province:	Northwest Territories.
	Latitude:	65° 00'N.
	Longitude:	127° 50'W.
	Species:	*Picea glauca.*
	Chronology coverage:	1626-1983.
	Reference:	L-DGO.
207.	Site name:	MACKENZIE RIVER DELTA.
	Province:	Northwest Territories.
	Latitude:	67° 43' - 68° 25'N.
	Longitude:	134° 37' - 135° 23'W.
	Species:	*Picea glauca.*
	Collector:	J. Giddings.
	Date of sample collection:	Summer, 1946.
	Application:	Dendroclimatology.
	Techniques:	Ring width.
	Chronology coverage:	1357-1945.
	Form of data in publication:	Figure 1 (graph of ring width).
	Reference:	Giddings (1947).
208.	Site name:	MACKENZIE RIVER DELTA.
	Province:	Northwest Territories.
	Latitude:	68° 00'N.
	Longitude:	135° 00'W.
	Species:	*Picea glauca.*
	Collector:	J. Giddings.
	Techniques:	Ring width.
	Chronology coverage:	1700-1941.
	Form of data in publication:	Raw data in Drew (1975).
	Reference:	LTRR No. 1261, Drew (1975).
209.	Site name:	MACKENZIE RIVER DELTA.
	Province:	Northwest Territories.
	Latitude:	66° - 68°N.
	Longitude:	134° - 135°W.
	Species:	*Picea* sp.
	Chronology coverage:	1357-1945.
	Reference:	Giddings (1947).
210.	Site name:	MACKENZIE RIVER.
	Province:	Northwest Territories.
	Latitude:	68° 00'N.
	Longitude:	135° 00'W.
	Collector:	J. Giddings.
	Chronology coverage:	1700-1941.
	Reference:	LTRR.

211.	Site name:	MARSHALL.
	Province:	Alaska.
	Latitude:	ca. 65°N.
	Longitude:	ca. 162°W.
	Species:	*Picea* sp.
	Date of sample collection:	Summer, 1948.
	Number of trees sampled:	6.
	Application:	Archaeology, dendroclimatology.
	Techniques:	Ring width.
	Chronology coverage:	1703-1947.
	Form of data in publication:	Table 2 (raw ring widths).
	Reference:	Oswalt (1950).
212.	Site name:	MAYO.
	Province:	Yukon.
	Latitude:	63° 75'N.
	Longitude:	135° 50'W.
	Collector:	C. Burn.
	Number of cores used:	6.
	Techniques:	Ring density, ring width.
	Form of data in publication:	Binary tape.
	Reference:	Forintek, National Archives see smith and de Cuypere.
213.	Site name:	MCGRATH, KISKOKWIM GROUP.
	Province:	Alaska.
	Latitude:	63°N.
	Longitude:	156°W.
	Species:	*Picea* sp.
	Chronology coverage:	1700-1941.
	Reference:	Giddings (1943).
214.	Site name:	MCMILLAN PASS.
	Province:	Yukon.
	Latitude:	63° 11'N.
	Longitude:	130° 12'W.
	Species:	*Picea glauca*.
	Chronology coverage:	1494-1987.
	Reference:	L-DGO.
215.	Site name:	MECATINA.
	Latitude:	53°N.
	Longitude:	03°W.(sic.)
	Species:	*Picea mariana*.
	Chronology coverage:	1817-1946.
	Reference:	Hustich (1956).in Jacoby, 1982

216. Site name: MENASTA.
Province: Alaska.
Latitude: ca. 63°N.
Longitude: ca. 144°W.
Species: *Picea* sp.
Number of trees sampled: 7.
Application: Archaeology, dendroclimatology.
Techniques: Mean ring width.
Chronology coverage: 1755-1950.
Form of data in publication: Table 1 (mean ring widths).
Reference: Oswalt (1952).

217. Site name: MILEPOST 2.
Province: British Columbia.
Latitude: 51° 11'N.
Longitude: 115° 36'W.
Species: *Pseudotsuga menziesii.*
Collector: M.L. Parker.
Chronology coverage: 1730-1965.
Reference: LTRR No. 103.

218. Site name: MILEPOST 2.
Province: Alberta.
Latitude: 51° 18'N.
Longitude: 115° 60'W.
Collector: C.W. Ferguson.
Chronology coverage: 1730-1965.
Reference: LTRR.

219. Site name: MILL WOODS.
Province: Alberta.
Species: *Picea glauca.*
Number of trees sampled: 1.
Application: Dendroclimatology.
Techniques: Isotopes (oxygen).
Chronology coverage: 1905-1975.
Form of data in publication: Figure 1 (graph of deuterium values).
Reference: Gray and Song (1984).

220. Site name: MILL WOODS.
Province: Alberta.
Species: *Picea glauca.*
Number of trees sampled: 1.
Application: Dendroclimatology.
Techniques: Isotopes (oxygen).
Chronology coverage: 1903-1973.
Form of data in publication: Raw data in Appendix.
Reference: Song (1982).

221.	Site name:	MONTANA MOUNTAIN.
	Province:	Yukon.
	Latitude:	60° 06'N.
	Longitude:	134° 40'W.
	Species:	*Abies lasiocarpa.*
	Collector:	W.E.S. Henoch.
	Chronology coverage:	1820-1975.
	Form of data in publication:	
	Reference:	ITRDB No. 219.
222.	Site name:	MONTROSE.
	Province:	British Columbia.
	Latitude:	49° 05'N.
	Longitude:	117° 33'W.
	Species:	*Larix occidentalis.*
	Collector:	C.A. Fox.
	Chronology coverage:	1776-1977.
	Reference:	LTRR No. 393-394.
223.	Site name:	MOODY.
	Province:	Alaska.
	Latitude:	64°N.
	Longitude:	149°W.
	Species:	*Picea glauca.*
	Chronology coverage:	1840-1952.
	Reference:	Oswalt (1958).
224.	Site name:	MOOSE RIVER.
	Province:	Ontario.
	Latitude:	52°N.
	Longitude:	81°W.
	Species:	*Picea mariana.*
	Chronology coverage:	1800-1946.
	Reference:	Hustich (1956).
225.	Site name:	MOUNT FAIRPLAY.
	Province:	Alaska.
	Latitude:	63° 50'N.
	Longitude:	142° 00'W.
	Species:	*Picea glauca.*
	Collector:	R.K. Haugen.
	Chronology coverage:	1680-1962.
	Reference:	LTRR, Blasing and Fritts (1975).
226.	Site name:	MOUNT SHELDON.
	Province:	Yukon.
	Latitude:	62° 00'N.
	Longitude:	130° 00'W.
	Species:	*Abies lasiocarpa, Picea mariana.*
	Reference:	M. Noel, 1978, pers. comm. in Hughes et al. (1982).

227. Site name: NAIN FOREST A.
Province: Newfoundland (Labrador).
Latitude: 56° 33'N.
Longitude: 62° 00'W.
Species: *Picea glauca.*
Chronology coverage: 1802-1973.
Reference: Blasing and Fritts (1976), ITRDB No. 142.

228. Site name: NAIN FOREST B.
Province: Newfoundland (Labrador).
Latitude: 56° 33'N.
Longitude: 62° 00'W.
Species: *Picea glauca.*
Chronology coverage: 1769-1973.
Reference: Cropper and Fritts (1982), ITRDB No. 141.

229. Site name: NAPAKTOK BAYB.
Province: Newfoundland.
Latitude: 57° 56'N.
Longitude: 62° 35'W.
Species: *Picea glauca.*
Chronology coverage: 1781-1978.
Reference: D. Elliott, 1978, 1980, pers. comm. in Syllogeus 33.

230. Site name: NARAMATA.
Province: British Columbia.
Latitude: 49° 36'N.
Longitude: 119° 35'W.
Elevation: 610 m.
Species: *Pseudotsuga menziesii.*
Collector: C.W. Ferguson and M.L. Parker.
Techniques: Ring width.
Chronology coverage: 1770-1965.
Form of data in publication: Raw data in Drew (1975).
Reference: Drew (1975), ITRDB No. 344.

231. Site name: NARAMATA.
Province: British Columbia.
Latitude: 49° 36'N.
Longitude: 119° 35'W.
Elevation: 610 m.
Species: *Pinus ponderosa.*
Collector: C.W. Ferguson and M.L. Parker.
Techniques: Ring width.
Chronology coverage: 1500-1965.
Form of data in publication: Raw data in Drew (1975).
Reference: Drew (1975), ITRDB No. 345.

232. Site name: NARAMATA.
Province: British Columbia.
Latitude: 49° 36'N.
Longitude: 119° 35'W.
Species: *Pseudotsuga menziesii.*
Collector: M.L. Parker.
Chronology coverage: 1415-1965.
Reference: ITRDB No. 346.

233.	Site name:	NARRSSARSSUAQ (GREENLAND).
	Latitude:	61° 09'N.
	Longitude:	45° 02'W.
	Species:	*Betula pubescens.*
	Chronology coverage:	1870-1977.
	Form of data in publication:	
	Reference:	D.W. Lawson, 1980, pers. comm. in Hughes et al. (1982).

234.	Site name:	NIAGARA ESCARPMENT.
	Province:	Ontario.
	Latitude:	43° 00' - 46° 00'N.
	Longitude:	80° - 81°W.
	Species:	*Thuja occidentalis.*
	Form of data in publication:	Ring widths available on 3 and 1/2" diskettes.
	Reference:	D.W. Larson, (pers. comm., 1989), Department of Botony, University of Guelph, Ontario.

235.	Site name:	NICOL LAKE.
	Province:	Northwest Territories.
	Latitude:	61° 35'N.
	Longitude:	103° 29'W.
	Species:	*Picea mariana.*
	Number of trees sampled:	12.
	Number of cores used:	24.
	Application:	Dendroclimatology.
	Techniques:	Ring width.
	Chronology coverage:	1873-1974
	Form of data in publication:	Figure 2 (graph of ring widths).
	Reference:	Kay (1978).

236.	Site name:	NIMPKISH.
	Province:	British Columbia.
	Latitude:	50° 30'N.
	Longitude:	126° 40'W.
	Elevation:	160 m.
	Species:	*Pseudotsuga menziesii.*
	Date of sample collection:	1956-1957.
	Number of trees sampled:	5.
	Number of cores used:	5.
	Application:	Tree growth and development.
	Techniques:	Ring width.
	Chronology coverage:	1963-1974.
	Form of data in publication:	Figure 4 (graphs of ring widths).
	Reference:	Cown and Parker (1979).

237.	Site name:	(NO NAME GIVEN)
	Province:	Alaska.
	Latitude:	65° 00'N.
	Longitude:	148° 00'W.
	Species:	*Picea glauca.*
	Chronology coverage:	1768-1977.
	Reference:	G. Juday, 1979, pers. comm. in Syllogeus 33.

238.	Site name:	(NO NAME GIVEN).
	Province:	Alaska.
	Latitude:	67° 00'N.
	Longitude:	144° 00'W.
	Species:	*Picea mariana.*
	Chronology coverage:	1768-1977.
	Reference:	G. Juday, 1979, pers. comm. in Syllogeus 33.
239.	Site name:	(NO NAME GIVEN).
	Province:	Alaska.
	Latitude:	67° 00'N.
	Longitude:	144° 00'W.
	Species:	*Populus balsamifera.*
	Chronology coverage:	1768-1977.
	Reference:	G. Juday, 1979, pers. comm. in Syllogeus 33.
240.	Site name:	NOATAK (comb).
	Province:	Alaska.
	Species:	*Picea* sp.
	Chronology coverage:	1640-1940.
	Reference:	Giddings (1941).
241.	Site name:	NOONALK LAKES.
	Province:	British Columbia.
	Latitude:	52° 20'N.
	Longitude:	128° 38'W.
	Elevation:	1440 m.
	Species:	*Abies lasiocarpa.*
	Collector:	J. Desloges and J. Wieniger.
	Chronology coverage:	1871-1983.
	Reference:	Desloges (1987).
242.	Site name:	NULATO GROUP.
	Province:	Alaska.
	Latitude:	65°N.
	Longitude:	158°W.
	Species:	*Picea* sp.
	Chronology coverage:	1700-1941.
	Reference:	Giddings (1943, 1953).
243.	Site name:	NULATO.
	Province:	Alaska.
	Latitude:	ca. 65°N.
	Longitude:	ca. 158°W.
	Species:	*Picea* sp.
	Date of sample collection:	Summer, 1948.
	Number of trees sampled:	6.
	Application:	Archaeology, dendroclimatology.
	Techniques:	Ring width.
	Chronology coverage:	1597-1947.
	Form of data in publication:	Table 2 (ring widths).
	Reference:	Oswalt (1950).

244.	Site name:	NUNGUNSAW PASS.
	Province:	British Columbia.
	Latitude:	56° 55'N.
	Longitude:	130° 05'W.
	Elevation:	45 m.
	Species:	*Picea glauca.*
	Collector:	F.H. Schweingruber.
	Date of sample collection:	1984.
	Techniques:	Ring density, ring width.
	Chronology coverage:	1725-1983.
	Reference:	K. Briffa, 1990, pers. comm..
245.	Site name:	NUNIVAK ISLAND.
	Province:	Alaska.
	Species:	Driftwood, *Picea* sp.
	Application:	Dendrohydrology.
	Techniques:	Ring width.
	Chronology coverage:	1735-1929.
	Form of data in publication:	Table 1 (ring widths).
	Reference:	Van Stone (1958).
246.	Site name:	OKAK BAY AREA.
	Province:	Newfoundland.
	Latitude:	57° 00'N.
	Longitude:	62° 00'W.
	Species:	*Larix laricina, Picea glauca.*
	Reference:	D. Elliott, 1980, pers. comm. in Hughes et al. (1982).
247.	Site name:	OLD LARCH A.
	Species:	*Larix lyallii.*
	Number of cores used:	34.
	Chronology coverage:	1820-1986.
	Reference:	Colenutt (1988).
248.	Site name:	YOUNG LARCH.
	Species:	*Larix lyallii.*
	Number of cores used:	32.
	Chronology coverage:	1893-1986.
	Reference:	Colenutt (1988).
249.	Site name:	OLYMPIC PENINSULA (1).
	Reference:	Forintek.
250.	Site name:	OLYMPIC PENNISULA (2).
	Reference:	Forintek.
251.	Site name:	OUIATCHOUAN.
	Latitude:	56° 11'N.
	Longitude:	75° 55'W.
	Species:	*Picea mariana.*
	Application:	Dendroclimatology, dendrogeomorphology.
	Techniques:	Frequency of reaction wood.
	Chronology coverage:	1845-1983.
	Form of data in publication:	Figure 1 (5-year group means of the frequency of reaction wood).
	Reference:	Laprise and Payette (1988).

252. Site name: PARKER RIDGE SITE 2.
Province: Alberta.
Latitude: ca. 52° 11'N.
Longitude: ca. 117° 10'W.
Elevation: 1920-2000 m.
Species: *Abies lasiocarpa, Picea engelmannii, Picea glauca, Pinus contorta, Populus tremuloides.*
Date of sample collection: June 17-Aug.14,1983.
Number of trees sampled: 17.
Application: Dendrogeomorphology.
Techniques: Corrasion scars, eccentric growth, growth pattern (suppression or release), growth termination, partial rings, resin canals.
Chronology coverage: 1672-1982.
Form of data in publication: Figures 5.12D (graph of chronology).
Reference: Frazer (1986).

253. Site name: PARKER RIDGE SITE 3.
Province: Alberta.
Latitude: ca. 52° 11'N.
Longitude: ca. 117° 10'W.
Elevation: 1920-2000 m.
Species: *Abies lasiocarpa, Picea engelmannii, Picea glauca, Pinus contorta, Populus tremuloides.*
Date of sample collection: June 17-Aug.14,1983.
Number of trees sampled: 28.
Application: Dendrogeomorphology.
Techniques: Corrasion scars, eccentric growth, growth pattern (suppression or release), growth termination, partial rings, resin canals.
Chronology coverage: 1831-1982.
Form of data in publication: Figures 5.10D (graph of chronology).
Reference: Frazer (1986).

254. Site name: PARKER RIDGE SITE 4.
Province: Alberta.
Latitude: ca. 52° 11'N.
Longitude: ca. 117° 10'W.
Elevation: 1920-2000 m.
Species: *Abies lasiocarpa, Picea engelmannii, Picea glauca, Pinus contorta, Populus tremuloides.*
Date of sample collection: June 17-Aug.14,1983.
Number of trees sampled: 49.
Application: Dendrogeomorphology.
Techniques: Corrasion scars, eccentric growth, growth pattern (suppression or release), growth termination, partial rings, resin canals.
Chronology coverage: 1745-1982.
Form of data in publication: Figures 5.8D (graph of chronology).
Reference: Frazer (1986).

255. Site name: PARKER RIDGE SITE 5.
Province: Alberta.
Latitude: ca. 52° 11'N.
Longitude: ca. 117° 10'W.
Elevation: 1920-2000 m.
Species: *Abies lasiocarpa, Picea engelmannii, Picea glauca, Pinus contorta, Populus tremuloides.*
Date of sample collection: June 17-Aug.14,1983.
Number of trees sampled: 40.
Application: Dendrogeomorphology.
Techniques: Corrasion scars, eccentric growth, growth pattern (suppression or release), growth termination, partial rings, resin canals.
Chronology coverage: 1795-1982.
Form of data in publication: Figures 5.6D (graph of chronology).
Reference: Frazer (1986).

256. Site name: PARKER RIDGE SITE 5B.
Province: Alberta.
Latitude: ca. 52° 11'N.
Longitude: ca. 117° 10'W.
Elevation: 1920-2000 m.
Species: *Abies lasiocarpa, Picea engelmannii, Picea glauca, Pinus contorta, Populus tremuloides.*
Date of sample collection: June 17-Aug.14,1983.
Number of trees sampled: 42.
Application: Dendrogeomorphology.
Techniques: Corrasion scars, eccentric growth, growth pattern (suppression or release), growth termination, partial rings, resin canals.
Chronology coverage: 1684-1982.
Form of data in publication: Figures 5.4D (graph of chronology).
Reference: Frazer (1986).

257. Site name: PARKER RIDGE SITE TRACK 1.
Province: Alberta.
Latitude: ca. 52° 11'N.
Longitude: ca. 117° 10'W.
Elevation: 1920-2000 m.
Species: *Abies lasiocarpa, Picea engelmannii, Picea glauca, Pinus contorta, Populus tremloides.*
Date of sample collection: June 17-Aug.14,1983.
Number of trees sampled: 33.
Application: Dendrogeomorphology.
Techniques: Corrasion scars, eccentric growth, growth pattern (suppression or release), growth termination, partial rings, resin canals.
Chronology coverage: 1759-1982.
Form of data in publication: Figures 5.2D (graph of chronology).
Reference: Frazer (1986).

258.	Site name:	PARKS.
	Province:	Alaska.
	Latitude:	61° 83'N.
	Longitude:	157° 50'W.
	Collector:	J.P. Cropper.
	Chronology coverage:	1725-1952.
	Reference:	LTRR.
259.	Site name:	PARSON.
	Number of cores used:	27.
	Techniques:	Ring density, ring width.
	Chronology coverage:	1720-1976.
	Form of data in publication:	Binary tape.
	Reference:	Forintek, National Archives.
260.	Site name:	PATRICIA LAKE.
	Province:	Alberta.
	Latitude:	52° 54'N.
	Longitude:	118° 06'W.
	Elevation:	1160 m.
	Species:	*Pseudotsuga menziesii.*
	Collector:	C.W. Ferguson and M.L. Parker.
	Techniques:	Ring width.
	Chronology coverage:	1700-1965.
	Form of data in publication:	Raw data in Drew (1975).
	Reference:	LTRR, Drew (1975).
261.	Site name:	PAVILION LAKE.
	Province:	British Columbia.
	Latitude:	50° 45'N.
	Longitude:	121° 33'W.
	Species:	*Pseudotsuga menziesii.*
	Chronology coverage:	1460-1960.
	Reference:	LTRR No. 381, ITRDB No. 339.
262.	Site name:	PAVILION.
	Province:	British Columbia.
	Latitude:	50° 50'N.
	Longitude:	121° 41'W.
	Elevation:	1160 m.
	Species:	*Pseudotsuga menziesii.*
	Collector:	H.C. Fritts.
	Chronology coverage:	1480-1965.
	Form of data in publication:	Ring width indices in Desloges (1987) and raw data in Drew (1975).
	Reference:	Desloges (1987), Drew (1975).

263.	Site name:	PAXSON.
	Province:	Alaska.
	Latitude:	ca. 63°N.
	Longitude:	ca. 146°W.
	Elevation:	610-915 m.
	Species:	*Picea* sp.
	Number of trees sampled:	4.
	Application:	Archaeology, dendroclimatology.
	Techniques:	Ring width.
	Chronology coverage:	1750-1950.
	Form of data in publication:	Table 1 (ring widths).
	Reference:	Oswalt (1952).
264.	Site name:	PEACE RIVER 1.
	Province:	Alberta.
	Latitude:	58° 58'N.
	Longitude:	111° 15'W.
	Elevation:	226 m.
	Species:	*Picea glauca.*
	Collector:	C.W. Stockton and T. Knowles.
	Techniques:	Ring width.
	Chronology coverage:	1804-1970.
	Form of data in publication:	Raw data in Drew (1975).
	Reference:	Drew (1975), Stockton and Fritts (1971) in Hughes et al. (1982).
265.	Site name:	PEACE RIVER II.
	Province:	Alberta.
	Latitude:	58° 59'N.
	Longitude:	111° 30'W.
	Elevation:	226 m.
	Species:	*Picea glauca.*
	Collector:	T. Knowles.
	Techniques:	Ring width.
	Chronology coverage:	1698-1970.
	Form of data in publication:	Raw data in Drew (1975).
	Reference:	Drew (1975), Stockton and Fritts (1971) in Hughes et al. (1982).
266.	Site name:	PEMBERTON.
	Province:	British Columbia.
	Techniques:	Ring density, ring width.
	Form of data in publication:	Binary tape.
	Reference:	Forintek, National Archives.
267.	Site name:	PEYTO LAKE.
	Province:	Alberta.
	Latitude:	51° 25'N.
	Longitude:	116° 20'W.
	Species:	*Picea englemannii.*
	Collector:	M.L. Parker.
	Chronology coverage:	1750-1967.
	Reference:	LTRR No. 126.

268.	Site name:	PEYTO LAKE.
	Province:	Alberta.
	Latitude:	51° 25'N.
	Longitude:	116° 20'W.
	Species:	*Picea englemannii.*
	Collector:	M.L. Parker.
	Chronology coverage:	1680-1967.
	Reference:	LTRR No. 127.
269.	Site name:	PEYTO LAKE.
	Province:	Alberta.
	Latitude:	51° 30'N.
	Longitude:	116° 30'W.
	Elevation:	2000 m.
	Species:	*Picea engelmannii.*
	Number of trees sampled:	13.
	Application:	Dendroclimatology, dendrochronology.
	Techniques:	Maximum latewood density, ring width.
	Chronology coverage:	1680-1968.
	Form of data in publication:	Figure 2 (graph of ring widths).
	Reference:	Parker and Henoch (1971).
270.	Site name:	PINE PASS.
	Province:	British Columbia.
	Latitude:	55° 30'N.
	Longitude:	122° 40'W.
	Elevation:	780 m.
	Species:	*Picea glauca.*
	Collector:	F.H. Schweingruber.
	Date of sample collection:	1984.
	Techniques:	Ring density, ring width.
	Chronology coverage:	1697-1983.
	Reference:	K. Briffa, 1990, pers. comm..
271.	Site name:	POSTE-DE-LA-BALEINE.
	Province:	Québec.
	Latitude:	55° 17'N.
	Longitude:	77° 47'W.
	Application:	Damage effects.
	Techniques:	Ring width, ring count, scars.
	Chronology coverage:	ca. 1835 - ca. 1984.
	Reference:	Delwaide and Filion (1987).
272.	Site name:	POSTE-DE-LA-BALENE.
	Province:	Québec.
	Latitude:	55° 17'N.
	Longitude:	77° 46'W.
	Species:	*Larix laricina.*
	Techniques:	Ring width, ring width.
	Chronology coverage:	1710-1987.
	Reference:	Arquilliere et al. (1989).

273.	Site name:	POWERHOUSE.
	Province:	Alberta.
	Latitude:	51° 12'N.
	Longitude:	115° 31'W.
	Elevation:	1430 m.
	Species:	*Pseudotsuga menziesii.*
	Collector:	C.W. Ferguson and M.L. Parker.
	Date of sample collection:	
	Number of cores used:	18.
	Techniques:	Ring width.
	Chronology coverage:	1410-1965.
	Form of data in publication:	Raw data in Drew (1975).
	Reference:	LTRR No. 109-110, Drew (1975), ITRDB No. 347,348.
274.	Site name:	PRELUDE LAKE.
	Species:	*Picea glauca.*
	Number of cores used:	10.
	Techniques:	Maximum ring density, ring width.
	Chronology coverage:	1700-1979.
	Form of data in publication:	Binary tape.
	Reference:	Forintek, National Archives.
275.	Site name:	PROCRASTINATION CREEK.
	Province:	Alaska.
	Latitude:	67° 40'N.
	Longitude:	142° 30'W.
	Species:	*Picea glauca.*
	Collector:	R.K. Haugen.
	Chronology coverage:	1633-1962.
	Reference:	LTRR, Blasing and Fritts (1975).
276.	Site name:	PURGATORY GROUP.
	Province:	Alaska
	Latitude:	66°N.
	Longitude:	148°W.
	Species:	*Picea* sp.
	Chronology coverage:	1740-1941.
	Reference:	Giddings (1943).
277.	Site name:	PYRAMID AND PATRICIA LAKES.
	Province:	Alberta.
	Latitude:	52° 54'N.
	Longitude:	118° 05'W.
	Species:	*Psuedotsuga menziesii.*
	Collector:	C.W. Ferguson and M.L. Parker.
	Chronology coverage:	1540-1965.
	Reference:	LTRR.
278.	Site name:	PYRAMID LAKE.
	Province:	Alberta.
	Latitude:	52° 54'N.
	Longitude:	118° 06'W.
	Species:	*Pseudotsuga menziesii.*
	Chronology coverage:	1730-1960.
	Reference:	Ferguson and Parker, in Drew, 1975.

279. Site name: PYRAMID LAKE.
Province: Alberta.
Latitude: 52° 55'N.
Longitude: 118° 06'W.
Elevation: 1278 m.
Species: *Pseudotsuga menziesii.*
Collector: C.W. Ferguson and M.L. Parker.
Number of cores used: 16.
Techniques: Ring width.
Chronology coverage: 1630-1960.
Form of data in publication: Raw data in Drew (1975).
Reference: Ferguson and Parker, in Drew, 1975.

280. Site name: PYRAMID LAKE.
Province: Alberta.
Latitude: 52° 00'N.
Longitude: 118° 06'W.
Collector: C.W. Ferguson.
Chronology coverage: 1630-1965.
Reference: LTRR.

281. Site name: QUATRE FOURCHES.
Province: Alberta.
Latitude: 58° 47'N.
Longitude: 111° 27'W.
Species: *Picea glauca.*
Chronology coverage: 1765-1970.
Reference: Stockton and Fritts (1971).

282. Site name: QUINQUALDALEN (Greenland).
Latitude: 60° 16'N.
Longitude: 44° 30'W.
Species: *Betula pubescens.*
Chronology coverage: 1876-1977.
Reference: Lawson, 1980, pers. comm., in Hughes et al. (1982).

283. Site name: RAINBOW RANGE.
Province: British Columbia.
Latitude: 52° 33'N.
Longitude: 125° 49'W.
Species: *Abies lasiocarpa.*
Collector: J. Desloges and T. Millard.
Chronology coverage: 1725-1984.
Reference: Desloges (1987).

284. Site name: RAMPART NORTH GR.
Province: Alaska.
Latitude: 65'N.
Longitude: 150'W.
Species: *Picea* sp.
Chronology coverage: 1730-1941.
Reference: Giddings (1943).

285. Site name: RANCHERIA RIVER.
Province: Yukon.
Latitude: 60° 15'N.
Longitude: 130° 05'W.
Elevation: 900 m.
Species: *Pinus contorta.*
Collector: F.H. Schweingruber.
Date of sample collection: 1984.
Techniques: Ring density, ring width.
Reference: K. Briffa, 1990, pers. comm..

286. Site name: RED DEER RIVER (near RED DEER).
Province: Alberta.
Species: *Picea* sp., *Populus* sp., *Salix* sp.
Application: Dendrohydrology.
Techniques: Ring count, scars.
Chronology coverage: 1935-1975.
Form of data in publication: Table 3 (dates and means scar stages for all trees sampled).
Reference: Smith and Reynolds (1983).

287. Site name: REVILLON COUPE.
Province: Alberta.
Latitude: 58° 52'N.
Longitude: 111° 18'W.
Elevation: 213 m.
Species: *Picea glauca.*
Collector: C. Stockton and T. Knowles.
Techniques: Ring width.
Chronology coverage: 1783-1970.
Form of data in publication: Raw data in Drew (1975).
Reference: LTRR No. 121-122, Stockton and Knowles (1971).

288. Site name: RICHMOND GULF.
Province: Québec.
Latitude: 56° 17'N.
Longitude: 76° 31'W.
Species: *Picea glauca.*
Techniques: Ring width.
Chronology coverage: 1628-1982.
Reference: Jacoby unpublished.

289. Site name: RICHMOND GULF.
Province: Québec.
Latitude: 56° 17'N.
Longitude: 76° 31'W.
Species: *Picea glauca.*
Techniques: Ring width.
Chronology coverage: 1681-1976.
Reference: Jacoby (1983).

290.	Site name:	RICHMOND GULF.
	Province:	Québec.
	Latitude:	56° 10'N.
	Longitude:	76° 30'W.
	Species:	*Picea* sp.
	Techniques:	Ring width.
	Chronology coverage:	1750-1982.
	Reference:	Morin (1985).
291.	Site name:	RICHMOND GULF.
	Province:	Québec.
	Species:	*Picea glauca, Picea mariana.*
	Number of trees sampled:	10.
	Number of cores used:	20.
	Application:	Dendrogeomorphology.
	Techniques:	Ring width.
	Reference:	Jacoby (1983).
292.	Site name:	RIDING MOUNTAI'N.
	Province:	Manitoba.
	Species:	*Picea glauca.*
	Number of cores used:	20.
	Techniques:	Maximum ring density, ring width.
	Chronology coverage:	1864-1981.
	Form of data in publication:	Binary tape.
	Reference:	Forintek, National Archives.
293.	Site name:	RIVER CRAG.
	Province:	Yukon.
	Latitude:	65° 40'N.
	Longitude:	138° 00'W.
	Species:	*Picea glauca.*
	Collector:	E. Cook.
	Chronology coverage:	1635-1975.
	Reference:	LTRR No. 1708.
294.	Site name:	RIVIERE AUX FEUILLES.
	Province:	Québec.
	Latitude:	58° 15'N.
	Longitude:	72° 00'W.
	Species:	*Larix laricina.*
	Techniques:	Ring width.
	Chronology coverage:	1596-1978.
	Form of data in publication:	
	Reference:	Arquillier et al. (1989).

295.	Site name:	ROBSO'N.
	Province:	Alberta.
	Latitude:	53° 09005'N.
	Longitude:	119° 07006'W.
	Elevation:	1676 m.
	Species:	*Picea engelmannii.*
	Collector:	B.H. Luckman and A. Beaudoin.
	Date of sample collection:	July 28, 1981.
	Number of trees sampled:	13.
	Number of cores used:	26.
	Application:	Dendroclimatology.
	Techniques:	Ring width.
	Chronology coverage:	1569-1980.
	Form of data in publication:	Appendix 4 (ring widths).
	Reference:	Watson (1983).
296.	Site name:	ROOT LAKE.
	Species:	*Picea glauca.*
	Number of cores used:	20.
	Techniques:	Maximum ring density, ring width.
	Chronology coverage:	1829-1981.
	Form of data in publication:	Binary tape.
	Reference:	Forintek, National Archives.
297.	Site name:	ROSS.
	Province:	British Columbia.
	Latitude:	49° 10'N.
	Longitude:	117° 27'W.
	Species:	*Larix occidentalis.*
	Collector:	C.A. Fox.
	Chronology coverage:	1846-1977.
	Reference:	LTRR No. 389-390.
298.	Site name:	RUSSIAN MISSION.
	Province:	Alaska.
	Latitude:	ca. 62°N.
	Longitude:	ca. 161°W.
	Species:	*Picea* sp.
	Date of sample collection:	Summer, 1948.
	Number of trees sampled:	6.
	Application:	Archaeology, dendroclimatology.
	Techniques:	Ring width.
	Chronology coverage:	1737-1947.
	Form of data in publication:	Table 2 (ring widths).
	Reference:	Oswalt (1950).
299.	Site name:	SALCHA BLUFF.
	Province:	Alaska.
	Latitude:	64°N.
	Longitude:	145°W.
	Species:	*Picea* sp.
	Chronology coverage:	1850-1938.
	Form of data in publication:	
	Reference:	Giddings (1941).

300. Site name: SALCHA RIVER HEADWATERS.
Province: Alaska.
Latitude: 64° 55'N.
Longitude: 144° 00'W.
Species: *Picea glauca.*
Collector: R.K. Haugen.
Chronology coverage: 1650-1962.
Reference: LTRR, Blasing and Fritts (1975).

301. Site name: SALTWATER POND.
Province: Newfoundland (Labrador).
Latitude: 56° 31'N.
Longitude: 61° 55'W.
Species: *Picea glauca.*
Chronology coverage: 1602-1988.
Reference: L-DGO.

302. Site name: SANDERSON LAKE.
Province: Northwest Territories.
Latitude: 61° 18'N.
Longitude: 104° 53'W.
Species: *Picea glauca.*
Collector: O.L. Hughes.
Chronology coverage: 1773-1965.
Reference: LTRR No. 1262-1263.

303. Site name: SEPTEMBER MOUNTAINS.
Province: Northwest Territories.
Latitude: 67° 11'N.
Longitude: 116° 08'W.
Species: *Picea glauca.*
Chronology coverage: 1340-1977.
Reference: L-DGO.

304. Site name: SHAKTOOLIK.
Province: Alaska.
Latitude: 65'N.
Longitude: 160'W.
Species: *Picea* sp.
Chronology coverage: 1700-1949.
Reference: Oswalt (1950).

305. Site name: SHAWINIGAN.
Province: Québec.
Number of cores used: 13.
Form of data in publication: Binary tape.
Reference: Forintek, National Archives.

306. Site name: SHEENJEK RIVER.
Province: Alaska.
Latitude: 68° 37'N.
Longitude: 143° 40'W.
Species: *Picea glauca.*
Chronology coverage: 1506-1979.
Reference: L-DGO.

307.	Site name:	SIKANNI RIVER.
	Province:	British Columbia.
	Latitude:	57° 12'N.
	Longitude:	122° 45'W.
	Elevation:	900 m.
	Species:	*Picea glauca.*
	Collector:	F.H. Schweingruber.
	Date of sample collection:	1984.
	Techniques:	Ring density, ring width.
	Reference:	K. Briffa, 1990, pers. comm..
308.	Site name:	SILVER CITY (driftwood).
	Province:	Yukon.
	Species:	*Picea glauca.*
	Number of trees sampled:	38.
	Chronology coverage:	ca. 1650 - ca. 1840.
	Reference:	Clague et al. 1982.
309.	Site name:	SILVER CITY (living trees).
	Province:	Yukon.
	Species:	*Picea glauca.*
	Number of trees sampled:	11.
	Number of cores used:	22.
	Application:	Dendrohydrology.
	Techniques:	Ring density, ring width.
	Chronology coverage:	ca. 1680 - ca. 1850.
	Form of data in publication:	Binary tape.
	Reference:	Clague et al. 1982, Forintek.
310.	Site name:	SILVER CITY (log cabins).
	Province:	Yukon.
	Species:	*Picea glauca.*
	Number of trees sampled:	8.
	Number of cores used:	16.
	Application:	Dendrohydrology.
	Techniques:	Ring density, ring width.
	Chronology coverage:	1680-1850.
	Form of data in publication:	Binary tape.
	Reference:	Clague et al. 1982, Forintek.
311.	Site name:	SIMONS HARBOUR.
	Number of cores used:	26.
	Techniques:	Ring density, ring width.
	Chronology coverage:	1670-1977.
	Form of data in publication:	Binary tape.
	Reference:	Forintek, National Archives.
312.	Site name:	SIOUX LOOKOUT.
	Province:	Ontario.
	Latitude:	50° 10'N.
	Longitude:	92° 00'W.
	Species:	*Pinus banksiana, Pinus resinosa.*
	Reference:	Suffling, R.S., (pers. comm., 1989).

313.	Site name:	SIOUX LOOKOUT.
	Province:	Ontario.
	Latitude:	50° 10'N.
	Longitude:	92° 00'W.
	Species:	*Pinus banksiana, Pinus resinosa.*
	Techniques:	Ring width.
	Chronology coverage:	ca. 1750.
	Reference:	R.S. Suffling and M.K. Hughes, 1989, in progress, from R.S. Suffling pers. comm., 1989.
314.	Site name:	SIXTY MILE CREEK.
	Province:	Yukon.
	Latitude:	64° 08'N.
	Longitude:	140° 35'W.
	Elevation:	1052 m.
	Species:	*Picea glauca.*
	Collector:	M.L. Parker and H.C. Fritts.
	Techniques:	Ring width.
	Chronology coverage:	1790-1966.
	Form of data in publication:	Raw data in Drew (1975).
	Reference:	LTRR No. 1695, Blasing and Fritts (1976).
315.	Site name:	SIXTY MILE CREEK.
	Province:	Yukon.
	Latitude:	64° 08'N.
	Longitude:	140° 35'W.
	Species:	*Picea glauca.*
	Collector:	M.L. Parker and H.C. Fritts.
	Chronology coverage:	1790-1960.
	Reference:	LTRR No. 1696, Blasing and Fritts (1976).
316.	Site name:	SKY PILOT CREEK.
	Province:	Manitoba.
	Latitude:	56° 24'N.
	Longitude:	94° 22'W.
	Species:	*Picea glauca.*
	Chronology coverage:	1725-1978.
	Reference:	L-DGO.
317.	Site name:	SLANA.
	Province:	Alaska.
	Latitude:	63° 38'N.
	Longitude:	144° 26'W.
	Species:	*Picea* sp.
	Number of trees sampled:	10.
	Application:	Archaeology, dendroclimatology.
	Techniques:	Ring width.
	Chronology coverage:	1700-1950.
	Form of data in publication:	Table 1 (ring widths) in Oswalt (1952).
	Reference:	LTRR, Oswalt (1952).

318. Site name: SLAVE LAKE.
Province: Alberta.
Latitude: 55° 20'N.
Longitude: 114° 34'W.
Species: *Picea mariana.*
Number of trees sampled: 30.
Application: Dendroclimatology, tree growth and development.
Techniques: Ring width.
Chronology coverage: 1925-1987.
Reference: Dang and Lieffers (1989).

319. Site name: SLOW RIVER.
Province: Northwest Territories.
Latitude: 63° 02'N.
Longitude: 100° 47'W.
Species: *Picea mariana.*
Number of trees sampled: 5.
Number of cores used: 10.
Application: Dendroclimatology.
Techniques: Ring width.
Chronology coverage: 1810-1974.
Reference: Kay (1978).

320. Site name: SMITHERS SKI AREA.
Province: British Columbia.
Latitude: 54° 54'N.
Longitude: 127° 15'W.
Elevation: 1200 m.
Species: *Picea glauca.*
Collector: F.H. Schweingruber.
Date of sample collection: 1984.
Techniques: Ring density, ring width.
Chronology coverage: 1684-1983.
Reference: K. Briffa, 1990, pers. comm..

321. Site name: SOAPBERRY HILL.
Province: Northwest Territories.
Latitude: 64° 17'N.
Longitude: 103° 32'W.
Species: *Picea glauca.*
Chronology coverage: 1495-1983.
Reference: L-DGO.

322. Site name: SPRING LAKE.
Province: British Columbia.
Latitude: 51° 53'N.
Longitude: 121° 15'W.
Elevation: 810 m.
Species: *Pseudotsuga menziesii.*
Collector: F.H. Schweingruber.
Date of sample collection: 1984.
Techniques: Ring density, ring width.
Chronology coverage: 1799-1983.
Reference: K. Briffa, 1990, pers. comm..

323.	Site name:	SPRUCE CREEK.
	Province:	Yukon.
	Latitude:	68° 38'N.
	Longitude:	138° 38'W.
	Species:	*Picea glauca.*
	Collector:	M. Church and H.C. Fritts.
	Chronology coverage:	1570-1977.
	Reference:	LTRR, ITRDB No. 547.
324.	Site name:	SPRUCE CREEK.
	Province:	Yukon.
	Latitude:	68° 31'N.
	Longitude:	138° 40'W.
	Species:	*Picea glauca.*
	Collector:	M. Church and H.C. Fritts.
	Chronology coverage:	1570-1977.
	Reference:	LTRR No. 1703-1704.
325.	Site name:	SPRUCE CREEK.
	Province:	Yukon.
	Latitude:	68° 31'N.
	Longitude:	138° 40'W.
	Species:	*Picea glauca.*
	Chronology coverage:	1723-1977.
	Reference:	LTRR No. 1705.
326.	Site name:	SQUIRREL RIVER.
	Province:	Alaska.
	Latitude:	67°N.
	Longitude:	161°W.
	Species:	*Picea* sp.
	Chronology coverage:	1690-1940.
	Reference:	Giddings (1941).
327.	Site name:	STAVE LAKE.
	Number of cores used:	9.
	Techniques:	Ring density, ring width.
	Form of data in publication:	Binary tape.
	Reference:	Forintek, National Archives.
328.	Site name:	STEPHENS VILLAGE.
	Province:	Alaska.
	Latitude:	66°N.
	Longitude:	149°W.
	Species:	*Picea* sp.
	Chronology coverage:	1770-1909.
	Reference:	Giddings (1941)
329.	Site name:	STEVENS VILLAGE GR.
	Province:	Alaska.
	Latitude:	66°N.
	Longitude:	149°W.
	Species:	*Picea* sp.
	Chronology coverage:	1675-1941.
	Reference:	Giddings (1943)

330.	Site name:	STONY.
	Province:	Alaska.
	Latitude:	61° 67'N.
	Longitude:	156° 50'W.
	Collector:	J.P. Cropper.
	Chronology coverage:	1741-1952.
	Reference:	LTRR.
331.	Site name:	STUIE.
	Province:	British Columbia.
	Latitude:	52° 25'N.
	Longitude:	126° 03'W.
	Species:	*Pseudotsuga menziesii.*
	Collector:	J. Desloges and P. Desloges.
	Chronology coverage:	1579-1983.
	Reference:	Desloges (1987).
332.	Site name:	SUKAKPAK MOUNTAIN.
	Province:	Alaska.
	Latitude:	67° 36'N.
	Longitude:	149° 48'W.
	Species:	*Picea glauca.*
	Chronology coverage:	1250-1979.
	Reference:	L-DGO.
333.	Site name:	SUMMIT LAKE PASS.
	Province:	British Columbia.
	Latitude:	58° 40'N.
	Longitude:	124° 40'W.
	Elevation:	1280 m.
	Species:	*Picea glauca.*
	Collector:	F.H. Schweingruber.
	Date of sample collection:	1984.
	Techniques:	Ring density, ring width.
	Chronology coverage:	1841-1983.
	Reference:	K. Briffa, 1990, pers. comm..
334.	Site name:	SUNSET PEAK 2.
	Province:	Alberta.
	Elevation:	1460-1580 m.
	Species:	*Abies lasiocarpa, Picea engelmannii, Picea glauca, Pinus contorta, Populus tremuloides.*
	Date of sample collection:	June 17-Aug.14,1983.
	Number of trees sampled:	17.
	Application:	Dendrogeomorphology.
	Techniques:	Corrasion scars, eccentric growth, growth pattern (suppression or release), growth termination, partial rings, resin canals.
	Chronology coverage:	1895-1982.
	Form of data in publication:	Figure 5.18D (final chronology).
	Reference:	Frazer (1986).

335.	Site name:	SUNSET PEAK 2.
	Province:	Alberta.
	Elevation:	1460-1580 m.
	Species:	*Abies lasiocarpa, Picea engelmannii, Picea glauca, Pinus contorta, Populus tremuloides.*
	Date of sample collection:	June 17-Aug.14,1983.
	Number of trees sampled:	41.
	Application:	Dendrogeomorphology.
	Techniques:	Corrasion scars, eccentric growth, growth pattern (suppression or release), growth termination, partial rings, resin canals.
	Chronology coverage:	1840-1982.
	Form of data in publication:	Figure 5.16D (final chronology).
	Reference:	Frazer (1986).
336.	Site name:	SUNSET PEAK.
	Province:	Alberta.
	Elevation:	1460-1580 m.
	Species:	*Abies lasiocarpa, Picea engelmannii, Picea glauca, Pinus contorta, Populus tremuloides.*
	Date of sample collection:	June 17-Aug.14,1983.
	Number of trees sampled:	56.
	Application:	Dendrogeomorphology.
	Techniques:	Corrasion scars, eccentric growth, growth pattern (suppression or release), growth termination, partial rings, resin canals.
	Chronology coverage:	1886-1982.
	Form of data in publication:	Figure 5.14D (final chronology).
	Reference:	Frazer (1986).
337.	Site name:	SUNWAPTA PASS.
	Province:	Alberta.
	Latitude:	52° 15'N.
	Longitude:	117° 00'W.
	Elevation:	2000 m.
	Species:	*Picea engelmannii.*
	Collector:	F.H. Schweingruber.
	Date of sample collection:	1984.
	Techniques:	Ring density, ring width.
	Chronology coverage:	1702-1983.
	Reference:	K. Briffa, 1990, pers. comm..
338.	Site name:	SUWANNE RIVER.
	Species:	*Picea glauca.*
	Number of cores used:	10.
	Techniques:	Ring density, ring width.
	Form of data in publication:	Binary tape.
	Reference:	Forintek, National Archives.

339. Site name: SWAN HILLS.
Province: Alberta.
Latitude: ca.55° 25'N Longitude ca.115° 25'W.
Species: *Picea glauca.*
Number of cores used: 20.
Techniques: Ring density, ring width.
Chronology coverage: 1651-1978.
Form of data in publication: Binary tape.
Reference: Forintek, National Archives.

340. Site name: SWEDE CREEK FILTER.
Province: Yukon.
Latitude: 64° 08'N.
Longitude: 139° 43'W.
Species: *Picea glauca.*
Collector: H.C. Fritts, J. Look and M.L. Parker.
Chronology coverage: 1800-1966.
Reference: Forintek.

341. Site name: SWEDE CREEK.
Province: Yukon.
Latitude: 64° 08'N.
Longitude: 139° 43'W.
Elevation: 1128 m.
Species: *Picea glauca.*
Collector: M.L. Parker and H.C. Fritts.
Date of sample collection:
Techniques: Ring width.
Chronology coverage: 1800-1966.
Form of data in publication: Raw data in Drew (1975).
Reference: Drew (1975).

342. Site name: SWIFT RIVER.
Province: Alaska.
Latitude: 61° 50'N.
Longitude: 156° 00'W.
Collector: J.P. Cropper.
Chronology coverage: 1724-1952.
Reference: LTRR.

343. Site name: TALKEETNA.
Province: Alaska.
Latitude: 62°N.
Longitude: 150°W.
Species: *Picea glauca.*
Chronology coverage: 1854-1952.
Reference: Oswalt (1958).

344. Site name: TANANA GROUP.
Latitude: 65°N.
Longitude: 152°W.
Species: *Picea* sp.
Chronology coverage: 1730-1941.
Reference: Giddings (1943).

345. Site name: TERASMAE.
Province: Yukon.
Latitude: 64° 51'N.
Longitude: 138° 19'W.
Species: *Picea glauca.*
Collector: H.C. Fritts, J. Look and M.L. Parker.
Chronology coverage: 1624-1964.
Reference: LTRR No. 1693, Blasing and Fritts (1976).

346. Site name: THELON GAME SANCTUARY.
Province: Northwest Territories.
Latitude: 63° 50'N.
Longitude: 104° 12'W.
Elevation: 207 m.
Species: *Picea glauca.*
Collector: J. Dennis.
Techniques: Ring width.
Chronology coverage: 1574-1969.
Form of data in publication: Raw data in Drew (1975).
Reference: LTRR 1254-1257, Drew (1975), ITRDB No. 182-184.

347. Site name: TORONTO (Dome Stadium).
Province: Ontario.
Latitude: 43° 30'N.
Longitude: 79° 30'W.
Species: *Pinus strobus, Thuja occidentalis.*
Chronology coverage: ca. 1600 - ca. 1880.
Form of data in publication: Ring width floating chronology.
Reference: R.S. Suffling, (pers. comm., 1989), A Consulting Report for Mayer, Pihl, Poulton and Associates.

348. Site name: TUNNEL MOUNTAIN.
Province: Alberta.
Latitude: 51° 10'N.
Longitude: 115° 33'W.
Species: *Pseudotsuga menziesii.*
Chronology coverage: 1570-1965.
Reference: ITRDB No. 349.

349. Site name: TUNNEL MOUNTAIN.
Province: Alberta.
Latitude: 51° 10'N.
Longitude: 115° 33'W.
Elevation: 1400 m.
Species: *Pseudotsuga menziesii.*
Collector: C.W. Ferguson and M.L. Parker.
Techniques: Ring width.
Chronology coverage: 1560-1965.
Form of data in publication: Raw data.
Reference: ITRDB No. 351, 352.

350.	Site name:	TUNNEL MOUNTAIN.
	Province:	Alberta.
	Latitude:	51° 10'N.
	Longitude:	115° 33'W.
	Species:	*Pseudotsuga menziesii.*
	Chronology coverage:	1460-1965.
	Reference:	ITRDB No. 350.
351.	Site name:	TWELVE MILE SUMMIT.
	Province:	Alaska.
	Latitude:	65° 20'N.
	Longitude:	146° 00'W.
	Species:	*Picea glauca.*
	Collector:	R.K. Haugen.
	Chronology coverage:	1650-1962.
	Reference:	LTRR, Blasing and Fritts (1975).
352.	Site name:	TWELVE-MILE SUMMIT.
	Province:	Alaska.
	Latitude:	66°N.
	Longitude:	146°W.
	Species:	*Picea* sp.
	Chronology coverage:	1540-1937.
	Reference:	Giddings (1941).
353.	Site name:	TWISTED TREE-HEART ROT HILL COMPOSITE.
	Province:	Yukon.
	Latitude:	64° 00'N.
	Longitude:	138° 20'W.
	Elevation:	900 m.
	Species:	*Pinus glauca.*
	Collector:	E. Cook.
	Number of trees sampled:	13.
	Number of cores used:	27.
	Application:	Dendroclimatology.
	Techniques:	Ring width.
	Chronology coverage:	1459-1975.
	Form of data in publication:	Raw data in Appendix of Jacoby and Cook (1981).
	Reference:	LTRR No. 1707, Jacoby and Cook (1981), L-DGO.

354. Site name: TWISTED TREE-HEART ROT HILL.
Province: Yukon.
Latitude: 65° 00'N.
Longitude: 138° 20'W.
Elevation: 900 m.
Species: *Picea glauca.*
Collector: E. Cook.
Number of trees sampled: 13.
Number of cores used: 27.
Application: Dendroclimatology.
Techniques: Ring width.
Chronology coverage: 1459-1975.
Form of data in publication: Raw data in Appendix of Jacoby and Cook (1981).
Reference: LTRR No. 1707, Jacoby and Cook (1981), L-DGO.

355. Site name: VERMILLION PASS.
Province: British Columbia.
Latitude: 51° 10'N.
Longitude: 116° 10'W.
Elevation: 1500 m.
Species: *Picea engelmannii.*
Collector: F.H. Schweingruber.
Date of sample collection: 1984.
Techniques: Ring density, ring width.
Chronology coverage: 1734-1983.
Reference: K. Briffa, 1990, pers. comm..

356. Site name: VERMILLION PASS.
Province: British Columbia.
Reference: Forintek.

357. Site name: VERNON.
Province: British Columbia.
Latitude: 50° 45'N.
Longitude: 119° 21'W.
Collector: H.C. Fritts.
Chronology coverage: 1680-1945.
Reference: LTRR.

358. Site name: VERNON.
Province: British Columbia.
Latitude: 50° 45'N.
Longitude: 119° 21'W.
Elevation: 762 m.
Species: *Pseudotsuga menziesii.*
Collector: H.C. Fritts.
Techniques: Ring width.
Chronology coverage: 1680-1960.
Form of data in publication: Raw data.
Reference: LTRR No. 385-386.

359. Site name: WALKER LAKE (several sites).
Province: Alaska.
Latitude: 67° 00'N.
Longitude: 154° 00'W.
Species: *Picea glauca.*
Collector: L.B. Brubaker.
Chronology coverage: 1627-1977.
Reference: LTRR, Brubaker, 1979, pers. comm. In: Syllogeus 33, Hecht (1985).

360. Site name: WATSON LAKE.
Province: Yukon.
Latitude: 60° 05'N.
Longitude: 128° 50'W.
Elevation: 7050 m.
Species: *Picea glauca.*
Collector: F.H. Schweingruber.
Date of sample collection: 1984.
Techniques: Ring density, ring width.
Chronology coverage: 1832-1983.
Reference: K. Briffa, 1990, pers. comm..

361. Site name: WELLAND CANAL.
Province: Ontario.
Latitude: 43° 00'N.
Longitude: 79° 10'W.
Species: *Quercus* sp.
Collector: R. S. Suffling.
Chronology coverage: ca. 1460 - ca. 1825.
Form of data in publication: Ring width.
Reference: R. S. Suffling, (pers. comm., 1989), A Consulting report for Mayer, Pihl, Poulton and Associates.

362. Site name: WELLAND CANAL.
Province: Ontario.
Latitude: 43° 00'N.
Longitude: 79° 10'W.
Species: *Pinus strobus.*
Collector: R. S. Suffling.
Chronology coverage: ca. 1650 - ca. 1825.
Form of data in publication: Ring width.
Reference: R.S. Suffling (pers. comm., 1989), A Consulting report for Mayer, Pihl, Poulton and Associates.

RECENT CHRONOLGIES NOT YET AVAILABLE ON THE DATA BASE

400. Site name: DIXON LAKE
Province: Ontario
Species: *Pinus resinosa*
Chronology: 1623-1973
Reference: Cook (1982), Table 4.8 in Hughes et al. (1982)

401. Site Name: DIXON LAKE
Province: Ontario
Latitude: 45° 17'N.
Longitude: 78° 20'W.
Species: *Pinus resinosa*
Chronology: 1550-1982
Reference: E. Cook (pers. comm. via R. D'Arrigo, 1990)

402. Site Name: TEMAGAMI LAKE
Province: Ontario
Latitude: 47° 00'N.
Longitude: 79° 92'W (sic.)
Species: *Pinus resinosa*
Chronology: 1664-1983
Reference: E. Cook (pers. comm. via R. D'Arrigo, 1990)

403. Site Name: POT LAKE- NORTHWEST ONTARIO LAKE
Province: Ontario
Latitude: 45° 17'N.
Longitude : 78° 75'W (sic.)
Species: *Tsuga canadiensis*
Chronology: 1641-1982
Reference: E. Cook (pers. comm. via R. D'Arrigo, 1990)

404. Site Name: RIVIERE DU MOULIN
Province: Québec
Latitude: 46° 63'N.
Longitude: 71° 88'W (sic.)
Species: *Tsuga canadiensis*
Chronology: 1524-1982
Reference: E. Cook (pers. comm. via R. D'Arrigo, 1990)

405. Site Name: ATHABASCA SNAG
Province: Alberta
Latitude: 52° 13' 30"N.
Longitude: 117° 14' 12"W
Species: various (mainly *Picea* ?)
Chronology: 1293-1898
Reference: B.H. Luckman (pers. comm., 1990)

406. Site Name: PEYTO LAKE
Province: Alberta
Latitude: 51° 45'N.
Longitude: 116° 13'W.
Elevation: 2050
Species: *Picea engelmannii*
Collector: F.H. Schweingruber
Techniques: Ring width, Maximum density
Chronology: 1634-1983
Reference: K. Briffa (pers. comm., 1990)

407. Site Name: SUNSHINE
Province: Alberta
Latitude: 51° 04'N.
Longitude: 115° 47'W.
Elevation: 2250
Species: *Larix lyallii*
Collector: M.Colenutt, B.H. Luckman
Techniques: Ring width, maximum density
Chronology: 1440-1987
Reference: M. Colenutt (pers. comm., 1990).

408. Site Name: FLOE LAKE
Province: British Columbia
Latitude: 51° 3'N.
Longitude: 116° 08'W.
Elevation: 2150
Species: *Larix lyallii*
Collector: M. Colenutt
Chronology: 1523-1987
Reference: M. Colenutt (pers. comm., 1990)

409. Site Name: MARMOT
Province: Alberta
Latitude: 50° 50'N.
Longitude: 115° 15'W.
Elevation: 2250
Species: *Larix lyallii*
Collector: B.H. Luckman, M.E. Colenutt
Chronology: 1588-1987
Reference: M.E. Colenutt (pers. comm., 1990)

410. Site Name: NAKISKA
Province: Alberta
Latitude: 50° 50'N.
Longitude: 115° 15'W.
Elevation: 2160
Species: *Larix lyallii*
Collector: B.H. Luckman, M.E. Colenutt
Chronology: 1563-1987
Reference: M.E. Colenutt (pers. comm., 1990)

411.	Site Name:	NAKISKA
	Province:	Alberta
	Latitude:	50° 50'N.
	Longitude:	115° 15'W.
	Elevation:	2160
	Species:	*Picea engelmannii*
	Collector:	M.E. Colenutt
	Chronology:	1616-1987
	Reference:	B.H. Luckman (pers. comm., 1990)
412.	Site Name:	TYRWHYTT
	Province:	Alberta
	Latitude:	50° 36'N.
	Longitude:	114° 59'W.
	Elevation:	2250
	Species:	*Larix lyallii*
	Collector:	B.H. Luckman, M.E. Colenutt.
	Chronology:	1580-1987
	Reference:	M.E. Colenutt (pers. comm., 1990)
413.	Site Name:	HIGHWOOD
	Province:	Alberta
	Latitude:	50° 36'N.
	Longitude:	114° 59'W.
	Elevation:	2250
	Species:	*Picea engelmannii*
	Collector:	B.H. Luckman, M.E. Colenutt
	Chronology:	1613-1987
	Reference:	B.H. Luckman (pers. comm., 1990)
414.	Site Name:	NAIN
	Province:	Newfoundland
	Latitude:	56° 27'N.
	Longitude:	62° 05'W.
	Species:	*Picea glauca*
	Collector:	G. Jacoby
	Chronology:	1574-1986
	Reference:	G. Jacoby (pers. comm., 1990)
415.	Site Name:	NORTH KLONDIKE RIVER
	Province:	Yukon
	Latitude:	64° 12'N.
	Longitude:	138° 35'W.
	Species:	*Picea glauca*
	Collector:	G. Jacoby
	Chronology:	1705-1987
	Reference:	G. Jacoby (pers. comm., 1990).
416.	Site Name:	FIRETOWER
	Province:	Yukon
	Latitude:	64° 04'N.
	Longitude:	139° 20'W.
	Species:	*Picea glauca*
	Collector:	G. Jacoby
	Chronology:	1851-1987
	Reference:	G. Jacoby (pers. comm., 1990)

417. Site Name: TTHH (Revisited).
Province: Yukon
Latitude: 65° 00'N.
Longitude: 138° 20'W.
Species: *Picea glauca*
Collector: G. Jacoby
Chronology: 1499-1987
Reference: G. Jacoby (pers. comm., 1990)

418. Site Name: TOP OF THE WORLD
Province: Yukon
Latitude: 64° 12'N.
Longitude: 140° 10'W.
Species: *Picea glauca*
Collector: G. Jacoby
Chronology: 1712-1987
Reference: G. Jacoby (pers. comm., 1990)

419. Site Name: RIVER CRAIG (Revisited).
Province: Yukon
Latitude: 65° 40'N.
Longitude: 138° 00'W.
Species: *Picea glauca*
Collector: G. Jacoby
Chronology: 1729-1987
Reference: G. Jacoby (pers. comm., 1990)

420. Site Name: EAGLE
Province: Alaska
Latitude: 64° 36'N.
Longitude: 141° 18'W.
Species: *Picea glauca*
Collector: G. Jacoby
Chronology: 1617-1987
Reference: G. Jacoby (pers. comm., 1990)

421. Site Name: ATKINSON ISLAND
Province: Québec
Latitude: 56° 12'N.
Longitude: 74° 33'W.
Species: *Larix laricina*
Collector: G. Jacoby
Chronology: 1657-1982
Reference: G. Jacoby (pers. comm., 1990).

422. Site Name: CAPE
Province: Québec
Latitude: 56° 18'N.
Longitude: 76° 33'W.
Species: *Picea glauca*
Collector: G. Jacoby
Chronology: 1663-1982
Reference: G. Jacoby (pers. comm., 1990)

423.	Site Name:	CLEARWATER CAMP
	Province:	Québec
	Latitude:	56° 16'N.
	Longitude:	74° 20'W.
	Species:	*Larix laricana*
	Collector:	G. Jacoby
	Chronology:	1703-1982
	Reference:	G. Jacoby (pers. comm., 1990)
424.	Site Name:	LEPAGE ISLAND
	Province:	Québec
	Latitude:	56° 14'N.
	Longitude:	74° 24'W.
	Species:	*Larix laricana*
	Collector:	G. Jacoby
	Chronology:	1670-1982
	Reference:	G. Jacoby (pers. comm., 1990)
425.	Site Name:	FINNIE FLATS
	Province:	Northwest Territories
	Latitude:	64° 09'N.
	Longitude:	102° 35'W.
	Species:	*Larix laricana*
	Collector:	G. Jacoby
	Chronology:	1745-1983
	Reference:	G. Jacoby (pers. comm., 1990)
426.	Site Name:	ARROWSMITH MOUNTAIN (Vancouver Island)
	Province:	British Columbia
	Latitude:	49° 09'N.
	Longitude:	125° 14'W.
	Elevation:	1020
	Species:	*Tsuga mertensiana*
	Collector:	F.H. Schweingruber
	Technique:	Ring width and density
	Reference:	K. Briffa (pers. comm., 1990)
427.	Site Name:	KOOTENAI PASS
	Province:	British Columbia
	Latitude:	49° 05'N.
	Longitude:	116° 45'W.
	Elevation:	1850
	Species:	*Picea engelmannii*
	Collector:	F.H. Schweingruber
	Technique:	Ring width and density
	Reference:	K. Briffa (pers. comm., 1990)
428.	Site Name:	NINGUNSAW PASS
	Province:	British Columbia
	Latitude:	56° 55'N.
	Longitude:	130° 05'W.
	Elevation:	459
	Species:	*Picea sitchensis*
	Collector:	F.H. Schweingruber
	Technique:	Ring width and density
	Reference:	K. Briffa (pers. comm., 1990)

429.	Site Name:	VERMILLION PASS
	Province:	British Columbia
	Latitude:	51° 10'N.
	Longitude:	116° 10'W.
	Elevation:	1500
	Species:	*Pinus contorta*
	Collector:	F.H. Schweingruber
	Technique:	Ring width and density
	Reference:	K. Briffa (pers. comm., 1990)
430.	Site Name:	KENNEDY RIVER
	Province:	British Columbia
	Latitude:	49° 10'N.
	Longitude:	125° 15'W.
	Elevation:	30
	Species:	*Psuedotsuga menziesii*
	Collector:	F.H. Schweingruber
	Technique:	Ring width and density
	Reference:	K. Briffa (pers. comm., 1990)
431.	Site Name:	KENNEDY RIVER
	Province:	British Columbia
	Latitude:	49° 10'N.
	Longitude:	125° 15'W.
	Elevation:	30
	Species:	*Tsuga heterophylla*
	Collector:	F.H. Schweingruber
	Technique:	Ring width and density
	Reference:	K. Briffa (pers. comm., 1990)
432.	Site Name:	KENNEDY RIVER
	Province:	British Columbia
	Latitude:	49° 10'N.
	Longitude:	125° 15'W.
	Elevation:	30
	Species:	*Thuja plicata*
	Collector:	F.H. Schweingruber
	Technique:	Ring width and density
	Reference:	K. Briffa (pers. comm., 1990)
433.	Site name:	WOLVERINE PLATEAU
	Province:	Yukon
	Latitude:	61° 30'N.
	Longitude:	140° 43'W.
	Species:	*Picea glauca*
	Collector:	W.E.S. Henoch
	Chronology:	1690-1975
	Reference:	ITRDB 222, LTRR 1716

CHRONOLOGIES UNDER DEVELOPMENT

1. *Lamont Doherty Geological Observatory*
   G. Jacoby pers. comm., 1990.
   All chronologies were collected in 1988.

Site	Province	Taxa	Coordinates	
Notrack	Yukon	*Picea glauca*	65° 46'	137° 45'
Ethel Lake	Yukon	*Picea glauca*	63° 22'	136° 18'
Continental Divide	Yukon	*Picea glauca*	60° 05'	130° 55'
Fox Creek	Yukon	*Picea glauca*	61° 53'	132° 49'
Keno Hill	Yukon	*Picea glauca*	63° 55'	135° 18'
Red Currant	Yukon	*Picea glauca*	62° 02'	128° 27'
Inuvik	Northwest Territories	*Picea glauca*	68° 18'	133° 20'

2. *1989 Canadian Treeline Sites*
   F.H. Schweingruber, pers. comm., 1990.
   Swiss Federal Institute for Forest, Snow and Landslide Research, Birmensdorf.
   All chronologies were collected between July 8 and August 1, 1989.
   The sites are listed in the sequence that they were sampled.

Site	Province	Taxa	Coordinates	
Bruno Lake	Manitoba	*Picea glauca*	51° 37'	95° 50'
Gunisao Lake	Manitoba	*Picea mariana*	53° 30'	96° 23'
(") Norway House	Manitoba	*Pinus banksiana*	53° 30'	96° 23'
Hurgrave Lake	Manitoba	*Picea glauca*	54° 27'	99° 45'
Sandy Bay	Saskatchewan	*Picea glauca*	55° 25'	102° 28'
Esker (Sandy Bay)	Saskatchewan	*Picea glauca*	55° 25'	102° 28'
Esker (southend)	Saskatchewan	*Picea mariana*	57° 42'	105° 16'
southend	Saskatchewan	*Pinus banksiana*	57° 42'	105° 16'
Uranium City	Saskatchewan	*Pinus banksiana*	59° 07'	107° 26'
Wallace Island	Alberta	*Pinus banksiana*	59° 51'	110° 08'
(") Andrew Lake	Alberta	*Picea glauca*	59° 51'	110° 08'
Buffalo Lake	Northwest Territories	*Picea glauca*	60° 17'	115° 16'
Fort Providence	Northwest Territories	*Picea glauca*	61° 10'	117° 22'
Fort Simpson	Northwest Territories	*Picea glauca*	61° 41'	120° 43'
Willow Lake (Island)	Northwest Territories	*Picea mariana*	62° 10'	119° 08'
(") east Fort Simpson	Northwest Territories	*Picea mariana*	62° 10'	119° 08'
Bras d'Or Lake	Northwest Territories	*Picea glauca*	62° 27'	116° 08'
(") west Yellowknife	Northwest Territories	*Picea glauca*	62° 27'	116° 08'
MacKiney	Northwest Territories	*Picea mariana*	62° 44'	111° 38'
Pethai Peninsula	Northwest Territories	*Picea mariana*	62° 41'	110° 58'
Austin Lake	Northwest Territories	*Picea glauca*	62° 10'	110° 05'
Knobowich Lake	Northwest Territories	*Picea mariana*	61° 13'	107° 05'
(") Rennie Lake	Northwest Territories	*Picea mariana*	61° 13'	107° 05'
Wholdiy Lake	Northwest Territories	*Picea mariana*	59° 38'	104° 38'

Site	Province	Taxa	Coordinates	
Charlie Lake	Manitoba	*Picea mariana*	60° 02'	100° 26'
(") east Kasba Lake	Manitoba	*Picea mariana*	60° 02'	100° 26'
Mosquito Lake	Manitoba	*Larix lariciana*	59° 39'	97° 28'
Seal River	Manitoba	*Larix lariciana*	59° 01'	95° 29'
Churchill	Manitoba	*Picea glauca*	59° 01'	93° 50'
Churchill	Manitoba	*Larix lariciana*	59° 01'	93° 50'
Fly Lake	Manitoba	*Picea mariana*	57° 27'	94° 34'
Little Limstone Lake	Manitoba	*Picea mariana*	56° 38'	95° 00'
Gods River	Manitoba	*Picea glauca*	55 28'	92° 53'
Dinwiddie Lake	Manitoba	*Picea glauca*	55° 14'	90° 42'
Webequi	Ontario	*Picea glauca*	53° 04'	87° 20'
Fishing Creek	Ontario	*Picea mariana*	52° 01'	82° 84'
Moosonee	Ontario	*Picea glauca*	51° 09'	80° 48'
eastmain River	Québec	*Picea mariana*	52° 02'	77° 51'
eastmain River	Québec	*Picea mariana*	52° 02'	77° 51'
Yasinski Lake	Québec	*Picea mariana*	53° 14'	77° 40'
(") La Grande Res. 2	Québec	*Picea mariana*	53° 14'	77° 40'
No Name Lake	Québec	*Picea mariana*	54° 35'	77° 34'
(") Kuujuarapik	Québec	*Picea mariana*	54° 35'	77° 34'
Coats River	Québec	*Picea mariana*	55° 44'	76° 09'
(") Lac a l'eau claire	Québec	*Picea mariana*	55° 44'	76° 09'
Lac du Loup Marin	Québec	*Picea mariana*	56° 34'	73° 34'
(") Lac a l'eau claire	Québec	*Larix lariciana*	56° 34'	73° 34'
Lac Natuak	Québec	*Picea mariana*	57° 13'	71° 30'
Lac Natuak	Québec	*Larix lariciana*	57° 13'	71° 30'
Lac du Dome	Québec	*Picea mariana*	57° 41'	68° 07'
(") Kuujjuaq	Québec	*Larix lariciana*	57° 41'	68° 07'
Lac Romanel	Québec	*Picea glauca*	56° 14'	67° 43'
(") south-southeast Kuujjuaq	Québec	*Picea mariana*	56° 14'	67° 43'
Waknach Lake	Québec	*Picea glauca*	55° 17'	67° 07'
(") north Schefferville	Québec	*Picea mariana*	55° 17'	67° 07'
(") north Scheferrville	Québec	*Larix lariciana*	55° 17'	67° 07'
Lac aux Goelards	Québec	*Picea mariana*	55° 17'	64° 09'
(") east Schefferville	Québec	*Larix lariciana*	55° 17'	64° 09'
Colford Lake	Québec	*Picea mariana*	54° 28'	61° 58'
Dorothea Lake	Québec	*Picea glauca*	54° 12'	61° 34'
(") northeast Goose Bay	Québec	*Picea mariana*	54° 12'	61° 34'
Mountain Lake	Labrador	*Picea glauca*	53° 29'	58° 40'
(") east Goose Bay	Labrador	*Picea glauca*	53° 29'	58° 40'
Some Other Lake	Labrador	*Picea mariana*	53° 07'	58° 50'
Dominion Lake	Labrador	*Picea mariana*	52° 40'	61° 42'
(") south Goose Bay	Labrador	*Picea mariana*	52° 40'	61° 42'
Riviere Romaine	Labrador	*Picea mariana*	52° 47'	63° 35'
(") southwest Churchill Falls	Labrador	*Picea mariana*	52° 47'	63° 35'
Germaine Lake	Québec	*Picea mariana*	53° 02'	67° 41'
Beach Lake	Québec	*Picea mariana*	52° 17'	67° 11'
Windy Lake	Québec	*Picea mariana*	51° 08'	66° 26'
(") north Sept Isles	Québec	*Picea mariana*	51° 08'	66° 26'
Capotigaman	Québec	*Picea mariana*	50° 10'	68° 10'

(") west Sept Iles	Québec	*Picea glauca*	50° 10'	68° 10'

Site	Province	Taxa	Coordinates	
Lac Periboncu	Québec	*Picea mariana*	50° 02'	71° 29'
Lac Chevrillon	Québec	*Thuja occident*	50° 01'	74° 27'
(") Chibougamau	Québec	*Picea mariana*	50° 01'	74° 27'
Lac McDonald	Québec	*Picea mariana*	49° 54'	76° 06'
Lac Mistonac	Québec	*Picea glauca*	49° 27'	78° 41'
Torrens Lake	Ontario	*Picea glauca*	49° 42'	82° 04'
(") Kapuskasing	Ontario	*Thuja occident*	49° 42'	82° 04'
Armstrong	Ontario	*Picea glauca*	50° 18'	89° 03'
Armstrong	Ontario	*Picea glauca*	50° 18'	89° 03'
Armstrong	Ontario	*Thuja occident*	50° 18'	89° 03'
High Stone Lake	Ontario	*Picea glauca*	50° 24'	91° 27'

NOTES: Ring-width and densitometric chronologies are currently being developed from these sites. Thirty had been completed by October, 1990. The sites are identified by a site name and region in the table provided by Dr. Schweingruber. The symbol (") is used to indicate that the site name is identical to the previous entry in the table but the region is also added to help identification. Where two chronologies are listed for the same species at a site, these chronologies were sampled from stands growing on different substrates or with different aspects.

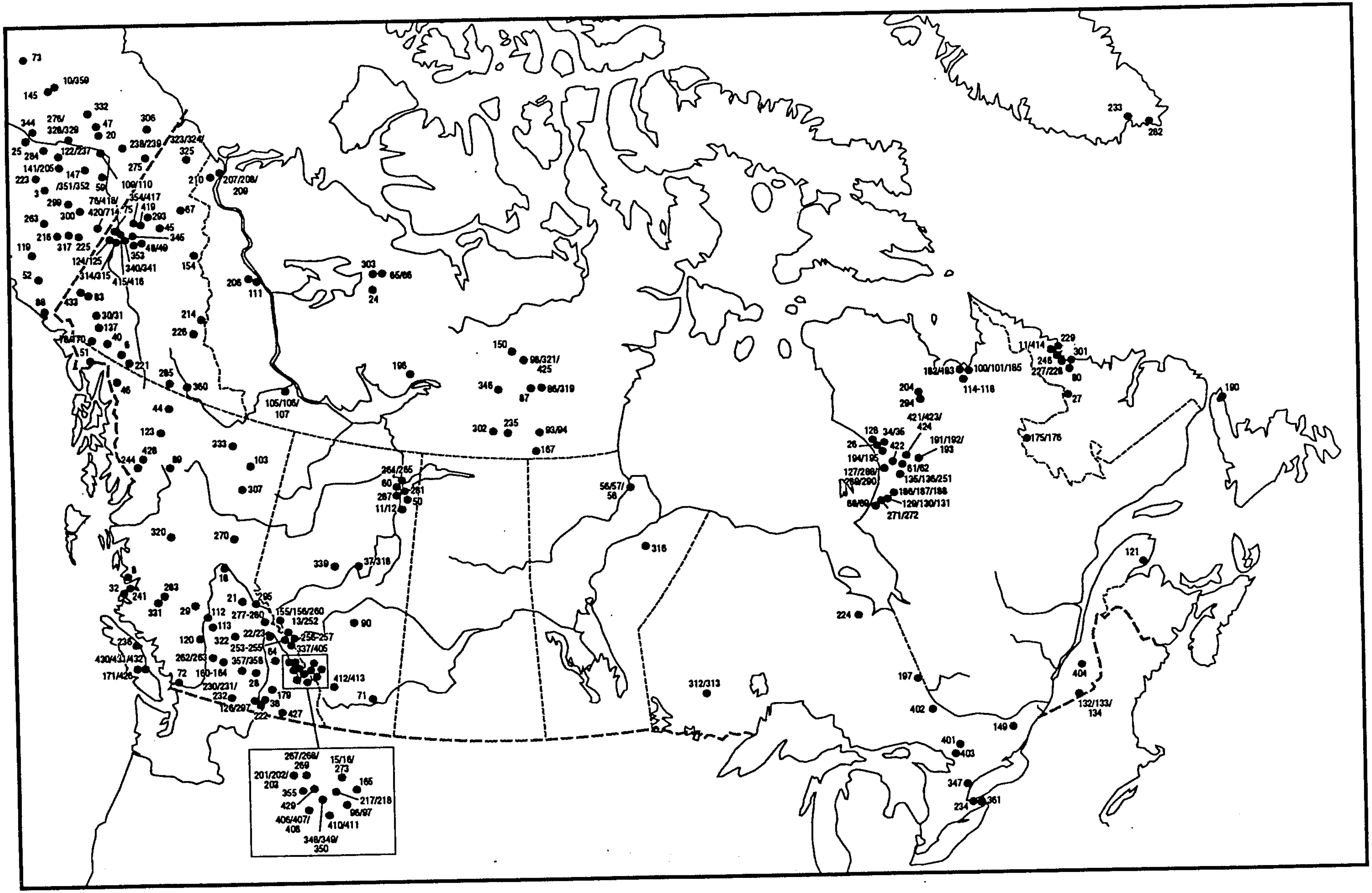
INDEX OF CHRONOLOGY DATA BASE ENTRIES BY SPECIES

INDEX OF CHRONOLOGY DATA BASE ENTRIES BY ADMINISTRATIVE REGION

APPENDIX I

Alphabetical Listing of the Scientific and Common Names of Tree Species used in the Species Index

SCIENTIFIC NAME	COMMON NAME	SCIENTIFIC NAME	COMMON NAME
Abies amabilis	Amabilis fir	*Pinus edulis*	New Mexican pinyon pine
Abies balsamea	balsam fir	*Pinus flexilis*	limber pine
Abies concolor	white fir	*Pinus jeffreyi*	Jeffrey pine
Abies grandis	grand fir	*Pinus latifolia*	Apache pine
Abies lasiocarpa	subalpine fir	*Pinus lambertiana*	sugar pine
Acer saccharum	sugar maple	*Pinus longaeva*	bristlecone pine
Alnus	alder	*Pinus monticola*	western white pine
Alnus glutinosa	black alder	*Pinus ponderosa*	ponderosa pine
Alnus incana	speckled alder	*Pinus radiata*	radiata pine
Alnus sinuata	sitka alder	*Pinus resinosa*	red pine
Betula alleghaniensis	yellow birch	*Pinus rigida*	pitch pine
Betula papyrifera	paper birch	*Pinus strobus*	eastern white pine
Betula populifolia	grey birch	*Pinus sylvestris*	Scots pine
Betula pubescens	European birch	*Pinus taeda*	loblolly pine
Chamaecyparis nootkatensis	Alaska cedar	*Pinus torreyana*	torrey pinr
Fagus grandifolia	American beech	*Populus*	poplar
Fagus sylvatica	European beech	*Populus balsamifera*	balsam poplar
Fraxinus americana	white ash	*Populus deltoides*	eastern cottonwood
Fraxinus nigra	black ash	*Populus grandidentata*	larchtooth aspen
Fraxinus pennsylvanica	red ash	*Populus tacamahaca*	balsam poplar
Juniperus communis	common juniper	*Populus tremuloides*	trembling aspen
Larix decidua	European larch	*Populus trichocarpa*	black cottonwood
Larix laricina	larch, tamarack	*Prunus serotina*	black cherry
Larix lyallii	alpine larch	*Pseudotsuga macrocarpa*	bigcone Douglas-fir
Larix sibirica	Siberan larch	*Pseudotsuga menziesii*	Douglas-fir
Nyssa sylvatica	Black gum	*Pseudotsuga taxifolia*	Douglas-fir
Picea	spruce	*Quercus alba*	white oak
Picea abies	Norway spruce	*Quercus muehlenbergii*	Chinquapin oak
Picea glauca	white spruce	*Quercus petraea*	Durmast oak
Picea engelmannii	Engelmann spruce	*Quercus prinus*	chestnut oak
Picea mariana	black spruce	*Salix*	willow
Picea rubens	red spruce	*Tilia americana*	basswood
Picea sitchensis	sitka spruce	*Tsuga*	hemlock
Pinus	pine	*Tsuga canadensis*	eastern hemlock
Pinus albicaulis	whitebark pine	*Tsuga heterophylla*	western hemlock
Pinus aristata	bristlecone pine	*Tsuga mertensiana*	mountain hemlock
Pinus banksiana	jack pine	*Thuja occidentalis*	eastern white cedar
Pinus contorta	lodgepole pine	*Thuja plicata*	western red cedar
		Ulmus americana	white elm



APPENDIX II **Tree-Ring Chronology Sites**

APPENDIX II

Distribution of Chronology Sites

This map illustrates the geographical distribution of those chronology sites listed in Section VI for which latitude and longtitude data were available (sites in western Alaska and in the coterminous United States are excluded). The numbers identify 287 chronologies, 242 in Canada, 43 in Alaska and 2 from Greenland. This map clearly shows the geographical biasses of the presently-available data base. Note the high concentration of sites in southern British Columbia, the Canadian Rockies, Alaska-Yukon areas and the Great Whale - Bush Lake area of north-western Quebec. Some of the significant gaps along the northern treeline have been partially filled by the Schweingruber 1989 sampling program from the Mackenzie to Labrador along the boreal treeline (see Section VI) but many serious gaps in coverage remain.

APPENDIX III

Canadian Researchers Contacted during the Preparation of this Report

Name	Institution
S. Archambault	Centre d'études nordiques, Université Laval.
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S.A. Harris	Geography, University of Calgary.
E. Johnson	Ecology, University of Calgary
L. Jozsa	Forintek Canada Corporation, Vancouver
B. Kronberg	Geology, Lakehead University, Thunder Bay
D. Larson	Biological Sciences, University of Guelph
D. Lavender	Forestry, University of British Columbia
B.H. Luckman	Geography, University of Western Ontario
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D. McIvor	Atmospheric Environment Service, Downsview
P. Murphy	Forestry, University of Alberta
M.L. Parker	Consultant, Vancouver
P. Scott	Zoology, University of Toronto
M.W. Smith	Geography, Carleton University
R. Suffling	Environmental Studies, University of Waterloo
D. Sauchyn	Geography, University of Regina