

C.A.S.T.

Colorado River Basin: Action for Streams & Tributaries

By: Alex Dinh, Aldo Casale, Jack McCabe, Ryan Petinga



Mission

Our mission is to restore and protect the water resources of the Upper Colorado River Basin. Recently, water levels have been declining due to rising demand, higher temperatures, and lower precipitation. We want to ensure a balanced ecosystem that positively impacts agriculture, urban needs, wildlife, and recreational activities. The goal is to complete this plan by 2040.

Problem 1- Declining Water Availability

- Over the past few years, there has been less snowpack within the Colorado River Basin
- This causes water shortages with the same societal needs
- The Colorado River Basin provides water for Colorado, California, Arizona, Nevada, New Mexico, Utah, and Wyoming
 - These states rely on the water for
 - Agriculture, Municipal, Industrial, and Recreational uses
- Impacts consist of:
 - Less water for farming, wildlife, and residents
 - Increased competition for water between states and towns



Problem 1 - Goal and solution

Goals:

- Increase Water Efficiency
- Expand Water Reuse and Supply
- Improve Water management and cooperation between States

Solutions:

- Switch irrigation system to drip irrigation
 - The majority of irrigation systems use flood irrigation which is uncontrolled, intensive water placement
 - Switching to drip irrigation precisely puts water into the roots of the plant and conserves water drastically
- Treating Recycling and Reuse
 - Treat wastewater and use it for irrigation and industrial use, If treated well - possibly for drinking water
- Update the Colorado River Compact
 - Updating the Colorado River Compact could reassign water usage based on population and need
- Protect Natural Systems
 - Restore wetlands and forests to improve water retention
 - Try to manage wildfires that affect watershed quality
- Plan for less snowpack
 - This prepares the states that depend on the watershed so that way they can plan and preserve water accordingly



Problem 2- Habitat Loss and Ecosystem Degradation

- There is a reduced water flow through the rising temperatures, causing more dryness
- The drought also means less water available for the ecosystem not just us the people
- In the Upper Basin, channels have been narrowing which is reducing biodiversity
- Too much water is being diverted before it can support natural ecosystems
- Invasive plants and species are also disrupting native ecosystems



Problem 2 - Goal and Solution

Goals:

1. **Restore Ecosystem Health:** Improve habitats for wildlife and plants, especially in wetlands and rivers.
2. **Maintain Ecological Services:** Ensure natural services like water filtration and flood control are preserved.
3. **Prevent Further Degradation:** Reduce the impact of human activities like irrigation, urban development, and invasive species.

Solutions:

1. **Restoring Natural Water Flow:** Modify or remove dams to allow water to flow more naturally and reconnect ecosystems.
2. **Efficient Water Management:** Implement better irrigation techniques and water conservation methods to reduce strain on river resources.
3. **Invasive Species Control:** Use targeted programs to control invasive species and promote the planting of native vegetation.
4. **Urban Development Regulations:** Enforce stricter development controls near critical habitats to protect wetlands and floodplains.
5. **Collaborative Conservation Efforts:** Work with federal, state, and local governments, as well as communities, to promote sustainable practices and restore ecosystems.

Problem 3- Climate Change Impacts

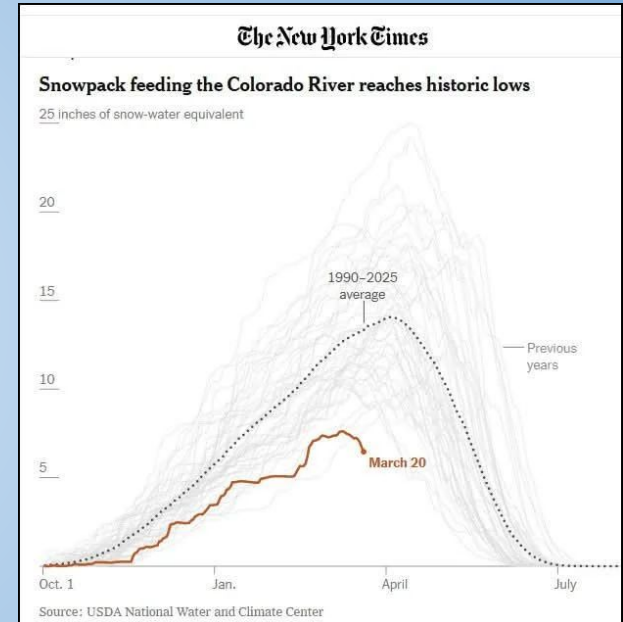
Reduced Snowpack: Warmer temperatures lead to less snow accumulation, reducing spring runoff into the river.

Increased Evaporation: Higher temperatures cause more water to evaporate from the river and reservoirs, depleting water levels.

Prolonged Droughts: Climate change intensifies droughts, reducing water availability during dry periods.

Unpredictable Precipitation: Changing rainfall patterns make water flow less predictable and harder to manage.

Ecosystem Disruption: Altered water temperatures and flow affect habitats for fish and wildlife, threatening biodiversity.



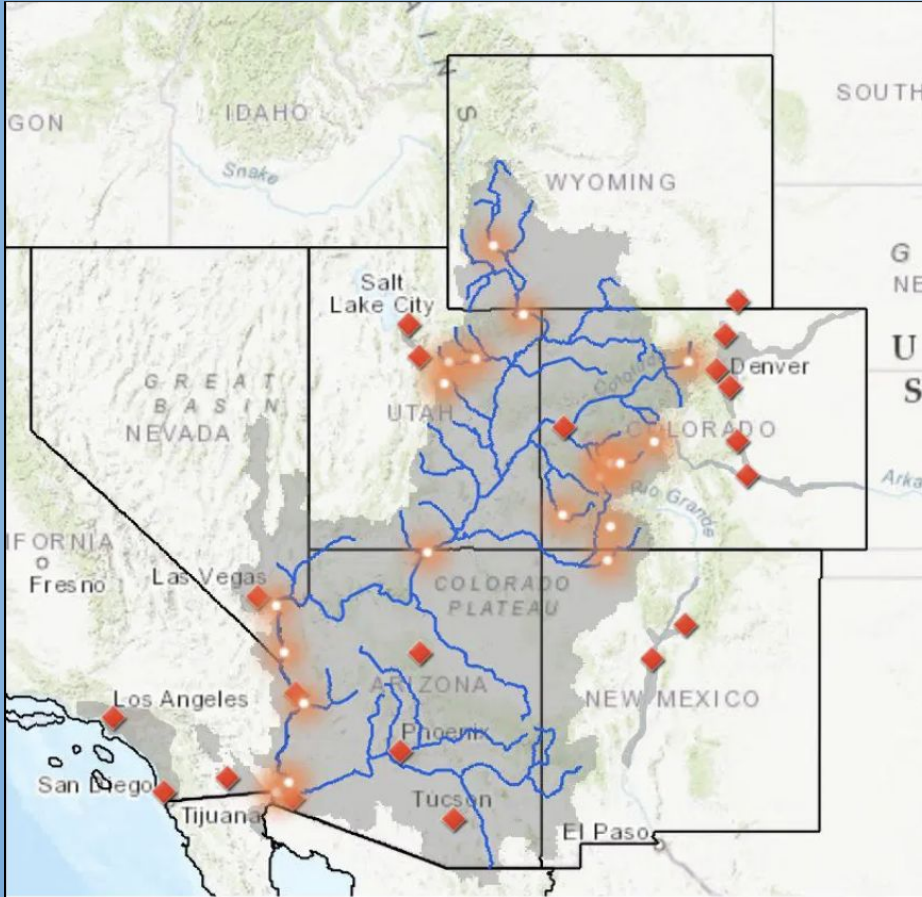
Problem 3 - Goal and Solution

1. **Increase Water Availability:** Ensure a reliable and sustainable water supply for all uses in the basin.
2. **Protect Ecosystems:** Maintain healthy aquatic and riparian habitats despite changing conditions.
3. **Adapt Water Management:** Adjust to unpredictable water flow and ensure efficient use during droughts.

Solutions:

1. **Enhance Water Storage:** Invest in infrastructure improvements like additional reservoirs and water-saving technologies to store more water during wetter years.
2. **Water Conservation:** Promote water conservation efforts in agriculture, industry, and residential areas to reduce demand.
3. **Climate-Resilient Water Management:** Develop adaptive water management strategies that account for shifting climate patterns and prioritize the most critical needs.
4. **Restore Ecosystems:** Implement projects that restore habitats, such as wetland and riparian zone restoration, to help ecosystems cope with changes in water availability.
5. **Research and Monitoring:** Increase research on climate change impacts and implement better monitoring systems to track changes in precipitation, temperature, and river flow for more accurate predictions.

GIS Mapping



Water In the Colorado Basin:

The Colorado River and its tributaries flow through seven U.S. states and 22 tribal communities, supplying water to nearly 40 million people and irrigating approximately 5.5 million acres of farmland. Water levels throughout the Colorado Basin are constantly decreasing as the drought intensifies.

History

The Upper Colorado River Basin has faced significant challenges, including water allocation conflicts, droughts, and growing demand. Tensions over water rights have increased as the river's flow has diminished due to climate change and over-extraction. Population growth and agricultural needs have made more of a competition for water, leading to frequent legal disputes. Sustainable management of the river's resources will require cooperation among states and innovative solutions to address scarcity and environmental impacts.

Water law in the Western United States is anchored in the concept of "first in time, first in right," meaning that those with the oldest water rights are the last to have their allocations cut in the event of a shortage. In *Winters v. United States*, the U.S. Supreme Court determines that a tribe's water rights date back to the year the tribe's reservation was established, which typically makes tribes the most senior rights holders.

1908

Indigenous people are made to become U.S. citizens.

1924

The Indian Reorganization Act is passed, allowing tribes to reestablish governments as long as they are similar in structure to the U.S. government.

1934

The Supreme Court affirms the Upper Colorado River Basin Compact's system as law in *Arizona v. California*.

1963

The Ten Tribes partnership is formed to advocate for tribal interests on the Colorado River.

1992

The estimated population of the Colorado River Basin is just shy of 500,000.

1915

1922

Seven states create the Colorado River Compact, dividing the river's water among them. Indigenous nations are not included in the negotiations or final compact, save for a cursory statement in the compact saying that the agreement does not affect "the obligations of the United States of America to Indian tribes."

1948

Wyoming, New Mexico, Colorado and Utah agree to the Upper Colorado River Basin Compact, a system that counts tribes' rights to the river as a line item in each state's total allotment, despite tribes' sovereign status.

1990

An estimated 23.5 million people are using Colorado River water.

2000

An estimated 28.8 million people are using Colorado River water. Drought conditions begin and reservoirs are 95 percent full.

2022

Roughly 40 million people use Colorado River water. Reservoir levels are around 25 percent. The federal government declares a historic water shortage and asks states to make cuts to water use.

Governance

- **Colorado River Compact (1922):**
 - Divides the Colorado River water between the Upper Basin (Colorado, New Mexico, Utah, Wyoming) and Lower Basin (California, Arizona, Nevada).
- **Upper Colorado River Commission (UCRC):**
 - Oversees the implementation of the Colorado River Compact in the Upper Basin, ensuring equitable water distribution and managing resources.
- **Bureau of Reclamation:**
 - Federal agency responsible for managing water resources, particularly through infrastructure like dams and reservoirs (e.g., Glen Canyon Dam).
- **State Water Agencies:**
 - Each state (Colorado, New Mexico, Utah, Wyoming) manages its water resources, regulating consumption and ensuring compliance with water allocation agreements.
- **Interstate Negotiation and Collaboration:**
 - States negotiate and collaborate on water-sharing agreements, with ongoing discussions around balancing supply with demand during droughts and climate change impacts.

Economics

Costs:

- Upgrading irrigation systems (drip irrigation)
- Building wastewater treatment systems
- Ecosystem restoration (wetlands, forests, etc.)
- Water monitoring and management systems

Benefits:

- Improved water use efficiency & long term cost savings
- More efficient & stable agricultural systems
- Reduced economic impact from droughts and shortages
- Supports reliable water access for people and farms

Conclusion

The Colorado River Basin has been facing multiple challenges since there has been a decline in snowpack, rising temperatures, and increased water demand. This has then caused a shortage of water and increased stress on the ecosystem and river basin as a whole. With scarcity of water coming into play, states are in contention for water and allotment for various usages. To address the problem of water scarcity we have decided that we should focus on expanding water efficiency, water reuse programs, and cooperation amongst states. Through protecting and restoring ecosystems within the watershed, all while trying to conserve water for the time being, will allow for more water to be stored so that way the region that depends on the Colorado River Basin can achieve a steady water supply by 2040.

Sources

Pulwarty, Roger S., Katherine L. Jacobs, and Randall M. Dole. "The hardest working river: drought and critical water problems in the Colorado River Basin." *Drought and water crises: Science, technology, and management issues* 86 (2005): 249-285.

Boepple, Brendan. "The Colorado River Basin: An Overview." *By the State of the Rockies Project 2011-12 Research Team* (2011).

Robison, Jason, et al. "Challenge and response in the Colorado River Basin." *Water Policy* 16.S1 (2014): 12-57.

Pontius, Dale. *Colorado River basin study*. Western Water Policy Review Advisory Commission, 1997.

Thank You!

Questions?