A BRIEF HISTORY OF SONORA (*Vers.* 14 March 2024)

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NOTE: Being but a brief overview, this essay cannot do justice to Sonora's long and colorful history; but it hopefully provides a condensed introduction to this marvelous state. Readers with a serious interest in Sonora should consult the fine histories and geographies of the region, many of which are cited in the References section. The topic of Spanish colonial history has a rich literature in particular, and no attempt has been made to include all of those citations in the References (although the most targeted and comprehensive treatments are included). Also see my "Bibliography on the Gulf of California" at www.rickbrusca.com. All photographs by R.C. Brusca, unless otherwise noted. This is a draft chapter for a planned book on the Sea of Cortez; the most current version of this draft can be downloaded at http://rickbrusca.com/http___www.rickbrusca.com_index.html/Sea_of_Cortez.html

For many reasons, Sonora has historically been quite isolated from the rest of Mexico. It is the farthest state from Mexico City (except for Baja California), and it has long been viewed by the country's strong central government as a "frontier region" or, worse, a dry desert wasteland. Its colonial history is not as deep or rich as that of central-southern Mexico, and its archeological past lacks remains of the great civilizations of the south (Aztecs, Mayas, Toltecs, Olmecs, etc.). Even today, many Sonorans feel the government of Mexico City largely ignores their presence. In fact, until the completion of the "Yécora Highway" (Mex Hwy 16) in 1992, Sonora was even largely isolated from its neighbor to the east, the state of Chihuahua. For these reasons, and because of the state's location on the border with the U.S., cultural and economic ties often seem stronger between Sonora and Arizona than between Sonora and Mexico City (despite the recent construction of the much-despised border fence).

LAND AND BIOTIC DIVERSITY

The State of Sonora encompasses 69,249 mi^2 (179,355 km^2), making it the second largest of Mexico's 32 states. Located west of Chihuahua (Mexico's largest state), Sonora shares its northern border almost exclusively with Arizona, and it is topographically, ecologically, and biologically diverse. It is the most common gateway state for visitors to the Sea of Cortez (Gulf of California). Its population is about three million.

The origin of the name "Sonora" is a bit convoluted. The first record of the name is probably that of explorer Francisco Vásquez de Coronado, who passed through the region in 1540 and called part of the area the *Valle de La Sonora*. Francisco de Ibarra also traveled through the area in 1567 and referred to the *Valles de la Señora*. Doolittle et al. (2024) write that in the 1700s there were two places in the Río Sonora Valley known as Sonora. The older of the two was a pre-European, Ópata settlement north of the present-day down of Ojo de Agua called "Sonota" by the people living there when the first Spaniards arrived in the valley. Cabeza de Vaca misunderstood the pronunciation of Sonota and called it Señora, a name later corrected by missionaries who understood the Ópata language and called it Sonora.

Four major river systems occur in the state of Sonora, to empty into the Sea of Cortez: the Río Colorado, Río Yaqui, Río Mayo, and massive Río Fuerte. Several smaller rivers originate almost entirely within the state, including the Río Sonoyta, Río Magdalena-Altar-Asunción-Concepción, Río San Miguel, Rio Zanion, and Río Sonora, and these also once (at least intermittently) emptied into the Gulf of California although they no longer do. The headwaters of the San Pedro River also originate in Sonora, but the river flows northward, crossing into the U.S. as one the last remaining undammed rivers in Arizona. The Santa Cruz River originates in Arizona, flows South into Sonora, and then turns north again to re-enter the U.S. at Nogales, eventually running all the way to the Gila River in central Arizona.

The eastern part of the state comprises the western slopes of the Sierra Madre Occidental range—part of the great North American Cordillera. The highest elevations are in the Sierra de los Ajos and Sierra San Luis in northeastern Sonora. In addition to the Sierra Madre range, about 35 high isolated ranges (often called Sky Islands) are found west of the Sierra Madre in the northern half of the state

(and another 33 Sky Island ranges occur in southeastern Arizona/southwestern New Mexico). The six highest mountains in the state are Cerro Pico Guacamayas (2625 m), Sierra Los Ajos (2620 m), Sierra San José (2540 m), Sierra La Charola (2520 m), Sierra San Luis (2520 m), and Sierra La Mariquita (2500 m).

Sonora encompasses several biological transition zones, with tropical ecosystems in the south, subtropical deserts in the north, and montane transitions in the sierras. The northern limit of Mexico's Tropical Deciduous (Dry) Forest and Sinaloan Thornscrub lies near the center of the state, whereas some of the most arid desert regions of North America occur in the northwest, in the Gran Desierto de Altar. This topographic and climatological mix makes Sonora one of the most biologically diverse regions of the world. An estimated 5,000 species of vascular plants are reported from Sonora—20% of Mexico's total flora, in an area of less than 10% of the country.

In general, precipitation in Sonora decreases from higher to lower elevations, from south to north, and from east to west. In the pine-oak forests around Yécora (1550 m; 5085 ft) average annual precipitation exceeds 90 cm (35.5 inches), and in the tropical deciduous forests near Alamos (440 m; 1444 ft) it is around 65 cm (26 in). However, in the volcanic desert of the Pinacate region in northwestern Sonora, average annual precipitation is less than 25 cm (9 in) per year, and in the extremely arid Gran Desierto de Altar (near the lowermost Río Colorado) average annual precipitation is just 4-7.5 cm (1.5-3.0 in) per year. During summer months, temperatures exceeding 38°C (100°F) are common in the Gran Desierto, and the high summer air temperatures here drive up evapotranspiration (i.e., loss of water from plant leaves and soil).

Historically, the highest temperature recorded for anywhere in northwestern Mexico was 56.7°C (134°F) in the Sierra Blanca of the Pinacate region (near where the El Pinacate y Gran Desierto de Altar Biosphere Reserve's visitor center is today). In spring and fall, rain is infrequent at best, although occasional tropical storms do reach Sonora in the fall. Summer temperature extremes are mitigated by rains, called monsoons (or *las aguas*—the waters), characterized by strong afternoon thunderstorms. Less violent winter storms, called *equipatas*, are derived from Pacific frontal storms with origins as far north as Alaska. (The name *equipatas* comes from the Yaqui language and literally means "gentle winter rains.") This biannual rainfall pattern is another key reason that the Sonoran Desert has one of the highest biological diversities in the world. Almost all of the summer and fall moisture comes from the Sea of Cortez and adjacent tropical Pacific Ocean that border the Sonoran Desert, thus making this a maritime desert. The traditional start of the monsoons (*las aguas*) is June 24, Saint John the Baptist's Day, or el *Día de San Juan*. Saint John, who baptized Jesus in the River Jordan, is celebrated in many ways throughout Latin America and the Catholic world.

The Pinacate area of northwest Sonora is unique for being home to North America's second largest lava flow region (the Snake River Plain basalt fields of Idaho are slightly larger), as well as North America's largest active sand dune field—the latter running northwestward from just north of Puerto Peñasco (Sonora) to Yuma (Arizona). The dune field embraces the western slopes of the Sierra Pinacate, and it completely surrounds the isolated granitic Sierra del Rosario (probably the westernmost Basin-and-Range mountain in North America). This 5700 km^2 (2200 mi^2) dune field is estimated to have developed during and following the last Glacial Maximum (~20,000 years ago). The dunes were built almost entirely from wind-transported Colorado River deltaic sands piled up over the centuries from prevailing Westerlies. Thus, these dunes are largely the eroded rocks of the Grand Canyon! East of the Pinacates, along Hwy 8 between the town of Sonoyta and the entrance to the Pinacate Biosphere Reserve, is a field of ancient, stabilized dunes. These are much older dunes, perhaps hundreds of thousands of years in age, but their origin is unclear.

Topographically and demographically, the State of Sonora can be thought of as having two great regions, with different geological and cultural histories (see West 1993). The eastern mountain region, called *La Serrana* (the highland), comprises the western slopes and foothills of the Sierra Madre Occidental. It was originally inhabited by Native American hunters and gatherers, later by indigenous farmers, and then in the 17th and 18th centuries by Jesuit missionaries and Spanish and mestizo miners and ranchers. Today it is losing population

Pillowed pahoehoe lava, Pinacates

because its younger generation is moving to the cities, and it has become a major marijuana and heroine-poppy growing area and a corridor for narcotrafficking as drugs move north to the U.S. The Western Lowland, on the other hand, originally was only sparsely populated by indigenous people. In the late 18th century, the lowlands were exploited by Spanish and Indian/mestizo gold seekers. Today the lowlands are characterized by recently developed government-sponsored irrigated agriculture (the so-called *Distritos de Riego*), with wells that exploit underground water sources, as well as coastal mariculture and tourism—all of which has given rise to dense farming, industrial centers, and rapid urbanization.

Sand dunes of the Gran Desierto de Altar (Photo by Rick Westcott)

Since prehistoric times, people have relied heavily on the native plants of Sonora, especially the legumes—mesquite, paloverde, ironwood, etc. The most important native grasses for grazing purposes were the gramas (*Bouteloua* spp.), 18 species of which have been identified from northeast Sonora alone. The gramas turn green and lush after summer rains, drying to nutritious hay during the fall dry season. The fruits of the pitahaya dulce, or organ pipe (*Stenocereus thurberi*), saguaro (*Carnegiea gigantea*), and cardón (*Pachycereus pringlei,* also called sahueso) cacti were all important food sources, and are still collected and consumed by the Tohono O'odham and Seri People (*Comcáac*) and others, as well as being enjoyed as delicacies by modern Sonorans.

The introduction of corn (*Zea mays*), which was first domesticated in south-central Mexico, into Sonora and the American Southwest is usually attributed to Uto-Aztecan-speaking groups who spread throughout much of the region between 3000 and 1000 B.C. A popular hypothesis suggests that the timing of the dispersal is likely related to environmental conditions following the end of the warm and dry Altithermal Period (middle Holocene), as Uto-Aztecans descended from refugia in the Sierra Madre Occidental to colonize the low country. The oldest occurrence of early maize in archaeological context is ~5000 B.C. (south-central Mexico), and the earliest records of domestic corn is from the Tehuacan Valley ~3600 B.C. (south-central Mexico). In the U.S., domesticated corn has been found in Arizona and New Mexico archaeological sites date ~2000 B.C.

The hearts, or trunk and leaf bases of agaves (or *maguey* as it is known in Mexico), known as *cabezas*, were gathered and slow roasted by native people to prepare a sweet and nutritious food called *mezcal*. Spaniards quickly learned to ferment and distill the *mezcal* to create the liquors we know today as mescal (and its regional variants, e.g., bacanora) and tequila. By law, tequila is always made from the blue agave, a variety of *Agave angustifolia* known as *A. angustifolia tequilana* (or *A. angustifolia weberiana*), and only in certain designated regions of central Mexico. Mescal can be made from many of the 400+ known species of agave (and may have other added ingredients), although it is typically made from regional varieties of the very widespread *Agave*

angustifolia. In *La Serrana* today, certain native agave plants also are used to distill *mescal de Bacanora*, a potent artisanal mescal similar to "white lightning." Bacanora was banned from production in Sonora in 1915 (though, of course, people continued to make it), and the ban was not lifted unitl 1992. [Endnote 1]

Of the native mammals, mule deer (in low elevations), white-tailed deer (largely restricted to higher elevations), rabbits, and perhaps bighorn sheep were the most commonly consumed meats in prehistoric times. Today, as in centuries past, Yaqui and Mayo People use small stuffed heads with antlers of white-tailed deer as headdresses for special

Sideoats grama (*Bouteloua curtipendula*)

dancers (deer dancers) during certain religious ceremonies, suggesting the prominence and importance of deer in those cultures. Hunted less commonly were pronghorn and javelina. Predators have rarely, if ever, been hunted for meat (*e.g.* mountain lion, jaguar, ocelot, black bear, coyote, gray wolf, and foxes). In addition to large quantities of fish and shellfish (and some sea lion), the Seri People also used to eat pelicans seasonally. However, sea turtles were their primary source of protein.

An agave plant used for making mescal in Oaxaca (not the blue agave variety)

The heart ("*cabeza*") of an agave, ready for roasting to make mescal

An agave roasting pit, the same design used since Pre-Columbian times

Burro-power drives a stone wheel that grinds roasted agave *cabezas* into pulp and liquid for subsequent fermentation

Leg rattles (*ténaborim*) used by Yaqui and Mayo dancers are made from cocoons of the saturniid moth *Rothschildia cincta*

A still used to recover the alcohol from cooked agave

Larva (caterpillar) of the saturniid moth *Rothschildia cincta* (Photo by E. Pfeiler)

The famous mescal or maguey worm – usually larvae of the cossid moth *Comadia redtenbacheri* (above), but sometimes a weevil larva (*Scyphophorus acupunctatus*) is used, or the larva of a skipper butterfly (*Aegiale hesperiaris*). A "worm" in a bottle of mescal probably imparts little, if any, flavor to the liquor; it is merely tradition.

The tequila bar at the Hacienda de los Santos, Álamos, Sonora, offers up ~100 varieties of the liquor. Salud!

La Serrana

Seven major rivers drain La Serrana: Río San Miguel, Río Sonora, Río Mayo, Río Moctezuma, Río Matape, and the upper and lower Río Bavispe, both of which drain into the Río Yaqui, historically the largest river in Sonora (not counting the Río Colorado). Each of these is fed by snowmelt, rain, and springs in the Sierra Madre. In times past, these rivers reached the Sea of Cortez, but today they rarely flow to the ocean due to damming and irrigation diversion. The river valleys of *La Serrana* were prehistoric sites of agriculture and permanent settlement. During Spanish colonial times these valleys continued to provide most of the food for Sonora. The rugged hills and mountain ranges of *La Serrana* held silver, gold, and copper where great mineralization activity had taken place along fault-block lines. The presence of these ores has attracted miners since the 17th century.

The Western Lowlands

Geologically, Sonora is underlain by the ancient and massive North American craton, and its dominant rocks were formed 1.2-1.7 billion years ago. Many of the mountain ranges west of the Sierra Madre Occidental and its Sky Islands have been eroded down nearly to their roots, forming isolated rock masses called *inselbergs*, separated by wide bajadas (flood plains) and basins. Rich deposits of gold dust and nuggets, eroded from the former mountains, have left placers—nuggets and flakes washed downslope through erosional and sedimentary action. The northern part of western Sonora includes the Altar Desert, part of the Lower Colorado River Valley region of the Sonoran Desert and one of the driest areas in North America. However, the rivers draining *La Serrana*, over millennia, deposited copious amounts of groundwater in aquifers below the desert surface in the Western Lowlands. These aquifers have sustained rapid growth of population and agriculture in coastal Sonora since the 1950s. However, there is now little water reaching these aquifers, the rivers have been dammed for decades, and the aquifers are being pumped at a much faster rate than they are being recharged.

***La Serrana*, the rugged western slopes of the Sierra Madre Occidental; photo taken east of Álamos (Rancho Santa Barbara)**

ABORIGINAL CULTURES

Coastal Sonora was first populated by indigenous hunter-gatherers such as the Seri (Comcáac), Yaqui, and Mayo Peoples. But in the 16th century, the Spanish conquest and the spread of diseases largely decimated these Native American populations.

Farther inland, the La Playa archaeological site, in the Boquillas Valley, is one of the most spectacular in the state. First described by Sauer and Bran (in 1931), it houses a deep and rich history. The oldest radiocarbon dates obtained from La Playa are ~44,000 ybp (two from fossil Sea of Cortez clams, *Anodonta* sp.), whereas most of the archaeologial material dates form the San Pedro phase or occupation (3150-2750 ybp) when the Boquillas River was likely perennial. Clovis points have also been collected at this site, suggesting a long history of paleo-occupation. The Early Agricultural Period at La Playa, beginning around 2100 BC, shows the presence of maize and the manufacture of shell ornaments including bracelets of *Glycymeris* sp.; in total, 58 marine shell species, seemingly all from the Sea of Cortez, have been found at the site (Carpenter et al. 2015). Decorated pottery first appeared around 400-800 AD. Carpenter et al. (2015) further note that 310 mortuary features have been documented from La Playa. Historic occupation dates from the later 1800s.

The major indigenous groups of Sonora that are still with us today are the Kwapa or Cucupás (in the Colorado River Basin south of the border), O'odhams (in northern Sonora/southeastern Arizona), the Comcáac or Seris (in coastal central Sonora), the Yaquis and Mayos (closely related Cahitan People of the Yaqui and Mayo River Valleys), and the little-known Guarijíos of southeastern Sonora. The Tarahumaras inhabit the high country of the

Sierra Madre, or the “spine of the Sierras,” but live primarily in Chihuahua.

Aside from the Comcáac (Seris) and Kwapa (Cucapás), most extant aboriginal cultures in Sonora belong to the Uto-Aztecan language group, which is widespread in Mexico. In southern Sonora this includes the Yaqui and Mayo languages (collectively known as Cáhita). In the eastern and central parts of Sonora it included the Ópata and Pima Bajo languages. In the northwest, it was Pima Alto and the closely related O'odham (previously known as Pápago) dialects. The origin of the isolated Seri tongue, on the other hand, largely remains a mystery, although some evidence suggests a relationship with languages from the Baja California peninsula. The now vanished “Guaymas people” (*Guaímas*) evidently were the southernmost band of Seris. The Apaches, especially the Chiricahua Apache, ranged (and raided) in the northeastern corner of Sonora; they spoke an Athapascan tongue typical of northwestern America, indicating their relatively recent arrival from the north.

Even before the Spanish began to settle northwestern Mexico, aboriginal populations had dwindled, presumably due to introduced European diseases. During the 16th Century, disastrous scourges of smallpox, typhus, measles, and other diseases swept through central Mexico soon after the Spanish Conquest and probably reached all the way to Sonora. It is known that by 1592 smallpox had, at least, reached southern Sonora, causing death and famine among the Yaquis and Mayos. During the Jesuit missionization, epidemics are thought to have killed half of the Mayo population.

Farming Cultures

The Río Sonora Culture. Most of the Indians of *La Serrana* were farmers, utilizing agricultural techniques similar to those used in Mesoamerica. Taken together, this farming culture of eastern Sonora is sometimes called the "Río Sonora Culture." Among these people were the Ópata and Pima Bajo, who practiced both dryfield (rain dependent) and small-scale irrigation farming. Spanish explorers (and recent archeological work) document the complex pueblos and farming of the Ópata, which included cultivation of maize, beans and squash. The Ópata region of northeastern Sonora, with an estimated 10,000 to 100,000 inhabitants, may have been the most densely populated area of northwestern Mexico when the Spanish arrived. The Ópata probably had strong trade routes to the Casas Grandes (Paquimé) people in what is now northwestern Chihuahua. However, by the time the Jesuits and miners arrived in *La Serrana*, populations had dwindled. In the south, the Yaqui and Mayo tribes used mainly natural floodplain farming along the Yaqui and Mayo rivers, as did many O’odham and Kwapa peoples until very recent times.

The Pima Bajo and Pima Alto Cultures. The terms "Bajo" (lower) and "Alto" (upper), probably introduced by the Jesuits, are geographical, not linguistic categories, and the people in both regions largely spoke the same basic language. Pima Bajo extended from the middle Río Sonora (around Ures) east to the middle of the Río Yaqui, and then into and over the Sierra Madre as far as La Junta in western Chihuahua. The Pima Alto lived in the more arid northwestern Sonora and southern Arizona, especially along the Gila and Salt Rivers.

The Desert Pima (later called Papago, and now Tohono O'odham) inhabited the arid Sonoran Desert in northwestern Sonora and southern Arizona, with the most arid region inhabited by the Hia C-ed O’odham (the “Sand Papago”). Several other related tribes lived farther to the east and south, including the Soba Pima (in the lower Magdalena and Altar River Valleys), Himiris (upper Magdalena), and Sobaipuri (San Pedro, Santa Cruz and middle Gila Rivers). After the Spanish conquest, all of these peoples (including any remaining Arizona Hohokam) were considered residents of the Pimería Alta. The O'odham were hunter-gatherers who farmed scattered fields during summer rains, although near present-day Sonoyta (Sonora) they used limited canal agriculture. The Riverine Pima of Arizona had permanent villages and canal irrigation.

Of all the prehispanic cultures, one of the most interesting was that associated with curious sites called *trincheras*—terraced hillside habitations constructed on mountain slopes overlooking arable land along streams. One of the largest of these sites (and the namesake) is *Cerro de Trincheras*, located at the railroad village of Trincheras, near the town Santa Ana, Sonora. *Trincheras* sites are abundant in the Magdalena, Concepción, and Cocóspera River Basins, in the Altar Valley, and from the San Miguel and Santa Cruz River Valleys as far

north as Sells, on the modern Tohono O'odham reservation in Arizona, and near Redrock (between Tucson and Phoenix). The *trincheras* are generally interpreted as having been both agricultural and defensive sites, possibly places of refuge when villages and fields were attacked by enemies. The Trincheras Culture had ties with the Hohokam Culture to the north and may have been a forerunner of Piman Culture. Evidence of Trincheran visitation is also common along the Gulf of California coast of northern Sonora, and inland to the Caborca and Santa Ana areas.

Hunting-Gathering Cultures

When the Spaniards arrived, two widely separated hunter-gatherer groups lived in parts of Sonora: the Seri People along the central Gulf coast (including the Guaímas people), and several Apache-related tribes of present-day Chihuahua, New Mexico and Arizona. In contrast to the Native American farming cultures, these two groups strongly resisted both Jesuit and secular attempts to "civilize," or acculturate them. The Seris were a small group of fewer than 5,000, living in distinct bands along the coast between Guaymas and Cabo Lobos (Puerto Libertad), inland nearly to modern-day Hermosillo, and on Tiburón and San Esteban Islands. They spoke a distinctive language, and might have originally migrated across the Gulf from the Baja California peninsula where several Yuman-related languages were spoken (and continue to be spoken, e.g., Cucapá, Kiliwa, Kumiai). Seris were primarily fishers, especially for sea turtles, and shellfish gatherers, who occasionally foraged inland where they used more than 100 different plant species for food and medicines. The Seris have probably inhabited coastal Sonora in the region of Isla Tiburón for at least 2,000 years. Today, there are fewer than 1,500 Seris, and they are one of the last functioning aboriginal hunter/fisher-gatherer societies remaining in North America. The Apaches were latecomers, probably not arriving from their gradual migration from Canada into Arizona, New Mexico and Chihuahua until the last decades of the 1500s.

THE SPANISH ARRIVE IN SONORA

In 1528, the Spanish explorer Alvar Núñez Cabeza de Vaca was shipwrecked off the Gulf Coast of what is now Texas. Thus began the epic journey on foot of he and three companions, including a North African named Esteban de Dorantes, traveling westward, passing through Sonora and eventually reaching Mexico City. Their journey probably took them through New Mexico and Arizona (or perhaps across Coahuila and Chihuahua), and during this time they heard stories of great Indian kingdoms to the north "where there were cities with large populations and great houses." Today, these are thought to have been the Zuni Pueblos of New Mexico. Cabeza de Vaca and his party traveled south from Sonora along the coast, eventually reaching Mexico City, where their stories of great northern Indian civilizations encouraged Viceroy Antonio de Mendoza to launch a series of expeditions in search of the "lost cities."

The border fence at Naco, Arizona (looking south from the U.S.)

The first expedition was that of Fray Marcos de Niza. The Franciscan took Esteban along as his guide. They traveled up the Pacific Coast, passing through Sonora, wherein Esteban moved forward and traveled as far north as the Zuni Pueblos. The Zunis killed Esteban, and there is no clear record of what he saw or learned at the pueblos. Whether or not Fray Marcos eventually reached the Zuni Pueblos is debatable, but he returned to Mexico City with claims of reaching Cíbola, one of what he called the "great seven cities in the north." It was the stories of Fray Marcos that led to Francisco Vázquez de Coronado's great northern *entrada*. Coronado, then Governor of Nueva Galicia in western Mexico, led at least 358 Europeans, their servants, slaves and women companions, and more than 1300 Indians from central and western Mexico on a well-organized expedition that took them from Nayarit all the way to central Kansas. Coronado also sent his lieutenant, Melchor Díaz, north along a coastal route, and Díaz eventually

crossed the Colorado River into California—the first European to do so. Another of Coronado's lieutenants, Hernando de Alarcón, traveled by ship northward in the Gulf of California and into the delta waters of the Colorado River. Coronado never found the "Great Cities in the North," and ended up convinced that Fray Marcos was a liar.

Spanish settlement of Sonora did not occur for nearly a century after Francisco Vázquez de Coronado's great *entrada*, much later than in Central and Southern Mexico due to the inclemency of the terrain and conflict with the native peoples of the region. Also, the missionary system of colonialism was distinctive from the rest of Mexico. Early in the 17th Century, the Jesuit Order began to establish missions in northwest Mexico. By the 1640s Spanish lay settlers, mainly miners from central Mexico, had crossed the Sierra Madre Occidental into Sonora. Both forms of settlement were originally restricted to *La Serrana*, along the river valleys.

The border fence at Lukeville (AZ)-Sonoyta (SON)

Actual missionary work in Sonora (called Nueva Andalucía by resident Captain Pedro de Perea) began around 1614 when the Jesuit Padre Pedro Méndez began to administer the Mayo Indians, near what today is the Sonora-Sinaloa border. By 1636 the Jesuit missionary frontier had pushed up to the Río Sonora Valley and a mission was established in the vicinity of Ures (Padre Bartolomé Castaños was the first resident priest). Pedro de Perea had difficulty getting along with Jesuits, and in the early 1640s he began to replace them with Franciscans, especially in the Sonora River Valley. Here, for a short time, five Franciscans were scattered in the region that was otherwise claimed by the Jesuits. The two orders clashed, and despite de Perea's desires, no Franciscans ever settled in the Pimería Alta region (northern Sonora/southern Arizona). Upon de Perea's death in 1644, the Franciscans were ordered out of the region by the authorities, leaving the Jesuits in undisputed possession of that missionary region.

Some of the most beautiful and interesting Spanish-era missions are in the Sonoran Desert. Those mission sites with still visible remains north of the border are San Xavier del Bac, San José de Tumacácori, Los Santos Ángeles de Guevavi (now an adobe ruin), and the *visita* of Calabazas. San Xavier del Bac is still an active parish, serving the descendants of the original Pimans (O'odham) for whom it was founded. The others are under the care of the U.S. National Park Service. All of these missions (though not all of the churches) were founded by the Jesuit Father Eusebio Francisco Kino. Photographs of some of the churches of Sonora (and Baja California) founded during the colonial era, by Kino and others, are provided below and in Appendix 1. [Endnote 2]

The Jesuits dominated mission activity in Sonora for more than 150 years, from their initial entry (via Sinaloa) among the Mayo and Yaqui People (1614-1617), until the order was expulsed from the Spanish colonies in 1767 by edict of King Charles III. The Jesuits were replaced by Franciscan missionaries, who arrived in the Pimería region in 1768. They quickly set out to repair or replace the Jesuit churches, often constructing new ones on or near sites of the original Jesuit churches. Before the mid-19th century, the Franciscans (of Spanish origin) were themselves banished from the northern missions, this time by the Republic of Mexico, and the buildings were left to fend for themselves. The Kino mission sites include 3 in Arizona and 13 in Sonora (see Appendix 1), although few of these have churches surviving from Kino's time. One of the Sonoran churches, Caborca, is now a museum, and five other Sonoran mission-site churches are still in use—San Ignacio, Magdalena, Tubutama, Oquitoa, and Pitiquito. The "mother mission" for all of Pimería Alta, Nuestra Señora de los Dolores (near Cucurpé), founded by Kino in 1687, no longer has a standing church, and today there is only a small cemetery (of uncertain age) and a large ranch at the site. Locals have erected an "altar" at the site, where they hold occasional pilgrimages. See Appendix 1 for photographs of some of the

churches from Padre Kino's 16 missions in the Pimería Alta.

Legend has it that the colorful Mexican "Robin Hood" Joaquín Murrieta—who Captain Harry Love (of the California Rangers) claimed to have captured, killed, and beheaded—actually lived on for many years until his death in the late 1870s. His body is said to be buried in a Jesuit cemetery in the town of Cucurpé. Murrieta was the basis of the wonderful and enduring *El Zorro* story.

It is important to distinguish between a mission and its church. Although the latter was typically the largest building dominating the site, it was not the mission proper, which was the whole enterprise established by the founding priests. Missions were settlements and centers of activity where the church introduced Native Peoples to a church-based belief system and European ways of life, which, in the Pimería Alta, included the introduction of European livestock, farming, and culture. Missions often grew into towns, and some missions had "oversight" for several pueblos in the surrounding area. The mission's outlying buildings surrounding the church were the lifeblood of the enterprise. Typically the church had a convento, which included the priests' quarters, kitchen, storerooms, etc. There also would have been blacksmith shops, loom rooms, milling rooms, etc., as well as the agricultural fields.

Padre Eusebio Francisco Kino arrived in Mexico from Spain in 1681. Although he was not the fist Jesuit in Sonora, he pushed the Spanish Empire far to the north (to Tucson) and became the most celebrated of all northwest Mexico's Jesuits. He tried to missionize Baja California, without success (mainly due to lack of support from his superiors), but succeeded beyond anyone's imagination in Sonora and southern Arizona. His northernmost settlement was San Xavier del Bac, near Tucson (Arizona). [Endnote 3] He established a mission program there in 1692 and had plans for a church, but it was not built until the 1750s. This first church was a simple adobe structure. The church we call San Xavier today was built by the Franciscans and dedicated in 1797. San Xavier church represents the finest example of baroque style architecture (with strong Moorish influence) in the borderlands region, and it maintains an almost complete, late-eighteenth century construct. To find an equally elaborate baroque church, one must travel to San Antonio (Texas) or Santa Fe (New Mexico), and even there what you will find are details, not an entire church of this genre and elegance. Walking through the front door of the San Xavier church is like stepping through a time machine into the late-18th century.

Today, one can view the skeletal remains of Padre Kino at the handsome domed crypt in the town of Magdalena de Kino, Sonora, near the church of Santa María Magdalena. Although there is evidence that Kino himself might have established a chapel near this site (perhaps in the 1690s), the existing church dates to 1832 and has been reworked several times.

Statue of Padre Kino in the city of Magdalena de Kino, Sonora. In the plaza with the statue is a memorial to Kino's remains and a 19th century church. Built around 1833, the present church does not stand on the site of the original Jesuit church.

Aside from his missionary work, Kino's other great contributions stemmed from his exploratory and cartography skills. He re-discovered that Baja California was indeed a peninsula, and not an island (Francisco Ulloa had discovered this in 1539, Melchior Díaz proved it again in 1540, and Juan de Oñate again in 1604, but their writings went largely unnoticed). His maps of northwestern Mexico and southwestern United States (the Pimería Alta region) were the most accurate made to that date, and they can still be used with good

precision, although there had been several earlier maps showing Baja California as a peninsula (e.g., the French Guillaume de l'Isle's *L'Amerique Septentrionale*, Paris, 1700; the Italian di Arnoldi map, *America*).

All that remains of the Jesuit mission at Santa Rosalía, Baja California Sur

The Jesuit mission of San Francisco Xavier, west of Loreto, high in the Sierra La Giganta (Baja California Sur). Founded in 1699, in an area then inhabited by Guaycura Indians, it was the first mission in Baja California to have glass windows. Construction was completed in 1758 under the direction of Padre Miguel del Barco.

An original mission olive tree, 300 year-old, still living at San Francisco Xavier mission in the Sierra La Giganta, Baja California Sur.

The spartan Jesuit mission at Mulegé, Baja California Sur, built in 1707

The old mission church at El Triunfo, about an hour south of La Paz (Baja California Sur) was built by the Franciscans in the 1800s. Established as a gold and silver mining town, El Triunfo drew miners from all over the U.S. and Mexico. Once the largest city in B.C.S., it was home to over 10,000 miners in its heyday. Now a remnant of the past, the town's 115 ft-high smokestack was designed by Gustav Eiffel (of Eiffel Tower fame). Today the town has fewer than 500 inhabitants.

Kino's expeditions to the Lower Colorado River and the Sierra Pinacate relied on the springs at Quitobaquito (now part of Organ Pipe Cactus National Monument), as well as other, smaller springs and *tinajas* that his Indian guides led him to. He made four expeditions into the Pinacates: October 1698, March and April 1701, and November 1706. [Endnote 4]

Mission Nuestra Señora de Loreto, the first mission built in the Californias; founded by Padre Juan María de Salvatierrra in 1697 and completed in 1752 (Loreto, Baja California Sur)

The Franciscan-built Nuestra Señora de La Paz church in La Paz (Baja California Sur). Hernán Cortés first landed at this site in 1535 (naming it Santa Cruz). Father Kino tried to establish a colony here in 1683, naming it Nuestra Señora de la Paz, but failed. In 1720, Jesuit Padre Jaime Bravo founded the first successful mission here, and in 1861 Bishop J. F. Escalante y Moreno began construction of the church that stands today.

Memorial housing Padre Kino bones, in the zócalo of Magdalena de Kino, Sonora

Bust of Padre Kino in the zócalo of Magdalena de Kino, Sonora

The skeletal remains of Eusebio Kino, in the zócalo of Magdalena de Kino, Sonora

By the end of the 17th Century, the Jesuits had founded 38 primary missions and 59 *visitas* in Sonora. According to Spanish law, a mission was to be dissolved 10 years after its founding, based on the supposition that by then the natives should be sufficiently versed in Christianity that they could be left on their own. However, the Jesuits had a habit of developing ranching and farming missions that were so

economically successful that they would forego the 10-year rule. When they were finally expelled from the New World in 1767 (by royal edict), at the promulgation of jealous lay officials who coveted the land and cheap native labor, most of their missions were taken over by the Franciscans (or by the Dominicans, in northern Baja California). The Jesuit enterprise of Sonora was one of the most successful endeavors of the order in the New World, on par with that of Paraguay, which was established at about the same time (recall the book "The Mission," and the movie of the same name filmed at Iguazu Falls where the countries of Brazil, Argentina and Paraguay meet).

Although Padre Kino founded the town of Caborca in 1688, the mission itself was founded by Francisco Javier Saeta, in 1694. The original Jesuit church was built on the banks of the Asunción River (today known as the Río Concepción), east of the present town center, although the church standing there today was built by Franciscans (1803-1809). This Franciscan church is gradually being destroyed by erosion, especially during flood events along the river. In 1857 the church was the scene of violent fighting when the people of Caborca were driven into the church by American filibusters led by Henry A. Crabb. Crabb and his men were eventually smoked out of their adobe house-fort opposite the church, and promptly executed. The standing church in the city today (pictured above) was built by the Franciscans in 1790.

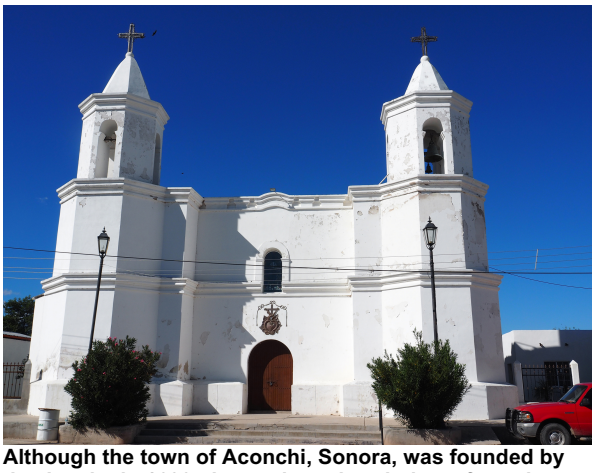
Probably the most enduring cultural changes that the missions made on native life were in agriculture, through the introduction of Old World crops (especially wheat), farm tools and techniques, and domesticated animals. During the planting and harvest periods, all men in the mission settlement were required to work the church lands 3 days/week, and their own plots 3 days/week—Sundays and feast days were reserved for compulsory church attendance. It was the introduction by the Jesuits of wheat that led to the invention of northwestern Mexico's famous flour tortillas. In Sonora to this day, thin flour tortillas (and beans and chilies) are the norm of rural diets; elsewhere in Mexico, native maize (corn) is the dietary staple. The later-arriving Franciscans were a more devotional-based sect and, not surprisingly, brought with them to Sonora the growing influence of Our Lady of Guadalupe. [Endnote 5]

While Kino and his colleagues missionized the Pimería Alta, other Jesuits, and eventually Franciscans, worked in the foothills of the Sierra Madre—La Serrana. A drive down the Río Sonora Valley today, from Cananea to Urés, takes one through a half-dozen charming colonial villages, each with its own Jesuit or Franciscan church (see images following, from north to south). This was the land of the Ópata People, and most of the names of these towns were derived from the Ópata language (e.g., Arizpe, Banámichi, Baviácora).

Although the period of initial Spanish conquest of Mexico (sometimes referred to in central Mexico as "The Rape of Mexico") and the destruction and devastation brought by Hernan Cortés was not felt in Sonora initially, a trip to the old Playa de Cortés Hotel near Guaymas will provide a vivid glimpse of those events. In the bar of this seaside resort are four large, exquisite, and disturbing, bas-relief panels that depict Cortés's subjugation of the Aztec people. [Endnote 6]

The Jesuit church at Huépac, founded 1639-1644, *Iglesia San Lorenzo de Huépac*. An original copy of the Mexican Act of Independence from 1810 is said to be protected inside Huépac's City Hall.

The beautiful church at Banámichi, on the zócalo. Although the mission (and town) was founded by Jesuits in 1639, the present church—*Iglesia de Nuestra Señora de Loreto*—dates from Franciscan times.



Although the town of Aconchi, Sonora, was founded by the Jesuits in 1639, the modern church dates from the 1700s, was built by the Franciscans, and features a legendary Black Christ.

The Jesuit church at Arizpe, founded in 1646 by Jerónimo de la Canal. Once the capital of northern New Spain, it was from Arizpe (Horcasitas) that Juan Bautista de Anza's expedition to Alta California was launched (in 1775), eventually leading to the his establishment of the city of San Francisco. De Anza's remains are believed to lie in the church at Arizpe, though probably still buried (the exhumed bones likely being from one of De Anza's soldiers).

The town and mission at Baviácora, Sonora, were founded by the Jesuit Bartolomé Castaños in 1639. The original church stands to the left of the newer church, built by Franciscans in the 18th century—*Iglesia Nuestra Señora de la Concepción de Banácora*.

The beautiful Jesuit mission at Ures, along the Río Sonora, built between 1636 and 1644.

Portrait of Hernán Cortés

Sketch of Eusebio Kino, by Frances O'Brien. Several interpretations of what Kino might have looked like have been prepared, including a bust in the zócalo in Magdalena de Kino

SPANISH SETTLEMENT: MINES AND RANCHES

Spanish settlers began colonizing Sonora about the same time the Jesuits were founding missions. By the end of the 17th Century, ranching and silver mining had become firmly established in Sonora, eventually rivaling (but not eclipsing) the silver towns of Taxco, Guanajuato, and Zacatecas in central Mexico. The silver deposits were mostly superficial (to 150-200m depth), but below them lay copper, and after the silver ore had been mined American companies moved in during the 1800s to begin mining copper ore. Some of the original copper mines are still producing, and Sonora is now the top-ranking state in Mexico for mineral extraction.

One of the most productive mining centers of Mexico was the area around Álamos in southeastern Sonora, where silver was mined for more than 200 years. In 1776, nearly two-thirds of the silver produced in northwestern Mexico came from the Álamos mines. Today Álamos is one of the most charming, largely restored colonial towns in northern Mexico.

A portion of Kino's famous 1701 map of the Pimería Alta Region, showing Baja California as a peninsula rather than an island (based on his 9 expeditions between 1698 and 1706).

Shrine to the Virgin of Guadalupe, just south of Hermosillo, Sonora

With the mines came merchants, and the Sierra Madre Occidental foothills' town of Hidalgo de Parral (in southern Chihuahua) came to be the merchant center for the region, being strategically positioned. Silver ore was packed

The enigmatic *Iglesia de la Virgen de Fatima* in Magdalena, Sonora. Built by two brothers who had a vision, or "calling." Construction began ~1980 and the church is still not fully finished, although it is functional. In front are two "Kino Heritage Fruit Trees," a peach and a loquat (and a large *el Guaje* tree on the right, from far to the south).

out to Parral, where it was assayed and then shipped to Durango or Mexico City. The Jesuits of the missions supplied food to the miners in return for silver, which was used to purchase church furnishings and luxury items such as cloth and tobacco.

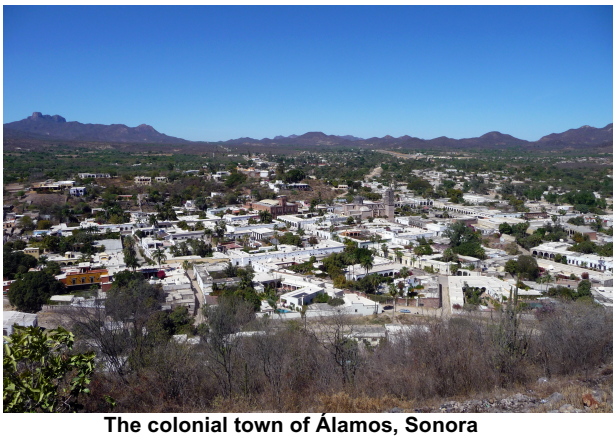
THE INDIAN WARS

During the 18th and 19th centuries, Indian raids on mines, missions and ranches were frequently made by Apaches, Jocomes, Janos, and Sumas from the north, and Seris from the west. The Apaches began raiding in the 1680s and continued for 200 years, until the last of the bands, led by renowned chief Geronimo, was finally defeated by combined Mexican and U.S. troops in the 1880s. The nomadic Apaches probably attacked simply because it was an easy way to acquire food, horses and slaves. Apaches became excellent horsemen, raiding the Spanish settlements for their mounts and, it is said, always choosing the best animals for riding. The American Southwest was not fully opened to colonization until Geronimo was captured. Even the Yaqui, who were powerfully missionized throughout most of their history, rose up against the Spanish briefly (1740-1742).

It has been said that destruction by these tribes (mainly Apaches) became so rampant in the mid-18th century that Spanish officials issued regulations that all houses in Sonora were to be constructed of adobe walls with flat roofs covered with sod or dirt to avoid destruction during Indian attacks. Their weapons were bow and arrow, and occasionally the lance. Eventually, the Spaniards built a series of *presidios*, or forts, at strategic places. In addition to protecting the local population against Indian depredations, another important activity of the sierra *presidios* was escorting mule trains carrying goods from Parral over the Sierra Madre into Sonora, and returning with silver bullion. The last of the northern *presidios* was established at Tucson in 1775, from which arose the present city of Tucson, originally on the banks of the Santa Cruz River. General small-scale warfare with the Apaches continued in Sonora and Chihuahua for most of the 19th century. In the mountains of Sonora (the Sierra Madre Occidental), isolated occurrences of Apache resistance actually continued until the 1920s.

The failure of the Spanish, and later the Mexican military to make peace with the Apaches may have been due, in part, from differences in sociopolitical thought between

Europeans and Indians. European ideas of hierarchy and subordination did not exist among the Apaches, each band having temporary leaders who were not necessarily recognized by the other bands. Thus, a truce made with one group likely did not apply to members of other bands. Farther east, the states of Texas, Coahuila, Nuevo León, and Tamaulipas confronted Comanche raids. Comanche were High Plains bison hunters of Shoshone stock that are said to have been the best riders among all the nomadic tribes of western North America. Some historians have suggested that the position of the present U.S.-Mexico border may have been largely determined by the presence of nomadic Indian bands that stopped and forced back Spanish settlement in southern Arizona and Texas.



The colonial town of Álamos, Sonora

The main zócalo and church at Álamos, Sonora

THE U.S. INVASION OF MEXICO

The short but significant Mexican–American War lasted from spring, 1846 to fall, 1847. It followed in the wake of the 1845 U.S. annexation of Texas, which was part of Mexico's territory.

Once the war began, American forces quickly occupied New Mexico and California, and then invaded parts of northern Mexico from Baja California and Sonora, to Nuevo Leon. A force eventually captured Mexico City, ending the war in a victory for the U.S. The Treaty of Guadalupe Hidalgo (*Tratado de Guadalupe Hidalgo*) was signed on February 2, 1848, spelling out the terms of the victory and forcing the cession of Mexico's territory of Alta California and a large area comprising New Mexico, Arizona, Nevada, Utah, and parts of Wyoming and Colorado, in exchange for $15 million. Mexicans living in those areas had the choice of relocating to within Mexico's new boundaries or receiving American citizenship with full rights (over 90% chose to become U.S. citizens). The treaty was signed in Villa de Guadalupe Hidalgo, now a neighborhood of Mexico City. In addition, the U.S. assumed a $3.25 million debt owed by the Mexican government to U.S. citizens. Mexico accepted the loss of Texas and thereafter the Rio Grande was recognized as the border between the two countries. The war was controversial in the U.S., with the Whig Party, anti-imperialists, and anti-slavery elements strongly opposed. The Whig Party opposed Manifest Destiny and rejected this Mexican expansion strongly. The financial cost and loss of American lives was high.

About the same time the Mexican-American War was being fought, a U.S. outpost at Yuma (Arizona Territory), called Camp Yuma, was growing as a army base needed to protect west-bound travelers to California. Supplying the fort overland was difficult and costly, so a plan was devised for a water route from the Gulf of California up the Colorado River. Much as been made of the steamship business that ran up river to Camp Yuma. However, this was not a large industry and it was plagued by problems of a shallow and changing river channel and the massive tides of the Upper Gulf. As noted by Sykes (1937), "It is improbable that in any other river service in the world has it been necessary to operate with such light steamers as the conditions upon the Colorado demanded." The service lasted for less than 25 years, and during that time many of the boats failed or were destroyed in their navigation attempts. It was an expensive, cumbersome, and risky operation. As soon as rail freight delivery at Yuma was established in 1877, river service was terminated. Much of the channel was so shallow

that soundings were done by using a willow pole instead of a lead line. The steamers had to be custom built with an extraordinarily shallow draft, around 0.4 to 0.8 m. The trip could only be made during favorable environmental conditions of river flow and tidal flux. When shoal water blocked navigation, a stern-steamer often had to back into the shallows to use its paddlewheel to dig through. So dynamic and changing was the river's channel, that no systematic logs or records of channel changes were kept by the masters and pilots of the steamers, and no permanent channel markers were ever established. It is likely that this short-lived enterprise succeeded only because it was a period of unusually high precipitation in the Southwest, with higher than average river flow (Michaelson et al. 1990, Meko et al. 2007). [Endnote 7]

THE SONORAN GOLD RUSH

In the last half of the 1700s, long before the California gold rush, Spanish Sonorans (and some Indians, mainly Yaqui and Mayo) began panning gold from placer deposits in the Sierra Madre. As the mainly pre-Cambrian rock slowly weathered down, gold in the form of nuggets and flakes eroded from quartz veins and washed down across the alluvial fans of the mountain bajadas to form the deposits. Most placers in southwestern U.S./northwestern Mexico were formed (trapped) between a layer of caliche (hardened calcium carbonate deposits) and the underlying bedrock. Nuggets could be obtained by "dry placering" -- tossing the broken earth, sand and gravel into the air and permitting wind to remove all but the heavier gold nuggets. "Wet placering" with running water recovered even the finer gold dust. The most productive areas were in the Altar Desert of northwestern Sonora, and there the first authentic gold rush in North America took place from 1775 to 1825. Unlike lode or ore mining, working placer deposits could be a one-person operation, or at most a small group association. It required simple tools and nuggets of pure gold needed no further refinement. Deposits were small, however, so placer camps were ephemeral, at best lasting only a few years. Gradually the gold miners pushed farther and farther north, into Arizona and eventually west to California. When news of the discovery of large gold deposits in the foothills of California's Sierra Nevada Mountains reached Mexico in 1848, some 5,000 fortune hunters from Sonora migrated to the new gold fields. Among the many marks they left is the namesake town of Sonora, in California's Mother Lode country.

THE WAR OF INDEPENDENCE AND THE MEXICAN REVOLUTION

So remote was Sonora from the rest of Mexico and the United States (and the world, really), and so caught up in the gold rush and other immediate affairs, that Mexico's War of Independence (early 1800s) was little more than background noise in the northwest of the country.

On October 15, 1853, with 45 men, the American soldier of fortune William Walker set out on his first of several filibustering expedition: the conquest of the Mexican territories of Baja California and Sonora. He succeeded in capturing La Paz, the capital of sparsely populated Baja California, which he declared the capital of a new "Republic of Lower California," with himself as president. Although he never gained control of Sonora, less than three months later he pronounced Baja California part of the larger "Republic of Sonora." Lack of supplies and an unexpectedly strong resistance by the Mexican government quickly forced Walker to retreat.

Sonora also played no important role during the first part of the Mexican Revolution, the so-called Maderista Period (1910-1913). However, after the killing of the great revolutionary leader Francisco Madero, in 1913, Nogales was strategically targeted by those opposed to President Victoriano Huerta. On March 13, 1913, Álvaro Obregón began his military career with the taking of this border town. The advantage that Nogales provided was access to weapons, communications, and foreign sources of financing for the revolution. Thus, Nogales came to be the place where the revolutionary government was formed by Venustiano Carranza after Madero´s murder, and it remained a principal base of the revolution between 1914 and 1929.

The famous revolutionary, Francisco "Pancho" Villa, often entered Sonora from his main hangouts in the Sierra Madre of Durango and Chihuahua, and several of his most important meetings took place in Nogales. The battle that ended Villa's dominance during the

revolution took place at Agua Prieta, Sonora (in 1916), when Obregón's army defeated him. Like so many Mexicans of fame, Pancho Villa's legacy is controversial; he is both revered as a hero of the Revolution and remembered as a notorious border bandit and killer! The statue of Villa in downtown Tucson was a gift to Arizona by the Mexican government in 1981. Obregón eventually won a post-Revolution presidential election with overwhelming support, and his presidency oversaw massive education reform, the rise and flourishing of Mexican muralism, land reform, and new labor laws. Plutarco Elías Calles (who founded the PRI political party, which ruled Mexico for nearly 70 years) also came from Sonora (Guaymas). [Endnote 8]

"NEW SONORA"

For most of its early years, Sonora was dominated culturally and economically by its eastern hills and mountainous *La Serrana* region. During the last half of the 20th Century, however, the arid Western Lowlands region experienced rapid economic growth, especially in irrigated agriculture along the river tracks and floodplains. This shift left the older mountainous region somewhat of a cultural backwater, characterized by quaint colonial era villages, like Álamos, Ures, Sahuaripa, Ariveche, Arizpe, Tecoripa, Suaqui Grande, Banámichi, Sinoquipe, and Bacanora. Thus, the present-day state of Sonora reveals its dual geographical personality—eastern, colonial, "Old Sonora," and the modern western "New Sonora." First to develop there were the towns of Guaymas (around 1820), the main seaport of the state, and Hermosillo, which became Sonora's capital in 1879. The first wagon road between Hermosillo and Tucson was established by 1860. The first rail line to Hermosillo opened in 1880, between Guaymas and Hermosillo, and to Nogales in 1882, which connected to southern Arizona. Grains went from Guaymas (by boat) and Hermosillo (overland) to the U.S., and machinery for the Sonoran mines was shipped to Guaymas from San Francisco.

Guaymas is one of the best natural harbors in all of Mexico. During the 19th century, large Mexican, U.S., and English mercantile firms were established there, and a regularly scheduled steamship line to San Francisco and much of the Pacific Rim developed.

Part of the fishing fleet (sardines and shrimp) at the new dock, outer Guaymas Harbor, Sonora

Hermosillo, in 1700, was no more than a small settlement (called Pitic) housing a few Spaniards and Pima Bajo Indians. It came to serve as a *presidio* against the rebellious Seri Indians, but eventually grew to become the city of Hermosillo (named in honor of a Mexican hero of the War of Independence).

After the final subjugation of the nomadic Indians in the 1880s, U.S. companies began to invest heavily in Mexico's mining industry. Foreigners and their Mexican partners reopened many of the abandoned silver, gold and copper mines (called *antiguas*), using modern techniques to exploit the deeper, poorer lode ores. Important copper mining towns such as Cananea, Nacozari de García, La Colorada, as well as Minas Piietas grew up along the southern end of the great Arizona copper belt. For a while, Cananea, with 20,000 inhabitants, was the largest city in the state. The revival of Sonoran mining was short-lived; it was arrested by the outbreak of the Mexican Revolution in 1910. Today, only the rich copper mines of Cananea and Nacozari still remain highly productive, although new mines have recently opened west of the federal highway (near Querobabi).

Agriculture in the Western Lowlands

Irrigated commercial farming on the coastal river floodplains and deltas of Sonora and Sinaloa began slowly in the 1890s, but it came to be the most significant factor in the "modernization" of Northwestern Mexico in the 1950s. The fertility of floodplain and deltaic soils was well known to both indigenous peoples and Spanish settlers.

Throughout much of the latter 19th century and early 20th century, coastal farming settle-

ments in the Río Yaqui region were ravaged by fighting between rebellious Yaqui and the Mexican military. Eventually, the government declared a campaign of extermination on the Yaqui, including taking many of them as indentured servants to work plantations in the far-away states of Nayarit, Yucatán and Oaxaca. Many escaped government persecution by fleeing to Arizona, where some families still live on the Pasqua-Yaqui and other reservations in Tucson.

After the end of the Mexican Revolution (beginning in the 1930s) the federal government set out to provide new opportunities for the public by developing numerous new irrigation districts in rural areas. Many of these were in the western lowlands of Sonora and Sinaloa, along the fertile alluvial plains of the Ríos Fuerte, Mayo, and Yaqui, and also on the deltaic plains of the Colorado River in the Mexicali Valley. These projects brought deep-well drilling, dams, electrification, refrigeration, and air conditioning to some of the most remote regions of the northwest. They prompted the colonization of these areas, which, until then, had been largely only sparsely settled. These efforts, which also took place in Chihuahua, promoted the growth of cities such as Monterrey, Monclova, Torreón, Juárez and Tijuana.

The first modern farmlands to be developed through the *Distrito de Riego* were along the Río Yaqui and Río Mayo in southern Sonora. Then came the Río Colorado and, finally, in the mid-20th Century, the Río Sonora and Río Magdalena-Asunción-Concepción. All were developed through government economic planning processes with no apparent regard whatsoever to water or land conservation issues. For the past half-century, the coastal plains of Sonora and Sinaloa have been Mexico's most important agricultural (and more recently, shrimp farming) lands. Major land crops include wheat, corn, rice, soy, sugar cane and vegetables, much of which finds its way to Arizona and California.

These developments also opened the way to ranching, and cattle grew to become an important economic driver in Sonora. As land was cleared of its native Sonoran Desert flora (and fauna), it gradually was replaced with vast regions of invasive (native) *Opuntia* cacti and, more recently, non-native and highly invasive buffelgrass (*Pennisetum ciliare*).

In 1926, Mexico passed the National Water Law, which committed the federal government to develop large-scale irrigation projects throughout the country. To administer the law, the government formed the Comisión Nacionál de Irrigación, the main duties of which were to undertake construction of large-scale dams and canals, and to colonize the newly formed irrigation districts. In 1946, the Comisión was replaced by the Secretaría de Recursos Hidráulicos, which had cabinet-level status and thus increased access to federal funds. This initiated a period of rapid dam construction and expansion of irrigated lands. Along the larger rivers, annual summer floods were controlled by the construction of large dams and reservoirs in the 1940s and 1950s.

By the 1960s, the first signs of increasing soil salinity were appearing in the Yaqui and Mayo deltas. Excessive application of water to the land was viewed as the cause, so deep drainage ditches were built to carry excess irrigation runoff to the Sea of Cortez. Extraction of water from aquifers in the Río Sonora delta (the "Costa de Hermosillo" District) has far exceeded natural replenishment, leading to a rapid fall in the water table. Since the turn of this century, depletion of the water tables and rivers of Sonora has become a significant threat that is amplified by a 15-year drought in southwestern U.S./northwestern Mexico. [Endnote 9]. Currently, Hermosillo is developing a highly controversial (and contested) plan to harvest water from the Río Yaqui, moving it north via a huge system of aqueducts and pumps.

Growth in the population of the Hermosillo area (over 700,000 residents today) has exacerbated this water problem. Intrusion of salt water from the Sea of Cortez into the aquifers, caused by the falling water table, made much of the groundwater along the coast too saline for agricultural use. In response to these problems, the government, in 1989, limited the number of permitted wells to 498, which halved the annual amount of ground water pumped, from 800 million to 400 million cubic meters per year. It was hoped that this would shift agriculture away from water-intensive crops like wheat and cotton, toward crops requiring less irrigation. However, over-exploitation of fossil water is now taking place in the Caborca area, where hundreds of wells supply water for wheat, cotton, olive groves and vineyards. [Endnote 10]

Hermosillo faces serious water shortages and is in the process of completing an extensive, expensive, and highly controversial aqueduct project to bring water from the Río Yaqui to the city (over strong objections from the Yaqui community).

Fishing

About the same time that government-sponsored irrigation districts were being established in western Sonora, commercial fishing was evolving along the Sea of Cortez coast. The first Mexican shrimp boats were operating out of Guaymas in the 1920s. In the 1930s the Japanese, with permission of the Mexican government, began exploiting shrimp stocks off Guaymas. John Steinbeck and Ed Ricketts observed the Japanese operations during their 1940 Sea of Cortez expedition, describing the destructive fishing methods in their classic book, *The Sea of Cortez. A Leisurely Journey of Travel and Research*. The Mexican government eventually banned the Japanese fleets from the Gulf, but their success led to the establishment of the three major fishing centers of Sonora: Guaymas, Puerto Peñasco, and Yavaros.

Due to its high productivity and subtropical location, the Gulf of California teems with many species of finfish, crustaceans, and molluscs. Over 6000 species of animals have been reported from this sea, and many still remain undescribed. One-third of the world's cetacean species can be found in the Gulf, as well as 5 species of sea turtle. The majority of the fisheries catch today is shrimp, Gulf corvina, squid and sardine. Nearly three-fourths of the shrimp catch is exported to the U.S., and today the shrimp harvest (including farmed shrimp) from the Sea of Cortez makes up about 60% of Mexico's total fishery by dollar value. Industrial ("high seas") shrimpers use one of the most destructive fishing methods known—dragging large trawls across the sea floor, ripping up the top few inches of the sea bed, capturing (and killing) virtually every animal the nets encounter. Limited data suggest that the entire benthic ecosystem of the shallow Gulf has been dramatically altered because of this continual disturbance, year after year, since the 1920s. The principal change appears to be greatly reduced species diversity, loss of rare species, and hypoxia (severe oxygen depletion) due to the rain of decomposing by-catch dumped off the shrimp boats day after day. However, no thorough scientific study of this long-term disturbance has been undertaken. The sardine catch (comprising mainly *Sardinops sagax* and *Opisthonema libertate,* and the recently reestablished northern anchovy *Engraulis mordax*) is six times the shrimp catch by tonnage, but of relatively less value. Sonora accounts for 60% of Mexico's sardine take. Most of it is processed for poultry feed and fishmeal fertilizer. It is likely that every commercial species in the Sea of Cortez is unsustainably fished today.

Shrimp boat, working out of Puerto Peñasco, 2013

ENVIRONMENTAL CONSERVATION IN SONORA

Much of Sonora is still sparsely populated, simply because of the aridity of the area and the rugged ranges of the Western Sierra Madre. However, much of the seemingly "natural" landscape of the region has been significantly disturbed over the past 60 years by ranching and by the spread of various invasive plants.

Sonora has over 7,000 sq mi (>18,130 sq km) of protected wildlife areas. Federally-protected natural areas in Mexico are of six types: biosphere reserves, national parks, areas for the protection of flora and fauna, protected natural resource areas, natural monuments, and shrines. The state of Sonora has about 10 federally protected areas, around 20 state-protected sites, and a number of private natural reserves. Among these is the *El Pinacate and Gran Desierto de Altar Biosphere Reserve* (both a Mexican and a UNESCO Biosphere Reserve, and a UNESCO World Heritage Site, and also one of Mexico's designated "13 natural marvels"), located between Puerto Peñasco and the U.S. border in the Altar Desert. The reserve

comprises rich Sonoran Desert habitat, massive dune fields, and hundreds of dormant volcanic craters. Bordering the western edge of the Pinacate reserve is the 3,609 sq mi (9,348 sq km) *Alto Golfo de California y Delta de Río Colorado Biosphere Reserve*, at the head of the Gulf of California. This, and the Pinacate reserve, were created in 1993. The *Sierra de Ajos-Bavispe Natural Resource Area* is in the central interior of Sonora. The 156 sq mi (405 sq km) *Reserve for the Protection of Flora and Fauna, Sierra de Alamos-Rio Cuchujaqui* is in the far southern foothills of the Sierra Madre Occidental in Sonora.

In addition to these, and others, all of the islands of the Sea of Cortez comprise the *Protected Natural Resources of the Flora and Fauna of the Islands of the Gulf of California*. Additionally, the entirety of Bahía Adaír, between the towns of Puerto Peñasco and El Golfo de Santa Clara, is a Ramsar Designated Wetland. Also, the Seri coast is a designated Ramsar Wetland. The Convention on Wetlands of International Importance, known as the Ramsar Convention, is an international treaty that defines actions and areas of cooperation for conservation of sustainable wetlands.

When you travel the byways of Sonora, admiring its natural beauty, keep in mind how the geological landscape has shaped its human history. And remember that the mountains and rocks you see were formed millions of years before the first human being ever set foot in these lands, and they will be here for millions of years after the last human perishes. Native Americans, Spanish colonists, and modern inhabitants of the region have been nothing but a passing breeze in geologic time. For these reasons, the land inspires awe and respect.

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ENDNOTES

Endnote 1. According to one popular myth, the Aztecs discovered the beverage *pulque* (later distilled into mescal/tequila by the Spaniards) when a bolt of lightning struck an agave field. The bolt instantaneously cooked the heart of one of the plants, and caused it to quickly ferment. The Aztecs noticed the aromatic nectar exuding from the cooked plant, and deemed it to be a miraculous gift from the gods (which they named *pulque*). Subsequently, during colonial times, it was distilled into *vino mezcal* ("mezcal wine"), the most popular version of which came to be tequila. (In Mexico, it is usually spelled *mezcal*; in the U.S. it is usually spelled mescal.) There are today around 30 tequila distilleries in Mexico, producing hundreds of brands/varieties of tequila in six categories (fixed by federal law): (1) 100% agave tequilas are required by law to be made from 100% fermented juices from the blue agave, with no additives, not even sugar. (2) *Mixto* tequilas must be at least 51% fermented juices from the blue agave, but additives may be used, such as fermented cane sugar juices (ethanol). (3) *Blanco* tequila is tequila in its youngest and purest form, just as produced by the distillation process, without the effects of any barrel aging. Blancos can be 100% agave, or *mixto*. (4) Gold (*joven abocado*) tequilas are usually *mixtos*, unaged blanco tequila to which additive colors (usually caramel) and flavors are mixed after the distillation process. (5) *Reposado* tequilas are, literally, "rested." By law, a *reposado* must be aged in wood for at least 60 days, but most are actually aged closer to a year. They are aged in large wooden tanks, or sometimes in small oak barrels. (6) *Añejo* tequilas are "aged" or "old." By law, *añejos* must be aged for at least 12 months in government-sealed barrels that are no larger than 600 liters. Often, the barrels used are old 190-liter whisky barrels from Kentucky. The longer the aging process (in wood), the darker the tequila becomes.

Many mescal makers put a "worm" in the bottle, said to enhance the flavor (also said to be a marketing ploy). The "worm" is actually an insect larva, typically either of a cossid moth (*Comadia redtenbacheri, =Hypopta agavis*), a skipper butterfly (*Aegiale hesperiaris*), or a weevil (*Scyphophorus acupunctatus*). All are found associated with living agaves, but only the weevil causes any real damage to the plants. In Oaxaca, these dried and ground-up larvae are often added to chile (and other secret ingredients) to concoct a tasty powder that one sprinkles on a citrus slice to accompany a glass of mescal. Locals insist the insect larva enhances the flavor and enjoyment of the drink, and perhaps even gives the drinker temporary special powers of love and intellect. Some recent research suggests mescal was being distilled in southern Mexico by Native Americans before the arrival of Europeans in the New World, but this is a hotly debated idea.

The agave plants used to make mescal take from 5 to 50 years to reach maturity, depending on the species. In the traditional mescal-making method the hearts of the agave plant (the piñas) are roasted underground for about 3 days. Fermentation of the cooked mash uses natural airborne yeasts and can take 5 to 12 days. Most are twice distilled, either in copper pots or traditional clay pots. The agave (maguey) plants are often cultivated in the same fields as corn (maize), the two being of fundamental importance to rural life in much of Mexico. 205 agave species occur in the state of Oaxaca alone, but the most commonly used species is maguey espadin (*Agave angustifolia*). Maguey Mexicano (*Agave rhodacantha*) is also sometimes cultivated and makes a distinctly flavored mescal known as Maguey de Monte. Maguey coyote (*Agave americana* var. *oaxacensis*) is recognizable by its broad leaves (pencas), maguey cuixe (*A. karwinskii*) by its long trunk and small piña, the rare maguey tobalá (*A. potatorum*) by its delicate flavor, and maguey tepeztate (*A. marmorata*) by its very large size and erratic leaves.

Endnote 2. Padre Kino's 12 missions in Sonora were located at (east-to-west): Cucurpé, Dolores, Cocóspera, San Ignacio, Magdalena, Tubutama, Santa Teresa, Atil, Oquitoa, Pitiquito, Caborca, and Bísanig

Endnote 3. San Xavier del Bac, about 12 miles south of Tucson, is the best known and most elaborate colonial mission church in the Pimería Alta. Padre Kino first visited this site in 1692, and that year he established a mission program for the Piman (O'odham) People that lived in the area. Although the villagers built a small adobe home that served as a mission church, Kino's plans for a full-fledged church never came to fruition. In the 1750s, a simple adobe hall church was constructed by Jesuits, supervised by Father Alonso Espinosa. In 1767 the Jesuits were expelled from the Spanish colonies and

replaced (a year later) by Franciscans, and it was they who built the church that stands today, under the supervision of Father Juan Bautista de Velderrain and Juan Bautista Llorens between 1783 and 1797. The old Jesuit adobe church was dismantled and moved in the early 19th century, piece by piece, to the east side of the new one, where it was recycle into the convento wing that still stands. (Some of the pine beams from the old Jesuit church are now part of the east Convento wing.) The eastern bell tower of the main church was never finished, perhaps because the builders ran out of money. The famous cat and mouse that occupy the front church facade have been there since the church was built, but no one today knows what they represent (although there is no shortage of interpretations). Today the church functions under the auspices of the Franciscans (the Order of Friars Minor), and it continues to serve the local O'odham community (although everyone is welcome at the services).

It is often said that all Jesuit churches in the Pimería Alta were built with the entrance facing south. While this is true for San Xavier church, it is not the case for all, many of which face west, south-by-southeast, or west-by-northwest.

Endnote 4. On Kino's first Pinacate expedition, he saw the mountains of Baja California and judged that there could be no seaway separating them from the mainland. On his second and third expeditions, he saw the head of the Gulf of California, the actual land connection between Baja and the mainland, confirming the peninsular nature of the former; on these trips he also reached the Sea of Cortez, on the coast of Sonora. On his fourth expedition, he took "official witnesses" to the top of Sierra Pinacate, to prove to them the peninsular nature of Baja California. Kino was 61 years of age on this fourth expedition to the Pinacates.

Endnote 5. The Virgin of Guadalupe has been known by many names (the Dark Virgin, the Virgin of Tepeyac, *La Criolla*, etc.), and the hold that devotion to Our Lady of Guadalupe has on the Mexican people is legendary and profound. In fact, she has come to be venerated throughout Latin America and is sometimes referred to as the Empress of the Americas. This devotion is based on the story of the Virgin Mary's appearance to the newly converted Aztec (Náhuatl) Indian, Juan Diego Cuauhtlatoatzin, in 1531, in the village of Tepeyac (today, a northern suburb of Mexico City). The apparition occurred early in the conquest of Mexico, just ten years after the Aztec capital of Tenochtitlán fell to the conquistador Cortés. Not only did the Virgin appear, but also she left her beautiful image on Juan Diego's agave-fiber cloak (*tilma*), in which he carried "miraculous roses" (Castilian roses, unknown in the New World at that time) from Tepeyac Hill to Bishop Zumárraga, with a request from the Virgin that a new church be built on the hilltop site. Zumárraga was a compassionate man who built the first hospital, library and university in the Americas. He was also the "protector of the Indians," entrusted by Emperor Charles V to enforce his decree of 1530 that Indians could not be made slaves. Shortly after the miracle, an adobe structure was built atop Tepeyac Hill in honor of the Blessed Mother, Our Lade of Guadalupe. It was dedicated on December 26, 1531, the feast of St. Stephen the Martyr. All this was 76 years before the first permanent English colony was established in the New World (Jamestown, 1607). A mortar-and-stone chapel was built around the original adobe structure in 1556. Eventually, a larger church was built nearby and dedicated in 1622. A much grander baroque church was consecrated at the base of Tepeyac Hill in 1709 (and dedicated as a basilica in 1904). A modern new basilica (the "New Basilica of Our Lady of Guadalupe") was built between 1974 and 1976 next to the old one, and today Juan Diego's cloak is still on exhibit there. In Mexico, December 12th is the "official" feast day in honor of Nuestra Señora de Guadalupe.

The first published account of the apparition came more than 100 years later, in 1648, by the Oratorian priest, Miguel Sánchez. Sánchez's account was responsible for the popularization and spread of the devotion among the *criollos* of Mexico City – that is, among those people of European stock who had been born in the New World. Though the only difference between *criollos* and Spaniards from Europe (from the Iberian Peninsula) was their place of birth, the *criollos* saw themselves as marginalized. Disdained by the Spaniards of New Spain (the Spanish colonies of the New World), excluded from the topmost positions of local government, and suppressed by what they regarded as second-class citizenship, they reacted by developing a strong sense of group and regional identity. Thus, Sanchez's book was not only a devotional treatise but a complex celebration of *criollismo* that used the vision of the Virgin of Guadalupe as proof of special divine favor

toward the *criollos* – the Virgin Mary had revealed herself to the *criollos*, even if through the agency of a lowly Náhuatl Indian. But of course, the image on Juan Diego's cloak was of a dark-skinned virgin, so the Native Americans (and those of mixed blood) also viewed the apparition as meant for them. The devotion quickly spread throughout New Spain. It reached Europe through the efforts of Pedro de Gálvez, a former *visitador* in New Spain and a member of the Council of the Indies, who in 1662 subsidized publication of Mateo de la Cruz's version of the apparition story.

The first political use of the Virgin of Guadalupe as a national symbol was during the Mexican War of Independence (1810), when the Virgin appeared on the banners of the military general Miguel Hidalgo, while his troops proclaimed long life to her and death to the Spaniards. Thus, the long-standing rivalry between the Virgin of Guadalupe (*La Criolla*) and the Virgin of Remedios (*La Conquistadora*) became clearly marked along nationalistic and political lines. It is not surprising, therefore, that, after independence was attained, the Virgin of Guadalupe emerged as the preeminent national religious symbol of Mexico. As the famous writer-philosopher Octavio Paz once observed, "The Mexican people, after more than two centuries of experiments and defeats, have faith only in the Virgin of Guadalupe and the National Lottery." The narration of the Virgin of Guadalupe is sometimes called the "fifth gospel." It has been one of the most important evangelizers in the history of the Americas.

Two hundred years after Juan Diego's vision, in the 18th Century, the road to fame for aspiring composers in Italy had come to be the writing of operas. For their Latin American, New World counterparts, however, the most prestigious genre was *Maitines* (or *Matins*), a Roman Catholic service traditionally performed in the early hours of the morning. The *Matins* provided a range of opportunities to display compositional skill, as it juxtaposed a wide variety of textures and style, commonly paralleling that of an Old World opera but with monophonic *Psalms* in chant, intoned *Lecciones* that could preach or weave a story, and sets of *Responsorios* that elegantly combined voices with instruments. In 1742, the Italian composer Ignacio de Jerusalem was recruited to Mexico City to help strengthen the music resources of New Spain's growing empire. In 1750 he was appointed to the top post of Chapel Master at the Cathedral. In 1764, in Mexico City, he presented his masterpiece, "*matins* for the Virgin of Guadalupe." Jerusalem's *matins* have rarely been recorded, but several versions of this stunning composition do exist; my favorite is "*Matins* for the Virgin of Guadalupe, 1764," by Chanticleer (Teldec 3984-21829-2).

The name "Guadalupe" may derive from the Aztec word *tlecuatlecupe*, which means "one who crushes the head of the serpent." When pronounced correctly, the name sounds like "Guadalupe," and this is how the Spaniards interpreted it. There is, in Spain, a town (with a prominent Marian shrine) by the name of Guadalupe, in the province of Cáceres. Although the feast day of Our Lady of Guadalupe is December 12, the feast day for Juan Diego, who was declared a saint in 2002 by Pope John Paul II, is December 9 (the day of the first apparition). And, the Virgin of Guadalupe in Spain is also dark skinned!

Endnote 6. The artist Dick Wiken was born and died in Milwaukee, Wisconsin (1913-1985). He was a self-taught sculptor, designer, and craftsman. Wiken attended the University of Wisconsin-Milwaukee for two years, studying journalism, English and history, but did not receive a degree. During World War II, he served in the U.S. Army Corps of Engineers (1943-1946). Although self-taught, Wiken eventually became an Instructor of Sculpture at the Art Institute in Milwaukee (1934-1937), and then at the University of Wisconsin Milwaukee (1938-1943). His works in wood, stone and metal decorate many buildings and homes in the Milwaukee area and beyond. Among his most unusual and interesting work is a set of wood carved panels at the Playa de Cortés Hotel, near Guaymas (Sonora). The panels depict the "Rape of Mexico" during the Spanish Conquest. The hotel was built in 1934 by a railroad baron, to facilitate the arrival of the passenger train to Guaymas. Wiken's four, commissioned, bas relief wood sculptures, which are displayed in the hotel's bar, are each about 4 ft X 6 ft, and they are crafted in deep rich mahogany. The scenes are of conquistadors and naked Aztec women, and lust and violence mingle as Spanish armor meets bare skin. Wiken carved these in 1946/47, with the intent of depicting the story of the Spanish conqueror Hernán Cortés overthrowing the Aztec Empire. Wiken titled the works, "The Rewards of Conquest—Wenching, Gambling, Drinking and Indolence." One of the

panels shows Cortés and his mistress, La Malinche, who betrayed her own people. Her legacy lives on today, in the word "*malinchista*," which refers to a person disloyal to their country. Another panel depicts Cortés mourning his losses after the great battle of *La Noche Triste* (The Night of Sorrows) where he lost many soldiers in a trap set by Aztec warriors. There is also a series of nine smaller panels by Wiken above the bar called "The Court of Cortez," and these illustrate the sacrifices, impalings, and destruction of Aztec icons by the Spanish soldiers. All this work is beautiful, and disturbing. The juxtaposition of these carvings in the bar of a happy seaside resort is somewhat jarring, and most visitors seem to prefer drinking their margaritas to studying the details in Wiken's exquisite art. Photos of Wiken's four panels follow.

Shortly after the expeditions of Christopher Columbus, and for much of the time that Baja California was thought to be an island, its mystery was also shrouded in legends of gold, pearls, griffins, and beautiful Amazon women. Most of the mystique about the "island" of California came from a famous chivalric novel titled, *Las sergas de Esplandián* (The Sagas of Esplandián), by the Spanish writer Garcí Ordóñez de Montalvo. This romantic novel had become beloved in medieval Spain, inspiring the ambitions of sailors, soldiers, and adventurers. The novel was greatly admired by Hernán Cortés and, in fact, the writings of Cortés also leaned toward the fantastic, as was the tendency of the times. In Ordóñez de Montalvo's story, the noble knight Esplandián survives the siege of Constantinople by a pagan group of Amazons from the "Island of California," riding griffins and led by Queen Calafia. The women of California were black skinned, valiant, with wondrous bodies, great strength, and ardent hearts. Their weapons were made of pure gold, the only metal that existed in California. The Island was said to be in the New World, west of the land that Columbus had

discovered, and “on the right hand of the Indies.” Many Europeans already believed that “the Indies” of Marco Polo lay not far beyond the lands of the New World. Cortés first received news of the Pacific Ocean in 1522, less than a year after the fall of Tenochtitlán (the ancient capital of the Aztec Empire), and 12 years after *Las sergas* was published. The report came from one of Cortés’ captains, Gonzalo de Sandoval, who had been sent to explore the western sea of México. De Sandoval reported seeing an island rich in pearls and gold, and populated by women who killed their male offspring—no doubt a story inspired by Ordóñez de Montalvo’s classic novel. In 1532, Cortés sent Captain Diego Hurtado to seek out the Island of California. But what Hurtado found were primitive people (and no Amazons) living in a parched desert with no gold and little water. Nonetheless, Cortés officially named the land California, reasoning it must be the place described in Ordóñez de Montalvo’s novel. In 1535, Cortés embarked on his own expedition to colonize California, placing 320 people in Bahía de la Santa Cruz (now known as the Bay of La Paz). Cortés claimed it for Spain, and as navigators pushed northward, the name California came to include Spanish claims from the tip of the peninsula to Puget Sound. But the colonists could not survive in La Paz, for lack of food and water, and probably because the locals were unfriendly. María Early Capistrán (2014) notes, had they discovered that sea turtles were a rich source of food, they might have fared far better; but records suggest that, for whatever reason, they did not take advantage of that abundant seafood.

Endnote 7. There have been three great myths about the Colorado River¹s pre-dam (pre-1935) flow to the Gulf of California: (1) it was a mighty river delivering a great deal of fresh water to the Gulf annually, (2) the river¹s waters provided a critical nutrient supply required to sustain biological productivity in the Upper Gulf, and (3) its waters diluted the Upper Gulf, creating a massive estuary and widespread brackish water conditions. Recent published papers have debunked the first two myths (largely summarized in Johnson et al. 2017, Mercado-Santana et al. 2017, and Brusca et al. 2017); the third myth was debunked by Rojas-Bracho et al. (2018). The latter provides evidence that the Upper Gulf has never been a brackish water estuary. Evidence suggests that the estuary of the pre-dam Colorado River has always been highly restricted, probably comprising no more than Montague Island and the small area north of it to the mouth of the river. This is, historically, likely to be the only place brackish water (<30 ppt) was ever typically found.

Understanding all this is more than an academic exercise. Papers in the scientific literature that have perpetuated these three myths, whether based on naiveté or as intentional “fake science,” have been used for years as the lynchpin to fight government regulation of gillnets in the Upper Gulf. And there are, of course, plenty of politicians (including presidents, past present and future) and agency administrators in Mexico who would like to shift the blame for the extinction of Mexico¹s only endemic marine mammal, the vaquita, from illegal capture in gillnets to U.S. control over the Colorado River.

Endnote 8. Pancho Villa was named by his parents, Doroteo Arango Arambula. He fled from his home (in Durango) to the sierras at the age of sixteen, after shooting the master of the hacienda in the foot for trying to rape his younger sister (or so the legend goes). It was then that he changed his name to Francisco “Pancho” Villa, and took up a life of crime and rebellion. The reason Pancho Villa was killed seems to be shrouded in mystery. The Revolution was over and he was “in retirement” in the Sierras, breeding fighting cocks and running his estate at Canutillo, Durango. It is said that, when the assassins murdered him in 1923 (in Parral, Chihuahua), he had more than 8000 rifles, a half-million cartridges, and a large supply of bombs and hand grenades at his hacienda. He was, as he liked to say, “hated by thousands and loved by millions.” President Obregón may have feared that Villa had more revolutionary ideas in him, and ordered his murder. Today, a statue of Villa also stands in the plaza of Canutillo—the state’s most famous native son. And the Francisco Villa Museum in Parral (Chihuahua) interprets his unique and colorful history and, every year in July, reenacts his assassination. To say the man was complicated is an understatement. After invading the U.S., and sacking and burning the town of Columbus, New Mexico, General Peshing himself went after Villa in Mexico, spending nearly a year perusing him to no avail. It is said that, during the revolution, Villa once ordered the killing of 90 women by firing squad in Camargo (Chihuahua), for consorting with the

enemy. He was fearless of death, leading his cavalry charges himself. He married 26 times, and was a compulsive womanizer.

Endnote 9. Studies of tree-ring data inform us that northwest Mexico suffered during most of North America's major droughts, historical and pre-historical. The two most severe droughts during the 20th century occurred in the 1930s (the "dust bowl drought") and 1950s. Similar widespread droughts likely also occurred during the 1750s, 1820s, and 1850-1860s. The 16th century "megadrought" is generally considered the most severe prolonged drought over much of North America for at least the last 500 years (Meko et al. 1995, Stahle et al. 2000), and possibly the last 2000 years (Grissino-Mayer 1996). During the mid- to late-16th century, drought extended across most of the North American continent. Drought conditions prevailed throughout much of the 16th century over Mexico's Sierra Madre Occidentalis and the Rocky Mountains. In northwestern Mexico, the era of strongest and most persistent drought was the 1540s to the 1580s, and in the southwestern U.S. it was 1550s to 1590s. (The tree-ring reconstructed drought during the 1930s exceeded the 16th century droughts only in the Pacific Northwest and western Canada [Stahle et al. 2016].) The human impact of the 16th century megadrought must have been significant. The event was most severe in northwestern Mexico and southwestern U.S., and in northern Mexico severe drought is estimated to have persisted for 24 years. The term "megadrought" has been used to imply a very large-scale drought more severe and sustained than any witnessed during the period of instrumental weather observations (e.g. Stahle et al. 2000). Two other severe sustained megadroughts are recorded in tree-ring data from the 15th and 14th centuries. These three western megadroughts lasted for 16-38 years each (Stahle et al. 2006). The 14th century megadrought extended over the West from 1387 to 1402. Earlier still, was another Southwest megadrouight that A. E. Douglass (1929, 1935) described as "the Great Drouth of AD 1276-1299," and it often viewed as the likely cause of the abandonment of Anasazi cliff dwellings across the Colorado Plateau.

S. Stine (1994) suggested use of the general term "Medieval Climate Anomaly," also known as the Medieval Warm Period, or Medieval Climate Optimum. This was a time of warm climate in the North Atlantic region that may also have been related to other climate events around the world during that time, lasting from about 950 to 1250. It was followed by a cooler period in the North Atlantic termed the "Little Ice Age." Despite uncertainties, especially for the period prior to 1600 for which data are scarce, the warmest period of the last 2,000 years prior to the 20th century very likely occurred between 950 and 1100. Proxy records show peak warmth occurred at different times for different regions, indicating that the Medieval Climate Anomaly was not a time of globally uniform change. Temperatures in some regions matched or exceeded recent temperatures in these regions, but globally the Medieval Warm Period was cooler than recent global temperatures.

Stahle et al. (2016) used Mexican Drought Atlas data to map drought periods across Mexico in four regions, southeast, central, northeast, and northwest (the latter being 22-31° N, 102.5-111° W). The most intense droughts in Mexico, since 1550, lasted from 4 to 8 years and were most severe over the northwest region. These were:

- 1566-1573 drought. Part of the 16th century megadrought, which lasted with little interruption for at least 20 years over northern Mexico.
- 1666-1669 drought: Covering most of Mexico, this was one of the two most extreme sub-decadal to decadal droughts of the past 600 years in the northeast region. This drought had well documented impacts among the Spanish and Native Americans of the southwestern U.S. (Stahle and Dean 2011), and was one of the most severe sustained droughts in the 470-year long tree-ring reconstruction of the Southwest by Griffin et al. (2013).
- Several severe sub-decadal droughts of 5-6 year duration are estimated to have occurred in the mid-18th and early 19th centuries.
- The 1950s drought (most intense from 1951 to 1957) is evident in both instrumental and MSDA data, and it may have been the most extreme decadal drought in the 600-year reconstructions for northeastern and northwestern Mexico. It began in the late 1940s and persisted into the 1960s over northern Mexico.

The two most extreme droughts during recent times (during "instrumental times" in Mexico) were the 1950s drought, and the current drought, which began in the mid- to late 1990s (Stahle et al. 2009). The current drought has had severe consequences for agricultural and water resources sectors in Mexico and has

induced widespread emigration from drought-affected regions of Mexico into the U.S. (Feng et al. 2010, Hunter et al. 2013).

The IPCC Assessment Report 4 model projections suggest that the subtropical dry zones of the world will both dry and expand poleward in the future due to greenhouse warming (Meehl et al. 2007). The U. S. Southwest is particularly vulnerable in this regard and model projections indicate a progressive drying at least to the end of the 21st century (Seager et al. 2007). Already, the west has been in a state of drought since around 1999.

Climate models suggest that Mexico, the southwestern U.S., and Central America will experience progressive drying over the 21st century (Feng and Fu 2013). Overgrazing, deforestation, and the extensive land conversion for human use are believed to have reduced evaporative cooling and sharply increased the sensible to latent heat flux, favoring higher daily temperature maxima and overwhelming the potential cooling effect of increased surface albedo (e.g., Balling 1988, Englehart and Douglas 2005).

The influence of anthropogenic land cover change on Mexican climate may have some precedent in the archaeological record. Model simulations of the climate consequences of deforestation by the ancient Maya in the lowland Yucatan indicate heightened drought conditions (Cook et al. 2012), which in turn may have contributed to the decline of certain Mayan city-states near the close of the Classic Period (Stahle et al. 2016). The conquest of the Aztec empire by a handful of Spanish conquistadores and their indigenous allies is one of the most remarkable military campaigns in the world history, and it has been suggested that it was made possible by the combination of imported disease (especially smallpox) and drought (Acuña Soto et al. 2002). The Aztec apocalypse in 1521 appears to have coincided with a severe sustained drought in central Mexico that may have begun as early as 1514 (Stahle et al. 2011) but was most extreme (based on MXDA data) from 1521 to 1524. This drought has been dubbed the “conquest drought.”

The worst famine of the colonial era in Mexico occurred in 1786, and is referred to as *El Año de Hambre*, the year of hunger (Florescano and Swan 1995, Therrell 2005). Two to three years of drought and early fall frost in 1785 appear to have led to the 1786 crop failure and famine. An estimated 300,000 people died during *El Año de Hambre*, with combined famine with an outbreak of epidemic typhus (Cooper 1965, Burns et al. 2014). The Mexican Drought Atlas data indicate that drought conditions were most serous during the two-year period from 1785 to 1786, when drought extended over most of Mexico (Stahle et al. 2016). The Mexican Revolution began in 1910, driven in part by grievances related to agrarian reform, but drought conditions have long been suspected as a contributing factor (e.g., Tutino 1986). Tree-ring data indicate at least 2 years of drought over most of Mexico in 1909 and 1910 (Stahle et al. 2016). Dell (2012) suggested that the highest rates of insurgent activity occurred in those Mexican municipalities that suffered the most severe drought conditions just prior to the activity. Hunter et al. (2013) have also suggested that some of the highest rates of illegal immigration to the U.S. have tended to come from the most drought-afflicted areas in Mexico.

Endnote 10. The vineyards provide table grapes and also supply several wineries in northwest Mexico, including the Domeq winery, which produces second-rate brandies and wines, including the famous "Padre Kino Vino Tinto"—at about $5/liter, an agreeable red table wine (Mexico’s version of “Three-Buck Chuck.” As of 2014, about 2000 acres of vineyards were under cultivation just north of Hermosillo.

Appendix 1. Photographs of some of Padre Eusebio Kino's 16 Mission Sites in the Pimería Alta (northern Sonora and southeastern Arizona).

The "Mother Mission" of the Pimería Alta was **Nuestra Señora de los Dolores**, north of Cucurpé. Founded in 1687 by Kino, it was situated on a high bluff overlook the beautiful Río San Miguel valley. Not long after Kino's death, Dolores began to deteriorate, and the religious site was abandoned in 1762. Nothing remains of the original structures today, although locals have built a new alter (left photo) and undertake occasional pilgrimages to the area. The graves (right photo) seem to all post-date the Kino era.

Kino established his mission at Cucurpé (**Los Santos Reyes de Cucurpé**) around 1650, 30 years before Dolores. It was from here that he launched his more northern expeditions. At the time, Cucurpé was the northernmost outpost of the Spanish in Sonora. There have been three churches built at the mission site. The first stood to the west of the present structure, and only fragments of this remain. The second still stands, to the east of the present structure, and is likely the one described by Antonio de los Reyes in 1772. The present one (shown above), still unfinished, has moved forward with fits and starts. In past times, locals scavenged the cut stone slabs for their homes, but more recently there has been a move to protect and, hopefully, complete this church.

Not much remains of the **Nuestra Señora del Pilar y Santiago de Cocóspera** church today. Kino founded the mission at this site in 1687, and construction began on the church some time around 1690. In 1697 Father Ruiz de Contreras became resident priest, although construction of the church was still underway. The church was likely completed in 1704, at least that is when it was dedicated. Kino wrote that Indians came from as far away as the Colorado River ("Yuma Indians") and brought gifts of the famous "blue shells" (abalone shells). It was the existence of these shells that led Kino to hypothesize a land passage from the Pimería Alta to California. Church construction was mainly by Pima Indians, imported from the area around Pueblo San Xavier del Bac (Tucson, Arizona). There were two chapels in the church, one dedicated to Nuestra Señora de Loreto and the other to San Francisco Xavier. However, by 1730 the church had fallen into disrepair and was abandoned, probably due to raids by Apaches and other Indian groups in 1698. The church was eventually rebuilt by the Jesuits, but in 1746 it was burned again. Just how much of the church structures were burned or destroyed, and what form the reconstructions took, is not well understood. Around 1768, Franciscans took over the mission site, and it is likely they built most of the structure visible today. However, they apparently used the old Jesuit shell as a core and simply built in and around it; thus the walls are quite thick. Recent work by INAH (Instituto Nacional Anthropología y Historía) has shored up the "false front" added by the Franciscans, but the structure, inside (left photo) and outside (right photo) is still poorly protected from vandals. There is a sizable graveyard behind the church, but dates are difficult to decipher.

Church (and town plaza) at the site of Kino's mission in San Ignacio, **San Ignacio de Cabórica**, on the bank of the Río Magdalena, 9 miles north of the city of Magdalena. The original mission at San Ignacio was founded by Padre Kino in the mid-1600, although by as late as 1699 an elaborate church structure still did not exist. The date of completion of the present church seems to be unclear. At one time, 8 bells hung in the bell tower but most have cracked and are now nonfunctional (these poor quality bells were probably locally cast, not imported from Europe, nor even from Mexico City). Two of the bells bear dates: 1813 and 1818. To the west of the church are the adobe ruins of the priest's quarters and other habitations, storerooms, work shops, kitchens, etc. (i.e., the convento). The circular stairs leading to the rooftop in this church are hand-carved mesquite—the only such example I have seen in the Pimería Alta (such stairs were typically carved stone).

The exquisite church at **Mission San Pedro y San Pablo de Tubutama**, in the Altar Valley. The current church at this Kino mission site (founded ~1690) is probably Franciscan, dating to the late 1780s, and its interior is more elaborate than any other churches in the region. This church underwent several major renovations in the 18th century. By 1730, the mission had four pueblos under its jurisdiction. A Pima uprising in 1695 led to the deaths of many Opatas, who had been brought in to aid in the work at Tubutama. The mission's head priest, Padre Daniel Januske was away at the time and thus survived. But, shortly thereafter, Padre Francisco Javier Saeta, resident priest at Caborca, was killed in the same uprising. The mission and church regrouped after the uprising, and it was prominent in the Altar District for many years. The famous Spanish explorer Juan Bautista de Anza (1735-1788), founder of San Francisco, visited Tubutama in January 1774 en route to California. One of the unique features of this church is the carved wooden pomegranates stuck into the ceiling under the choir loft (which itself was added during one of the renovations). Of the four bells in the tower, the oldest is dated 1740.

The grave of Padre Enrique Ruhen, the only priest ever to be in (brief) residence at **Nuestra Señora de Loreto y San Marcelo de Sonoyta**. Founded in 1693, this was Padre Kino's westernmost mission. None of the original mission structures remain at the site—only Ruhen's grave.

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