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सत्यमेव जयते

# **SILTING OF RESERVOIRS**

**BY**

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## FOREWORD

The subject " Silting of Reservoirs " has been on the agenda of the Central Board of Irrigation and Power since 1939 and has been discussed in the Annual Meetings of the Research Committee and the Board. It has assumed greater importance now due to the large number of storage schemes under construction and contemplation in India, as it is linked with the life of the reservoirs. Shri A. N. Khosla has given particular attention to this subject and published two papers in 1940 and 1941. Since then, some work on the subject has been done in the Irrigation Research Stations, and some data has been collected from Indian rivers and Reservoirs.

In view of the importance of the subject in the successful development of river valley schemes and the wealth of information contained in Shri Khosla's papers and the data since collected, the Executive Committee of the Board requested Shri Khosla to prepare a publication of the Central Board of Irrigation & Power on the subject.

Shri Khosla has compiled the information available on the subject in the form of this publication and it is hoped that besides being of value to the profession, it will help in further work on the subject at the various Stations.

The Central Board of Irrigation & Power is grateful to Shri A. N. Khosla and others who have collected the data on the subject and are helping in advancement of this important subject further. It is hoped the information contained in this publication will be useful to those interested in the study of the subject and will supply the need of the Indian Engineers employed on construction of river valley schemes. The author has stated that the treatment of the subject in the publication is by no means exhaustive and up-to-date. It is however, hoped that in view of the vigorous research in hand on the subject in various research and field stations in India, it will in the near future be possible to bring out a more comprehensive and upto-date edition of this publication.

S. L. MALHOTRA,

*Secretary,*

*Central Board of Irrigation and Power,*

## PREFACE

As Superintending Engineer, High Dams Circle in the Punjab, in 1939, the author was faced with the problem of "Siltling of Reservoirs" in dealing with the designs of Bhakra, Balehu and other storage dams in the Punjab. During his visit to the United States of America from April to October 1939, he made a special study of the problem in its relation to storage reservoirs in that country. On return to India, he initiated sediment studies on several streams in the Punjab. Many of these studies are still continuing. In 1945, soon after assuming charge as Consulting Engineer and Chairman, Central Waterways, Irrigation and Navigation Commission—now Central Water and Power Commission—the author initiated similar sediment studies on the Kosi and Mahanadi rivers and later on the Tapi and other rivers.

The author submitted two papers on the subject of Silting of Reservoirs to the Central Board of Irrigation, one in 1940 and the other in 1941. This subject has since been widely discussed in the Central Board of Irrigation and elsewhere. This was one of the subjects discussed at the fourth plenary session of the International Commission on Large Dams held in Delhi in January 1951.

There has been a very considerable and insistent demand in India for authentic information on the subject, particularly that relating to Indian rivers. This paper has been written primarily to satisfy this demand and in the hope that it will facilitate and encourage further exhaustive and scientific study of the subject.

In recent years, considerable amount of work has been done on sediment studies of various rivers in India and abroad and much useful data has become available in different parts of the world. Not all of this data has, however, been available to the author; nor had the author sufficient time to make an exhaustive study of what was available.

An attempt has been made in this paper to present the problem of 'Siltling of Reservoirs' in its fundamental aspects and to draw attention to certain salient features as well as some current misconceptions. One conclusion appears to stand out and that is that the silt yield of a catchment is essentially a function of its area and geological formation.

The treatment of the subject in this paper is by no means exhaustive, nor quite upto date. The only justification for its publication at this stage is, therefore, to meet the persistent demand of irrigation engineers for the maximum available information on the

subject and for conclusions, though tentative, based on an analysis of this information. The study of the subject is being vigorously pursued in many research centres and field stations in India and abroad and it is hoped that based on these a more comprehensive and upto date publication will be brought out by the Central Board of Irrigation in the not distant future.

The literature in U.S.A. has been obtained through the courtesy of the Bureau of Reclamation, Geological Survey, Soil Conservation Service, Forest Service, Corps of Engineers and other organisations. Acknowledgments are due to all of these organisations. In particular, the author owes a debt of gratitude to Mr. Michael W. Straus, Commissioner and the Bureau of Reclamation for their generous help in supplying literature and providing facilities for establishing contacts with the research and field workers.

Acknowledgments are due to the Irrigation Research Division Poona, Bombay State, for the information on reservoirs in that State mentioned in Chapter 2, Part A, and Shri B. P. Saxsena, I.S.E., for his contribution in respect of storage reservoirs in Uttar Pradesh reproduced in Chapter 2, Part B.

The author is particularly indebted to Dr. R. C. Hoon who has done very considerable original work in connection with the silt problems of the Mahanadi and Kosi rivers, the data in respect of which, as given in the text, are mainly derived from his work. He has given many original and useful ideas on the technique of observations, field equipment and method of analysis. He has also assisted the author in preparing and editing the text.

The author is equally indebted to Shri N. D. Gulhati, I.S.E., Chief of Natural Resources, Planning Commission, Government of India and formerly Secretary of the Central Board of Irrigation, for the immense pains he took in compiling the original text from the various papers and discussions contributed at the meetings of the Central Board of Irrigation; and to Shri M. L. Madan for his general assistance. Acknowledgments are also due to Shri S. L. Malhotra, I.S.E., the present Secretary of the Central Board of Irrigation and Power for his valuable assistance in finalising the text and its printing.

# CONTENTS

## INTRODUCTION

PAGE

### CHAPTER 1—CATCHMENT, STREAM FLOW AND SILT

The origin of silt . . . . .	1
Silt load of streams . . . . .	2
Silt distribution and velocities in a vertical section. . . . .	4
Silt percentage and discharge . . . . .	6
Some heavy silt concentrations . . . . .	10
Rate of fall of particles . . . . .	11
Thixotrophy and density currents . . . . .	11
Settling of silt in reservoir . . . . .	12
Volume-weight relationship. . . . .	12
Rate of silting and catchment area . . . . .	14
Methods available to combat silting up of reservoirs . . . . .	14

### CHAPTER 2—SILTING OF THE EXISTING RESERVOIRS IN INDIA

#### A.—Storage reservoirs in Bombay State

Nature of data . . . . .	17
Dhupdal Reservoir (near Gokak) . . . . .	17
Lake Fife (Khadakwasla Dam) . . . . .	21
Lake Beale (Darna Dam,) . . . . .	23
Nandur Madhmeshwar Weir . . . . .	24
Visapur Tank . . . . .	25
Pimpalgaon Tank . . . . .	26
General Observations. . . . .	30

#### B. Storage reservoirs in Uttar Pradesh

Dhukwan Reservoir on Betwa River . . . . .	31
Paricha Reservoir on the Betwa River . . . . .	33
Pahari Reservoir on the Dhasan River . . . . .	35
Laohura Reservoir on Dhasan River . . . . .	36
Gangao Reservoir on the Ken River . . . . .	38
Bariapur Reservoir on the Ken River . . . . .	39
Pahuj Reservoir on the Pahuj River . . . . .	40
Barwa Sagar on Barwar River . . . . .	41
Small Tanks . . . . .	42
Bara Tal (Babina) . . . . .	42
Koncha Bhanwar Tank . . . . .	42
Observations of suspended load in rivers . . . . .	42
General Observations . . . . .	44
Summary and Conclusions . . . . .	45

**CHAPTER 3—SILT STUDIES OF SOME PROPOSED RESERVOIRS IN INDIA**

Bhakra Reservoir . . . . .	55
Balehn Reservoir . . . . .	76
Hirakud Reservoir . . . . .	79
Kosi Reservoir . . . . .	89
Special investigations in connection with the suspended silt load of the Mahanadi and the Kosi Rivers . . . . .	113

**CHAPTER 4—SILT STUDIES OF SOME EXISTING RESERVOIRS IN OTHER COUNTRIES**

General . . . . .	137
Aswan Reservoir . . . . .	150
Boulder (Hoover) Reservoir . . . . .	153
Grand Coulee Reservoir . . . . .	155
Lake Austin Reservoir . . . . .	155
Elephant Butte Reservoir . . . . .	158
Lake McMillan Reservoir . . . . .	162
Four large reservoirs in South Africa . . . . .	164
Roosevelt Reservoir . . . . .	167
Lake Worth Reservoir . . . . .	169
Zuni Reservoir . . . . .	171
Parksville Reservoir . . . . .	173
Medina Reservoir . . . . .	174
Gibraltar Reservoir . . . . .	176
Sweet Water Reservoir . . . . .	178
The Yellow River . . . . .	179
General Observations . . . . .	182

**CHAPTER 5****SUMMARY AND CONCLUSIONS**

Bibliography . . . . .	192
------------------------	-----

<b>APPENDIX</b> . . . . .	194
---------------------------	-----

<b>INDEX</b> . . . . .	196
------------------------	-----

# INDEX

## " A "

	PAGE
Aare River .. .. .	142
Abbot .. .. .	2
Abhanpur Reservoir .. .. .	52
Alluvium .. .. .	1
Alluvial deposits .. .. .	1
Almansa Reservoir .. .. .	144
Almaehua Reservoir .. .. .	50
Ardmore Club Lake Reservoir .. .. .	148
Arid Climate .. .. .	2
Arun River .. .. .	98
Ashti Tank .. .. .	18
Aswan Dam .. .. .	4, 7, 14, 96, 150, 153, 156
Aswan Reservoir .. .. .	74, 138, 150, 153, 157
Atbara River .. .. .	150
Avignounette Reservoir .. .. .	140
Avisia Reservoir .. .. .	142
Avisia River .. .. .	142

## " B "

Bagdeonala (River) .. .. .	46
Baker Reservoir .. .. .	148
Balehu Reservoir .. .. .	76, 77, 78
Baloda Reservoir .. .. .	50
Bandha Nala .. .. .	50
Banet Reservoir .. .. .	144
Bara Tal (Babina) .. .. .	41, 45, 46
Barcroft Reservoir .. .. .	146
Bariarpur Reservoir .. .. .	39, 40, 45, 46
Barpali Reservoir .. .. .	52
Barwar River .. .. .	41, 46
Barwar Sagar .. .. .	41, 46
Bay View Reservoir .. .. .	144
Beas River .. .. .	76, 77, 78
Bed load .. .. .	2
Bedload percentage in different rivers .. .. .	2, 3
Begrenzer River .. .. .	142
Belan river .. .. .	43
Betwa River .. .. .	31, 33, 34, 43, 45, 46
Bhakra on Sutlej .. .. .	7, 55, 56, 57- 74, 75, 77, 186, 192, 199
Bhandardara .. .. .	18
Bibliography .. .. .	194
Biebr See Reservoir .. .. .	142
Big Hora River .. .. .	138
Black Canyon Reservoir .. .. .	140
Blaney .. .. .	2
Blue Nile River .. .. .	150

	PAGE
Bodal Kassa Reservoir .. .. .	46
Bodensee Reservoir .. .. .	140, 142.
Boomer Lake Reservoir --- ...	143
Boomer River .. .. .	148
Bori Reservoir .. .. .	46
Borland .. .. .	3, 9, 12, 13
Bosikhara Reservoir .. .. .	50
Bosque River .. .. .	140
Boulder Dam .. .. .	154, 155, 158, 187, 192
Boulder Dam : Life of— .. .. .	155
Boulder Reservoir .. .. .	13, 72, 74, 75, 138, 153, 184, 186, 193
Boyer marchand Tank .. .. .	52
Boysen Reservoir .. .. .	139
Brahmaputra River .. .. .	98
Braudeau, G. .. .. .	12, 195
Brazos River .. .. .	74
Brown, Carl. B .. .. .	194
Buck Reservoir .. .. .	148
Buck Horn Reservoir .. .. .	144
Buck Horn River .. .. .	144
Budhara Nala .. .. .	48
Burlington Reservoir .. .. .	144
Burnt mills Reservoir .. .. .	146
Burrinjuck Reservoir .. .. .	138
Byllesby Reservoir .. .. .	148
“ C ”	
Capacity of reservoir : Minimum— .. .. .	192
Capacity surveys .. .. .	26, 31
Capacity surveys for final rate of siting .. .. .	17
Capacity surveys of the Elephant Butte Reservoir .. .. .	153
Capacity surveys of the Gibraltar Reservoir .. .. .	176
Capacity surveys of the Medina Reservoir .. .. .	174
Capacity surveys of the Roosevelt Reservoir .. .. .	167, 168
Capacity surveys of the Zuni Reservoir .. .. .	172
Cassedy, W.C. .. .. .	14, 15, 194
Catchment, Stream Flow and Silt .. .. .	1
Catchments . Weathering and corrosion in various type of .. .. .	2
Cedar Creek River .. .. .	148
Cöllna River .. .. .	144
Chankapur .. .. .	18
Charkhamaranala (River) .. .. .	46
Charkhamara Reservoir .. .. .	46
Cheoha Reservoir .. .. .	140
Chourfas Reservoir .. .. .	140
Chiem See Reservoir .. .. .	142.
Ching Ho River .. .. .	180, 182.
Cimarrow River .. .. .	146
Cusmon Reservoir .. .. .	144
Cusmon Reservoir .. .. .	144



	PAGE
Clear Fk. Brazos River .. .. .	140
Coeurd. Alene River .. .. .	3
Cold Water River .. .. .	148
Colorado River .. .. .	2, 9, 13, 74, 75, 133, 153, 154, 155, 156, 184, 192
Columbia River .. .. .	14, 74, 138, 155, 192
Combating silting up of reservoir .. .. .	14, 15
Coon Creek .. .. .	9
Coosa River .. .. .	138
Cordevole Lagodi Allenghee Reservoir .. .. .	144
Corrosion .. .. .	1, 2
Cotton Wood Creek, River .. .. .	144
" D "	
Darna Dam .. .. .	18, 23, 30
Darna Reservoir .. .. .	24
Darna River .. .. .	18, 23, 24, 25
Davis .. .. .	3
Deep River .. .. .	144
Density Currents .. .. .	11
Devil's Gate Reservoir .. .. .	146
Dhanras Reservoir .. .. .	48
Dhasan River .. .. .	35, 36, 46
Dhukwan Dam .. .. .	43, 45
Dhukwan Reservoir .. .. .	31, 32, 33, 34, 35, 36, 44, 46
Dhumama Nala .. .. .	50
Dhupdal Reservoir .. .. .	17, 18, 20, 21 30
Disintegration .. .. .	1, 2
Disintegration of rocks : Main factors causing— .. .. .	1
Djidovia Reservoir .. .. .	142
Dodha Nala .. .. .	48
Doritala (Reservoir) .. .. .	48
Dorki Nala .. .. .	48
Dorli Reservoir .. .. .	52
Doougar Bari Reservoir .. .. .	52
Dras, Reservoir .. .. .	142
Dredging .. .. .	15
Drouhin, Mallet and Pacquant .. .. .	11, 15, 194
Duquesnois, H .. .. .	11, 15, 194
" E "	
Edgecombe, A. R. B. .. .. .	9, 168, 194
Ehrmann, P. .. .. .	15, 194
Ekin, Henry M .. .. .	194
Ekrak Tank .. .. .	18
Elephant Butte Dam .. .. .	158
Elephant Butte Reservoir .. .. .	10, 11, 14, 72, 74, 76, 138 158, 159, 160 161, 162, 184 186, 192, 193

## ( IV )

	PAGE
Elephant Butte Reservoir : Life of— .. .. .	162
Elliot, Sir John .. .. .	7
Erosion and Transportation of silt as effected by rainfall .. .. .	2
Erosion of soil .. .. .	1
Existing Reservoirs in India : Silting of— .. .. .	17
“ F ”	
Fall Reservoir .. .. .	138
Faris, Orvilla A .. .. .	4, 7, 13, 193, 194
Feng Ho River .. .. .	180
Ferozemann Creek River .. .. .	146
Forsna Cantanghel Reservoir .. .. .	144
Fettenbach Reservoir .. .. .	138
Field Manufacturing Co. Reservoir .. .. .	143
- Fish River .. .. .	140, 164, 184
Flat River .. .. .	144
Follett .. .. .	2
Fortier and Blanoy .. .. .	2
Fox, C. S. .. .. .	11, 55, 76, 153, 194
Franklinton Reservoir .. .. .	148
Furnish Reservoir .. .. .	140
“ G ”	
Gambhar Khad .. .. .	55, 56
Gangao Reservoir .. .. .	38, 39, 40, 44, 45, 46
Ganga River .. .. .	30, 43
Garai River .. .. .	43
Garhya Reservoir .. .. .	45
Genfer-See-Reservoir .. .. .	140
Ghaggar Reservoir .. .. .	46
Ghaggar River .. .. .	43
Ghataprabha River .. .. .	18
Ghun Powder River .. .. .	142
Gibraltar Reservoir .. .. .	144, 176, 177, 184, 186
Godam-nala (River) .. .. .	46
Gomdoh Reservoir .. .. .	52
Goon Rapids Reservoir .. .. .	138
Gorzente Lavaguina Reservoir .. .. .	148
Grand Coulee Dam .. .. .	14, 194
Grand Coulee Reservoir .. .. .	74, 138, 155, 187
Grand Saline Reservoir .. .. .	148
Grass Ridge Reservoir .. .. .	76, 140, 164, 166, 183, 184, 186
Great Fish River .. .. .	164
Greenbelt Lake Reservoir .. .. .	143
Greenshore Reservoir .. .. .	144
Guthrie Reservoir .. .. .	146
Gurnej Reservoir .. .. .	138

	Page
" H "	
Males Bar Reservoir .. .. .	128
Hanga River .. .. .	18, 25
Hargahan Reservoir .. .. .	50
Hayden, T. A. .. .. .	167, 168
Hemphil, R. C. .. .. .	2, 4
High Point Reservoir .. .. .	144
High Rock Reservoir .. .. .	140
Hirakud Dam .. .. .	79, 80, 81, 92, 93, 94, 95, 96, 99
Hirakud Reservoir .. .. .	79, 81, 99
Hodges Reservoir .. .. .	142
Holecek, V. .. .. .	1, 15, 194
Holmesrun Reservoir .. .. .	140
Hoon, R. C. .. .. .	4, 14, 194
Hoover Dam .. .. .	74, 75
Horse Pen River .. .. .	144
Humphreys and Abbot .. .. .	2
" I "	
Imperial Dam .. .. .	9
Im River .. .. .	133
Irac River .. .. .	140
Iran River .. .. .	138
Ishikari River .. .. .	148
" J "	
Jam Mohgaon Reservoir .. .. .	80
Jamunia Reservoir .. .. .	48
" K "	
Kallnach Reservoir .. .. .	142
Kander River .. .. .	142
Karamnasa River .. .. .	43
Ken River .. .. .	28, 39, 43, 46
Keokuk Reservoir .. .. .	138, 157
Khadakwasla Dam .. .. .	19, 27
Khairadatan Reservoir .. .. .	48
Khairbanda Reservoir .. .. .	48
Khajuri River .. .. .	43
Khapri Reservoir .. .. .	45
Kharang Reservoir .. .. .	46
Kharang River .. .. .	46
Khortora Reservoir .. .. .	52
Khosla, A. N. .. .. .	194
Khushdil Khan Reservoir .. .. .	142
Kirna Reservoir .. .. .	50
Kiso River .. .. .	143
Koncha Bhanwar Tank .. .. .	42, 45, 46
Koregaon .. .. .	18
Kosi Reservoir .. .. .	97, 112
Kosi River .. .. .	4, 14, 97, 98, 132

	PAGE
Koyadira Reservoir .. .. .	148
Kukrdshi Reservoir .. .. .	50
Kumhari Reservoir .. .. .	48
Kurobe River .. .. .	148
Knarangi Reservoir .. .. .	48
	"L"
Lachura Reservoir .. .. .	36, 37, 45, 46
La Grange Reservoir .. .. .	140
Laguna Creek River .. .. .	148
Laguna Dam .. .. .	9
Lake Ardmere Club Reservoir .. .. .	148
Lake Arthur Reservoir .. .. .	140, 164, 166, 167, 182, 184, 186
Lake Austin Reservoir .. .. .	74, 138, 155, 156, 186, 193
Lake Bannet Reservoir .. .. .	148
Lake Beale Reservoir .. .. .	18, 23, 24, 30
Lake Boomer Reservoir .. .. .	148
Lake Booneville Reservoir .. .. .	148
Lake Brackon Reservoir .. .. .	148
Lake Calhoun Reservoir .. .. .	146
Lake Chabot Reservoir .. .. .	146
Lake Chinton Reservoir .. .. .	146
Lake Concord Reservoir .. .. .	148
Lake Crook Reservoir .. .. .	144
Lake Decatur Reservoir .. .. .	140
Lake Eldorado Reservoir .. .. .	146
Lake Fife Reservoir .. .. .	17, 18, 21, 22, 30
Lake Gibbons Reservoir .. .. .	148
Lake Harris Reservoir .. .. .	146
Lake Hayes Reservoir .. .. .	146
Lake Hurlay Reservoir .. .. .	144
Lake Lee Reservoir .. .. .	144
Lake Meade County State Reservoir .. .. .	146
Lake McMullan Reservoir .. .. .	138, 162, 163, 164, 183, 184, 186
Lake Menta Reservoir .. .. .	76, 138, 164, 165, 183, 184, 186
Lake Michie Reservoir .. .. .	144
Lake Mission Reservoir .. .. .	146
Lake Olathe Reservoir .. .. .	148
Lake Ottawa County State Reservoir .. .. .	146
Lake Penick Reservoir .. .. .	140
Lake Pine Reservoir .. .. .	146
Lake Purdy Reservoir .. .. .	146
Lake Sapulpa Reservoir .. .. .	148
Lake Sherwood Reservoir .. .. .	146
Lake Spavinaw Reservoir .. .. .	142
Lake Tancyemo Reservoir .. .. .	140
Lake University Reservoir .. .. .	146
Lake Wasco Reservoir .. .. .	140

	PAGE
Lake Worth Dam .. .. .	13
Lake Worth Reservoir .. .. .	76, 140, 169, 170
Lancaster Reservoir .. .. .	148
Lane, E.W. .. .. .	11, 12, 194
Large Reservoir in South Africa : Four	164
Lay Reservoir .. .. .	138
Lech River .. .. .	142
Lete Letino Reservoir .. .. .	146
Linth Reservoir .. .. .	142
Little Colorado River .. .. .	171
Little River .. .. .	148
Little Rock Reservoir .. .. .	144
Little Tennessee River .. .. .	140
Live Oak Reservoir .. .. .	148
Lloyds Shoals Reservoir .. .. .	140
Loch Raven Reservoir .. .. .	142
Lo Ho River .. .. .	130, 182
Lunkhar .. .. .	55
" M "	
Maddock, T and Borland, W.M. .. .. .	3, 9, 12, 13, 195
Meade County State Reservoir .. .. .	146
Mahanadi River .. .. .	4, 14, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 99, 113, 114, 116, 117, 118, 119, 120, 121, 122, 128
Mahotra, J, K .. .. .	160
Mallet .. .. .	11, 15
Mamari Reservoir .. .. .	46
Mamari River .. .. .	46
Man River .. .. .	18
Marmull Reservoir .. .. .	46
Maswad Tank .. .. .	18
Matoba Tank .. .. .	18
Mayani Tank .. .. .	18, 30
McCrae, J. .. .. .	13, 195
Meckera River .. .. .	140
Medicine Creek River .. .. .	146
Medina Reservoir .. .. .	13, 142, 174, 175, 176, 184
Medina River .. .. .	142, 174, 184
Meiktila Reservoir .. .. .	76, 142, 184, 186
Mission Creek River .. .. .	146
Mission Lake Reservoir .. .. .	146
Mississippi River .. .. .	2, 139
Mont Reab Reservoir .. .. .	144
Morena Reservoir .. .. .	144
Morgan Creek Reservoir .. .. .	146

	PAGE
Morid Reservoir .. .. .	52
Moroda Reservoir.. .. .	48, 52
Muchkundi Tank .. .. .	18
Mukti Tank .. .. .	18
Mur River .. .. .	140
Murrum Bridges River .. .. .	138
Mutha River .. .. .	18, 21
" N "	
Nandur Medhmeshwar Weir .. .. .	24
Naraj Dam .. .. .	80, 117
Narbada River .. .. .	38
Nehr Tank .. .. .	18
New Austin Dam .. .. .	156
New Austin Reservoir .. .. .	138, 183, 184, 193
New River Reservoir .. .. .	140
Nile River .. .. .	2, 7, 14, 138, 150, 151, 153, 156
Nile River : Silt and discharge curves at Haifa on the Nizery, A, and Rousseher, M .. .. .	7 15, 195
Nokanan Reservoir .. .. .	148
North Platt River .. .. .	138
Nuscos River .. .. .	74
" O "	
Ocmulgee River .. .. .	140
Ocoee River .. .. .	142, 173, 184
Oi Reservoir .. .. .	148
Oi River .. .. .	148
Old Lake Austin Reservoir .. .. .	138
Orba Ortiglieto Reservoir .. .. .	144
O'Shaughnessy Reservoir .. .. .	140
Ottawa County State Lake Reservoir .. .. .	146
" P "	
Pacquant .. .. .	11, 15
Pahari Reservoir .. .. .	35, 36, 44, 45, 46
Pahuj Reservoir .. .. .	40, 41, 45, 46
Pahuj River .. .. .	40, 46
Palampur Reservoir .. .. .	45
Panjara River .. .. .	18
Paricha Dam .. .. .	33
Paricha Reservoir .. .. .	33, 34, 36, 46
Parkerville Reservoir .. .. .	142, 173, 174, 183, 184, 186
Parsul Tank .. .. .	18
Pathri Tank .. .. .	18
Payette River .. .. .	140
Pecos River .. .. .	138, 162, 184
Pangri Reservoir .. .. .	50

	PAGE
Perolles Reservoir .. .. .	142
Pescara 3° Salto Reservoir .. .. .	140
Phono River .. .. .	140
Pindraon Reservoir .. .. .	48
Pimpalgaon Tank .. .. .	18, 26, 27, 28, 29
Pine Creek River .. .. .	144, 146, 148
Pine Lake Reservoir .. .. .	146
Pingli Tank .. .. .	18
Pocharam Reservoir .. .. .	52
Povnogg Reservoir .. .. .	140
Pout Du Loup River .. .. .	142
Precarboniferous rocks .. .. .	1
Puentes Reservoir .. .. .	140
" Q "	
Quinson Reservoir .. .. .	140
" R "	
Rao, K. L. and Raghavachari, S. .. .. .	12, 195
Raynaud, J. P. .. .. .	11, 15, 195
Reuss River .. .. .	142
Relief energy .. .. .	12
Reminieras .. .. .	12, 195
Reservoir : Rate of Silting of Any— .. .. .	2
Rhine River .. .. .	140
Rio Grande River .. .. .	2, 10, 74, 138, 158, 184, 192
Rock River .. .. .	133
Rojers Reservoir .. .. .	148
Roosevelt Dam .. .. .	192
Roosevelt Reservoir .. .. .	11, 14, 76, 138, 167, 184, 186, 192
Rose Lake .. .. .	3
Rosshaupten Reservoir .. .. .	142
Rousselier .. .. .	15
" S "	
Saalache Reservoir .. .. .	142
Saalache River .. .. .	142
Salt River .. .. .	138, 167, 168, 184, 192
Sampling of water from a stream : A comparison of the " bucket " and	
" bottle " .. .. .	121
San Carlos Reservoir .. .. .	138 184
San Carlos River .. .. .	3, 138, 184
San Dieguts River .. .. .	142
Sand Stone Creek River .. .. .	148
San Leander River .. .. .	146
San Leandro Creek River .. .. .	146
Sanpablo Reservoir .. .. .	146
Santa Anita Reservoir .. .. .	146, 148
Santa Fe Reservoir .. .. .	146
Santa Yaniz River .. .. .	144, 176, 184

	PAGE
Sapt Kosi River .. .. .	14, 98, 99, 100, 102, 104, 106, 107, 108, 109, 110, 111, 112, 113, 115, 116, 121, 122, 128
Sarathi Nala (River) .. .. .	46
Sarathi Reservoir .. .. .	46
Sarnee River .. .. .	142
Satchal Creek River .. .. .	146
Savio Quarto Reservoir .. .. .	144
Sayaji Sarovar (Ajiva Lake) .. .. .	52
Scioto River .. .. .	140
Scoltenna Riolutato Reservoir .. .. .	144
Sedimentary deposits .. .. .	1
Sedimentary rocks .. .. .	1
Sedimentation : Reducing .. .. .	15
Sediment : Correlation between Discharge and .. .. .	9
Senzu Reservoir .. .. .	148
Shetphal Tail Tank .. .. .	18
Shursuphal Tank .. .. .	18
Shuzugawa Reservoir .. .. .	148
Sho River .. .. .	148
Sif River .. .. .	150
Silt : Definition of .. .. .	1
Silt : Erosion and transportation of .. .. .	2
Silt : Origin of .. .. .	1
Silt : Settling of in reservoirs .. .. .	12
Silt : Volume weight relationship of .. .. .	12, 20, 21, 22, 23
Silt and connected data of some existing dams in Bombay State .. .. .	18, 19
Silt and connected data of some existing dams in Uttar Pradesh, Madhya Pradesh and Berar, Baroda and Hyderabad .. .. .	46, 47, 48, 49, 50, 51, 52, 53
Silt characteristics of catchments .. .. .	14
Silt concentrations of rivers in China .. .. .	11
Silt concentrations : Estimation of by weight .. .. .	13
Silt concentrations : Some heavy .. .. .	10
Silt deposited at Dhukwan : Quality of .. .. .	44
Silt deposit in reservoirs of catchment area above 1000 square miles .. .. .	188, 189
Silt deposit in reservoirs of catchment area below 1000 square miles .. .. .	190, 191
Silt discharge graph of Beas at Balehu .. .. .	78
Silt discharge graphs of Sutlej at Bhakra .. .. .	57, 58, 59, 60, 61, 62, 63, 64
Silt discharge in lower course of the Yellow River .. .. .	181
Silt discharge relationship on the Colorado at Boulder Dam .. .. .	154
Silt distribution and velocities in a vertical Section .. .. .	4
Silting : Capacity surveys to determine ratio of .. .. .	17
Silting : Methods available to combat up of reservoirs .. .. .	14
Silting : Stages leading to .. .. .	1
Silting : Upper and Lower limits of .. .. .	187
Silting decreases with age .. .. .	54, 187, 193



	PAGE
Siltng and catchment area . . . . .	14
Siltng of the Bombay State Reservoir . . . . .	20, 22, 25
Siltng of the Elephant Butte Reservoir . . . . .	159, 160
Siltng of the Elephant Butte and Roosevelt Reservoirs . . . . .	183
Siltng of the four large reservoirs in South Africa . . . . .	165, 166
Siltng of the Gibraltar Reservoir . . . . .	177
Siltng of the Hirakud Reservoir . . . . .	181
Siltng of the Kosi Reservoir . . . . .	112
Siltng of the Lake Austin Reservoir . . . . .	156, 157
Siltng of the Lake McMillan Reservoir . . . . .	162, 163
Siltng of the Medina Reservoir . . . . .	175
Siltng of the Parkeville Reservoir . . . . .	173, 174
Siltng of the Roosevelt Reservoir . . . . .	168, 169
Siltng of the Sweet Water Reservoir . . . . .	178, 179
Siltng of the Uttar Pradesh Reservoirs . . . . .	31, 33, 35, 36, 37, 38, 39, 40, 41, 42
Siltng of the various reservoirs . . . . .	183, 186
Siltng of the Zum Reservoir . . . . .	171, 172
Siltng of reservoirs . Resolutions and Recommendations of the Central Board of Irrigation and Power . . . . .	196
Siltng rate : Estimation of — . . . . .	192, 193
Silt in the Nile and its Control . . . . .	150
Silt investigations at Balehu . . . . .	77
Silt investigations on the Mahanadi . . . . .	80, 92, 93, 94, 95
Silt investigations on the Mahanadi and the Kosi . . . . .	79, 128, 129, 130, 131, 132, 133, 134, 135
Silt investigations on the Sapt Kosi . . . . .	99, 106, 107, 103, 109
Silt load and runoff of the Mahanadi . . . . .	81
Silt load and discharge of the Mahanadi and the Kosi . . . . .	113, 114, 115
Silt load from surface samples to mean silt : Graph of correction factors for Sapt Kosi for converting — . . . . .	110
Silt load in rivers during freights : Variation in the nature of — . . . . .	121, 122
Silt load of streams . . . . .	2, 3, 4, 74
Silt load of the Columbia River . . . . .	155
Silt load of Texas Streams . . . . .	13
Silt load of the Rio Grande . . . . .	158
Silt load of the Sutlej at Bhakra . . . . .	56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 74
Silt loads of the Sutlej and the Beas . . . . .	77
Silt load of the Yellow River . . . . .	180, 181
Silt loads of Bhakra and Boulder Reservoirs . . . . .	74, 75
Silt runoff graphs of the Sutlej at Bhakra . . . . .	72
Silt studies of some existing reservoirs in other countries . . . . .	137
Silt studies of some proposed reservoirs in India . . . . .	55
Silt Surveys . . . . .	24
Silt Surveys of Lake Austin . . . . .	156
Silt Yield of Mahanadi Catchment . . . . .	81

	PAGE
Simaika, Y.M. .. .. .	3, 4, 195
Sina River .. .. .	18, 26
Sir Khad .. .. .	55
Soil erosion in the Watershed of the Yellow River .. .. .	181
Sorli Reservoir .. .. .	52
South Pecolet River .. .. .	144
Sowpit Reservoir .. .. .	148
Soyama Reservoir .. .. .	148
Spartonourg Reservoir .. .. .	144
Spin Karez Reservoir .. .. .	146
Spin Karez River .. .. .	146
Stabler, Herman .. .. .	1
St. Denis Reservoir .. .. .	140
Sterling Pool Reservoir .. .. .	138
Stevens .. .. .	3
Steyrdurehoruch Reservoir .. .. .	142
Steyr River .. .. .	142
Storage Reservoirs in Bombay State .. .. .	17
Storage Reservoirs in Uttar Pradesh .. .. .	30
Summary and conclusions .. .. .	192
Sundays River .. .. .	138, 140, 164, 184
Sun Kosi River .. .. .	98
Sunset Canyon Reservoir .. .. .	148
Surya River .. .. .	52
Suspended load concentration .. .. .	2
Suspended load observation in Uttar Pradesh Rivers .. .. .	42
Suspended load of the Colorado at the Boulder Dam .. .. .	154, 155
Suspended load of the Mahanadi .. .. .	80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91
Suspended load of the Mahanadi and the Kosi Rivers : Special investigations in connection with— .. .. .	113
Suspended load of the Nile .. .. .	151, 153
Suspended load of the Sapt Kosi .. .. .	99, 100, 101, 102, 103, 104, 106
Suspended load of the Sapt Kosi Compared to annual runoff .. .. .	111
Suspended load passing in Wadi Haifa .. .. .	152
Suspended load with depth along the sampling vertical : Variation of— .. .. .	113, 118, 119, 120, 121
Sutlej River .. .. .	7, 55, 56, 75, 76, 77, 192
Sutlej River at Bhakra : Silt load of— .. .. .	56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72
Sweet Water Reservoir .. .. .	144, 178, 179, 184, 186
Sweet Water River .. .. .	144, 178, 184
"T"	
Tamur River .. .. .	98
Tandula and Sukha Nala .. .. .	46
Tandula and Sukha Reservoirs .. .. .	46

	PAGE
Tangundaing Tank .. .. .	144
Tennessee River .. .. .	138
Thixotrophy and Density Currents .. .. .	11
Three Rivers Reservoir .. .. .	74
Thunor See Reservoir .. .. .	142
Tidone Molato Reservoir .. .. .	146
Tikkerpara Dam .. .. .	80
Tirolár Ache River .. .. .	142
Tolumne River .. .. .	140
Torre Crossin Reservoir .. .. .	146
Tow Reservoir .. .. .	74
Trinity River .. .. .	13, 144, 169
Turkey Creek River .. .. .	146

## " U "

Umatilla River .. .. .	140
Under Flow in the Elephant Butte Reservoir: The Phenomenon of— .. .. .	162
University Lake Reservoir .. .. .	146
Upper Crystal Springs Reservoir .. .. .	148
Upper San Leandro Reservoir .. .. .	146
Usri Reservoir .. .. .	52

## " V "

Vaal Dam .. .. .	3
Vanoni, A .. .. .	4, 195
Van Rynevelds Reservoir .. .. .	76, 140, 164, 166, 184, 186
Verdun River .. .. .	140
Vetter, C. P. .. .. .	9, 195
Vierwald Reservoir .. .. .	142
Visapur Tank .. .. .	18, 25
Volume—weight relationship .. .. .	12

## " W "

Wadi Haifa .. .. .	152
Waghad Tank .. .. .	18
Wallen See River .. .. .	142
Wars Tank .. .. .	48
Washington Mills Reservoir .. .. .	148
Weathering—See Disintegration	
Wei Ho River .. .. .	180, 182
Well Fleet Reservoir .. .. .	146
West Frankfort Reservoir .. .. .	148
W. Fr. Trinity River .. .. .	140
White Nile River .. .. .	150
White Rock Reservoir .. .. .	144
Wilcocks, Sir William .. .. .	7, 195
Wills Point Reservoir .. .. .	148

## " X "

(XIV)

	" Y "	PAGE
Yadkin River .. .. .		140
Yamuna River .. .. .		30
Yangtse River .. .. .		179
Yellow River .. .. .		11, 14, 137, 179, 180, 181, 182
Yerla River .. .. .		18
	" Z "	
Zuni Reservoir .. .. .		76, 171, 172, 184, 186
Zuni River .. .. .		171, 172, 184