

A Colorado Based Perspective on Water: Scarcity, Allocation, and the Imperative for Legal Reform

By Tony Corrado

Water is the single necessity of human existence over which we exercise deliberate physical and legal control. We do not regulate the composition of the atmosphere we inhale, nor do we allocate solar radiation, but we build dams, dig diversions, adjudicate acre-feet, and write statutes governing surface flow and groundwater. Yet the legal and economic frameworks governing western water remain anchored in nineteenth-century assumptions of limitless abundance and frontier expansion—assumptions that modern hydrology, ecology, and climate reality have rendered obsolete.

The Physical Reality of Global and Regional Scarcity

From orbit, Earth presents itself as an oceanic expanse. However, the total volume of water on the planet is misleading when evaluated against human and ecological needs.

According to data compiled by the U.S. Geological Survey, approximately 96.5 percent of all water on Earth resides in the oceans and is saline. Freshwater accounts for only about 2.5 percent of the global total. Furthermore, nearly 69 percent of that freshwater is sequestered in the polar ice sheets and glaciers of Antarctica and Greenland.

The remaining accessible liquid freshwater—found in rivers, lakes, the atmosphere, and subterranean aquifers—represents less than 1 percent of all water on Earth. In physical terms, if all of Earth's water were gathered into a single sphere, its diameter would span roughly 860 miles. The sphere representing all liquid freshwater would measure just 170 miles across, and the volume encompassing all liquid surface freshwater in rivers and lakes would shrink to a ball merely 35 miles in diameter. Every human community, agricultural enterprise, and terrestrial ecosystem depends upon that fractional 35-mile sliver of surface water and its connected aquifers.

The Ecological Deficit in Freshwater Systems

Because human societies concentrate their diversions on this limited fraction of surface flow, freshwater ecosystems have borne the heaviest ecological toll of modern industrialization.

Synthesizing global biodiversity data from the Worldwatch Institute (Worldwatch Paper 132, "Sustaining Freshwater Ecosystems: Working with Nature" by Janet N. Abramovitz) and regional species assessments by conservation biologists, one-fifth of the world's freshwater fish species—approximately 2,000 of the 10,000 identified taxa—are endangered, vulnerable, or extinct.

In North America, where aquatic systems have been studied with the greatest granularity, the degree of imperilment is unprecedented:

- 75 percent of freshwater snails are rare, imperiled, or extinct.
- 67 percent of freshwater mollusks are rare or imperiled.
- 51 percent of crayfish species are vulnerable or at risk.
- 40 percent of native amphibian populations are in decline or imperiled.
- 37 percent of freshwater fish species are at risk of extinction.

These figures illustrate that the depletion and degradation of stream corridors cannot be characterized merely as an aesthetic or recreational inconvenience; it represents the structural collapse of native riverine biotas that trace their heritage in millions of years while the steep degradation is measured in hundreds of years.

Where the Water Actually Goes: Allocation and Agricultural Footprints

Popular discussions around water conservation often emphasize domestic habits—shorter showers, low-flow plumbing fixtures, and residential conservation. While necessary, municipal indoor consumption constitutes a minor portion of the Western water budget.

According to regional allocation audits from the Colorado Watershed Assembly and the Colorado Water Conservation Board:

- Agriculture accounts for approximately 86 percent of all water deliveries in Colorado.
- Municipal and domestic use consume roughly 7 percent.
- Environmental, recreational, and fishery needs receive 3 percent.
- Industrial and commercial sectors account for 2 percent. (*This does not include data center water usage.*)
- Aquifer recharge and system augmentation account for the remaining 2 percent.

Dietary Water Footprints and the Livestock Multiplier

Examining agricultural water use requires evaluating what crops are grown. The overwhelming majority of agricultural water in the Colorado River basin does not hydrate human populations directly through grain, fruit, or vegetable cultivation; it is dedicated to low-value, water-intensive forage crops—primarily alfalfa and pasture grass—grown to feed beef cattle and dairy cows.

Research on virtual water footprints conducted by the Water Footprint Network (M.M. Mekonnen and A.Y. Hoekstra) and the University of California Agricultural Extension highlights the stark disparity between plant-based food production and livestock protein:

- It requires roughly 6 gallons of water to produce a single standard serving of lettuce.
- It requires approximately 49 gallons of water to produce a single eight-ounce glass of dairy milk, accounting for cow hydration, feed crop irrigation, and facility processing.
- Producing an average day's food supply for a family of four demands approximately 6,800 gallons of embedded water.
- A full pound of beef steak requires in excess of 2,600 gallons of water.

The Policy Impasse: Municipal Inefficiency and Legal Inflexibility

While agricultural reform remains the largest numerical lever, municipal practices continue to exhibit short-sighted resource allocation. Expanding suburban developments have historically permitted water-intensive landscaping and decorative lawns, consuming potable supplies that are unsustainable under future supply projections. While communities are beginning to transition toward mandatory xeriscaping, municipal policy has moved slowly relative to the pace of reservoir depletion.

Yet the primary structural obstacle to regional resilience remains the political reluctance to modernize western water law. For generations, water rights have been treated by political figures as a "third rail"—a topic too contentious to address proactively. Senior water rights holders frequently treat adjudicated decrees as permanent, immutable property rights rather than what they are under constitutional law: conditional usufructuary¹ rights granted by the public.

¹ Under **civil law**, a **usufruct** is a real property right that allows an individual (the **usufructuary**) to temporarily use and enjoy another person's property and collect its profits, provided the underlying substance of the property is preserved and not destroyed.