Dear Ladies and Gentlemen, dear MAR family, good morning!

Attached some MAR-related news for 2022 June.

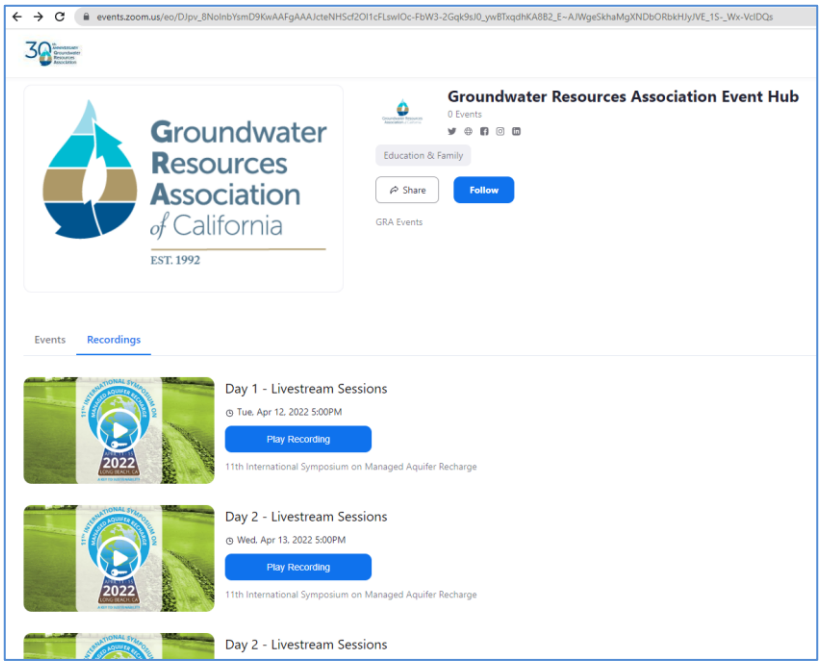
**IAH MAR Commission Newsletter. 2022 June**

**INDEX:**

## 11st International Symposium on Managed Aquifer Recharge, ISMAR 11. ORGANIZERS WILL SEND THE PRESENTATIONS AND ABSTRACTS SHORTLY!

The 11ST International Symposium on Managed Aquifer Recharge (ISMAR 11), entitled: ***"Managed aquifer recharge: A key to sustainability"*** has provided plenty of results that will be shared with the MAR community shortly by means of https://www.ismar11.net, and through the usual IAH-MAR canals.

The videos available from the event, (not all the sessions were recorded) can be accessed at GRAC Website, zoom portal, after login: https://bit.ly/3boabN7




The collection of posters has been gathered in the P-ISMAR 11 publications. We will hopefully dispose of the abstracts and presentations´links for the next newsletter.


The new publication is already accessible on the Internet. Download P-ISMAR 11: https://dinamar.tragsa.es/file.axd?file=/PDFS/P-ISMAR-11.pdf

Once again we are grateful to ISMAR 11 organizers for so outstanding conference.

## NEW MAR PUBLICATIONS

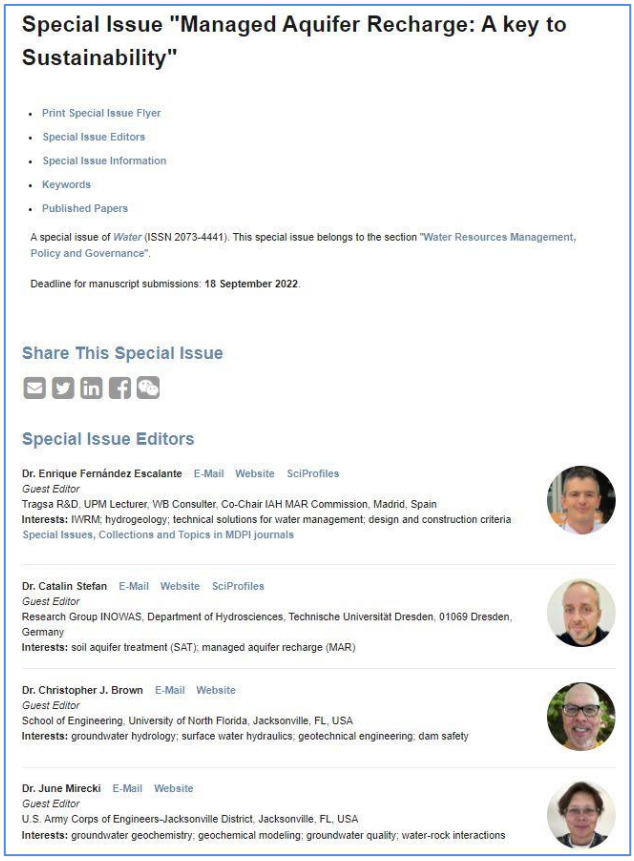
### Managed Aquifer Recharge. A key to sustainability. Journal Water special issue. Call for papers!

Selected papers on MAR, specially presented at ISMAR 11 will be published in a Special Issue of the open-access journal WATER, continuing the tradition from previous symposia, including ISMAR 8 and ISMAR 10.

Submission is open for all ISMAR 11 participants, as well as all members of the international MAR community. **EVERYONE IS INVITED TO SUBMIT!** Please, proceed before Mid-September, preferentially.

The Special Issue “Managed Aquifer Recharge: A key to Sustainability” is already open for contributions. Papers will be available in electronic format and as part of a printed book. For more details, please visit:
https://www.mdpi.com/journal/water/special_issues/Aquifer_Recharge.

Guest editors:
*Enrique Fernandez Escalante (Spain)*
*Catalin Stefan (Germany)*
*Christopher J. Brown (USA)*
*June Mirecki (USA)*



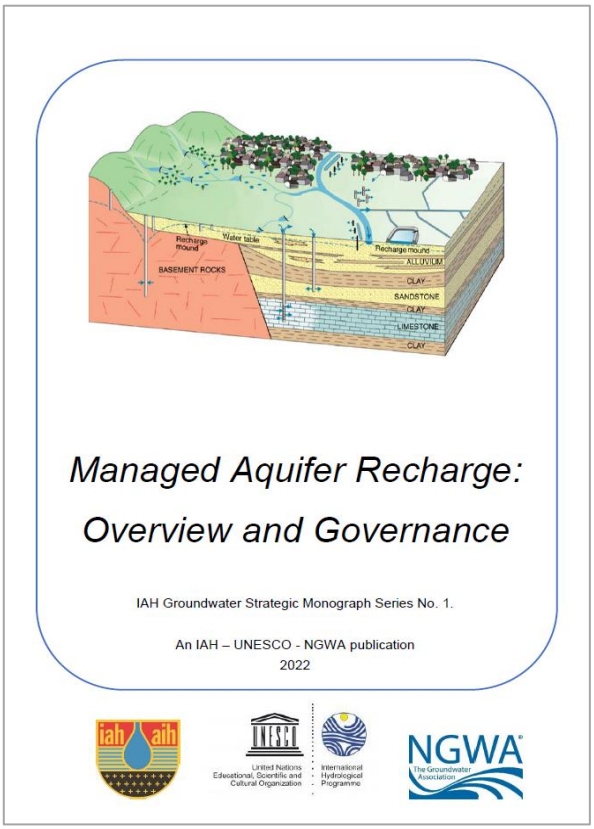

**UPDATED CITESCORE (2021 SCOPUS DATA) OF 4.8.**

## Managed Aquifer Recharge: Overview and Governance

This book was produced as a joint effort of IAH, UNESCO and NGWA with encouragement of the Ground Water Project and published as a Special Publication of IAH in June 2022. Its three sections written by different teams give (1) an overview of purposes… read more: https://recharge.iah.org/

Dillon, P., W. Alley, Y. Zheng, and J. Vanderzalm (editors), in press, Managed Aquifer Recharge: Overview and Governance. The Groundwater Project, Ontario, Canada.

Download from https://bit.ly/3nm4K4i or from the mirror site https://bit.ly/39SkF74




THE GROUNDWATER PROJECT

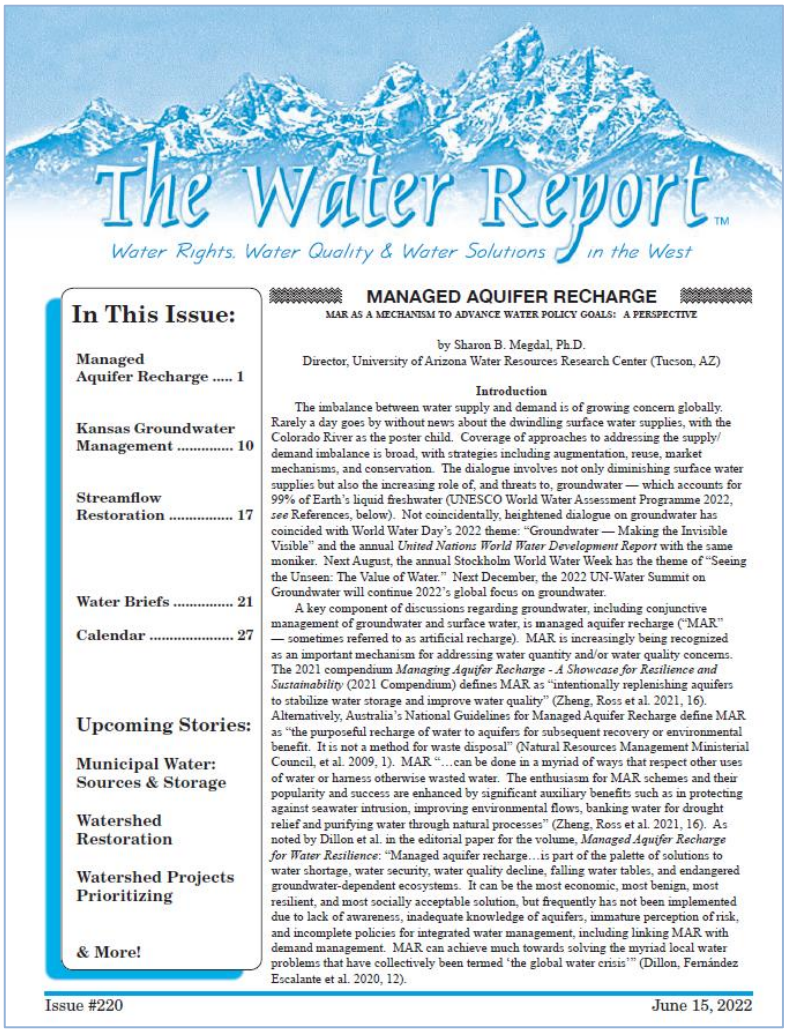
## The water report. Managed Aquifer Recharge (2022 June edition).

We report a MAR contribution of the professor Sharon Megdal in the Water Report. Water rights, Water quality and water solutions in the West.

The imbalance between water supply and demand is of growing concern globally. Rarely a day goes by without news about the dwindling surface water supplies, with

the Colorado River as the poster child. Coverage of approaches to addressing the supply/demand imbalance is broad, with strategies including augmentation, reuse, market mechanisms, and conservation… The document has copyright, but it is available at: https://wrrc.arizona.edu/publications/reports/managed-aquifer-recharge

Contact Sharon for more info, please. Smegdal (a) arizona.edu



The Water Report™

Water Rights, Water Quality & Water Solutions in the West

**In This Issue:**



**Upcoming Stories:**

Municipal Water: Sources & Storage
Watershed Restoration
Watershed Projects Prioritizing
& More!

## MANAGED AQUIFER RECHARGE

### MAR AS A MECHANISM TO ADVANCE WATER POLICY GOALS: A PERSPECTIVE

by Sharon B. Megdal, Ph.D.
Director, University of Arizona Water Resources Research Center (Tucson, AZ)

**Introduction**

The imbalance between water supply and demand is of growing concern globally. Rarely a day goes by without news about the dwindling surface water supplies, with the Colorado River as the poster child. Coverage of approaches to addressing the supply/demand imbalance is broad, with strategies including augmentation, reuse, market mechanisms, and conservation. The dialogue involves not only diminishing surface water supplies but also the increasing role of, and threats to, groundwater — which accounts for 99% of Earth's liquid freshwater (UNESCO World Water Assessment Programme 2022, *see* References, below). Not coincidentally, heightened dialogue on groundwater has coincided with World Water Day's 2022 theme: "Groundwater — Making the Invisible Visible" and the annual *United Nations World Water Development Report* with the same moniker. Next August, the annual Stockholm World Water Week has the theme of "Seeing the Unseen: The Value of Water." Next December, the 2022 UN-Water Summit on Groundwater will continue 2022's global focus on groundwater.

A key component of discussions regarding groundwater, including conjunctive management of groundwater and surface water, is managed aquifer recharge ("MAR" — sometimes referred to as artificial recharge). MAR is increasingly being recognized as an important mechanism for addressing water quantity and/or water quality concerns. The 2021 compendium *Managing Aquifer Recharge - A Showcase for Resilience and Sustainability* (2021 Compendium) defines MAR as "intentionally replenishing aquifers to stabilize water storage and improve water quality" (Zheng, Ross et al. 2021, 16). Alternatively, Australia's National Guidelines for Managed Aquifer Recharge define MAR as "the purposeful recharge of water to aquifers for subsequent recovery or environmental benefit. It is not a method for waste disposal" (Natural Resources Management Ministerial Council, et al. 2009, 1). MAR "…can be done in a myriad of ways that respect other uses of water or harness otherwise wasted water. The enthusiasm for MAR schemes and their popularity and success are enhanced by significant auxiliary benefits such as in protecting against seawater intrusion, improving environmental flows, banking water for drought relief and purifying water through natural processes" (Zheng, Ross et al. 2021, 16). As noted by Dillon et al. in the editorial paper for the volume, *Managed Aquifer Recharge for Water Resilience*: "Managed aquifer recharge…is part of the palette of solutions to water shortage, water security, water quality decline, falling water tables, and endangered groundwater-dependent ecosystems. It can be the most economic, most benign, most resilient, and most socially acceptable solution, but frequently has not been implemented due to lack of awareness, inadequate knowledge of aquifers, immature perception of risk, and incomplete policies for integrated water management, including linking MAR with demand management. MAR can achieve much towards solving the myriad local water problems that have collectively been termed 'the global water crisis'" (Dillon, Fernández Escalante et al. 2020, 12).

Issue #220 June 15, 2022

Thank you Professor Sharon Megdal for reporting.

## MAR-related conferences and seminars

### 49th IAH Congress. Wuhan, China. 2022 September 18th to 23th

The IAH (International Association of Hydrogeologists) Congress bring the hydrogeological community together to share ideas, experiences and latest advancements in this field as well as supporting, training and encouraging early career colleagues.

The Organizing Committee have to determine that the meeting will be held fully online due to the COVID-19 pandemic status worldwide and China's current travel restrictions.


More details on the IAH 2022 website: https://www.iah2022.com/

Session 15: Managed Aquifer Recharge. Please, submit your work. The **deadline of abstract submission is June 30th**, and the deadline of early-bird registration is July 20th.

### 6-Day MAR course organized by UNAM, Mexico City, 2022 June 6th-10th + 17th, has finished successfully

Theoretical and practical training action on applied hydrogeology: Managed aquifer recharge techniques.

Mixed (classroom and virtual), this course has presented the most common technologies to recharge aquifers efficiently and safely, covering from the basic concepts of hydrogeology to practical cases of worldwide recognition.

The course included a workshop on the afternoon of June 6 for the development of the artificial recharge guidelines in Mexico.

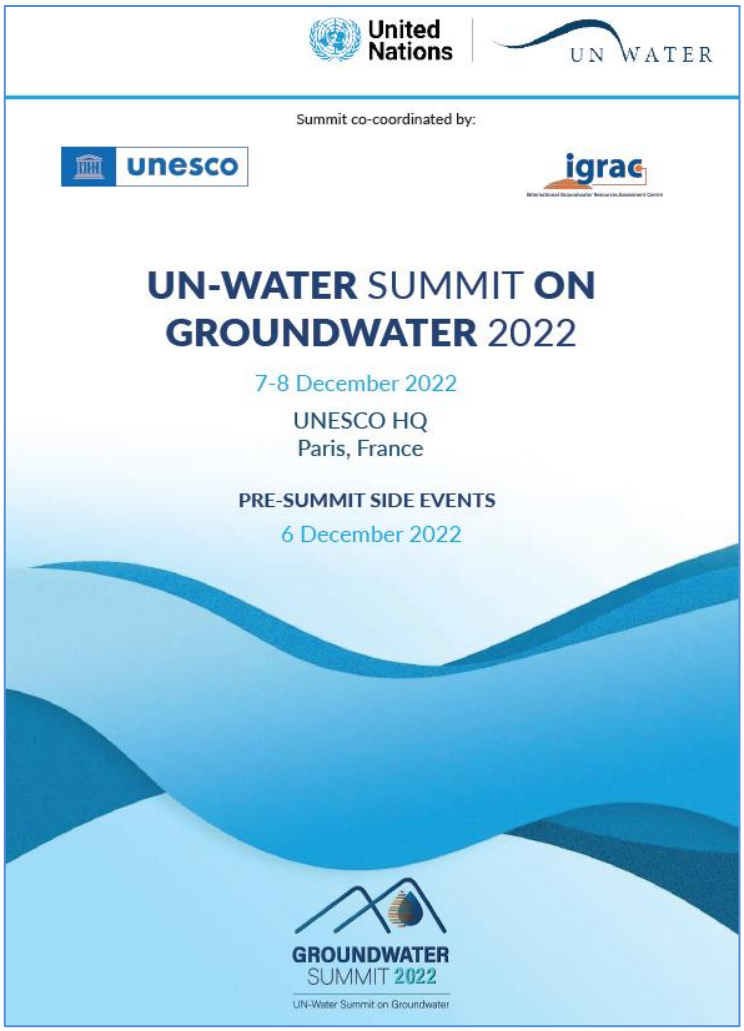
It has also included a technical visit to three MAR projects in Mexico City, including one on water injection, another on artificial wetlands construction and a use-case for monitored land subsidence and automatic replenishment with MAR water, to balance the subsidence impact on a public building.

For more information, please, contact the coordinator: M.I. Adriana Palma Nava, Latin-MAR Community of Practice coordinator, IAH-MAR: APalmaN@iingen.unam.mx

## UN-Water Summit on groundwater. Paris, 7 and 8 December 2022

The UN-Water Summit on Groundwater will be the culminating event of the 2022 campaign "**Groundwater: making the invisible visible**", implemented by the dedicated UN-Water Task Force, co-coordinated by UNESCO and the International Groundwater Resources Assessment Centre (IGRAC), on behalf of UN-Water. The main messages from the Summit will be conveyed to the United Nations 2023 Water Conference.

Flyer and provisional program in their website.




More information: www.groundwater-summit.org and info@groundwater-summit.org

The IAH-MAR Commission has submitted an official request to host a MAR side event: Managing Aquifer Recharge: making the visible, invisible!! The opverall objective(s) of the Side Event is increasing awareness of MAR and its capabilities to face frontally climate change adverse impacts, to provide local solutions to the global water crisis and to become a key for sustainability.

Please, stay tuned to the results (to be informed in the next Newsletter).

## MARSOLut Marie S-Curie project. Malta training workshop 4.

The Managed Aquifer Recharge ITN Project (MARSOLut) has developed its 4th workshop in Malta island during 2022 June 21st to 23rd . The aspects more developed have been MAR Legislative and Regulatory processes (conducted by the IAH-MAR working Group on regulations leader, Manuel Sapiano), water governance and economic aspects

MARSoluT
Managed Aquifer Recharge ITN

**MARSoluT Training Workshop 4, Malta**

**Workshop, 21. - 23. June 2022**

Local organizer: EWA, Malta

Meeting location: GHAJN National Water Conservation Awareness Centre, Triq Ghajn Qajjet, Ir-Rabat, Malta

**AGENDA**

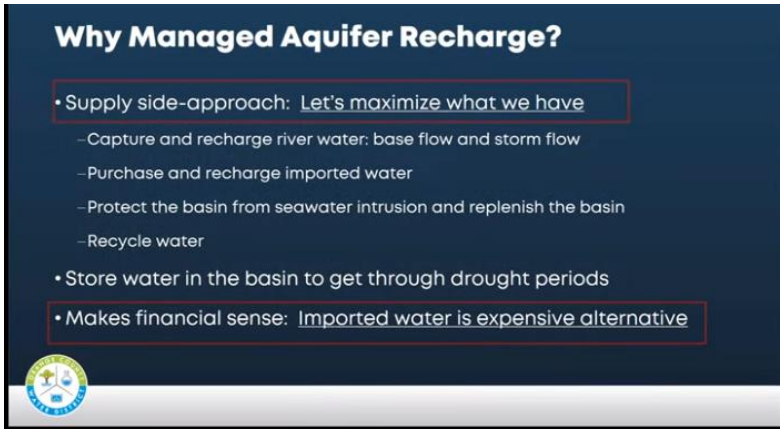
**Tuesday June 21st**

| | |
|---|---|
| 09:00-09:15 | Welcoming words by Prof. Christoph Schüth (TUDa) and Manuel Sapiano (EWA) |
| 09:15-10:00 | Workshop: An Introduction on Water Management in Malta – Manuel Sapiano (EWA) |
| 10:00-10:45 | Workshop: EU Legislative and Regulatory Process – Dr. Ondine Gaerty (University of Malta) |
| 10:45-11:00 | Introduction to GHAJN – the National Water Conservation Awareness Centre – Amanda Zahra (EWA) |
| 11:00-11:30 | Coffee break (and Water Conservation Games at GHAJN) |
| 11:30-12:00 | Short presentation by Francesco Demichele (EWA) on his work – Malta South and Pwales |
| 12:00-14:00 | Lunch break, site visit<br>Underground Spring System |
| 14:00-15:00 | Workshop: Water Governance – Dr. Kevin Gatt (University of Malta) |
| 15:00-16:00 | Workshop: Brief Presentation of Malta's 3rd River Basin Management Plan – Manuel Sapiano (EWA) |

More info: https://www.marsolut-itn.eu/

## Future of Managed Aquifer Recharge in the United States.

This public session took place Tuesday May 10th and Wednesday May 11th from 11:00AM to 2:00PM EDT both days. This joint meeting explored the potential of Managed Aquifer Recharge (MAR) to meet U.S. water needs over the next 30-50 years.



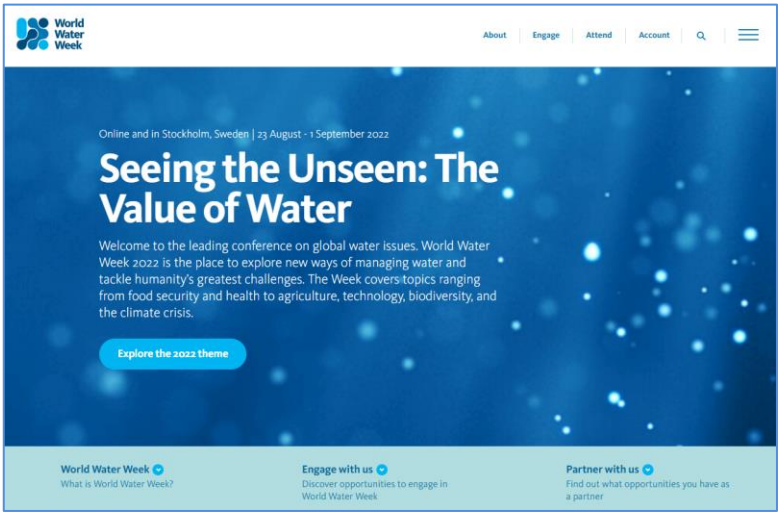

More info and recorded video (2 h 59 min):
https://www.nationalacademies.org/event/05-10-2022/future-of-managed-aquifer-recharge-in-the-us

Thank you Adam Hutchinson and June Mirecki for reporting.

## NEW MAR OR MAR-RELATED ACTIVITIES.

### 2022 World Water Week in Stockholm, Aug 23 - Sept 1

In-Person & Hybrid Session: Valuing Groundwater.
At least, two abstracts on MAR have been accepted.




More info: https://www.worldwaterweek.org/

### Webinar about drilling and constructive differences between water supply and MAR wells (in Spanish)

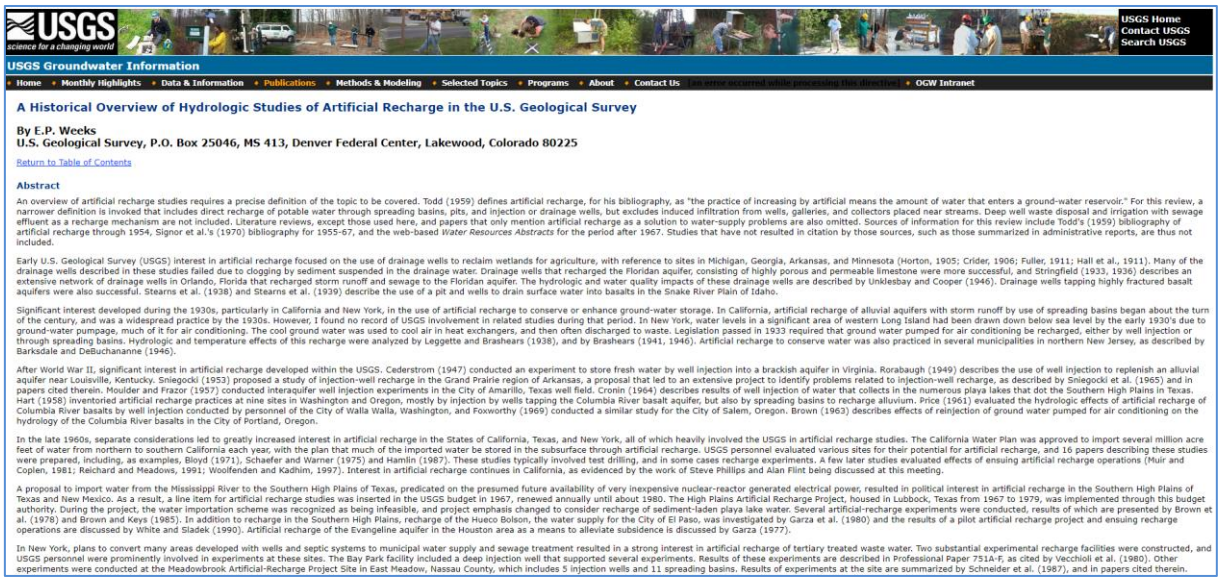
Organized by Hidro-Drilling Chile, the webinar has been imparted by drilling experts and former university lecturers, with the title: *"drilling wells for catchment versus drilling wells for artificial recharge of aquifers. Differences and similarities in procedures and design".*


Due to a human error, the video of the webinar was not saved.

## Another drop of nostalgia

The selected publication for this newsletter has been:

A Historical Overview of Hydrologic Studies of Artificial Recharge in the U.S. Geological Survey. By E.P. Weeks. U.S. Geological Survey, P.O. Box 25046, MS 413, Denver Federal Center, Lakewood, Colorado 80225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**A Historical Overview of Hydrologic Studies of Artificial Recharge in the U.S. Geological Survey**

By E.P. Weeks
U.S. Geological Survey, P.O. Box 25046, MS 413, Denver Federal Center, Lakewood, Colorado 80225

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**Abstract**

An overview of artificial recharge studies requires a precise definition of the topic to be covered. Todd (1959) defines artificial recharge, for his bibliography, as "the practice of increasing by artificial means the amount of water that enters a ground-water reservoir." For this review, a narrower definition is invoked that includes direct recharge of potable water through spreading basins, pits, and injection or drainage wells, but excludes induced infiltration from wells, galleries, and collectors placed near streams. Deep well waste disposal and irrigation with sewage effluent as a recharge mechanism are not included. Literature reviews, except those used here, and papers that only mention artificial recharge as a solution to water-supply problems are also omitted. Sources of information for this review include Todd's (1959) bibliography of artificial recharge through 1954, Signor et al.'s (1970) bibliography for 1955-67, and the web-based *Water Resources Abstracts* for the period after 1967. Studies that have not resulted in citation by those sources, such as those summarized in administrative reports, are thus not included.

Early U.S. Geological Survey (USGS) interest in artificial recharge focused on the use of drainage wells to reclaim wetlands for agriculture, with reference to sites in Michigan, Georgia, Arkansas, and Minnesota (Horton, 1905; Crider, 1906; Fuller, 1911; Hall et al., 1911). Many of the drainage wells described in these studies failed due to clogging by sediment suspended in the drainage water. Drainage wells that recharged the Floridan aquifer, consisting of highly porous and permeable limestone were more successful, and Stringfield (1933, 1936) describes an extensive network of drainage wells in Orlando, Florida that recharged storm runoff and sewage to the Floridan aquifer. The hydrologic and water quality impacts of these drainage wells are described by Unklesbay and Cooper (1946). Drainage wells tapping highly fractured basalt aquifers were also successful. Stearns et al. (1938) and Stearns et al. (1939) describe the use of a pit and wells to drain surface water into basalts in the Snake River Plain of Idaho.

Significant interest developed during the 1930s, particularly in California and New York, in the use of artificial recharge to conserve or enhance ground-water storage. In California, artificial recharge of alluvial aquifers with storm runoff by use of spreading basins began about the turn of the century, and was a widespread practice by the 1930s. However, I found no record of USGS involvement in related studies during that period. In New York, water levels in a significant area of western Long Island had been drawn down below sea level by the early 1930's due to ground-water pumpage, much of it for air conditioning. The cool ground water was used to cool air in heat exchangers, and then often discharged to waste. Legislation passed in 1933 required that ground water pumped for air conditioning be recharged, either by well injection or through spreading basins. Hydrologic and temperature effects of this recharge were analyzed by Leggette and Brashears (1938), and by Brashears (1941, 1946). Artificial recharge to conserve water was also practiced in several municipalities in northern New Jersey, as described by Barksdale and DeBuchananne (1946).

After World War II, significant interest in artificial recharge developed within the USGS. Cederstrom (1947) conducted an experiment to store fresh water by well injection into a brackish aquifer in Virginia. Rorabaugh (1949) describes the use of well injection to replenish an alluvial aquifer near Louisville, Kentucky. Sniegocki (1953) proposed a study of injection-well recharge in the Grand Prairie region of Arkansas, a proposal that led to an extensive project to identify problems related to injection-well recharge, as described by Sniegocki et al. (1965) and in papers cited therein. Moulder and Frazor (1957) conducted interaquifer well injection experiments in the City of Amarillo, Texas well field. Cronin (1964) describes results of well injection of water that collects in the numerous playa lakes that dot the Southern High Plains in Texas. Hart (1958) inventoried artificial recharge practices at nine sites in Washington and Oregon, mostly by injection by wells tapping the Columbia River basalt aquifer, but also by spreading basins to recharge alluvium. Price (1961) evaluated the hydrologic effects of artificial recharge of Columbia River basalts by well injection conducted by personnel of the City of Walla Walla, Washington, and Foxworthy (1969) conducted a similar study for the City of Salem, Oregon. Brown (1963) describes effects of reinjection of ground water pumped for air conditioning on the hydrology of the Columbia River basalts in the City of Portland, Oregon.

In the late 1960s, separate considerations led to greatly increased interest in artificial recharge in the States of California, Texas, and New York, all of which heavily involved the USGS in artificial recharge studies. The California Water Plan was approved to import several million acre feet of water from northern to southern California each year, with the plan that much of the imported water be stored in the subsurface through artificial recharge. USGS personnel evaluated various sites for their potential for artificial recharge, and 16 papers describing these studies were prepared, including, as examples, Bloyd (1971), Schaefer and Warner (1975) and Hamlin (1987). These studies typically involved test drilling, and in some cases recharge experiments. A few later studies evaluated effects of ensuing artificial recharge operations (Muir and Coplen, 1981; Reichard and Meadows, 1991; Woolfenden and Kadhim, 1997). Interest in artificial recharge continues in California, as evidenced by the work of Steve Phillips and Alan Flint being discussed at this meeting.

A proposal to import water from the Mississippi River to the Southern High Plains of Texas, predicated on the presumed future availability of very inexpensive nuclear-reactor generated electrical power, resulted in political interest in artificial recharge in the Southern High Plains of Texas and New Mexico. As a result, a line item for artificial recharge studies was inserted in the USGS budget in 1967, renewed annually until about 1980. The High Plains Artificial Recharge Project, housed in Lubbock, Texas from 1967 to 1979, was implemented through this budget authority. During the project, the water importation scheme was recognized as being infeasible, and project emphasis changed to consider recharge of sediment-laden playa lake water. Several artificial-recharge experiments were conducted, results of which are presented by Brown et al. (1978) and Brown and Keys (1985). In addition to recharge in the Southern High Plains, recharge of the Hueco Bolson, the water supply for the City of El Paso, was investigated by Garza et al. (1980) and the results of a pilot artificial recharge project and ensuing recharge operations are discussed by White and Sladek (1990). Artificial recharge of the Evangeline aquifer in the Houston area as a means to alleviate subsidence is discussed by Garza (1977).

In New York, plans to convert many areas developed with wells and septic systems to municipal water supply and sewage treatment resulted in a strong interest in artificial recharge of tertiary treated waste water. Two substantial experimental recharge facilities were constructed, and USGS personnel were prominently involved in experiments at these sites. The Bay Park facility included a deep injection well that supported several experiments. Results of these experiments are described in Professional Paper 751A-F, as cited by Vecchioli et al. (1980). Other experiments were conducted at the Meadowbrook Artificial-Recharge Project Site in East Meadow, Nassau County, which includes 5 injection wells and 11 spreading basins. Results of experiments at the site are summarized by Schneider et al. (1987), and in papers cited therein.

Download: https://water.usgs.gov/ogw/pubs/ofr0289/epw_historical.html

## More actions

### Whatsapp group on Aquifer Recharge Management

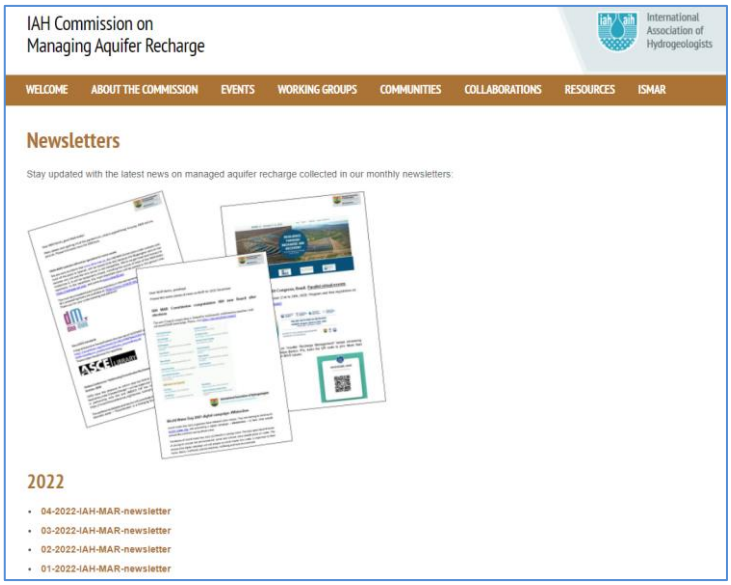
This is the new link to join the group:

https://chat.whatsapp.com/BxYZq7wERpc7nDeTRlYN63

### Previous IAH-MAR Newsletters

Please, remember that you can access the previous newsletters in our website:

https://recharge.iah.org/newsletters




That´s all by now… please, keep reporting (dinamar@tragsa.es).

Thank you very much for your kind attention
All the best…

Dr. Enrique Fernández Escalante of behalf of the IAH MAR Commission co-chairs, Catalin Stefan and Yan Zheng.

2022 June 27th

**Please, remember you can book freely in the IAH MAR Commission Forum: https://lists.flinders.edu.au/mailman/listinfo/iah-mar.listcgs**
to stay informed on MAR issues and to share your info.

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