REGULATED RIVERS

EDITED BY

ALBERT LILLEHAMMER
AND
SVEIN JAKOB SALTVÆIT

UNIVERSITETSFORLAGET AS
Oslo-Bergen-Stavanger-Tromsø
# Contents

**Opening address** .......................................................... 11  
Rolf Vik  
Running waters and mankind .............................................. 15  
H.B.N. Hynes  
The regulated stream as a testing ground for ecological theory  .. 23  
J.V. Ward and J.A. Stanford

**Chapter I: Hydrology and management**  
Physico-chemical parameters of a regulated river: The Verdon (France) .............................................................. 41  
A.M. Gregoire and A.M. Champeau  
The characterisation of flow regimes for assessing the impact of water resource management on river ecology ....................... 53  
A. Gustard  
The impact of emptying and cleaning reservoirs on the physico-chemical and biological water quality of the Rhone downstream of the dams ......................................................... 61  
A.L. Roux  
Water chemistry: Interaction of stream regulation and acid precipitation ................................................................. 71  
R.F. Wright  
The effect of supersaturated water at Norwegian water power plants on fish mortality .................................................. 81  
S. Pettersen and P. Mellquist  
The River Suldalslågen: A case study of the Norwegian decision process ................................................................. 87  
E. Tøndevold

**Chapter II: Botany**  
Effect of stream regulation on riparian vegetation .................... 93  
C. Nilsson  
Effect of stream regulation on algal vegetation ........................ 107  
O. Skulberg  
Comparison of vegetation stability on two river banks, subject to short-term water-level regulation, at the river Umeälven in northern Sweden ......................................................... 125  
G. Grelsson  
Hydro-electric development as a set of ecological factors ............ 133  
H. Sjørs
Chapter III: Invertebrates

Environmental changes induced by stream regulation and their effect on lotic macroinvertebrate communities

P.D. Armitage

The distribution and abundance of benthic insects subjected to reservoir-release flows in the Clearwater River, Idaho, USA

M.A. Brusven

Responses of the benthic fauna to short-term lowerings of the water level in a lowland stream in Denmark

F. Jensen and C. Jensen

The impact of a water transfer scheme on the benthic macroinvertebrates of a Norwegian river

J.E. Brittain, A. Lillehammer and R. Bildeng

The effect of the regulation on the aquatic macroinvertebrate fauna of the River Suldalslågen, western Norway

A. Lillehammer and S.J. Saltveit

Stream zoobenthos below two short-term regulated hydro-power dams in Sweden

J. Henricson and G. Sjöberg

Benthic animal production in a weir basin area in western Norway

T. Baekken, A. Fjellheim and R. Larsen

Biological and physicochemical changes downstream from construction of a subalpine reservoir in Colorado, USA

L.D. Cline and J.V. Ward

Stream regulation and blackfly larvae

R.S. Wotton

A survey of regulated streams in the Rocky Mountains of Colorado, USA

H.J. Zimmermann and J.V. Ward

Zooplankton of regulated and unregulated rivers: Murray-Darling River System, Australia

R.J. Shiel and K.F. Walker

Chapter IV: Fish

Genetic and physiological correlates in fish adapted to regulated streams

E.G. Zimmermann

Populations of presmolt Atlantic salmon (Salmo salar L.) and brown trout (Salmo trutta L.) before and after hydroelectric development and building of weirs in the River Skjoma, North Norway

T.G. Heggberget
Density of juvenile Atlantic salmon (*Salmo salar* L.) and brown trout (*Salmo trutta* L.) in two Norwegian regulated rivers .......................... 309
  S.J. Saltveit and J.O. Styrvold

Migrations of brown trout (*Salmo trutta* L.) at a weir in a regulated river in western Norway ........................................ 321
  T.H. Evensen

The short-time effects on anadromous salmonids caused by the regulation of the Eidfjord river system .................................................. 329
  J.W. Jensen and I. Steine

Influence of discharge and stream gradient, on fish community composition in the regulated River Glåma, Norway ...................... 341
  R. Borgstrøm and T. Løkensgard

Age, growth and yield of brown trout (*Salmo trutta* L.) in the River Hallingdalselv, eastern Norway ................................................. 351
  P. Aass

Effectiveness of reservoir releases to provide river temperatures and flows optimal for Pacific salmon and steelhead trout in the Pacific Northwest, USA ........................................ 365
  D.W. Larson

Setting an instream flow requirement for small-mouth bass (*Micropterus dolomieui*) ................................................................. 387
  T.R. Lambert and J.M. Handley

Effects of short-term regulation on fish stocks in the rivers Kyrönjoki and Lapuanjoki, Finland ......................................................... 395
  E. Ranta and P. Sevola

The effect of reduced discharge on the distribution of trout .......... 407
  R.N.B. Campbell, D.M. Rimmer and D. Scott

The river lamprey in two regulated Finnish rivers ....................... 417
  J. Eklund, A. Niemi and E. Ojutkangas

Effects of hydroelectric development on the fisheries of the Wai-taki river, New Zealand ................................................................. 427
  E. Graynoth

Migratory fish stocks and fishery management in regulated Finnish rivers flowing into the Baltic Sea ................................................. 437
  E. Ikonen

Chapter V: Regional studies

Biogeographical effects of stream regulation .................................. 455
  A. Sundborg

The effects of regulation on the limnology of Gunnison River: A North American case history ......................................................... 467
  J.A. Stanford and J.V. Ward

Stream regulation in Spain .............................................................. 481
  D.G. de Jalón
Biology of regulated rivers in France .......................... 495
H. Decamps

The effect of the Volga flow regulation on biological processes 515
N.V. Butorin and A.V. Monakov

Changes of river water quality in reservoirs, exemplified by studies in Poland ................................................. 521
Z. Kajak

Closing address
Exploitation and exploration of running water ..................... 533
P. Brinck