

THE FRASER RIVER ESTUARY STUDY

AN ANNOTATED BIBLIOGRAPHY

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## PREFACE

In 1977 the governments of Canada and British Columbia, recognizing the complexity and the special importance of the rich economic and environmental resources of the Fraser River estuary, undertook a joint series of studies - the Fraser River Estuary Study - leading towards a coordinated management program for the estuary. In 1983 federal-provincial agreement was reached on the framework for such a program. On July 6, 1984 Environment Canada and the B.C. Ministry of Environment jointly released an implementation strategy report which outlined how a management program was to proceed. This report is available from the Environment Canada Information Directorate's office.

During the seven year course of the Estuary Study public information and involvement were important components of the process. In implementing the Fraser River Estuary Management Program, access to information and ongoing public consultation will continue to be important elements of management activities.

The selected bibliography which follows is one component of these activities. The bibliography provides references to a broad range of materials useful in understanding the many issues involved in managing the Fraser estuary.

THE FRASER RIVER ESTUARY:  
A SELECTED BIBLIOGRAPHY

INTRODUCTION

The Fraser River estuary is the largest estuary on the Pacific coast of Canada and has historically been a focus of human activity on the west coast. The estuary today supports both a wide range of economic developments and a rich variety of ecological systems, and these diverse resources play a crucial role in the social and economic well-being of British Columbia and Canada. Managing these resources so that their benefits will still be enjoyed in the future is an important and difficult responsibility.

For the more than 1.5 million people who live in the Lower Mainland area of British Columbia, the river is a major source of employment and recreation. Many thousands of people work in the ports, lumber mills, warehouses and processing plants along the Fraser's shores and the jobs of many more people throughout the region and the province depend indirectly on these industrial and commercial activities. Parks, informal recreation areas and small-boat marinas are scattered along the length of the lower river and the Estuary foreshore, and on a busy summer weekend more than 35,000 people may enjoy estuary related recreational activities - fishing, boating, walking, picnicing - at these sites. Farming too, in the delta and valley, is an important regional activity as the fertile, well-irrigated soils are highly productive.

The Fraser River and its upstream tributaries accommodate one of the world's great natural salmon runs, supporting a large commercial, recreational and native fishery. As many as 300 million young salmon migrate out of the estuary in some years and more than 10 million spawners may return. The Estuary itself provides an important rearing ground for juvenile salmon. Estuary wetlands, though much diminished from their historical dimensions by extensive dyking and development, still provide the wintering ground for a large population of waterfowl and are a critical stopping point for millions of birds migrating along the Pacific Flyway each spring and fall.

Estuary waters are also used to receive large amounts of the industrial and domestic effluent wastes that are generated regionally. Much of this effluent is treated in the 3 primary treatment plants located along the estuary shores, but some effluent is discharged directly into the water. Much of the region's solid waste is landfilled near estuary waters and the resulting leachates pose a pollution problem. Uncontrolled run-off from urban and agricultural areas add other pollutants. Though control and treatment efforts have increased, the maintenance of acceptable water quality standards still depends in large part on the river's enormous flow and large dilution capabilities.

As the region's population grows and economic activity increases, economic and environmental demands on the Estuary are growing. The challenge in managing the Estuary is to maintain economic development opportunities while sustaining the abundance and diversity of environmental and recreational resources.

OVERVIEW

It is not surprising, given widespread awareness of the importance of the Estuary and of the complexity of management issues involved, that a considerable amount of material on the Estuary has been published. This material covers the diversity of Estuary resources and uses, and ranges from the general to the highly technical. The references cited in this Bibliography form a selected rather than comprehensive listing of materials relating to the Estuary and its management. Included are references to government reports, academic studies, books, and journal articles, drawn from a number of different sources. Most of these references contain their own specialized bibliographies which may be used by the reader to pursue a particular interest further.

The bibliography is intended to be a convenient and useful reference for the many people of the region who are interested in knowing more about the Fraser Estuary and who are concerned for its future.

To help readers find the references of greatest interest to them the bibliography is divided into a number of subject areas. The major subject headings are: Habitat, Water Quality, Land Use & Transportation, and Recreation. Two other subject headings are also used: Cultural History and a section on Development Issues. A short section references audio-visual materials related to the Fraser Estuary. The bibliography begins with a brief description of the Fraser River Estuary Study and its reports, and of the Fraser related publications of the Westwater Institute at U.B.C.

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The Fraser River Estuary Study

The Fraser River Estuary Study was a joint Federal-Provincial study initiated in 1977 under agreement between Environment Canada and the British Columbia Ministry of Environment. Its purpose was to develop a management program that would provide a way to guide future changes in the estuary and ensure it is preserved and protected as a natural resource while continuing to serve as a vital economic resource. The Study was a multi-agency program of activity involving federal, provincial, municipal and regional agencies, industry and public interest groups.

The Study was organized in two phases: Phase I (1977-78) and Phase II (1979-82). The Phase I Reports provide an extensive inventory of the existing conditions and trends in the estuary and outlined a set of management proposals. The Phase II Reports include background information and technical data in support of a proposed Management Program for the Estuary - A Living River by the Door. These reports were widely distributed and formed a basis for informed public discussion and involvement in the Study process. The Phase I and II reports are cited below.

A detailed series of Water Quality Background Reports was also published as part of the Study. The reports in this series are referenced in the section on Water Quality. Several other publications were prepared in support of the Study, among them: Explore the Fraser Estuary! and a Fraser River Estuary Heritage Resource Inventory. These are referenced in the sections on Recreation and Cultural History.

PHASE I REPORTS

Dunn, Michael W. Constitutional and Legislative Frameworks. Fraser River Estuary Study, Victoria. August, 1978.

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The first seven of these reports, published in August, 1978, are sometimes found bound together and catalogued as a single entry:

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Management Systems Sub-Committee. Wolfe, L.D.S. (ed.). A Linked Management System Proposal for the Fraser River Estuary. Fraser River Estuary Study, Surrey. March, 1982.

Mention should be made here of an important earlier study of the Fraser River Estuary undertaken by Environment Canada and published in 1974 as the first of an ongoing series of studies of estuaries in British Columbia.

Hoos, Lindsay M. and Glen A. Packman. 1974. The Fraser River Estuary: Status of Knowledge to 1974. Special Estuary Series No.1. Environment Canada.

This comprehensive report summarizes existing information on the Fraser estuary and includes a very extensive bibliography of general and Fraser related references to 1974. Some 1800 titles are cited.

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In 1972 the Westwater Research Centre at the University of British Columbia began a four year study of water quality and pollution control in the lower Fraser River. Since then research at Westwater has expanded to address a wide range of issues relating to coastal zone and estuarine resource management, but has retained the problems of the Fraser estuary as an ongoing focus. Westwater has published the results of their research on the Fraser in a number of books and a series of technical reports. These have greatly increased both detailed knowledge and broad public understanding of issues and options in managing the Fraser estuary. Many of these are referenced in the sections on Water Quality and Habitat. Special mention is made here to 4 books which provide an introduction to important aspects of managing the estuary's resources.

Dorcey, A.H.J. (ed.) 1979. Coastal Resources in the Future of British Columbia. Westwater Research Centre, Vancouver.

This collection of six essays provides an overview of the importance of coastal resource management issues for British Columbia.

Dorcey, A.H.J. (ed.) The Uncertain Future of the Lower Fraser. Westwater Research Centre, Vancouver.

The book is based on a series of public lectures given in 1976 by Westwater research staff to present the findings and conclusions of their four years of investigations focused on water quality concerns in the Lower Fraser river system. The lectures and book played an important role in raising public awareness and concern for the future of the Fraser prior to the inception of the Fraser River Estuary Study.

Dorcey, Anthony H.J. and Kenneth J. Hall. 1981. Setting Ecological Research Priorities for Management: The Art of the Impossible in the Fraser Estuary. Westwater Research Centre, Vancouver.

This study was prepared for the Fraser River Estuary Study - Phase II. The report outlines schematically a framework for understanding the Estuary ecosystem and examines "gaps" in the information needed to manage estuary resources. The report distinguishes between "descriptive" and "functional" knowledge and "reactive" and "proactive" management, and suggests a process and set of priorities for developing new management information.

Dorcey, A.H.J., K.J. Hall, D.A. Levy, and I. Yesaki. In preparation. Estuarine Habitat Management: A Prospectus for Tilbury Slough. Westwater Research Centre, Vancouver. The report provides an introduction to the complex biophysical interrelationships of a slough habitat and describes a "proactive" management approach to the development of Tilbury Slough. Such an approach would allow the industrial potential and recreational resources to be developed while at the same time protecting and enhancing ecological values.

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Siemens, A.H. (ed.). 1968. Lower Fraser Valley: Evolution of a Cultural Landscape. B.C. Geographical Series, No. 9. Tantulus Research, Vancouver.

Suttles, W. 1955. Katzie Ethnographic Notes. Anthropology in British Columbia, Memoir No. 2. British Columbia Provincial Museum, Victoria.

## GENERAL WORKS

This section is used to categorize sources of a more general or informative nature.

Aird, W.J., Pierce, S.P., 1984. Remote Sensing Data Summary: Fraser River Delta, Environmental Protection Service, Ottawa.

Byrne, M. and C.J. Anastasiou. 1981. The Estuary Book. Western Education Development Group, University of British Columbia in cooperation with the Ministry of Environment, Victoria.

The book presents a number of activities which may be used by secondary students in studying the complex interplay of physical, biological and human activities in an estuary.

Dorcey, A.H.J. (ed.) 1976. The Uncertain Future of the Lower Fraser. Westwater Research Centre, Vancouver.

The book is based on a series of public lectures given in 1976 by Westwater Research Centre staff to present the findings and conclusions of their four years of investigations focussing on water quality concerns in the lower Fraser River.

Dorcey, A.H.J. (ed.) 1979. Coastal Resources in the Future of British Columbia. Westwater Research Centre, Vancouver.

The six edited lecture texts which make up this book were first presented in the Westwater Lectures '79 and present an overview of coastal resource management issues in B.C.

Dorcey, A.H.J. and K.J. Hall. 1981. Setting Ecological Research Priorities for Management: The Art of the Impossible in the Fraser Estuary. Westwater Research Centre, Vancouver.

This study was prepared for the Fraser River Estuary Study - Phase II. The report outlines schematically a framework for understanding the estuary ecosystem and examines "gaps" in the information needed to manage estuary resources. The report distinguishes between "descriptive" and "functional" knowledge and "reactive" and "proactive" management, and suggests a process and set of priorities for developing new management information.

Dorcey, A.H.J. 1982. The uncertain quest for a management strategy in the Fraser River estuary. Canadian Water Resources Journal 6(4):95-118.

Dorcey, A.H.J. 1983. Coastal management as a bargaining process. Coastal Zone Management Journal 11(1/2).

Fox, I.K., Nowlan, J.P., 1978. The Management of Estuarine Resources in Canada, Canadian Environmental Advisory Council, Report No. 6, Ottawa.

Hagen, M.E., 1984. British Columbia Estuarine Information Catalogue. Vol.2, Lower Mainland-Sunshine Coast. Lands Directorate, Environment Canada, Vancouver.

Hutchison, Bruce. 1950 The Fraser. Clarke, Irwin & Co. Ltd., Toronto.

Though written more than 30 years ago, this book remains a classic evocation of the history and the beauty of the Fraser. Hutchison includes stories of the first explorers and settlers, the devastation of the Fraser River salmon runs early in this century and the building of the Hell's Gate Fishway in the late 40's.

Ince, J.G. 1983. Environmental Law: A Study of Legislation Affecting the Environment of British Columbia. Rev.ed. Butterworth & Co., Vancouver.

Lauff, G.H. (ed.) 1967. Estuaries. American Association for the Advancement of Science.

Leopold, L.B. 1974. Water: A Primer. W.H.Freeman, San Francisco.

A good introduction to the general subject of water resources. The book provides clear explanations of scientific, technical and policy issues affecting resource development and use.

McNeely, R.N., V.P. Neimanis and L. Dwyer. 1979. Water Quality Sourcebook: A Guide to Water Quality Parameters. Water Quality Branch, Inland Waters Directorate, Ottawa.

Discusses in general terms some 70 different water quality parameters that are frequently encountered in the aquatic environment. For each of the parameters, from alkalinity to zinc, information includes the environmental range, natural and man-made sources, water quality guidelines and effects on use.

Ministry of Environment. 1981. The Fraser River: Protecting A Resource. Ministry of Environment, Victoria.

This colourful booklet provides a short description of the resources and management issues in the Fraser estuary and is available from the Information Services Branch of the Ministry of Environment.

Stainsby, D. et.al. 1979. Special Report: The Fraser River Estuary. B.C. Outdoors 35(4).

Swainson, N.A. (ed.) Managing the Water Environment. University of British Columbia Press, Vancouver.

Wolfe, L.D.S. Organizational Options for Linked Management. Fraser River Estuary Study, Surrey. March, 1982.



The Fraser River and Estuary have inspired not only a large output of printed materials, but also a number of video productions, films and slide/tape presentations. These have been produced by various government agencies, interest groups, and by local cable television stations. Some describe in broad outline the diversity and significance of estuary resources, while others picture a single aspect of estuary use. Several productions reconstruct a sense of the estuary's history, while others focus directly on present problems and future prospects in managing the estuary.

For many people living in the region, the most common views of the river are those from a car speeding across one of the Fraser River bridges. The visual materials listed below provide immediate and wide-ranging new views of the river and activities in the estuary. Some of the productions might be useful as a part of a group or public meeting discussing estuary related issues. Teachers, too, might use some of these productions in teaching ecology, regional history or geography, or in encouraging classroom discussions of current environmental and urban issues.

Some of the productions which may be available for showing are listed below, beginning with the most recent. The length and format for each production, a distribution contact and a brief subject description are provided.

Tugboat on the River. 1983. A 1/2 hour video produced by Delta 10 Television.

Tugboats are an important part of moving cargo along the river. The video shows the tugs in action and talks with several skippers about their work. Available from Delta Cable 10 Studios on 3/4" video tape.

The Fraser Factor. 1982. A 59-minute video produced by Western Cable 10 and directed by David Dick.

Using interviews with many people whose lives are involved with the river, including some long-time area residents, the video describes changes in the river in the Surrey/New Westminster area. Available from Western Cable 10 on 3/4 " video tape.

A Question of Values. 1981. A 20-minute slide/tape presentation produced for use in the Fraser River Estuary Study - Phase II.

The presentation documents the wide range of issues and concerns regarding the future of the Estuary and discusses proposals for a new management program. The show is available in slide/tape or video format from the Regional Director General's Office of Environment Canada in Vancouver.

Living With the River. 1980. A 6-part series of 1/2 hour video programs. A joint production of Douglas College and several community cable stations. Directed by Norma Tait with host Dr. Barry Leach.

The six titles in the series are: History, The Decline of Wildlife, The Revival of Wildlife, The Impact of Development, The Fishery, and Access. Available from Burnaby Cable 10 or the Kwantlen College Library on 3/4" video tape.

Estuary. 1979. A 12-minute, 16 mm film, produced by the National Film Board.

The diverse biophysical components of an estuary and their complex interrelationships are shown, close-up, in this NFB short. Available from the Vancouver office of the National Film Board.

The Fragile Web. 1979. A 15-minute slide/tape show produced by Fisheries and Oceans Canada.

The production outlines the ecological importance of estuaries and is available from Fisheries and Oceans Canada in Vancouver.

The Fraser Delta: An Estuary in Crisis. 1979. A 27-minute slide/tape show produced by the Fraser River Coalition, with narration by Stanley Burke.

Problems in maintaining water quality standards and protecting important wildlife and fish habitats in the estuary are documented and discussed. The presentation is available through the Society Promoting Environmental Conservation (SFEC) in Vancouver.

Save the Fraser. 1976. A 15-minute slide/tape show produced by SFEC.

The production briefly outlines the special importance of the Fraser River estuary. Available from SFEC in Vancouver.

Conclusion

This bibliography is certainly not a complete list of ~~all~~ the information that exists on the Fraser River Estuary. It is only a collection of source titles and is meant to act as an aid to the understanding of the status of knowledge on the Estuary.

After reading the bibliography it becomes obvious how complex the issues are on the Fraser River and how difficult it is to manage such a resource. Hopefully this bibliography will encourage those who have become interested in the Estuary to study further and may we all learn and participate further in the protection of the Fraser River Estuary as a vital resource.



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