

A satellite photograph of the Mississippi River delta region. The river is a prominent dark blue-green line winding through a vast, arid, tan-colored landscape. The river's path is highly irregular and meandering, especially in the lower half of the image. The top of the image shows the river's mouth where it meets the Gulf of Mexico, with a large, green, vegetated area. The overall scene is a stark contrast between the water and the dry land.

ISSUE ELEVEN : SUMMER 2018
OPEN RIVERS :
RETHINKING WATER, PLACE & COMMUNITY

PARADOXES OF WATER

<http://openrivers.umn.edu>

An interdisciplinary online journal rethinking the Mississippi
from multiple perspectives within and beyond the academy.

ISSN 2471-190X

The cover image is of The Nile River, July 19 2004. To the right of the Nile is the Red Sea, with the finger of the Gulf of Suez on the left, and the Gulf of Aqaba on the right. In the upper right corner of the image are Israel and Palestine, left, and Jordan, right. Below Jordan is the northwestern corner of Saudi Arabia. Jacques Descloitres, MODIS Rapid Response Team, NASA/GSFC.

Except where otherwise noted, this work is licensed under a [Creative Commons Attribution-NonCommercial 4.0 International License](https://creativecommons.org/licenses/by-nc/4.0/). This means each author holds the copyright to her or his work, and grants all users the rights to: share (copy and/or redistribute the material in any medium or format) or adapt (remix, transform, and/or build upon the material) the article, as long as the original author and source is cited, and the use is for noncommercial purposes.

Open Rivers: Rethinking Water, Place & Community is produced by the [University of Minnesota Libraries Publishing](https://www.libraries.umn.edu/) and the [University of Minnesota Institute for Advanced Study](https://www.umn.edu/institute-for-advanced-study/).

Editors

Editor:
Patrick Nunnally, Institute for Advanced Study,
University of Minnesota

Administrative Editor:
Phyllis Mauch Messenger, Institute for Advanced
Study, University of Minnesota

Assistant Editor:
Laurie Moberg, Doctoral Candidate,
Anthropology, University of Minnesota

Media and Production Manager:
Joanne Richardson, Institute for Advanced Study,
University of Minnesota

Contact Us

Open Rivers
Institute for Advanced Study
University of Minnesota
Northrop
84 Church Street SE
Minneapolis, MN 55455

Telephone: (612) 626-5054
Fax: (612) 625-8583
E-mail: openrvrs@umn.edu
Web Site: <http://openrivers.umn.edu>

ISSN 2471-190X

Editorial Board

Jay Bell, Soil, Water, and Climate, University of
Minnesota

Tom Fisher, Metropolitan Design Center,
University of Minnesota

Lewis E. Gilbert, Institute on the Environment,
University of Minnesota

Mark Gorman, Policy Analyst, Washington, D.C.

Jennifer Gunn, History of Medicine, University of
Minnesota

Katherine Hayes, Anthropology, University of
Minnesota

Nenette Luarca-Shoaf, Art Institute of Chicago

Charlotte Melin, German, Scandinavian, and
Dutch, University of Minnesota

David Pellow, Environmental Studies, University
of California, Santa Barbara

Laura Salvesson, Mill City Museum, Minnesota
Historical Society

Mona Smith, Dakota transmedia artist; Allies:
media/art, Healing Place Collaborative

CONTENTS

Introductions

Introduction to Issue Eleven By Patrick Nunnally, Editor	5
Guest Editor's Introduction to Issue Eleven: The Paradoxes of Peace and Water By Joseph B. Underhill	7

Feature

Learning from the Dakota: Water and Place By Mona Smith	14
--	----

Forum

New Orleans Was Once Above Sea Level By Richard Campanella	19
Water as a Source of Regional Cooperation in the Middle East: The Work of EcoPeace Middle East in Jordan, Israel, and Palestine By Giulia Giordano	24
Water, Conflict, and Peace By Peter Gleick	33
Meandering and Riversphere: The Potential of Paradox By Irene J. Klaver	45
The Sources of the Nile and Paradoxes of Religious Waters By Terje Oestigaard	66

Feature

Writing the River By Leslie Thomas	86
---	----

Primary Sources

Paradoxes of Water: A Reading List By The Editors of <i>Open Rivers</i>	110
--	-----

Perspectives

An Endangered River: The Mississippi River Gorge By Olivia Dorothy	119
---	-----

Teaching and Practice

Paradise Lost: The Struggle to Preserve the Pongola River and its Inhabitants
By Shira Lanyi 126

Geographies

Water Unifies Us All
By Kristi Achor Pursell 142

In Review

A Tour of the Mississippi River Visitor Center
By Joanne Richardson 149

FORUM

WATER, CONFLICT, AND PEACE

By Peter Gleick

We live on a water planet. As the writer Arthur C. Clark noted, if we didn't happen to be land-dwelling creatures, we would call our planet Ocean, rather than Earth. And for humans, fresh water is critical for life, health, our economies, and vibrant ecosystems. The vast majority of water on the planet—more than 97 percent—is salt water, in our oceans. Most of the small fraction that is freshwater is locked away in ice caps, glaciers, and deep groundwater. Yet the little bit of water left over in the form of rain, flowing rivers, lakes, and accessible soil moisture is what grows our food; powers spinning turbines; feeds our industries, businesses, and homes; and provides for recreational, artistic, and spiritual support.

Every child learns about the hydrologic cycle in school, and every day we see evidence of it in clouds, falling rain and snow, and running streams and rivers. Yet we also know that fresh water is unevenly distributed around the world with dry, arid deserts in some regions, rainforests and monsoon climates in others, with wet and dry seasons, and with extremes of weather in the form of both droughts and floods.

It is this uneven distribution of water, and the uneven distribution of money, technology, and institutions to manage our water, that contributes to some of the global challenges we face. There is no lack of water crises: toxic water contamination, water-related diseases, inadequate access to



A landscape of water in Kyrgyzstan. Photographer Frantisek Duris.

safe and affordable drinking water and sanitation for billions of people, death and destruction from extreme hydrological events, collapsing fisheries and disappearing wetland ecosystems, and now human-caused climate change. These crises cause widespread human suffering. The United Nations estimates that more than a million people die every year from preventable water-related diseases. Floods and droughts kill thousands of people at a time and cause billions of dollars of damage. Bird and fish populations are plummeting as critical wetland habitat and rivers are drained, dammed, and polluted. These challenges are well understood, and for decades scientists, policy makers, activists, academics, and concerned citizens have worked to solve water problems. Great progress is being made, but much remains to be done, requiring new technology, better information and data, advances in science, smarter management

and water institutions, and innovative economic approaches.

But one major water challenge remains under-appreciated and under-addressed: the growing threat of violence and conflicts over water resources. Water can be a source of both cooperation and conflict: history is replete with examples of both. But violence over water appears to be waxing, not waning, as pressures over limited water grow, as populations and economies expand, and as war and violence spill over into the civilian sector.

The issue is not “water wars,” despite the euphonious and alliterative nature of the term and the attractiveness to headline writers. Wars are big, brutal, miserable things, and they start for complex economic, political, ideological, religious,



Water pollution on the Latvian coast.

ISSUE ELEVEN : SUMMER 2018

and historical reasons. Rarely is any “war” (and there are no single accepted definitions of what conflicts rise to the level of “war”) attributable to a single cause. Yet it is indisputable that fresh water is—and has been for millennia—a trigger, weapon, and casualty of conflict, violence, and war. A project of the Pacific Institute for nearly three decades has tracked the history of water-related violence in its open-source database: The Water Conflict Chronology.^[1] Currently with over 500 entries, going back nearly 5,000 years, the database includes examples from every region of the world except Antarctica.

Disturbingly, reports of water-related violence are on the rise, with a serious spike in the past

decade. And the vast majority of entries involve non-state actors: individuals, non-governmental militias, and civil conflicts, rather than nation-to-nation disputes. This increase may in part reflect better reporting, but it is also well correlated with water-scarce regions of the world where rising populations and growing economies must compete for fixed and often seriously limited amounts of water. In addition, while many shared international rivers do not have formal treaty agreements among the nations sharing those rivers, nation-to-nation violence is more likely to be constrained by international political and diplomatic tools and norms. The same cannot be said for sub-national violence.



Piazza di Spagna and Fontana della Barcaccia in Rome. The fountains in Rome are not only artwork, but were also built as critical urban infrastructure in response to economic and population pressures of their time.

ISSUE ELEVEN : SUMMER 2018

Violence over water through history takes three forms: water as a trigger of violence, water resources and water systems as weapons of conflict, and water infrastructure as targets or casualties of conflicts. Each of these is described below, but note that some historical accounts of violence associated with water can be associated with more than one form. The Hwacheon Dam in Korea, completed in 1944, was both a target and a tool of opposing forces during the Korean War.

In 1951, North Korea opened the dam to flood downstream areas and slow advancing UN forces. In response, the U.S. Navy sent aircraft to bomb the dam. In the 1990s Saddam Hussein reportedly poisoned and drained the water supplies of southern Shiite Muslims, the Marsh Arabs (or Ma'dān). These are examples of water resources being both a weapon of conflict and a target or casualty, as well.



Marsh Arabs poling a traditional mashoof in the marshes of southern Iraq. Photographer Hassan Janali, U.S. Army Corps of Engineers.

Water as a Trigger

The first category is the most clearly related to water scarcity and competition for resources. When water is scarce, or access to water is constrained for political or ideological reasons, conflict can result. In AD 90 Josephus wrote about the diversion of a stream to Jerusalem by the Roman Procurator Pontius Pilate in AD 30 and a deadly attack by Roman soldiers on the crowds that gathered to protest. Disputes over access to water and water rights in the western United States in the 1800s led to violence between farmers and rangers. Between 1907 and 1913, the Los Angeles Valley aqueduct/

pipeline was repeatedly bombed in an effort to prevent diversions of water from the Owens Valley to Los Angeles. Most recently, in places as diverse as India, Sudan, the western United States, and southern Africa, violence triggered by disputes over access to fresh water has killed and injured many people. And because populations worldwide are growing and total available water is fixed, water scarcity is rising. Complicating these factors is the reality that human-caused climate change is already observed to be affecting the hydrologic cycle, water scarcity, and extreme hydrologic events.



Whitsett Pumping Plant on Lake Havasu lifts the water 291 feet (89 m) for the Colorado River Aqueduct, bring water to Los Angeles. Photographer Charles O'Rear, 1972.

Water as a Weapon

The earliest entries in the Chronology are examples of the use of water as a weapon, including both historically documented cases as well as classic myths and legends. The biblical story of Noah and the flood, which has roots in the ancient Sumerian legend of the deeds of the deity Ea, relates the use of water as a weapon to punish humanity for its sins. Around 2450 BC, in “Gu’edena” (edge of paradise) region between the Tigris and Euphrates Rivers in

ancient Mesopotamia, the king of Lagash diverted water from irrigation canals as a weapon in a dispute with the neighboring city-state of Umma. Between 700 and 400 BC there are numerous accounts from Egypt, Persia, Babylon, and Assyria of the diversion of rivers and the poisoning of wells as weapons of war. In 1642 toward the end of the Ming dynasty in China, dikes restraining the Huang He River were intentionally breached for military purposes, killing thousands. And in



*The Deluge engraving by William Miller after John Martin which takes inspiration from the story of the flood in the first book of the Bible, in which God punished man’s wickedness by destroying nearly every living thing on earth. Published in *The Imperial Family Bible According to the Authorized Version* (John Martin Illustrator) Glasgow, Edinburgh, and London: Blackie & Son. 1844.*

the recent violence in Iraq and Syria, dams along the Euphrates and Tigris Rivers have been a locus of conflict, with water being repeatedly and intentionally held back or released in the form of floods for military purposes.

See the *Memorial Cone of Mesilim*, in the Louvre Museum, which depicts the earliest recorded conflict over water in BC 2450 between the city-states of Umma and Lagash in ancient Mesopotamia, described above.

Water as a Casualty of Conflict

The third category of water-related violence is the targeting of water resources and water systems during wars and conflicts, regardless of the root cause. International humanitarian laws, or “the laws of war” such as the 1949 Geneva Convention and the 1977 Additional Protocols to the Geneva Convention, provide explicit protections to civilians and critical infrastructure that supports civilian populations, including explicitly water

systems. Despite these protections, water sources, pipelines, treatment plants, dams, and irrigation systems are regularly damaged and destroyed either intentionally or as collateral damage, leaving large populations without access to safe water and sanitation and contributing to the forced migration of refugees. As with the other categories, there is a long history of such cases. Even the *Old Testament* Book of Chronicles relates



Dragan Dam in Romania. Photographer Colin Woodcock.

ISSUE ELEVEN : SUMMER 2018

the story of how King Hezekiah of Judah had springs and a brook outside Jerusalem stopped to keep water from the Assyrians coming to war (“So there was gathered much people together, who stopped all the fountains, and the brook that ran through the midst of the land, saying, Why should the kings of Assyria come, and find much water?” 2 Chronicles 32:1–4). Wells have been poisoned throughout history as a casualty of war

(note that the offensive use of this tactic falls under water as a “weapon”), including in the early 1900s in German Southwest Africa, 1999 Kosovo, Angola, and East Timor, and the civil war in the Sudan between 2003 and 2007. More recently, civilian water supply systems have been regularly attacked during the Syrian and Yemeni civil wars, contributing to a massive outbreak of cholera in Yemen.



Hanging wet clothes to dry in Pushkar, India. In 2010, the United Nations formally declared a human right to water and sanitation for basic needs.

Reducing the Risks of Water-related Conflicts

Reducing the risks of violence over fresh water requires that we first understand the root causes, and second, work to reduce the factors that contribute to water and conflict. Where water is a “trigger” of conflict, the principal factors include water scarcity and disputes over access to water sources. When populations are deprived of water, or lack control over local resources, tensions arise. Absolute scarcity of water is typically not the problem; instead, it is the maldistribution of water or of water infrastructure, combined with uncertain or conflicting legal rights to water that most contribute to tensions arising over access to fresh water.

When such tensions are exacerbated by the lack of effective institutions or governance mechanisms to manage and allocate water, violence is more likely to ensue., and the UN Sustainable Development Goals include the target of providing 100 percent of the world’s population with safe and affordable water and sanitation by 2030. Achieving this target will be extraordinarily difficult, given the current scope of the challenge, but doing so would help to reduce tensions over access to water.

Where water is a weapon of war or a target and casualty of war, international norms of behavior are vitally important—hence the creation over the history of civilization of guidelines, standards, and laws setting limits to protect civilian populations and the natural environment. Such codes of behavior extend back thousands of years in texts from early Sanskrit, Jewish, Christian, Islamic, and other cultures that offer guidelines for the conduct of war and the treatment of non-combatants. In 1439, Charles VII of Orleans ruled that officers would be held responsible for

‘the abuses, ills and offences’ committed by the men they commanded. The Lieber Code of 1863, promulgated by President Lincoln during the U.S. Civil War, provided guidance for Union armies in the field and stated

“Military necessity...does not admit of the use of poison in any way, nor of the wanton devastation of a district. It admits of deception, but disclaims acts of perfidy; and, in general, military necessity does not include any act of hostility which makes the return to peace unnecessarily difficult.” (Section 16)

And

“The use of poison in any manner, be it to *poison wells*, or food, or arms, is wholly excluded from modern warfare. He that uses it puts himself out of the pale of the law and usages of war.” (Section 70, emphasis added)

The early declarations informed more comprehensive international law that began to take shape with the 1899 and 1907 Hague Conventions and Declarations. The purpose of the 1907 Hague Convention was laid out in the preamble: “to diminish the evils of war, as far as military requirements permit.” It included the famous Martens Clause:

Until a more complete code of the laws of war has been issued, the High Contracting Parties deem it expedient to declare that, in cases not included in the Regulations adopted by them, the inhabitants and the belligerents remain under the protection and the rule of the principles of the law of nations, as they result from the usages established among civilized

peoples, from the laws of humanity, and the dictates of the public conscience.

The Hague declarations include articles protecting basic infrastructure such as water systems, undefended towns, villages, dwellings, or buildings (Article 25), and call for sparing “as far as possible, buildings dedicated to religion, art, science, or charitable purposes, historical monuments” and medical facilities “not being used at the time for military purposes” (Article 27).

Following World War II, new efforts were made to develop legal protections for civilians and infrastructure. The 1949 Fourth Geneva Convention prohibits deliberate or indiscriminate destruction of property belonging to individuals or “the

State, or to other public authorities” (Article 53) and “extensive destruction and appropriation of property, not justified by military necessity and carried out unlawfully and wantonly” (Article 147). The most explicit protections for water-related infrastructure, however, were not put in place until the addition of the 1977 Protocols to the Geneva Convention, designed to protect victims of international and non-international armed conflict. These agreements limit the means and methods of warfare that cause “superfluous injury or unnecessary suffering” or “widespread, long-term and severe damage to the natural environment, prohibit indiscriminate attacks on civilians and civilian infrastructure, and protect civilian infrastructure critical to the survival of civilian populations including explicitly “*drinking*



Qadisiyah Reservoir on the Euphrates River, Iraq. This image, taken in 2009, shows the reservoir at less than half its size in 2003 due to human consumption of water for drinking and agriculture. Image via NASA.

water installations and supplies and irrigation works.” Militaries are to avoid attacking such installations so as not “*to leave the civilian population with such inadequate food or water as to cause starvation or force its movement.*”

Given the large and growing number of examples of attacks on water systems and the serious adverse consequences for civilian populations, existing humanitarian laws of war as currently framed, interpreted, or applied are inadequate: They have failed to prevent attacks on civilian water systems and to impose sufficient liability

on governments in a way that offers effective constraints on military operations against such infrastructure. Part of the problem is that international laws are mostly focused on limiting intentional attacks on civilians and the use of specific instruments of war, like chemical and biological weapons. Less attention has been paid to the secondary or indirect health consequences of the destruction of civilian infrastructure, raising the question of how to push legal reforms to more explicitly protect critical civilian water systems and infrastructure and improve enforcement mechanisms of existing laws.

Conclusion

Water is a critical resource for the production of food, goods, and services, the health of humans and natural ecosystems, and the successful functioning of modern society. Violence and conflict related to water resources are worsening for many reasons, including growing populations and water demand, expanding economies, widespread water contamination, worsening human-caused climate change, and weak water management and

governance. Strategies for reducing water-related conflicts exist, including improvements in technology, more sustainable water supply and demand options, and a wide range of legal, political, and institutional tools. But unless these are more quickly and widely deployed, the risks of conflicts over water seems likely to continue to worsen.

Footnotes

[1] www.worldwater.org

Resources and Additional Reading

Gleick, Peter. 2017. *Water and U.S. National Security*. The WarRoom, United States Army War College, Carlisle, PA. At <https://warroom.armywarcollege.edu/articles/water-u-s-national-security/> (June 15, 2017).

Reed, David, ed. 2017. *Water, Security and U.S. Foreign Policy*. New York: Routledge Press.

The World's Water: The Report on Freshwater Resources (Volumes 1-9). Washington, D.C.: Island Press and the Pacific Institute, Oakland, California. P.H. Gleick (editor). www.worldwater.org.

The Water Conflict Chronology. *The World's Water*. Pacific Institute. At <http://www.worldwater.org/water-conflict/> (updated May 2017).

Recommended Citation

Gleick, Peter. 2018. "Water, Conflict, and Peace." *Open Rivers: Rethinking Water, Place & Community*, no. 11. <http://editions.lib.umn.edu/openrivers/article/water-conflict-and-peace/>.

About the Author

Dr. Peter Gleick is a hydroclimatologist, a member of the U.S. National Academy of Sciences, a MacArthur Fellow, and co-founder of the Pacific Institute in Oakland, California. For over thirty years, he has studied global water and climate challenges and has worked to develop effective solutions with a focus on climate change, the human right to water, and water and conflict. He is the editor and co-author of the regular book series, *The World's Water: The Report on Freshwater Resources*.