

The Evolution of the Urban Acequia Landscape of the American Southwest

Moises Gonzales

University of New Mexico, Albuquerque, New Mexico USA
mgonzo1@unm.edu

Abstract. This paper describes the evolution and erasure of the urban acequia landscape in three urban centers of the American Southwest. These cultural landscapes were first developed by Native American peoples in present day New Mexico, Arizona and California. In the late sixteenth century, expansion of New Spain into the region introduced acequia irrigation methods to establish permanent agricultural settlements. Further expansion of these systems occurred in the seventeenth and into the eighteenth centuries. Spanish settlement policies followed *La Recopilación de Las Leyes de Las Indias* which established design criteria for organizing acequia irrigation systems and the built environment. This study explicates the transformation and adaption of the urban acequia landscape from the settlement period under Spanish Law, the Mexican Period, and through the organization as modern cities of the American Southwest. Today, the cities of San Antonio, Albuquerque, and Los Angeles have evolved into major population centers while containing the material memory of the acequia landscape in the urban form of the city. Through the use of geospatial visualization mapping, this paper documents the morphological process of urbanization and how irrigation systems became the framework for the spatial organization of the southwest cities that were within Mexican territory before the Treaty of Guadalupe Hidalgo.

Key Words: Acequia, Urban Landscape, American Southwest.

1 Introduction

The urban landscapes of the American Southwest have evolved, adapted, and transformed into modern cities in the United States; however they still maintain the material memory of the acequia network today. The cities of Santa Fe, Albuquerque, San Antonio, El Paso, Tuscon, and Los Angeles were all settled under *La Recopilación de Las Leyes de Las Indias* which were the guiding settlement principles in the 17th and 18th century in northern Mexico (Veregge 1993). Although the modern utility and use of the acequia irrigation system varies from each city in the region, it is certain that the urban form expressed in these cities was generated by the acequia cultural landscape. The purpose of this study is to demonstrate the importance of the irrigation landscape in dry-arid cities of the southwestern United States and how the system was the foundation for organizing urban form in the city. Through the use of archival mapping and visualization techniques, this paper will reveal the urban morphology and evolution of cities and explicate the material memory of the acequia embedded in the city.

The paper provides a framework for how laws and regulations for establishing villages and towns served as the urban design principles for building irrigation systems in the region. Albuquerque, San Antonio, and Los Angeles are developed here as case studies in which to examine how the irrigation landscapes provided the generator for urban form in the city today. All these cities are situated in semi-arid landscapes in which the acequia irrigation system made it possible to develop agricultural settlements. These case studies provide three different historical strategies for engaging with traditional irrigation systems in the urban context that have expressed variations in urban morphology. The study also provides examples of how these cities are beginning to re-discover the importance of the

acequia cultural landscape and how recovery of its material memory can improve the ecology of the urban landscape for generations to come.

2 Visualization Methodology

Visualization tools for urban morphological analysis are used in this study to examine the evolution of acequia landscapes in the Southwest. Urban morphology analysis assists in the comprehension of factors that transform the cultural landscape and describe the changes in urban morphology (Gonzales et al 2013). Archival and historical maps of Albuquerque, San Antonio, and Los Angeles were collected and analyzed in relationship to town design principles of the Laws of the Indies. Morphology analysis is based on three principles: 1) urban form defined by buildings, streets, lots and agricultural plots; 2) the resolution of scale from the local block scale, city and the regional scale; and 3) urban form in the built environment undergoes continuous transformation and replacement (Moudon 1997; Conzen 1960). The evolution of these settlements was examined through archival maps of the 19th and 20th century to understand forces of transformation that altered the urban built environment and natural systems (Carmora and Tiesdell 2007). Visualization tools provide the analysis to understand the utility, function, and value of the acequia landscape in the modern context in the cities of the Southwest.

3 The Laws of the Indies as formation of the urban irrigation landscape of the Southwest

The Laws of the Indies established the structure for organizing settlements in the Americas by establishing planning and urban design standards to ensure regularity in the built environment. Although not formally published until 1681, the rules for physical planning of new towns were issued by official ordinance by King Philip II in 1573 (Morris 1994). By the late 18th century, a network of settlements described as villas, pueblos, presidios, and missions stretched across northern Mexico from Texas, New Mexico, Arizona, and California (Urrutia 1771) (see Fig. 1 Map of the Southwest Region). Although there is some debate whether all settlements in northern Mexico adhered to the guiding principles of the Laws of the Indies which seems to be the case for small settlements and ranchos (Ebright 1994), one could clearly see that in the case of more populated settlements, such as villas and pueblos, which the rules did apply. In the case of villas, which served as the administrative and governmental center for satellite communities and other settlements, the rules set forth by the laws were more rigorously applied. However, modifications in the theory of planning settlements under the laws were modified during the actual practice of building settlements to accommodate for localized climate and terrain conditions.

In the organization of villas and pueblo settlements, the laws specified that four square leagues be established as the boundary of the settlement. The measurement of a Spanish league is the distance of 5000 varas (a vara is equal to 32.99 inches) which is equal to a distance of 2.6 miles. In New Mexico, a measurement of 5000 varas would be determined with a rope in each cardinal direction to establish the boundary of the settlement (Miller 2014). The site for a plaza and the course of the acequia irrigation network were the first physical elements in organizing a settlement (see Fig. 2, Urrutia Map of Santa Fe 1767). According the royal ordinances, “the four corners of the Plaza were aligned to face the four points of the compass, thus assuring that streets diverging from the plaza would not be

directly exposed to the four principal winds, which would cause much inconvenience” (Estrada 2008). Each poblador (settler) of a pueblo settlement would be assigned a solar which was a building lot for a home on the plaza and a farm plot along the acequia called a suerte. Often times the town council of a villa or pueblo would reserve town ownership of suertes and solares known as propios for lease or sale for the benefit on the town. The land outside of the plaza and acequia irrigated farm land used in common by the town were called ejidos which were used for hunting, wood gathering, and all other public uses. The ordinance also required that land within the exterior boundary of the settlement known as dehesas were set aside for the grazing of livestock by vecinos (residents) of the community. And finally, the land outside of the exterior boundaries of the pueblo shared amongst various settlements was called baldíos which served as the regional common public land (Arguello 1768)(see Fig. 3. Plan of Los Angeles).

The framework for town settlement under the leyes de las indias served as the design principles in organizing the dry arid towns of La de Villa Alburquerque de San Francisco in 1706, La Villa de San Antonio de Bejar in 1731, as well as El Pueblo de la Reyna de Los Angeles in the year 1781. For most of the 18th century up until the late 19th century, these towns maintained a similar urban landscape supported by a subsistent agricultural system made possible through acequia irrigation. However, the succession of Mexican territory to the United States at the end of the Mexican American war in 1848 began to transform the acequia urban landscape in the Southwest. By the late 1880s, the railroad along with the industrial revolution began to alter the urban form of the region. The competition for land and territory between Mexicans and Americans resulted in a contested terrain between the acequia system and the modern city such as in the City of Albuquerque, or the overlay of the built environment and near erasure of the historic urban form such as in Los Angeles. In recent years, cities of the region have become interested in the recovery of the material memory of the acequia system. Perhaps understanding the morphology through mapping visualization as demonstrated in this paper can be a tool to develop strategies for recovery of the irrigation landscape in the modern city.

4 Case studies on the irrigation landscape of cities in the Southwest

Three studies have been examined in this study to describe the evolution of the urban form that was engendered by the irrigation landscape. The case studies examined are Albuquerque, San Antonio, and Los Angeles which were all founded in the 18th century and supported by irrigation systems to sustain settlement. All three case studies show how the acequia network is embedded in the material memory of the city as well as three different examples of how the preservation or erasure of acequias occurred in the city.

4.1 La Villa de Alburquerque Nuevo México (1706)

La Villa de Alburquerque was established approximately sixty miles south of Santa Fe for the purpose of inhabiting the open river valley along the Río Grande known as the Río Abajo region. The Villa would serve the purpose of providing governmental administration and the center for organizing future town settlements. In 1706, Governor Francisco Cuervo y Valdes of New Mexico in a formal report made to the viceroy in Mexico City details how the acequia, plaza, home plots were laid out in strict compliance and conformity with the ‘leyes de las indias’ (Simmons 1982). Although the formal plaza and church would take nearly 75 years to establish into a formal fortified plaza, the acequia network flourished. New Mexico historian Marc Simmons describes the irrigation network

in 17th century Albuquerque: “the acequia madre, siphoned off water from the Río Grande several miles above the villa, then ran along the eastern edge of the valley, near the foot of the tumbled sand hills.” By the late 18th century, Albuquerque would operate as an administrative center for the expansive Río Abajo region in New Mexico. The first detailed map documenting the organization of settlements in the Alcaldía de la villa de Alburquerque was drawn by Bernardo de Miera y Pacheco in 1779. The map depicts a developed network of Native and Hispanic pueblos along the agricultural valley of the middle Río Grande Valley as well as developing mountain protective settlements such as Carnue (see Fig. 4 Miera y Pacheco Map of 1779 illustrating the Alcaldía de Alburquerque).



Fig. 1. Urrutia Map of the Southwest 1771.

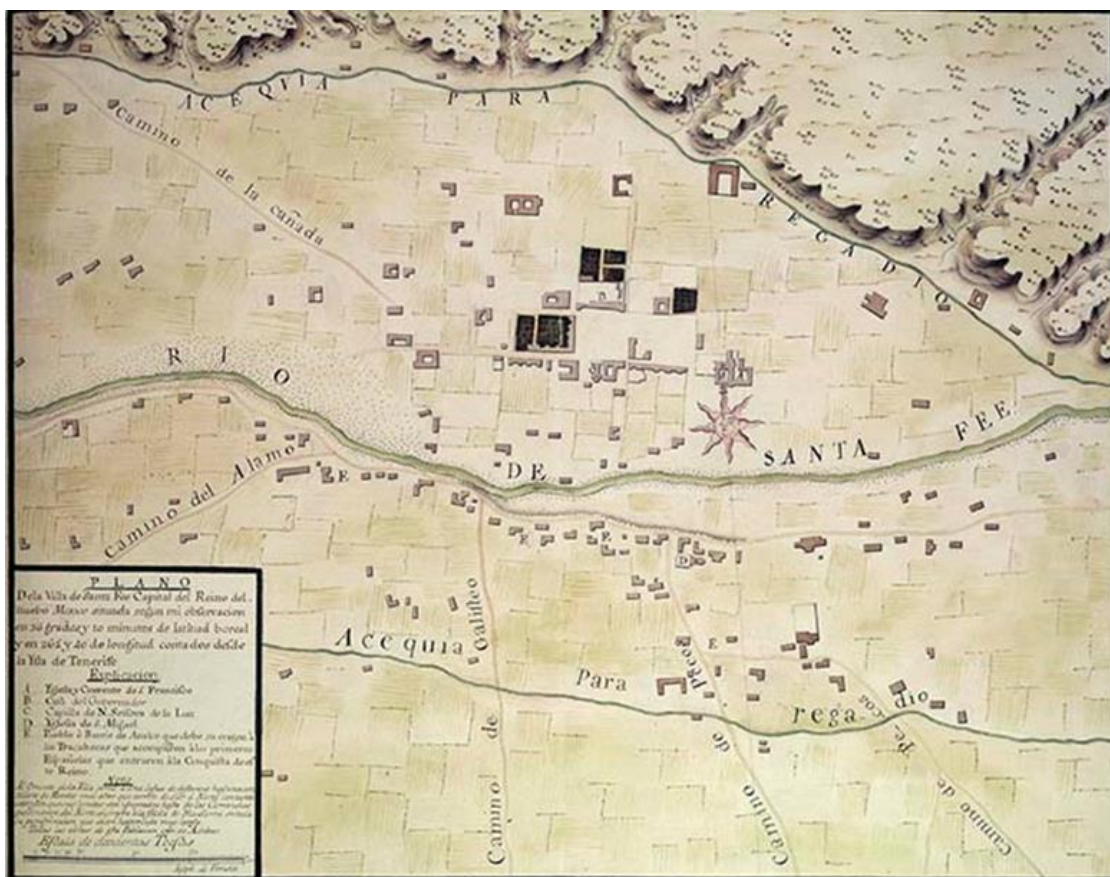


Fig. 2. Urrutia Map Plan of Santa Fe 1767.

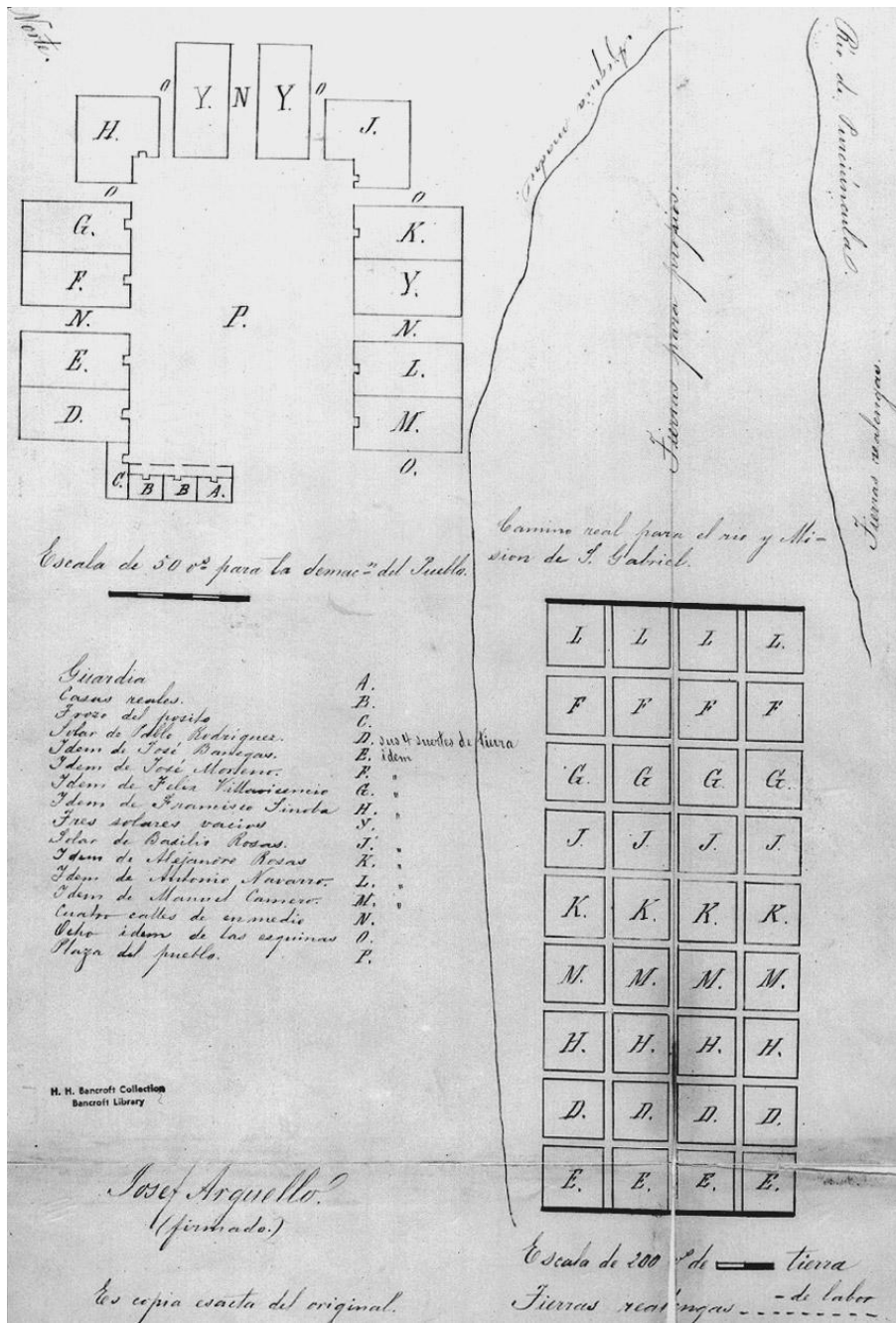


Fig. 3. The 1768 Plan of Los Angeles demonstrating Solares, Suertes, and Propios

By the early 19th century, Albuquerque began to flourish as a villa, and by 1822 the population in the villa and surrounding communities was 2,302 including 297 farmers, 15 merchants, 13 craftsman, 121 laborers, 3 teachers, and 1 priest (Verrege 1993). The population was supported by a complex network of acequias on both the east and west banks of the Río Grande. However, Albuquerque would be transformed, as other cities in the region, by the occupation of the United States in 1848. The arrival of the Americans into Albuquerque provided competition for urban space. Throughout the late 1800s, the vecinos of the Villa de Aburquerque attempted to have the community land grant recognized by the Unites States through the Court of Private Land Claims. The vecinos of old town claimed right to the four square Spanish leagues to protect the ejidos for communal use; however in 1898 the U.S. Supreme court ruled against the town allowing

for Anglos to claim land within the boundaries of the grant (US GAO 2004). The ruling allowed for the protection of American land squatters which had established 'New Albuquerque' in April of 1891 (Simmons 1982). The court ruling created contested terrain and spatial competition with Mexicans occupying the land to the North, West and North East portions of the grant, while Americans began to occupy the Southwestern section of the land grant (US Surveyor General 1893) (see Fig. 5 Survey of the Town of Albuquerque Grant 1883).

During the early part of the 20th century, Albuquerque experienced rapid growth with Mexicans and Americans generating two distinct development patterns of urban form. Mexicans favored clustered compact settlements in which roads followed an irregular organic form to accommodate farm plots and acequia paths, whereas, the Americans favored an orthogonal grid pattern that would eventually form to the Jeffersonian grid. In 1935, the Middle Rio Grande Conservancy District was created to mitigate flooding and over seventy independent acequias were consolidated into one governance structure and some acequias were modified to improve irrigation efficiency (Shah 2000). Today, many of the acequias function as a vital part of the urban fabric in the city supporting agricultural and recreational uses in the city. A morphological analysis of existing and abandoned acequias within the original boundaries of the Villa de Albuquerque reveals that much of the Acequia network has been preserved. However, the Barrelas, San José, and Martínez Town acequias have been abandoned due to more intense urban development. (Fig. 6 Irrigation Network, Albuquerque New Mexico) The existence of acequias in these neighborhoods has been virtually erased from the material memory of the city, but they were preserved in other sections of Albuquerque. In Figure 7, morphological analysis of the contemporary urban landscape reveals the residual impact of the acequia systems on street, block, and building formation. By comparison, the platting structure represented by the grid system in the Barrelas community demonstrates a complete erasure of the acequia system (see Fig. 7 Contemporary Community form in the Town of Albuquerque Grant).

4.2 La Villa de San Antonio de Bexar, Tejas (1731)

San Antonio de Bexar is the second largest city in Texas today with a population of 1.3 million in addition to being one of the fastest growing cities in the United States. San Antonio is also the oldest major urban center which predates other cities in Texas such as Dallas, Austin, and Houston by nearly 150 years. The San Antonio region was first recommended for settlement by Fray Antonio San Buenaventura Olivares during late 1690s and was finally granted permission for settlement by Martín de Alarcón, Governor of Tejas in 1718 (De la Tejas 1995). On April 25, 1718, a small group of settlers established a mission settlement on the east bank of the San Antonio river known as the Mission de San Antonio de Valero. The first acequias constructed in the San Antonio area was the Labor Alta acequia as well as the Alamo Acequia, which was laid out by Captain Alvarez Barreiro to provide a water source for the Mission (Cox 2005). Later in 1729, the Concepción Acequia was constructed to support the development of the San José Mission, and later a fourth acequia was built in 1731 to support the San Juan Mission. By the early 1730s, the need to support a presidio and villa settlement with a standing municipal government had grown. Due to lack of settlers in northern Mexico, the Spanish government began a program to recruit settlers from the Canary Islands (Glick 1972). In that same year, fourteen families from the Canary Islands, in addition to eight other families were settled and established La Villa de San Antonio de Bejar. Following the leyes de las indias, Captain Juan Antonio Pérez y Almazán laid out a town plan as well as designating the solares, suertes, propios, and the ejidos for the settlement (Cox 2005; De la Tejas 1995). The San

Pedro Acequia was constructed in 1732 to provide a water supply to both the presidio and the villa. By the late 1700s and early 1800s the San Antonio region became a network of settlements as well as the social and economic center of Tejas (Fig. 8 The Plan of San Antonio 1767).

In 1836 Texas declared itself an independent state from Mexico and would later join the United States in 1845. As in Albuquerque, many American land speculators and business interests began to move into the area threatening the historic land tenure system of the villa. For example, by 1852 Americans had gained control of the San Antonio town council and began to sell proprios of land and water rights not yet appropriated by the Villa to private individuals (Porter 2009) (see Fig. 9 Land Claims of San Antonio de Bejar County). By the 1870s the city population grew to 12,265 people, and due to the pressure of rapid growth and urbanization the acequias began to be abandoned. The rapid urbanization and industrialization also shifted the use of acequia as water delivery systems to dumping grounds for solid waste and sewer. Beginning in 1896 the City of San Antonio began to condemn and close community ditches on the basis that they were a risk to public health until the last urban ditch was closed by city ordinance in September of 1912 (Cox 2005).

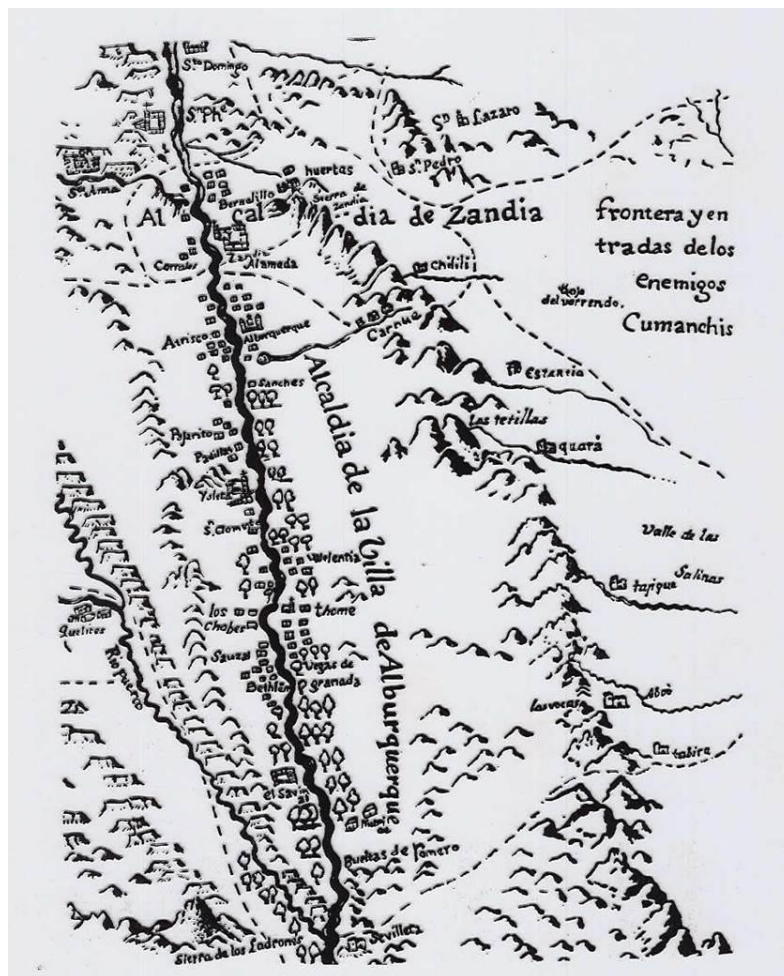


Fig. 4. Alcaldía de Albuquerque, Miera y Pacheco Map 1779.

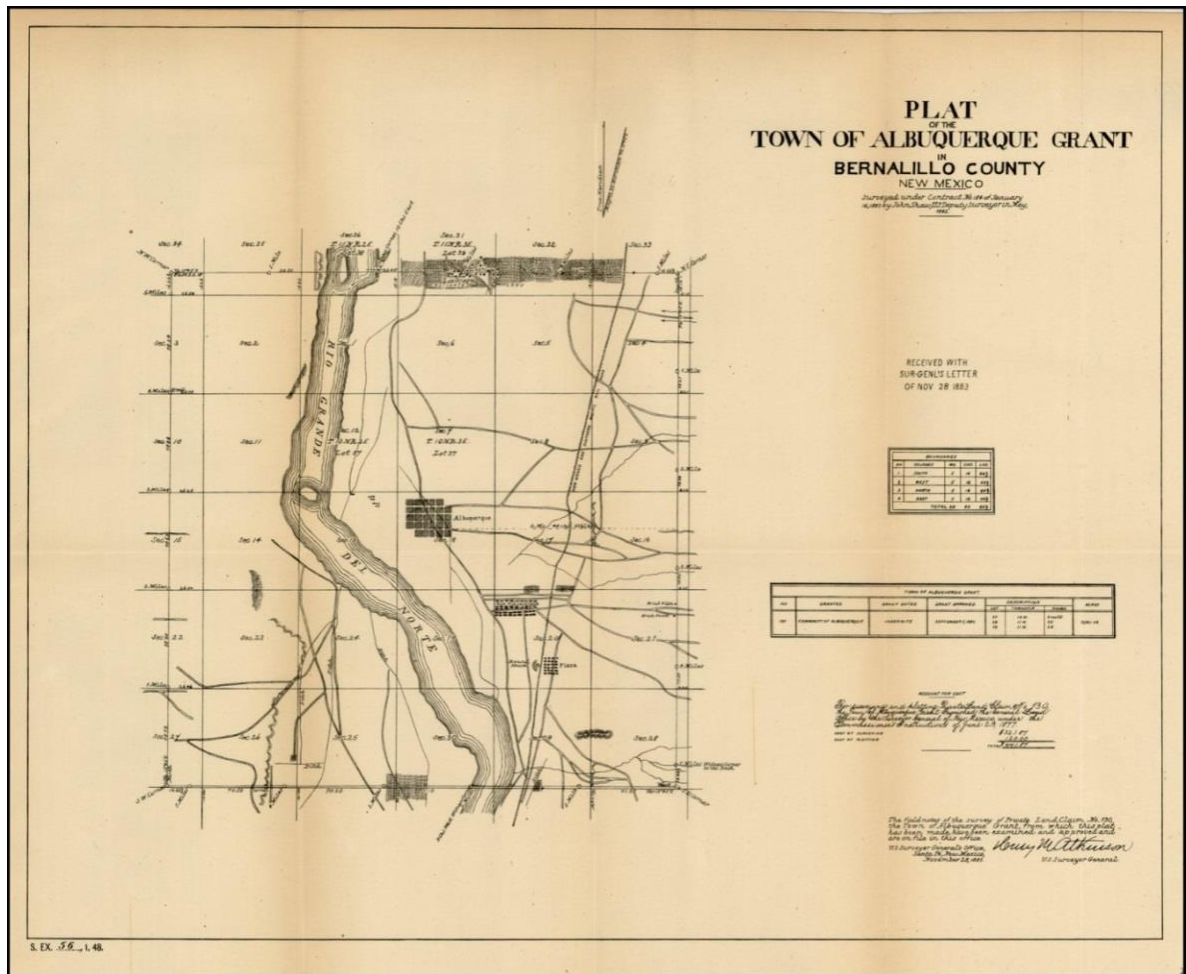


Fig. 5. Survey of the Town of Albuquerque Grant 1883.

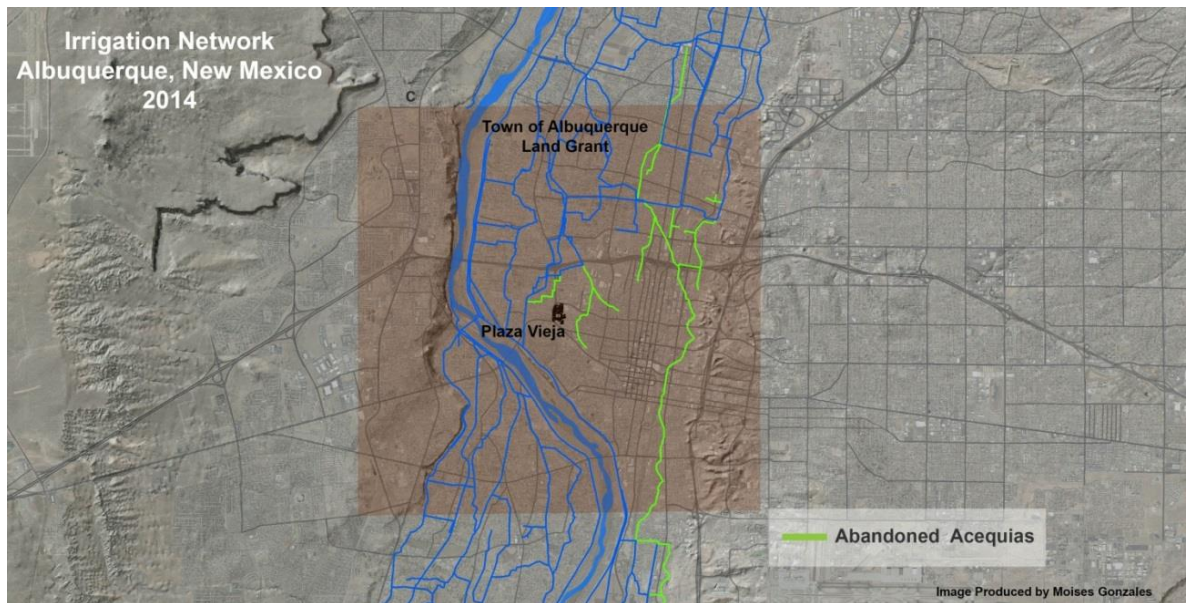


Fig. 6. Irrigation Network, Albuquerque New Mexico.

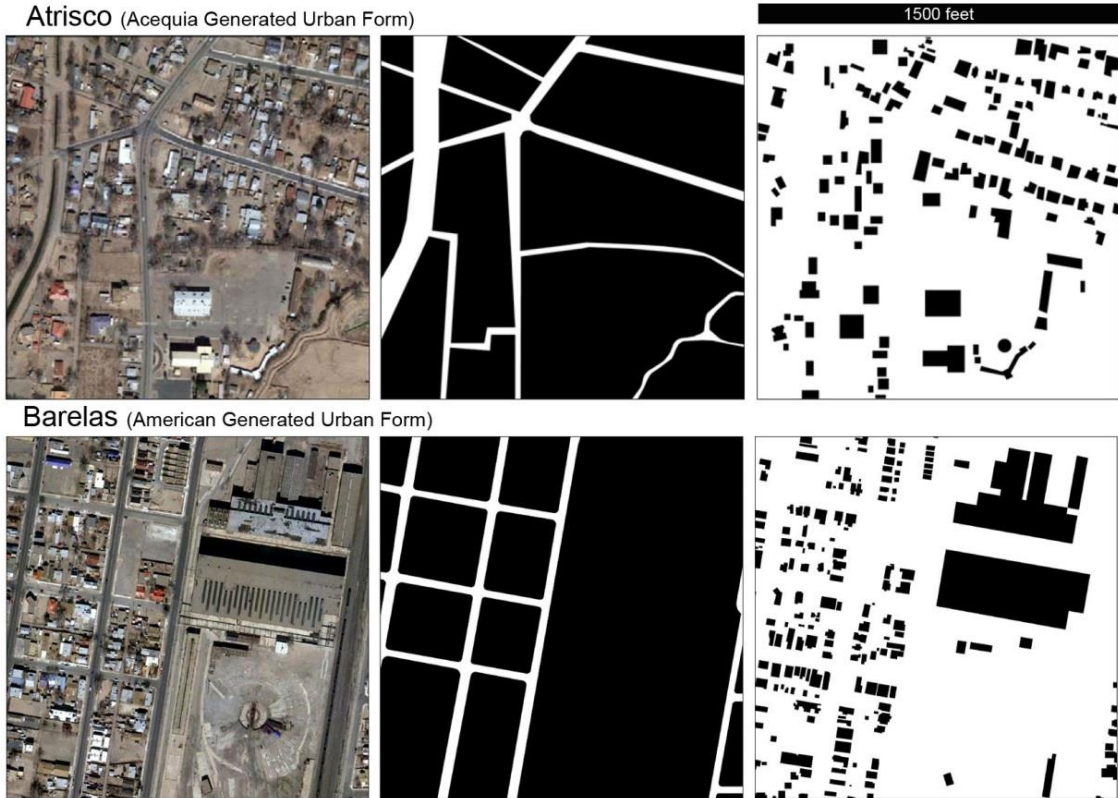


Fig. 7. Contemporary Urban form within the Town of Albuquerque Grant.

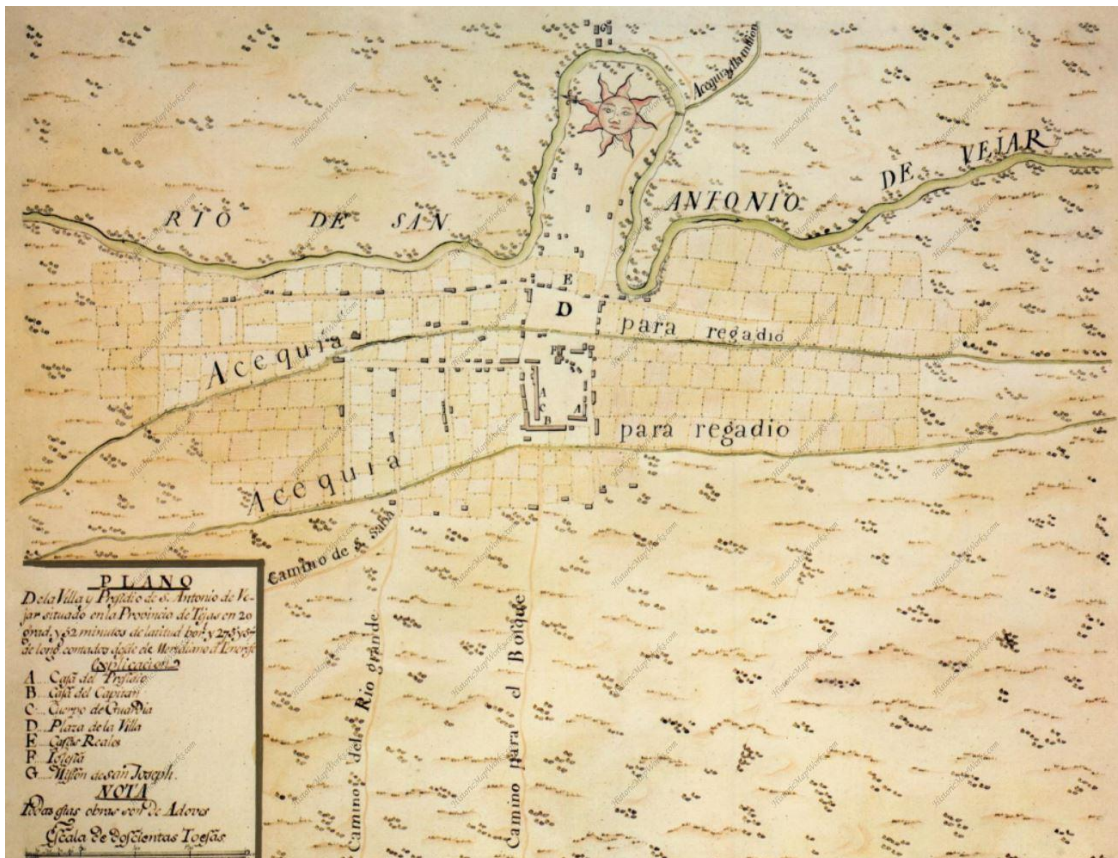


Fig. 8. The Urrutia Plan of San Antonio 1767.

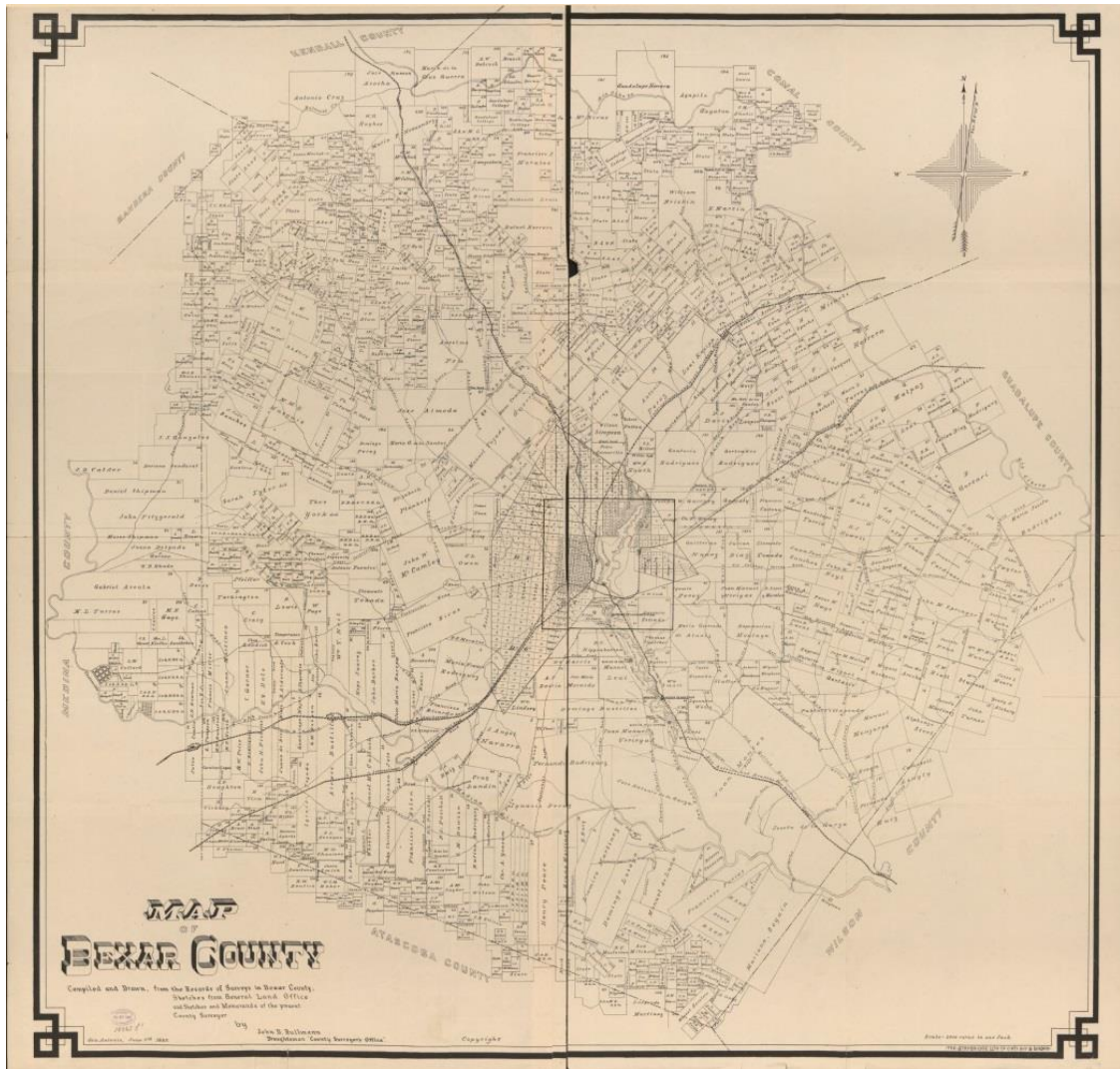


Fig. 9. Land Claims San Antonio de Bejar County.

In the last half of the 19th century, the City of San Antonio slowly began the process of recovery and reconciliation of its historic acequia landscape. One of the first steps of acequia recovery came in 1958 when the San Antonio River Authority allowed gravity flow irrigation into the San Juan Acequia which later failed but was reconstructed (Rivera 2003). Later in 1968 while clearing the Hemis Fair site for the World's fair, a portion of the Alamo Acequia was exposed to celebrate the 250 year anniversary of the city. In the 1970s the National Park Service conducted studies revealing the cultural significance of the San Antonio missions and the importance of preserving their physical characteristics (National Park Service 1975). This led to an eleven million dollar project to restore acequia irrigation to the San Juan ditch benefitting private property owners as well as the park service. Today, the City of San Antonio works aggressively to brand itself the Acequia Landscape of the Southwest. I. Wayne Cox states (2005), "Display of such major features of the original acequias can only enhance the visual resources that display San Antonio's rich cultural history for its citizens, as well as for the visitors upon whom so much of the region's economy depends." (see Fig. 10)



Fig. 10. Photo Espada Aqueduct 1895-2000. Photo Left: 1895, DRT Library Collection, Picture File, SL98.1. Photo by Jack Butterfield, Alamo Research Center, San Antonio, Texas. Photo Right: Photo by José Rivera October 1-, 2000.

4.3 Nuestra Señora de Los Angeles, California (1781)

The plan to establish the settlement of El Pueblo de la Reyna de Los Angeles, present day Los Angeles was proposed in 1777 by Governor Felipe de Neve to provide a more stable civil center in Alta California by providing an urban center that would support the supplies for the presidios which had been reliant on the missions. Based on the importance of becoming the governmental center for Alta California, the plan for Los Angeles would follow compliance with the laws in both design as well as governance. According to the plan of the settlement, Governor Neve designed a civic plaza in accordance with the Laws of the Indies, (see Fig. 11 1849 Survey of Los Angeles) while assigning *solares* to *pobladores* around the *plaza* as well as assigning *suertes*. The Acequia Madre was noted on the drawing to divert water from the west bank of the Los Angeles River to supply both the settlement with domestic water as well as the source of irrigation for the farm plots. The settlement was designated four square leagues of land to be used in common as the *ejidos* and *dehesas* to sustain the resource needs of the settlement. Although not depicted in Governor Neve's plan map for Los Angeles, the plaza and principal roads leading out of the plaza were oriented toward the four cardinal directions (Estrada 2008). The plaza was built at a 30 degree orientation in which to ensure adequate exposure to sun light and air circulation for home sites on the plaza. Through the Spanish and Mexican periods, Los Angeles functioned in the typical urban settlement pattern as other villas and pueblos in the arid Southwest.

Just as in the case of Albuquerque and San Antonio, Mexicans in Los Angeles fell to the same fate with the arrival of Americans. However, in the case of Los Angeles, the deconstruction and erasure of the Acequia landscape occurred rapidly. One year after the signing of the Treaty of Guadalupe-Higalvo ending the Mexican American war on February 2, 1848, an American Survey of the Town was conducted. "Lieutenant O.C. Ord surveyed Los Angeles to affirm and extend the street pattern of the Mexican city to facilitate real estate speculation" (Estrada 2008). The American legal system determined that the *ejidos* and *plaza* were municipal lands and therefore could be sold which was contrary to prior

Spanish and Mexican law. The gold rush of the 1849 generated an explosion of the American population to Los Angeles causing the alienation of *vecinos* to their ancestral lands. The 1849 survey of the pueblo depicts the platting of the typical American grid and block network accompanied by the orthogonal grid street pattern. This was in conflict with the organic acequia cultural landscape (see Fig. 11 1849 Survey of Los Angeles).

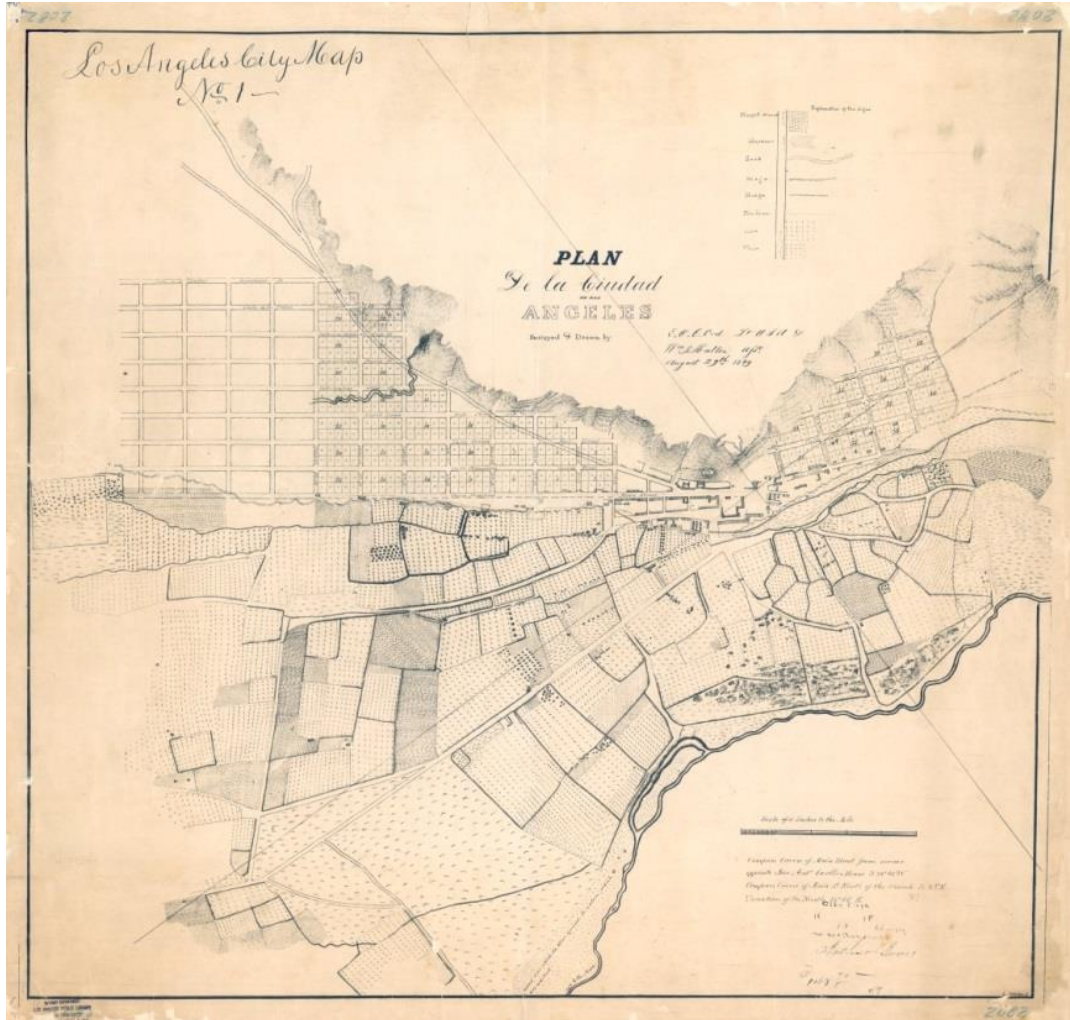


Fig. 11. 1849 Survey of Los Angeles

In a period of about fifty years, the entire cultural landscape of the Pueblo de Los Angeles was erased and replaced by the modern American city. The *Zanja Madre* had been constructed during the settlement of the original pueblo and fed water for both irrigation of farmland and domestic use, but was closed in the 1870s and finally abandoned in 1904 (LA Times 2014) (see Fig. 12 1868 map by William Moore of the *Zanja Madre*). The Río Porciúncula (Los Angeles River) was the next natural feature dismantled from the natural landscape. The L.A. river today is a massive concrete culvert designed to control flooding in the larger metropolitan region. The river channel was constructed by the Army Corps of Engineers between 1935 and the late 1950s (Gumprecht 2005). In 1959, the Los Angeles Dodger stadium was built on the hilly communal *ejido* grazing lands north of the pueblo which was one of the last natural landmarks (see Fig. 13. Transformation of the Los Angeles Landscape 1849 – 2014) Today, the last remaining feature of the acequia community pattern is the historic plaza and block pattern of the *plaza*, and because it is the last remaining physical feature of the historic settlement, the City of Los Angeles has developed plans to ensure its preservation (City of Los Angeles 2013).

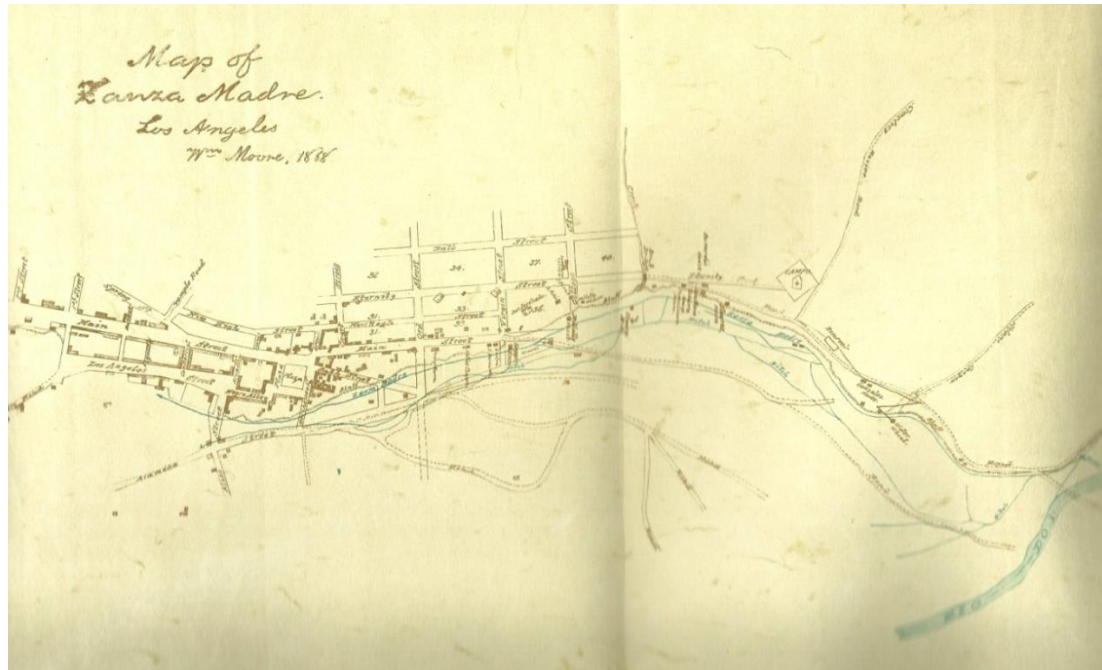


Fig. 12. 1868 map by William Moore of the Zanja Madre

By comparison with other cities in this study, the cultural landscape of Los Angeles was the most impacted by American occupation and modernization. However, The City of Los Angeles is spending significant capital investment in the restoration of the plaza as well as an aggressive plan to restore the Los Angeles River which will be the largest urban river restoration project in the United States.

5 Discussion, recovery of the material memory from the erasure of the acequias landscape

This study has revealed that the acequia irrigation landscape emerged in the Southwest through the urban design principles promulgated by the Laws of the Indies in the late 17th and early 18th century. The acequia system and the cultural landscape it supported were maintained through the Spanish and Mexican periods in the cities of Albuquerque, San Antonio, and Los Angeles. The American occupation of the southwest after the Mexican American war in 1848 led to the alteration of irrigation landscape by imposing street, block, and building forms that threatened the acequia network. By the late 19th century, during the rise of the industrial period in the United States, the acequias were viewed as ancient antiquated systems and were buried and replaced by modern water and drainage systems. In Albuquerque, although several acequias were abandoned, the city still maintains the acequia system for agricultural, recreational, and aesthetic purposes. In San Antonio the acequias went through a period of erasure from the 1870s through the 1890s only to be re-discovered and celebrated in the city a century later as historic monuments. In Los Angeles the city has begun to unbury, restore, and reconstruct portions of the original acequia landscape.

Acequia scholar I. Wyenne Cox (2005) asked a decade ago, “Is there a need for the further work of the old waterways? The answer is yes. Unanswered questions and distinctive resources remain beneath the ground, ready to reveal their part of San Antonio’s heritage.” Today, all three cities have become interested in the recovery of the material memory of the city that acequias provide. Los Angeles has the most impaired acequia landscape, but

recently initiated an aggressive plan to restore the Los Angeles River (see Fig. 14 Los Angeles River Revitalization Plan). The analysis used in this study perhaps can provide a future vision for these cities to maintain, recover, and preserve the materiality of the cultural landscape fabric to be re-discovered and celebrated.



Fig. 13. Transformation of the Los Angeles Landscape 1850-2014. Top, Birdseye Drawing of Los Angeles Plaza, 1850. Bottom, Google Earth image of Los Angeles Plaza, 2014.



Fig. 14 Los Angeles River Revitalization Plan

References

- Arguello, J. (1786): Map of Los Angeles, *Bancroft Library*. University of California, Berkeley, California. <http://bancroft.berkeley.edu/collections/digital.html> (Accessed June 11, 2014)
- Camora, M. and S. Tiesdell. (2007): The Morphological Dimension, *The Urban Design Reader*, Oxford, United Kingdom, pp. 375.
- Conzen, M.R.G. (1960): *Alnwick, Northumberland; A Study in Town-Plan Analysis*, London, England, pp. 5.
- Cox, I.W. (2005): *The Acequias of San Antonio*, Maverick Publishing Company, San Antonio, Texas.
- De La Teja, J.F. (1995): *San Antonio de Bexar: A Community on New Spain's Northern Frontier*, University of New Mexico Press, Albuquerque, New Mexico, pp. 56.
- Ebright, M. (1996): *Land Grants and Lawsuits in Northern New Mexico*, University of New Mexico Press, Albuquerque, New Mexico, pp. 18.
- Eidenback, P. (2012): *An Atlas of Historic New Mexico Maps, 1550-1994*, University of New Mexico Press, Albuquerque, New Mexico.
- Estrada, W.D. (2008): *Los Angeles Plaza: Sacred and Contested Space*, University of Texas Press, Austin, Texas.
- Glick, T.F. (1972): The Old World Background of the Irrigation Systems of San Antonio, Texas, Monograph No. 35, Texas Western Press, the University of Texas at El Paso, El Paso, Texas.
- Gonzales, M. (2014): Map of Irrigation Network Albuquerque, New Mexico, Created on June 23, 2014, University of New Mexico.
- Gonzales, M. and J. Rivera et al. (2013): Qualitative and Visualization Methodologies for Modeling Social-Ecological Dimensions of Regional Water Planning on the Rio Chama, *Universities Council on Water Resources Journal of Contemporary Water Research & Education*, 152: 55-68.
- Gomprecht, B. (2005): Who Killed the Los Angeles River?, in Deverell, W. and G. Hise, (Eds.) *Land of Sunshine: An Environmental History of Metropolitan Los Angeles*, University of Pittsburgh Press, Pittsburgh, Pennsylvania.
- Los Angeles Times (2014): Workers discover part of L.A.'s first municipal systems, <http://www.latimes.com/opinion/opinion-la/la-ol-zanja-madre-ground-chinatown-20140519-001-photo.html>.
- Miller, M. (2014): La Vara: New Mexico's Yard Stick, New Mexico History, <http://newmexicohistory.org/people/la-vara>.

- Morris, A.E.J. (1994): *History of Urban Form; Before the Industrial Revolutions*, London, England, pp. 305-306.
- Moudon, A.V. (1997): Urban morphology as an emerging interdisciplinary field, *Urban Morphology*, 1, pp. 3-10.
- National Park Service (1975) Proposed San Antonio Missions National Historical Park: Alternatives for Implementation, *Division of Cultural Resources*, Southwest Regional Office, Santa Fe, New Mexico.
- Porter, C.R.Jr. (2009): *Spanish Water, Anglo Water; Early Development in San Antonio*, Texas A&M University Press, College Station, Texas, pp. 92.
- Rivera, J.A. (2003): Restoring the Oldest Water Right in Texas: The Mission San Juan Acequia of San Antonio, *Southwestern Historical Quarterly*, Vol. CVI, No. 3: 367-395.
- Shah, S.K. (2000): Water Growth and Sustainability: Planning For the 21st Century, *New Mexico Water Resources Research Institute*, <http://wrri.nmsu.edu/publish/watcon/proc45/shah.pdf>, (Accessed June 24, 2014). December 2000, pp. 1-9.
- Simmons, M. (1982): *Albuquerque: A Narrative History*, University of New Mexico Press, Albuquerque, New Mexico.
- United States General Accounting Office (2004): Treaty of Guadalupe Hidalgo; Findings and Possible Longstanding Community Land Grant Claims in New Mexico, GAO-04059, Washington D.C, 89.
- United States Surveyor General (1893): Survey of The Town of Albuquerque Grant, *General Land Office Records*, <http://www.glorerecords.blm.gov/> (Accessed June 20, 2014)
- Urrutia, J. (1769): Mapa, que comprende la frontera del rey, el la America Septentrional, *Library of Congress Digital Archives*, <http://www.loc.gov/item/00556406/> (Accessed June 20, 2014)
- Veregge, N. (1993). Transformations of Spanish urban landscapes in the American Southwest, 1821-1900. *Journal of the Southwest*, pp. 371-459.