

**The Water Problem**  
**Climate Change and Water Policy in the United States**

Pat Mulroy, Editor

**Book Report By:** Ryan Schaefer  
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**Important Note:** *Completed approximately 75% of the book and all cases west of the Mississippi.*

**Author (Editor):** Pat Mulroy is the former General Manager of the Southern Nevada Water Authority. During this time, she served as Nevada’s lead negotiator on the Colorado River for 25 years. Other noteworthy experience:

- Senior Fellow at the Williams S. Boyd School of Law, University of Nevada-Las Vegas.
- Nonresident Senior Fellow for Climate Adaptation and Environmental Policy with the Metropolitan Policy Program at Brookings.
- Distinguished Faculty Adviser for Water Resources and Technology at Nevada’s Desert Research Institute.

**Executive Summary:** The Water Problem is a collection of geographically specific case studies from across the US that consider the impacts of climate change on water supplies, utilities, and the water management policies behind them. Most of these cases explore the way utility and resource planning are changing as each region struggles to adapt to climate change and historic over allocation of water. The related complexities of navigating agricultural and population growth demands, environmental concerns, conservative, and economic, legal, policy, regulatory, and governance issues are also touched on to varying degrees.

I presume due largely to the water constrained nature of the west and Mulroy’s vast experience in this region, over 75% of the book focuses on the Western US, including case studies on:

- Climate Change and Water Utility Planning,
- The Sacramento-San Joaquin River Delta,
- San Diego County Water Authority’s multi-pronged water solution, highlighted by a new \$1 billion desalination project,
- Conflicts and collaboration on the Colorado River,
- Nebraska’s Management of ground water within the Ogallala Aquifer, and
- Hydroecological Analysis as a tool to improve Ground Water Management in the West.

Geographic exceptions include examples from Florida and New York City.

No doubt due to the complex nature of “the water problem”, I found the book to be interesting, encouraging, saddening, and contradictory at times. I found it to be another good resource that complements our Water Literate Leaders curriculum well and I recommend reading it.

## Highlights from Case Studies (1 -6):

### Chapter 1

#### Climate Change: A Strategic Opportunity for Water Managers

Kathy Jacobs and Paul Fleming

- Models based on historical precedent are becoming increasingly limited due to the impacts of climate change.
- Preparing for climate change and its impacts should be considered as part of reasonable diligence and risk management.
- Water Cycle changes in average conditions are occurring as well as more dramatic extremes. Examples include: snowpack, precipitation, flooding, seasonality of runoff and other events.
- Authors suggest that we cannot continue to solely rely on historical data, that increased collaboration between climate researchers and utilities with clearly defined objectives is necessary, and that utility managers must build adaptive capacity in order to react to the significant impacts posed by climate change.

### Chapter 2

#### The Sacramento-San Joaquin River Delta: Resolving California's Water

Conundrum

Pat Mulroy

- "The delta is the epicenter of California Water" and "few societies in the world have placed their water facilities in the heart of an estuary."
- "Little about today's delta is functioning as nature – and now governments-intended..."
- The US's two largest pumping stations are located in the delta but, pumping levels are at odds with environment regulation.
- "Since the 1990s, wildlife agencies have listed one dwindling fish population after another under the Endangered Species Act (ESA). They have largely tried to solve the problem by restricting the water systems, not restoring habitat."
- "This severe regulatory approach has not been accompanied by the recovery of a single fish species."
- One of every six acres of irrigated US farmland is sustained by this watershed.
- "One stake holder's solution can be quickly perceived as another's new problem. And with a state this big, and a water system so vast and complex, there has never been a delta solution that satisfies everyone."
- This Case Study illustrates the complexity of the water problem by presenting data from various interests and underscoring the poor results from past regulatory efforts. It goes on to suggest that new cooperative efforts are needed in order to find a new "balance point for urban, agricultural, and environmental requirements."

### Chapter 3

#### The San Diego Strategy: A Sea Change in Western Water

Maureen A. Stapleton

- In 2015, production of 50 million gallons a day of “drought-proof” water started as part of the \$1 billion Carlsbad Desalination Project.
- Funded by tax-exempt bonds and Poseidon Water (private company).
- Impact on rate payers was an average of \$5 per month.
- Decades long collaborative effort of The San Diego County Water Authority, its 24-member agencies and Poseidon Water.
- Back drop of multiple droughts, public-private partnership, costly capital improvements, and technological aspects of desalination and integration into existing system.
- Three-part project: (1) the desalination plant, (2) ten-mile, fifty-four-inch diameter pipeline, pumping uphill, to connect the plant to the existing aqueduct, (3) upgrade to existing Water Authority infrastructure.
- “The total cost of water, after accounting for the purchase price from Poseidon and the cost of the Water Authority’s own facility modifications, ranges from \$2,014 to \$,2257 per acre-foot (2012 dollars), depending on purchase problems.

### Chapter 4

#### The Colorado River Story

Jim Lochhead and Pat Mulroy

- Overview of the Colorado River and its water management.
- The use and management of the Colorado River water are ruled by a series of negotiations, agreements, and court cases collectively known as the “Law of the River.”
- Foundation is the Colorado River Compact of 1922, which allocated more water than has turned out to exist in the river.
- Seven basin states: Arizona, California, New Mexico, Nevada, Utah, and Wyoming. Also includes provisions to supply water to Mexico.
- After several court cases, including some supreme court cases, states began to work together in attempt to avoid federal interreference.
- Lower Basin: Lake Mead and west to California.
- Upper Basin: Lake Powell and east to Rockies.
- 2012 comprehensive Colorado River Basin Water Supply and Demand Study (“Study”) quantified current and project supply and demand imbalances in the system over the next 50 years, and “for the first time” incorporated climate change projections.
- Finding from Study = “warming will continue across the basin, increasing evaporation, plant consumption of water, and other water losses.”
- “Climate change not only speeds up the imbalances that came out of the first agreement on the Law of the River, but also accelerates all of the challenges the states face now...”
- “No single entity or project – such as new large federal reservoirs or desalination projects on the coast – can feasibly offer an easy way out.

## Chapter 5

### Nebraska's Water Governance Framework

Ann Bleed

- For almost 40 years, Nebraska has relied on a unique, locally controlled water governance system to manage and regulate many of the state's natural resources, including groundwater.
- "Nebraska has more irrigated acres than any other state, and more than all but a dozen countries."
- Water for agriculture = 73% of total water withdrawals. Public use = 3%.
- Groundwater is used for 83% of irrigated acres and 96% of public water supplies.
- Source of groundwater is Ogallala Aquifer.
- Surface water in Nebraska is regulated by Nebraska State Department of Natural Resources while ground water is regulated by 23 locally elected natural resources district boards ("NRDs").
- Instead of operating under a prior appropriation system, the NRDs use a reasonable use/correlative rights system in which, in times of shortage, the resource is shared.
- NRDs have wide authority over prevention of erosion, floods, flood damages, pollution, drainage improvement and channel rectification, soil conservation, solid waste disposal and sanitary drainage, forestry and range management, development and management of fish and wildlife habitat and recreational and park facilities. Also have taxing authority.
- Author argues that "to cope with climate change, there are advantages to relying on decentralized overlapping authority, which leads to a diversity of focused localized strategies that promote regulatory experimentation and opportunities for jurisdictional learning."

## Chapter 6

### Groundwater in the American West: How to Harness Hydrogeological Analysis to Improve Groundwater Management

Buke W. Griggs and James J. Butler Jr.

- Ogallala Aquifer has lost some 276 million acre-feet of water since the onset of groundwater pumping for irrigation.
- Colorado River Basin groundwater supplies connect to the river dropped by 41 million ac-ft between 2004 to 2013.
- In order to better manage this resource, we need a better way to quantify how much we are using (e.g. improved Hydrogeological Analysis or "HGA").
- Basic formula of HGA is: Change in volume of water in aquifer = inflows into aquifer – outflows from aquifer.
- Recharge is often estimated and highly uncertain, therefore an improved formula might be: Change in volume of aquifer = net inflow – groundwater pumping.

- Increasingly common form of HGA is “Distributed Parameter Groundwater Flow Model Analysis” where an aquifer is divided into cells and each cell as well as the whole can be studied to allow for an exchange of water across the network. It is “commonly used to assess the aquifer-wide impact of proposed wells, the future declines produced by different management strategies, and the estimated usable lifetime of the groundwater supply for a given management strategy.”
- Benefits of HGA: (1) better protection of property rights in groundwater, (2) enables policy makers to manage groundwater resources more clearly, (3) can improve marketability of groundwater, and (4) can be used as a tool to reduce “the scale, the burdens, and perhaps even the intensity of groundwater-related regulatory and legal disputes.”
- “The more we can rely on the facts and uncontroversial forecasts of HGA, the less we will need to resort to strained and distant legal doctrines, and the better prepared we will be to confront the realities of the future through necessary policy reforms.”