

Colorado River Delta Restoration

Gianluca Erculei

University of Nevada Reno

INTRODUCTION

The Colorado river is one of North America's most vital waterways that sustains the arid climate of the Southwestern deserts in North America by providing both water and hydroelectric power. The delta where the river pours out into Northern Mexico was once a flourishing ecosystem with diverse flora and avian species, is now suffering from acidification from factors such as overconsumption, damming, and climate change has resulted in 20% of the river flow removed before it reaches the sea. In this project we will look at Mexican conservation projects and their efforts to restore the delta/riparian areas of the river.

OBJECTIVES

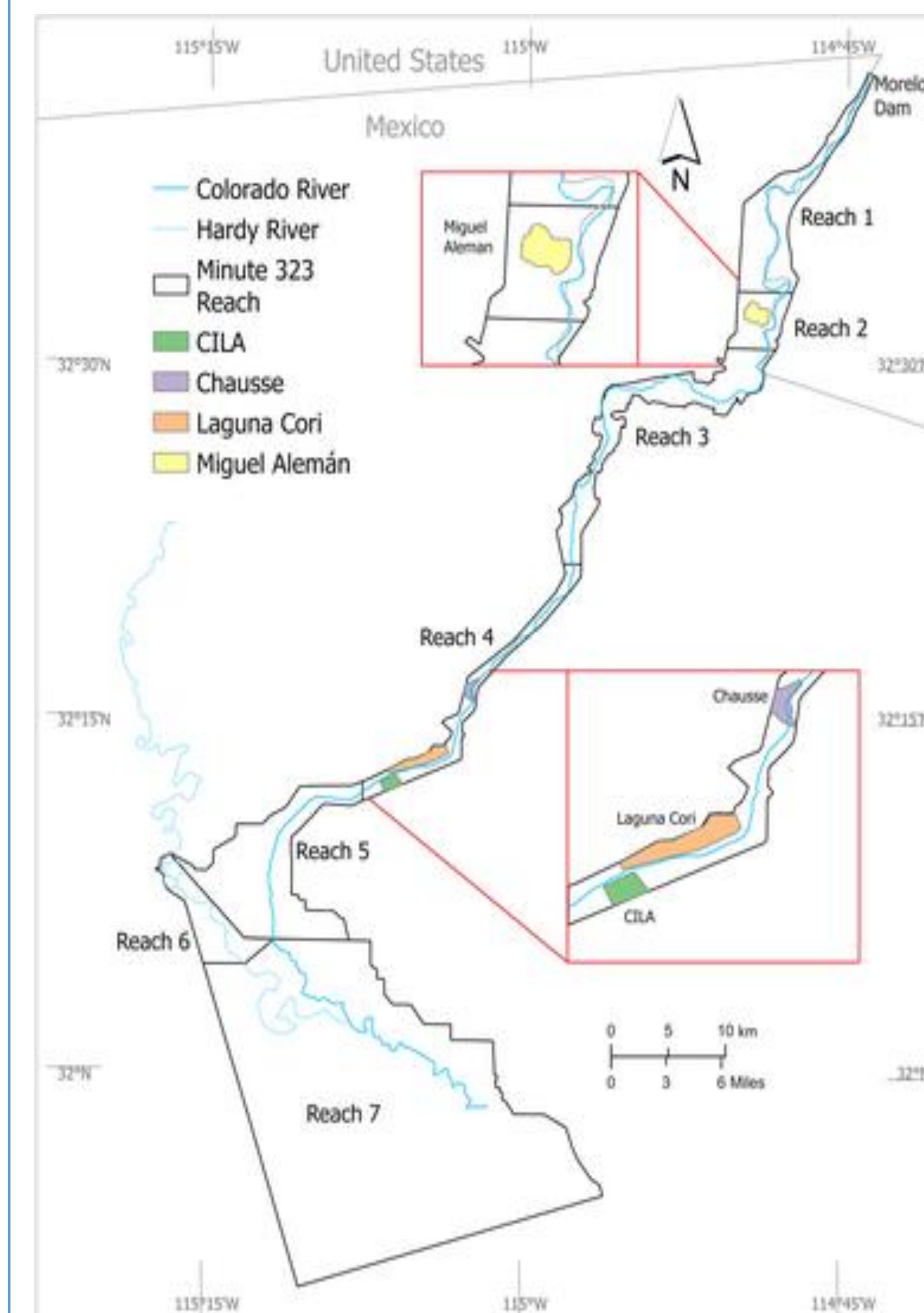
- Evaluate restoration efforts implemented through minutes 319 and 323 by the 1944 Water treaty between the U.S. and Mexico to help revive the delta (Nagler, et Al. 2024)
- Assess riparian vegetation recovery from satellite based studies such as evapotranspiration data (Nagler, et Al. 2024)
- Evaluate the relationship between water restoration and avian restoration. (González-Sargos et Al. 2024)

METHODS

- **Study Area:** There are 7 restoration sites known as reaches along the river. 2 and 4 focused on the restoration while the rest were unrestored. (Nagler, et Al. 2024)
- **Restoration framework:** These efforts were coordinated through minutes 319 and 323 which were agreed on by the 1944 Water Treaty, these minutes are meant to control the water release to help restore the delta. (Nagler et, Al. 2024)
- **Satellite Monitoring:** Researchers used Landsat 8 Imagery to monitor the vegetation greenness through Enhances Vegetation Index (EVI2) and to estimate the evapotranspiration in the plants (Eta). These help track vegetation growth through the means if water flow has improved (Nagler et, AL. 2024)
- **Avian Monitoring:** 230 monitoring stations were input through 5 of the same reaches that were monitoring riparian vegetation. The researchers monitor the avian species, diversity, and how abundant they are which will give researchers a big idea how improved water flow attracts birds. (González-Sargos et Al. 2024)

RESULTS

- **Vegetation:** reaches 2 and 4 showed positive results with increase of greenness (EVI2) by 41.3% from 2014-2022 while the unrestored reaches showed a dry percentage of 27.3%. The high result of EVI2 is due to stronger water deliveries
- **Avian Restoration:** studies resulted in a total of 163 taxa of birds with 73 total species found. Reach 4 contained the highest improved sight of river flow while reach 2 is a slow improvement, though dry the water flows are starting to make the area wet again. (Photo below referenced to Nagler et. Al, 2024)



CONCLUSIONS

In conclusion, the overall restoration project of the delta seems to have a positive outlook. The result of avian species and riparian vegetation making a return is a result of areas becoming wetter in the region. Personally though there is so much Mexico can do to restore as the United States consumes the Colorado River the most so the United States needs to find ways to restore the river to provide more flow to the Sea of Cortez, Mexico.

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Flows of Power: Cartel Operations and Law Enforcement Adaptations Around the Rio Grande

Brian Fournier – Undergraduate – University of Nevada, Reno

Introduction (1)

-The Rio Grande Valley (RGV) is a sector of interest along our southern border, consisting of ongoing geopolitical and spatial operations between Mexican cartels and government agencies. The Rio Grande River, stretching almost 1,900 miles from the Gulf of Mexico to Colorado, provides not only a freshwater lifeline, but an operational corridor for cartel activity. Pertained by versatile changes in depth and seasonal shifts, the river creates a complex environment for government agencies to operate in when conducting anti-narcotic procedures.

-As cartels utilize new methods and technology for transporting narcotics, weapons, and people, government agencies have launched a series of joint operations aimed at deterring further cartel operations through the use of technological advancements, funding, and cooperation.

Agencies and Adversaries (2)

-The United States Border Patrol (USBP) is the primary government agency operating along the Rio Grande, with responsibilities including immigration control, interdiction of narcotics, and security operations across 47 ports of entry along the southern border as a whole.

-Within the RGV, specialized units such as BORTAC (Border Patrol Tactical Unit) and the Border Patrol Dive Team focus on more complex and high-risk situations, ranging from direct confrontation with cartel members to search and rescue missions along the river.

-Other agencies, such as the United States Coast Guard (USCG) and Drug Enforcement Agency (DEA) work in cooperation with the USBP's 19,000 agents stationed along the southern border.

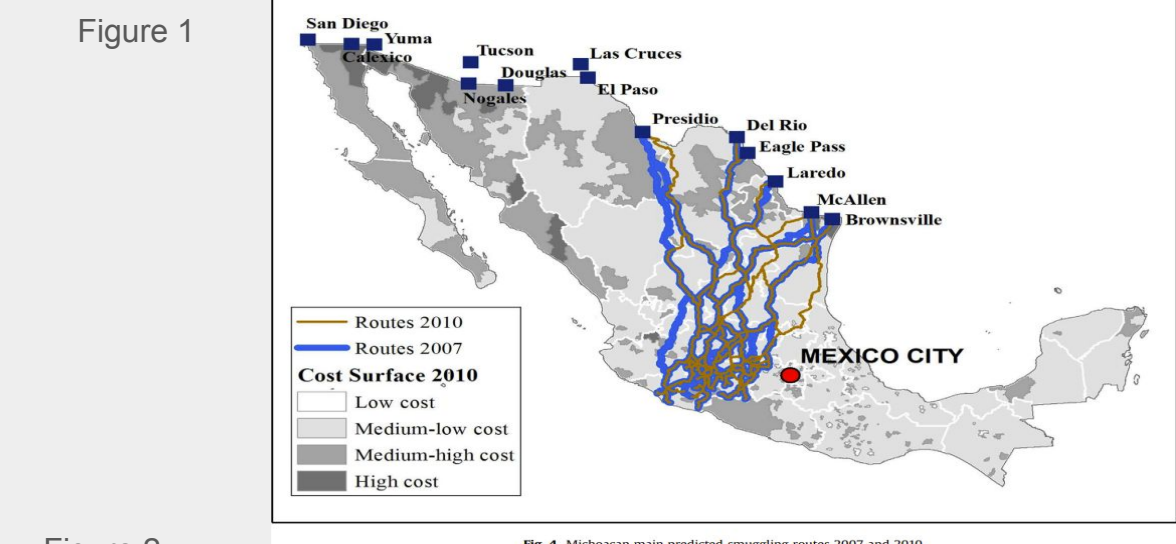


Figure 2

Variables included to define drug trafficking cost.

Variables	Data format	Data source	Spatial reporting unit	Time reporting period	Weights	
Physical	Land Cover	Polygon	INEGI	Municipality	2000	5
	Road network	Polyline	INEGI	Split at municipality	2000	15
Socio-Political	Population	Table	INEGI	Municipality	2005	5
	Police presence	Table	INEGI	Municipality	2005	10
	Poverty	Polygon	SEDESOL	Municipality	2005	5
Drug violence	Drug-related killings	Table	Mexico's Presidency	Municipality	2007–10	20
	Drug confiscations	Table	SEDENA	Municipality	2006–10	40

Conclusion (5)

Due to federal and international jurisdictions, government agencies within the United States are restricted to certain parameters, whereas cartel organizations are not. Both Medel and Wilson show this to be true, along with how cartels have evolved into organized businesses through the usage of rational decision making and advanced technologies, adapting to and exploiting the Rio Grande Valley and border as a whole, requiring government agencies to constantly change and adapt logistics, research, and anti-narcotic operations. The Rio Grande itself proves as a unique area of operability for both sides of the conflict, representing not only a fresh waterway, but a corridor in which both characters at play creatively utilize the river to further their agendas.

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Cartel Operations (3)

-Cartels base their operations on the same factors as corporate boards and CEOs, aiming to maximize profit while minimizing loss through rational decision making. Medel et al. (2015) represents how cartels choose desired transportation routes (Figure 1) and the external factors that impact how secure a certain route is (Figure 2), stating "criminals do not make random movements...rational choice theory believes that an offender makes spatial decisions on offenses to maximize the potential benefit from committing crime and minimize the possible risk" (p. 241). The Rio Grande provides a sophisticated domain when concerning the movement of narcotics, primarily utilized by the Gulf and Sinaloa Cartel.

- Wilson (2011) addresses the shift of the movement of narcotics to water-based craft, highlighting how 30% of cocaine and 70% of exports of narcotics from Colombia are transversed by self-propelled and semi-submersible vessels (SPSS) (p. 49).

Agency Responses (4)

-In response to cartel operations along the Rio Grande, government agencies have exponentially increased counter-operations. Wilson (2011) addresses the creation of specialized teams with specific roles in the dismantlement of narco-trafficking, such as the DoD-led Joint Task Force South (JIATF-South).

-Recently, the USCG launched Operation River Wall, focusing on securing the Rio Grande and counteract the illicit movement of narcotics through the deployment of response craft, command-control assets, and tactical teams, aimed at securing and controlling approximately 260 miles of the Rio Grande Valley (Department of Homeland Security [DHS], 2025).



The Impact of Lake Mead's Drought on Interstate Water Distribution

Kiana Hasek

Lake Mead Water Allocation

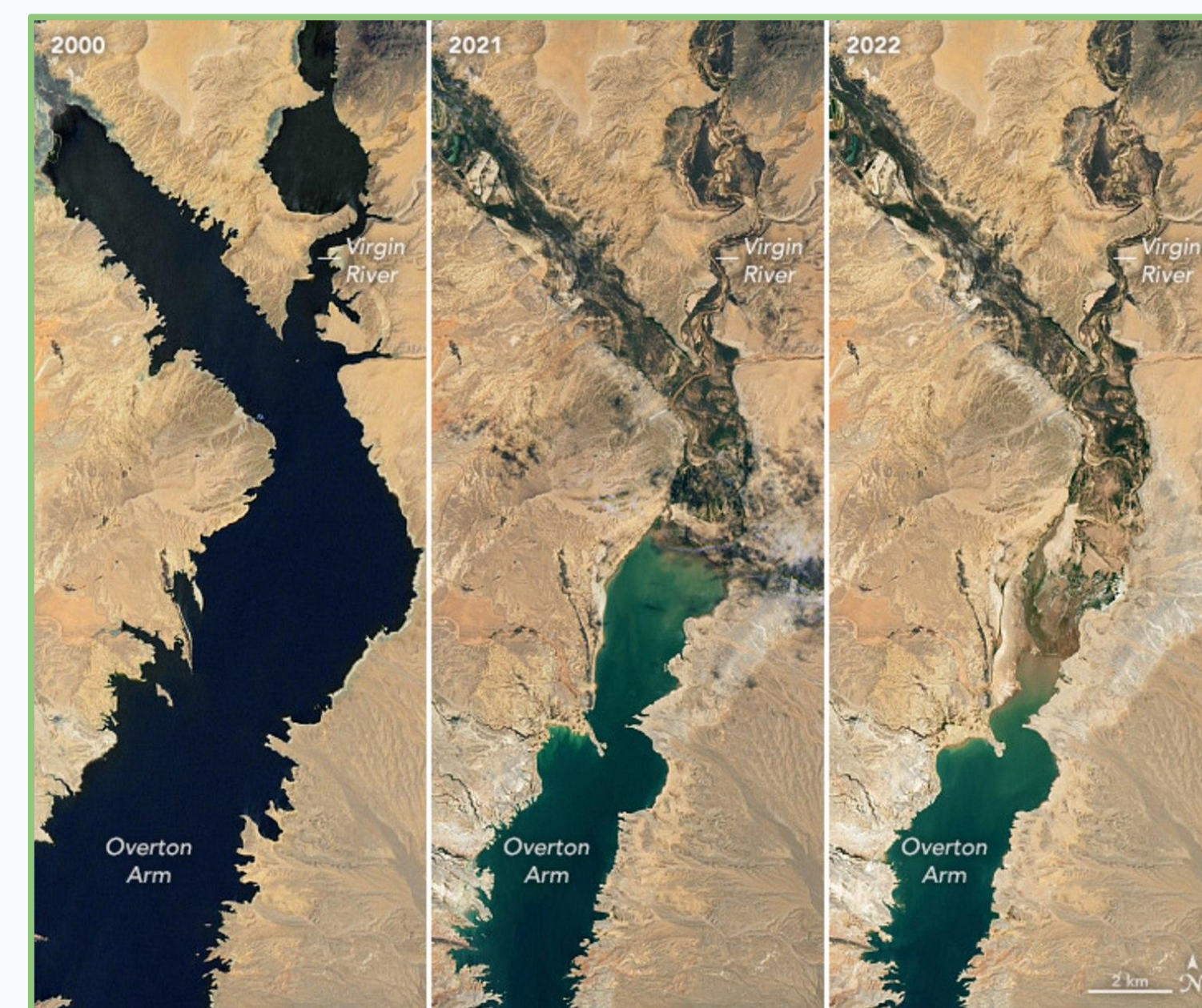
- The Lake Mead, which is on the Colorado River by the Nevada-Arizona border, is the largest reservoir in the U.S.A and an essential water source for the southwest states which are dry and less populated. If you want to know how large it can keep Los Angeles running for a decade (Karamanos, 2019).
- Over 25 million people living in Nevada, Arizona, California, and even northern Mexico.
- The reservoir has many purposes including human consumption, agriculture, urban development, and hydroelectric power generation that supports smaller economies.
- The last two decades we have seen these states going through a long and intense drought or “Mega Drought” causing the water level in Lake Mead to reach record lows.

The Impacts Contributing to the Drought of Lake Mead

- The continued drought, along with global warming, diminishing snowpack in the Rockies and is seriously affecting the long-term water supply and distribution sustainability.
- Increased salinity and lower oxygen levels harm aquatic life.
- Algal blooms and shifts in plankton species show an ecosystem under stress.
- Hoover Dam power output has dropped by 30% since 2000.
- Reduced hydroelectric generation leads to higher fossil fuel use.

What is the Crisis?

- Lake mead is known as having hot summers, mild winters, and very low precipitation, for the amount of rain we have very high evaporation rates. So the amount of water we need can't catch up to how much we actually get and keep which helps with the drought.
- Experiencing a historic drought worsened by climate change and population growth.
- Water level has dropped from 1,220 ft (2000) to below 1,060 ft (2025) , the lowest in history. (Charlotte et al., 2025).
- Lake Mead is now below 35% capacity.
- Visible markings showing the drastic water loss.

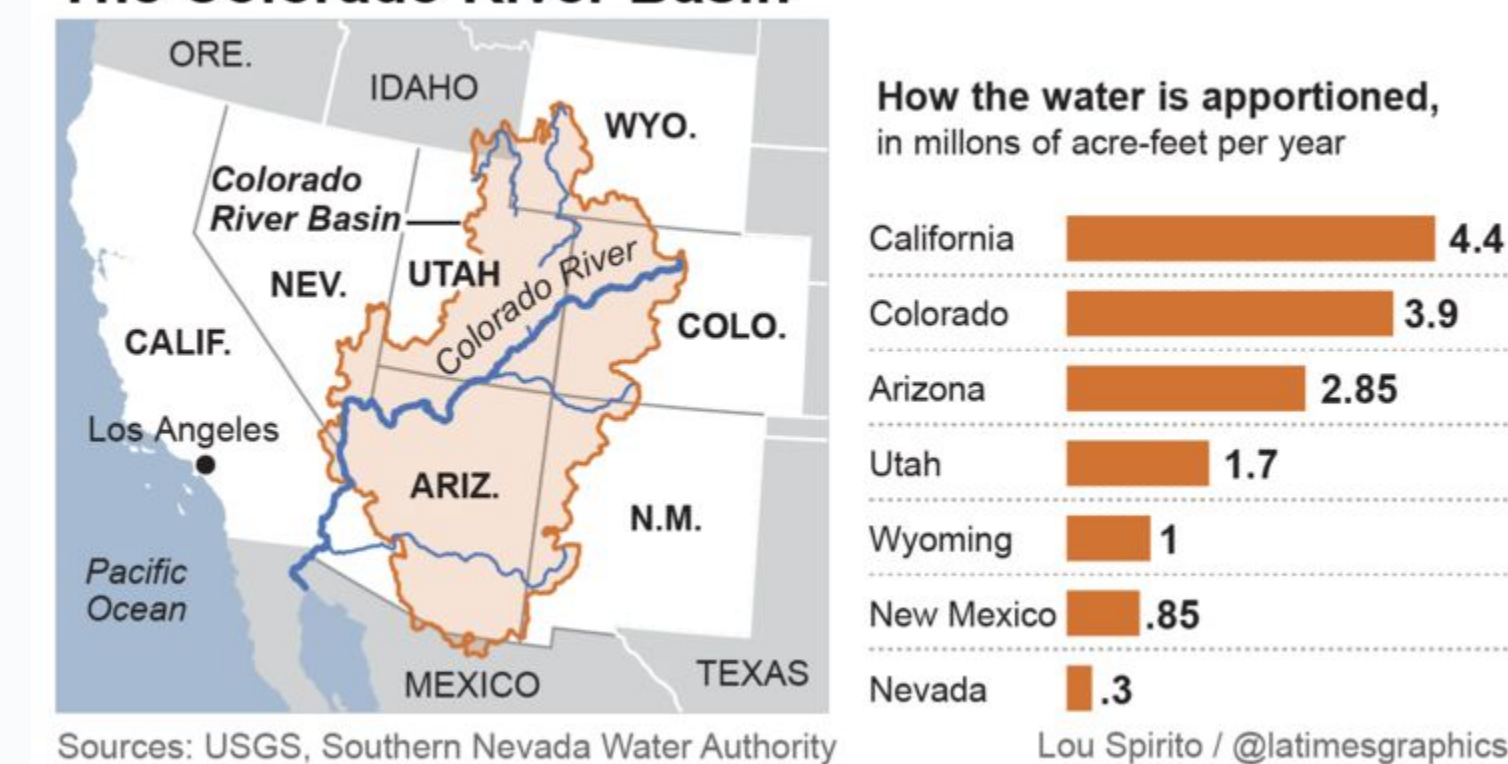


Satellite images showing the drop in water levels at Lake Mead from 2000 to 2022. earthobservatory.nasa.gov (Lenthang, M. (2022, July 25). NASA satellite images show how much Lake Mead has receded since 2000. NBC News. <https://www.nbcnews.com/news/us-news/dramatic-nasa-satellite-images-show-lake-mead-water-levels-receded-200-rcna39803>)

Political Allocation Impact

- Not less significant is the political aspect of Lake Mead crisis. The Colorado River Compact, once a model of inter-state collaboration, is now a reflection of its shortcomings in times of climatic instability.
- With the reduction of river flows, the law imposed, which has always been rigid allocation structure, has created conflict between the states which are now fighting over the same shrinking resources.
- The industry of Arizona, which greatly relies on the Central Arizona Project water deliveries, has faced major cutbacks, resulting in less crops and economic loss.
- On the other hand, Nevada's increasing population has made the state to continuously expand the water conservation and reuse programs in order to support urban supplies.
- The allocation systems have inherent inequalities which reflect the failures of legal frameworks during environmental crises.

The Colorado River Basin



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Global Significance

- Urban conservation methods have been successful in cities like Las Vegas where the aggressive recycling of water and removal of residential turf have combined to bring down per capita water use by about sixty percent in the past twenty years.
- Desalination projects planned with Mexico.
- 2019 Drought Contingency Plan triggered mandatory water cuts, as the water level in the reservoirs went below the limits set by the agreements.
- Future solutions: recycling, desalination, conservation, and adaptive policies.

Solutions to Improving the Drought and Water Distribution

- Lake Mead reflects a worldwide challenge, water crises in the Nile, Indus, and Murray-Darling basins show similar climate pressures.
- Serves as a “living laboratory” for managing water scarcity in a changing climate.
- States face Tier 2 water shortages and mandatory cuts.
- Arizona and Nevada hardest hit; California less affected due to senior water rights.
- Sparks interstate conflicts and questions of fairness in water sharing.

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Granting legal personhood to the Whanganui River, Aotearoa/New Zealand: What are the legal and political implications that come with this change?

Elle Van Wyngarden
University of Nevada, Reno

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Background

The river holds materialistic value to the Crown: a place for tourism and travel, a place where gravel and silt can be harvested and fishing can be practiced.

The Whanganui is the heart of Maori life: it's where they get food and water, they travel on it, it provides protection like a defensive moat, and they use it as their medicine cabinet. The river is seen as their priest, healer, and parent. It has ancestral ties with the Maori peoples and has its own life force (mauri).

The Maori are inseparable from the river, it provides a connection between all of them. The health of the river affects their health.

In 1840, the Treaty of Waitangi was signed by both parties, the Maori unaware of the differing translations. They lost authority over their land for about 175 years during which the Crown dynamited and decapitated their river.

In 2017, the Whanganui River was given guardians, a committee, and a commission, granting it legal personhood. It's rights cannot be infringed upon, giving it the respect and care it deserves.

Legal and Political Implications

The Whanganui River has two guardians to speak for it (Te Pou Tupua). One is selected by the crown, the other is selected by the Maori. To spread out the responsibility, a committee (Te Kopuka) was formed of both Maori and state people to make the river's management strategy.

Legal pluralism is finally coming into play as the Maori's and the Crown's systems of laws and rights are being simultaneously recognized.

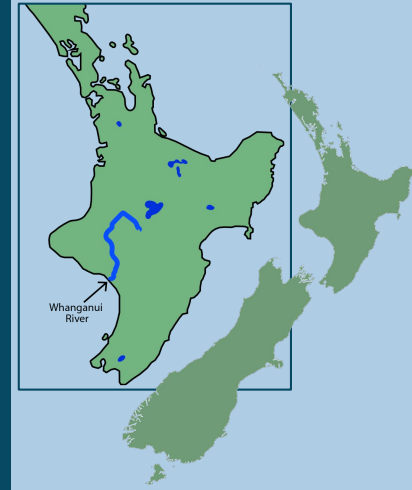
The Maori got some authoritative power over their land back. The shared power ensures that nature is considered in decision making.

The Maori have the power to veto projects they feel are disrespectful/harmful to the environment/their culture. Goals of political projects shifted to be about the mutual enhancement of people AND nature.

Future Implications

- A bridging of the gap between western law and indigenous law.
- Authority being given back to indigenous communities in various places.

“The great river flows from the mountains to the sea. I am the river, the river is me”



Conclusion

Granting the Whanganui River legal personhood ultimately brought the differing sides of New Zealand together, encouraging mutually beneficial practices. This example of granting legal personhood to a piece of the environment to protect it could be key to another country's problems if they are of the same nature.

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