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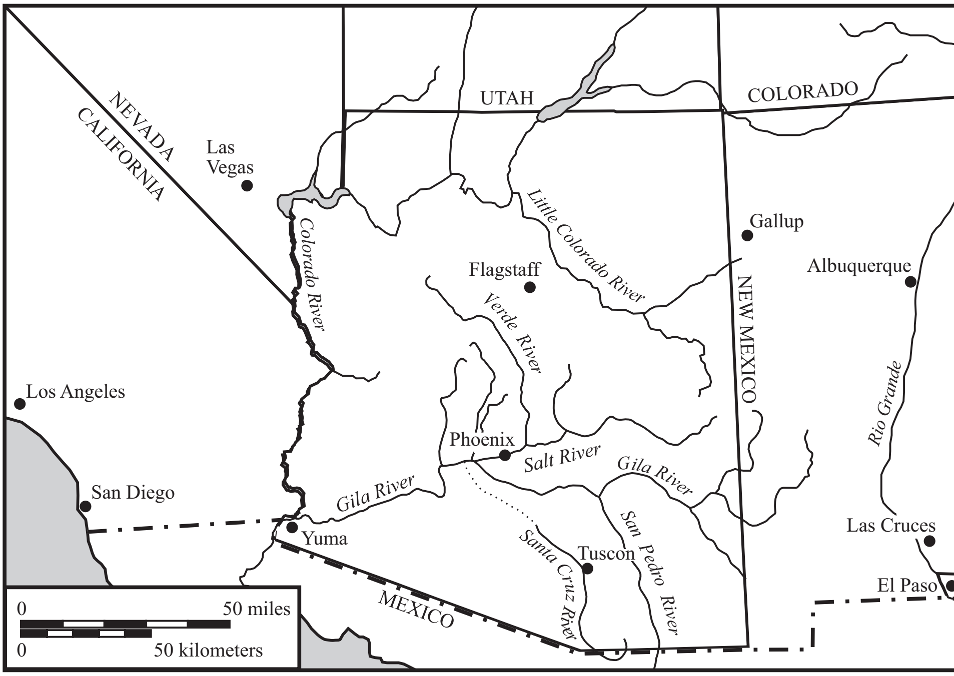
Two Rivers

THE SETTINGS OF the two cities exhibit only slight variations in terrain, vegetation, and annual rainfall and at first glance give little indication that such divergent urban development could take place in the twentieth century. The two cities seem to be situated similarly within desert surroundings. Sunshine is plentiful; rainfall is scant. As Arizona's commissioner of immigration noted in 1889, "The air is dry; bright, sunshiny days the rule; cloudy days the exception."[1] Elevation, ambient temperature, and vegetation differ minimally. On the other hand, minor differences at times proved to be significant. Along the rivers—the Salt River at Phoenix, the Santa Cruz River at Tucson—similar riparian ecosystems marked the water courses close to the rivers, but within the broader ecosystem slight differences occurred. Thirsty vegetation such as cottonwood and willow hugged the stream banks. Mesquite, tapping groundwater up to eighty feet beneath the surface, spread farther from the surface water, at times occurring in thick *bosques* (forests). In the vicinity of the rivers and in the mesquite forests, wildlife flourished. Fertile alluvial soil supported grasses, vines, and lush undergrowth. With greater distance from the rivers, cactus and desert shrubs came to dominate the terrain, along with their indigenous wildlife species, including desert bighorn sheep, mule deer, and jackrabbits. It was in these broad valley expanses that the slight differences in the two locations became clear.[2]

Ambitious farmers established the location of the Phoenix settlement, eleven hundred feet above sea level, in the center of the Salt River valley in 1870. At that elevation in the lower Sonoran desert, June high temperatures soar to over 110 degrees. Tucson began as a Spanish presidio in 1775. More than one thousand feet higher than Phoenix (twenty-four hundred feet above sea level) and about 120 miles to the southeast, Tucson enjoys temperatures about ten degrees cooler—still hot and dry, but distinctly less so. Having personally experienced such temperature extremes in both locations, I can attest to the fact that there is a great difference between 110 degrees and 100 degrees, even when accompanied by single-digit humidity. In comparison, the 10-degree difference renders 100 degrees downright pleasant. Phoenix is also drier than Tucson. Phoenix expects about seven inches of rainfall per year. Tucson on average receives twelve inches. Given the semiarid setting, the five additional inches of rain per year in Tucson is significant, although no doubt still insufficient for those who prefer verdant surroundings. The modest additions to annual rainfall make for a more succulent appearance to the desert in Tucson. Palo verde and mesquite trees give modest shade, and various types of cactus abound, saguaro most notably—a national park in Tucson preserves impressive stands. The drier setting of Phoenix prior to urbanization was dominated by spindly clumps of creosote bush, hackberry, and desert broom. More sparsely vegetated, "an arid, forbidding land," Phoenix presented a much less hospitable appearance.[3]

Fitful streams had serviced irrigated agriculture in the desert valleys since prehistoric times. The rivers barely trickled in the dry summer months and conversely raged in destructive floods during seasonal wet cycles. These environmental factors were critical to future urban development.

At the most basic level, the rivers and their watersheds determined the extent of human society in the region. I am not arguing here for an environmentally deterministic explanation of city development. Other factors, emanating from human culture, clearly affected the placement and expansion of the two communities. It is important to understand, however, that environ-



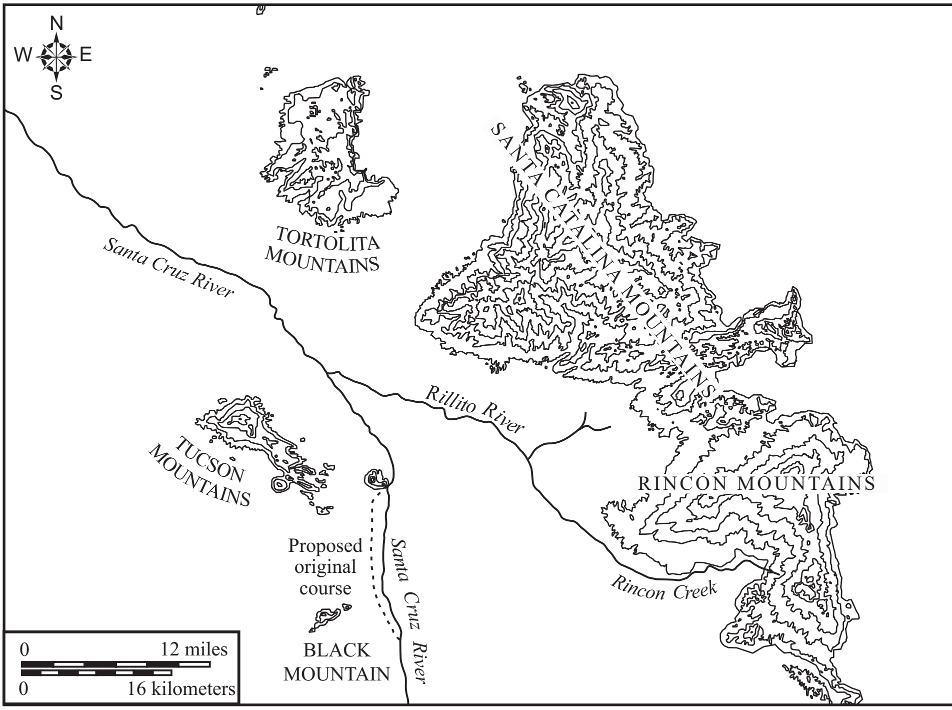
Map 1.1. Arizona and the Southwest. Arizona in its southwestern region, showing the location of urban centers and the rivers that gave rise to the cities of Tucson and Phoenix.

mental factors were often the most dominant in preindustrial societies. Among the industrial societies of the late nineteenth and early twentieth centuries, physical conditions of terrain, climate, and hydrology became more tractable and manageable. With a progressive sense of optimism, residents of the two desert valleys expressed both the certainty and hope that environmental limitations had been swept away by human artifice. Preindustrial societies, on the other hand, lived within natural constraints determined by their environment. The early societies consistently endeavored to stretch nature's limits to the greatest degree possible, or allowable, within their ethical and spiritual concepts of appropriate behavior. But nature set the parameters. What societies do with the parameters depends on their political, social, and cultural guidelines, as well as on their mechanical abilities. At those times when mechanical abilities were limited, or a cultural reverence for nature was heightened, nature exerted a dominating force on the human society.

The Salt River at Phoenix drains a watershed of about 12,700 square miles, while the Santa Cruz River has a watershed of about 8,500 square miles.[4] Given the smaller watershed, the Santa Cruz River flowed at a meager rate of about twenty-five cubic feet per second (cfs) during low-flow periods (measured in the fairly moist year of 1884), while the Salt River's low-flow rate averaged about 116 cfs (averaged from 1889 to 1901).[5] At this basic level, the Salt River could be expected to perform at a rate more than four and one-half times greater than the smaller Santa Cruz. Although this fact did not seem overly significant in 1890, when Tucson still held the lead over Phoenix in population and prosperity, during the subsequent period, in which calls for federal reclamation appeared, the potential usefulness of the Salt River became pivotal.

Rivers spring from their watersheds, which amount to the land mass—mountains, canyons, mesas, valleys—upon which precipitation falls to create the stream. Once engorged, the stream takes on a character of its own, and its personality is formed by the mountains and canyons that gave it birth. The mountains, valleys, and plains through which the river flows determine whether the river trickles, meanders, or rages. To gain an understanding of any river's nature, it is first necessary to grasp the fundamental circumstances of the river's watershed.

Mountains and valleys seem timeless in their physical configurations, but geologists posit with assurance the relative youth or decrepitude of mountain ranges and the rivers flowing through their intervening valleys. In the case of central and southern Arizona, the local mountains began forming about 50 million years ago, supplanting the previous landscape of huge tropical swamps on the margins of ebbing and flowing seas. The seascape had developed about 100 million years ago during the period known as Cretaceous, next most recent to the Jurassic era of dinosaurs. Central and southern Arizona were on the southern and eastern shore of the migrating sea, respectively. Plate tectonics and orogenic episodes of mountain building directed the waters hither and yon. About 60 million years ago, the Sierra Nevada mountains began to arise, creating a barrier to the west that created a huge inland sea. The high mountains to the west also formed an obstacle to rain and storms emanating from the Pacific, creating a rain shadow effect that significantly dried the downwind areas. As the next tens of millions of years ticked off, the range and basin terrain of the American Southwest formed as the inland sea slowly retreated and ultimately disappeared. Mountains rose in sharp, craggy eruptions;



Map 1.2. The Tucson Basin. The basin and its rivers and surrounding mountains and the two courses of the Santa Cruz River are shown.

then erosion proceeded to wear down the uplifted blocks of rock to form the basins and valleys between the peaks. In succeeding events over millions of years, mountains arose, sediment washed down, and the valleys filled with alluvium to depths, in places, of twenty thousand feet. Much more recently, perhaps 1 or 2 million years ago, the valleys so filled with sediment saturated by eons of rain and runoff, that flowing streams and rivers appeared. In both valleys, the subsurface geology indicates the rivers' early history, at times in somewhat surprising fashion.

The Tucson Basin is the middle of three basins in the Santa Cruz River valley. In the far-distant past, the three basins existed independently, runoff forming playa lakes that dried quickly in the bright sunshine. Eventually sedimentation filled the basins to the point that runoff flowed through each basin in succession, creating the protoriver in the Santa Cruz valley 0.7 to 0.25 million years ago.[6] Initially there may have been two rivers. The historical Santa Cruz River flows first to the south into Mexico, then makes a unique U-turn to the north, and reenters the United States near Nogales. The subsurface geology suggests, however, that the original river may have flowed steadily south.[7] In this supposed scenario, the first stream forming in the high basin of the San Raphael Valley would have flowed steadily south in the Magdalena River watershed in Mexico. A second stream would have formed at the head of the middle basin of the Santa Cruz River valley. This stream would have flowed northward through the middle and lower basins of the valley, eventually joining the Gila River system in central Arizona.

Regardless of the geological mystery and the question of two oppositely flowing rivers, the existent Santa Cruz River flows south first and then north. The river enters the Tucson Basin from the south, flowing generally northwest toward its confluence with the Gila River near Phoenix. The distance from Tucson to the river junction is about ninety miles. The topography of the region was described and categorized in 1931 by geologist Nevin Fenneman. The Tucson Basin lies in the Mexican highland section. Most of the lower basin of the Santa Cruz and the Phoenix Basin to the north fall within the lower and drier Sonoran region. The Mexican highland terrain is marked by more succulent cacti species and more varieties of grasses and woody shrubs.[8]

The river in the Tucson Basin was shallow and meandering, hugging the more recent mountains (the result of volcanic extrusions about 1 million years ago) on the western border of the basin.[9] The river's floodplain lay at the foot of low *bajada* (descending) slopes that formed the transition zone from the river to the valley floor. During flood episodes, the river would spread across a mile or more of floodplain framed between the gently terraced uplift to the basin floor. Drainage in the basin flowed generally south to north and east to west. From the eastern side of the basin, moisture and runoff from the surrounding mountains made their way to the river to the west through dozens of minor and major arroyos and stream channels that traversed the mildly rolling terrain.

The Santa Cruz River's broad, shallow valley lacks the sort of rocky narrows favored by turn-of-the-twentieth-century dam builders. On the other hand, the valley—and particularly the Tucson Basin—rests upon thousands of feet of alluvium that contained millions of acre feet of stored water (an acre foot is the amount of water it would take to cover an acre of land one foot deep, or 325,851 gallons). More than twenty thousand feet of silt, sand, and gravel has eroded down from the surrounding mountains.[10] Beneath the sediment is the impermeable bedrock—the ancient roots of the surrounding mountains. On top of the bedrock, and for most of the depth of eroded material, are the most highly compacted (consolidated, in the language of geologists) formations—this is the older alluvium. The permeability of the older alluvium is limited; nonetheless the total volume of stored water is probably quite large because of the huge volume of sediment itself. In general this deep water is inaccessible because of the difficulty and expense of lifting it to the surface. The low permeability of older alluvium causes underground water to move especially slowly through the formations. This results in wells that are slow to recharge. The problem is threefold: the expense of sinking a deep well, the cost of lifting water from such extreme depths, and the slow recharge of especially deep wells.[11]

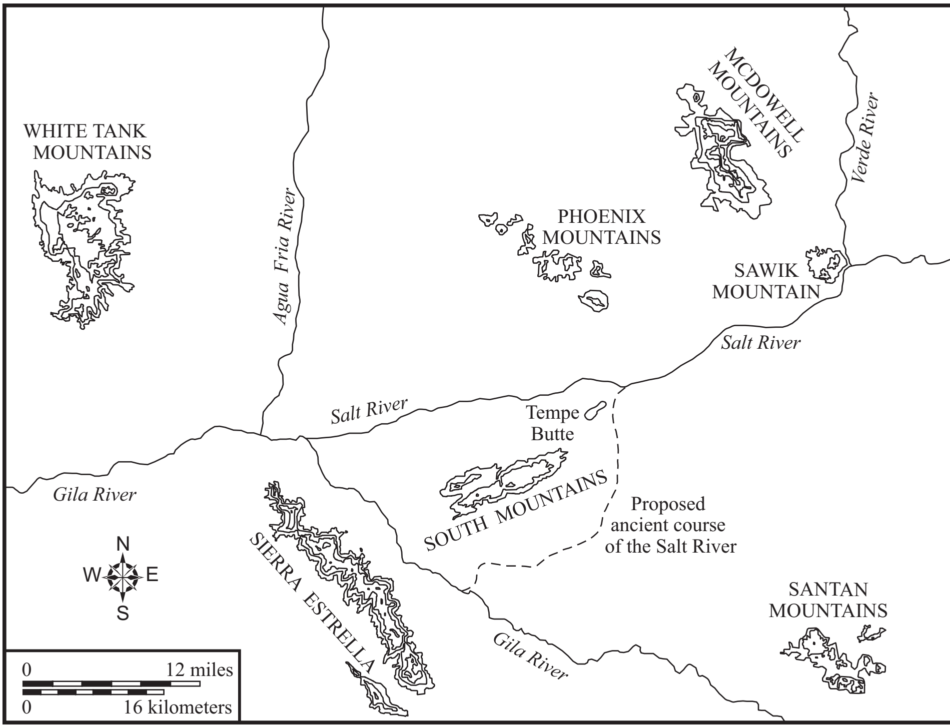
Resting on the more ancient deposits are the relatively recent (0.7 to 0.25 million years old) sediments known as younger alluvium.[12] The highly permeable younger alluvium, in places more than a thousand feet deep, allows water to move more freely. Difficulty arises, however, when trying to apply our human-driven perceptions underground; we have to adjust, for instance, our concepts of speed and free movement. Geologists tell us that groundwater moves through permeable strata at the relatively quick rate of a little more than two hundred feet per year.[13] That speed translates into the passage of an inch every 3.7 hours. Snails travel faster. Even earthworms munch their way through the earth at a faster rate.

Before extensive groundwater pumping was carried out in the twentieth century, the younger alluvium in the Tucson Basin held about 70 million acre feet of water.[14] This is a staggering amount of water, the result of eons of precipitation and snow melt. The human demand for water since the onset of industrial society has been staggering as well. Since the turn of the twentieth century, groundwater mining has steadily depleted the underground supply, causing the water table in the basin to drop in places several hundred feet. At the turn of the twenty-first century, projected overdraft of the aquifer (the amount of water removed from wells beyond that returned to the aquifer through recharge) was more than 3 million acre feet from 1995 to 2025.[15] Given a supply of 70 million acre feet, an overdraft of 3 million over thirty years may seem somewhat paltry. After all, such rates of withdrawal from the aquifer could stretch into the upcoming centuries. Alarm arises, however, because of the finite quality of the resource. Once the 70 million acre feet are gone, Tucson simply ceases to exist, at least in any form recognizable by current residents of the valley.

The flowing streams and green ribbons of vegetation in the arid Southwest have always appeared shocking, if not miraculous. The more typical brown and thorny surroundings are a testament to the prevailing dry conditions. The streams exist only because so much rain and snow falls on the mountainous watersheds. Whereas seven inches or less of rain may fall on the Phoenix Basin each year, over thirty inches will accumulate on the peaks of the upstream mountains.[16] The Salt River benefits from a much more extensive watershed than does the Santa Cruz. Peaks over nine thousand feet overlook the Santa Cruz River valley, but the Salt River in central Arizona emanates from a more general uplift in the terrain. The Salt River's watershed reaches to the east and northeast first to the central mountains and the Mogollon Rim country (three thousand to five thousand feet in elevation) and beyond to the flatter and higher Colorado Plateau (five thousand to six thousand feet in elevation).[17]

The drainage from the high plateau country flows generally to the southwest and west. The Verde River drains extensive territory to the north and joins the Salt River to the northeast of Phoenix. Augmented by the Verde's flow, the Salt River joins the Gila River to the west of Phoenix, near the Gila's confluence with the Santa Cruz River. Continuing west and enlarged by the two tributaries, the Gila joins the Colorado River near Yuma. Compared to the Colorado, the Gila's flow pales, and so the tributary relationship is clear. But upstream the three component parts of the Gila River seem mislabeled, at least as far as volume is concerned. Most diminutive is the Santa Cruz, flowing at a rate less than one-quarter that of the Salt. In second place is the Gila, flowing at a rate typically one-third that of the Salt. According to the volume of the river's flow, maps should be redrawn and the river joining the Colorado near Yuma should be called the Salt.[18] Yet the Gila River is considered the main stem and the other streams, the branches.

The Gila's claim to primacy rests mainly on its length, which surpasses that of the Salt. Another factor is simply the geographic placement of the rivers. Spanish explorers wandered into the region in the late 1600s, traveling generally south to north, encountering first the Santa Cruz and Gila rivers and their Native American inhabitants. No settlements existed on the Salt River, named Salado by the Spanish, and so the Spanish initially showed little interest. Later



Map 1.3. The Phoenix Basin. The basin and its rivers and mountains, including the ancient course and the suggested underflow of the Salt River, as described by geologist Willis T. Lee in 1904, are shown.

Spanish prospectors discovered gold deposits in the narrow canyons of the Salt River upstream from the Phoenix Basin, but the remoteness of the area from Spanish presidios along with its proximity to Apache realms rendered the Spanish development efforts extremely haphazard. The Salt River was marginal to the Spanish occupation of the region. The Gila, on the other hand, was central to the Spanish. The headwaters of the Gila arise in the mountains of western New Mexico, near the nexus of Spanish colonization in the Río Grande valley.

Regardless of the hierarchy in labeling, the Salt River's traverse through the central mountains into the Phoenix Basin is significant because the journey required that the river cut its way through several narrow canyons that proved to be more or less perfect dam sites. Not only did the Salt River possess greater volume, it also presented more tractable features to early-twentieth-century engineers. This is not to suggest that Phoenix rose to metropolitan supremacy in the state solely because of the water supply. Rather, the circumstances of the Salt and Santa Cruz rivers provided the baseline parameters for human society in the valleys. Even before the construction of high dams in the early 1900s, the Salt River potentially could support greater human populations. Whether it did so or not was dependent on the human societies themselves. The strategies for water use formulated by the societies in the valley were certainly influenced by the environmental circumstances, but the political decisions regarding the manipulation of water supplies were also subject to a myriad of cultural variables.

The Salt River enters the Phoenix Basin from the east. The basin itself is subdivided into several smaller basins formed by hills and buttes.[19] Examples of the dividing structures are the twin Tempe and Papago buttes and Camelback Mountain. The subbasins (Paradise Valley, for example) are composed of alluvium eroded down from the surrounding hills and mountains. Geologically speaking, the Phoenix Basin is generally only half as deep as the Tucson Basin. The alluvium in the center of the Phoenix Basin is about ten thousand feet thick, whereas sediment in the Tucson Basin extends to depths of twenty thousand feet. The basins share a similar subsurface geology of older and younger alluvium, with stored water resources more readily available closer to the surface. Likewise, the two basins exhibit comparable bajada slope configurations. Prior to urbanization, the Salt River meandered within a floodplain of varying width between gently rising terraces. In places the terraces were shallow—four feet—in other places fifty feet or more. The highest terrace in the Phoenix Basin was the Sawik Terrace, 235 feet above the river.[20]

South Mountain forms the southern boundary of the basin, so named because the river flows from east to west to the north of the mountain. Such geologically determined names seem to be the safest, free of any cultural embellishment that might run afoul of future political correctness and guaranteed of a basic spatial accuracy. Not to dispute the contemporary accuracy of the name, geologists suggest that the Salt River initially flowed on the other side of the mountain. Prior to the most recent sedimentation, an obstructing crystalline ridge ran from the east end of South Mountain to the north through Tempe and Papago buttes, culminating in the Phoenix Mountains. Most of that ridge is now buried under sediment. The buttes near Tempe are a much eroded, visible reminder of the structure. In the past the Salt River was diverted by the ridge, flowing southwest around the eastern end of South Mountain, joining the Gila River much farther upstream and, coincidentally, bypassing completely the future town site of Phoenix. Even after sedimentation had created the historic channel of the river to the north of South Mountain, the ridge continued to block the underflow of groundwater in the aquifer. At the turn of the twentieth century, a large marsh and lake filled the Gila River channel east of South Mountain. The lake seemed unusual, since the Gila River typically was dry for a reach of fifty miles upstream from the lake. U.S. Geological Survey (USGS) hydrologist Willis T. Lee expressed the opinion in 1904 that the lake, six feet deep and four thousand feet long, resulted from the Salt River's underflow.[21] According to Lee, below the surface of the valley the crystalline ridge directed the ooze of groundwater to the south, while aboveground the surface flow trended steadily westward. Eons of surface flow had regularized the channel to the north of South Mountain.

A trickle during the dry seasons and periodic droughts, a flooding torrent during heavy monsoons or El Niño episodes, the perennial stream of the Salt River supported a riparian ecosystem of plants and animals that flourished within the river's pattern of periodic constancy. Its virtue was reliability, even if a somewhat tempestuous nature characterized the flow. Cottonwoods and willows lined the banks, while grasses and mesquite occupied the open spaces between river and bajada slopes. In places where the river's meanders created especially broad open spaces, half-moon-shaped meadows of grass and thick mesquite forests occurred. On the rocky bajada slopes grasses diminished but mesquite persisted, its taproots able to reach water at greater depths.

All manner of wildlife gravitated toward the lush green river channel: six species of hooved animal, including mountain sheep and mule deer; twenty-three types of carnivore, including mountain lions and bobcats; twenty-nine variations of rodent; five types of rabbit; sixteen species of bat; and one insectivore, the vagrant shrew. In addition to the four-legged critters and bats along the river, there were forty-six types of bird, including ducks, herons, doves, swallows, warblers, owls, and hawks. Reptiles and amphibians also inhabited the river's ecosystem.[22]

The first human beings in the valley were ancient hunter-gatherers, venturing into the valley because the river supported the game animals and edible plant life they required for subsistence. At this very basic level, the river made possible human society—it did not create the human society; rather, it determined where humans could live. This became especially true during the Neolithic era, when human beings began developing sedentary lifestyles that required stable and renewable sources for subsistence.

The first humans to happen upon the future town sites of Tucson and Phoenix may have remarked on the pleasant qualities of the setting: gurgling stream, chirping birds, wind in the trees, distant mountain vistas, and many likely campsites for these constantly on the move Paleo-Indian big-game hunters. These nomadic hunters arrived in North America about ten thousand years ago, crossing the frozen Bearing Straits out of Asia at the end of the last ice age. Scholars assume the Paleo-Indians would have quickly spread over the continent since it was their custom to follow the herds of grazing large mammals, and so the hunters soon would have moved into the region of the two river valleys. It can be imagined that these first human residents of the valley arrived by following the Gila River upstream from its confluence with the Colorado. An approach directly from the north would have been blocked by the Grand Canyon. Traveling up the valleys, the Paleo-Indians may have explored each tributary in succession, investigating the headwaters of the Santa Cruz, Salt, and Gila rivers. Whether they considered the Salt to be the tributary or the main stem is subject to pure conjecture.

Many scholars assume that the Paleo-Indians were very efficient hunters, perhaps even rapacious. Soon after arriving, the hunting groups would have depleted the region of its resources, particularly the herds of gregarious animals, and moved on, leaving no trace of their presence other than the occasional stone tool or kill site. Coincidental with the arrival of these first human beings, 70 percent of the large mammal species (adults larger than one hundred pounds) in North America became extinct. Paul Martin refers to this mass extinction of more than one hundred species as Pleistocene overkill.[23]

Clouding the issue of overkill is the roughly concomitant occurrence of fundamental climate change. At the close of the Pleistocene period, glaciers receded and the last ice age came to a close, bringing about much warmer and drier conditions. In central and southern Arizona, extensive grasslands and spruce and juniper forests characterized the region during the earlier, cooler, wetter period. About eight thousand years ago the river valleys took on their current desiccated appearance, prickly brown expanses interrupted by the occasional green ribbon of a river.[24] With the drier conditions, habitats necessary for many of the large mammals shrank and disappeared. The dwindling herds of gregarious animals no doubt migrated north, following the retreating grasslands and forests. For those scholars focusing on the changing climate, human predation looks much less destructive. The Paleo-Indians may have killed off the last members of a species, but the hunters were not the agents primarily responsible for the extinctions.

Not until about 2000 BCE did sedentary cultures evolve through a reliance on incipient agriculture along streambeds and other likely locations. At that point human presence in the valleys, and on the future town sites of Tucson and Phoenix, became recognizable and verifiable.[25]

Archaeologists have identified habitation sites dating back thousands of years in the two river valleys, but the earliest sites give evidence of periodic abandonment. Not until the development of the Hohokam culture does a human society appear to more or less permanently inhabit the future locations of Tucson and Phoenix. Progenitors of the Hohokam appear in the Early Agricultural Period, 1200 BCE to 150 CE, and the Early Ceramic Period, 150 to 650 CE. Archaeologists describe the Hohokam culture as inhabiting the region from about 650 to 1450 CE.

The Hohokam developed extensive agricultural domains with large populations that used sophisticated methods of crop irrigation. Because of the Hohokam's reliance on the flows of the two rivers, their geographic placement and population ranges provide a baseline comparison between the two river valleys. Unfortunately, the estimates of population and acreage seem to defy any lasting consensus.

One of the first estimates of Hohokam population and acreage came from F. W. Hodge in 1893. Hodge had studied the Hohokam remains along the Salt River as part of the Hemenway expedition in 1887–1888. In his 1893 report, written from his notes taken in the field, Hodge estimated that the Hohokam had "at least 250,000 acres" under cultivation on the Salt River alone. He then went on to estimate their population, despite expressing misgivings about the accuracy of the estimate, "at from 200,000 to 300,000" people.[26]

From 1893 and Hodge's initial estimate, archaeologists have been generally driving the numbers down. The current consensus somewhat tenuously states that at the height of the Hohokam culture, around 1300 CE, as many as thirty thousand Hohokam cultivated thirty thousand to sixty thousand acres along the Salt and Gila rivers near present-day Phoenix.[27] But once again, defying consensus, a recent study increased the estimate of Hohokam population to fifty thousand to two hundred thousand, returning to a high range similar to that which Hodge proposed more than one hundred years ago. Another recent study repeated Hodge's estimate of the Hohokam's cultivated acreage at 250,000.[28]

Despite disagreement about population and acreage, scholars of the Hohokam accept as fact that the center of Hohokam population was along the Gila and Salt rivers, with a peripheral population of Hohokam in the Santa Cruz valley near present-day Tucson. Once again, variations in estimates occur, but the consensus is that the Hohokam in the Santa Cruz River valley cultivated less than ten thousand acres with a population of six thousand to seven thousand.[29] The relative sizes of the prehistoric populations can be taken as evidence of the relative usefulness of the rivers.

At their peak, the Hohokam canals along the Salt and Gila rivers reached a cumulative length of 180 miles; these were the main structures, or trunk lines, some ten feet deep and thirty feet across. As with the expansive estimates of population, some scholars assert a longer cumulative length of the Hohokam canals: three hundred miles of canals on the Salt River alone. Whereas the total length of Hohokam canals along the Salt could have been three hundred miles, it is doubtful that all of those canals were in use at the same time.[30] In addition, there were hundreds of miles of laterals and smaller feeder ditches, thousands of miles in total, with only a small percentage in use at any given time. As to the Tucson Basin, scholars agree that the smaller river and smaller population maintained no such extensive system of canals. Smaller irrigation ditches serviced the fields in the Tucson Basin, but nothing resembling the ten-feet-deep and thirty-feet-across trunk lines on the Salt River.[31]

The Hohokam increased in population and geographic expanse into the 1300s. Slight variations occurred in material culture—for example, in ceramic styles—and in social organization—a trend toward centralizing in fewer, larger communities. Also occurring in the later stages of the Hohokam period were so-called ballcourts, large structures of apparent ceremonial use.

Whether dispersed in dozens of smaller settlements or congregated in a few large communities, the Hohokam lived close to the river. Strung out along the rivers, permanent habitation remained closely linked to the river and its riparian ecosystem. Not until industrial technology arrived in the late nineteenth century did society achieve the ability to move some distance from the river while maintaining access to the river's water supply.

By 1450 the Hohokam mysteriously had disappeared from the archaeological record. Scholars suggest several possible explanations for the collapse of the Hohokam culture. One idea is that warfare drove the people out of their villages. Another possibility is that floods on the rivers irreparably destroyed the extensive irrigation systems (huge floods occurred in the region in the 1300s). In the Tucson Basin, which had no extensive canal system to be destroyed by floods, a phenomenon related to floods may have caused the abandonment of the river. Floods in the Tucson Basin may have caused the river to entrench itself in a deep arroyo, rendering it useless for purposes of intensive agriculture, given the irrigation technology available to the Hohokam. With the river flowing through a channel ten, fifteen, or twenty feet below the intake structures for the irrigating ditches, and no pump technology capable of lifting the necessary volume of water to the fields, intensive agriculture would have become impossible in the Tucson Basin.

Artifacts of the Hohokam culture survived the people's disappearance. Museum shelves display varieties of pottery and other examples of their material culture. Remnants of the extensive canal system in the Phoenix Basin also survived. The first of the modern canal builders in the 1870s scratched out their irrigation ditches following the outline of the Hohokam system. To these early developers, the ancient canals had stood as a testament to the agricultural possibilities in the desert valley. But since an extensive system of canals had never existed in the Tucson Basin, it might seem that little remained of the Hohokam culture except for the fragile remains of their material culture. As it turns out, the very course of the river may have been the creation of Hohokam engineering. Geologists posit that the first recorded course of the river, as noted by Spanish explorers and map makers, deviates from geologic rationality. This historic river followed the western edge of the basin, closely hugging the foot of the recent volcanic mountains, including Sentinel Peak (A Mountain). Rather, the geologists suggest, a more logical course for the river is a mile or two to the east, following the course of the current arroyo in Tucson.

One scenario that could explain how the river came to follow its illogical western course is that the Hohokam dug a long irrigation canal to the west of the river to service their agricultural fields throughout the basin. The fields would have lain between the river to the east and the irrigation canal to the west. The irrigation canal would have hugged the western limit of the basin at the foot of the recent mountains. To supply water to the canal, the Hohokam would have dug a headcut into the river channel far to the south, drawing water from the river channel upstream near the future site of the San Xavier Mission. Once constructed, this system would have created a vulnerability to floods in the Tucson Basin similar to the vulnerability created by the extensive system of canals in the Phoenix Basin. When severe flooding struck in the 1300s, the headcut in the Santa Cruz River would have eroded away, and the intersected river would have surged down the irrigation canal, destroying all the fields and structures in its path and leaving the original river bed to the east high and dry. This illogical historic river lasted into the late nineteenth century when once again structures built in the river bed, including a headcut, began a process of erosion and arroyoization that created the current, geologically logical, entrenched river channel in Tucson.

Exhibiting a clear engineering ability, and a highly effective development ethos, the Hohokam reached population levels not matched in the river valley until the early decades of the industrial twentieth century. To achieve these population levels the Hohokam maximized the productive capacity of the rivers in the two valleys. Perhaps it was that maximization, stretching resources to their limit, that created the ultimate vulnerability that caused the culture to collapse. Whatever the cause, by 1450 the Hohokam culture was gone in both river valleys.[32] The rivers remained, even if in somewhat altered fashion.