NEW BRUNSWICK

AQUATIC

DATA WAREHOUSE

U S E R M A N U A L

Version 3.0

August 2003

Acknowledgements

The New Brunswick Aquatic Data Warehouse is a program of the Canadian Rivers Institute of the University of New Brunswick. The Data Warehouse gratefully acknowledges the contributions and support from the following organizations:

New Brunswick Environmental Trust Fund

New Brunswick Wildlife Council

NB Department of Natural Resources

NB Department of the Environment and Local Government

Fisheries and Oceans Canada

Service New Brunswick

ESRI Canada Ltd.

J.D. Irving, Limited

Bowater Pulp and Paper Canada Inc.

Fraser Papers Inc.

Repap New Brunswick Inc.

Atlantic Salmon Museum

Fundy Model Forest

Table of Contents

Acknowledgements i

Table of Contents ii

List of Figures iv

How To Use The Data Warehouse Manual v

PART ONE INTRODUCTION

Chapter 1 **Data Warehouse Concept** 1-1

PART TWO DATA WAREHOUSE ARCHITECTURE

Chapter 2 **Tabular Data Architecture** 2-1

Chapter 3 **Spatial Data Architecture** 3-1

Chapter 4 **Technical Architecture** 4-1

PART THREE DESCRIPTION OF THE DATA SETS

Chapter 5 **Drainage System** 5-1

Chapter 6 **Water Resource Inventory** 6-1

Chapter 7 **Habitat Assessments: Lakes** 7-1

Chapter 8 **Habitat Assessments: Streams** 8-1

Chapter 9 **Water Resources Classification Programs** 9-1

Chapter 10 **Water Quality: Chemistry** 10-1

Chapter 11 **Water Quality: Biology** 11-1

Chapter 12 **Water Quality: Temperatures** 12-1

Chapter 13 **Water Quality: Flows** 13-1

Table of Contents - Cont'd

Chapter 14	**Fish Population Estimates: Streams**	**14-1**
Chapter 15	**Fish Population Estimates: Lakes**	**15-1**
Chapter 16	**Fish Population Assessments: Age & Growth**	**16-1**
Chapter 17	**Recreational Fishery Catch & Effort: Mail Surveys**	**17-1**
Chapter 18	**Recreational Fishery Catch & Effort: Creel Surveys**	**18-1**
Chapter 19	**Recreational Fishery Socioeconomic Information**	**19-1**
Chapter 20	**Commercial and Native Fisheries**	**20-1**
Chapter 21	**Management Activities: Fish Stockings**	**21-1**
Chapter 22	**Management Activities: Regulated Waters**	**22-1**
Chapter 23	**Management Activities: Habitat Rehabilitation**	**23-1**

PART FOUR STANDARDS

Chapter 24	**Element Naming Conventions**	**24-1**
Chapter 25	**Tables of Codes**	**25-1**
Chapter 26	**Glossary**	**26-1**

PART FIVE APPENDICES

Appendix A	**New Brunswick's Five Level Hierarchal Drainage System**

List of Figures

Figure 1	Illustration of the data warehouse concept	**1-2**
Figure 2	Subject level data model for the Aquatic Resources Data Warehouse	**2-3**
Figure 3	Example of aquatic feature codes used within the Service New Brunswick's hydrographic spatial data	**3-2**
Figure 4	Illustration of how ArcInfo's route systems are applied to hydrographic data	**3-5**
Figure 5	Drainage unit delineation and numbering scheme	**5-5**
Figure 6	Comparison of two types of coastal stream confluences and how head of land is determined	**5-6**
Figure 7	Water inventory numbering technique used within the Aquatic Resources Data Warehouse	**6-2**

How To Use the Data Warehouse Manual

The purpose of the New Brunswick Aquatic Data Warehouse Manual is to document the framework or architecture of the data warehouse. An overview of each fisheries and aquatic data set is provided, including a description of the data file structures. The manual does not provide an exhaustive discussion of data collection methodologies, but strives to provide sufficient detail for analysis and interpretation of the data. The intent is to provide a general overview; detailed methodologies are referenced, where available. It is assumed readers have a working knowledge of fisheries and aquatic management techniques.

The manual is divided into five parts, each containing one or more chapters:

Part 1 **INTRODUCTION**

Part 2 **DATA WAREHOUSE ARCHITECTURE**

Part 3 **DESCRIPTION OF THE DATA SETS**

Part 4 **STANDARDS**

Part 5 **APPENDICES**

INTRODUCTION describes the data warehouse concept and rationale.

DATA WAREHOUSE ARCHITECTURE describes the underlying architecture of the GIS-based Aquatic Data Warehouse and the factors which influenced its design. The first chapter presents the data model for aquatic and fisheries information and the second discusses the design of the spatial data. Finally, the third chapter describes the technical environment of the data warehouse, that is, the hardware and software used to develop the system.

DESCRIPTION OF THE DATA SETS describes the data within the data warehouse. Each chapter provides an overview of each data set and how the data tables are structured. The methodology used to collect the data is described if required to clarify unfamiliar data collection or compilation methods. Each chapter also has a section on the positional accuracy when some component of the data set is incorporated within GIS. This is followed by a description of the data tables. Each field of information is described, along with its internal field name, field type and width. Where codes are used, the code translation table within the manual is referenced.

STANDARDS includes standard conventions for field names, code tables and a glossary.

APPENDICES support the manual.

PART ONE

INTRODUCTION

CHAPTER 1

DATA WAREHOUSE CONCEPT

The New Brunswick Aquatic Data Warehouse is a Geographic Information System (GIS) based repository for aquatic and fisheries information collected by public and private agencies. The data warehouse has been created to provide a common framework for the efficient exchange of spatial and tabular resource data and to ensure its preservation for future use.

Many organizations collect aquatic and fishery resource data. Unfortunately, the information is stored in a variety formats, is poorly documented, and use of standard codes is non-existent. Resource managers, however, need efficient access to a wide range of information in order to manage on a watershed basis.

The data warehouse facilitates the exchange of information by acting as a "clearing house". That is, data from the various agencies are collected on a regular basis, converted to standard codes and formats, then returned to the participating organizations. All data within the warehouse is thoroughly documented. The data warehouse also establishes a standard format for the use of lake and stream GIS data (spatial data), again to ensure compatibility among the various agencies.

Traditionally, data is viewed from a single user's perspective, creating islands of data with limited access. The Aquatic Data Warehouse is designed to allow participants to continue collecting information in the manner they are accustomed to, i.e using their own preferred software packages. The Data Warehouse simply obtains regular updates from these systems. For instance, the New Brunswick Departments of the Environment and Natural Resources and Energy have many custom applications, such as their water chemistry lab system or barrier fish counts system. These applications are focussed on one type of data and are used for entering data and generating standard summary reports; ad hoc reporting capabilities, however, are not available. The Data Warehouse merges all these isolated bits of information into a central repository, thereby eliminating labour intensive processes when related information must be summarized or integrated. In addition to ad hoc data analysis, the GIS-based data warehouse can produce maps to illustrate the tabular data. Figure 1 presents the Data Warehouse concept.

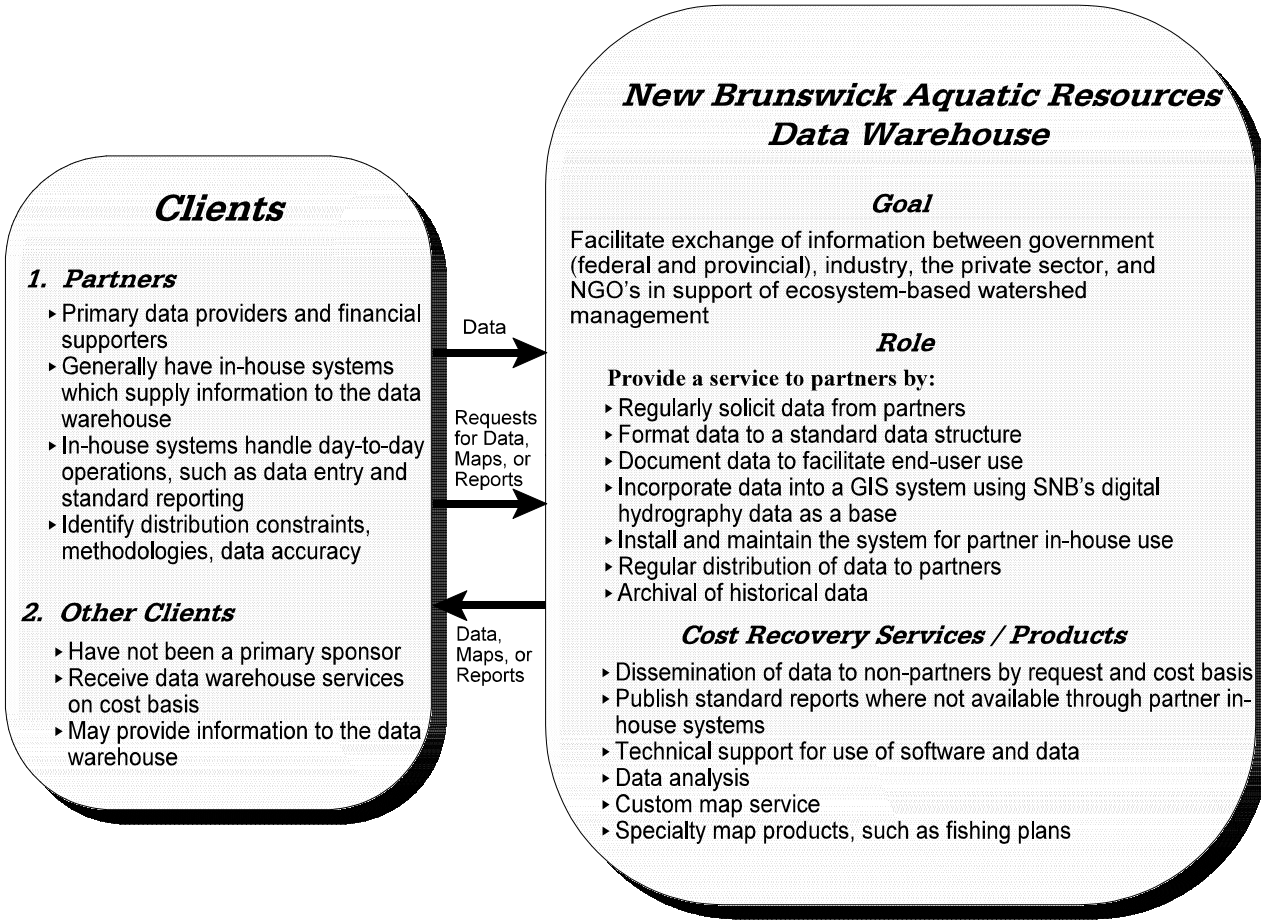
BACKGROUND

The Aquatic Data Warehouse was initiated by the Atlantic Salmon Museum in 1995 and is now a program of the Canadian Rivers Institute of the University of New Brunswick. The Data Warehouse would not have possible without the generous support and funding from many sources including: the Environmental Trust Fund, NB Wildlife Fund, NB Department of Natural Resources, NB Department of the Environment and Local Government, Fisheries and Oceans Canada, ESRI Canada Ltd. and the forest industry.

WHAT'S IN THE DATA WAREHOUSE?

An inventory of New Brunswick's lakes and streams is the foundation of the Aquatic Data Warehouse. The inventory exists as digital maps (used in GIS mapping systems) and as a tabular

Figure 1. Illustration of the data warehouse concept.



database of lakes and streams. Each body of water is assigned a unique number, plus a set of drainage system codes. Within New Brunswick, all lakes and streams belong to one of 13 major drainage basins or drainage composites which flow into the Gulf of St. Lawrence or Bay of Fundy. Each drainage area is further subdivided into smaller drainage units.

Data obtained from a variety of agencies provides a wide range of information. Together, they describe the physical, chemical, biological and social characteristics of the province's lakes and streams (see adjacent table).

Compiling data is an on-going effort; some data sets are more complete than others.

PRODUCTS and SERVICES

The Aquatic Data Warehouse distributes data upon request and also provides custom mapping and data analysis services.

FOR MORE INFORMATION

The Aquatic Data Warehouse would be pleased to provide additional information. Please contact **Faye Cowie** at:

NB Aquatic Data Warehouse
Canadian Rivers Institute
University of New Brunswick
Sir James Dunn Wildlife Research Center
Rm 263
1350 Regent Street
Fredericton, NB E9C

Phone: (506) 365-8927
Fax: (506) 365-8972
E-Mail: ardw@nbnet.nb.ca

AQUATIC and FISHERIES DATA

Water Resource Inventory
Drainage Basin System
Lake and Stream Inventory
Watershed Boundaries

Physical & Chemical Properties
Lake Assessments
Stream Habitat Assessments
River Classification Program Assessments
Water Chemistry, Temperatures
Stream Flows

Fish Population Assessments
Electrofishing
Fish Migration Counts
Spawners & Redd Counts
Lake Population Estimates
Fish Age & Growth

Other Biological Assessments
Bacterial Analysis
Invertebrate Surveys

Fishery Harvest
Recreational Fishing Catch & Effort
Commercial & Native Fisheries
Recreational Fishing Socio-Economic Data

Fishery Allocation / Management Activities
Regulated or Protected Waters
Fish Stocking
Habitat Alterations

Watercourse Disturbances
Watercourse Alterations
Pollution Sources
Pollution Events

Recreation
Salmon Angling Pools
Canoeing Routes