Introduction

The Colorado River represents the best and worst of American industry and resourcefulness. On the positive side, the Southwest has harnessed the resources of this desert oasis to provide life-giving moisture to huge desert communities like Las Vegas, Phoenix, and Los Angeles. The river has also supplied irrigation water, which has transformed parched desert valleys into vibrant centers of agriculture. But these waterconsuming activities have not come without a staggering cost. For instance, the river’s delta, once one of the most distinctive and biologically diverse areas in the world, has all but disappeared as the river now runs dry through the scorching heat of the Sonoran desert—fifty miles before it ever reaches its outlet into the Gulf of California (Fradkin 320).

Human intervention in the Colorado River system has had profound ecological consequences for the entire Southwest. From a purely environmental standpoint, it would be convenient to simply “reverse” a century’s worth of degradation and begin the painfully slow healing process. However, 30 million people now depend on the river for drinking water, electricity, and other basic necessities of life, making this goal impossible to achieve. While we should make every reasonable effort to preserve what remains of the Colorado, this mighty river can probably never regain its glory lost.

Geography of the Colorado River

The Colorado River basin is traditionally divided into two regions, the Upper and Lower River Basins (Mueller 8). The Upper Colorado originates in Rocky Mountain National Park in Colorado State and is joined by the Green River near Moab, Utah (Fradkin 42). It flows south through Lake Powell just before entering the Lower Basin, continuing on through Arizona, into the Grand Canyon, Hoover Dam, and various aqueducts.
which provide agricultural and urban water supplies for much of the Southwest. It completes its southward journey as it is tapped by the All-American canal (watering the fertile Imperial Valley), crosses the border into Mexico, and finally drains into the Gulf of California (xi).

**The Colorado River in its Natural Condition**

The Colorado River as we know it today is a far cry from what Francisco de Ulloa discovered in 1539. As late as 1858 when Lieutenant Joseph Ives led the first scientific expedition up the Lower Colorado, the river still ran free in its natural condition (Freeman 142). Each spring and early summer, it experienced cataclysmic flooding, depositing millions of tons of sediment downstream and occasionally spilling into its two major flood basins, the Salton Sink near Imperial Valley and the Pattie Basin near present-day Laguna Salada (Mueller 8). The delta “meandered through the 10- to 20-mile wide corridor and during floods carved a complex maze of sloughs, oxbows, and wetlands. Flood waters frequently covered hundreds of square miles of the desert” (11). This desert oasis created a one-of-a-kind ecosystem which supported many organisms found nowhere else in the world. Indeed, seventy-five percent of the river’s fish species were found exclusively in the Colorado River basin (37).

**The Colorado River as It Exists Today**

Contrast this wild, pristine, desert river to the one we know today. According to David L. Wegner, an ecologist with the U.S. Bureau of Reclamation, “The Colorado River delta, […] one of the most biologically rich and diverse ecosystems on the planet just a scant eighty years ago, is today a hollowed out and desiccated remnant. By the end of 1997 less than ten percent of the original wetlands were left” (qtd. in Collier 10). Gordon A. Mueller of the U.S. Bureau of Reclamation notes that when the river flowed free, it gained volume as it approached the Gulf of California. Today, however, “its water volume actually dwindles as it flows south” (Mueller 29). As mentioned above, the Colorado River now runs completely dry before it ever reaches of its outlet at the Gulf of California (Fradkin 320).

**Human Intervention in the Colorado River System**

The evolution of the river from its natural state to its modern condition can be traced back to the beginning of the twentieth century, when farmers began diverting river water to irrigate areas such as
California’s Imperial Valley (Mueller 19). Using the waters of the Colorado, these pioneers turned parched desert valleys into some of the most productive farmland in the nation. In 1923, Lewis Freeman revealed a common view of the river that prodded on many of these farmers:

The Colorado might be likened to a blooded bull standing at about the bovine mean between the barnyard bossy and the Texas high tail. Roped, dehorned, blind-folded, harnessed and put to work it can be made worth a whole herd of dairy cows or range steers. (Freeman 369)

For the first part of the century, these agricultural pioneers worked earnestly to tame the Southwest’s “blooded bull,” mostly with small-scale diversions for irrigation water.

From 1908 onward, the U.S. government significantly altered the Colorado’s tributaries by funding several small dams along the Salt, Gila, and Verde rivers (Mueller 25). Starting modestly with the eighteen-foot tall Granite Reef Dam in 1908, these projects gradually increased in magnitude with the 280-foot tall Theodore Roosevelt Dam in 1911 and later the 305-foot tall Horse Mesa Dam in 1927 (23). But the landscape of the Colorado itself changed forever in 1935 with the completion of Hoover Dam at the Arizona-Nevada border (Mueller 25). Not only did the dam create Lake Mead and generate unheard of quantities of electricity, but it also mediated a huge problem which had haunted locals for generations: the Colorado’s ruthless seasonal flooding. For example, in 1905 a flood decimated the entire Imperial Valley as the river spilled its banks and filled the Salton Sink (Ward 6). (The modern Salton Sea provides lingering evidence of this flood.) Thus, eliminating floods had become a major priority to facilitate the area’s economic growth. Subsequent dams which further alleviated the flooding problem include the Glen Canyon Dam, creating Lake Powell in southern Utah (Stevens 36); Parker Dam near Parker, Arizona; and Imperial Dam near Yuma, Arizona.

Of course, dams aren’t the only modification humans have made to the Colorado River through the years; aqueducts drain water from the river system through its entire length. From the Strawberry Aqueduct and Front Range Diversions—supplying water to the Salt Lake City and Denver areas, respectively—to the Colorado River Aqueduct near Los Angeles and the Mexican Irrigation Projects south of the border, civilization drains the river from its headwaters to its outlet (Mueller 31).
Ecological Effects of Human Intervention

From a purely pragmatic point of view, the progress of human civilization in the Southwest might justify these modifications to the Colorado River system. After all, they have supplied Las Vegas, Phoenix, Los Angeles, San Diego, and other cities across the region with life-giving water and electricity; they have turned the parched desert in Imperial Valley and Arizona into fertile farmland; and they have eliminated the haunting specter of the river’s erratic runoff flooding. But is convenience to a human population worth the staggering ecological cost?

According to a report at the 1981 Symposium on the Aquatic Resources Management of the Colorado River Ecosystem, “The [Glen Canyon] dam has affected three very basic features of the river: 1) sediment discharge and turbidity, 2) seasonal flow patterns and maximum/minimum flows, and 3) water temperature variation” (Adams and Lamarra142). Although this statement was directed specifically toward the Glen Canyon Dam, the same could be said of the other major dams along the Colorado (especially Hoover Dam).

The first artificially altered feature of the river system, sediment discharge and turbidity, has had profound effects on the entire ecosystem. Sand and silt that would naturally flow downstream now backs up in Lake Powell and Lake Mead, causing the downstream waters to become unnaturally clear when they should be quite cloudy (Mueller 32). While clearer water might be a boon to the river running business in the Grand Canyon (Stevens 38), the lack of silt in the water promotes the growth the algae *Cladophora*. Unnaturally high levels of this algae support a nonnative trout population which has led to the extinction of several fish species found nowhere else in the world (Mueller 32).

The second result of tampering with the Colorado is change to maximum/minimum flow patterns. According to the Symposium report mentioned above, prior to human intervention the “average high flows were usually 20 times greater than the average low flows” (Adams 143). Today, flow levels are kept more or less constant throughout the year. While artificial flow moderation has saved countless acres of farmland and protected thousands of people from the Colorado’s raging floods, it has also wreaked havoc on riparian (riverside) habitats that have evolved specifically for this unstable environment. Since native populations lost
their competitive advantage over nonnative species when this instability was removed, introduced species have now largely replaced native populations (Collier 62).

Finally, the dams along the Colorado have had a huge impact on water temperature. According to the Symposium report, “Winter lows [before the dams] ranged from just above freezing to 40°F; temperature gradually warmed to 60° or 70°F during early spring and finally reached 75° to 85°F […] during July or August” (Adams 143). By contrast, winter temperatures now dip only 1°F below the mean of 45°F and increase by only 5°F during summer months (143). These temperature changes give nonnative species an additional advantage over their native competitors. Of the seventy fish species which have been introduced in the Colorado River, “Half of these species have established and spread throughout much of the river basin and have virtually eliminated native fish” as a result of these profound alterations to the natural habitat (Mueller 1).

Perhaps the most tragic loss to the Colorado River, however, is found south of the border in Baja California. As noted above, the river’s delta now runs dry because of upstream diversion, damming, and evaporation. David Wegner’s comments put the delta’s destruction in perspective and are worth repeating: “The Colorado River delta, […] one of the most biologically rich and diverse ecosystems on the planet just a scant eighty years ago, is today a hollowed out and desiccated remnant.” Sadly, even valiant attempts at restoring the delta can never return it to its original condition.

What We Can Do to Prevent Further Destruction

But even if we can’t restore the Colorado to its natural state, we can implement certain policies that will improve the river’s current condition or at least prevent further degradation. In 1991, Secretary of the Interior Manuel Lujan took a major step forward for the entire river system when he announced that regulators of the Glen Canyon Dam would factor in environmental considerations, not just demand for electricity, when making decisions about flow rates and water levels (Miller 100). Even though this was a tiny step in addressing an enormous problem, it was nonetheless progress from the government’s historical indifference.

Some scientists recommend placing restrictions on water level fluctuation—justified by fluctuating need for electricity—in order to protect native species (102). Still other wonder whether controlled seasonal flooding—simulating the river’s natural floods—could help redistribute the silt more naturally and restore
some of the degraded riparian habitats (120). More radically, the Sierra Club advocates tearing down the Glen Canyon Dam to drain Lake Powell. They hope that this will restore at least one portion of the river to something approximating its natural state (123).

But the delta still risks further degradation because it flows directly through areas of high agricultural and urban consumption. Edward Glenn of the University of Arizona notes that “Water managers are inclined to channelize [the delta] and clear vegetation to prevent flood damage” from water released out of upstream reservoirs (Glenn 23). But despite ongoing struggles just to prevent additional destruction in the area, some progress is being made in educating the policymakers about the delta to slow the rate of its destruction. Considered a “dead” habitat in the early 1990’s, some newer research is beginning to suggest that preserving just one percent of the Colorado’s original flow is enough to sustain some of the delta’s most endangered species (23). The scientific community is now lobbying for stricter environmental regulations to preserve what little habitat is left in the Colorado River delta.

International relations compound the delta’s problems. During the first half of the twentieth century, the U.S. consumed as much water as it wanted without regard to downstream effects in Mexico (Ward 31). Over time, the U.S. has cooperated more and more with Mexican officials in response to Mexican water demand and uproar among environmentalists. However, the current drought has again strained U.S.-Mexican relations over the delta. According the Steve Cornelius of the Sonoran Institute,

There will be significant pressure to meet state entitlements and allocate any surplus water that becomes available to rebuild depleted supplies in the Lake Powell and Lake Mead reservoirs to prevent domestic shortfalls. These increasing demands in the United States will inevitably curtail flow to Mexico and the delta. (14)

Although preserving the delta will be an uphill battle in light of the ongoing drought, it should nonetheless remain a top priority for citizens and policymakers alike.

Conclusion

As we can see, the issues facing the Colorado River today are complex. Rapidly developing agricultural and urban areas, which demand a dependable supply of water and electricity, often take precedence over
environmental concerns for the river. Thus, human needs in and around the Colorado River basin has made “solving” the river’s problems nearly impossible. But even if it is not feasible to fix the river’s biggest issues—the ecological impact of dams and diversions, for instance—it is possible to take smaller steps toward minimizing further damage. And although we may not see visible results in our lifetime, by acting wisely today we can protect the Colorado River from future degradation, preserving what is left of one of our country’s most valuable resources.