WAPDA (1977). Groundwater Investigations in Selected Areas in Balochistan: Mastung (Shirinab-Pishin Basin). Preliminary Hydrogeological Report 1, WAPDA Hydrogeology Directorate, Quetta.
WAPDA (1978). Groundwater Investigations in Selected Areas of Baluchistan: Reconnaissance Survey of Kuchlak Area (Pishin Lora Basin). Internal Hydrogeologic Report 8, WAPDA Hydrogeology Directorate, Quetta.
WAPDA (1983). Groundwaters of Rakshan River Basin. Quetta: WAPDA Hydrogeology Project.
WAPDA (1989). Groundwater Levels During 1975-1989 in Mastung Sub-Basin. WAPDA Hydrogeology Project. Quetta.
WAPDA (1992). Uncontrolled Mining of Groundwater in Balochistan and Possible Remedial Measures. WAPDA Hydrogeology Project, Quetta.
Wilkinson, J. C. (1978). Islamic water law with special reference to oasis settlement. *Journal of Arid Environments* 1: 87-96.

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The Social and Ecological Consequences of Early Cattle Ranching in the Little Colorado River Basin

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Commercial cattle ranching began in east central Arizona during the late 1880s when thousands of head of cattle were introduced onto the previously unexploited grasslands of the Little Colorado River Basin. Most of these animals were imported from western Texas where serious overgrazing had resulted in both catastrophic cattle losses and widespread range deterioration. By the turn of the century, the Texas experience had been repeated in Arizona, because Texas cattlemen continued to follow the same destructive stocking practices in this new region. This paper examines: (1) the early development of cattle ranching in the Little Colorado River Basin; (2) the various factors which contributed to overgrazing in the region; and (3) the consequences that commercial cattle ranching had on the local environment and on the pre-existing farming communities of the region.

KEY WORDS: Little Colorado River Basin; cattle; overgrazing; range deterioration.

INTRODUCTION

The Little Colorado River Basin is an arid to semi-arid region of about 5000 square miles (12,800 square kilometers) in east central Arizona (see Fig. 1). Situated at the southern periphery of the Colorado Plateau, the basin appears as an undulating plain increasing in elevation to the south and southeast. Average elevation ranges from 5000 feet (1520 meters) in the lower valley of the Little Colorado to over 8000 feet (2400 meters) along the Mogollon Rim, a steep escarpment defining the southern boundary for much of the region. The highest elevations occur in the southeastern

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portion of the basin, where several peaks exceed 10,000 feet (3050 meters) and where Mount Baldy, the second highest peak in Arizona, reaches 11,403 feet (3476 meters).

Annual precipitation increases with elevation and ranges from 9 inches (22 cm) in the north to over 25 inches (64 cm) in the south. As a result, northern desert vegetation predominates along the lower valley of the Little Colorado River near Holbrook and is succeeded southwards by grassland, juniper-piñon woodland, and montane forest communities. In addition, since elevation increases gradually and since most of the basin lies below 6000 feet (1830 meters), the majority of the region receives less than 15 inches (38 cm) of precipitation per year. Consequently, the largest single vegetative community in the basin is the grassland community, which covers over 41% of the total land surface. The juniper-piñon woodland community is the second largest plant community, encompassing 38% of the total surface area. The montane forest and northern desert communities comprise 17% and 4% of the total surface area, respectively, with the remaining land containing largely narrow riparian habitats created by the Little Colorado River and its principal tributary Silver Creek.

The grassland community contains primarily grama, ring, muhly, needle, triple awa, and galleta grasses (Salt River Project, 1974 [Section 3], p. 42), with various desert shrubs intermingled. Snakeweed is the dominant shrub, amounting to 77% of all shrubs in the grassland community north of Snowflake (*ibid.*, p. 82). Bare soil accounts for 55–65% of the total surface cover throughout the grassland community (Dames and Moore, 1973 [Section 4], p. 201), while herbaceous vegetation comprises only 14% of basal cover near St. Johns and a mere 3% north of Snowflake (Salt River Project, 1974 [Section 3], pp. 102, 82).

The dominant species within the juniper-piñon woodland community are one-seeded juniper, Utah juniper, and piñon pine. Both juniper and piñon are short, woody types of vegetation that dominate in rough country due to their shallow root system (Harrell and Eckel, 1939, p. 27). Overall tree density and the proportion of piñon within the juniper-piñon woodland community increase with elevation until this community is abruptly replaced by ponderosa pine forests at 6000 feet (1830 meters). Ponderosa pine is, in turn, replaced by aspen and Englemann spruce at 8000 feet (2400 meters), while lush alpine meadows occur extensively throughout the basin above 9000 feet (2740 meters).

The grassland and juniper-piñon woodland communities have been primarily utilized for livestock grazing since the early 1880s. The ponderosa pine community forms part of the largest continuous stand of ponderosa pine in the United States and has been extensively exploited for its lumber. Since local precipitation is both sparse and highly variable and since both

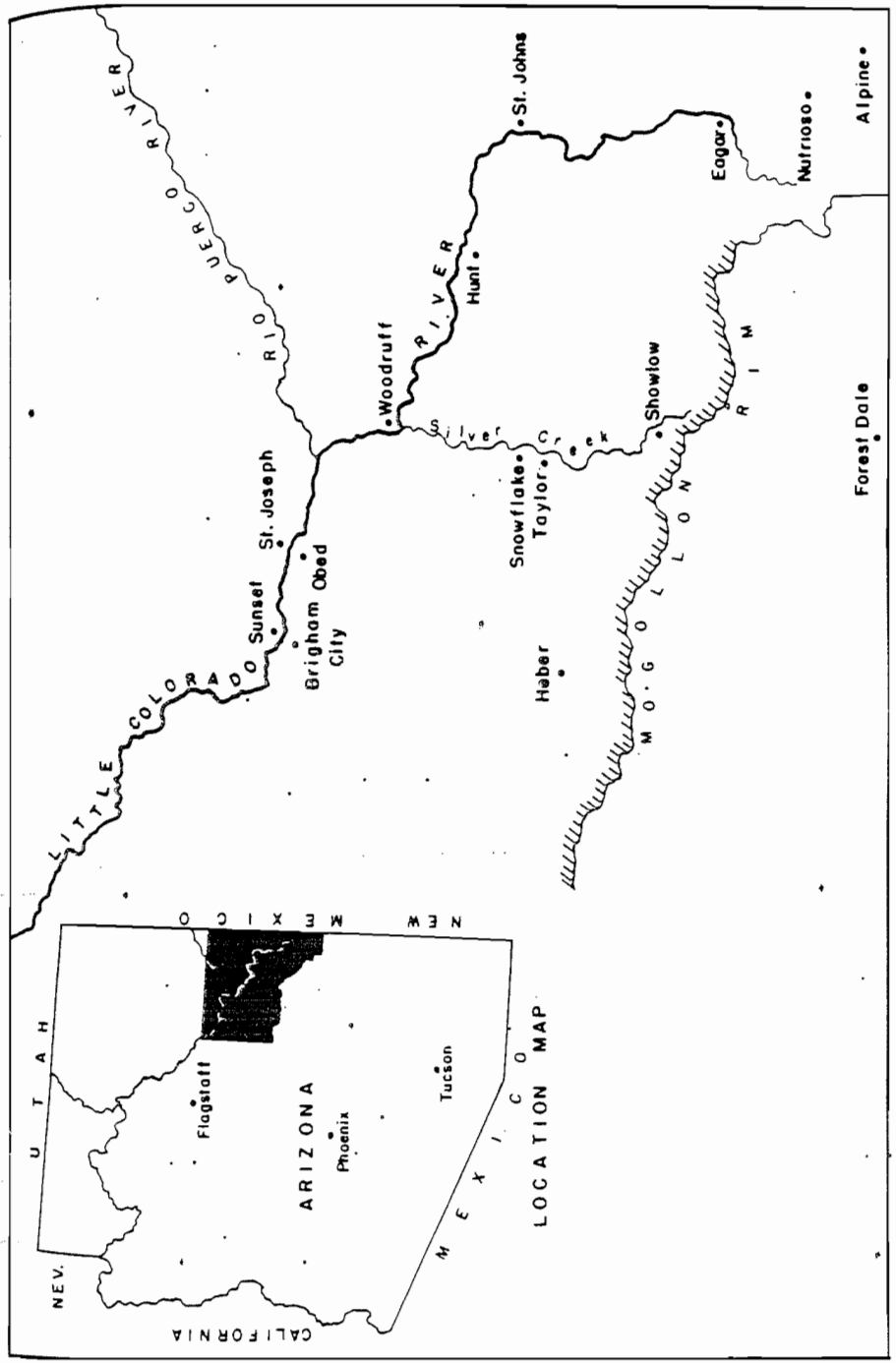

Fig. 1. Little Colorado River Basin: Mormon settlements.

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the length and stability of the growing season vary inversely with elevation, all successful farming in the basin was necessarily restricted to river valleys below 6000 feet (1830 meters) until the utilization of groundwater resources in the twentieth century enabled farmers to exploit new locations outside the river valleys (Abruzzi, 1985).

EARLY FARMING IN THE BASIN

Most of the nearly two dozen small towns currently distributed throughout the Little Colorado area were founded during the late nineteenth century by Mormon pioneers who colonized the region under the direction of Church leaders in Salt Lake City in an effort to establish self-sufficient agricultural communities socially and politically removed from the encompassing non-Mormon economy and society (see Peterson, 1973; Leone, 1979; Abruzzi, 1993). Mormon colonization officially began in 1876 when 500 pioneers established four settlements—Sunset, Brigham City, Obed and St. Joseph—in the lower valley of the Little Colorado River.[2] Additional towns were subsequently founded along the upper reaches of the Little Colorado River and Silver Creek.

Colonizing the Little Colorado River Basin with farming communities was an exceedingly difficult task that was eventually achieved only at great individual and collective expense. Many towns sustained near-annual crop failures due to heat, frost, drought, and flooding—frequently to more than one of these causes during a single agricultural season—as well as to hailstorms, insect infestations, and destructive winds. Several towns also suffered near-regular dam failures. These catastrophes not only destroyed any hope of raising a crop the year a dam was lost; it also painfully increased the labor needed to secure a crop the following year. Two towns, St. Joseph and Woodruff, lost 14 and 13 dams, respectively, between 1876 and 1923. Finally, the whole region endured two devastating droughts which lasted for nine years between 1892 and 1905 and which produced widespread crop failures and livestock losses.

Due largely to the persistent environmental instability which characterizes this arid region (see Abruzzi, 1993, pp. 79-120), most Little Colorado Mormon towns experienced either poor harvests or complete crop failures during half the years between 1880 and 1900 (*ibid.*, 1993, pp. 33-35). As a result, several communities failed. Of the four original settlements founded in 1876, only St. Joseph survived.[3] Many other towns would also have failed

[2]A previous colonizing effort was initiated in 1873. However, this company returned to Utah before reaching its destination along the Little Colorado.

had it not been for the tithing redistribution they received from the regional church organization, and for the strategic assistance they obtained from Church headquarters in Salt Lake City (see Abruzzi, 1989). St. Joseph and Woodruff, for example, would clearly not have withstood so many dam failures had it not been for the recurring subsidies they received. However, despite continued church assistance, emigration from the basin remained high, and church leaders were repeatedly forced to dispatch new settlers to the Little Colorado in order to sustain the colonization effort.

In the end, the colonization succeeded. However, the Little Colorado Mormon communities were explicitly founded and organized so that they would develop separately and independently of the encroaching Gentile economy and society and received frequent xenophobic sermons by church leaders to avoid unnecessary contact with the non-Mormons around them. But their isolation lasted only a few years. In 1866, Congress authorized the construction of a railroad line along the 35th parallel, and the Atlantic and Pacific Railroad arrived at the Little Colorado in 1881. The arrival of the railroad eliminated all possibility of continued isolation.

THE ADVENT OF THE RAILROAD

Initially, the Little Colorado Mormon settlements received critical benefits from the arrival of the railroad. The winter of 1879-1880 had been particularly difficult, owing largely to: (1) the heavy immigration of near-destitute settlers who severely taxed local food supplies, and (2) the inauguration of several new towns along the upper reaches of the Little Colorado which simultaneously placed a heavy strain on local manpower and resources (see Abruzzi, 1993, pp. 31-32). This difficult winter was then followed by the complete failure of the 1880 harvest. The situation had become so desperate as early as the spring of 1880 that many individuals were forced to scavenge the countryside in search of roots, weeds, and other edible foods. Conditions remained serious enough at St. Joseph the following year that two men and a team of horses were dispatched in September of 1881 to obtain flour at Sanders, Arizona some 50 miles (80 km) to the east, even though the railroad was to arrive at St. Joseph within 2 weeks. Sizable shipments of flour and grain were subsequently received at St. Joseph that November and then again in January, February, and March of 1882.

[3]St. Joseph's name was changed to Joseph City in 1923. A fifth town, known as "Old Taylor," was founded along the Little Colorado a few miles downstream from St. Joseph. It was founded in 1878 and abandoned the same year, following the construction and loss of five dams.

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The advent of the railroad also offered a critical employment opportunity for the local Mormon population, which enabled them to purchase much needed foodstuffs. Men and teams from several Mormon towns, including 40 men and 20 teams from Snowflake alone, left the region during July of 1880 to grade track on the approaching railroad line some 150 miles (241 km) to the east. On the basis of this grading contract the settlers were able to purchase needed food and supplies from Albuquerque which were sent back to their communities.

The arrival of the railroad also made the acquisition of food and supplies easier and less costly in this remote region where crop failures were a frequent occurrence. Previously, when crops failed, food and supplies could only be obtained by traveling by wagon to either Kanab, Utah, or Albuquerque (and later Socorro) New Mexico. The roundtrip wagon journey to Albuquerque or Socorro required 15 to 20 days (see Greenwood, 1960, p. 13), while roundtrips to Utah took up to 6 weeks (Tanner and Richards, 1977, p. 84). Following the arrival of the railroad, the same goods could be acquired more easily and more cheaply within the basin itself at the newly established town of Holbrook.

The growth of Holbrook and Winslow along the railroad line and the regional population increase which followed the railroad's arrival also created a growing local market for Mormon produce. In addition, the railroad brought Eastern commercial markets within reach of local Mormon producers. As early as May 1882, 8943 pounds (4056.5 kg) of wool were shipped from St. Joseph to Philadelphia, earning $1490 for that cash-poor town (Warner, 1968, p. 22; Tanner and Richards, 1977, p. 84).

Finally, the economic boom which followed the railroad's arrival increased the local demand for labor, most notably in those towns closest to the railroad line. Some of the railroad-induced occupations recorded at St. Joseph included:

> . . . tending post office, stabling and feeding mail horses, shoeing horses for travelers, shearing sheep, repairing wagons, working on railroad, cutting and hauling ties, building fence, hauling freight, and cutting and stacking hay. (Tanner and Richards, 1977, p. 79).

However, the railroad also generated a substantial growth in the size of the regional non-Mormon population. The overall size of the non-Indian population in the Little Colorado area nearly doubled in 20 years, increasing from 3464 persons in 1880 to 6778 persons in 1900. This increase generated both economic competition and political conflict between local Mormon and non-Mormon populations (see Abruzzi, 1993, pp. 175-180). A political-mercantile collusion known as the St. Johns Ring surfaced at this time which dominated the newly-formed Apache County and which seriously threatened the viability of several Mormon economic ventures.

At the height of its power, the Ring even barred Mormons from voting, removed Mormon jurors when chosen, and refused to allow Mormon candidates to serve when elected.

The most significant consequence of the arrival of the railroad, however, was that it opened this previously isolated territory to exploitation by powerful economic interests outside the region, in particular those associated with the highly speculative range cattle industry of the time. Holbrook, which was founded in 1881, quickly emerged as the central shipping point for all of northeastern Arizona, and both livestock and livestock products became the principal freight shipped from there. In 1881, some 300,000 pounds (136,000 kg) of wool were shipped from Holbrook (Wayte, 1962, p. 107), and by 1896 wool shipments from there had increased nearly fourfold to 1,120,000 pounds (508,000 kg) (*Holbrook Argus*, 6/19/1898). During this same year, some 20,000 head of cattle and 22,000 head of sheep were shipped from Holbrook as well (*ibid.*).

The largest single enterprise to enter the Little Colorado River Basin during the nineteenth century as a result of the arrival of the railroad was the Aztec Land and Cattle Company. Due to its sheer size and to the specific range management policies it employed, the Aztec Company was to have profound impact on this region: it brought the Little Colorado River Basin within the purview of the highly speculative range cattle industry of the nineteenth century and subjected the people, communities, and lands of the basin to the same devastating impact that this industry regularly imposed elsewhere in the American West (see Webb, 1931, pp. 233-260).

THE AZTEC LAND AND CATTLE COMPANY

In order to reduce the growing debt it had incurred in constructing its western line, the Atlantic and Pacific Railroad Company attempted to sell 5,424,800 acres of land (2,195,386 hectares) granted to it by Congress in 1866 (see Kennedy, 1968, pp. 2-3). Over one million of these acres was acquired at a cost of 50 cents per acre by the Aztec Land and Cattle Company, a consortium of eastern businessmen and Texas ranching interests.[4] The land claimed by the Aztec Company included every other section (640 acres or one square mile) extending from 12 miles (19.3 km) east to 50 miles (80 km) west of Snowflake for a depth of 50 miles (80 km) south of the railroad line (see Fig. 2). By owning every other section and by controlling all critical water sources throughout its vast domain, the Aztec

[4]See Kennedy (1968, p. 3) or Abruzzi (1993, p. 185) for a list of the stockholders in the Aztec Company at the time of its founding.

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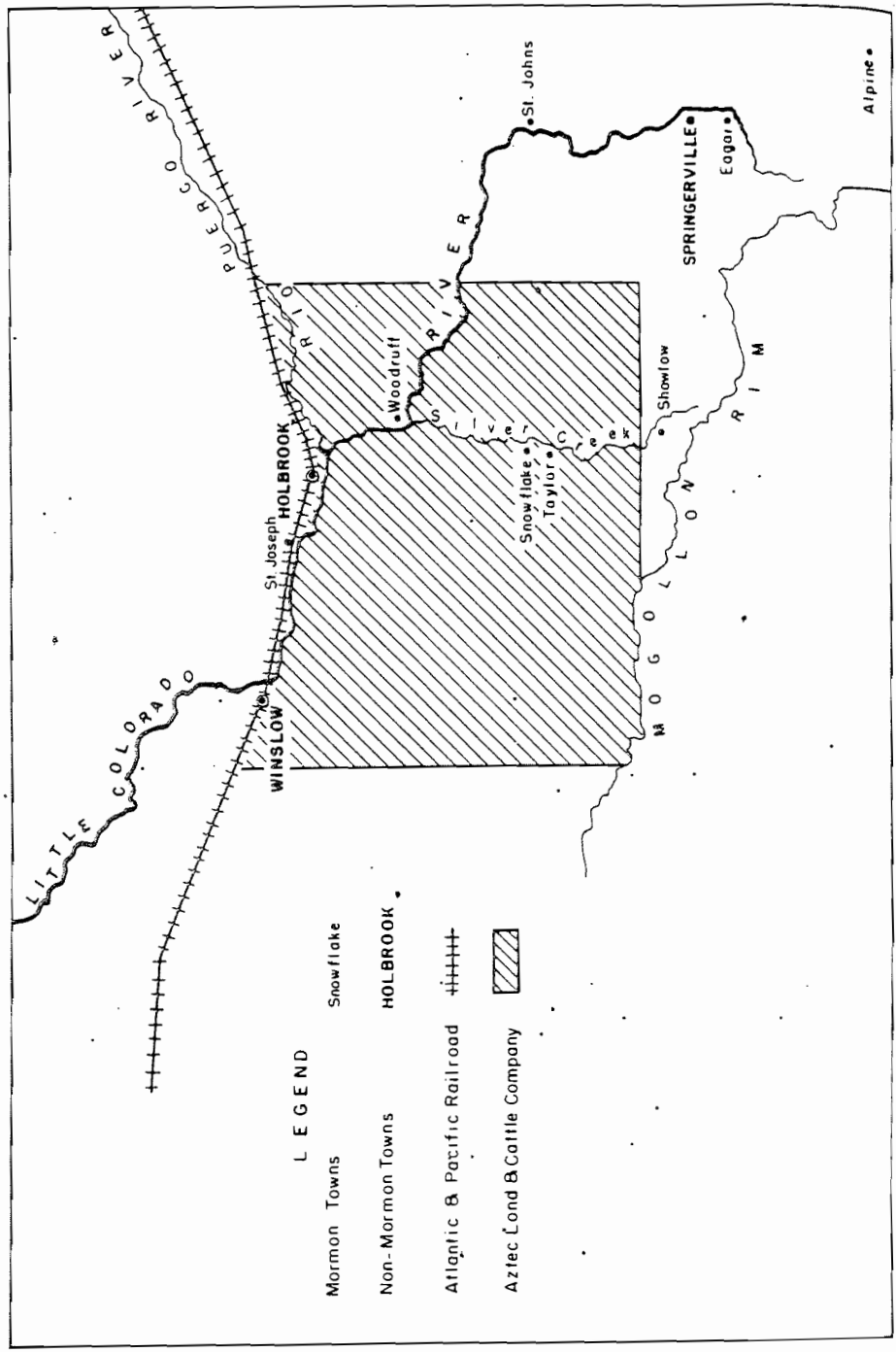

Fig. 2. Little Colorado River Basin: Non-Mormon factors.

Company effectively monopolized over 2,000,000 acres (809,400 hectares) of range land and, in effect, removed a substantial resource from local utilization.

The Aztec Land and Cattle Company was the third largest ranch in North America during the late nineteenth century. It was the direct successor of the Continental Cattle Company founded in western Texas during the late 1870s. The latter was the original owner of the Hashknife brand subsequently made famous by the Aztec Company, which resembled the kitchen tool of the same name (Wayte, 1962, p. 134).

The Aztec Company was also a direct product of the deteriorating range conditions that prevailed throughout western Texas during the mid-1880s. Open range, rising meat prices, and mild weather created a highly speculative livestock investment atmosphere in Texas during the early 1880s. This attracted considerable capital, much of it from English and Scottish cattle syndicates, and led to the importation of millions of head of cattle into the arid West Texas region. By 1885, however, the situation in western Texas had changed drastically. The introduction of barbed wire and windmills, together with the passage of legislation favorable to small farmers, spelled the end of the open range. In order to recoup their investment before the encroachment of farmers resulted in the complete enclosure of grasslands, ranchers in western Texas dangerously overstocked their ranges.[5] However, a drought which began in 1883, produced falling cattle prices during 1884 and a complete crash in the beef market in 1885. By the close of 1885, thousands of cattle had died and thousands more existed half-starved on a dry and desolate range. A report in *Hoof and Horn* (5/20/1886) described the devastation.

> The plains of West Texas are parched and carcasses of thousands of cattle are to be seen in every direction. In some localities no rain has fallen since last September . . .it is drier than it has been in twenty years. Of 7,000,000 head of cattle in Texas, one-third are in the section visited by the drouth. (The drouth came as far east as Big Springs, Texas. Cattle were dying at the rate of 900 per day. Twenty thousand carcasses are to be found. On the A and P railroad, the stench is terrific) [parentheses in the original].

In a later article, *Hoof and Horn* (2/3/1887) noted that conditions had become so bad that cattle had to be "turned loose to keep them from dying." Unable to sell their livestock at profitable prices, ranchers searched for a new range where cattle could be maintained until the market rebounded. The lush grasslands of eastern Arizona, combined with the fi-

[5]Webb (1931, p. 237) reports that one ranch near Forth Worth, Texas stocked 25,000 cattle on a range of only 100,000 acres (40,470 ha). Four acres (1.6 ha) were completely inadequate to support a steer in arid western Texas. As Webb notes, "in the spring of 1883 the roundup brought in 10,000 head; 15,000 dead cattle on the range told the rest of the story."

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nancial difficulties of the Atlantic and Pacific Railroad, made the formation of the Aztec Land and Cattle Company and the relocation of thousands of starving Texas cattle on this cheaply-acquired land an attractive investment opportunity.

The newly-formed Aztec Company experienced little difficulty finding livestock to purchase. Due to the seriously depressed market for cattle, it was able to purchase 22,000 head from the Continental Cattle Company for only $333,000.00 ($15 per head), considerably less than the $30 to $35 per head price that had prevailed just a few years earlier. An 1887 stockholders' report indicates that the Aztec Company had by that time spent $421,615.93 to purchase 23,000 head of cattle ($18.33 per head) (see *Hoof and Horn*, 2/3/1887; Kennedy, 1968, p. 7). However, the company encountered numerous obstacles transporting these animals to its newly acquired range in Arizona. Besides the logistical problem of moving seriously weakened cattle hundreds of miles across desolate transit ranges, the company had to contend with fierce opposition from Arizona ranchers who were pressuring the Arizona Territorial Legislature to impose a quarantine on all Texas cattle (see *Hoof and Horn*, November, 1885 through November, 1886; Kennedy, 1968, p. 9-11). Despite these difficulties, the Aztec Company imported between 33,000 and 40,000 head of cattle into Arizona by the close of 1887, which quickly grew to a herd of 60,000.[6] The company also imported some 100 cowboys with supplies and over 2500 horses to manage its investment. These cowboys came to be known as the Hashknife Outfit and soon earned a notorious local reputation.

Although the 1877 stockholders' report recommended that the company adopt a "liberal policy towards persons taking a homestead" on Aztec Company land (primarily to counter the growing negative local attitude that had developed toward the company), an exclusionist policy prevailed. During June of 1886, for example, the Aztec Company published a letter in various local papers which reiterated the company's rights to the land it had purchased and which warned all of the consequences that would befall those who trespassed on Aztec Company land (cf. *Apache County Critic*, 6/3/1886). The company also occupied every possible waterhole, stationed men along the borders of its territory and dealt sternly with all trespassers.[7] The Aztec Company's determined policy yielded numerous violent confrontations between Hashknife cowboys and trespassers on company

[6]Estimates of the exact amount of cattle imported by the Aztec Company vary. Kennedy (1968, p. 1) claims that 34,000 head were shipped into northern Arizona, while Wayte (1962, p. 133), Peterson (1973, p. 169) and LeVine (1977, p. 32) report that 40,000 were imported by the company.

[7]The *Apache County Critic* reports several cases of trespassing brought to trial by the Aztec Company between May and August of 1886.

land. The company likewise failed to deal "liberally" with local Mormon settlers, some of whom had inadvertently homesteaded land that had been granted to the railroad and subsequently sold to the Aztec Company. Since the original railroad grant pre-dated all Mormon claims in the basin, individuals and towns located on what became Aztec Company land had to negotiate with the company for the purchase of that land. Three Mormon settlements—Snowflake, Taylor and Woodruff—were immediately threatened with the loss of their land and of the improvements they had made on their land during the previous 10 years.[8]

Successive droughts, repeated economic crises, and declining cattle prices[9] during the 1890s produced dangerously overstocked ranges within the basin, just as they had in western Texas the previous decade. The Aztec Company retained over 60,000 head of cattle on the Little Colorado range while waiting for better prices. However, several years of drought ensued which were followed by the severe winter of 1898, and thousands of cattle died. The extent of the devastation is described in the following account (*Holbrook Argus*, 12/16/1899):

> We had heavy losses in our section this last year from drought. Along the Santa Fe Pacific the loss has been fully 50 percent. The Aztec Company expected to gather between 35,000 and 40,000 head and they cleared up about 16,000 head. The big outfits are all pulling out of our part of the territory and they are going for good.

In the end, the cumulative effect of drought, range deterioration, falling prices and heavy losses of cattle from starvation and rustling forced the Aztec Company to declare bankruptcy in 1900. After only 16 years of operation, the company had to liquidate its extensive holdings in the basin, thus ending the speculative cattle ranching era in this region.[10] However, despite its brief reign, the Aztec Company had a devastating impact on local ranges and, therefore, a decidedly negative effect on the peoples and communities that depended on these ranges for their survival.

[8]The town of Woodruff was actually situated on land still owned by the railroad. Settlers there had, therefore, to negotiate with the Railroad Company for their land. Mormon settlers at St. Joseph and St. Johns did not have to negotiate with either the railroad or the Aztec Company to gain title to their land. St Johns' claim rested on an earlier claim established by Solomon Barth, a local merchant from whom they purchased their land and water rights, whose claim pre-dated the railroad's claim. The settlers at St. Joseph were situated on land set aside for education and were eventually able to receive full title to their land at nominal fees charged by the state (Peterson, 1973, p. 175).

[9]Cattle sold for only $5.00 at Holbrook during the summer of 1895 (Wayte, 1962, p. 139).

[10]The Aztec Company managed to retain considerable rangeland in the Little Colorado River Basin, which it still leases to local ranchers.

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IMMEDIATE EFFECTS

The impact that the arrival of the Aztec Company had on ranchers and farmers in the region was immediate and severe. First, conflict quickly developed between local cattlemen and sheepherders due to the overcrowding of ranges that resulted from the arrival and rapid growth of the Aztec Company's herd. By excluding all competitors from over two million acres of rangeland, the Aztec Company imposed a considerable hardship on the numerous local cattle ranchers and sheepherders who had previously exploited this formerly open range and who now had to compete with one another for the substantially reduced grazing lands that remained.[11] Simultaneously, a drought in New Mexico during 1885–1886 forced Hispanic sheepmen westward into northern Arizona in search of grass for their herds, complicating the rapidly deteriorating situation even further. As one contemporary source maintained, "before the coming of the railroad, there wasn't any trouble between sheep and cattlemen because there was altogether more land for everybody than they could possibly use." (see Kennedy, 1968, p. 15)

The Little Colorado River Basin, thus, became yet another arena for the classic struggle between cattle and sheep interests in the American West. However, as events in the Tonto Basin to the southwest indicate (see Barnes, 1931, 1932; Forrest, 1952), the arrival of the Aztec Company precipitated an increased competition for grazing land in northern Arizona that was felt beyond the boundaries of this region. A struggle developed in the Tonto Basin between the Grahams and the Tewksberrys, cattlemen and sheepmen respectively, which quickly erupted into the Pleasant Valley War leaving 21 men dead. The Aztec Company did not directly participate in this feud; however, many of its cowboys did, siding with the cattle interests in that basin.

Excluded from the range they had formerly exploited and experiencing increased competition on the lands which remained, the Little Colorado Mormon settlers also suffered from the arrival of the Aztec Company. Soon after the Hashknife outfit established its territorial claim, Joseph Fish (n.d., p. 19) described the Eastern Arizona Stake[12] herd as being in a "sickly

[11]In addition to the numerous cattle that were grazed throughout the region, approximately 100,000 head of sheep were regularly herded there prior to the Aztec Company's arrival, mostly by local Hispanic settlers. The sheep industry has completely disappeared from the region (see Peterson, 1978).

[12]The Mormon Church is divided administratively into stakes and wards, which may be compared to dioceses and parishes respectively in the Roman Catholic Church. During the nineteenth century, each Little Colorado settlement comprised one ward. Wards in the lower valley of the Little Colorado River were initially organized into the Little Colorado Stake, with the remaining wards included within the Eastern Arizona Stake. In 1887, local wards

condition . . . hardly able to maintain an existence." Fish (*ibid.*, p. 21) further noted that as early as 1877, "many of our people were disposing of their stock as fast as possible." Equally troublesome was the rampant lawlessness which followed the Aztec Company's arrival. The violence and banditry attributed to the cowboys of the Hashknife outfit was felt throughout the region (cf. Barnes, 1931, 1932; Lesueur, n.d.; Fish, n.d.; Forrest, 1952; Wayte, 1962; Kennedy, 1968; Peterson, 1973). Formerly isolated and subject exclusively to the consequences of their own actions, the Mormon population soon found itself in the midst of a rowdy and frequently violent cattle frontier. Fish (n.d., pp. 71-75) chronicled some 50 persons killed during the years immediately following the Aztec Company's arrival, several of whom were Mormons, and local church records reported that "nearly all of the valuable horses in the Snowflake part of the country were driven out, the settlers thus losing thousands of dollars" (Jensen, n.d., 4/2/1887). The isolation of their towns and the conspicuous aloofness they maintained made the Mormons a favorite target of the rustling and violence perpetrated by the Hashknife Outfit. However, many other persons also paid dearly for the rustling committed by the Hashknife cowboys, including the stockholders in the Aztec Company itself (see Kennedy, 1968, p. 18-19).

Perhaps the most immediate threat which the Aztec Company presented to the Little Colorado Mormon settlers was the potential loss of the lands they had farmed and the communities they had struggled to build during the previous ten years. Unable to persuade the government to grant the railroad other lands to replace those which the Little Colorado Mormon settlers had occupied, Jesse N. Smith, the Eastern Arizona Stake President, negotiated with the Aztec Company for the purchase of seven sections of land (1813 hectares) in and around Snowflake and Taylor. Smith finally agreed to a purchase price of $4.50 per acre. One-fifth was paid down, with the balance to be paid in four yearly payments at an interest of 6% per annum (Fish, n.d., p. 66). At $4.50 per acre, the settlers at Snowflake and Taylor were charged $20,160.00 for land which had cost the Aztec Company $2,240.00.[13]

were reorganized into the Snowflake and St. Johns Stakes, containing the western and eastern settlements, respectively. The Eastern Arizona Stake herd consisted mostly of cattle that the local church organization had accumulated from individual tithing contributions.

[13]By comparison, the settlers at Woodruff, who were resident on land owned by the Atlantic and Pacific Railroad, were forced to pay $8.00 per acre for the land they had to purchase (Fish, n.d., p. 66). At $8.00 per acre, the settlers at Woodruff were charged $5,120.00 for land granted to the railroad for free. The railroad company clearly exploited the fact that it had the settlers at Woodruff in a poor bargaining position, as $8.00 per acre was a particularly high price for land in this basin, even given the speculative climate of the time. In both of the above situations, Church headquarters in Salt Lake City assisted in the negotiations and forwarded the money needed to cover the downpayments. In 1891, the Church paid both the Atlantic and Pacific Railroad and the Aztec Company the full

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OVERGRAZING

The most enduring legacy of the Aztec Land and Cattle Company's brief reign has been the impact it had on the local grassland and juniper-piñon woodland communities. Widespread grassland deterioration occurred throughout the region as a result of the severe overstocking of ranges that prevailed during the late nineteenth century. Local authorities presently estimate that between seven and ten animal units[14] could have been supported on one section of local rangeland prior to its deterioration during the 1890s. The Aztec Company clearly exceeded these figures. Grazing 60,000 head of cattle on two million acres, the company maintained animal densities of nearly 20 animal units per section, that is, between two and three times what the land could support. Overgrazing in conjunction with the disastrous droughts of the 1890s had a swift and devastating impact on the grassland community. This impact is clearly reflected in the observation of an early pioneer.

> When we came to Arizona in 1876, the hills and plains were covered with high grass and the country was not cut up with ravines and gullies as it is now. This has been brought about through overstocking the ranges. On the Little Colorado we could cut hay for miles and miles in every direction. The Aztec Cattle Company brought tens of thousands of cattle into the country, claimed every other section, overstocked the range and fed out all the grass. Then the water, not being held back, followed the cattle trails and cut the country up. Later tens of thousands of cattle died because of drouth and lack of feed and disease. The river banks were covered with dead carcasses. (quoted in McClintock, 1921, p. 191)

As Kennedy (1968, p. 21) notes, "the Texans fled to Arizona to escape the effects of their malpractices. They proceeded to repeat the process in Arizona. Drought and range deterioration followed as a matter of course." And, as previously happened in Texas, the devastation came quickly and resulted from the speculative nature of the nineteenth-century cattle industry. With large sums of money invested in herds, specific prices needed to be obtained if speculators were to recover their investment. When drought conditions prevailed and prices declined in an ensuing buyer's market, the Aztec Company withheld its herd from sale and waited for prices to return to their previous levels. However, the drought of the 1890s persisted—as droughts so frequently do in the arid West—and devastation was wrought upon herds and grazing lands alike.

purchase price for all the land acquired at Snowflake, Taylor, and Woodruff in order to assure that the settlers would quickly gain clear title to their lands. Although the settlers in these towns were initially expected to repay the Church the money it had forwarded, the drought and the ensuing depression of the 1890s made repayment impossible for most. In the end, the Church assumed these debts, further subsiding the colonization effort.

[14]An animal, unit equals one cow and her calf.

The overstocking of Little Colorado ranges did not cease with the demise of the Aztec Company, however. Cattle and sheep numbers remained relatively high. Apache County assessment rolls registered an average of 35,119 head of cattle and 117,762 sheep between 1916 and 1925 compared to an average of only 19,630 cattle and 3882 sheep between 1958 and 1967. Overgrazing continues to be a problem even today. Due to the unpredictable nature of local precipitation, ranchers experience difficulty adjusting cattle numbers to changing moisture conditions. They, therefore, stock their ranges for conditions intermediate between high and low extremes (Salt River Project, 1974 [Section 3], p. 42). Given the level of overstocking that prevailed during the nineteenth century, the perpetuation of an intermediate stocking strategy (see also Underwood, 1970) has, in effect, functioned to preserve the already deteriorated condition of the range. Consequently,

> the once almost pure stands of winter fat on the heavy alkaline-free soils have been virtually eliminated and replaced by snakeweed and rabbitbush. The broad expanse of grass that once covered most of Navajo and Apache Counties has deteriorated under heavy grazing pressure and become overrun with snakeweed and pinque. (Salt River Project, 1974 [Section 3]: 76)

Several indicators signify the existence of overstocked ranges. One is the relatively sparse vegetation cover. As previously indicated, between 55% and 65% of the surface area within the grassland community is devoid of vegetation. An equally significant indicator is the relative predominance of nonpalatable perennial grasses. As already mentioned, the herbaceous class of vegetation accounts for only a small fraction (between 3% and 14%) of the total vegetation contained within the grassland and juniper-piñon woodland communities. Palatable shrub species are similarly scarce, and the frequency of unpalatable grasses such as ring muhly is high. Galleta, the most commonly occurring grass, is practically useless for grazing when dry and can even be lethal if consumed in sufficient quantities by livestock while in its dry state (see Schmutz et al., 1968).

Another indication of overgrazing is the expansion of juniper trees into the grassland community. The grazing habits of livestock provide the very conditions which facilitate juniper expansion (see Nichol, 1937, p. 191). Juniper seeds germinate only after they have passed through the alimentary tract of an animal. Livestock, thus, facilitate the dissemination of juniper seeds at the same time that they remove the competing grasses which inhibit juniper expansion. Controlling the spread of juniper has been a major concern of local ranchers, especially in recent years, and extensive stands of juniper may be seen uprooted throughout the region as a result of widespread bulldozing. "Chaining," as this process is called, has been undertaken—most notably north of Snowflake—in order to control the spread

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of juniper and, thus, increase the number of palatable grasses available for cattle. However, the "chaining" of juniper has also been extended into areas where these species normally occur in order to increase the productivity of that rangeland as well.

The extensive range deterioration that occurred during the late nineteenth century and its perpetuation throughout the twentieth century has significantly reduced local range productivity. Rangeland in the Joseph City area is currently producing 225 pounds of forage per acre (41 kg per hectare) per year. This is only 45% of the 500 pounds of forage per acre (92 kg per hectare) per year that is considered the potential range productivity at this location (Dames and Moore, 1973 [Section 4], p. 225). Consequently, only 6 or 7 animal units can be supported per section in the Joseph City area (*ibid.*, p. 235). An estimated 3.5 and 9.9 animal units can be supported on a section of rangeland in the Snowflake[15] and St. Johns areas respectively (Salt River Project, 1974 [Section 3], pp. 85, 105). These figures represent perhaps one-third to one-half the number of animal units supportable prior to the 1880s, and a 40% reduction in current grazing levels has been proposed as the decrease needed to restore the Little Colorado ranges to their full productive potential (Dames and Moore, 1973 [Section 4], p. 225).

SURFACE WATER

Overgrazing has also had a detrimental effect on surface water in the basin and, therefore, on those who depend on this resource. Given the prevailing arid climate and the erratic nature of local precipitation, irrigation is a prerequisite for farming in the region, and surface water was the only source of water available to local farmers prior to the exploitation of groundwater resources. Only two streams of any significance exist within the region: the Little Colorado River and Silver Creek. The Little Colorado River begins as snowmelt on Mount Baldy and crosses the region in a northwesterly arc, eventually entering the Colorado River above the Grand Canyon. Silver Creek originates from Silver Creek Spring southeast of Taylor and flows northward until it meets the Little Colorado River above Woodruff. Silver Creek is the only fully perennial stream in the entire region. The Little Colorado is perennial south of St. Johns only, at which point its flow becomes intermittent and confined to subsurface channels

[15]It is significant that the supportable number of animal units on the land north of Snowflake is the lowest in the region. This is also the location where "chaining" has been used most extensively to control juniper expansion. This was the territory owned and grazed by the Aztec Company.

most of the year. All other streambeds in the basin are dry throughout the year and flow only in immediate response to precipitation.

Surface flow in the Little Colorado follows a distinct annual cycle (see Fig. 3). Streamflow is generally moderate through the winter months as intermittent warming causes the melting of accumulated snowpacks at higher elevations. The gradual runoff which this snowbelt produces continues until the early spring, by which time the snowpacks have generally disappeared. Then, with the onset of intense summer storms in July, both the velocity and the volume of water flowing in the Little Colorado increase dramatically. Streamflow subsequently subsides again as the summer storms recede and remains low until snowpacks re-accumulate in the southern highlands.

Surface water quality varies inversely with elevation (see Fig. 4). Water quality is quite high in the Little Colorado south of St. Johns. However, it deteriorates quickly downstream as the growing concentration of suspended and dissolved solids (particularly soluble salts) render it increasingly useless for either domestic, agricultural or industrial use (Dames and Moore, 1973 [Section 4], pp. 148-151). Dissolved solids in the Little Colorado near Holbrook normally exceed 500 mg/l (milligrams per liter) during average discharge conditions and increase to over 1000 mg/l during periods of high evaporation (*ibid.*). Porter (n.d., p. 8) estimated the annual silt discharge in the Little Colorado River at 27,500 acre-feet.[16] Similarly, a U.S. Department of the Interior report (1946, p. 152) suggested that in one year the Little Colorado River transports "the equivalent of nine inches of topsoil from an entire township." Even Silver Creek, which originates from a clear mountain spring and which contains among the purest water in the basin near Snowflake and Taylor, quickly loses that purity as it descends towards the Little Colorado and receives water from its own tributaries along the way. The total sediment concentration in Silver Creek increases from between 119 and 160 parts per million near Snowflake and Taylor to over 400 parts per million just south of Woodruff (Bureau of Reclamation, 1947, pp. 66-67).[17]

The magnitude of silt deposition is most clearly illustrated by the history of Zion Dam and Reservoir, which is located on the Little Colorado River 15 miles (24 km) below St. Johns. Zion Dam was built between 1902 and 1905 and reconstructed in 1908 with a reservoir capacity of 12,896 acre-

[16]Acre-feet is the predominant measure used for calculating water volume in irrigation reservoirs in the U.S. No precise metric equivalent exists. An acre-foot represents the volume of water which would be contained within one acre (.4 ha) to the depth of one foot (4.7 cm).

[17]Milligrams per liter (mg/l) and parts per million (ppm) are roughly equivalent measures of chemical concentrations in water below 5000 ppm.

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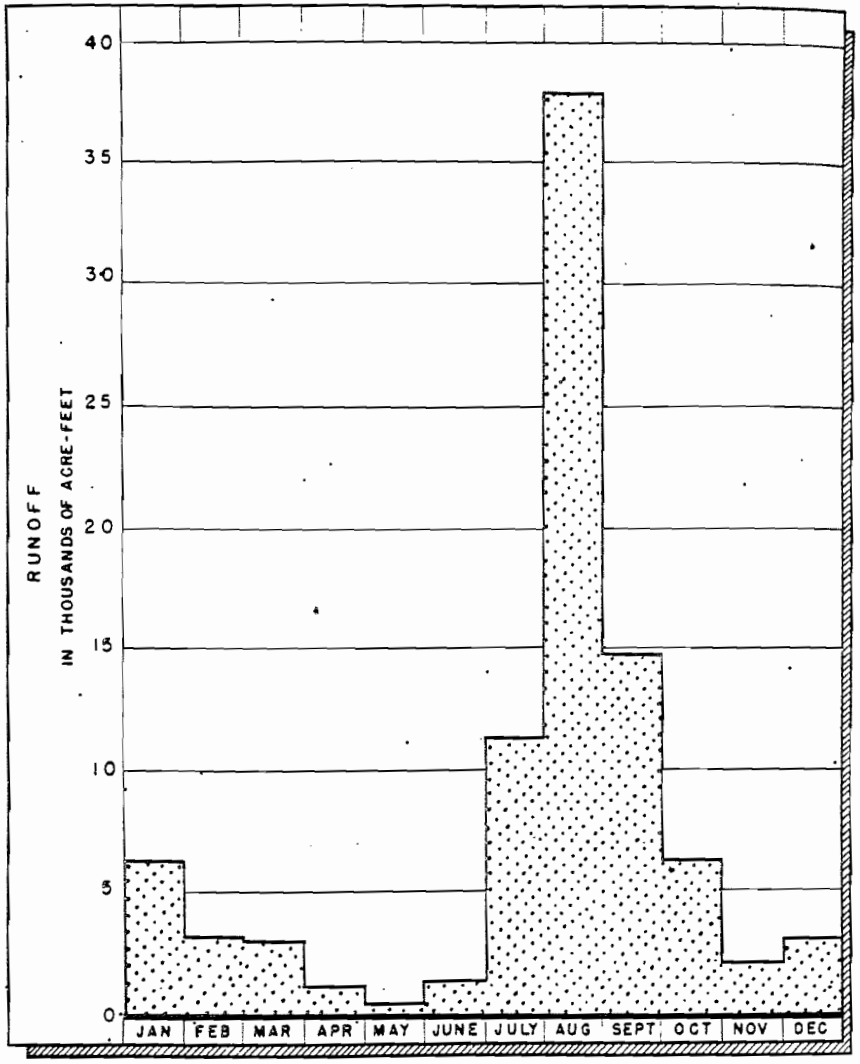

Fig. 3. Average monthly runoff: Little Colorado River at Holbrook.

feet (Akers, 1964, pp. 8-9). By 1952, over 22,700 acre-feet of sediment had been deposited behind this dam, reducing its storage capacity to a mere 760 acre-feet (*ibid.*). Continued silting eventually ended the use of this reservoir. Silting has even reduced the storage capacity of Lyman Reservoir, the largest reservoir in the region, which is located five miles (8 km) upstream from St. Johns. Leone (1979, pp. 92-93) maintains that continued silt accumulation not only rendered early Mormon dams increasingly useless, but that it also made them dangerous. According to Leone, Holbrook, which is located 10 miles (16 km) above the Joseph City dam, is continuously threatened with flooding as a result of the silt which has accumulated upstream from the dam.

The heavy silting of the Little Colorado River was also a prime factor inhibiting the successful construction of early Mormon dams. McClintock (1921, p. 141) has described the Little Colorado River as a "treacherous stream at best, with a broad channel that wanders at will through the alluvial country that melts like sugar at the touch of water." Consequently, settlers in the lower valley of the Little Colorado River were constantly forced to experiment with new sites and new construction techniques in their struggle to secure a permanent dam on this stream (see Tanner and Richards, 1977, pp. 41-50; Abruzzi, 1993, pp. 123-128). The lack of a firm foundation upon which to built their dams was the critical problem they continually faced, and St. Joseph's farmers constructed 15 dams between 1876 and 1923 before they achieved a permanent structure. One dam, which was constructed in 1884 and lost in 1887, contained 22 pilings driven 16–20 feet (5 to 6 meters) deep across the riverbed. Although the alluvium is less than 30 feet (9 meters) deep in most places (Babcock and Snyder, 1947, p. 7), in at least one location near Joseph City it has been measured at 180 feet (54.8 meters) (Dames and Moore, 1973 [Section 4], p. 155). Consequently, of all the Mormon towns in the basin, it was specifically those in the lower valley of the Little Colorado that had the most difficulty with their dams (see Abruzzi, 1993, pp. 121-142), and of the six towns which were settled there, only St. Joseph and Woodruff survived.

The high sediment content of the Little Colorado and its more northerly tributaries clearly predated the arrival of cattle ranching and the Aztec Land and Cattle Company. However, since grasses provide a dense root system which counteracts erosion during periods of high runoff, the decrease in effective floral cover caused by excessive overgrazing quickly resulted in increased soil erosion and the deposition of substantially greater amounts of silt into the Little Colorado at lower elevations.

The swiftness with which overgrazing can yield increased silting has been clearly illustrated by Colton (1937) further downstream. While excavating what he believed was a prehistoric pit house—the floor of the house

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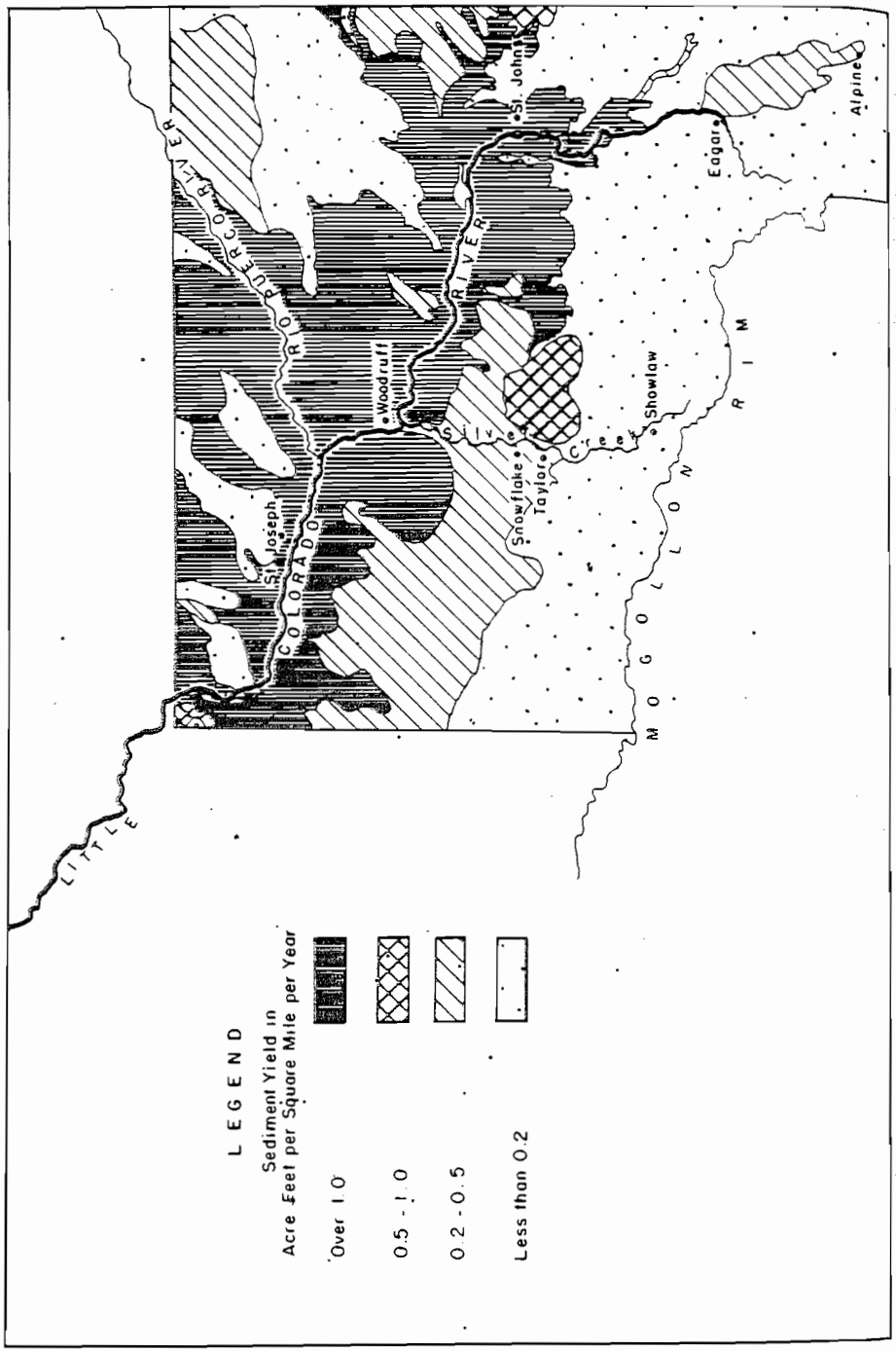

was 30 inches (76.2 cm) below the existing level of the river bank—Colton discovered that, in fact, the house had been built in either 1878 and 1879 and was still in perfect condition as late as 1884. At that time, both sides of the river supported cottonwood stands, while grama grass covered most of the surrounding hills. The house stood about 100 feet (30 meters) from the river and beaver were known to inhabit the stream, living off the cottonwood trees. However, in 1884 several thousand head of sheep were imported into the valley. The sheep were apparently maintained without noticeable range deterioration until the drought of the early 1890s, when Navajos reportedly entered the area to cut down the cottonwoods and feed them to their herds. When the rains resumed, there was no grass to hold the water and disastrous floods ensued depositing 30 inches (76.2 cm) of silt by 1935. When Colton returned to the excavation site in 1937, the river had widened another 14 feet (4.3 meters) and only the back wall of the house was still standing.

The declining quality of water in the lower valley that resulted from overgrazing was exacerbated by the growth of farming communities upstream on both the Little Colorado River and Silver Creek. Eventually, 37 reservoirs were constructed which impounded 72,795 acre-feet of water (Bureau of Census, 1930). Streamflow variability generally increases downstream in all river basins, since rivers drain an increasingly larger surface area at lower elevations. However, as more surface water was impounded behind dams upstream in the Little Colorado River and Silver Creek, a greater proportion of the streamflow in the Little Colorado near St. Joseph and Woodruff originated in the more ephemeral northern tributaries. Streamflow variability, therefore, increased further. More importantly, since the more northerly streams flow mostly in direct response to precipitation, they contain the highest sediment concentrations in the region, with a large proportion of this sediment consisting of exceptionally fine-textured silt derived from shale (Bureau of Reclamation, 1950, p. 9). Sediment loads in the Little Colorado River frequently approach 20% of streamflow (*ibid.*, p. 3).

Finally, since most of the water which emanates from these less desirable, northern tributaries enters the Little Colorado during intense summer storms, their high sediment content is added to the river at the very height of the irrigation season. Furthermore, as much of the better quality water originating in the southern highlands became increasingly appropriated upstream, farmers at St. Joseph and Woodruff had to cope with the fact that a growing proportion of their irrigation water originated in the Rio Puerco and other more northerly tributaries; that is, in those streams which contain the highest concentration of suspended and dissolved solids in the basin. The continued use of this water for irrigation steadily reduced the productivity of the soils farmed in the lower

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valley, and it is not uncommon to see fields there blanketed with a white layer of fine silt particles which coat the surface of the soil and bake dry in the hot summer sun. Due to its exceptionally fine texture, this silt produces a clay-like layer when it dries that is highly impervious to water. This imperviability causes poor drainage and inadequate soil aeration, both of which inhibit agricultural production.

CONCLUSION

Large-scale cattle ranching began in the Little Colorado River Basin during the 1880s following the arrival of the Aztec Land and Cattle Company. Significant local range deterioration occurred shortly thereafter as it had elsewhere in the American West following the expansion of the livestock industry. While grassland deterioration was greatest on Aztec Company land, it also occurred on the remaining lands where local ranchers and sheepherders were forced to graze their herds following the removal of the sizable Aztec Company holdings from local exploitation.

Numerous local indices of overexploited grasslands persist throughout the region even to this day, including the predominance of bare soil, the low percentage of herbaceous vegetation among the vegetation that remains, the widespread invasion of juniper trees into the grassland community, and the overall reduction in range productivity. Significantly, the worst conditions prevail on those lands which were owned and operated by the Aztec Company.

The ultimate cause of regional grassland deterioration lay in the speculative nature of the nineteenth-century range cattle industry and in the effect that livestock speculation had on local range management policies. Because range-stocking decisions were based on national market considerations rather than on local environmental conditions, the number and density of cattle that were maintained on local ranges was both excessive and unresponsive to the marked variability which characterized local climatic conditions. Furthermore, because the Aztec Company's stocking policy occurred within an arid environment which was not only variable but also highly erosive, its consequences were devastating and persist to this day. Current range productivity is still well below its estimated potential forage production level, and current descriptions of grassland conditions differ sharply from those recorded by early pioneers. However, diminished grassland productivity, while initially caused by the exploitative procedures of the Aztec Company, persists because local ranchers continue to apply inappropriate range management policies. Although contemporary range management policies are clearly less destructive than those followed by the

Aztec Company, they are nevertheless detrimental to local grasslands given the prior overexploitation that these lands have already sustained.

The material consequences of deteriorating grasslands were most profoundly and immediately felt by farmers and communities in the lower valley of the Little Colorado River who, because they existed downstream from all other users, necessarily bore the full brunt of changing conditions of resource exploitation elsewhere in the region. They were forced to irrigate their agricultural fields with water obtained from a river that became increasingly variable and silt-laden as a result of both overgrazing and the prior appropriation of higher-quality water upstream. It was specifically declining surface water quality and availability that prompted farmers at Joseph City to initiate permanent groundwater exploitation in 1924.

However, groundwater exploitation provided the lower valley communities with only a temporary escape from the negative consequences of resource exploitation upstream, because other water users soon followed suit. The basin witnessed a near-doubling of irrigated farmland between 1940 and 1980, the construction and expansion of three coal-fired electric generating stations and a major pulp and paper mill between 1960 and 1990, and a consequent tripling in the size of the regional population. Together, these developments yielded a 340% increase in regional groundwater exploitation between ca. 1950 and 1970 (Abruzzi, 1985, pp. 257-258) which subsequently produced a significant decline in both the quantity and quality of groundwater available to farmers and communities in the lower vallye (*ibid.*, pp. 258-261). The lower valley towns are, therefore, again suffering the negative consequences of changing conditions of resource exploitation upstream. Ironically, history is repeating itself in the Little Colorado River Basin.

REFERENCES

Abruzzi, W. S. (1985). Water and community development in the Little Colorado River Basin. *Human Ecology* 12: 241-269.

Abruzzi, W. S. (1989). Ecology, resource redistribution and Mormon settlement in Northeastern Arizona. *American Anthropologist* 91: 642-655.

Abruzzi, W. S. (1993). *Dam That River! Ecology and Mormon Settlement in the Little Colorado River Basin.* University Press of America, Lanham, MD.

Akers, J. P. (1964). *Geology and Ground Water in the Central Part of Apache County, Arizona.* U.S. Geological Survey Water Supply Paper 1771, U.S. Government Printing Office, Washington, D.C.

Babcock, H. M., and Snyder, C. T. (1947). *Ground-Water Resources of the Holbrook Area, Navajo County, Arizona.* U.S. Geological Survey, Ground-Water Resources of Arizona 4.

Barnes, W. C. (1931). The Pleasant Valley War of 1887: Its genesis, history, and necrology, Part I. *Arizona Historical Review* 4 (October): 5-34.

Barnes, W. C. (1932). The Pleasant Valley War of 1887: Its genesis, history, and necrology, Part II. *Arizona Historical Review* 4 (January): 23-40.

HP2300

Bureau of the Census (1930). *1930 Decennial Census.* U.S. Department of Commerce, Washington, D.C.
Bureau of Reclamation (1947). *Snowflake Project Arizona.* Project Planning Report 3-8b.2-0, U.S. Department of the Interior, Washington, D.C.
Bureau of Reclamation (1950). *Report on Joseph City Unit, Holbrook Project, Arizona.* Project Planning Report 3-8b.6-1, U.S. Department of the Interior, Washington, D.C.
Colton, H. S. (1937). Some notes on the original condition of the Little Colorado River: A side light on the problem of erosion. *Museum Notes of the Museum of Northern Arizona* 10(6): 17-20.
Dames & Moore, Inc. (1973). *Environmental Report, Cholla Power Project, Joseph City, Arizona.* Arizona Public Service Company, Phoenix.
Fish, J. (n.d.). History of the Eastern Arizona Stake of Zion and the Establishment of the Snowflake Stake. Historical Department, Church of Jesus Christ of Latter-Day Saints, Salt Lake City.
Forrest, E. R. (1952). *Arizona's Dark and Bloody Ground, Revised Edition.* Caxton Printers, Caldwell, Idaho.
Greenwood, N. H. (1960). *A Geographical Survey of the Upper Watershed of the Little Colorado River, Arizona.* M.S. thesis, Department of Geography, Brigham Young University.
Harrell, M. A. and Eckel, E. B. (1939). *Ground-Water Resources of the Holbrook Region, Arizona.* U.S. Geological Survey Water-Supply Paper 836-B, Government Printing Office, Washington, D.C.
Jensen, A. (n.d.). Eastern Arizona State Manuscript History. Historical Department, Church of Jesus Christ of Latter-Day Saints, Salt Lake City.
Kennedy, S. A. (1968). A General History of the Hashknife Range under the Aztec Land and Cattle Company, Limited. Unpublished Manuscript. Arizona Collection, Arizona State University Library, Tempe.
Lone, M. P. (1979). *The Roots of Modern Mormonism.* Harvard University Press, Cambridge.
LeSueur, J. W. (n.d.). Trouble with the Hashknife Company. James W. LeSueur Collection, File LeSu 6445, Arizona Pioneer Historical Society, Tucson.
LeVine, A. J. (1977). *From Indian Trails to Jet Trails: Snowflake's Centennial History.* Snowflake Historical Society, Snowflake, Arizona.
McClintock, J. H. (1921). *Mormon Settlement in Arizona: A Record of Peaceful Conquest of the Desert.* Manufacturing Stationers, Phoenix.
Nichol, A. A. (1937). *The Natural Vegetation of Arizona.* University of Arizona Agricultural Experimental Station Technical Bulletin No. 68, pp. 181-222.
Peterson, C. S. (1973). *Take Up Your Mission: Mormon Colonizing along the Little Colorado River 1870-1900.* University of Arizona Press, Tucson.
Peterson, S. (1978). Shepherd of the open range. *Arizona Highways* 54 (August): 2-9.
Porter, R. E. (n.d.). Joseph City Irrigation Company. Box 4, Filder 2, Special Collections, Northern Arizona University Library, Flagstaff.
Salt River Project (1974). *Environmental Report, Arizona Station Project: Snowflake and St. Johns Generating Station Sites.* Salt River Project, Phoenix.
Schmutz, E. M., Freeman, B. N., and Reed, R. E. (1968). *Livestock-Poisoning Plants of Arizona.* Tucson: University of Arizona Press.
Tanner, G. M., and Richards, J. M. (1977). *Colonization on the Little Colorado: The Joseph City Region.* Northland Press, Flagstaff, Arizona.
Underwood, A. H. (1970). A Study of Ranch Management Practices in Navajo County, Arizona. M. A. thesis, Department of Agricultural Education, University of Arizona.
U.S. Department of Interior (1946). *The Colorado River.* U.S. Government Printing Office, Washington, D.C.
Warner, R. W. (1968). United Order of the Little Colorado Stake in Arizona. Unpublished manuscript, Historical Department, Church of Jesus Christ of Latter-Day Saints, Salt Lake City.
Wayte, H. C. (1962). A History of Holbrook and the Little Colorado Country (1540-1962). M. A. thesis, Department of History, University of Arizona.
Webb, W. P. (1931). *The Great Plains.* Grossett and Dunlap, New York.

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The "Dragon of Kovachitsa": Local Perceptions of Radioactive Pollution Near the Kozlodui Nuclear Power Station (Bulgaria)

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There is continuing uncertainty surrounding the safety of nuclear power stations in Eastern Europe, among them the one at Kozlodui, Bulgaria. It is argued in this paper that attempts on the part of the state to assert the safety of nuclear power stations are expressed in terms of an official "nuclear-safe" discourse, while the local inhabitants near the Kozlodui nuclear power station employ a vernacular mode of expression to explain possible radioactive pollution.

KEY WORDS: mode of discourse; power code; vernacular mythologies; nuclear power stations; Bulgaria.

BACKGROUND

The construction of the nuclear power station (NPS) at the small town of Kozlodui, on the Bulgarian bank of the Danube, began in 1974. The NPS currently operates six reactors: four VVER 440 and two VVER 1000. The station was built to help alleviate the rapidly increasing energy problems of the country. The numerous water-power stations built during the 1950s, and the coal power stations built in the 1960s were no longer producing sufficient energy to keep up with the demands of migration-inflated cities and equally inflated heavy industry. Thus, the building of the Kozlodui station not only appeared to solve the energy problem, but also was hailed by official propaganda as evidence that Bulgaria should now be counted among the technologically sophisticated nations.

The building of the nuclear power station in Kozlodui coincided with a push by the Bulgarian Communist Party, personified by Todor Zhivkov,

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