Appendix J

Cultural Setting - Sonny Bono Salton Sea National Wildlife Refuge Complex

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The following sections describe the cultural setting in and around the two refuges that constitute the Sonny Bono Salton Sea National Wildlife Refuge Complex (NWRC) - Sonny Bono Salton Sea NWR and Coachella Valley NWR. The cultural resources associated with these Refuges may include archaeological and historic sites, buildings, structures, and/or objects.

Both the Imperial Valley and the Coachella Valley contain rich archaeological records. Some portions of the Sonny Bono Salton Sea NWRC have previously been inventoried for cultural resources, while substantial additional areas have not yet been examined. Seventy-seven prehistoric and historic sites, features, or isolated finds have been documented on or within a 0.5-mile buffer of the Sonny Bono Salton Sea NWR and Coachella Valley NWR.

Cultural History

The outline of Colorado Desert culture history largely follows a summary by Jerry Schaefer (2006). It is founded on the pioneering work of Malcolm J. Rogers in many parts of the Colorado and Sonoran deserts (Rogers 1939, Rogers 1945, Rogers 1966). Since then, several overviews and syntheses have been prepared, with each succeeding effort drawing on the previous studies and adding new data and interpretations (Crabtree 1981, Schaefer 1994a, Schaefer and Laylander 2007, Wallace 1962, Warren 1984, Wilke 1976). The information presented here was compiled by ASM Affiliates in 2009 for the Service as part of Cultural Resources Review for the Sonny Bono Salton Sea NWRC.

Four successive periods, each with distinctive cultural patterns, may be defined for the prehistoric Colorado Desert, extending back in time over a period of at least 12,000 years. They include: Early Man (Malpais), Paleoindian (San Dieguito), Archaic (Pinto and Amargosa), and Late Prehistoric (Patayan). These periods are summarized below.

Early Man Period (Malpais Pattern) (ca. 50,000 to 10,000 B.C.)

The Malpais Pattern is represented by archaeological materials that have been hypothesized to date between 50,000 and 10,000 B.C. (Begole 1973, Begole 1976, Davis et al. 1980, Hayden 1976). The term was used originally by Rogers (1939, 1966) for ancient-looking cleared circles, tools, and rock alignments that he later classified as San Dieguito I. Malpais continued to be applied to heavily varnished choppers and scrapers found on desert pavements of the Colorado, Mojave, and Sonoran deserts that were thought to predate Paleoindian assemblages that included projectile points. Although few would question that most of the artifacts are culturally produced, dating methods remain extremely uncertain and have been assailed on numerous grounds (McGuire and Schiffer 1982). Arguments for early settlement of the Colorado Desert have been further eroded by the re-dating of the "Yuha Man." Originally dated to over 18,000 B.C. based on radiocarbon analysis of caliche deposits, more reliable dates based on the accelerator mass spectrometry (AMS) radiocarbon method applied to bone fragments now place the burial at about 3,000 B.C. (Taylor et al. 1985).

Paleoindian Period (San Dieguito Pattern) (ca. 10,000 to 5,000 B.C.)

Most of the aceramic lithic assemblages, rock features, and cleared circles in the Salton Basin were routinely assigned to the San Dieguito Phase III complex by many of the initial investigators. Rogers first distinguished the San Dieguito pattern in western San Diego County, based initially on surface surveys that were subsequently refined through excavations at the C. W. Harris Site (Rogers 1929, Rogers 1939, Rogers 1966). His extensive surveys identified the pattern in the southern California deserts. Rogers proposed three phases of the San Dieguito complex in its Central Aspect, which encompassed the area of the Colorado and Mojave Deserts and the western Great Basin. The successive phases were characterized by the addition of new, more sophisticated tool types to the pre-existing tool kit.

San Dieguito complex lithic technology was based on primary and secondary percussion flaking of cores and flakes. San Dieguito I and II tools include bifacial and unifacially reduced choppers and chopping tools, concave-edged scrapers (spokeshaves), bilaterally notched pebbles, and scraper planes. Appearing in the San Dieguito II phase are finely made blades, smaller bifacial points, and a larger variety of scraper and chopper types. The San Dieguito III tool kit is appreciably more diverse, with the introduction of fine pressure flaking. Tools include pressure-flaked blades, leaf-shaped projectile points, scraper planes, plano-convex scrapers, crescentics, and elongated bifacial knives (Rogers 1939, Rogers 1958, Rogers 1966, Warren 1967, Warren and True 1961). Various attempts have also been made to seriate cleared circles into phases, but no convincing chronological scheme has yet emerged (Pendleton 1986).

Site distributions suggest some of the basic elements of San Dieguito settlement patterns. Sites might be situated on any flat area, but the largest aggregations occurred on mesas and terraces overlooking major washes. Where lakes were present, sites are located around the edges. These were areas where a variety of plant and animal resources could be found and where water would have been at least seasonally available.

Archaic Period (Pinto and Amargosa Patterns) (ca. 5,000 B.C. to A.D. 500)

The Pinto and Amargosa patterns were regional specializations within the general hunting and gathering adaptations that characterized the Archaic period. These patterns occur more frequently in the northern Great Basin, the Mojave Desert, and the Sonoran Desert east of the Colorado River. However, few Pinto or Amargosa (Elko series) projectile points have been identified on the desert pavements in the Colorado Desert, although that condition is beginning to change as the number of investigations increases. Some late Archaic sites are known, indicating occupations along the boundary between the low desert and Peninsular Range and at more favored habitats.

Several Archaic sites have been studied in recent years. The most substantial Colorado Desert site dated to this period is Indian Hill Rockshelter in Anza-Borrego Desert State Park. Particularly significant were 11 rock-lined cache pits and numerous hearths indicative of either a residential base or a temporary camp where food storage was integral to the settlement-subsistence strategy. Two rock-lined pits similar to those at Indian Hill Rockshelter, along with an accompanying late Archaic assemblage, were documented at a small rockshelter in Tahquitz Canyon near Palm Springs (Bean et al. 1995). The small number of artifacts at the site suggested strategically stored food processing equipment that was used by a small, mobile group.

Radiocarbon dates of almost 1,000 B.C. and associated bird and fish bone confirm a Late Archaic period Lake Cahuilla occupational horizon. The emerging picture of late Archaic occupation in the Salton Basin is of mobile hunter and gatherer bands with atlatls (spear throwers) for hunting and milling stones for seed and nut processing, operating out of a limited number of base camps in optimal areas on the boundaries of the Salton Basin and on the shoreline of Lake Cahuilla. This Archaic pattern may be viewed as a cultural precursor of the Late Prehistoric period, although linguistic data and tribal origin stories suggest some demographic displacements in the late prehistoric past.

Late Prehistoric Period (Patayan Pattern) (ca. A.D. 500 to 1700)

Sites dating to the Late Prehistoric period are probably more numerous than any other in the Colorado Desert. The period has been divided into four phases, including a pre-ceramic transitional phase from A.D. 500 to 800. The major innovations were the introduction of pottery production using the paddle-and-anvil technique around A.D. 800 and the introduction of floodplain agriculture on the Colorado River, perhaps at about the same time (Rogers 1945). Within the Colorado Desert, according to some investigators, ceramics first appear around A.D. 1000 (Love and Dahdul 2002). Exact dating for the presence of early domesticated plants is not available (Schroeder 1979). Both these technological advancements were presumably introduced either directly from Mexico or through the Hohokam culture of the Gila River (McGuire and Schiffer 1982, Rogers 1945, Schroeder 1975, Schroeder 1979).

Within the Late Prehistoric period, between A.D. 1000 and 1700, desert peoples of this region developed wide-spectrum and diversified resource procurement systems emphasizing a collector organization using residential bases and temporary logistical camps, scheduled according to the ripening seasons of staple plant resources. Mobility was an important element in this pattern, with frequent travel between the Colorado River and Lake Cahuilla, when the lake was present.
The diversity of sites and assemblages associated with Lake Cahuilla indicate considerable variability in Late Prehistoric and protohistoric social and ecological adaptations to the lake (Wilke 1978). The number of house pits at fish camps ranges from one to more than a dozen, perhaps indicating the number of households in residence at any one time. Fish traps range from single examples to long lines that are suggestive of cooperative fishing ventures.

Archaeologically excavated house pits indicate that some have developed middens and diverse artifact types, suggestive of season-long temporary camps, while others have only sparse artifact associations suggestive of short-term fishing expeditions. Faunal assemblages vary from those largely limited to fish bone or the remains of migratory waterbirds, to others that contain more diverse resources, including rabbit and large mammal bone. This variability in site types and assemblage contents has yet to be correlated in a systematic manner with other variables, such as the recessional stages of Lake Cahuilla (reflected in elevation), localized geography and paleoenvironments, ethnicity, or other factors.

The numerous trail systems throughout the Colorado Desert attest to long-range travel to special resource collecting zones and ceremonial locales, trading expeditions, and possibly warfare. Pot drops, trailside shrines, and other evidence of transitory activities are associated with these trails (McCarthy 1993). Trade and travel is also seen in the distribution of localized resources such as Obsidian Butte obsidian, wonderstone from the south end of the Santa Rosa Mountains, soapstone, marine shell from the Gulf of California and the Pacific coast, and ceramic types.

Ethnohistory

Ethnography refers directly to cultural patterns that were observed during the historic period, primarily during the first half of the twentieth century, or to traditional culture as remembered during that period. However, used with proper caution, it also provides an invaluable source of analogies and inferences concerning earlier, prehistoric cultural patterns.

At the time of European contact, both the Salton Basin as a whole and the two major portions of the Sonny Bono Salton Sea NWRC were occupied by two distinct native ethnolinguistic groups. The Cahuilla occupied the northern half of the basin, including the lands within the Coachella Valley NWR, while the Kamia (also known as Kumeyaay, Tipai, and Diegueño) occupied the southern half, including the areas within the Sonny Bono Salton Sea NWR.

The Cahuilla

Several ethnographic and ethnohistoric studies have documented the lifeways and culture of the Cahuilla (Barrows 1900, Bean 1972, Bean 1978, Bean and Saubel 1972, Curtis 1926, Drucker 1937, Hooper 1920, Kroeber 1908, Patencio 1943, Strong 1929). The ancestors of the Cahuilla, Cupeño, Luiseño, Serrano, and Gabrielino, speaking a language that belonged to the Takic branch of the Uto-Aztecan linguistic family, apparently migrated from the north into southern California, perhaps during the first millennium B.C. A subsequent expansion of ancestral Cahuilla-speaking people into the Colorado Desert may have taken place substantially later, during the first millennium A.D. (Golla 2007, Kroeber 1925, Laylander 1985, Laylander 2007, Moratto 1984).

Within traditional Cahuilla territory, centered on the Santa Rosa and San Jacinto Mountains and the Coachella Valley, territories were owned by a dozen or more independent, politically autonomous land-holding clans. Ideally, each of these territories extended from the desert or valley floor to mountain areas and crossed several biotic zones. Clans included one or more lineages, each of which had an independent community area that it owned within the larger clan area. Cahuilla oral histories indicate that some clans replaced others, often by force, and that new lineages would bud off from clans to establish new territories. Cahuilla mythology and oral tradition also suggest that when Lake Cahuilla dried up, it was the mountain people who resettled the desert floor. William Duncan Strong (1929) reported that the wavaïkiktum clan was associated with an area north of Indio, which may have included the lands within the Coachella Valley NWR. By 1850, at least 17 Cahuilla rancherias were reported in the Coachella Valley, most associated with hand-dug wells, springs, or palm oases. Reservoirs, irrigation ditches, and agricultural fields are documented at least as far back as the early nineteenth century, although it is argued by some that native cultivation may have origins in the Late Prehistoric period (Wilke and Lawton 1975).

Although villages were occupied year-round, many inhabitants would leave at specific times to exploit seasonally ripening foods in different environmental zones. Temporary camps would be established in these food-collecting areas, and surpluses would be transported back to the main village. Mountain Cahuilla would move to the upper desert areas and establish temporary camps to process agave in the late winter and early spring, and then move to lower desert areas to harvest mesquite beans in the late spring. Conversely, the Desert Cahuilla ascended the mountains in the fall for the pinyon and acorn harvests. Spring and early summer were the times to harvest and store the all-important mesquite bean, an important desert source of protein and carbohydrates. Other springtime resources included yucca, wild onion, barrel cactus and other cactus fruits, goosefoot, and grass seeds. Major upper desert resources collected in summer included manzanita, wild plum, and other berries. Fall was also the occasion to gather grass seeds,

chia seeds, saltbush seeds, palm tree fruit, thimbleberry, wild raspberry, juniper berry, and chokeberry. Many animal resources were also hunted, with bighorn sheep and deer hunts often coinciding with the pinyon harvest. Rabbits were the most common game animals hunted throughout the year.

The Desert Cahuilla became familiar with Europeans as early as 1797. Often their linguistic kinsmen in western Cahuilla areas were baptized and worked among the Spanish, and runaway neophytes sought refuge among the desert tribes. The impacts of the Spanish mission system and colonization were less intensive and slower to arise among the isolated desert and mountain groups than for coastal and western foothill groups. More direct influence was not felt until after the establishment of the San Bernardino *estancia* in 1819 and a cattle ranch at San Gorgonio subsequently. When the Romero Expedition passed through the area in 1823-1824, it was clear that the Cahuilla were accustomed to seeing vaqueros employed by the rancho driving cattle through the area. Certainly by 1823 they were not only familiar with Hispanic ways but were comfortable in dealing with them, as evidenced by their reaction to the members of the Romero Expedition (Bean and Mason 1962). The expedition also reported that the Cahuilla at Toro were engaged in agricultural pursuits, growing corn and melons, and that they were already familiar with the use of horses and cattle.

Introduced diseases were probably beginning to take their toll on the Cahuilla in the early 1800s, but they became particularly severe in the 1860s. The most dramatic was the great smallpox epidemic of 1863 that killed Juan Antonio as well as many bearers of traditional tribal culture. Survivors of previously autonomous clans came together into the remaining villages or founded new settlements in an accelerated pattern of population aggregation and reorganization. This process continued through the following decades.

The Cahuilla land base was substantially reduced in the 1860s and 1870s when the Federal government ceded alternate sections near the new transcontinental railroad to the railroad companies. Sections 16 and 36 of every township were also removed from Federal control as a tax base for schools. Any de facto Cahuilla control of more extensive areas was eliminated in 1876 when President Ulysses S. Grant issued an Executive order to set aside small reservations for the native groups classified as "Mission Indians." These reservations included the sections or parcels in which the Cahuilla had aggregated in the previous decades and in which they had made improvements for farming. The following year, another Executive order by President Rutherford B. Hayes set aside even-numbered sections and certain other unsurveyed portions of townships for Indian reservations. The result was a checkerboard pattern of Indian-controlled land, amounting to 48 sections, spread across the eastern edge of the Santa Rosa and San Jacinto mountains and the Coachella Valley (Cultural Systems Research 1983). With various subsequent additions and withdrawals, this has remained the permanent home of the Desert Cahuilla down to the present.

As traditional lifeways became more difficult to pursue, the Cahuilla adapted to their new social and economic environment by taking jobs in Euro-American ranches, towns, and cities. The 1860s, 1870s, and 1880s were a time of increased acculturation as new technologies, material goods, and practices were incorporated into the traditional lifeways of the reservation. Traditional ceremonial practices remained particularly strong despite Catholic and Protestant influences on the reservations. Ceremonial houses still existed through the 1950s, 1960s, and early 1970s, and many cultural traditions survive as parts of Westernized lifestyles. The Cahuilla today retain an acute interest in their cultural heritage and cultural resources of their traditional territories.

The Kamia

The principal ethnographic source for the Kamia, or desert Kumeyaay, is E. W. Gifford (1918, 1931), but considerable additional information can be gleaned from A. L. Kroeber (1920, 1925) and C. Daryll Forde (1931), given the close association between the Kamia and Quechan, and from Leslie Spier (1923) and William D. Hohenthal (2001) with regard to the Kamia's Tipai/Kumeyaay affinities. Synthetic overviews and interpretations of merit have been prepared by Frederic N. Hicks (1963), James P. Barker (1976), Martha Knack (1981), and John C. Russell and his associates (2002).

The Kamia were directly related by language and culture to the western Ipai, Kumeyaay, and Tipai groups of the mountains and coastal areas of San Diego County and northern Baja California, and a little more remotely to the Cocopa and other Yumans in the Colorado River's delta. The Kamia occupied areas along the New and Alamo rivers, and at springs and walk-in wells in the Imperial Valley. During the ethnohistoric period, they were politically and militarily associated with the Quechan-Mohave alliance in opposition to the Cocopa in the Colorado River delta and the Halchidhoma in the Palo Verde Valley portion of the lower Colorado River. They maintained particularly close relations with the Quechan at the confluence of the Colorado and Gila rivers and were permitted a farming rancheria at the large Quechan settlement of *Xuksil* (Quechan: "sandstone"), located a few kilometers south of the modern Mexican town of Algodones and north of the course with the Alamo River near the southern tip of the Imperial Dunes (Russell et al. 2002). These people were collectively known as the *Kavely cadom* or "south dwellers" and were known to the early Spanish expeditions as the rancherias of San Pablo, whose leader was also named Captain Pablo. They were estimated to number 800 people when the Anza expedition passed through in 1774 (Bolton 1930, Forde 1931). The Sonora Franciscans established the mission of San Pedro y San Pablo de Bicuñer near this location in 1776, along with another mission at La Purisíma Concepción, later to become Fort Yuma. Both were destroyed in a Quechan uprising on July 17, 1781, six months after their founding (Forbes 1965).

The Kamia maintained settlements at optimally watered locations on the New and Alamo rivers, planting crops after major overflows from the Colorado River into the Salton Trough. An 1849 census counted 254 Kamia people on the New River in Imperial Valley under Chief Fernando. By 1860, the County of San Diego Census recorded 105 Kamia people at New River (Indian Wells or *Xachupai*), distributed among 11 households or rancherias and led by a Captain Zacariah (San Diego Genealogical Society n.d.). A series of prolonged droughts or floodwater failures in the nineteenth century also took their toll on the population and eventually drove most Kamia in Imperial Valley to live at the rancheria of *Xatopet*, possibly on an east-west portion of the Alamo River south of the Imperial Dunes near the village of Huerta, Baja California. The Kamia suffered additional casualties during conflicts with the Mexican military at Huerta and ultimately fled to live primarily with the Quechan.

The Kamia practiced a mixed economy of horticulture and hunting and gathering. Mesquite (*Prosopis glandulosa*) was the most important wild staple crop, as it was for other groups in the Colorado Desert. Seedpods were ready in July and were readily collected at *Espayau*, south of Pilot Knob, where the Kamia would make camp but where agriculture was not feasible. Acorns were either obtained directly in the Peninsular Range or through trade with the Kumeyaay in exchange for cultigens, especially watermelons. The Kamia procured baked and dried agave cakes from the Kumeyaay but otherwise did not participate in the early spring agave harvest. They also fished for all the native species, applying the same methods as the River Yumans, except that they

did not use the dip net. Like other River Yumans, hunting was a minor activity, but prey included migratory waterfowl, squirrel, gopher, lagomorphs, deer, beaver, and bighorn sheep.

Clay for making ceramics was dug from Colorado River alluvial deposits (Gifford 1931). One of Clyde Wood's Quechan consultants also identified the Imperial Dunes as an area to obtain clay (Russell et al. 2002).

The Kamia applied the same system of floodplain agriculture as the river and delta Yumans (Castetter and Bell 1951). Their fields extended along the lower alluvial terraces of the New and Alamo rivers, their locations shifting with each seasonal flood cycle. In a rare recording on the Township 12 North, Range 13 West U.S. General Land Office (GLO) Map from 1954-1956, a "Rancheria corn field" was documented on the west side of Section 36, about .4 kilometers from the New River and about 10.5 kilometers upstream from where the New River empties into the modern shore of the Salton Sea. Many other agricultural fields mostly likely also existed throughout the area although this was one of the few that was bisected by a surveyed section line and was thus mapped. Indian trails, ponds of fresh water and mesquite hummocks also dot the area, suggesting other attractions to the Kamia within the vicinity of the Sonny Bono Salton Sea NWR.

Trade relations were an important means of getting items not found within a tribal territory and of cementing social and political ties between different groups. Lying near the ethnohistoric boundaries between different linguistic groups, the project area may have been on or near a corridor for the exchange of goods and knowledge. The Kamia were very favorably positioned to trade with the Quechan because they enjoyed a close social relationship with them and they had access to the resources in the mountains of the Peninsular Range into which their territory extended. They were closely related to the other Kumeyaay groups of the mountains and coast and could act as trading middlemen with the Quechan. Both directly and indirectly, the Cahuilla of the Coachella Valley, the Paipai in Baja California, and the O'odham in Sonora may have also participated in this network. Chris White (1974) postulated that some of the alliance patterns were linked to east-west trade relationships, across which the greatest differential distribution of natural resources was present, as opposed to north-south relationships between groups that shared the same environmental zones.

Archaeological evidence indicates regular movement of obsidian for arrow points from Obsidian Butte at the southern end of the Salton Sea and soapstone arrow shaft straighteners from the Peninsular Range. Wonderstone for making flaked tools may also have had some trade value. It was obtained from the Rainbow Rock source at the southeast edge of the Santa Rosa Mountains and from Cerro Pinto, west of Mexicali and just south of the Mexican border. Not only utilitarian goods, but esoteric objects, knowledge, and songs were also exchanged. Eagle feathers and even live eagles for the eagle-killing ceremony were much valued. The Cahuilla received gourd rattles and red pigment from the Colorado River Yumans. As another example of cultural exchange, very late in their history (ca. 1890), the Quechan incorporated the specific style of image from the Kamia into their *kar♣úk* (mourning) ceremony (Forde 1931).

Historic Period

Exploration and Initial Development

The lands within the Sonny Bono Salton Sea NWRC have generally been marginal to major historic period events in the Colorado Desert (Lawton 1976). The wider region first came to the attention of Europeans in 1539-1540, when Francisco de Ulloa reached the northern limit of the

Gulf of California, Hernando de Alarcón sailed up the lower Colorado River at least as far as present-day Yuma, and Melchior Díaz traveled overland from Sonora to reach and cross the river. The portions of the desert west of the Colorado River were first visited only as late as the 1770s, when Juan Bautista de Anza and Francisco Garcés pioneered a route from the Colorado River to coastal southern California, passing to the south and west of the Refuge lands.

During the following decades, Spanish and Mexican forays into the Colorado Desert from coastal southern California and from northwestern Sonora continued, first in opening an overland route through Yuma and subsequently, after the Quechan revolt of 1781, in more limited probes to retaliate or to attempt to reopen the route. Most of the travel occurred well to the south of the Refuges. However, from 1823 through 1826, José Romero led two expeditions that penetrated the Coachella Valley, in one instance probably passing just south of the future Coachella Valley NWR. With the Mexican-American War of 1846-1848, the Gold Rush in northern California, the development of the Butterfield Stage route, and explorations of potential railroad routes through the Colorado Desert, familiarity with the region steadily grew.

In 1853, Lieutenant K. S. Williamson of the U.S. Topographic Engineers and geologist William Blake surveyed the Salton Basin for railroad routes. In the process, Blake described the character of prehistoric Lake Cahuilla and recognized the fertility of the Salton Basin. Sporadic flooding occurred at least eight times from 1824 to 1904. Oliver Wozencraft lobbied the California legislature to gather support for the idea that the Salton Basin desert was irrigable. Despite Wozencraft's continued lobbying efforts in Washington over the years, the transfer never occurred (Laflin 1995, Ní Ghabhláin and Schaefer 2005, Redlands Institute 2002a).

In the late 1800s, the Federal government sponsored individual land development in the west in the form of a series of Acts, including the Homestead (1862), Timber-Culture (1873), Desert Land (1877), and Timber and Stone (1878) Acts (Robinson 1948). Most settlers in the desert depended on artesian wells in 1894, which made sustained irrigation efforts difficult. Hydraulic well drilling began in Indio in 1898 and offered another method of water collection for settlers (Nordland 1978, Redlands Institute 2002a).

Early Irrigation Systems in the Imperial Valley

The possibility of diverting Colorado River water to irrigate the Imperial Valley was first raised in 1853. This was followed by several attempts to finance construction of a canal to bring water to the Imperial Valley. The first diversion canal and irrigation system was constructed by the California Development Company (CDC) (Dowd 1956, Starr 1990). Construction on the Alamo or Imperial canal, as it was known, began in August 1900. In Mexico, CDC also made use of the Alamo overflow channel of the Colorado River to conduct the water a distance of approximately 40 miles. Minimal work was required to render the channel serviceable as a canal. Four miles east of Calexico another canal, the Central Main Canal, was constructed to transport water north to the Imperial Valley. On May 14, 1901, the first diversion was made from the Colorado River to the new intake canal and the first delivery of water occurred in June 1901 (Dowd 1956). Cultivation of 1,500 acres began in the fall of that year. By the second year, 100,000 acres were irrigated in the Imperial Valley.

The Central Main Canal was extended from the U.S. border to the northern boundary of Mutual Water Company No. 1 at Heading 4, a few miles to the southwest of the present city of Brawley. It began service in March 1902. From this point, water was supplied to Water Company No. 4 and to Water Company No. 8 through a branch canal and flume across the New River (Dowd 1956).

Water Company No. 8 is located at the northern end of the system and includes the southernmost portion of the Sonny Bono Salton Sea NWR.

The Westside Main Canal was originally constructed around 1901 to supply water from the Alamo Canal to Water Company No. 6 located north of the international border and west of the New River via the Encina Flume (Corey 1915). It began at Sharp's Heading, traveled across the New River by flume and crossed the international boundary at a point approximately 10 miles west of Calexico. Construction of additional canals included the East Side Main Canal, which supplied water to Water Company No. 7, and the Low Line or No. 5 Main Canal, which served Water Company No. 5. The southeastern portion of the Sonny Bono Salton Sea NWR lies just north of what was Water Company No. 5 but would not have been developed until much later. By January 1, 1905, over 80 miles of main canals and over 700 miles of distribution canals had been constructed in Imperial and Mexicali valleys (Dowd 1956).

By 1911, 220,000 acres were under cultivation (Dowd 1956). It is possible that some farming began in the southernmost portion of the Refuge at this time, although additional research would be needed to demonstrate this. It is likely that agriculture did not extend this far north. In any case, any physical evidence would have been destroyed by subsequent agricultural development. For the most part, presently submerged portions of the Refuge were used as a sump for agricultural runoff during the early years of irrigation in the Imperial and Coachella Valleys.

The IID was organized for the purpose of acquiring the rights and properties of the CDC and its Mexican subsidiaries, after the CDC declared bankruptcy in 1909. In 1914, the IID voted a bond issue of $3.5 million to purchase the CDC and its Mexican subsidiaries from the Southern Pacific Company and to undertake improvements to the canals and levees. Consequently the entire Westside Main Canal and Encina Flume were rebuilt and extended to serve the area to the west of New River, including the project area south of the Salton Sea (Dowd 1956).

Among the early projects that occurred within the project area under IID management was the closure of the Low Line (No. 5 Main) Canal, from which seepage was waterlogging arable lands at the southeastern end of the Salton Sea. In its place, irrigation laterals were constructed at half-mile intervals from the newly enlarged East Highline Canal. This work occurred between 1923 and 1927, which probably dates the Vail Laterals and Pumice Drain. It was also from 1922 on that the IID began efforts to channelize the outlets of both the New and Alamo rivers into the Salton Sea, cutting off bends and controlling bank erosion with new levees. Portions of a small number of agricultural drains, canals, and levees are present within the Sonny Bono Salton Sea NWR at the south end of the Salton Sea. These include Pumice Drain; Trifolium Drain and Lateral One, 13, 14, and 15; and Vail Drain and Lateral 4-A. The northern most portion of the Westside Main Canal is also located in the far western end of the Refuge.

Military Use

Portions of the Sonny Bono Salton Sea NWR were formerly managed as the Salton Sea Test Base. Military use of the Salton Sea area began as early as 1939, when the U.S. Navy established a seaplane area for bombing practice and emergency landings. A larger seaplane base, the Naval Air Facility, was established on the southwestern shore in 1942. The base included an asphalt parking apron, a ramp to the water, and a small group of buildings. In 1944, the base was upgraded to a Naval Auxiliary Air Station (NAAS), with the construction of a larger airfield for land-based planes and a barracks. After the end of World War II, in 1946 the NAAS was disestablished, but it was maintained as an emergency seaplane facility and various new facilities were constructed. In the 1960s, the facility was taken over by Naval Air Facility El Centro (Apple et al. 1997, Osbourne 2002, Shettle 1997).

Developments in the Coachella Valley

Early settlers in the Coachella Valley began developing agriculture several decades before construction on the Coachella Canal, with the discovery of artesian water sources in 1894. However, the expense of drilling wells precluded substantial development in the valley before 1900, when settlers placed the first hydraulic well in the center of the valley at a more reasonable cost (Ní Ghabhláin and Schaefer 2005:9). Dates were an essential crop for the valley, with the earliest establishment of commercial date cultivation in the Coachella Valley credited to Bernard Johnson. In 1903, Johnson traveled to Algeria and returned with date offshoots, mostly of the Deglet Noor variety, which he planted near Mecca (Ní Ghabhláin and Schaefer 2005:13; Nordland 1978:50). The addition of approximately 400 wells (a majority artesian) in 1907 reflected an increase in settlement and agriculture in the valley. Six years later, approximately 4,000 acres were under cultivation (U.S. Bureau of Reclamation 1955). Irrigation made possible the expansion of date palm cultivation in the Coachella Valley. In 1913, eight local date enthusiasts formed the Coachella Date Growers' Association and sent Bernard Johnson back to Algeria to bring back 10,000 additional date offshoots for cultivation. Dates quickly became the dominant crop in the Coachella Valley. The Indio newspaper, *The Date Palm*, carried front-page stories of the latest importation of date palm offshoots and updates of the latest date prices (Laflin 1995). Many of the towns of the Coachella Valley, such as Indio, Arabia, and Mecca, have exotic names derived from the Middle East, reflecting the importance of the date industry to the local economy (Ní Ghabhláin and Schaefer 2005:13). Farmers also grew grapes, most garden vegetables, alfalfa, maize, barley, flax, melons, figs, and citrus (U.S. Bureau of Reclamation 1939:25-26).

As a result of inconsistent rainfall and the impact of increasing irrigated land, farmers drew more water than nature could replenish. This dependence on artesian wells caused a significant decrease in the water table and prompted valley farmers to support a supplemental water supply to maintain and grow crops in the Coachella Valley (Nordland 1978:55). The passage of the Boulder Canyon Project Act in 1928 represented the most important legislation to affect the Coachella Valley. This Act authorized the construction of the Coachella Canal that extended from the All-American Canal through the Imperial and Coachella valleys. The underground, concrete-piped irrigation system that fed agricultural lands at the north end of the canal was a precise gravity flow lateral system that utilized the Colorado River waters as the primary source for irrigation in lieu of dependence solely on the water table tapped by artesian and pumped wells. The systematic approach to water distribution facilitated higher crop yields and allowed more farmers to cultivate the lands. In 1939, the total irrigated acreage bearing crops was 14,030 with the majority of land devoted to growing dates, and in 1955 there was more than 50,000 acres devoted to crop production (Du Bry 2007:71; U.S. Bureau of Reclamation 1939:131). From 1948 to 1958, total agricultural acreage increased to 61,378 (Du Bry 2007:70). According to local historian Ole Nordland (1978:52), water delivery was "the most important thing that has happened in Coachella" between 1938 and 1978. Today, suburban communities are an increasing crop in the Valley, but agriculture is still an important revenue source.

Transportation

In the midst of this western settlement, the Southern Pacific Railroad built a line across the Salton Basin. Both Chinese and Native Americans were among those employed as laborers. The proposed route extended northwesterly through the Indian village of San Sebastian near San Felipe Creek, but the actual chosen route extended around the eastern boundary of the dry lakebed (Frey and Nell 1868; Rand McNally 1883). The first Southern Pacific trains operated in Indio in 1876, four years after choosing the spot as a halfway point between Los Angeles and Yuma. In 1877, rail lines continued southeast from Indio to Thermal, Walters (Mecca), Caleb, Durmid, Mortmar, Salton,

Flowing Wells and Dos Palmas. The California and Arizona Express Company stage left the Dos Palmas station every other day, headed for Prescott and Phoenix (Nordland 1978:12, 103; Redlands Institute 2002a). As late as 1908, an abandoned section of the Southern Pacific Railroad extended in a southeasterly direction through the eastern portion of the Salton Sea. A connecting line extended southward at Imperial Junction through the Imperial Valley to Calexico, California (G. W. & C. B. Colton & Co. 1875; Rand McNally 1883; Redlands Institute 2002a:29).

Salt Industry

Salt mining in the Salton Sink was an important business opportunity. Depending on the sporadic inflow of Colorado River water, the natural resource existed as either a salt marsh or a bed of dry salt. Although Native Americans had used the salt, the New Liverpool Salt Company was the first to commercially extract the pure 6- to 12-inch-thick salt crust (Nordland 1978:58; Redlands Institute 2002b). New Liverpool Salt Company operations began in 1884 at the north end of the basin, outside the NWR area, where salt reserves covered over 1,000 acres. The Company transformed this resource into the production of 2,000 tons of salt each year. Workers plowed the land and created furrows 8 feet wide by 6 inches deep, with each plowman harvesting 700 tons of pure salt each day, tens hours a day in extreme heat (Bailey and Aubry 1902:124; Laflin 1995. Piles of the smashed salt were then sent by tram railway to the salt works in Salton for milling. At the salt works, Japanese and Cahuilla busily ground the salt and prepared the product for shipping to San Francisco (Laflin 1995). Salt produced by the Company supplied factories, dairies, druggists, and American consumers (Laflin 1995; Bailey and Aubry 1902:124; Redlands Institute 2002b). In 1902, houses and sheds surrounded the area that appeared to be a “crystal lake” because of all of the salt deposits.

At that time, salt seemed to be a never-ending resource. Neither the New Liverpool Salt Company nor the Standard Salt Company held land rights, so when President McKinley signed a bill that opened up the land, both companies raced to claim the best land. A collaborative effort between the two ultimately gave the companies several productive years, until the 1905 flood inundated the New Liverpool Salt Company (Laflin 1995).

Salt mining operations in the Salton Sink did not resume until 1919, when the Mullet Island Paint Company produced a small amount of salt from the hot springs. An independent operation of evaporative ponds existed from 1927 to 1930 near Mecca. In 1934, another salt works company, the Mullet Island Development Company, accumulated salt via salty wells. A joint venture between Seth and Chester Hartley in 1935 produced the Imperial Salt Company. It was the largest operation and existed on leased Imperial Irrigation District land, near Frink, until the Western Salt Company purchased the operation in 1942. From 1940 to 1942, the Mullet Island Salt Works of the Reeder Salt Company operated three evaporative ponds on land leased from the Imperial Irrigation District and produced salt for local icing and refrigeration cars. (The Mullett Island Salt Works lies outside of the NWR.) The Western Salt Company ceased operations in 1947 after producing 16,000 tons of salt from 175 acres of evaporative ponds (Redlands Institute 2002b).

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