



NEWSLETTER

INTERNATIONAL LAKE ENVIRONMENT COMMITTEE FOUNDATION

No.33 January 1999

— For Better Lake Management —

This Newsletter is also available in Japanese.

Lake99 - will you be there?



The 8th World Lake Conference heads for Denmark

Held every two years, the International Conference on the Conservation and Management of Lakes is possibly the most important event of the year for all those concerned with lakes and reservoirs. As stated in the Second Announcement for the Conference, "the importance of lakes and reservoirs for local climate, tourism, recreation, fishery, wildlife, humans and other species (is such that) the exchange of experience and discussion of the latest findings is as vital as ever". The World Lakes Conference provides an ideal stage for just such exchange, and ILEC is fully committed to supporting it.

As with previous conferences, the variety and range of subjects up for discussion, and the quality of the Keynote speakers are all

of the highest quality. Furthermore, in addition to the usual array of workshops and technical excursions, for the first time pre-conference courses have been arranged to add a teaching element to the Conference. These courses will be taught mainly by ILEC Scientific Committee Members and will include lectures, conceptual models and case studies. For those with an interest in modelling, ecotoxicology and reservoir management, these courses are a rare chance to be taught by world-renowned scientists in their field.

Denmark was one of the first countries in the world to pass an act of law on environmental protection, and it is therefore appropriate that the beautiful capital city of Copenhagen plays host

to the Conference on this occasion. The city is not only striving to find comprehensive solutions to environmental problems, but is also favourably disposed to sharing its experiences with others. Visitors to the Conference will have ample opportunity to meet with members of the local organising committee; all of whom are leading lights in their area of specialisation.

In this edition of the ILEC Newsletter, we provide a brief guide to the Conference, but more details can be found in the Second Announcement which is available on the Internet (see Page 4 for access details), or from the Conference Secretariat. It is our hope that the Conference will be well attended and we urge you to go.

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Temporary Wetlands: Neglected Lakes

W.D. Williams

Temporary wetlands are inland bodies of fresh or saline water which are frequently dry, either seasonally (intermittent wetlands in semi-arid and subhumid areas) or for longer periods (episodic wetlands in deserts). Temporary wetlands are characteristic water-bodies of drylands, that is, areas of the world receiving less than an average of 500 mm rain each year, but are by no means confined to them; they occur in all major climatic regions. In drylands, they are often numerous, so much so that they may well be the dominant landscape feature, as, for example, in the high veldt of southern Africa, in south-east South Australia, or in parts of Texas. In all these regions and elsewhere when water is present, they often take the form of large, turbid, shallow bodies of water, constantly stirred by the wind, and displaying significant short-term variation in many attributes. Other sorts of temporary wetland are also common: roadside ditches, claypans, rockpools, small ponds (vernal pools) provide examples.

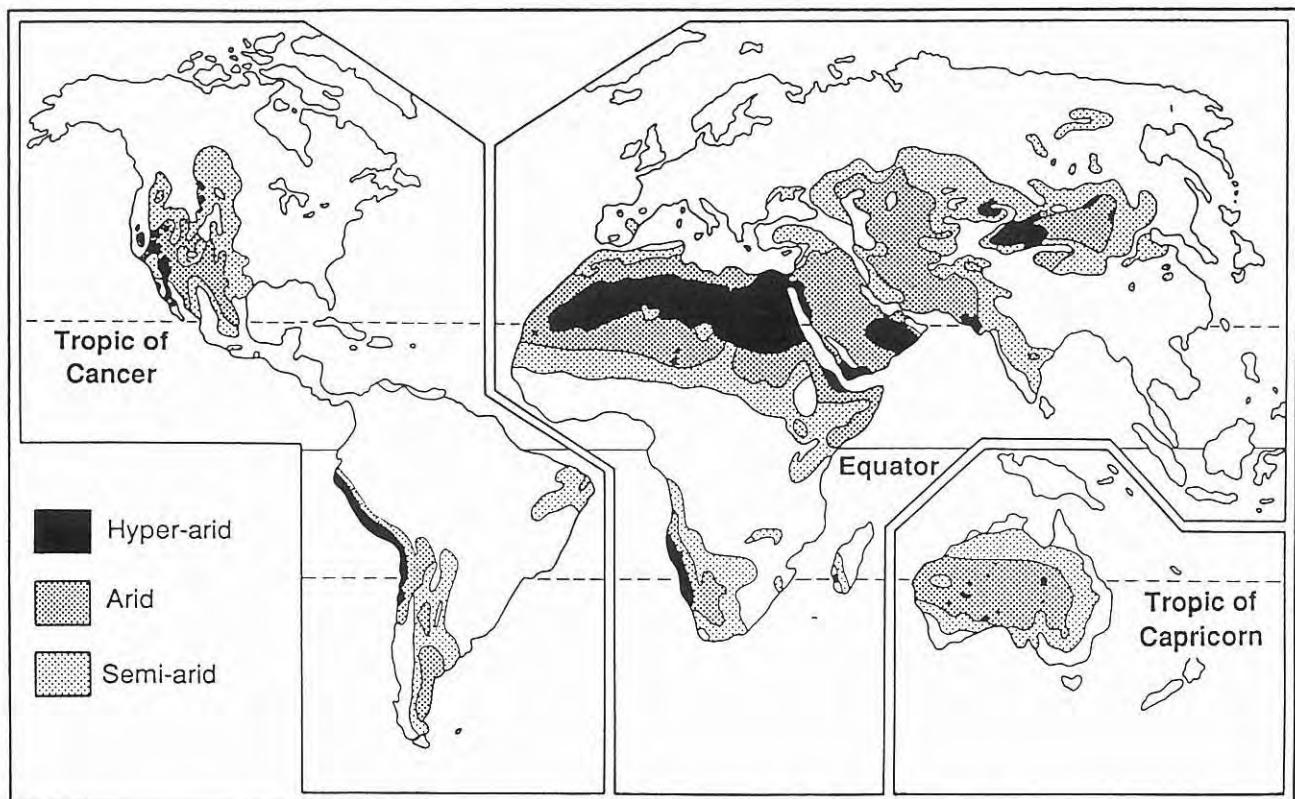
Our knowledge of temporary waters is lim-

ited in comparison to our knowledge of permanent inland water-bodies, a not surprising fact given the smaller utility of temporary waters (especially those that are saline) and their frequent location in places some distance from scientific centres. But this relative lack of utility and inaccessibility should not be taken as indicative of a lack of scientific interest, nor that they lack other wider values. That is far from the case. The purpose of this article is to draw attention to at least part of this interest and these values, and to argue that limnologists, water resource managers and conservationists need to take greater account of temporary wetlands.

The figure below indicates the geographical extent of dryland regions of the world (shown in the figure as hyper-arid, arid and semi-arid regions). It can be seen that they are extremely extensive. In total, they cover over a third of the world's land surface (and the semi-arid regions at least include some of the most densely populated countries). Although, paradoxically, they contain some of the world's largest

permanent lakes (e.g. Lake Chad, the Caspian Sea, Lake Turkana), they also contain large numbers of much smaller temporary bodies of water. No accurate inventories are available of the number and area of these - partly because limnologists have focussed upon permanent water-bodies or on large temporary wetlands. Even so, there is no question that they are both numerous and extensive as a whole. Some 250,000 lakes of area $<0.1 \text{ km}^2$ have been noted as present in dry and arid zones and many of these lakes may be expected to be temporary given their small size (cf. 260,000 of similar size in temperate areas). The actual numbers will be in excess of this figure since there are many temporary wetlands over 0.1 km^2 in area and many very small temporary wetlands will not have been included.

Early limnological views concerning the scientific interest of temporary wetlands were that it was somewhat limited and that biodiversity in particular was depauperate and the biota present involved rather few groups and displayed



The Geographical Extent of Wetlands



A temporary, freshwater wetland in north-eastern South Australia when water was present

little if any regional restrictions. Elements of these views persist even now. The views are quite wrong as an increasing amount of research has shown. This research, amongst other findings, illustrates four significant facts.

First, faunal diversity is high and often higher than in many permanent wetlands (including lakes). Second, a wide range of faunal groups occurs, the particular assemblage at a given time depending largely upon the time from filling. Branchiopod crustaceans, for example, usually occur immediately after the wetland has filled and are the first to disappear. They are succeeded by a wide variety of insect and other groups not already present. All major invertebrate groups are found, even those with no stage in their life-cycle resistant to drying (these survive the dry period as adults in refuges). All the major vertebrate groups occur, though usually as migrants. Many elements of the fauna occur in permanent wetlands also and are thus no more than opportunistic in occurrence, but many species are confined to temporary wetlands. Third, local differences in hydrology, frequency of filling, basin shape and other factors often give rise to distinct differences in the assemblage of species present even in temporary wetlands close to each other. The same wetland may also

display differences after different filling events. The result is a mosaic of communities. And fourth, considerable endemism is present at both continental and regional levels, particularly in the case of intermittent wetlands and less so in the case of episodic wetlands. A fifth, more speculative finding, can be added. During the dry phase in episodic wetlands, a small but characteristic biota is associated with the dry sediments (and is not found in terrestrial situations beyond the lake edge). This is certainly true for large salt lakes in the central Australian desert; the situation elsewhere, and in particular in lakes which contain fresh water when full, is more problematical.

These findings have considerable implications for scientists. The major implication is that a large and mostly unexplored segment of the inland aquatic environment exists where: (1) high diversity, endemism and many adaptations to environmental stresses quite different from those of permanent waters characterize much of the biota, (2) ecosystem function and structure are markedly different from these attributes in permanent waters, and (3) interactions between terrestrial and aquatic, surface and underground, and various climatic events are likely to be closer than for most permanent wetlands.

The scientific interest of temporary wetlands is only one of their values. Whilst their economic value is certainly less than that of permanent fresh waters, it is by no means negligible. Economic values include the function of temporary wetlands as groundwater recharge systems, for cropping and pasture when the basin is dry, and as places where floods are moderated. Non-economic values in addition to their scientific value include aesthetic, recreational and educational appeal. All of these values need careful management if they are not to be degraded (and in this connection note that temporary wetlands by their very nature are (1) often regarded as unimportant environments and therefore more 'expendable' than permanent wetlands, and (2) more sensitive to human disturbance).

For conservationists, the most important implication from recent research is that more attention needs to be directed to the conservation of biodiversity in temporary wetlands. This must certainly be the case if the recent international convention on Biological Diversity is to be fully implemented. The relative paucity of temporary wetlands amongst those sites listed by Ramsar as sites of international importance is another issue of concern for conservationists worldwide.

Lake99 Draws Near - Are You Ready?

Professor Jørgensen writes:

Welcome to Lake99

This is the 8th conference in a row of the World Lake Conferences resulting from ILEC's activities. The conference will be held in the beautiful city of Copenhagen in May, when the Danish national tree, the beech tree, is in its full beauty. Many Danes are of the opinion that May is the best month of the year in Denmark.

The conference is characterised by covering a wide spectrum of topics: nutrient, toxic substances, littoral zone, fish, macrophytes, plankton as well as political issues, management, models, education, social-economic dimensions, ecological indicators and monitoring. There will be scientific sessions, sessions focusing on education and on social-economic issues, sessions on management and sessions for NGOs. Three workshops are planned on harmful algae bloom, on risk assessment in lake management and on the influence of global changes on lakes. In addition, three courses have been arranged before the conference: modelling of lakes and reservoirs, ecotoxicology of lakes and reservoirs and reservoir management.

Appealing post conference tours have been arranged on which it will be possible to see lakes which have recovered after improvements in the waste water treatment, lakes which are recovering but have yet to fully recover, lakes which are still in a hopeless eutrophied situation, lakes which are restored by a wide spectrum of restoration methods. You can choose between a one day excursion close to Copenhagen, where many beautiful lakes are situated or a two-day excursion to Jutland where, in particular, many lakes have been successfully restored.

I am convinced that this conference will give new and useful information to everybody dealing with lakes and reservoirs, and I hope to be able to meet many readers of the ILEC Newsletter there personally. See you in May.

A brief guide to Lake99 - 17-21 May 1999

Sessions

1. Effects of changed nutrient loadings.
2. Xenobiotics in lake loadings, fate and effects.
3. Lake development for various purposes.
4. State of the art on application of lake models in environmental management.
5. Restoration of lakes: physical, chemical and biological methods.
6. Lake management in tropic developing countries and temperate industrial countries: comparative studies.
7. Monitoring of lakes: strategies, ecological indicators, methodology and techniques.
8. Urban lake management.
9. Impact of agriculture in the catchment areas of lakes and lake management.
10. The Importance of the littoral zone in lake dynamics and management.
11. Management of fishing for recreational and commercial use.
12. The role of lakes in river basin management.
13. Application of GIS and other spatial information technologies in lake management.
14. State of the art of lake conservation in Europe.
15. Aims, objectives and research priorities in sustainable management.
16. Environmental education.
17. NGO and citizen participation.
18. Human, social and economic dimensions of lake and reservoir management.
19. Political issues in lake management.

Guidelines for abstract(s) and posters

ELECTRONICALLY

Media: Diskette or CD-ROM, black/white.
Text: PC format, Windows 95, written in Word or WordPerfect.

Pictures: All illustrations and pictures must be in tiff/eps format.

Copies: 2 printed copies must be enclosed.

point typeface.

Pictures: Paper photos, black/white

Format: A4, left and right margin each 10 mm, top and bottom margin 15 mm. Maximum width per line is 107 characters (including space, etc.) and maximum height of 52 lines.

Copies: 1 original and two copies must be enclosed. Do not bend the papers.

PRINTED COPY

Media: Printed copy, black/white

Text: Must be written in Helvetica 12

Mail your abstract(s) to:

Lake99, c/o DIS Congress Service Copenhagen A/S
Herlev Ringvej 2C, DK2730 Herlev, Denmark

Pre-conference courses - 15-16 May 1999

1. Modelling of lakes and reservoirs. Tutors: S.E. Jørgensen and Søren N. Nielsen
2. Ecotoxicology of lakes and reservoirs. Tutors: S. Matsui and S.E. Jørgensen
3. Reservoir management. Tutors: M. Straskraba and J. Tundisi

Workshops

1. Harmful algal blooms.
2. Risk assessment in lake management.
3. Influence of global changes on lakes.

The Organising Committee is most willing to consider new ideas for other subjects. Please contact the Conference Secretariat.

www.lake99.dk

Profile on Dr. Madhav Chitale ILEC Scientific Committee Member

Dr. Madhav Chitale is currently heading the interim South Asia Technical Advisory Committee of the Global Water Partnership and is developing a network of water related agencies/institutions to promote integrated water resources management in the countries of South Asia. One of their immediate tasks is to develop a Water Vision for South Asia and to propose a framework for action by March 2000.

Simultaneously, as the Chairman of the Maharashtra State's Water and Irrigation Commission, (population 80 million and geographical area 3,008,000 km²) Dr. Chitale is also involved in finalising a 30 year perspective plan for the development of the State's Water Resources (75 km³) - and for the systematic development and management of their irrigation facilities. Currently, the irrigation area is 3 million hectares, which is expected to double by 2030.

From January 1993 to December 1997, Dr. Chitale was the Secretary General of the International Commission on Irrigation and Drainage (ICID) - the first full time Secretary General of the Commission since its establishment in 1950. Some 80 countries with interest in irrigation are members of the Commission. In his capacity as chairman, Dr. Chitale was involved in the work on the problems of the Aral Sea Basin - for which ICID has established a separate work team to evolve and pursue appropriate remedial measures.



Dr. Madhav Chitale

He was also instrumental in establishing in 1995, the International Water Related Associations Liaison Committee of the 10 scientific and professional worldwide associations related with the water sector. He was a member of their Board of Governors and Chairman of their Regional Centres Committee (1996-1997).

In 1985, Dr. Chitale introduced the Water Resources Day in India to promote water awareness of the people at large and for organising extensive public debates on the critical water issues facing the country. In 1992, the theme for the national debate was "Water & Environment" and the Water Resources Day was organised at more than 1000 sites around the country. From 1997, National Water Conventions have been organised to sum up the outcome of the debates on the national themes of the Water Resources Day. To popularise the topic of water amongst children, Dr. Chitale organised a national exhibition on water for school children in 1988.

As a chairman of the committee on Mumbai's water supply, he prepared and presented a report to the Government indicating the possible water conservation measures, demand management measures and the sequence of development of additional water resources for the future requirements of the city. The report was formally accepted by the Government in 1996, and is under implementation.

For his contribution to the conservation of world's water resources and public education programmes, he was honoured with the Stockholm Water Prize in 1993, which is described as the Nobel Prize of Water and is awarded by the King of Sweden on recommendation from the Royal Swedish Academy of Sciences.

Currently, Dr. Chitale is involved in the extensive promotion of grass root level voluntary action groups in the water sector such as for the development and management of irrigation in the field and for the protection and management of the water quality of lakes and reservoirs.

1998 Biwako Prize for Ecology

The 8th Biwako Prize for Ecology was awarded to Dr. Chongrak Polprasert and Dr. Mutsumi Nishida.

Professor Polprasert is the Dean of the School of Environment, Resources and Development at the Asian Institute of Technology in Thailand. His award was recognition of the outstanding contributions he has made in the field of low-cost waste treatment technologies applicable in tropical climates. A major accomplishment of his has been the derivation of engineering design criteria for sewage ponds introduced with water hyacinths.

Professor Nishida is based at the Faculty of Biotechnology at Fukui Prefectural University in Japan. He has introduced molecular techniques, DNA in particular, into ecological study, and his significant discoveries include the fact that the ayu sweetfish (*Plecoglossus altivelis*) in Lake Biwa has differed from the amphidromous form of ayu for more than one hundred thousand years.

1999 Biwako Prize for Ecology

Nominations are now being accepted for the 9th Biwako Prize for Ecology. Nominations will be accepted until 17 May 1999. The prize, which will be conferred on two researchers by the Governor of Shiga Prefecture, will consist of a certificate of merit and 5 million yen. The names of the winners will be announced in July 1999, and the awards ceremony will be held in October 1999.

For further details, please contact:
Secretariat of Biwako Prize for Ecology
c/o Planning Division
Department of Planning and Public Life
Shiga Prefectural Government
4-1-1 Kyomachi, Otsu, Shiga 520-8577
Japan
Tel: 81-77-528-3312 Fax: 81-77-528-4830
Email: prize@mail.ilec.or.jp

www.ilec.or.jp/prize/e-index.html

LAKES OF THE WORLD

UNIQUE SIBERIAN MINERAL LAKES - SHIRA

ANDREI DEGERMENDZHY

Natural waters and medicative mud of salt lakes have long been among traditional methods to heal human ailments. About 323,000 such water bodies that can be counted in Siberia amount to 11% of their total number over Russia. Large lakes - Bele, Shira, Vlasyievo, Uchu, Tagarskoye, Ulukhkol, Chernoye, Gorkoye, Altaiskoye, Terskoye, Tus and Utichyie - measuring more than 1 km² are mostly in Khakassia. Actually, the mineral lakes of Khakassia are an undeveloped powerful recreational potential of Siberia with tremendous prospects. Shira Lake is the most famous among the mineral lakes with medicinal qualities

Shira Lake is located at 54°34' northern latitude 90°12' eastern longitude. Its major physical and geographical features are location - 120 km from Abakan (the capital of Khakassia), 360 km from Krasnoyarsk; solar days in summer - 46-52; altitude above sea level - 354 m; length - 9 km; width - 5 km; water-

surface area - 34.7 km²; average depth - 11.2 m, maximum depth (1997) - 24.7 m; mineral water volume - about 387 million m³; natural annual normal runoff into the lake - 21 million m³; anthropogenic (in addition to natural) annual runoff 1.6 million m³; underground water exchange (% of total water supply) - 9; water formulation - alkalescent, sulfate-chloride-sodium-potassic; total salt stock - more than 9 million tons; mineralization - 20 g/l (1997); depth of occurrence of mud - 9 m; layer thickness - 1.5 m; mud stock - 18.1 million m³; mud area - 19.7 km²; mud composition - silicates and carbonates of Ca, Mg, Fe; Al, Ca oxides; organic matter - 4%.

Vertically the lake is divided into two layers: the top layer which is 13-15 m deep with a salinity of 19-20 g/l and mixes during spring and autumn circulation periods, and the bottom anisotropic layer with the salinity of 22-28 g/l. According to mean yearly data in the summer period the chloride content

increases with depth and a part of carbonates transforms into bicarbonates. The content of sulfates in summer in the surface

About the Author

Biophysicist Professor Andrei Degermendzhy is Director of the Institute of Biophysics, Siberian Branch of Russian Academy of Sciences. He is a leader of the biophysical approach to integrate theoretical, experimental and field research methods to forecast water quality on the basis of the Siberian salt lakes study.

layer is 53% (8.9 g/l), magnesium - 7.4%, ammonia - 1.55 mg/l, chlorine ions - 12%, potassium and sodium ions - 20-21%; magnesium ions - 5%; phosphates - 76 mkg/l; total phosphorus - up to 200 mkg/l.

Descriptions and investigations of the medicative effects of Shira Lake date back as long as 1771-72. To-date the water of the lake has been proved to be efficient to heal diseases of digestion duct, cardio-vascular system, respiratory organs and locomotor system. Another healing factor is the medicative mud with anti-inflammatory, desensitizing and immune-control effects.

From the stand point of ecology and science Shira Lake is a unique natural small research model of a marine system in terms of its near-bottom hydrogen sulfide zone that starts at the depth of 12 m and is the healing component, steady thermal stratification, hemo-, halo-clines, etc. Resolution of problems inherent to Shira lake is of fundamental significance both for scientifically substantiated monitoring and control of the condition of lakes with medicative effects and for ecology on the whole.

1. The lake ecosystem is reduced and poor



Shira Lake - a unique natural small research model of a marine system

in the number of species and trophic levels. Algae (25 species) of Cyanophyceae, diatom, Chlorophyceae divisions dominated by the blue-green (*Lyngbya contorta*, *Microcystis pulvrea*); zooplankton (*Arctodiaptomus salinus*, *Brachionus plicatilis*, *Hexarthra oxiuris*), a number of functional bacterial groups found bring the lake closer to laboratory ecosystems. The literature available (from 1771 to date) has no evidence of ichthyofauna, even though the red fish has accommodated to nearby Bele salt lake. This raises the question - how does such a reduced ecosystem maintain matter turnover?

2. The cause of perennial changes in the mineral composition and general mineralization of water is one of essential scientific problems. Hydro-geological evidence suggests that the curve of mineralization is in antiphase to the level of the lake, i.e. the total amount of dissolved salts is constant (about 9 million tons) and, accordingly, the total concentration of salts is defined by the ratio of "income-outcome" balance of the fresh water (ultimately - by the volume of the lake). In this case the salt percentage should not vary. However, according to Leman (1890) and Gebler (1926) the salt composition substantially changed in 25 years: concentration of NaCl increased by 107%; Na₂SO₄ - by 30%, MgSO₄ - by 85%, MgCO₃ - by 45%. This phenomenon could be attributed to hydrological exchange processes with underground water and brines, however, hydrological data suggest that this exchange is not more than 9% of the total flow into the lake. This indicates plausible significant contribution of other factors, e.g. microbiological (hymolitrophic) and/or chemical transformations in salt composition dynamics which also call for further profound research.

3. Among major scientific problems is the issue of high anti-microbial properties of Shira lake waters and its reasons in addition to salinity. Few indirect facts indicate the importance of natural microflora of the lake and/or organic matter for the sanitary-medical property of water. The problem calls for further detailed investigation.

4. Slight "blooming" of microalgae that occurs at Shira Lake is also atypical for mineralized water bodies. The literature on Shira Lake has no evidence of this phenomenon. The question of development of the "blooming" mechanism leaves the matter open: this is either an adaptation of a known species or changes in a chemical environmental factor that "provides" favorable conditions for the microalgae to introduce.

5. The relationship between medicative properties of water and its chemical composition established by ecological- mathematical simulation of the mineral and organic composition of water can create prerequisites to predict its healing properties.

The main objectives of the scientific work (Federal Programme "Integratsia") of the Institute of Biophysics under way at Shira Lake are: 1) to assess the current ecological state of Shira Lake, including assessment of hydro-biological, hydrochemical and hydrological conditions of the lake and its healing potential; 2) to develop a system to monitor the state of the lake and establish the relationship between the structure of various "clines" of the lake and inhomogeneities with their functional contribution into the matter turnover; and 3) to analyze and develop recommendations based on mathematical simulation and computer-simulated sequels of several scenarios for water management of the lake.

Lakes & Reservoirs

Research and Management

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The Journal aims to promote environmentally sound management of natural and artificial lakes, consistent with sustainable development policies. To facilitate the international exchange of results, research papers, review articles and notes dealing with any aspect of the management and conservation of lakes and reservoirs will be published in *Lakes & Reservoirs: Research and Management*.

Abstracting and Indexing: *Lakes & Reservoirs: Research and Management* is covered by AESIS, BIOSIS, Cambridge Scientific Abstracts, FLUIDEX, GeoArchive, GEOBASE, UnCover and University Microfilms.

Subscription Rates: *Lakes & Reservoirs: Research and Management* is published quarterly. The subscription rates for 1999 (Volume 4) are Institutions: ¥42,000, Aus\$485 and/or US\$300; Personal: ¥23,100, Aus\$270 and/or US\$165 (per calendar year). Personal subscriptions are to individuals at a private address only. Subscribers will automatically receive issues already published in 1999. The journal is despatched to subscribers outside Australia by TNT Mailfast. ISSN 1320-5331.

New Publications

Wetlands in a Dry Land: Understanding for Management - Workshop Proceedings, Edited by W.D. Williams. (Environment Australia, Department of the Environment, Canberra, Australia)
ISBN: 0 642 21412 X

This book consists of the proceedings of a workshop held in Albury, NSW, Australia on 29 and 30 September, 1997. It was convened as part of the activities of the National Wetlands Research and Development (R&D) Program both to inform and be informed by all those interested in and concerned about the management of Australia's wetlands.

Limnological Studies on the Rio Doce Valley Lakes, Brazil, Edited by José Galizia Tundisi and Yatsuka Saito. (Brazilian Academy of Sciences, University of S. Paulo School of Engineering at S. Carlos, Center for Water Resources and Applied Ecology)
ISBN: 85-85761-07-5

This book is a contribution towards the scientific understanding of a tropical lake system located at the Middle Rio Doce Valley, Eastern Minas Gerais State, Brazil. The book reports on the geomorphological characteristics and lake origin, climate, vegetation of the region, physics, chemistry and biology of the approximately 150 lakes that comprise this system.

Study Report for the Lake Environment Conservation in Developing Countries - Argentina.

Reported by ILEC for the Environment Agency, Government of Japan. With permission of the Agency, ILEC is planning to make this report available from the ILEC Home Page at:
<http://www.ilec.or.jp>

Forthcoming Events

International Conference on Quality, Management and Availability of Data for Hydrology and Water Resources Management

22-26 March 1999, Koblenz, Federal Republic of Germany
Contact: K. Hofius,
Bundesanstalt Fur Gewasserkunde,
IHP/OHP-Sekretariat,
Postfach 309, D-56003 Koblenz, Germany
Tel: 49-261-1306 5131/5440
Fax: 49-261-1306 5422
Email: schroeder@koblenz.bfg.bund400.de

1999 Open Meeting of the Human Dimensions of Global Environmental Change Research Community

24-26 June 1999
Contact: 1999 Open Meeting Secretariat
Institute for Global Environmental Strategies (IGES)
Shonan Village Centre,
1560-39 Kamiyamaguchi,
Hayama, Kanagawa 240-0198, Japan
Tel: 81-468-55-3720 Fax: 81-468-55-3709
Email: hdgec@iges.or.jp
URL: <http://www.iges.or.jp/>

IWRA Regional Conference on Regional Water Cooperation in the Middle East

June 1999, Jerusalem, Israel
Contact: Secretariat - IWRA Regional Conference,
Regional Water Cooperation in the Middle East,
P.O. Box 50006
Tel Aviv 61500,
Israel
Fax: 972-3-514-007 or 972-3-517-5674



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