Man-Made Lakes:
Their Problems and
Environmental Effects
Geophysical Monograph Series
American Geophysical Union
Man-Made Lakes:
Their Problems and
Environmental Effects
Man-Made Lakes:  
Their Problems and  
Environmental Effects
# Contents

Foreword .............................................. WILLIAM C. ACKERMANN vii

Preface .................................................. WILLIAM C. ACKERMANN ix

CHAPTER 1: Summary of Symposium and Recommendations ...................... 3

CHAPTER 2: Case Studies of Major Man-Made Lakes

Section: World and National Registers

World Register on Man-Made Lakes ................................................. E. FELS AND R. KELLER 43

Artificial Lakes of Romania .................................................. PETRE GÂSTESCU AND ARIADNA BREIER 50

Biological, Chemical, and Related Engineering Problems in Large Storage Lakes of Tasmania ........................................... HENRY H. MCFIE 56

Man-Made Lakes in South India .................................................. S. V. GANAPATI 65

Man-Made Lakes in Ivory Coast .................................................. P. LESSENT 74

Section: Volta Lake, Ghana

Volta Lake in Relation to the Human Population and Some Issues in Economics and Management ............................................... E. A. K. KALITSI 77

Volta Lake: Physical and Biological Aspects .................................. LETITIA E. OBENG 87

People in a Rapidly Changing Environment: The First Six Years of Volta Lake .................................................. B. W. TAYLOR 99

Sociologic Aspects of Fishery Development on Volta Lake ...................... D. A. P. BUTCHER 108

Early Development of the Fish Populations and Fisheries of Volta Lake ............ WILLIS A. EVANS AND JOHN VANDERPUYE 114

Limnological Observations during the Early Formation of Volta Lake in Ghana .................................................. S. BISWAS 121

Entomological Aspects of Trypanosomiasis at Volta Lake ...................... F. A. S. KUZOE 129

Section: Lake Kariba, Zambia and Southern Rhodesia

Lake Kariba: Early History and South Shore .................................. M. I. VAN DER LINGEN 132

Lake Kariba: The UNDP Program and North Shore ................................ LEONARD S. JOERIS 143

Results of Fish Population Size Assessments in Lake Kariba Coves (Zambia), A Decade after Their Creation ............................................... EUGENE K. BALON 149

Potamodromesis in the Mwenda River, Lake Kariba ................................ A. P. BOWMAKER 159

Supply of Plant Nutrient Chemicals in Lake Kariba ................................ DAVID S. MITCHELL 165

Section: Great Man-Made Lake of Bhakra, India .................................. K. L. RAO AND B. R. PALTA 170

Section: Lake Brokopondo .................................................. P. LEENTVAAR 186
Chapter 3: Physical Systems

Section: Hydrology and Hydraulics

Summary: Hydrology and Man-Made Lakes ........................................... K. SZESZTAY 259
Experience on Hydrologic Substantiation of Projected Reservoirs ............ A. A. SOKOLOV 264
Hydrometeorological Studies of Lakes Victoria, Kyoga, and Albert
   K. V. KRISHNAMURTHY AND A. M. IBRAHIM 272
Retardation of Evaporation from Open Water Storages .................. ES. P. KUMARASWAMY 278
Accuracy for the Computation of Water Balance of a Large Reservoir of the USSR
   Z. A. VIKULINA AND T. D. KASHINOVA 283
Seepage Losses from Lake Nasser .................. TAHER ABU WAFA AND AZIZ HANNA LABIB 287
Fall and Rise of Lago del Oro ..................................................... REMY L. A. DE JONG 292
Influence of a Very Large Number of Small Reservoirs on the Annual Flow Regime of a Tropical Stream
   PIERRE DUBREUIL AND GEORGES GIRARD 295
Mechanics of Flow through Man-Made Lakes  WALTER O. WUNDERLICH AND REX A. ELDER 300
Stratified Reservoir Density Flows Influenced by Entering Streamflows ...... L. S. SLOTTA 311
Some Results of 20-Year Network Observations on Currents in Tchudsko-Pskovskoe Lake
   T. N. FILATOVA AND T. O. KALEJARV 316

Hydraulic Transients in Man-Made Lakes
   JEAN-PIERRE GRANJU, JACK GARRISON, AND JAMES PRICE 320

Movement of Heated Water Discharges from Power Plants in Man-Made Lakes
   BARRY A. BENEDICT, EDWARD M. POLK, JR., FRANK L. PARKER, LOUIS H. MOTZ, AND JOHN E. EDINGER 327

Selective Withdrawal as a Water Quality Management Tool for Southwestern Impoundments
   E. GUS FRUH AND HERMAN M. CLAY, JR. 335

Section: Sedimentation

Summary: Sedimentation of Reservoirs ............................................... LOUIS M. GLYMPH 342
Reservoir Sedimentation Surveys in the United States
   F. E. DENDY, W. A. CHAMPION, AND R. B. WILSON 349
Accumulation of Debris in Water Storage Reservoirs of Central Europe ...... JERZY CYBERSKI 359
Reservoir Sedimentation Studies ............................................... D. C. BONDURANT AND R. H. LIVESEY 364
Sedimentology of Whites Creek Delta in Watts Bar Lake, Tennessee
   THOMAS R. WORSLEY AND JOHN M. DENNISON 368
Sediment Studies Pertaining to Small-Reservoir Design

JOHN W. ROEHL AND JOHN N. HOLEMAN 376

Sediment and Nutrient Research on Selected Corn Belt Reservoirs

H. G. HEINEMANN, R. F. HOLT, AND D. L. RAUSCH 381

A Unique Sediment Depositional Pattern ........................................... JOE M. LARA 387

Sediment Accumulation in Reservoirs of Moderate Size ...................... MELVILLE S. PRIEST 395

Section:  Meteorology and Hydrometeorology

Summary: Interaction between Reservoirs and the Atmosphere and Its Hydrometeorological Elements ................................................. J. NEMEC 398

Effect on the Atmospheric Boundary Layer of Three Small Man-Made Prairie Lakes in Alberta .................................................... R. M. HOLMES 406

Cooling Pond Fog Prediction Model .......................... Y. J. TSAI AND D. R. DE HARPPORTE 421

Applications of Nimbus Satellite Imagery to the Monitoring of Man-Made Lakes HANS J. ACKERMANN AND GEORGE A. RABCHEVSKY 429

Section:  Seismic Effects

Summary: Geophysics Report ...................................................... J. P. ROTHÉ 441

Earthquakes in the Koyna Region and Common Features of the Reservoir-Associated Seismicity .................................................. HARSH K. GUPTA, B. K. RASTOGI, AND HARI NARAIN 455

Seismic Activity and Reservoir Filling at Oroville and San Luis Dams, California RENNER B. HOFMANN 468

Reservoir Seismic Effects ....................................................... WENDELL V. MICKEY 472

CHAPTER 4:  Biological Systems

Section:  Physical Limnology

Summary: Physical Limnology of Man-Made Lakes ....................... B. R. ALLANSON 483

Stratification and Circulation in Kainji Lake .............................. F. HENDERSON 489

Man-Made Lakes and the Changing Limnological Environment in Australia W. D. WILLIAMS 495

A Limnological Reconnaissance of Lake Gorewada, Nagpur, India S. U. HUSSAINY AND M. K. ABDULAPPA 500

Limnological Studies of Ambazari Reservoir, Nagpur, India, in Relation to Water Quality K. P. KRISHNAMOORTHI, ANURADHA GADKARI, AND M. K. ABDULAPPA 507

Quality of Water of Man-Made Lakes in India I. C. DOS M. PAIS-CUDDOU, N. C. RAWAL, AND K. R. AGGARWAL 513

Limnological Basis for Modeling Reservoir Ecosystems ................... MILAN STRAŠKRABA 517

Thermal Structure of the Artificial Reservoir .................................. TADASHI ARAI 536

Selective Withdrawal from Man-Made Lakes .................................. JOHN L. GRACE, JR. 539

Influence of Reservoir Discharge Location on the Water Quality, Biology, and Sport Fisheries of Reservoirs and Tail Waters ...................... RICHARD H. STROUD AND ROBERT G. MARTIN 540
Gas Supersaturation Problem in the Columbia River .......................... PETER B. BOYER 701

Section: Resettlement

Summary: Resettlement .......................................................... THAYER SCUDDER 707
Resettlement of People from Dam Reservoir Areas .......................... CHARLES A. P. TAKES 720
Resettlement Agriculture: An Experiment in Innovation .................. E. K. AFRIYIE 726
Guidelines for Resettlement and Rehabilitation of Uprooted Agricultural Population in River Valley Projects .............................. D. R. SIKKA 730
Forced Resettlement: Selected Components of the Migratory Process .... JERRY EIDEM 734

Section: Marginal Agriculture and Wildlife

Summary: Planning and Development of Marginal Agriculture, Watersheds, and Rural Water .................................................. D. R. SIKKA 738
Small Watershed Program: Its Status and Effects .......................... JOSEPH W. HAAS 743
Farm Ponds in the United States: A New Resource for Farmers ........ ARTHUR J. HAWLEY 746
Man-Made Lakes and Wildlife Values ...................................... JAMES B. TREFETHEN 750

Section: Health

Summary: Health Aspects of Man-Made Lakes ......................... A. W. A. BROWN AND J. O. DEOM 755
Health Problems of Man-Made Lakes: Anticipation and Realization, Kainji, Nigeria, and Kossou, Ivory Coast ......................... B. B. WADDY 765

Section: Tourism

Summary: Outdoor Recreational Use of Man-Made Lakes .............. G. DOUGLAS HOFE, JR. 769
Economic Impact of Water-Based Recreation ............................. DANIEL D. BADGER 775
Perception, Attitude Change, and the Multiple Use of Domestic Water Supply Reservoirs ................................................ DUANE D. BAUMANN 783

Section: Shoreline and Terrestrial Features

Summary: Terrestrial Ecosystems ........................................... ELWOOD A. SEAMAN 788
Evolution of Shoreline Features of Kainji Lake, Nigeria, and Lake Kariba, Zambia and Southern Rhodesia .............................. L. BEVERLY HALSTEAD 792
Plants for Shoreline Erosion Control in Southern Areas of the United States ........................................ W. C. YOUNG 798
Lake Burley Griffin, Australia ............................................... A. E. MINTY 804
Effects of Man-Made Lakes on Ecosystems ................................ JOHN E. BARDACH AND BERNARD DUSSART 811

Section: Water Transportation on Man-Made Lakes ................... M. I. FOSTER 818

Section: Strategy of Archaeological Salvage .............................. WILLIAM Y. ADAMS 826

Section: Engineering Techniques

Summary: Engineering Management Techniques for Beneficial Use JAMES M. SYMONS AND GORDON G. ROBECK 836
Estuarial Storage in the United Kingdom: Morecambe Bay .............. O. GIBB AND J. CORLETT 838