The Way of Water:

Comparison of the Ecological Changes of the Po River and Colorado River Basins

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Frontier crossing disciplinary borders

Università degli Studi di Padova

Mark Chapman Scholars Program

Background

- K-State's Mark Chapman Scholars Program provides funding to freshmen and sophomores in the College of Arts and Sciences for summer experience.
- The University of Padova's International Mobility of Veterinary Students (iMOVES) program involves U.S. veterinary and public health students travelling to northeastern Italy to learn about the complexities of food safety, public health, and related issues.
- The Chapman Scholars Program, together with the interdisciplinary *Frontier* program, enabled the authors to travel to the Po River Basin (PRB) and other historical water-related sites before and after iMOVES.
- Both the Colorado River Basin (CRB) and the PRB have seen drastic changes in water levels in recent years. During early 2023, flooding took place in the Emilia-Romagna region, increasing the level of the Po River by five feet. This occurred after Italy had declared a state of emergency due to extended drought.[1] Similarly, the CRB has faced prolonged drought and recent flooding.
- By travelling to the PRB, the authors were uniquely positioned to acquire an experiential understanding of its ecological and public health challenges.

The value of historical perspectives

- After visiting ruins in Brescia, Italy at the Santa Giulia Museum, it was possible to understand how ancient Romans utilized water and waste in their homes and cities (see Figure 1).
- Ancient Romans in Brescia had adapted to transporting their water through an innovative aqueduct system. The aqueduct network connected one's home (or *domus*) to the precious resource of water (see Figure 3).
- Two of the lakes in the Colorado River Basin (CRB) are currently at risk of becoming "dead pools," a situation that results when there is not enough water to keep water continuously flowing and the water stays at a standstill. By understanding how the ancient Romans kept water flowing, it is possible to grasp new concepts that may have relevant application today in the CRB.
- The societal value of water and seafood in Roman society is evidenced by artwork seen in a triclinium (dining area) in the Brescia ruins (see Figure 2).

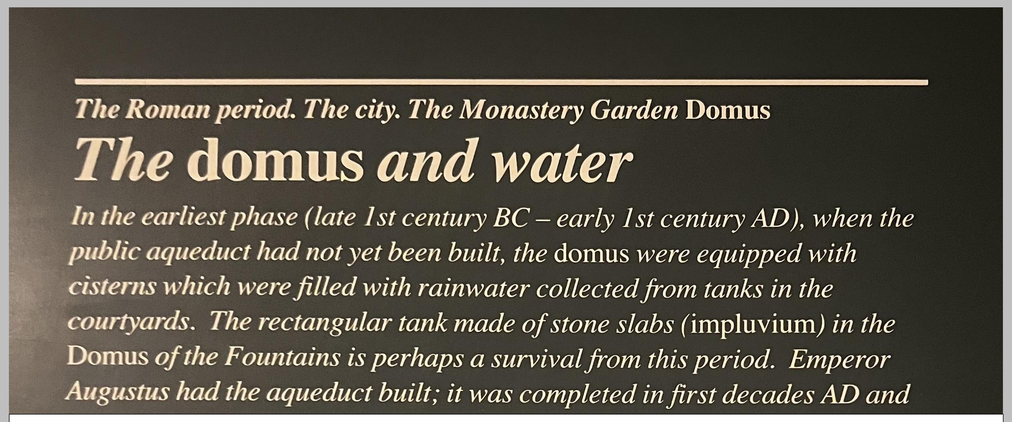

Figure 1. Seen in the Santa Giulia museum in Brescia, this exhibition signage outlines how the ancient Romans handled water in a home (or *domus*). *Domus* in Latin translates to "home" in English; the authors were literally able to visit 1900-year-old homes with kitchens, dining rooms, and garden areas.

Figure 2. Image of artwork on the wall of a domus's triclinium, or dining area. Note the mosaic including a lobster and other aquatic life. (Photo taken at the Santa Giulia Museum in Brescia, Italy)

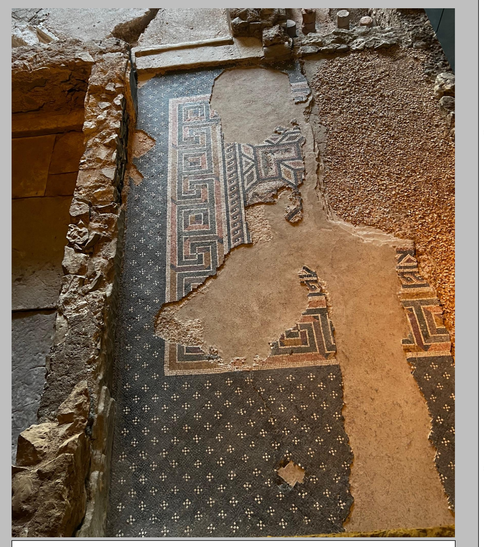

Figure 3. Image of the indoor water systems from the domus of 1st-century Roman family in Brescia. (Photo taken in the Santa Giulia museum in Brescia, Italy)

Figure 4. The Po River in Piacenza, Italy, taken by the authors in July 2023. This area previously suffered drought, yet recent rainfall refilled the basin. This river's level recently rose by five feet.

Key findings

- From 2000 to 2018, there was a forty-four million-acre feet/year (maf/year) deficit across the CRB, with the average flow from 2000-2018 being 12.44 maf/year.[2] For the last several years, the PRB has faced a significant water-flow deficit.
- With respect to public health, both basins have seen increased cases of West Nile virus (WN), an arbovirus most commonly transmitted by *Culex* mosquitoes. Between 2000 and 2022, there is an increase in the number of cases of reported WN in humans. In 2000, there were 14 cases in the state of Colorado, whereas in 2022, there 205 reported cases.[3] (There are seven states in the CRB; however, Colorado is the only one referred to here.)
- Italy has thus far reported 203 cases of WN in humans in 2023, two-thirds of the total 386 reported cases in the entire European Union.[5] WN was first reported in Italy in 1998 and reemerged in southern Italy in 2020.
- As well as infectious disease prevalence, agriculture and trade are also affected by climate impacts regarding water. The CRB and its connecting rivers supply water across seven states in the southwestern United States to 30 million people and 4 million acres of farmland. Without a continuous flow of water, U.S. agriculture is not only at risk. but those living in communities across the southwest are at risk. Those living in communities across the PRB also face increased risk in agriculture.
- According to scholars based in Europe, water insecurity and drought can lead to an array of public health challenges: "Unavailability of food resources leads to an increased risk of mental health ... The impacts of droughts on economic sectors, such as agriculture, livestock, and other water-dependent sectors, and associated migration produce mental health effects, especially among vulnerable populations such as rural communities and farmers." [6]

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