



# the international water association

Watershed and River Basin  
Management Specialist Group  
Newsletter

Special Edition - Groundwater  
in Focus

March 2016

**Disclaimer:** *This is not a journal but a newsletter issued by the IWA Specialist Group on Watershed and River Basin Management. Statements made do not necessarily represent the view of the Specialist Group or IWA.*

## Contents

Welcome.....	2
Physical, Chemical and Biological Characterization Surface water in Low Basin Of The Mayo River Sonora México.	2
IWA Basins of the Future Programme Update.....	3
Big Changes for Groundwater Management in California.....	4
Groundwater Management in the Metropolitan Zone of Guadalajara: The Case Aquifer Recharge Zone Called "El Bajio Del Arenal".....	6
9th International Symposium on Managed Aquifer Recharge.....	7
IWA Water Quality and Land Use Impacts Report.....	8
A Household Filter in an Iron and Nitrate Rich Aquifer in Sembung Subwatershed, Sleman, DIY, Indonesia.....	9
News from IWA Headquarters.....	10
NEW journal papers from IWA Publishing.....	11

## Welcome

### John Riddiford, Australia, Chair

Welcome to the first Watershed & River Basin Management (WRBM) newsletter for 2016.



Climate change continues to be a key driver when considering different water resource

management options for the growing global population. The United Nations recently approved the new Sustainable Development Goals (SDG) including SDG6 – Ensuring availability and sustainable management of water and sanitation for all. It is expected that another 2.5 billion people will be living in cities by the year 2050, an increase from the current 50% living in urban communities to nearer 70% of the world's population living in cities by 2050. How do we provide sustainable water management for our cities of the future? We need to investigate and develop many options including the supply of different and integrated water supplies. Integrated catchment and basin management will be even more important in defining solutions to these challenges.

In this edition of our newsletter we will be focussing on different water resource management options including the use of groundwater, including "banking" groundwater.

### Jordan

I attended the Water and Development Congress held in Jordan in October 2015. My colleague, Andrea Capodaglio, from Italy also attended. One very sobering thought was that Jordan is currently hosting 1.4 million refugees, this equates to 20% of that nation's population. The strain on its natural resources including the supply of clean water is very much ever-present. I met a number of international participants including Jordanians, Palestinians and Israelis. At the grass-roots level there is a concerted effort for global cooperation and the provision of essential services for all.

Together with Katharine Cross from the IWA we hosted a basin workshop. At this workshop we discussed the following elements;

- The Basins of the Future Programme
- Identifying the key challenges and management options for managers of watersheds under climate change impacts
- Seeking out different approaches for water resource management under climate change from various international and multi-jurisdictional perspectives
- Identifying the main challenges and feasible solutions for river basin management of multi-nationally shared river basins and what mechanisms would be recommended for effective transboundary watershed management
- Identifying the key research topics over the next 20 years for the IWA family in facing climate change

- Engaging with IWA's strategic partners (international agencies and organisations in the sector)
- Enabling international leaders in the sector to participate in the Congress
- To participate in further ongoing IWA activities (from Specialist Groups, Task Groups, Programmes)

The specialist group leaders of the IWA also met in Jordan immediately after the Congress.

The IWA secretariat provided an update on IWA activities, and an overview of the new website. The group leaders then undertook a visioning exercise to investigate strategic priorities and possible interaction between the groups for the next five years.

### New Management Committee Members: are you interested?

The WRBM specialist group currently has fifteen members on its Management Committee. We are seeking expressions of interest for new members to join this the group. Members must be current IWA members, have an interest and specialist skills related to watershed and river basin management, and have a commitment to participate within the group.

I will be accepting nominations for consideration by the wider management committee. Please email your interest to me at [riddifordjohn@gmail.com](mailto:riddifordjohn@gmail.com)

**John Riddiford**

**Chair Watershed & River Basin Management specialist group of the IWA**

## Physical, Chemical and Biological Characterization Surface Water in Low Basin Of The Mayo River Sonora México

### Julio César Duarte Ruiz & Teresita Parra Valencia<sup>1</sup>

The low basin of the Mayo river is mainly polluted by industrial-urban and agriculture and cattle residues, causing detriment to ecosystems and

quality of life in the region. This work presents preliminar results on a inter-institutional project which was done in 1996. A physical, chemical and biological characterization of water to evaluate types and levels of contamination applying Mexican Official Norms and Standards Methods For The Examination Of Water And Wastewater was made. Six sampling were made; one monthly in eight points, determining Ph, temp, E.C., salinity, consumption, dissolve oxygen, OBD., OQD, solids, orthophosphates, N-NH<sub>3</sub>, organic nitrogen, fats and oils, detergents, total and faecal coliforms. The results show a gradual increase of total solids (200-5,000 mg/l); increasing significantly in points 7 and 8. The OQD remains low (<200 mg/l), with variations up to 327 mg/l.

The total and faecal coliforms present the points 4 to 7 (>160,000 NMP/100 ml) and 1 to 8 (>200 NMP/100 ml) respectively out of norms. It was concluded that contamination by coliforms is high and considerable to human health. The organic and nutriment contents is low and also registering important contributions of inorganic elements due to agriculture activities and tide effects.

M.I. Teacher-Researcher Universidad de Sonora, Unidad Regional Sur. División de Ciencias e Ingeniería. Lázaro Cárdenas 100, Navojoa, Son, Mex. Tel and fax +521(642)59952 e-mail: [jcduarte@navojoa.uson.mx](mailto:jcduarte@navojoa.uson.mx), [tparra@navojoa.uson.mx](mailto:tparra@navojoa.uson.mx)

## IWA Basins of the Future Programme Update

The Basins of the Future (BoF) programme continues to work closely with the Watershed and River Basin Management Specialist Group. At the upcoming **World Water Congress from October 9-14<sup>th</sup>, 2016 in Brisbane, Australia** <http://www.iwa-network.org/event/world-water-congress-exhibition-2016/>, there will be a number of leaders' forums, including a Basin Leaders Forum.

### What is the Basin Leaders Forum? And who will take part?

The Basin Leaders Forum will provide an opportunity for basin organizations, catchment authorities as well as water resource managers from sectors across river basins (e.g. mining, energy, industry, agriculture, etc) to share knowledge and experiences and explore viable pathways for sustainable economic, social and environmental development of catchment areas. The Forum intends to connect multisector stakeholders with a prime interest in developing and sustaining water resources at the catchment level. Furthermore, the Basin Leaders Forum will be a stepping stone for development of a "Charter for Sustainable Basin Management" which will provide guidance to better manage water resources across scales especially for urban and industrial areas through actions at the catchment level.

### Charter for Sustainable Basin Management

Over the past few years, IWA has provided guidance to the water sector through risk management tools, such as Water Safety Planning; benchmarking, including performance indicators for water supply services; and providing principles for sound public policies and the regulation for water services, such as the [Lisbon Charter](#) for public policy and regulation of water and wastewater management. Building on these knowledge products, and the soon to be launched Urban Water Charter, IWA is exploring the concept of a "Charter for Sustainable Basin

Management". The Charter will set out broad principles that will guide cities and their basins in ensuring planning and management of water resources across scales, from catchment to consumer, meeting growing demands and responding to the challenges of climate variability and change. Beyond setting the principles for action, the Charter will define roles and responsibilities of the various stakeholders collaborating to achieve sustainable basin management.

If you are interested in being part of the Basin Leaders Forum, contributing to the Charter for Sustainable Basin Management and/or the Basins for the Future programme, please contact [Katharine.cross@iwahq.org](mailto:Katharine.cross@iwahq.org)

### Nexus trade-offs and strategies for addressing the water, energy and food security nexus in Africa

IWA with IUCN carried out a study for the Infrastructure Consortium for Africa (ICA) that outlines a roadmap for nexus solutions in a typical African transboundary river basin. The study focused on identifying possible regional solutions to local problems and understanding the institutional capacity and the gaps to reach implementation. The report launched last December provides a first overview of where investments can be focused and the need to include agreed cost/benefits sharing protocols. This work is a starting point that provides an opportunity for hands-on training, joint communications and learning to propose infrastructure development (multi scale, natural or built) that has benefits across sectors. The report is freely available here <http://www.iwa-network.org/blog2/beating-the-odds-approaches-for-developing-infrastructure-for-water-energy-and-food-security-in-africa->.

For more information please contact [Carolina.latorre@iwahq.org](mailto:Carolina.latorre@iwahq.org).

### Flood and Drought Management Tools

The executing agencies of the [Flood and Drought Management Tools](#) project, DHI and IWA, carried out a series of technical trainings for the project, to validate and test the computer software-based decision making system (Decision Support System; DSS) being developed for basins and utilities to integrate climate, flood and drought information into their planning processes. The trainings provided stakeholders in the pilot basins (Chao Phraya, Lake Victoria and Volta Basins) with a first glance of the tools potential functionality and the project with an opportunity to receive feedback for further development and improvement of the DSS. To learn more visit <http://fdmt.iwlearn.org/en>.

### Building a Climate Resilience Knowledge Base – Call for Contributions

Urbanisation and increasing impacts of climate change are placing continued pressure on cities and their ability to be resilient. Preparing for Extreme And Rare events in coastal regions ([PEARL](#)), in its efforts, is helping cities (in coastal regions) to prepare effective responses to extreme events by improving forecasting, prediction and early warning capabilities which policy makers and emergency services can use to develop robust risk reduction strategies.

One component of the project is the collection of resilient measures into a knowledge base platform offering coastal cities with a catalogue of practical solutions to manage extreme events. PEARL is seeking the contribution of practical example illustrating how resilient measures can be implemented and how these measures provide coastal cities the tools to manage their extreme events.

If you would like to contribute, please contact Raul Glotzbach from the International Water Association ([raul.glotzbach@iwahq.org](mailto:raul.glotzbach@iwahq.org)).

# Big Changes for Groundwater Management in California

William T. Stringfellow, University of the Pacific, Stockton, CA, USA

“Our reservoirs are still really low, our soil moisture is low, our groundwater is overdrafted. We’re in a deeper hole than one year is going to fill.” - Peter Gleick, Director of the Pacific Institute, in response to a question about normal rainfall this year.

## California faces continuing water crisis

California and the western USA has been in the grip of a record drought for over four years. Despite the occurrence of an El Nino this year, precipitation to date has not been above normal and the snowpack, an important storage component of the State’s water system, is currently only 75% to 90% of normal for this time. Most of the state’s major reservoirs still hold much less than their historical averages for February. Some scientists are predicting that climate change is ushering in a new era of sustained drought in the Western US. It is clear that California is facing a sustained water crisis and business as usual can not continue.

## California faces groundwater sustainability crisis

California is dependent on groundwater and it is widely recognized that current groundwater use is unsustainable. Groundwater is particularly important for crop irrigation in California’s Central Valley, the most productive agricultural region in the world. On average, groundwater accounts for about 40 percent of the state’s annual water supply. That number grows to 60 percent or more in dry years, when creeks, rivers and reservoirs are stressed by drought. Additionally, some communities are totally reliant on groundwater, even in the absence of drought.

Statewide, the Department of Water Resources (DWR), the state agency tasked with management of water quantities, estimated the annual rate of overdraft – taking more water from aquifers than can be replenished by rain and other means – to be 1 million to 2 million acre-feet per year (1.2 to 1.5 km<sup>3</sup> per year). During the past three-year drought, there is concern that overdraft has increased, especially in the Central Valley (Figure 1). The National Aeronautics and Space Administration (NASA)/German Aerospace Center

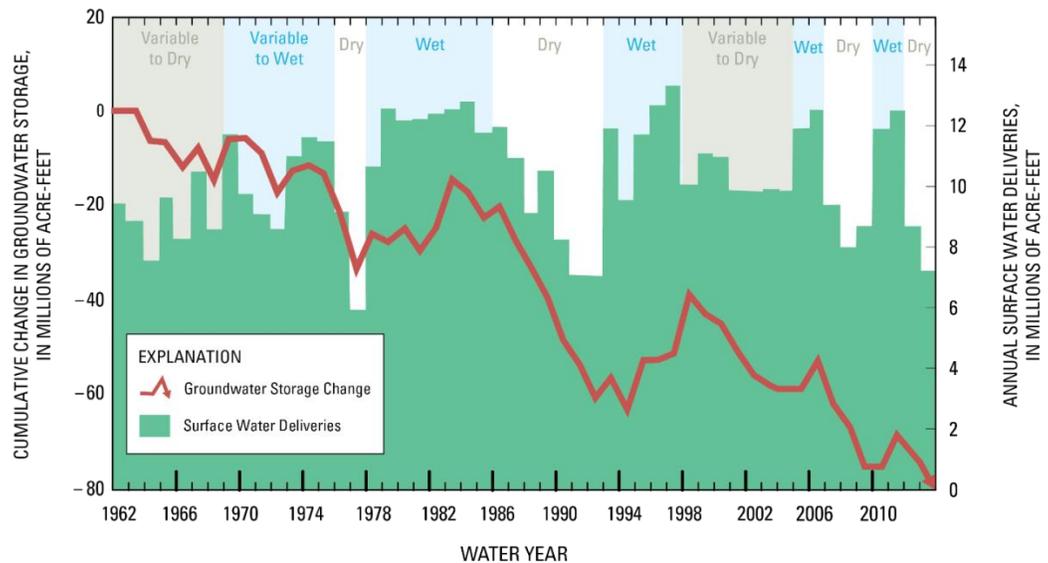


Figure 1. Graph showing surface water deliveries and cumulative storage changes for the central Valley of California as estimated by USGS models. On average about 40% of the water supply of the Central Valley has come from groundwater (ranging from about 30% during wet years to 70% during dry years). Over time, the extra pumping has stressed the aquifer, which for decades has had an overall loss in storage. The Central Valley has been depleted by about 1.85 km<sup>3</sup> per year on average since 1960 (Faunt et al. 2009), and has been depleted about twice this rate during the current drought. From: California Water Science Center (February 29, 2016)

Gravity Recovery and Climate Experiment (GRACE) revealed that between 2003 and 2009 the aquifers for the Central Valley and its major mountain water source, the Sierra Nevada, had lost almost 26 million acre-feet (32 km<sup>3</sup>) of water – which is nearly enough water to fill Lake Mead, North America’s largest reservoir.

## Land subsidence impacts

The land surface can sink when groundwater levels fall as a result of groundwater being withdrawn faster than it is replenished. Recent studies by the U.S. Geological Survey (USGS) examined land subsidence in the southern portion of the Central Valley (the San Joaquin Valley) from 2008 to 2010 (Figure 2). The USGS found significant subsidence that is reducing the capacity of water conveyances and other infrastructure that transport floodwater and deliver water to agriculture, cities, industries and wildlife refuges across California. Systems such as the Delta-Mendota Canal, California Aqueduct, Eastside Bypass, and various local canals are at risk for damage such as reduced freeboard (the distance between the water surface and infrastructure that crosses it, such as bridges), damaged panels of lined canals, erosion in unlined canals, and damaged wells. Land subsidence can

also exacerbate flooding and damage to pipelines, roads, and railways. These results were confirmed by a study from NASA that also include an analysis of more recent data. The more recent data indicated that the rate of land subsidence has accelerated during the drought, which started in 2012.

## Groundwater usage traditionally not well regulated

The demand for groundwater during the drought, especially for irrigated agriculture, has resulted in a boom in well-drilling. The demand for water has resulted in the deployment of bigger and better pumping technology, that allows more water could be reached from even deeper underground. The drought has created an “arms race” between farming interests for groundwater supplies and has driven the drilling of deeper wells at ever increasing cost as groundwater levels drop. Clearly the Tragedy of the Commons is not just economic theory.

Prior to January 1, 2105, groundwater in California was not regulated at the State level. Rather, groundwater utilization was regulated under a hodgepodge of laws, regulations, agreements, and rules. **(Continued on next page)**

In some regions, groundwater basins were managed under the auspices legislatively created authorities that rely on voluntary compliance. In some areas, local governments (counties) adopted ordinances governing the use of groundwater, including specifically banning transfers of groundwater outside of their jurisdiction. Counties are also responsible for issuing drilling permits for new wells. There are at least 22 groundwater basins, mostly in Southern California, that have been adjudicated – a process in which the court decides how much groundwater can rightfully be extracted by each landowner. The court appoints a “watermaster” to regulate the adjudication. Some 149 groundwater management plans in California were developed after the “AB 3030” law was passed almost 25 years ago. This law allowed local agencies to develop groundwater management plans to account for issues such as seawater intrusion, wellhead protection, recharge, groundwater cleanup, overdraft, conjunctive use, storage, conservation, recycling and extraction projects. But plans under AB 3030 were strictly voluntary and did not allow local entities to control extractions from the groundwater basin. Thus, overdraft and land subsidence continued to be a problem in many areas, even those with rules and regulations.

### New law governs groundwater usage at the State level.

In September of 2014 the Sustainable Groundwater Management Act (SGMA) became law and went into effect in January, 2016. SGMA gives local agencies the authority to manage groundwater in a sustainable manner and allows for limited state intervention when necessary to protect groundwater resources. SGMA requires the creation of groundwater sustainability agencies to develop and implement local plans. However, there is a timeline allowing 20 years to achieve groundwater sustainability. SGMA provides a state framework to regulate groundwater for the first time in California history.

SGMA is groundbreaking in that it establishes a definition of sustainable groundwater management; establishes a framework for plan development and implementation; prioritizes basins with the greatest problems (ranked as high- and medium-priority); and sets a specific, albeit 20-year, timeline for implementation.

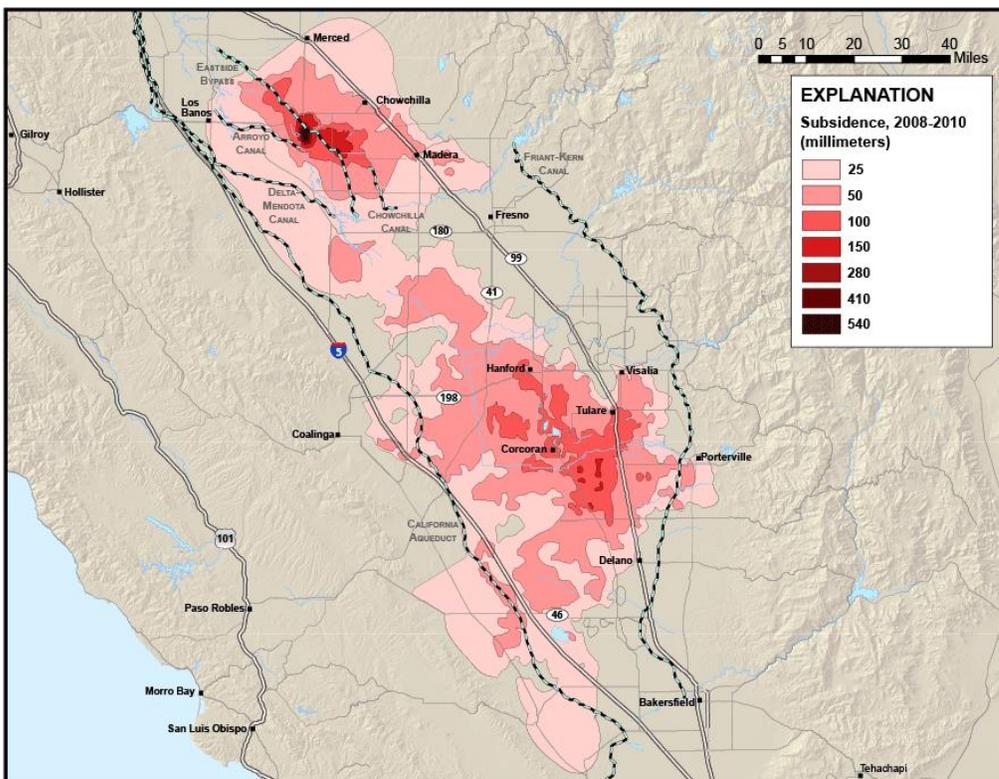
Under SGMA, basins that must establish Groundwater Sustainability Agencies (GSAs). The GSAs, made up of one or more local agencies overlying a groundwater basin, will be required to develop Groundwater Sustainability Plans (GSPs).

GSAs responsible for high- and medium-priority basins must adopt GSPs within five to seven years, depending on whether the basin is in critical overdraft. Agencies may adopt a single plan covering an entire basin or combine a number of plans created by multiple agencies.

Under SGMA, sustainable yield is defined as the maximum quantity of water – calculated over a base period representative of long-term conditions in the basin and including any temporary surplus – that can be withdrawn annually from a groundwater supply without causing an undesirable result. Undesirable result includes any of the following effects caused by groundwater conditions occurring throughout the basin:

- Chronic lowering of groundwater levels, but excluding reductions in groundwater levels during a drought if they are offset by increases in groundwater levels during other periods;
- Significant and unreasonable reductions in groundwater storage;
- Significant and unreasonable seawater intrusion;
- Significant and unreasonable degradation of water quality;
- Significant and unreasonable land subsidence; and
- Surface water depletions that have significant and unreasonable adverse impacts on beneficial uses.

Figure 2. Land subsidence in the San Joaquin Valley of California from 2008 to 2010. Groundwater overdraft has caused significant land subsidence and associated infrastructure damage. From: California Water Science Center (February 29, 2016)



The law stipulates that it is not a “one size fits all” approach and gives considerable flexibility to the GSAs as to how they achieve sustainability. The State, according to SGMA, can intervene only in extreme conditions when local control is inadequate, so the GSA is the primary agency responsible for achieving sustainability within the designated timeframe. However SGMA does include many new authorities and tools for GSAs, including the option to conduct investigations, measure and limit extraction, require registration of wells, and impose fees. Under the Act, DWR has the lead role in working with local agencies in implementing its provisions.

### The future of California’s groundwater

Given the importance of groundwater to California’s economy, environment, and quality of life, the future of groundwater will determine the future of California itself. The future of groundwater as an available and sustainable source of supply is a **(Continued on next page)**

function many factors, both natural and manmade. Natural factors, include the prospect of long-term drought, do not seem favorable. It will be dependent on human factors, including laws, regulations, and economics, to control and potentially reverse long-term damage to groundwater resources. The development of State-wide regulation of groundwater supply, including for the first time comprehensive measurement of groundwater use and replenishment, is an important first step in recovering what is already a severely damaged system. Tools are being developed, including active, science-based management of groundwater recharge. Large-scale groundwater banking projects are being envisioned as part of California's overdue response to a long ignored aspect of the continuing water crisis.

**Sources of further information**

Water Education Foundation (October, 2015) The 2014 Sustainable Groundwater Management Act: A Handbook to Understanding and Implementing the Law. Sacramento, CA, USA.

(<http://www.watereducation.org/downloadable-publications>)

Department of Water Resources (February 2, 2016) California Snowpack Holds More Water than Last Year, But Drought Conditions Continue and So Should Conservation. Sacramento, CA, USA. (<http://www.water.ca.gov/news/newsreleases/2016/020216snowsurvey-1.pdf>)

Adam Wernick (February 29, 2016) January snows in the Sierras ease, but will not end, California's drought. Public Radio International (<http://www.pri.org/stories/2016-02-29/january-snows-sierras-ease-will-not-end-californias-drought>)

Department of Water Resources (February 29, 2016) Snow Water Equivalents. California Cooperative Snow Surveys. (<http://cdec.water.ca.gov/cdecapp/snowapp/sweg.action>)

Herring, S. C., M. P. Hoerling, T. C. Peterson, and P. A. Stott, Eds., 2014: Explaining Extreme Events

of 2013 from a Climate Perspective. *Bull. Amer. Meteor. Soc.*, 95 (9), S1–S96.

([https://www2.ametsoc.org/ams/assets/File/publications/BAMS\\_EEE\\_2013\\_Full\\_Report\\_high\\_res.pdf](https://www2.ametsoc.org/ams/assets/File/publications/BAMS_EEE_2013_Full_Report_high_res.pdf))

California Water Science Center (February 29, 2016) Groundwater Depletion and Land Subsidence in California's Central Valley. US Geological Survey, Sacramento, CA, USA.

(<http://ca.water.usgs.gov/data/drought/drought-water-decisions.html>)

Faut, C.C., ed., 2009, Groundwater Availability of the Central Valley Aquifer, California: U.S. Geological Survey Professional Paper 1766, 225 p. ([http://pubs.usgs.gov/pp/1766/PP\\_1766.pdf](http://pubs.usgs.gov/pp/1766/PP_1766.pdf))

Farr, T. G., C. Jones, Z. Liu (2015) Progress Report: Subsidence in the Central Valley, California. Jet Propulsion Laboratory, California Institute of Technology, NASA. ([http://water.ca.gov/groundwater/docs/NASA\\_REPORT.pdf](http://water.ca.gov/groundwater/docs/NASA_REPORT.pdf))

## Groundwater Management in the Metropolitan Zone of Guadalajara: The Case Aquifer Recharge Zone Called “El Bajío Del Arenal”

### Dr. José Arturo Gleason Espíndola

Chief of Laboratory for Sustainable Architecture and Urbanism, University of Guadalajara, Guadalajara City, México.

Email: [arturo.gleason@cuaad.udg.mx](mailto:arturo.gleason@cuaad.udg.mx)

This article presents a specific groundwater problematic in the metropolitan zone of Guadalajara, the second largest city in Mexico. The water supply of this urban concentration is 30 % depends on groundwater; the rest comes from surface sources. During the last years the urbanization was been expanded without order covering almost the surface of the watershed. This situation has produced a contradictory situation. In one side, the urbanization avoids the infiltration rate that reduces the groundwater availability, and in the other hand, it is produces floods every year. This situation is more serious because the urbanization is still covering the aquifers recharge zone specially “El Bajío del Arenal” that is located in the western part of Guadalajara. Figure 1 shows the groundwater flow from the recharge zone called El Bajío, towards the discharge zone through Huentitán Ravine.

This area is part of La Primavera Forest, which is being threatened by urban developers. Already this area has been affected by the construction of Soccer Stadium and Pan-American dorms built for the games celebrated in 2011 (Figure2). Nevertheless, the local government is still

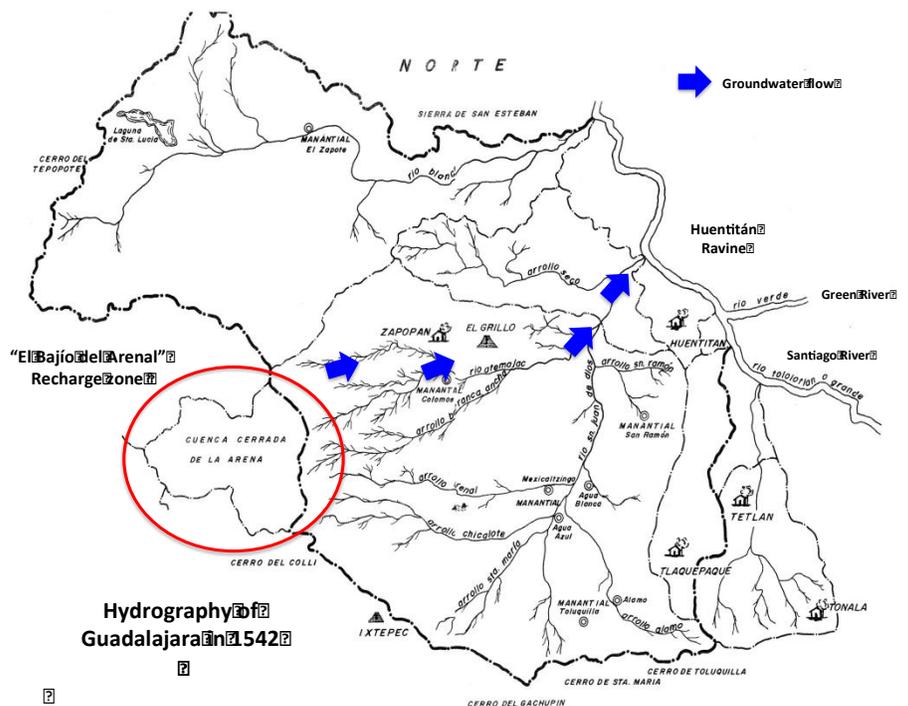


Figure 1. Groundwater flow from recharge (El Bajío) to discharge zone (Huentitan Ravine)

(Continued on next page)

promoting the urbanization of the rest of the zone. This situation has provoked a complex debate between voices in favour the urbanization and voices against. Both sides have their own arguments showed in a intensive debate that endures more than one a half year through 20 technical and political meetings. From this experience arose the lack of official technical groundwater information and opened the need to study more about its situation. Besides, arose some questions as such as: how much water do we have in order to supply the next generations? What would happen if Guadalajara still pumping groundwater with out measurements? How much time do we have to solve this problematic? This is an example of bad groundwater management in the zone.

If this recharge zone will be covered by concrete, it may affect the water supply from more than 1 million habitants of the western part of Guadalajara without considering the future generations. In spite of insistence from developers to urbanize the rest of the recharge zone, some experts have proposed an alternative strategy. First o of all, it necessary to realize a serious technical assessment for the zone in order to define the state of damage and determine if the constructions are need to be destroyed or there will be necessary to implement restoration strategies. Some environmental groups have appeal pursued the matter in court because there were irregularities in the expeditions of building permits, so the urban development is stopped, but in anytime the developers will won the legal issue and they will start urbanize the zone. It is necessary a change of mind that can allows the people to protect this zones and ensure the future.



Figure 2. Stadium built in the recharge zone "El Bajío"

## 9th International Symposium on Managed Aquifer Recharge (ISMAR9)

**Mexico City, 20-24 June 2016**

Managed Aquifer Recharge (MAR) is the intentional recharge of water to aquifers for subsequent recovery or environmental benefits; a technique at the cutting edge of integrated water management. To stretch limited water supplies, many communities are turning to MAR for conjunctive management of surface water, groundwater, and recycled water resources.

It has several potential benefits, including, inter alia, a) storing water for future use; b) stabilising or recovering groundwater levels in over-exploited aquifers; c) reducing evaporation of stored water; d) managing saline intrusion or land subsidence; e) enabling reuse of waste or storm water; f) maintaining environmental flows and groundwater-dependent ecosystems, which improve local amenity, land value and biodiversity.

ISMAR is widely regarded as the premier international symposium on managed aquifer recharge, research and practice. It is held every three years under the auspices of IAH, ASCE and UNESCO. ISMAR 9, the next in this series, will be held in Mexico City, Mexico, 24-26 June. This is the first time it will be held in Latin America, organised and hosted by the National Water Commission (Conagua), the Institute of Engineering of the National Autonomous University of Mexico (UNAM), and the National Association of Water and Sanitation Utilities (ANEAS).

ISMAR 9 will bring together water utilities, practitioners, the wider water industry, all levels of government, academics and students to present, exchange and acquire knowledge through roundtables, debates and keynote speeches around water banking and water re-use via aquifers, integrated water management, groundwater governance, regulation and management, economics, water quality, water reclamation technologies for MAR, alternative recharge systems, adaptation to climate change, MAR and land subsidence, and aquifer thermal energy storage.

**Mexico welcomes you!**



## IWA Water Quality and Land Use Impacts Report

### Call for Expressions of Interest for the Establishment of an IWA Task Group on Water Quality and Land Use Impacts Report

Changing land use is resulting in increasing diffuse pollution which impacts water quality and consequently environmental and public health. IWA is proposing to develop a report which consolidates knowledge on the problems and solutions linking land use management and water quality. We intend to create a multi-disciplinary task group to guide and develop this report. If you are interested in contributing, please contact Brian D'Arcy ([brian@enviroexperience.co.uk](mailto:brian@enviroexperience.co.uk)).

The interaction between land use and water quality (and quantity) is of fundamental importance for river basin management, with adverse impacts frequently experienced for potable water quality, irrigation, groundwater resources, and coastal waters and habitats. The water quality aspects are of course classic diffuse pollution issues. When seen on a global scale, impacts are impressive and diverse:

Tropical forest clearance leading to siltation of reservoirs, rivers, coral reefs, and air pollution from burning depositing PAHs and creating smog many kilometres away

Logging temperate forests or overgrazing grass and hill landscapes and silting the spawning rivers of salmonid fish and sensitive invertebrates such as freshwater pearl mussels

Reduction of vegetation cover exacerbating sediment loss to watercourses in storm events – reducing resilience to climate change driven weather patterns in many regions

Contamination of groundwater resources by pollutants associated with various industries (including pesticides from agriculture, toxic metals from mining, solvents, detergents and hydrocarbons from industrial and commercial estates)

Pollution of surface waters by pollutants in urban runoff (involves construction industry and transportation, as well as others above)

Sealing soils as urbanisation extends, with reductions in groundwater recharge.

There has been extensive research on individual issues, however there needs to be action from decision makers on how to tackle the larger picture of land use and degradation and its impacts on water quality. As the global network of water professionals, IWA and its members are well positioned to contribute to an integrated Impacts Report, perhaps in partnership with other international organisations; such an effort can go a long way to raising awareness and creating a more positive climate of political will to pursue land-use management and mitigation measures at landscape scale, for the multiple benefits that are needed.

Many of the impacts affect water utilities, irrigation operations and hydropower facilities, as well as flood control authorities. Multi-million dollar water-driven industries are incurring massive costs, as a result of the land-use and water environment interactions. Risk-based drinking-water quality management methods and procedures applied along the water supply chain, from catchment to consumer, known as water safety planning (WSP) are considered best practice across the world, but the diffuse pollution costs implicit in that are rarely described and

reported as such. A strong water industry input to this report is essential.

The same land-use activities that create diffuse pollution also adversely affect the quantity of water, for example rapid runoff (loss of water) in storm events causing flooding, then drier periods following the rain. The land-use changes often also involve loss of valuable habitats and associated biodiversity; again there is common cause to be made in seeking holistic solutions.

Demonstrating the importance of all impacts, as well as the processes involved and the links between the various issues, is a key step in driving progress to implement best practice mitigation measures across landscapes and catchments. Therefore we intend to establish a task group under the auspices of the Diffuse Pollution Specialist Group, but with members from other Specialist groups to seek resources for a global impacts report and oversee its production. To develop the content of the report, IWA specialist groups will be encouraged to invite *impacts papers* for their forthcoming conferences in 2016-18, including case study reviews either at a catchment, a sector, or a national or regional scale. There are quite some relevant specialist groups, such as Watershed and River Basin Management, Diffuse Pollution, Urban Drainage, Lakes and Reservoirs Management, Sustainability in the Water Sectors, etc. In addition, the Basins of the Future programme will provide inputs and take an active role in the development of the report. If this is of interest to you, please contact Brian D'Arcy as below.

Brian D'Arcy

[brian@enviroexperience.co.uk](mailto:brian@enviroexperience.co.uk)

# A Household Filter in an Iron and Nitrate Rich Aquifer in Sembung Subwatershed, Sleman, DIY, Indonesia

By Visi Asriningtyas\*

\*Environmental Science Graduate of UGM, Indonesia; Certified in CWWT of UNESCO-IHE, The Netherlands; e-mail: [visiasri.va@gmail.com](mailto:visiasri.va@gmail.com) (mostly active); [visiasri@gmail.com](mailto:visiasri@gmail.com) (sometimes dormant); +6281310052395 (LINE)

The water purifying experiment took place in year 2005 to 2006, then continued in year 2013 in one well in Sleman Regency, Sembung Subwatershed, Indonesia. Sleman regency in DIY (*Daerah Istimewa Yogyakarta* or Special District of Yogyakarta), Indonesia is an area which has excess in Iron in the natural groundwater. The area of research lies between 7°37'30" – 7°47'30" S and 110°24'00" – 110°26'30" E. Annual average rainfall during ten years is around 2106 mm to 2526 mm, while the annual average temperature is around 23.34°C to 27.7°C. Groundwater temperature is 26°C at the time of measurement in February 2013. Merapi Aquifer, Special Province of Yogyakarta (DIY), Indonesia, is one of the best source of potable water in DIY. The research of household filtration took place in a dwelling area of Yogyakarta (DIY), Indonesia which has Iron excess in groundwater used for drinking water. Nitrate is also prevalent especially in regions where family husbandries surround the wells. The experiments using charcoal and sand as the main material for removal of Iron and Nitrate in drinking water has been conducted in year 2005 to 2006. There have also been 8 dug wells examined for the water quality, including the Iron and Nitrate contains. PDAM (*Perusahaan Daerah Air Minum* or the Government Regional Drinking



Fig. 1 The Household Filter Device

Water Industry) in Merapi aquifer has also examined the Iron and Manganese contaminant and has analyzed the database together with the Environmental and Sanitation Laboratory, Civil and Environmental Engineering Department, UGM in year 1999 to year 2000. Afterwards, the filter is elaborated for more practical use for drinking water which contains Iron and also Nitrate from wells. The results of the use of these filters are fine, with no more Iron and Nitrate excess. Nitrate contains becomes less than 1 mg/l and total Iron does not exceed 0.3 mg/l. The color of water becomes neutral and odorless, if maintained at least once a month by brushing and washing the charcoal (activated carbon) filter and the

Figure 2. Iron and Nitrate Concentration in Merapi Aquifer, Sembung Subwatershed, DIY Indonesia

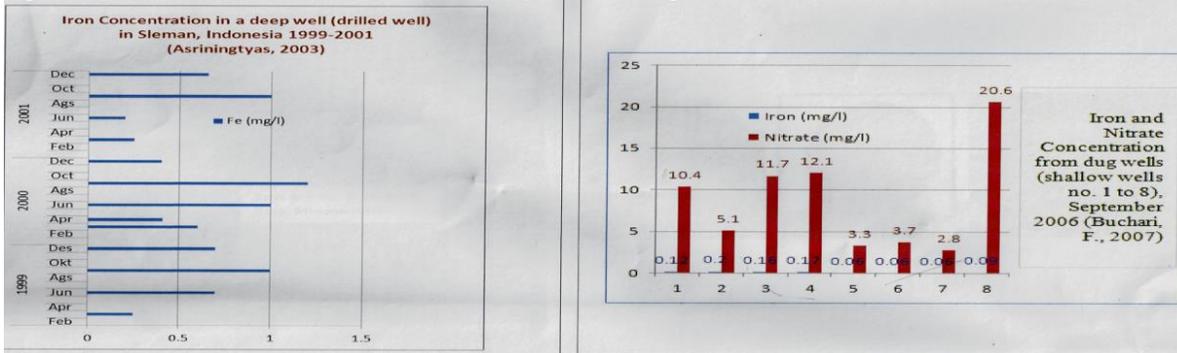
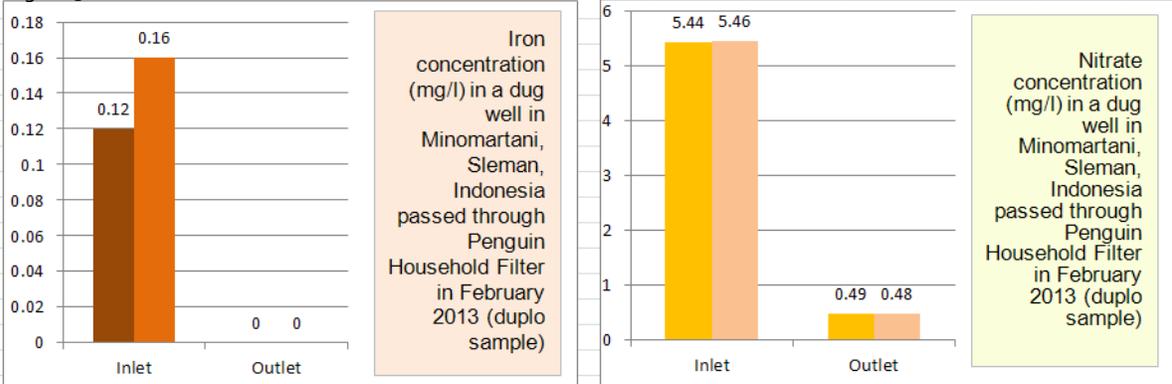


Figure 3. The Household Filter Result



polypropylene or Cartridge Carbon Filter.

In developing country where database are mostly scarce, some estimation can be used in some simulations prior to available more complete database. Better on site observations and external sources such as the climatic parameters and also population data and land use at certain location, both over a certain time frame is needed together with the water quality data (Iron and Nitrate) of the area, to understand better the behavior of Iron and Nitrate reduction, for a safer drinking water. A further added zeolith in the filter has been done since year 2014, and is going to be analyzed within this year. More complete findings of this household research can be found in the 5<sup>th</sup> International SSABC Nagoya 2014 as a Poster Conference Paper.

## News From IWA HQ

### [Early Bird Registration Now Open](#) for the IWA World Water Congress and Exhibition 2016

October 9-14, 2016; Brisbane, Queensland Australia

The IWA World Water Congress & Exhibition is the global event for water professionals. It offers new insights into how pioneering science, technological innovation and leading practices shape the major transformation in water management that is underway. It draws over 5,500 of the top water, environment and related professionals from more than 100 countries from across the water sector, including thought leaders from within and beyond the water sector.

The Congress Programme Committee will be meeting on 14-16 March to agree the advance programme for the week. Authors will be notified of the committee's decisions in the following weeks and **the Advance Programme** will be released in early April. With more than 1400 paper submissions from 70 different countries undergoing peer review and competing for approximately 390 presentation spaces and almost 80 additional workshop proposals to consider – the committee has a tough task ahead.

If you become an IWA member while registering for the Congress you will have a greater discount in delegate registration and when booking exhibition space. Take advantage of the additional benefits of membership including The Source Magazine, exclusive online content and further discounts on IWA publications.

Visit the website for more information: [www.worldwatercongress.org](http://www.worldwatercongress.org)

**IWA Head Office:**  
Alliance House  
12 Caxton Street  
London SW1H 0QS  
UK

Tel: +44 207 654 5500  
Fax: +44 207 654 5555

**IWA Global Operational Office:**  
New Babylon - Den Haag  
Anna van Buerenplein 48, 11th floor  
2595 DA Den Haag  
The Netherlands

General e-mail: [water@IWAhq.org](mailto:water@IWAhq.org)  
Membership e-mail:  
[members@iwahq.org](mailto:members@iwahq.org)  
Web site: <http://www.iwa-network.org/>

Company registered in England No. 3597005  
Registered Charity (England) No. 1076690

## Vienna University of Technology

### Vienna Doctoral Programme on Water Resource Systems

The Centre for Water Resource Systems at the Vienna University of Technology announces competition for the third intake of doctoral candidates for the Doctoral Programme on Water Resource Systems. The programme is anticipated to host a total of 70 doctoral students over a period of 12 years. This is a dedicated programme of the Austrian Science Fund (FWF) that promotes doctoral research and education at the highest standards and provides excellent opportunities for cross-disciplinary research. International networking is facilitated by a mobility programme with a spectrum of attractive international partner institutions and a comprehensive guest scientist programme.

Seven PhD student positions are available in the following research themes related to Water Resource Systems:

- Flood-hydrology
- Aquatic microbiology
- Micro-meteorology
- Socio-hydrology
- Environmental economics
- Environmental engineering
- Soil moisture remote sensing
- Mechanics of structures

Applicants must have a Master's degree (or equivalent), preferably in a subject related to water resource systems. The working language of the programme is English. Students are expected to work across disciplines and in cooperation with others. A capacity and willingness to integrate and collaborate is essential.

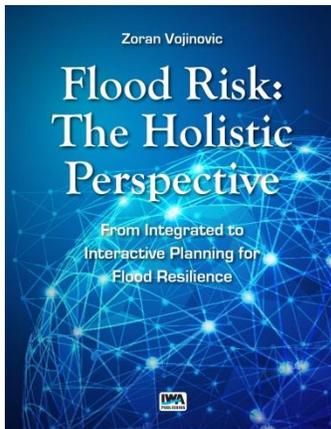
The Programme provides a salary according to the FWF scheme (approx. EUR 20000/year net), together with health and social security benefits. There is also significant allowance for travel and research support. TU Wien is an equal opportunities employer. The preferred starting date is Oct. 1, 2016.

Candidates should send a letter of application, a statement of research interests, a Curriculum Vitae, and copies of education certificates including transcripts of grades as a single .pdf file to: [office@waterresources.at](mailto:office@waterresources.at).

Application deadline is April 30, 2016. Short listed candidates will be invited to a selection seminar. Financial support towards travel expenses is available on request.

## New publications from IWAP

### Flood Risk: The Holistic Perspective



Zoran Vojinovic

ISBN: 9781780405322  
March 2015 • 296 pages • Hardback

IWA Members price: £ 74.00 / US\$ 133.00  
/ € 100.00

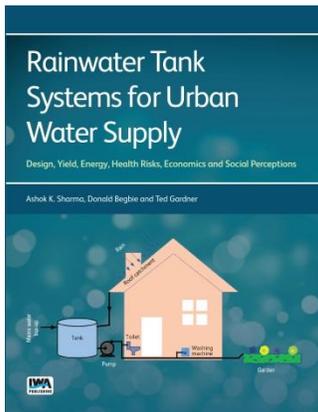
<http://www.iwapublishing.com/books/9781780405322/flood-risk-holistic-perspective>

Over the last seventy years, flooding has increased faster than any other type of disaster. Whilst our technological capabilities for dealing with floods have advanced rapidly and global economic growth has doubled, floods are ever more

disastrous. Have our technological developments advanced independently from social and wider ecological needs? *Flood Risk: The Holistic Perspective* argues that this paradoxical situation results from the narrow and fragmented perception of reality of our academic disciplines and government agencies. It suggests that we must broaden our view and learn how the natural or social phenomena can provoke a response in a social group, which can trigger the technical developments, and so on, in a network of interactions and relationships through coevolving cycles.

### Rainwater Tank Systems for Urban Water Supply

Ashok K. Sharma, Donald Begbie & Ted Gardner



ISBN: 9781780405353  
May 2015 • 372 pages • Paperback

IWA Members price: £ 79.00 / US\$ 142.00 /  
€ 107.00

<http://www.iwapublishing.com/books/9781780405353/rainwater-tank-systems-urban-water-supply>

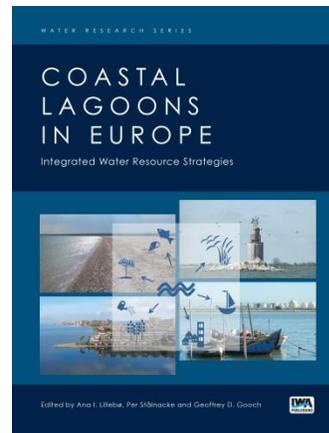
This book provides insights and detailed analysis of design, modelling, implementation, operation, energy usage, economics, management, health risk, social perceptions and implications for water quality/quantity of roof water runoff. It considers expected performance and

potential pitfalls of rainwater tank systems including:

- actual harvested yield and resulting mains water savings,
- optimal sizing for rainwater storages and roof collection systems,
- expected water quality and implications for managing public health risks,
- modelling tools available for decision support,
- operation and management approaches of a decentralised asset at the household scale and community acceptance.

### Coastal Lagoons in Europe: Integrated Water Resource Strategies

Ana I. Lillebø, Per Stalnacke & Geoffrey D. Gooch



ISBN:  
July 2015 • 256 pages • Hardback

IWA Members price: £ 74.00 / US\$  
133.00 / € 100.00

<http://www.iwapublishing.com/books/9781780406282/coastal-lagoons-europe-integrated-water-resource-strategies>

Coastal lagoons are coming under threat, partly due to climate change impacts (sea-level rise and hydro-meteorological extreme events) but also more direct human activities and pressures.

The book addresses these challenges through integrated management strategies. Pan-European management challenges are seen from the perspectives of Policy, Environment and Modelling. Four case study lagoons in different European locations demonstrate practical experiences and results. Possible impacts on drainage basins and lagoons are introduced through integrated scenarios, developed through a multi-science and land-lagoon science perspective combined with interactions and contributions from stakeholders and citizens.

### Mitigating Droughts and Floods in Agriculture: Policy, Lessons and Approaches

#### Organisation for Economic Co-Operation and Development (OECD)

ISBN: 9781780408132  
March 2016 • 74 pages • Paperback

IWA Members price: £ 19.00 / US\$ 34.00 / € 26.00

<http://www.iwapublishing.com/books/9781780408132/mitigating-droughts-and-floods-agriculture-policy-lessons-and-approaches>

Climate change is expected to increase the frequency and magnitude of extreme weather, notably droughts and floods to which the agriculture sector is particularly exposed. While productivity growth and policy development have allowed the sector to better cope with these risks and impacts, there is substantial room to improve policy responses and co-ordinate across policy domains, including water rights and allocation, weather and hydrological information, innovation and education, and insurance and compensation schemes. Drought and flood risks are likely to become major policy concerns, with increasing population raising demand for food, feed, fibre, energy, and water resources, and urbanisation calling for flood protection and mitigation.

## Drying Wells, Rising Stakes: Towards Sustainable Agricultural Groundwater Use

### Organisation for Economic Co-Operation and Development (OECD)

ISBN: 9781780407968

March 2016 • 180 pages • Paperback

IWA Members price: £ 19.00 / US\$ 34.00 / € 26.00

<http://www.iwapublishing.com/books/9781780407968/drying-wells-rising-stakes-%E2%80%93-towards-sustainable-agricultural-groundwater-use>

Groundwater has provided great benefits to agriculture irrigation in semi-arid OECD countries, but its intensive use beyond recharge in certain regions has depleted resources and generated significant negative environmental externalities. The report provides a characterisation of the diversity of groundwater systems, reviews policies in OECD countries, and proposes a package of recommendations to ensure that groundwater can sustain its services to agriculture and contribute to climate change adaptation.

For more information on IWA Publishing products or to buy online visit  
[www.iwapublishing.com](http://www.iwapublishing.com)

Or contact one of IWA Publishing's distributors:

#### UK, Europe and Rest of World:

Turpin Distribution Ltd  
Pegasus Drive  
Stratton Business Park  
Biggleswade  
Bedfordshire  
SG18 8TQ  
United Kingdom

Tel: +44 (0)1767 604800

Fax: +44 (0)1767 601640

E-mail: [iwap@turpin-distribution.com](mailto:iwap@turpin-distribution.com)

#### North America:

BookMasters, Inc.  
P.O. Box 388

Ashland

OH 44805, USA

Tel: +1 800 247-6553 (+1 419 281-1802 from Canada)

Fax: +1 419 281-6883

Email: [order@bookmasters.com](mailto:order@bookmasters.com)

## Philosophy of the IWA WRBM Specialist Group

The goal of the Watershed and River Basin Management (WRBM) Specialist Group is to promote the understanding, utilization, and values of integrated watershed management approaches for the beneficial and sustainable use of rivers and watersheds worldwide. It seeks to achieve this by sharing of expertise and experience among its members and with other interested individuals and organizations, organizing specialist conferences, issuance of newsletters, undertaking of cooperative projects, and engaging in other activities under the auspices of the International Water Association.

Edited by: Chelsea Spier, USA. For questions, comments, or suggestions for the next issue email: [clspier@gmail.com](mailto:clspier@gmail.com)

Or for more information on the Specialist group you can contact: John Riddiford, IWA WRBM Chair at: [riddifordjohn@gmail.com](mailto:riddifordjohn@gmail.com).

