

July 24, 2013. WTE Editor's Headline: "Trees: Keepers of the Water"

In 2011, UW Professor Larry McDonnell produced an overview, "Western Water and Climate Change," that included an examination of water over-allocation of the Colorado River. Inasmuch as the West is warming faster than the U.S. as a whole, smaller snowpacks are to be expected, along with earlier snowmelt and reduced streamflow; additionally, frequent droughts increase water loss through evaporation, he wrote. A rapidly growing population means more demand for less supply. In future, even less Colorado-River water will be available.

Since Mr. McDonnell's condensed evaluation, UW's Haub School & Ruckelshaus Institute has completed its more extensive analysis of the Colorado and other water resources in the West, also in light of a changing climate. The analysis, reflected in "Assessing the Future of Wyoming's Water Resources: Adding Climate Change to the Equation," took several years to complete. Its authors conclude that the combined effects of drought and warmer temperatures are key disturbances in our state.

Focus on a warming climate

Climate change must become "a primary focus in water management," the authors urge, since water supplies are endangered by global warming. Our planet has experienced a warming trend of "a 1°F increase in average global temperature." Such an increase may appear small, but "Small Warming, Big Changes" reads one heading. The changes portend water shortages due to precipitation patterns, snowmelt, and river flow. Together, they significantly reduce water availability in Wyoming.

Snowpack and runoff

Mountain snow is the main source of Wyoming's surface water; however, most of the snowpack is concentrated in a small area. Climate change diminishes snowpack and changes runoff dynamics, even as it hugely increases the severity and frequency of drought. The West has a relatively small amount of surface water and what there is must be shared across state and tribal boundaries, even across international borders.

The Colorado

The Colorado River system originates in the high mountains of Wyoming and Colorado. Along with Utah and New Mexico, these states comprise the river's Upper Basin, while Arizona, California, and Nevada encompass the Lower Basin. Projected climate change will render "increasingly difficult" Upper Basin delivery obligations. Unless effective management changes are put in place without delay, Lake Mead and Lake Powell, two critical Colorado River storage reservoirs, have a fifty-fifty change of "effectively going dry by 2021." The need exists for "trade-offs and reductions among water users," since Lower Basin demands will be met "only 60 percent of the time."

"We were stunned at the magnitude of the problem and how fast it was coming at us," a Scripps Institute researcher is quoted on Colorado-River dilemma. "Make no mistake, this water problem is not a scientific abstraction, but rather one that will impact each and every one of us that live in the Southwest."

Energy Production

The widely recognized links between climate change and energy productions with polluting emissions like CO₂ have garnered little attention here, though “Wyoming’s energy industry is tied to coal and natural gas production.” Power generation also requires large amounts of water. In addition, coalbed natural gas development affects groundwater.

Reduced water supplies hold major consequences to the “conflicting interests” of industry, people, and energy production. Wyoming’s Powder River and Green River basins, where energy development is concentrated, deserve scrupulous cost-and-benefit assessments, the authors state.

Water Markets

Economic forces drive water toward uses with the highest return. In Wyoming the trend is away from agriculture, historically the dominant user of water. Today many agricultural users are under pressure to transfer their water rights. Fluctuations in water supply “result in ‘thin’ markets with few participants” despite the significant costs of transporting the water.

Pine Beetle Impact

Mountain pine beetles have a substantial impact on water resources. The authors quote experts that within the next five years, the beetles will have killed every mature lodgepole pine in Wyoming—and snowmelt from lodgepole pine forests is among Wyoming’s primary sources of streamflow. Additionally, beetle outbreaks are occurring throughout every major mountain range in the state; hence, we have “fewer live trees [that] take up water.” Extended periods of drought have weakened the trees, while the winter survival and more rapid reproduction cycles of the insects (due to fewer days of extremely low winter temperatures) have facilitated the devastation. Forest diebacks caused by the insects “fundamentally alter watersheds in Wyoming and the West.”

Monitoring Required

Better monitoring of climate and water resources, the authors postulate, will answer questions such as

- Why is water in the West so vulnerable to climate change?
- How do current management practices and policies affect our vulnerability to climate change?
- How will climate change impact water demand?
- How do changing land use, land cover, and climate interact?
- How does climate change and energy production diminish water availability in Wyoming?

The authors quote a Western Governors’ Association’s recommendation to increase partnerships with state climatologists and regional climate centers. Wyoming no longer employs a

climatologist; however, we do have NCAR in Cheyenne, a state-of-the-art climate-research center.

Water sustains life. The trees are our keepers of the water. In Wyoming as elsewhere, trees and water are gravely endangered. In spite of several late-spring snowstorms, “The mountains west of Cheyenne received 25 percent less snow than normal,” states a publication of the City of Cheyenne's Board of Public Utilities.

The university text does not examine projected groundwater scarcity; however, the Powder River Basin Resource Council has compiled an analysis of Wyoming's aquifers. Its publication will be considered in my next column.