

A Deep Decarbonization Pathway

“The Nexus of Energy and Water”

By Carl L. McWilliams, originally conceived Circa 2017- updated 2021)

Cadillac Desert, is a 1986 book by Marc Reisner about land development and water policy in the western United States. Subtitled ***The American West and its Disappearing Water***, it gives the history of the Bureau of Reclamation and U.S. Army Corps of Engineers, and their massive water development programs, (such as Hoover Dam), to remake the American West. The book's main conclusion is that development-driven policies, (formed when settling the West was the country's main concern), are now having serious long-term negative effects on the environment and water quantity as well as water quality of the American Southwest. What Reisner's work uncovers is that **over-drafting of the aquifers within the Colorado River Valleys, acted as an unsustainable (deficit) water source during the population explosion of the 20th Century in the American Southwest.** Accordingly, today in 2021 the bill for the over-drafting ("*deficit spending*") of the aquifers is due; **and if the citizens of the American southwest desire to continue as a civilization,** a new massive source of water must be acquired. Therefore the only solution is technological based:

THE SOLAR POWERED, HIGH-TECH, DESALINATION OF BAJA CALIFORNIA (SEA OF CORTEZ) OCEAN WATER TO SUPPLEMENT THE DISAPPEARING COLORADO RIVER.



Lake Mead water levels are reaching historic lows amid widespread drought conditions in the Colorado River Basin. Photo: Reuters/Mario Anzuoni

https://www.cpc.ncep.noaa.gov/products/expert_assessment/monthly_drought.pdf

<https://www.usbr.gov/lc/region/g4000/riverops/crss-5year-projections.html>

As foretold by Marc Reisner in 1986 by ***Cadillac Desert***, the Colorado River basin has lost 17 trillion gallons of water in the past decade due to drought and ever-rising demand. According to data gathered from NASA satellites. The disappearance threatens to jeopardize the long-term water supplies of the seven U.S. states and parts of Mexico served by the basin, NASA and University of California researchers said.



To reiterate, a 2014 study conducted by NASA and the University of California at Irvine, is the first to quantify how much groundwater people in the Southwest are using during the region's current, decades long drought,

the Associated Press reported. **"This is a lot of water to lose. We thought that the picture could be pretty bad, but this was shocking,"** Stephanie Castle, the study's lead author and a water resource specialist at UC Irvine, said in a prepared statement. Unlike the water in the rivers and lakes, whose levels are tracked and managed by the U.S. Bureau of Reclamation, underground water supplies are poorly documented and ill-managed, so it's difficult for scientists to know how much of the water is still available. "We don't know exactly how much groundwater we have left, so we don't know when we're going to run out," Castle said.

Using NASA satellites, the researchers found that since 2004, the Colorado River basin has lost 53 million acre feet, or 17 trillion gallons, of water. That's nearly twice the volume of Nevada's Lake Mead -- the nation's largest reservoir -- and is enough to supply more than 50 million households with water for a year. More than 75 percent of the total water losses was from groundwater, the study said.

While above-ground water sources can be replenished by rainfall, groundwater sources can become so depleted that they may never refill, Castle told the AP. In Southwestern states, the loss of groundwater is emptying the reserves that protect farmers, consumers and ecosystems during prolonged periods of drought. **The Colorado River basin -- the largest in the Southwest -- supplies water to about 40 million people in California, Arizona, Colorado, New Mexico, Nevada, Utah and Wyoming, as well as to people in Mexico. The basin, which irrigates about four million acres of farmland on both sides of the border, "is the water lifeline of the western United States,"** Jay Famiglietti, the study's co-author and a senior water cycle scientist at NASA's Jet Propulsion Lab, said in a statement.

When the Western states were sorting out water rights, in the late eighteen-hundreds and nineteen-hundreds, groundwater was not well understood. Lawmakers and even scientists often thought of it as a distinct resource, despite the fact that there's almost always a hydrological connection between water above the surface and water below it. Some of that early ignorance persists in state statutes. California's approach to groundwater is still primitive; it was getting most of its water from wells even before the drought and has only recently begun to talk seriously about regulating withdrawals. There are places in California's San Joaquin Valley where the land has subsided by dozens of feet, because groundwater there has been pumped so much faster than nature can replenish it.

Groundwater depletion is hard to quantify, but recently University of California scientists have been able to estimate it by using data from a NASA mission called the Gravity Recovery and Climate Experiment. GRACE employs two satellites: **The satellites are separated by two hundred kilometres, and the primary thing they measure, using infrared lasers and G.P.S., is tiny changes in that distance, plus ups and downs.** The fluctuations are caused by variations in the Earth's gravitational pull, which are caused by variations in the mass of whatever the satellites are passing over. **The original focus of the mission was on such obviously climate-related phenomena as melting glaciers and rising sea levels, but the scientists eventually realized that they could also detect changes on land caused by fluctuations in groundwater volumes. "One thing you see from the figures is that, between the end of 2004 and the end of 2013, the Colorado River basin lost fifty cubic kilometres of groundwater. That's almost two Lake Meads. "Everyone is very focussed on the bathtub ring around Lake Mead and the dropping of the lake, but the rate of disappearance of groundwater is six or seven times greater."**

Imperial Dam

Imperial Dam, located about 20 miles north of Yuma, Arizona, is a diversion structure for the Colorado River for the All-American Canal and Gila Canal water deliveries, serving southeastern California, Arizona and Mexico. **The operations at Imperial Dam, as well as system wide water distribution, all fall under the direction of**

the United States Bureau of Reclamation. Water diverted at Imperial Dam for use in the Imperial Valley first passes through one of three desilting basins, used to remove silt and clarify the water. Each desilting basin is 540 feet wide by 770 feet long and is equipped with 72 scrapers designed to remove 70,000 tons of silt per day. The silt is returned to the river by means of six sludge return pipes that deposit the silt into the California Sluiceway. From the desilting basins, water is then delivered to the Imperial Valley through the All-American Canal. The All American Canal is a major water source for Los Angeles, San Diego and Riverside Counties.



Imperial Dam

Sea of Cortez- Gulf of California

The **Gulf of California** (also known as the **Sea of Cortez**), is a body of water that separates the Baja California Peninsula from the Mexican mainland:



Gulf of California

The Gulf of California (**highlighted**)

Yuma, Arizona is located approximately 60 miles from the Gulf of California (Sea of Cortez) and the Imperial Dam is located about 20 miles north of Yuma. Thus, a reasonable estimate for the straight-line distance between the Sea of Cortez and Imperial Dam is approximately eighty (80) miles. **The Imperial Dam is the beginning of the All American Canal.**

All American Canal



Map showing the All-American Canal (yellow) and the desert areas of Mexico that need fresh water for agriculture and economic development. The southern portion of the proposed DEEP DECARBONIZATION PATHWAY is the ocean water in the Gulf of California. Which will be desalinated by “concentrator solar radiation” “SOLAR TROUGHS”. See this link for conceptual rendering:

https://res.cloudinary.com/tbmng/image/upload/c_scale,w_700,f_auto,q_auto/v1518851169/ctf/entries/2012/20120621101207_ConcentratedSolarDesalinators.gif

<https://cdn.greenoptimistic.com/wp-content/uploads/2014/02/jpSOLARWATER-superJumbo.jpg?x58405>

https://docs.google.com/document/d/1kXhJn4duZdZJ_OlxRAsI47s0ET7zq_u1jxK76vUgpgU/edit?usp=sharing

The DEEP DECARBONIZATION PATHWAY will employ green solar energy in gigawatt scale capacity, to desalinate 2.5 million acre feet (annually) of Gulf of California sea water. Whereby fully one half (1.25 million annual acre feet) will remain in Mexico, the remaining 50% will be pumped north to Parker Dam for transport by the Colorado River Aqueduct to Southern California.

NORTH AMERICAN DEVELOPMENT BANK (NADBANK) is the logical source for originating capital for the DEEP DECARBONIZATION PATHWAY, whereby “Green Bonds” are issued by NORTH AMERICAN DEVELOPMENT BANK to fund the project: <https://www.nadb.org/about/overview>

The capital needed for the DEEP DECARBONIZATION PATHWAY, can be funded by these

“Net-Zero-Banking/Members” purchasing the Green Bonds from NORTH AMERICAN DEVELOPMENT BANK:
<https://www.unepfi.org/net-zero-banking/members/>
<https://www.unepfi.org/wordpress/wp-content/uploads/2021/04/UNEP-FI-Guidelines-for-Climate-Change-Target-Setting.pdf>

Signed, Carl L. McWilliams

NORTH AMERICAN SOLAR NETWORK, PBC - a Colorado Public Benefits Corporation “start-up”.



Colorado River Aqueduct

Residents of metropolitan Los Angeles recognized over a century ago that obtaining domestic and industrial water to meet the needs of the fast growing L.A. populace was one of their most pressing problems. The Metropolitan Water District (MWD) was organized in 1928 to help solve that problem. It was authorized to plan, finance, build and operate a water-supply system from the Colorado River to California cities and other areas within MWD.



In September 1931, MWD voters authorized a \$220 million bond issue to finance construction of the Colorado River Aqueduct. Construction of the Aqueduct began in 1932. The U.S. Bureau of Reclamation, using funds advanced by MWD, began constructing Parker Dam two years later. But it wasn't until June 17, 1941, that the Aqueduct began delivering water from Lake Havasu to the Pacific Coast. By 1947, **the San Diego Aqueduct** was placed in service and the benefits of the system were extended to San Diego County.

Between 1952 and 1961, the Colorado River Aqueduct was enlarged to its full delivery capacity of 1,212,000 acre-feet of water annually, or more than 1 billion gallons a day.



Map of the Colorado River Aqueduct

Solar CPV (Concentrator PhotoVoltaic) electricity, on a gigawatt scale, can power a 2.5 million annual acre feet desalination facility for the treatment of Sea of Cortez, (Gulf of California) ocean water; 50% of the water for Mexico and 50% of the desalinated water to be piped north to the Colorado River Aqueduct at Parker Dam:

https://docs.google.com/document/d/1kXhJn4duZdZJ_OlxRAsI47s0ET7zq_u1jxK76vUgpgU/edit?usp=sharing

<https://www.wateronline.com/doc/world-s-first-project-to-pipe-desalinated-water-into-natural-lake-set-to-start-operations-0001>

Signed, Carl L. McWilliams, "Founding Entrepreneur"

NORTH AMERICAN SOLAR NETWORK, PBC - A Colorado Public Benefits Corporation "start-up".

<https://docs.google.com/document/d/1KOsd36mpOGRFpgrLsmNn0KNo7Qwdlwgz9EZiQqVNkJ8/edit?usp=sharing>

