

The La Grande Rivière Hydroelectric Complex

The Environmental Challenge



Société d'énergie de la Bale James

Contents

Foreword	i
Contents	iii
Introduction	1
Part I: The La Grande Rivière Hydroelectric Complex and Its Optimization	
The La Grande Complex (1975)	9
The La Grande Complex Phase I	11
The La Grande Rivière Hydroelectric Installations	12
The Opinaca-Boyd-Sakami Diversion Structures	13
The Caniapiscau-Laforge Diversion Structures	14
The La Grande Complex Phase II	15
Part II: Creating Structures to Protect the Environment	
Project and Environment Group Develop Together	21
Mechanisms and Techniques for Protection of the Environment	23
The Environment-Engineering Committee	23
Environment Directives	24
Environment-Protection Monitoring at the Jobsite	25
Information Sessions at Head Office and at Construction Sites	25
The Link Between the Hydroelectric Project and the James Bay and Northern Quebec Agreement	27
The James Bay and Northern Quebec Agreement	27
Organizations Created by the James Bay and Northern Quebec Agreement	30
The Environmental Experts Committee	30
The La Grande Complex Remedial Works Corporation (SOTRAC, la Société des travaux de correction du Complexe La Grande)	32
The Caniapiscau-Koksoak Joint Study Group (GECCK, le Groupe d'étude conjoint Caniapiscau-Koksoak)	33

Part III: Achievements

Design and Planning Research	39
The Biophysical Agreement Studies	39
Monitoring the Evolution of New Environments	41
The Basic Ecological Monitoring Program	41
Monitoring Programs for Particular Regions	45
Rivers with Reduced Flow	46
Diversion Zones	48
The Estuaries and the Coast of James Bay	48
James Bay	49
The Monitoring Program for Particular Features	49
Program for Assessment of Corrective Work	49
Corrective Work in Created or Altered Aquatic Environments	51
Corrective Work in the Reservoirs	52
Clearing of Reservoirs	52
Clearing for Reservoir Accessibility and Utilization	56
Clearing to Improve Reservoir Stability and Biological Productivity	56
Technical Aspects of Clearing Work	57
Control and Elimination of Floating Wood Debris	60
Technical Aspects of the Elimination of Wood Debris	62
Diking of Bays	63
Planting in Riparian Habitats	65
Technical Aspects of the Planting of Riparian Habitats	66
Corrective Work in Diversion Zones	66
The Caniapiscou-Laforge Diversion	67
The Brisay-Fontanges Section	68
The Fontanges Basin	68
The Fontanges-Vincelotte Section	68
The Vincelotte Section	70
Additional Work in the Caniapiscou-Laforge Diversion	71
The Opinaca-Boyd-Sakami Diversion	72
The Boyd Section	73
The Sakami Section	75
Additional Work in the Opinaca-Boyd-Sakami Diversion	76
Corrective Work in Rivers with Reduced Flow	77
The Eastmain and Opinaca Rivers	78
Construction of Weirs	80
Seeding	81
Planting	83
The Caniapiscou and Koksoak Rivers	83
The Sakami and Vincelotte Rivers	84
Corrective Work in the La Grande Rivière	85
Other Work	86
Walleye Spawning Ground at Lake Yasinski	86
Creation of a Brook Trout Spawning Ground on the Desaulniers River	87
Landscaping and Restoration of Sites Affected by Construction Work	87
Reforestation of Sites Affected by Construction	89
The Activities of the La Grande Complex Remedial Works Corporation (SOTRAC)	91
Preservation of Wildlife in Affected Environments	91

Improving Wildlife Habitats in Unaffected Environments	92
Improving Land Access	93
The Winter Road	93
Snowmobile and Snowbus Trails	94
Improving Access by Water	95
Construction of Small Hydroport Complexes	95
Navigation Chart	95
Assistance Program for Access to the James Bay Coastal Territory	96
Navigation Channel in the James Bay Coastal Region	96
Improving Conditions for Wildlife Harvesting	96
The Radio-Communication Project	96
Base Camp and Satellite Camps	97
Supplying Camps	97
Miscellaneous Programs	97
Improving Living Conditions in the Villages	98

Part IV:

Lessons of the La Grande Complex

Evolution of the Reservoirs	105
A Drawdown Zone and Stable Shoreline	106
Clearing by Natural Agents and Behaviour of Wood Debris	107
Riparian Habitats	107
Floating Bogs	108
Water Quality	110
Evolution of Water Quality during Impounding	110
Post-Operation Evolution of Surface-Water Quality	110
Post-Operation Evolution of Water Quality in the Deepwater Layer	112
Secondary Production	112
Zooplankton	112
Macroinvertebrates	113
Colonization of Newly Flooded Environments	114
Macroinvertebrate-Population Composition during Reservoir Operation	115
Characteristics of Ichtyfauna	115
Fish-Habitat Enhancement Projects	119
Evolution of Diversion Zones	121
Main Hydrological Characteristics	121
Ice Regime	121
Geomorphological Evolution of Shoreline and Riverbeds	122
Riparian Habitats	123
Water Quality	123
Primary and Secondary Production	125
Characteristics of Ichtyfauna	126
Evolution of Rivers with Reduced Flow	127
Main Hydrological Characteristics	127
Riverbank Geomorphological Evolution	127
Riparian Habitats	130
Recolonization of Newly Exposed Riverbank	130
Recolonization of Emergent Shoreline	132
Water Quality	132

Secondary Production	134
Zooplankton	134
Macroinvertebrates	134
Characteristics of Ichtyfauna	134
Evolution of the River with Increased and Regulated Flow	137
Evolution of the Estuaries	141
Estuaries with Reduced Flow	141
The La Grande Rivière Estuary: Increased and Regulated Flow	142
The East Coast of James Bay	143
Behaviour of Birds and of Terrestrial and Semi-Aquatic Fauna	145
Reservoirs and Diversion Zones	145
Wildlife Behaviour during Impoundment	146
Wildlife Behaviour after Impoundment	146
Rivers with Reduced Flow	147
Developments in Native Land-Use Patterns	151
Land-Use Patterns	151
The Cree Communities	151
Annual Cycle of Activities Associated with Wildlife Harvesting	152
Income Security Program for Cree Hunters and Trappers	152
The Inuit Community of Kuujjuaq	153
The Schefferville Naskapi Community	154
Developments in Utilization of Environments Associated with Components of the La Grande Complex	155
The Cree Communities	155
Land-Use Pattern Modifications Associated with the Reservoirs	155
Land-Use Pattern Modifications Associated with the Road Infrastructure	156
Land-Use Pattern Modifications Associated with Increased Flow in the La Grande Rivière	157
Land-Use Pattern Modifications Associated with Reduction of Flow in the Downstream Portion of the Eastmain and Opinaca Rivers	158
The Inuit Community of Kuujjuaq	159
The Schefferville Naskapi Community	160
Discovering the History of the James Bay Territory	161
Archaeology	161
Human Occupation of the La Grande Complex Region	162
Sharing Experiences	165
Conclusion	171
Select Bibliography	177