

What
Is Water?

The Nature|History|Society series is devoted to the publication of high-quality scholarship in environmental history and allied fields. Its broad compass is signalled by its title: nature because it takes the natural world seriously; history because it aims to foster work that has temporal depth; and society because its essential concern is with the interface between nature and society, broadly conceived. The series is avowedly interdisciplinary and is open to the work of anthropologists, ecologists, historians, geographers, literary scholars, political scientists, sociologists, and others whose interests resonate with its mandate. It offers a timely outlet for lively, innovative, and well-written work on the interaction of people and nature through time in North America.

General Editor: Graeme Wynn, University of British Columbia

Claire Elizabeth Campbell, *Shaped by the West Wind: Nature and History in Georgian Bay*

Tina Loo, *States of Nature: Conserving Canada's Wildlife in the Twentieth Century*

Jamie Benidickson, *The Culture of Flushing: A Social and Legal History of Sewage*

William J. Turkel, *The Archive of Place: Unearthing the Pasts of the Chilcotin Plateau*

John Sandlos, *Hunters at the Margin: Native People and Wildlife Conservation in the Northwest Territories*

James Murton, *Creating a Modern Countryside: Liberalism and Land Resettlement in British Columbia*

Greg Gillespie, *Hunting for Empire: Narratives of Sport in Rupert's Land, 1840-70*

Stephen J. Pyne, *Awful Splendour: A Fire History of Canada*

Hans M. Carlson, *Home Is the Hunter: The James Bay Cree and Their Land*

Liza Piper, *The Industrial Transformation of Subarctic Canada*

Sharon Wall, *The Nurture of Nature: Childhood, Antimodernism, and Ontario Summer Camps, 1920-55*

Joy Parr, *Sensing Changes: Technologies, Environments, and the Everyday, 1953-2003*



NATURE | HISTORY | SOCIETY

What Is Water?

The History of a Modern Abstraction

JAMIE LINTON

FOREWORD BY GRAEME WYNN



UBC Press • Vancouver • Toronto

© UBC Press 2010

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, without prior written permission of the publisher, or, in Canada, in the case of photocopying or other reprographic copying, a licence from Access Copyright (Canadian Copyright Licensing Agency), www.accesscopyright.ca.

20 19 18 17 16 15 14 13 12 11 10 5 4 3 2 1

Printed in Canada with vegetable-based inks on FSC-certified ancient-forest-free paper (100% post-consumer recycled) that is processed chlorine- and acid-free.

Library and Archives Canada Cataloguing in Publication

Linton, Jamie

What is water? : the history of a modern abstraction / Jamie Linton.

(Nature/history/society, 1713-6680)

Includes bibliographical references and index.

ISBN 978-0-7748-1701-1

1. Water. 2. Hydrologic cycle. 3. Water – History. 4. Water – Environmental aspects. 5. Water – Social aspects. I. Title. II. Series: Nature, history, society

GB665.L55 2010

553.7

C2009-906381-6

Canada

UBC Press gratefully acknowledges the financial support for our publishing program of the Government of Canada (through the Canada Book Fund), the Canada Council for the Arts, and the British Columbia Arts Council.

This book has been published with the help of a grant from the Canadian Federation for the Humanities and Social Sciences, through the Aid to Scholarly Publications Programme, using funds provided by the Social Sciences and Humanities Research Council of Canada.

UBC Press

The University of British Columbia

2029 West Mall

Vancouver, BC V6T 1Z2

www.ubcpres.ca

Contents

Illustrations / vii

Foreword / ix

Graeme Wynn

Preface / xvii

PART 1: INTRODUCTION

- 1 Fixing the Flow: The Things We Make of Water / 3
- 2 Relational Dialectics: Putting Things in Fluid Terms / 24

PART 2: THE HISTORY OF MODERN WATER

- 3 Intimations of Modern Water / 47
- 4 From Premodern Waters to Modern Water / 73
- 5 The Hydrologic Cycle(s): Scientific and Sacred / 105
- 6 The Hortonian Hydrologic Cycle / 126
- 7 Reading the Resource: Modern Water, the Hydrologic Cycle, and the State / 148
- 8 Culmination: Global Water / 162

PART 3: THE CONSTITUTIONAL CRISIS OF MODERN WATER

- 9 The Constitution of Modern Water / 175
- 10 Modern Water in Crisis / 191
- 11 Sustaining Modern Water: The New “Global Water Regime” / 212

PART 4: CONCLUSION: WHAT BECOMES OF WATER

- 12 Hydrolectics / 223
- Notes / 248
- Bibliography / 295
- Index / 324

Illustrations

FIGURES

- 1.1 Developed and potential hydroelectric power in Canada / 10
- 1.2 “Largest dams in Canada,” 1985 / 11
- 1.3 “World’s water system” / 16
- 1.4 “The hydrologic cycle” from the US Geological Survey / 16
- 1.5 The ultimate abstraction / 16
- 2.1 “‘Moments’ in a cognitive map of the social process” / 32
- 2.2 “The production of socio-nature” / 38
- 4.1 Water dethroned in Lavoisier’s laboratory / 78
- 4.2 Dalton’s atomic symbols / 79
- 4.3 The Roman aqueducts by Zeno Diemer, ca. 1920 / 82
- 4.4 Rivers as social entities: *The Nile* / 92
- 5.1 A depiction of the widely held notion of the subterranean source of springs and rivers, from Athanasius Kircher’s *Mundus Subterraneus*, ca. 1664 / 112
- 6.1 “The hydrologic cycle” from Horton, 1931 / 129
- 6.2 The hydrologic cycle as an expression of the basic water balance equation for a basin / 133
- 6.3 Hydrologic science = The hydrologic cycle / 137

- 6.4 “The hydrologic cycle” from Meinzer, 1942 / 140
- 6.5 “The hydrologic cycle” from the American Society of Civil Engineers, 1949 / 142
- 7.1 “Precipitation and the hydrologic cycle” / 158
- 7.2 “How the water cycle is measured” / 159
- 8.1 “Scheme of the hydrologic cycle” / 169
- 9.1 Can you find the politics in this picture? / 188
- 9.2 The hydrologic cycle, with global annual average water balance given in units relative to a value of one hundred for the rate of precipitation on land / 189
- 10.1 “The world’s water supply” / 196
- 10.2 A juxtaposition of two abstractions: “Water availability vs. population” / 197
- 10.3 “Freshwater availability, cubic metres per person and per year, 2007” / 198
- 12.1 “The global water system” / 230
- 12.2 The cycle of public water and the production of a body public / 232
- 12.3 Interruption of the cycle of public water / 233
- 12.4 Diversion from the public water cycle and the production of individual consumers / 234
- 12.5 Mass swim at Richardson beach, Kingston, Ontario, 22 July 2008 / 237

TABLES

- 1.1 Water content in the hydrosphere / 17

FOREWORD

Making Waves

by Graeme Wynn

Beginning a book as Jamie Linton does this one, with the claim that “water is what we make of it,” is an act of provocation. Just as a sudden gust of wind ruffles reflections on the mirror surface of a still pond, so this assertion disturbs the seemingly self-evident truth that water is water. There are dangers in such a strategy. Readers who take the existence of this most common of the earths’ natural substances for granted may well be puzzled by Linton’s opening words. Those who think about water only as fresh or salt, hard or soft, hot or cold, dirty or clean might concede individual responsibility for heating or chilling small quantities of it and accept collective human blame for water pollution, yet insist that water is fundamentally the same as it was when “the Spirit of God moved upon the face of the waters.”¹ Those who know that water is a colourless, transparent, tasteless, scentless compound of oxygen and hydrogen – H₂O in its intermediate state between ice and vapour – might doubt the veracity of the author. Others, equally misguided, might see this sentence as the beginning of yet another convoluted and ultimately irrelevant exercise in academic hair splitting.

Like the effects of the perturbing wind, the implicit challenge of these first words may dissipate, but it cannot be ignored. Even as reflections paint the calming waters anew, those who watched their precursors disappear appreciate their fragility, sense their imperfection, and know them differently. So, once made, the assertion that water is what we make of it complicates our thinking about it. Just as a stone thrown into a lake spreads ripples outward across its surface, so Linton’s provocation sends intellectual

shock waves hammering into pervasive ways of understanding and defining water, invites reflection on the ways in which people have thought about water in the past, and heightens awareness of the consequences that will flow from what we make of water in the future. These are not small matters.

Water is everywhere these days, at least metaphorically and representationally. It is in the news: too little or too much, it is the centrepiece of stories of crisis and disaster precipitated by droughts, floods, or tsunamis, and impure, it is a source of disease and death. It is the topic of countless magazine articles: read about “Situational Waste in Landscape Watering,” about the Great Salt Lake as America’s Aral Sea, or about the economics and psychology of bottled water, on which Americans spent more in 2007 than they did on iPods or movie tickets, an astonishing \$15 billion. It has spawned a groaning shelf of books: it appears as blue gold, liquid assets, an uncooperative commodity, a precious resource, and a disconcertingly diminished drop at the centre of the last oasis. It is on film and DVD: see *Waterlife*, winner of the 2009 Canadian Hot Docs Special Jury Prize for the story of the last huge supply of fresh water on earth, the Great Lakes, or Deepa Mehta’s film *Water*, which is not really about water at all! It is even in museums: a major (US\$ 3 million plus) exhibition “Water: H₂O = Life” opened at the American Museum of Natural History in 2007, offering “the fascinating story of water’s influence on Earth and, simultaneously, a cautionary tale of growing demands on an essential and limited resource.”²

Making a distinctive contribution to this hubbub is no easy task, but Linton rises to the challenge by tracing the development of particular ways of thinking about water in the twentieth century and pondering their consequences. He does so with a singular vision and an unusual voice, both rooted in personal experience. Trained first in political philosophy and international development studies, Linton was an environmental policy researcher and environmental activist with a special interest in aquatic ecosystems and water issues before beginning the doctoral work in geography from which this book is derived. Reflecting its author’s varied training and his engagement on the front lines of debates about water in the 1990s, when it was widely asserted that the world was on the brink of unprecedented and calamitous water scarcities, *What Is Water?* is an extended essay making the argument that this “water crisis” owed (and owes) its existence and rhetorical power to the ways in which modern Westerners think about water.

The crux of Linton's case lies in an insight offered by the philosopher and social critic Ivan Illich in the 1980s: in developing the idea of water as a scientific abstraction, modern society disenchanted that "ineffable stuff called water," robbed it of its history, and made it almost impossible for its members to know the waters of "the deep imagination" (75). Put slightly differently, this suggests that premodern societies typically lived with the reality of various waters diversely known, whereas modern societies essentialize water to the point where it is extracted from the social contexts of human experience and treated as an invariant essence, be that essence H_2O or a "resource." In more formal terms yet, this is to say that Linton's argument draws its impetus from the identification of an epistemological revolution in the way that people knew and represented water, a revolution that presumed and established a fundamental separation between the natural and the social realms and thus, sometime in the nineteenth century, robbed water of its social nature.

There is much to think about in all of this. Reflecting his geographical training and ongoing debate in the discipline of geography about what is commonly described as *socionature*, Linton first outlines the theoretical approach he uses to develop his understanding of the "essential relations between water and society" (20) and to underpin his basic point that water (and nature) are far less natural than they have generally been taken to be by those educated in the modern Western tradition. He draws together notions of relational dialectics and hybridity to offer a way of "analyzing both the history of water and how the idea of water articulates with its material and representative forms to produce this history" (41). This discussion is far less difficult than this stark summary suggests; taken in full it provides a thoughtful engagement with diverse literatures and an intriguing platform for reflecting more broadly upon human-environment relations.

Although a historical perspective is central to Linton's argument, his discussion of the past is neither chronological nor comprehensive. It begins retrospectively, noting recent expressions of dissatisfaction with the ways in which water has been conceptualized and represented in the industrialized world through the twentieth century, to establish both the need for critical perspective on this way of seeing – treating water as an abstraction – and the importance of examining, once more, "the institutional, social and political dimensions of the water-society nexus" (48). His argument then proceeds to consider a series of "moments" that might be regarded as "separate, independent, or self-sufficient," but which are here understood through the lens of relational-dialectical analysis to "actually produce each

other in mutually constitutive processes” (27). In this central section of his book, Linton reflects in turn upon the ways in which premodern conceptions of water differed from those framed through the practices of modern science, engineering, and state-building. He compares the hydrological cycle (a scientific concept) with older ideas about the circulation of water and examines its importance as the predominant mode of thinking about the ways in which water flows through the hydrosphere. He also shows how articulations of the hydrological cycle with government agendas in mid-twentieth-century America facilitated unprecedented manipulation and control of rivers. The projection of the hydrologic cycle on a global scale yields the further abstraction that Linton describes as “global water,” a necessary ingredient of the full-blown water crisis that emerged in the 1990s. Finally, *What Is Water?* takes the turn suggested by its title, to explore the philosophical commitments that underpin the abstraction “modern water” and to argue that the idea of a global water crisis emerges from the incommensurability of “global water” and a second, equally gross, abstraction, “world population.” The conclusion then outlines a new approach to thinking about water in relation to both social and hydrological circumstances.

Readers with very different interests will be intrigued by the rich array of arguments, ideas, interpretations – and provocations – in this book. Those preoccupied by theoretical considerations and larger questions about the nature-society binary, as raised by Bruno Latour, Erik Swyngedouw, David Harvey, and others, will find reflexive engagement with the ideas of these writers and a substantive treatment of some of the questions their works raise, at least as they are evinced by water, every instance of which, as Linton has it on page 36, “combines nature and society, the properties of H₂O, the material practices of people, and the effects of discourse.”

Those interested in modernity and especially its promise of “human emancipation through the domination of nature,”³ the culmination of which James C. Scott has described and interrogated as “high modernism,”⁴ will likewise find much to mull over in these pages. Big dams holding back enormous rivers are almost archetypal products of what Scott sees as large-scale, authoritarian planning intended to realize grand utopian schemes. In the minds of many twentieth-century politicians and planners, these dams were icons of progress and development, veritable “temples of modernity” as Indian prime minister Jawaharlal Nehru famously described them in the 1950s.⁵ As parts of complex engineering works for the generation of electricity, they helped turn rivers into organic machines.⁶ As

devices for controlling flows of water, changing the seasonal rhythms of rivers running to the sea, and redefining their purpose according to new metrics of “efficiency,” they were integral elements of a pervasive water management paradigm that more than doubled per-capita rates of water withdrawal from rivers, lakes, and aquifers during the twentieth century. In Linton’s account, their escalating costs, both ecological and economic (“the next water project costs twice as much as the last” quip those who plan them), are forcing water managers in many parts of the world to think anew about the challenges they face when planning new developments.

In this context, the story of modern water management follows its own intriguing cycle, moving through a series of supply-side emphases – from resource development, through water management, to sustainable resource management – to a recent demand-side emphasis on managing consumption. There are echoes in this cycle of the distinction that Samuel Hays draws between the conservation and environmental movements in the United States. In Hays’ view, the early twentieth-century conservation movement grew out of and reflected producers’ concerns about the finitude of resources and promulgated a “gospel of efficiency” in resource use. By contrast, he sees post-Second World War environmentalism as a consumer-led movement that reflected growing public anxiety about the quality of human life on earth.⁷ Both environmental historians and resource managers might find a good deal to think about, and with, in these parallels.

Thanks to the work of Donald Worster, the fact that the state became “an agency for [the] conquest” of water in the early twentieth-century United States is hardly a revelation,⁸ but Linton’s discussion of these developments (Chapter 7) is worth reading for two reasons: first for its treatment of the role played by W.J. McGee, sometimes described as “the chief theorist of the conservation movement,”⁹ in defining water as a resource; and second for its discussion of the ways in which this definition depended upon developing the capacity to measure and inventory water (in effect, upon making water legible, in Scott’s terms).¹⁰ Developing a quantitative view of water was part of the process that enabled science, in the words of German philosopher Martin Heidegger, “to pursue and entrap nature as a calculable coherence” (183). It allowed estimates of the stock of water, identified the limits of supply, implied the prospect of scarcity, and facilitated the exercise of allocative power over what became, in this context, a finite resource.

These moves were foundational for the development of resource management and, as Linton has shown elsewhere, they were codified and

extended by the work of the economist and geographer Erich W. Zimmerman between 1933 and the early 1950s.¹¹ Most often remembered for his aphoristic comment that “resources are not, they become,” Zimmerman was no harbinger of a social constructivist view of the world but a firm believer in the divide between (civilized) humans and nature. He thought of nature as “neutral stuff” and the word “resource” as an abstraction, referring not “to a thing or substance but to a function which a thing or substance may perform or to an operation in which it may take part.”¹² From this perspective, nature was either (economically) useful to modern humans or it was meaningless. It follows from this that once something is identified as a resource, it is open to exploitation “to yield the highest return” to capital or society (more abstractions) in order to further “the promotion of real wealth.”¹³ Thus questions of access to the resource are reduced to the language of calculation and technique, political agendas are hidden behind a veil of bureaucratic competence, difficult questions of social justice (who defines such terms as resource, return, wealth?) are swept aside, and resource managers are empowered to make what they take to be the best of the situation.

These developments were important because they framed ways of thinking that led inexorably to “the gloomy arithmetic of water” (203) – that there is simply not enough to go around, that “all land-bound life has to share one ten-thousandth of the planet’s water” (194) – and thus produced the notion of a general water crisis. For proponents of this way of thinking, the crisis is largely a consequence of runaway demand. The earth’s supply of fresh water is finite, and the world is running dry because its human population continues to grow. But this crisis is, Linton insists, manufactured in another sense. The people factored into these calculations and facing water crises are, in his fine and ironic phrasing, “one dimensional, consuming, procreating, biological units, whose relation with water is as fixed and determinate as the statistical methods by which they are made known” (198).

The noble essence of Linton’s position is that people are more than Malthusian figures, and that water is much more to them than a cluster of molecules or a resource defined in functional terms. A couple of decades ago, amid much debate about the development of bulk water exports from Canada to the United States, Chief Kathy Francis of the Klahoose Nation of British Columbia offered a moving counterpoint to the arguments of those who saw water as something “to be captured or tamed, put in containers ... and transported far away to be used or sold for money.” Her people, she said, saw water very differently:

A creek, which to a non-native person may be seen simply in terms of flow rates and acre-feet per year, may have a special name and spiritual significance. It may be a private bathing place for special ceremonies or initiation rites, or in some cases be owned by a particular individual or family. It not only physically and spiritually cleanses people, but it also cleanses the earth and, eventually the sea to which it inevitably flows, if left alone.¹⁴

Here is the heart of Linton's argument: "that phenomena [as the English geographer and proponent of socionature Noel Castree has written] do not have properties in themselves but only by virtue of their relationships with other phenomena."¹⁵ Linton's answer to the question *What Is Water?* is that water becomes what it is in relation to other things and processes; it is what we make of it.

Provocation indeed. This simple observation is a call to arms. It signals rejection of utilitarian, managerial attitudes toward nature, undergirded by catch-phrases such as "sound ecology is good economics" and sustained by the conviction that "environmental planning can make the most of nature's resources so that human resourcefulness can make the most of the future."¹⁶ In its refusal to accept definitions of water as a commodity, it echoes American conservationist Aldo Leopold's call for an ethic in which humans see themselves as part of a "community of interdependent parts."¹⁷ And in the process it drives waves of dissent against the very foundations of what the Indian anthropologist and human rights activist Shiv Visvanathan, reacting against the managerial underpinnings of the Report of the World Commission on Environment and Development, entitled *Our Common Future*, once described as "Mrs Bruntland's disenchanting Cosmos."¹⁸

NOTES

- 1 Genesis 1:2.
- 2 Endter-Wada et al., "Situational Waste in Landscape Watering"; Bedford, "The Great Salt Lake as America's Aral Sea?"; Fishman, "Message in a Bottle"; Barlow and Clarke, *Blue Gold*; Boberg, *Liquid Assets*; Bakker, *An Uncooperative Commodity*; De Villiers, *Water*; Postel, *The Last Oasis*; McMahon, dir., *Waterlife* (see also: <http://waterlife.nfb.ca>); Mehta, dir. *Water*; Schmit, "Water: H₂O = Life."
- 3 Kaika, *City of Flows*, 12.
- 4 Scott, *Seeing Like a State*.
- 5 Williams and Mawdsley, "Postcolonial Environmental Justice."
- 6 White, *The Organic Machine*.
- 7 Hays, *Conservation and the Gospel of Efficiency*; Hays, *Beauty, Health and Permanence*.
- 8 Worster, *Rivers of Empire*.

- 9 See Helms, "The Early Soil Survey."
- 10 McGee, "Water as a Resource."
- 11 Linton, "The Social Nature of Natural Resources."
- 12 Zimmerman, *World Resources and Industries*, 7.
- 13 *Ibid.*, 17.
- 14 Francis, "First They Came and Took Our Trees."
- 15 Castree, *Nature*, 224.
- 16 Conable, "Address to the World Resources Institute," 6, 3.
- 17 Leopold, *A Sand County Almanac*, 204.
- 18 United Nations World Commission on Environment and Development (Gro Harlem Brundtland, chair), *Our Common Future*; Visvanathan, "Mrs Bruntland's Disenchanted Cosmos."

Preface

In the 1990s, I worked as a freelance writer and researcher specializing in water issues. There was a lot to write about, as problems like water scarcity, water pollution, and inadequate water services for billions of people were then (as now) giving rise to concerns about a global water crisis. In 1997, I put together a small book on water issues that was published by the Canadian Wildlife Federation and titled *Beneath the Surface: The State of Water in Canada*. The book was a snapshot of the contemporary health of aquatic ecosystems throughout Canada. On virtually every page, along with data on water quality, the hydrology of rivers, and the status of freshwater biota, there was information and comment about people: the legacy of activities such as mining on water quality and of land clearance on wetland ecosystems; the effects of large dams on the diet of First Nations peoples in the North; the impacts of agricultural and industrial practices on rivers; the influence of recreational fishing on the species composition of the Great Lakes. In a book devoted to “The State of Water in Canada,” I found it unavoidable to include a long chapter at the beginning that dealt with the history of human-water relations. The concluding chapter asked, “Are things getting better or worse?” and dealt largely with the water policy of the federal government.

I learned from producing that first book the difficulty of writing, talking, and even thinking about water without involving people in the story. The state of water always reflects, in one way or another, the state of society. And yet perhaps the greatest hydrological accomplishment in the modern world has been to construct an idea of water as something apart

from the broader social contexts in which it occurs. Water has been made known as an abstraction – as H_2O , the stuff that flows through the hydrologic cycle. This book provides a history of this abstraction and a critique of the kind of management thinking that flows from it.

Among the many people who have helped bring this book to light, there are several whom I wish to thank in particular: Graeme Wynn, the Nature | History | Society series editor at UBC Press, has been an inspiration and mentor as well as a source of suggestions and ideas along the way. Randy Schmidt, the acquisitions editor with whom I have worked throughout the project, has provided invaluable assistance and much-appreciated doses of humour when needed. Laraine Coates and the editing and production team at UBC Press have made it a pleasure to bring this book out while doing an excellent job of making it as presentable as possible. Although I cannot thank them personally, the comments of the three anonymous reviewers engaged by the Press have greatly improved the original manuscript. I am grateful to several colleagues for having reviewed parts of the text or otherwise having helped to improve it, especially Andrew Baldwin, Bruce Braun, Mike Brklacich, David Brooks, Sean Carey, Simon Dalby, Alex Loftus, Bill Nuttle, and Iain Wallace. I also wish to thank all those involved in the Department of Geography and Environmental Studies at Carleton University (Ottawa) and the Department of Geography at Queen's University (Kingston) for providing me with a solid and convivial academic home in which to carry out my research and writing. I am also very pleased to acknowledge the Social Sciences and Humanities Research Council (of Canada) (SSHRC) for supporting my study habits in recent years. My deepest thanks of all go to Deb Vuylsteke for her assistance and support throughout this project and to our children, James Jules and Samantha, for the same.

PART I
Introduction

I

Fixing the Flow: The Things We Make of Water

Water is what we make of it. This is not a particularly novel assertion. The philosopher and historian of religions Mircea Eliade wrote that water “is *fons et origio*, the source of all possible existence ... it will always exist, though never alone, for water is always germinative, containing the potentiality of all forms in their unbroken unity.” Everyone knows that we can’t exist without water. But neither can water, as *fons et origio*, exist without us. We give to water that which enables it to realize its potential. All by itself, water is supremely fluid, fluctuating, fleeting. We mix language, gods, bodies, and thought with water to produce the worlds and the selves we inhabit. *Encyclopaedia Britannica* reports that “the body of a normal man weighing 65 kilograms (about 145 pounds) contains approximately 40 litres (about 42 quarts) of water.” “We made every living thing of water,” says the Qu’ran. “Water has a nearly unlimited ability to convey metaphors,” declares the social critic Ivan Illich. Indeed, almost anything can be distilled into a watery metaphor. But then we can always (re)turn to water as a means of dissolving the very things we have made of it: “Only in contemplation of [water] do I achieve true self-forgetfulness and feel my own limited individuality merge into the universal,” writes Thomas Mann. “Yes, as everyone knows, meditation and water are wedded forever,” wrote Herman Melville in his classic work on the human condition.¹

If we were to ascribe to water an essential nature, this might best be described as its legendary fecundity. Something of this essence can be gleaned from ancient cosmology, particularly theories about the origin of

the universe. People in ancient Egypt, Babylonia, and Greece conceived of water as the fundamental substance out of which everything came into being.² Thales of Miletus (a seventh century BC Greek thinker often considered the first philosopher in the Western tradition for having postulated a reason for the manifold of nature) declared that it was water out of which the entire world took form. The Judeo-Christian tradition bequeathed a similar sense of the fecundity of water, even though it required a transcendent mind (God) to bring things to life: “In the beginning,” declares the first sentence of the Old Testament, the universe consisted of formless, dark waters. Then, during the course of the first six days, “a wind from God swept over the face of the waters” to produce light, dry land, vegetation, animals, people, and every other thing that populates this worldly realm.³

These ideas and accounts of the origin of the universe reveal a kind of truth about water that doesn't translate easily into modern language. We are more used to thinking of – and representing – water as a fixed thing rather than a principle or process out of which things occur. One purpose of this book is to consider the difficulties that arise when we lose sight of water's essential fecundity and consider its essence in more fixed, material terms. Certainly, water is among the least cooperative of things when it comes to being contained in words and in deeds. Water is what we make of it, but it seldom stays that way for long. When we do contrive to slow down the flow for long enough to substantiate it in language, represent it in numbers, or confine it in Euclidian spaces, water transforms and slips into impermanence; reservoirs rise and fall, winter comes along and the stuff turns to ice, sublimates, and gets spirited away on the first available breeze. Even H₂O, that pregnant compound that emerged from the eighteenth-century laboratory of French chemist Antoine Lavoisier is shockingly promiscuous – it goes and bonds with practically everything once it escapes the lab!⁴

We will be considering water primarily as a process rather than a thing. The “water process” is that out of which every specific instance of water gets abstracted, including scientific representations such as H₂O. On this view, things such as H₂O do not constitute the fundamental reality of water but, rather, are fixations that occur at the nexus of the water process and the social process of producing and representing scientific knowledge. The stability of such representations of water, moreover, is contingent on these social processes. Every instance of water that we can think of occurs as a product of the water process and various kinds of social processes and practices. It is in this sense that we discuss the *social nature of water* – not

that society produces water per se, but that every instance of water that has significance for us is saturated with the ideas, meanings, values, and potentials that we have conferred upon it.⁵

The water process has a remarkable capacity to connect things. The ancient Romans didn't go to the public baths primarily to wash their private bodies of the dirt of the city; they went to the baths to cement a civic bond. "Cleanliness was a shared civic experience," writes sociologist Richard Sennett, "and a public bath was the most popular building a ruler could erect. The baths mixed the enormous diversity of the city together in a common nakedness."⁶ But just as it has the capacity to dissolve things in a common solution, water is able to undo the world completely, even if only to allow it to be put together again in some new and improved way: The significance of the biblical flood was that it ended after forty days and forty nights, allowing things to get established on a sounder footing thereafter. The significance of baptism by submersion is in receiving the initiate as born again upon his or her emergence from beneath the surface. Dissolving and resolving ourselves in water, we partake in a dialectical process of solvent and solution in which emergent and diverse capacities of water, and people, come into relevance. It is this dialectic that I want to explore here, ultimately with the aim of arguing that society and water can be understood to make each other, a process by which both water and society are changed.

I direct this argument to a broad audience. Specifically – as might have been inferred from the liberal use of the pronoun "we" in the paragraphs above – it is addressed to those who, like me, understand themselves to be the heirs and critics of a broad tradition described as Western thought. This tradition may be considered as both the cause and effect of narratives of intellectual development through the various epochs of Western history, described by the philosopher Richard Tarnas as "ancient and Classical Greece, the Hellenistic era and imperial Rome, Judaism and the rise of Christianity, the Catholic Church and the Middle Ages, the Renaissance, Reformation, and Scientific Revolution, the Enlightenment and Romanticism and onward to our own compelling time." The argument that this is a tradition "whose sum and consequence we all bear within ourselves" will be relevant to most readers,⁷ and I would add that it is an argument only strengthened by the vehemence with which we may reject the tradition. In the broadest sense, then, this book is about the idea of water in Western thought. More specifically, it is about how a particular idea of water has attained widespread prominence in recent times, and about the implications and consequences of this idea.

To speak of Western thought is to invoke a wide variety of (often completely opposite) ideas and ways of seeing; in fact, it is impossible to characterize Western thought as a whole. Nonetheless, at any point in history it may be said that certain presumptions about things and about how it is possible to gain knowledge of them predominates. The historian of ideas, R.G. Collingwood, described three key phases in the history of the idea of nature in Western thought: ancient Greek, Renaissance, and modern.⁸ Taking a very different approach, the social theorist and philosopher Michel Foucault described a sequence of “regimes of knowledge” or “epistemes” dating from the sixteenth century that he identified as Renaissance, Classical, and Modern.⁹ Although Foucault’s “archaeology” of these epistemes somewhat eclipsed the history of ideas approach, he nevertheless retained the notion that in any given period certain ways of thinking predominate “in the mainstream of a culture such as ours.” Foucault’s aim was to excavate these epistemes, “to rediscover on what basis knowledge and theory become possible.”¹⁰ In short, although people in every society have simultaneously entertained wonderfully different concepts and ways of thinking, one may nevertheless speak of *predominant* ideas that pertain in any given time and place, and analyze these ideas in ways that consider the reasons for, as well as the effects of, their predominance.

For most of the twentieth century, we generally took water for granted. We held a firm understanding of what water was and what it meant, as well as a certain faith in its material abundance. Today, of course, this is no longer the case. Various factors – reflected in growing concerns about a global water crisis, water scarcity, water pollution, the uneven geographic and social distribution of access to water and to water services, and the potentially disastrous hydrological consequences of climate change – suggest that we no longer take water for granted in a material sense. Rather than fecundity or potentiality, we are now more likely to associate water with scarcity, pollution, war, and crisis. It could be said that “Water and Dreams” – the title of Gaston Bachelard’s meditation on the place of water in the Western psyche – has given way to the generalized “water nightmare” of a recent newspaper headline.¹¹

No longer taking water for granted in a material sense, we have also begun to *think* about water in a different way. Water is now more complicated than it seemed in the mid-twentieth century. In modern times, water has most commonly been thought of as a resource that could be considered and managed in abstraction from the wider environmental, social, and cultural context(s) in which it occurred. Today, however, water

is complicated by (and co-implicated with) these contextual circumstances. It has become far more difficult to think about water in the abstract: We can no longer ignore water's *ecological* dimensions, such as its importance for sustaining healthy terrestrial, as well as aquatic, ecosystems.¹² Nor can we ignore water's *cultural* dimensions, as in the myriad ways that water articulates with people to produce different meanings and different kinds of relationships.¹³ And we cannot ignore water's *political* dimensions, as marked by the distribution of economic benefits and affordances associated with particular modes of water governance.¹⁴ These various dimensions have always been present in water, of course. Now, however, the ecological, cultural, and political aspects of water present themselves to us in ways that challenge and defy our abstract understanding of water's nature.

This complication of water, I argue, is at the root of what is often called the water crisis. The water crisis is often understood in terms of things such as water scarcity and water pollution and is presented as something that manifests physically, often at a global scale. There is no question that people in different parts of the world face enormous and urgent problems associated with water. It is a stark fact, for example, that over a billion people lack access to safe sources of drinking water and over two billion people lack adequate sanitation services. But to gather these issues under the rubric of the "global water crisis" diverts attention from the political and social circumstances that produce such problems and frames their solution in predominantly technical and hydrological terms. This book develops the argument that our idea of water needs to be complicated by the fact that in every instance, water bears the traces of its social relations, conditions, and potential. We are indeed facing a water crisis, and this crisis stems from the fact that we can no longer presume a simple identity for water as well as from the facts of water scarcity and water pollution.

In an effort to describe the futility of identifying the fixed truth of things, the philosopher Friedrich Nietzsche described the world as "an unstable foundation of running water."¹⁵ If pinning down the world is so difficult, how much more difficult it must be to fix the flow that Nietzsche invoked to illustrate the very principle of inscrutability. But we do have a penchant for fixing things, and water is no exception. This habit of pinning things down perhaps owes something to our biological inheritance, which predisposes us, like other primates, to "see the environment as a collection of things rather than merely as a pattern."¹⁶ But our tendency to perceive discrete things that relate to one another as separate entities is greatly aided by how we are *taught* to see. How have we been taught to see water? How have we managed to pin down water as a "thing" (for

example, a compound of hydrogen and oxygen denoted by the chemical formula “H₂O”) despite its rather obvious processual nature? In the chapters that follow, I describe how we have produced the idea of water as an abstraction and have upheld this abstraction as water’s essence. “Modern water” is the term I use to describe this way of knowing water and the habits of thought and practice that it helps induce. One virtue of modern water is that it is not complicated by ecological, cultural, or social factors. This has made it relatively easy to manage. Another virtue of modern water is its universality – all waters, in whatever circumstances they may occur, are reducible to this abstraction. A third virtue is its naturalness – not only may all waters be reduced to H₂O but the product of this reduction is understood to constitute water’s essence, its basic nature.

Today, we take these virtues quite for granted. After all, our modern understanding of water is perfectly true in its consistency; as a basis for managing water for human society it has been immeasurably beneficial, helping improve health and standards of living for most people, especially in the modern, developed world. However, what we now presume to be the basic nature of water is actually a remarkable accomplishment, one that can be traced through the history of relations between water and people, including the myriad uses to which water has been put, the attachment of various meanings to water, the social differences and conflicts that have been mediated by water, and the ways that water has been made known to (and by) philosophers and scientists. Foucault developed an approach for studying the history of things that are not usually considered to have a history – things like sexuality, conscience, sentiments, and instincts. He called this approach “genealogy.”¹⁷ To some extent, this book falls in the genealogical tradition in its investigations of something – water – which, despite the substantial literature in water history, described in Chapter 3, *itself* isn’t usually considered to have a history.¹⁸ I have retained the word “history,” because Foucault’s genealogy is concerned primarily with investigation of the discourses that produce particular forms of human subjectivity – especially how discourses have the effect of objectifying the human subject – rather than aspects, or ideas, of nature per se. Thus, Part 2 of the book deals with the “history” of modern water.

The word “modern” is used here in two related senses. First, it denotes an approximate period of time. Because I have located the more salient historical developments of modern water in the Scientific Revolution (approximately the seventeenth century) and the Enlightenment (approximately the eighteenth century), this may be considered the beginning

of the modern period for our purposes. This period extends to the present albeit in attenuated form since the last third or so of the twentieth century, when a growing awareness that a basic rupture in Western thought was underway began to be reflected by changes in the ways people thought about water.¹⁹ Second, “modern” corresponds to a particular way of understanding things. Maria Kaika, a geographer who has investigated the social and material dimensions of flows of water in urban environments, describes modernity in terms of “a new, forward-looking world view and a new set of social expectations.” The most significant feature of this world view, as Kaika and others have pointed out, is a sense of the capacity for “human emancipation through the domination of nature.”²⁰ This sense in turn is associated with an intellectual manoeuvre – the Cortesian claim that the human mind is separate from nature, and therefore properly knows it as an object. Thus, modern water implies a way of knowing water that has become dominant, along with the idea that this way of knowing water reveals its true essence.

To speak of the domination of a particular idea or understanding requires some explanation: At any given time and place, different concepts and understandings of water prevail. Even from moment to moment, I might regard water as a source of inspiration, then as a natural resource, and then again as a medium of social relations. Nevertheless, it is possible to speak of a *hegemonic* construction of water in that there is one way of knowing water that has attained general predominance in my own place and time.²¹ Because the uses to which water is put, the people in whom authority is vested for its control, and the distribution of benefits that accrue from its allocation are central to any social order, it can be said that such order is maintained through discourses, laws, and tacit as well as formal rules that reinforce certain ideas and meanings of water in any given society. These ideas and meanings, moreover, get fixed in a material sense, as in the concrete engineering and infrastructural works that materialize hydrosocial relations in different places and times.

In a memorable phrase, David Harvey describes how certain kinds of social and natural relations – or connections – become consolidated through “an ecological transformation which requires the reproduction of those relations to sustain it.”²² Thus, all these things – ideas, meanings, laws, concrete fixtures, management techniques – hang together in a way that makes the hegemony of an idea seem natural, at least until confronted with a problem or contradiction that reveals it to be held in place by a web of powerful but ultimately changeable relations.

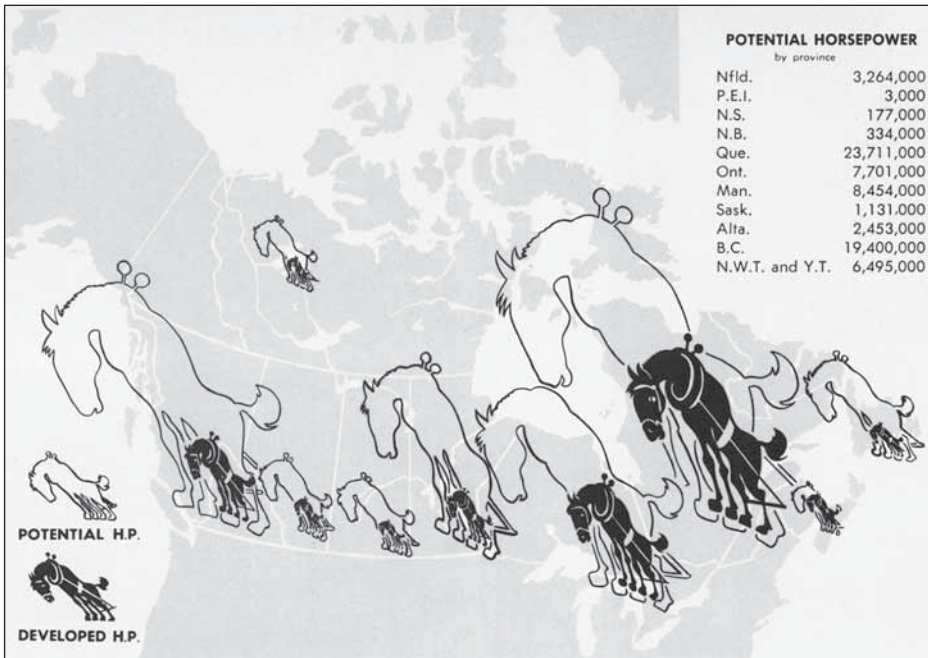


FIGURE 1.1 Developed and potential hydroelectric power in Canada
 J.E. Robbins, ed., *Encyclopedia Canadiana* (Ottawa: Grolier Society of Canada, 1957), 5:214.

Let me give an example from Canada. One of the dominant ways of fixing water (conceptually and materially) in Canada over the past century has been bound up with its capacity to assist people in the production of electricity. This consolidation of water's identity is particular to a certain kind of society, namely one in which people subscribe to ideas of technological advancement, economic development, and centralization of social power (i.e., the state). Perhaps because of its sense of advancement, development, and centralization, our society – at the height of its modernist vision – has thought it only reasonable to project this meaning onto the waters of a vast geographical space, thus representing the entirety of Canada's rivers as a quantity of hydropower just waiting to be harnessed (see Figure 1.1). The materialization of such meaning in the form of hydroelectric dams constitutes an important chapter in late twentieth-century Canadian history, sometimes referred to as “the postwar era of dams and diversions”²³ (see Figure 1.2.). Meanwhile, the dams have literally helped consolidate this meaning of water, just as the dams themselves have been fixed in a growing

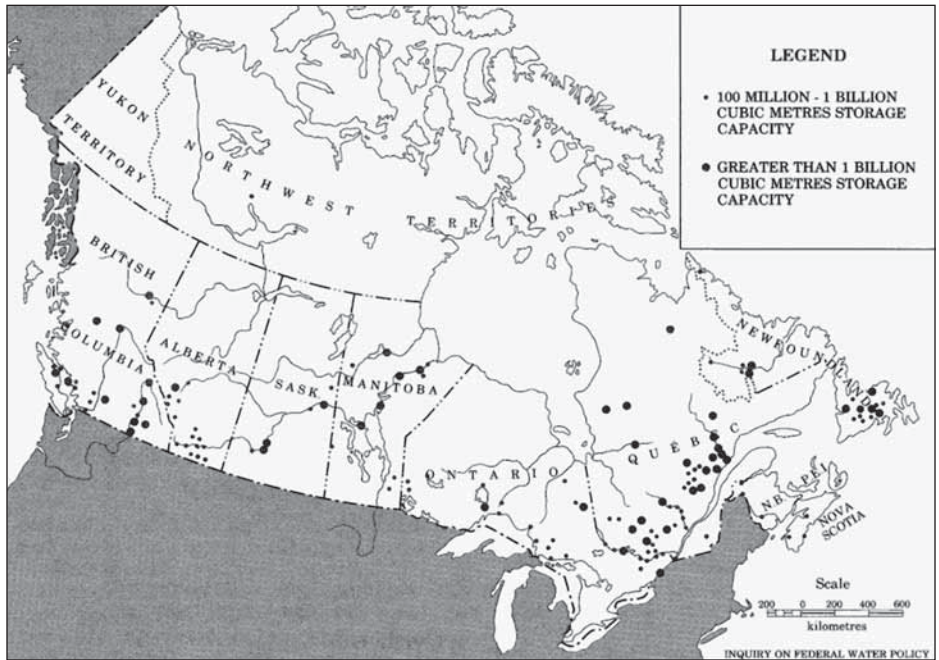


FIGURE 1.2 “Largest dams in Canada,” 1985

Most of these dams were built since 1950 and more than 80 percent serve the purpose of generating electricity. | Pearse, Peter, F. Bertrand, and J.W. MacLaren, *Currents of Change: Final Report, Inquiry on Federal Water Policy* (Ottawa: Government of Canada Inquiry of Federal Water Policy, 1985), 32.

entanglement of transmission lines, laws and regulations, transformers, industrial growth, consumer demand for electricity, and discourses that produce nationalist sentiments through the control of northern rivers.²⁴

Thus, a particular kind of identity, representation, and material form of water can get caught and held within a web of social and hydrological relations. Such webs can impose a kind of inertia, or “sclerosis” upon the water in question, and upon the society that produces it.²⁵ This is what I mean by hegemony, and it provides an example of what can be described as the hegemony of modern water. Such ways of imagining, representing, and materializing water might be considered hegemonic when alternative kinds of water are made out to be less real or less legitimate, or when they become so overshadowed that they are made invisible.

A hegemonic construction may enter a period of crisis when alternatives are recognized as being just as real and just as valid. With respect to water,

alternative identities and ideas become more apparent as we consider the waters of marginalized groups of people.²⁶ When government agencies built the dams in the decades following the Second World War, the views of water held by First Nations peoples inhabiting the affected areas of the vast physiographic region known as the Canadian Shield were considered of so little importance that they were left out of the calculations that resulted in the harnessing of rivers for electricity. These alternative waters became visible to the dominant society only when the people who give them life and meaning managed to place them(selves) directly in our line of vision.

The southward journey of the *odeyak* from the shores of James Bay in 1990 provided such a moment of recognition. The *odeyak* was a hybrid canoe/kayak built by the Cree and the Inuit of northern Quebec.²⁷ These peoples wished to demonstrate their opposition to the plans of Hydro-Québec (the public hydroelectric utility in the province of Quebec) to build a series of hydro dams on the Great Whale River, located approximately in the region represented by the head of the largest, black horse in Figure 1.1. The dams would have flooded vast territories and drastically altered the ecology of the river and, along with it, the livelihoods and lifeways of the people for whom it was an integral part of their cultures. The construction of the *odeyak* by residents of Whapmagoostui and Kuujjuaraapik – respectively the Cree and Inuit communities that would have been most heavily impacted by the dam – on the shores of James Bay symbolized the solidarity of the two communities. The craft was taken to Ottawa and from there was paddled by members of the two communities to the Hudson River and eventually to New York City in the spring of 1990. This voyage was intended to bring the Great Whale River, as it was known to these peoples, to the very doorsteps of the people whose consumption of electricity threatened to transform it into a foreign object. As one of the organizers of the voyage put it, “I think you can do that by having the people who live at the mouth of the river build a large paddling canoe to become an ark, a symbol of their way of life, their culture.”²⁸ The campaign was an important contribution to a significant historical change of direction: the premier of Quebec announced a halt to the Great Whale Project in 1994, mainly because Hydro-Québec’s prospective customers in the northeastern United States – now more aware of the implications of their actions on the waters of northern Quebec – backed away from initial commitments to purchase electricity from the project.

A host of water-related problems, together with glimpses of alternative waters such as were represented by the *odeyak*, is beginning to change

our view of rivers and waters generally. Water is becoming much more complicated than it was in the 1950s and 1960s, when hydro-horsepower seemed to map so naturally onto Canadian territory. Nevertheless, the way we see water remains rather fixed and simplified in our textbooks, in the speeches of our politicians, and in the physical infrastructure of a large portion of the hydrosphere surrounding us. Overcoming the hegemony of modern water involves changes in how we think about water, as well as how we represent, manage, distribute, value, and use it, for all these are closely related.

We can see how particular kinds of water can be held fast in recursive webs of social and natural processes. Because such fixations – like the identity of water as a resource for producing hydroelectricity – are the product of mixing water with social processes, they perform a kind of political work in the sense that they strengthen some social relations while making it difficult for others to establish or sustain themselves. To treat water as an economic resource allows some people to use it as a means to whatever ends they may have the economic and technological capacity to effect. Thus, alternative, potential meanings and relations with water may be ignored or shunted aside, along with the people for whom such meanings and relations are constitutive of life and livelihood. The business of fixing water, in other words, is hardly just an intellectual performance; in each instance, it allows for certain hydrosocial realities while making it difficult or impossible for others to spring to life. The meanings of water that get fixed in any particular time and place can therefore be seen as a function of the relative power of different social actors.

MODERN WATER

In subsequent chapters, we examine how the modern tendency to fix water got established in scientific discourse, was eventually made invisible to society at large, and thus became hegemonic. Our aim is to make modern water visible in a way that will help us reconstitute waters in different ways. A few introductory remarks are in order.

First, modern water is an intellectual achievement with far-reaching consequences for human society and the environment. By relating the history of this achievement – and thus considering the extent to which it involves human and cultural, rather than purely natural, phenomena – we do not discount its value to modern society. Much of what follows may

be taken as a critique of the hydrological sciences because it puts the practice of these sciences in a social and cultural context. However, it is readily acknowledged that the intellectual abstraction of water as a natural quantity has been of primary importance to modern economic development, urbanization, agriculture, transportation, public health, and flood control, to name just a few modern necessities that have been made possible by developments in hydrological science. The question of whether water science might even provide “the basis of civilization” has been raised by scholars working in a variety of fields.²⁹ Such a contention only underscores the importance of modern water and of critical examination of the knowledge practices that have made it possible.

Modern water can be defined as the dominant, or natural, way of knowing and relating to water, originating in western Europe and North America, and operating on a global scale by the later part of the twentieth century. A moment’s reflection will reveal that people do indeed relate to water in many different ways. However by “modern water” I mean to highlight the particular way of knowing and understanding what water is that dominates and pervades modern discourse. In essence, modern water is the presumption that any and all waters can be and should be considered apart from their social and ecological relations and reduced to an abstract quantity. Modern water’s historicity is suggested by geographer Derek Gregory when he writes that, toward the end of the nineteenth century, “a new discourse of hydrology and hydraulic engineering emerged which translated ‘nature’ into mathematical formulae. In these there would be no place for ‘local’ knowledge, and the hydraulics of irrigation channels and the mechanics of dam construction could be made the same the world over.”³⁰

The notion of translating “‘nature’ into mathematical formulae” suggests the predominantly scientific discourse in which modern water has incubated and proliferated. Through this discourse, all water is made known as an abstract, isomorphic, measurable quantity that may be reduced to its fundamental unit – a molecule of H_2O – and represented as the substance that flows in the hydrologic cycle. The scientific nature of (modern) water shows up quite clearly in our standard definitions of the term:

water 1a: the liquid that descends from the clouds as rain, forms streams, lakes, and seas, issues from the ground in springs, and is a major constituent of all living matter and that when pure consists of an oxide of hydrogen H_2O or $(H_2O)_x$ in the proportion of 2 atoms of hydrogen to one atom of oxygen and is an odourless, tasteless, very slightly compressible liquid which appears bluish in thick layers, freezes at $0^\circ C$ and boils at $100^\circ C$, has a

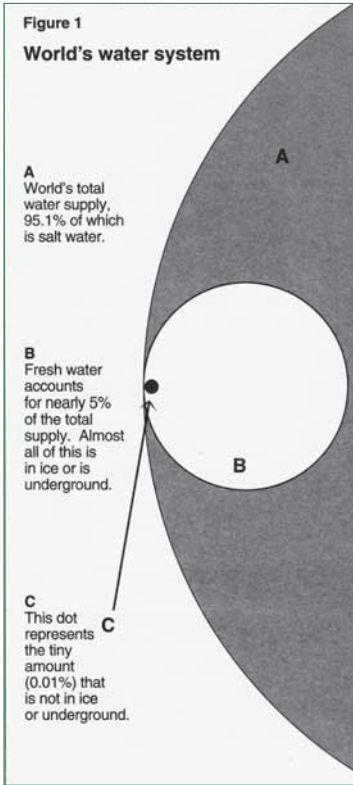
maximum density at 4°C and a high specific heat, contains very small equal concentrations of hydrogen ions and hydroxide ions, reacts neutrally, and constitutes a poor conductor of electricity, a good ionizing agent, and a good solvent.³¹

water 1. Colourless transparent tasteless scentless compound of oxygen and hydrogen in liquid state convertible by heat into steam and by cold into ice, kinds of liquid consisting chiefly of this seen in sea, lake, stream, spring, rain, tears, sweat, saliva, urine, serum, etc.³²

Water – Water (H₂O) occurs in the atmosphere and above and below the Earth's surface as a liquid, solid or gas. It is continually changing state (e.g., by freezing/thawing, evaporation/condensation) and location (e.g., by gaseous, liquid or glacier flow). All water is involved in a continuous hydrologic cycle, of which evaporation into the atmosphere from oceans, lakes, rivers and land surfaces and transpiration through plant leaves may be considered the first phase. This moisture is transported, often great distances, by winds and is precipitated, as rain or snow, upon water and land surfaces.³³

Or, to cite a highly popular “authority” on all things, the opening sentence of Wikipedia’s main article on “Water” states: “Water is a common chemical substance that is essential to all known forms of life.”³⁴ Water – in its modern guise – is thus made common to every circumstance – geographical, cultural, ecological, and historical – in which we find it. This commonality – or universality – is representable in diagrams and tables that have the effect of reducing all possible waters to a quantifiable substance (see Figure 1.3 and Table 1.1). The flow of modern water through the earth’s hydrosphere is represented by means of the ever-popular hydrologic cycle (see Figure 1.4). And to provide one further illustration, Figure 1.5 represents (modern) water in what is perhaps its most abstract form.

Although we can – and shall – trace the path of H₂O back to the late eighteenth century, and the scientific hydrologic cycle to a little over a century later, modern water is suggested in the notion that H₂O and the hydrologic cycle have always existed but simply required the application of proper (scientific) method to be brought to light. Of course, the universality of modern water is true in a sense: Water didn’t change its physical properties when the chemists pronounced it a compound. And it didn’t behave any differently when the hydrologists put it through the hydrologic cycle. However, to equate this (way of understanding and



◀ FIGURE 1.3 “World’s water system”
“Water – Here, There and Everywhere,” Freshwater Series A-2 (Ottawa: Environment Canada, 1992), 1. Reproduced with permission of the Department.



FIGURE 1.5 The ultimate abstraction

▼ FIGURE 1.4 “The hydrologic cycle”
National Atlas of the United States, 5 March 2003, <http://nationalatlas.gov>. Reproduced with permission of the National Atlas of the United States.

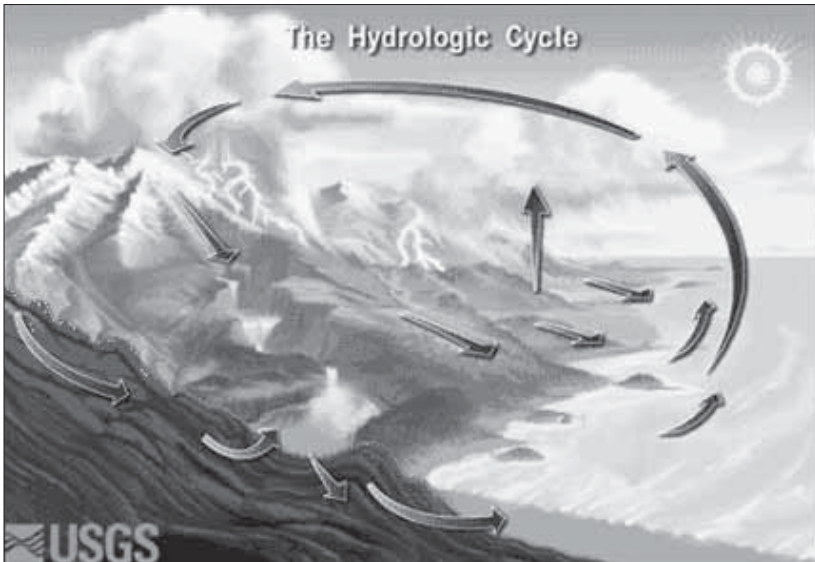


TABLE 1.1

Water reserves on the Earth

Type of water	Area of distribution ($\text{km}^2 \times 10^3$)	Volume ($\text{km}^3 \times 10^3$)	Water layer (m)	Fraction of total volume of hydrosphere (%)	Fraction of fresh water (%)
World ocean	361,300	1,338,000	3,700	96.5	—
Ground water (gravity and capillary)	134,800	23,400	174	1.7	—
Predominantly fresh ground water	134,800	10,530	78	0.76	30.1
Soil moisture	82,000	16.5	0.2	0.001	0.05
Glaciers and permanent snow cover:	16,227.5	24,064	1,463	1.74	68.7
Antarctica	13,980	21,600	1,546	1.56	61.7
Greenland	1,802.4	2,340	1,298	0.17	6.68
Arctic islands	226.1	83.5	369	0.006	0.24
Mountainous regions	224	40.6	181	0.003	0.12
Ground ice of permafrost zone	21,000	300	14	0.022	0.86
Water in lakes:	2,058.7	176.4	85.7	0.013	—
Fresh	1,236.4	91.0	73.6	0.007	0.26
Salt	822.3	85.4	103.8	0.006	—
Swamp water	2,682.6	11.5	4.28	0.0008	0.03
River stream water	148,800	2.12	0.014	0.0002	0.006
Biological water	510,000	1.12	0.002	0.0001	0.003
Water in the air	510,000	12.9	0.025	0.001	0.04
Total volume of the hydrosphere	510,000	1,386,000	2,718	100	—
Fresh water	148,800	35,029.2	235	2.53	100

Source: I.A. Shiklomanov, "World fresh water resources," in *Water in Crisis: A Guide to the World's Freshwater Resources*, ed. P.H. Gleick (New York and Oxford: Oxford University Press), 13.

representing water's) essence and behaviour with the nature of water itself is to tread modern water. It might well be asked, Was water not always H₂O, even before it was recognized as such? Of course the answer to such a question must be yes. However, the significant point here is that to ask this very question – or to make the assertion that water was always H₂O – is characteristic, even definitive, of modern water. Modern water reduces *all* water to this essential substance, this homogeneous chemical compound, both spatially and temporally. Thus, all water was, is, and always will be H₂O. That we find it necessary to make this assertion is distinctly modern.

By means of its conceptual abstraction, modern water materializes modern *man's* legendary distaste for mud, muck, and swamps of all kinds.³⁵ Modern water has been a tremendous ally of drainage projects and the creation of hardened shorelines. And just as we like to keep it neat and separate in the physical environment, we like to keep it separate from people too. Even though it flows constantly through our bodies and our psyches, in the modern cosmos, water has been banished to the Cartesian realm of extended substance.³⁶ Society and modern water are externally related as two independent and intransigent categories; water may be understood as affecting society, and society may be understood as affecting water, but neither may be understood as being fundamentally (internally) changed as a result of these exchanges.

Another characteristic of modern water can be described as its deterritorialization. The philosopher Bernard Kalaora has noted how the conquest of water by means of its conceptual abstraction and technical control has broken relations that otherwise bind specific groups of people to the waters of particular territories. A corollary of the placelessness of modern water (perhaps best symbolized by the tap) is the transfer of water control to placeless discourses of hydrological engineering, infrastructural management, and economics. Kalaora describes this in terms of a “déresponsabilisation” by which we have left all the responsibility for maintaining relations with water to experts.³⁷ Making a similar argument, Colin Ward describes our water problems in the title of his book, *Reflected in Water: A Crisis of Social Responsibility*.³⁸ And as described by anthropologist Veronica Strang, water has been dematerialized, rendered “a metaphorical abstraction ... in which it ceases to be particular to any place or group.” Thus, deterritorialized and dematerialized, modern water “denies the reality of local, specific human-environmental relationships and alienates the medium through which individuals can identify with a locale and its other inhabitants.”³⁹

Other characteristics of modern water will surface in the discussion that follows. For now, we might consider how the environmental historian Donald Worster describes the Friant-Kern Canal (a water diversion from the Sierra Mountains through the Great Central Valley of California) as a rough description of our subject:

Quite simply, the modern canal, unlike a river, is not an ecosystem. It is simplified, abstracted Water, rigidly separated from the earth and firmly directed to raise food, fill pipes, and make money. Along the Friant-Kern Canal, as along many others like it, tall chain-link fences run on either side, sealing the ditch off from stray dogs, children, fishermen (there are no fish anyway), solitary thinkers, lovers, swimmers, loping hungry coyotes, migrating turtles, indeed from all of nature and of human life except the official managerial staff of the federal Bureau of Reclamation. Where the canal passes under highways large, ominous signs are posted: "Stay alive by staying out." The intention of the signs, of course, is to promote public safety by warning the innocent of the dangers of drowning, of being sucked into siphons by the swift current. However their darker effect is to suggest that the contrived world of the irrigation canal is not a place where living things, including humans, are welcome.⁴⁰

This passage illustrates how the characteristics of modern water – its intellectual abstraction, scientific specification, material containment, and alienation from society and from the rest of non-human nature – hang together: the modern idea of water as an objective, homogeneous, ahistorical entity devoid of cultural content is complemented by its physical containment and isolation from people, and reinforced by modern techniques of management that have enabled many of us to survive without having to think much about it. I argue that modern water has entered a critical phase wherein each of these characteristics is recognized as untenable, or unsustainable, and that this crisis is forcing us to think about, and get involved with, water in ways to which we are little accustomed.

DOWNSTREAM FROM HERE

Chapter 2 provides an outline of the theoretical approach used in this study. One of the virtues of theory is that it helps instigate ways of seeing and understanding that suggest how things might be changed for the better. The approach described here directs attention toward the essential

relations between water and society; it provides a way of seeing that allows us to recognize the sense in which water is a social product, and thus the sense in which water can be changed as a result of changes in society. The name of this theoretical approach – relational dialectics – might suggest that it involves a discussion comprehensible only to people with a PhD in philosophy. That it derives from current ideas in the discipline of geography will likely be of only minor consolation. I have made every effort to ensure that the discussion is relatively easy to follow in order to encourage those who are neither geographers nor of a theoretical bent to engage in the argument that informs everything that follows.

Part 2 (Chapters 3 to 8) offers an account of the history of modern water. Here, modern water is seen as an idea that has arisen out of historical circumstances and has contributed to history approximately since the seventeenth century. However, we approach modern water retrospectively, beginning with the present and working our way back. Water is in a critical state and this condition compels us to look for the roots of the crisis. This search – or intimations of the need for such a search – is the main focus of Chapter 3. Here it is shown how, over the past twenty or more years, researchers and writers in many disciplines have engaged in work that stresses the importance of different ways of thinking about water. We survey examples of this work and show that, when taken all together, it points to the need for a direct critique of modern water.

Because it is usually taken to be natural (or timeless), an effective critique of modern water begins by describing its history. This description begins in Chapter 4 by considering an article written by historian of science Christopher Hamlin. Hamlin has identified a transition from an empirical emphasis on diverse “premodern waters,” which were regarded as heterogeneous entities exhibiting different properties and qualities, to a modern “essentialist conception of water itself,” a transition that appears to have taken place throughout the industrialized world by the end of the nineteenth century.⁴¹ A key moment in this conception of water itself was the naming and representation of water as a chemical compound of hydrogen and oxygen, and we will consider the importance of this moment to the idea of modern water. Furthermore, while agreeing with Hamlin’s analysis, we will broaden the argument by describing how the consideration of what might (anachronistically) be called hydrological questions has long effected an essentialist conception of water, and how the emergence of scientific, quantitative, hydrological practice beginning in the late seventeenth century has been instrumental in giving rise to modern water.

In Chapters 5 and 6, we consider the historiography of water science through the concept of the hydrologic cycle. Along with H₂O, the development and dissemination of the concept of the hydrologic cycle represents an important contribution to the idea of abstract, modern water. This contribution, as well as its centrality to the discipline of scientific hydrology, warrants consideration of the hydrologic cycle in some depth. Three different histories of the hydrologic cycle are presented, the first two in Chapter 5 and the third in Chapter 6, each describing a slightly different thing. The first history presented (and the one most commonly told) is that offered by modern-day hydrologists. This is the history of the scientific hydrologic cycle, the one that has always existed and was known intuitively to a host of ancient savants but awaited the application of correct scientific method to be truly revealed for the natural system that it is. The second history involves the story of how natural philosophers in the tradition of natural theology constructed what I call the “sacred hydrologic cycle” to buttress their theological arguments.⁴² This history would probably have remained untold had it not been for the geographer Yi-Fu Tuan, who published a unique study on the subject in 1968.⁴³ He shows that differences between the scientific and the sacred hydrologic cycles, and the difference between the histories that animate them, are explained mainly in terms of the distinctions between the epistemological approaches of modern hydrology and natural theology.

The third history of the hydrologic cycle, offered in Chapter 6, considers how the hydrologic cycle can be regarded as a concept that was deliberately *constructed* in, rather than *revealed* through, scientific practice. The hydrologic cycle that it describes is different from the scientific and sacred versions discussed in Chapter 5; it is a concept whose origin is specific to a particular time and place and yet has succeeded in obliterating its origins by virtue of having been planted firmly in the soil of nature by its progenitor. I call this the Hortonian hydrologic cycle, after Robert E. Horton (1875-1945), the American hydrologist who first presented it in 1931.⁴⁴

In Chapter 7, the links between modern water, the hydrologic cycle, and the modern state are explored. The main intention here is to show how modern water and the modern state are related. Essentially, the state has materially engineered modern water as a resource, while water resources have strengthened the apparatus of the state. This relation is illustrated by showing how the hydrologic cycle was implicated in the mid-twentieth century state-sponsored project to control and regulate the major river basins of the western United States. Following on the discussion of the Hortonian hydrologic cycle in Chapter 6, attention is focused

here on the history of modern water as it developed in the United States in the twentieth century. It is noted, however, that similar developments have occurred throughout the modern Western world.

Chapter 8 concludes Part 2 with the historical culmination of modern water – the abstraction and representation of the world’s total hydrological stocks and flows, which I call “global water.” Global water is latent in modern water, and its assessment was always implicit in the (scientific) hydrologic cycle. The most reliable methods of calculating the world’s quantity of water were developed and refined by hydrologists working in the Soviet Union, where the state’s needs for aggregated hydrological data were particularly demanding. These methods began to be transferred to Western hydrological practice via international collaborative efforts, the most notable of which was the International Hydrological Decade (1964–74). Although most hydrologists working in the United States and other English-speaking countries were committed to hydrological investigation on the scale of the drainage basin, “global hydrology” eventually became an accepted practice, such that by the 1990s, global water had achieved scientific credibility and growing popular currency in the West.

As modern water’s culmination, global water presents a way of knowing and representing water that does not mix well with people. In Part 3 (Chapters 9 to 11), we shift from an historical to a more philosophical register to elaborate on this fundamental incompatibility. The articulation of modern water with people now becomes the focus of the argument. In Chapter 9, I argue that although it was certainly produced in relation to social (i.e., scientific) practice, modern water is nevertheless taken to be entirely independent of social relations. This fictional independence is at the core of what we will consider here in terms of the “constitution” of modern water. The constitutional metaphor is taken from the writings of philosopher Bruno Latour.⁴⁵ The main purpose of the chapter is to identify the philosophical commitments that are necessary to produce, from the ephemeral flux of the water process, water’s essential, modern identity. By describing its constitution as a set of commitments that evacuate the social content of water, light is shed on the kind of difficulties that arise when attempts are made to reintroduce modern water to society.

These difficulties are the main theme of Chapter 10, which deals substantively with the water crisis, an issue that became a global concern in the 1990s. The argument is that a kind of philosophical crisis is produced when global water is juxtaposed with another abstraction: human population. As abstractions, global water and human population cannot be related dialectically, and so their juxtaposition produces an inevitable crisis

of scarcity. In contrast to the way the water crisis is often presented – that is, as a measurable consequence of fixed water supplies and growing human populations – the aim here is to show how modern water itself establishes the epistemological conditions that inevitably give rise to crisis. The crisis presented in this chapter is therefore not the water crisis per se but *the crisis of modern water*.

In Chapter 11, we consider the dominant response to this water crisis. It is argued that this response has been orchestrated by a network of water experts and professionals who have managed only to strengthen modern water in the process of trying to fix it. Such is the inevitable outcome of a way of seeing that continues to regard water fundamentally as an object rather than a process capable of internalizing social relations. Responding to the crisis of modern water – rather than the water crisis – requires that we address the social circumstances that make water what it is in every particular instance.

The reconstitution of water in a way that deliberately recognizes, or restores, its social nature is the subject of the concluding chapter. Here, the term “hydrolectics” is used to describe an approach to water that re-defines what it is, in relation to social as well as to hydrological circumstances. In setting out something of a program of research and political action, a distinction is made between analytical and practical hydrolectics. The overall objective of this program is to facilitate the adoption of more flexible, fluid hydrosocial relations. Together, water and people constitute great potential for changing each other in ecologically healthy and socially just ways.