

The Evolution of the Plan in U.S. Settlement Examples

by Brenda Case Scheer
University of Utah

Keywords: Plot, evolution, town foundation, stability, US.

Abstract: Does the original plan of a city have an effect on the subsequent evolution of the block and lot pattern? This research will compare four cases of city centre changes over a minimum of 150 years each to determine the effect of origin form in the stability of the plan. “More stable” means that the original pattern of blocks has stayed clear and constant throughout the period of time, and “less stable” means there are many instances of change, including disruptive change that compromises the original pattern substantially. The different plan types include: 1) Grids and plot patterns planned for a specific building type that was common at the time (Waco, TX); 2) Grid patterns with plots that were incorrectly sized at their origin (Cincinnati, OH and Salt Lake City, Utah); and 3) Areas where the original plan was farm allotments (Providence). While four cases are not enough to make a definitive finding about the evolutionary differences because of different original patterns, this framework could be replicated easily in many places around the world. If the differences in the relative stability of the block patterns can be demonstrated, it would make a case for the best kind of new city foundations, which would be flexible and yet stable.

1. Introduction

This paper reports on a study of four cases of town foundation in the United States, and the subsequent development of the area of those original foundation blocks or allotments. The cities are Providence, RI, founded in 1638, Waco, TX, founded in 1846, Cincinnati, OH, founded in 1790, Salt Lake City, founded in 1847. The research question is to study the short-term (150 to 200 year) evolution of American grid foundations. Initially the expectations were that there might be different kinds of evolutionary patterns based on different origin patterns of the plan matrix. That conclusion cannot be supported by the data we collected and analyzed, however, there were several important observations from these four cases.

The elements that are part of most urban morphology studies, if the data are available, are *built form*--buildings, monuments, paving, eg.); *plan matrix*--the land subdivision, including the land given over to public infrastructure; and land --the natural and reconfigured landscape that underlies the place) (Scheer, 2016) These elements are then analyzed and interpreted as patterns that can be compared and related to history and culture to build up a knowledge base. After identifying, measuring and mapping these data points, morphologists work to interpret

patterns that can be seen not only in the place under study, but also occurring in multiple places concurrently.

According to theories of urban morphology, the physical city is in constant flux, with buildings being torn down and replaced quite commonly. The three elements (built form, the plan matrix and the land) change at different frequencies, as has been noted in most theories of urban morphology. (Panerai *et al.*, 2004; Moudon, 1986; Caniggia and Maffei, 2001). Although buildings can be very long lived, their endurance is much shorter than the plan matrix. For example, the current street pattern of lower Manhattan has endured from the 17th century, but there are no buildings that survive from that time period.

This paper exams only one of the elements of urban morphology – the plan matrix. Just as with built form, once a plan is initiated, it also undergoes evolution. Figure 1 outlines some of the common ways in which that evolution occurs, e.g, lots that are combined or subdivided (Conzen, 2004). An evolutionary change in the plan matrix is also correlated with the city's responses to the cultural and economic conditions, but when the plan matrix is altered, it means that most of the built form has also been destroyed.

Figure 1a shows the several categories of change that a plan may undergo over even very short periods of time. These are generally operations involving changes at the lot and block level: vacating alleys, combining and recombining original lots, subdividing blocks with alleys, subdividing larger lots.

Disruption of the plan matrix is not like these stepwise evolutions, however, which are carried out by individual actors in a slow evolving dance. It is a radical restructuring caused by deliberate action of a powerful agent or a catastrophe (Figure 1b). Just as evolutionary changes reflect subtly shifting conditions in the environment, disruption signals a radical change in those same conditions: a new regime has taken control, or a powerful agency has started a slum clearance program, or a new superhighway must be built through a neighborhood. With a disruption to the plan matrix, most of the built form is also destroyed. The most dramatic changes, which also cause a plan disruption, are those that change the landform itself: cat-

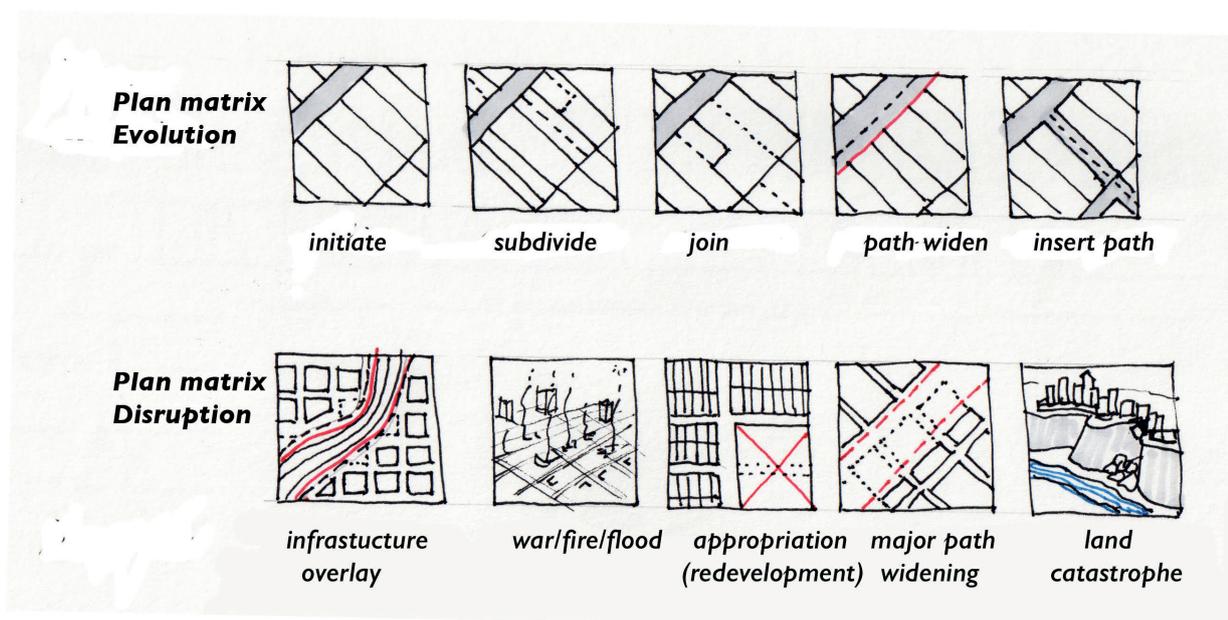


Figure 1a e 1b.

aclysmic events like earthquakes, landslides, and floods, or a man-made land-altering event like leveling a hill to fill in a harbor (e.g. Boston, Seattle, New York).

Many American cities sported some form of geometric layout as part of their original foundation, usually a grid (Reps, 1965). Until the 1940's, new subdivisions also took the form of an addition to the grid, perhaps only slightly modified. (Southworth, 1997, pp. 106-107). In most cases the initial blocks were subdivided into lots, which were somewhat regular. These lots were built to accommodate, in size, the expected urban building type of the period. The same kind of planning occurs today in suburban subdivisions, where the lots are sized to accommodate a particular scale and type of single-family house. (Scheer 2010, pp. 47-50)

Town planning, from Miletus to today, meant laying out an orderly plan of streets and lots in advance of building. The grid plans that underlay many historic areas in the U.S. were often speculative, built as a way to quickly survey property for rapid settlement (Reps, 1965). Grid towns are one example where a particular formal pattern is seen over and over, often grouped in a particular era. Minor changes in grid dimensions and overall scale of layout can reveal new meanings when many places across the world are compared.

2. Methodology

The primary methodology of urban morphology is to collect, compare, and measure maps of places at different time intervals, comparing them for physical changes. Frequently, study areas are also compared to similar places elsewhere. The purpose is to identify and explain the patterns of development, as well as to understand and reveal the physical and non-physical forces that drive change. (Scheer, 2016). In this study, four cities were selected that were founded in the 19th century, with one (Providence) founded earlier but significantly rebuilt in the 19th century. Maps of the city from the 19th century that indicate their early plans were overlain with contemporary GIS maps of the same area, using the GIS map as the registration marker, and to provide information about the scale. Only the extent of the original plan was studied, although all the cities have greatly expanded since that time and most expanded very quickly soon after they were initially surveyed.

The following were compared: from the early maps: the number of blocks in the initial survey, the total physical extent of the survey, the size of regular blocks, the number of irregular and regular blocks, the physical location (e.g., on a navigable river) and the degree of orientation off north of the entire physical plan. Three of the cities were founded with rectilinear grid and Providence was developed on an irregular grid that developed from 17th century allotments.

The original city plans were then compared to two time periods: late 19th century plans (from Sanborn maps) and 2018 or 2019 Google aeriels and GIS maps. The data specifically collected in all cases was the number of regular blocks preserved (block perimeter and surrounding streets) vs not preserved and the number of irregular blocks preserved. A check of the extent of the persistence of original lot boundaries was also made.

3. Analysis/Results

3.1. Individual city analysis

Providence, Rhode Island

The Providence Plantation was originally founded by Roger Williams in 1638, with long narrow allotments similar to the burgage lots common in England at the time. These bordered the west side of the head of Narragansett Bay (Fields, 1902). Because this part of the area was on a hill, Providence city centre developed across the bay from the original foundation. By 1830, these lots were overwritten with an irregular grid, which was subdivided for individual houses and institutions. However, the allotment property boundaries provided many of the boundaries for 1830 streets and blocks. Remarkably, the surrounding streets of the original allotment and the original internal streets were all retained from 1638 into 2019.

The majority of the changes from the 19th century to 2018 are to blocks that have been either subdivided or combined. Most changed are blocks that are along the waterfront, especially where bridges were built, and waterfront parks or highways exist today. There are residential buildings and some institutional buildings that remain from 1840. The relatively small-scale grid, which has seen some consolidation, has nevertheless resisted larger typologies. Many lots are from 19th c, most of them are residential.

Cincinnati, Ohio

Cincinnati was founded on a navigable Ohio River in 1802. Its purpose was initially as a place for shipping, connecting to both the Mississippi river as well as the Erie Canal. The foundation plan was a grid consisting of mostly square blocks, which ignored the steep drop off from the bluff to the riverfront itself. Riverfront blocks and streets, which were the significant economic drivers in the 19th c, did not survive into the 20th century, at first being replaced by a large interstate and then with a combination stadium, and later two stadiums, a park, a buried highway, and some housing projects.

The original regular blocks had 8 large lots, were quickly subdivided and built up with a very dense fabric, which persisted until the decline of the city in the 1940s and 1950s. All but a tiny part of this fabric has been demolished, with blocks consolidated into three or two lots to accommodate much larger typologies and new developments by 2019. Interstate highways and railroads slid along the edges of the original grid and disrupted it below the waterfront bluff area.

Waco, Texas

Waco was founded along the navigable Brazos River in 1846. Its original grid is relatively small, but it also took a long time to fill out. A suspension bridge (still extant) was built across the river in 1870, and it resulted in a torrent of new business and development in Waco, serving farm to market traffic for ranchers and cotton farmers. (Waco History Project, 2019)

The original fabric is relatively small grained, with small blocks and small lots. The lots were usually combined to make larger lots as the city built out. It became very dense with one and two story buildings by the early 20th c. A railroad was built right through the middle of the original grid, disrupting its continuity. The grid is somewhat persistent, but with very few small or

even double lots remaining. The lots do not seem to have formed a background matrix for any kind of 20th or 21st century development.

The most remarkable transformation was the overwriting of the town's city hall square, which was a central location near the warehouses and the downtown activities. Stores used to line the square itself, which was an entire city block, much like the historic courthouses popularly preserved in Texas. In Waco, this square was obliterated and replaced with parking lots, a convention center and hotels. The city hall building still exists as it was rebuilt, in 1933 but its "urban square" is gone and its surroundings are considerably diminished, following an urban renewal project in the 1950's. (Waco History Project).

Waco's original grid provides some organization for the city, but the city itself is greatly "thinned out" – taking on the density and form of suburban offices jammed into a 19th c grid. No historic buildings survive in the original grid area. The biggest disruptions avoided the original grid, but surrounded it with interstate highway.

Salt Lake City

The City of the Great Salt Lake was founded in 1847, just a year after Waco, Texas. It was a city built on a religious intention, founded by Mormons and their prophet, Brigham Young. Young went on to found over 300 towns in the western territories of Utah, Arizona, Idaho, Nevada, and California. The size and extent of the plan was quite unusual, and the orientation of lots on the blocks was also unique. The city was not founded next to the Jordan River, but some distance away, apparently to provide for agriculture. The river was slight, and not navigable, but did provide for many small canals and channels. (Nelson, 1952).

Despite its large size, after its founding Salt Lake was engulfed with thousands of religious immigrants, who quickly filled the original plat and necessitated two more town plats within five years. The original large lots were very quickly subdivided into 8 to 10 lots each. The city densified especially in the original blocks downtown, with two to four story buildings quickly providing lot coverage and the original large blocks often divided with half alleys to provide access to their interiors.

The original plat with 10-acre blocks has seen little disturbance, the most being the two blocks that have been joined together in the late 20th c., one for the convention center and one for the Temple Square. The enormous size of the original blocks has allowed for contemporary downtown building types to accrue without joining smaller blocks together. Highways and railroads were built along the river, and proposals for cross-town freeways were dismissed.

The original odd configuration of the lots can still be read in the contemporary plan, as it provides a superstructure to further subdivision in almost every block. Of the original three public squares (parks), only one survives as a park, the others are now a high school and the City-County building.

4. Discussion/Conclusion

The research question, whether different patterns of grids or foundation plans had different level of persistence, cannot be answered in this research. The comparison of the four cities is inconclusive in regard to this question, although the cities shows a great many similarities, despite their differences in extent of original foundation, number of blocks and block sizes.

Some important distinctions were also observed, but could not be attributed to the original foundation plan.

Turning to the data itself (Table 1) we see that the most stable plan is Salt Lake City, which is also the youngest place examined. The grid there has been very well preserved (79%) compared to other places. The distinction it has are 1) the blocks and the streets were exceptionally large in size, so that making room for density and for larger building types in the 20th c. has not required joining of blocks except in a few cases, 2) the interstate highway and the railroads did not intrude physically anywhere near the original plan area, despite its large extent. These were placed along the river, which was actually peripheral to the plan, and proposals for cross-town highways were rejected, partly due to topography, 3) the extent of the original plan is much larger than the other cities, yet it was built out very rapidly – with two years – due to the flood of Mormon immigrants.

Waco, like Cincinnati, has far more change – with only 34% of the original blocks still preserved. Cincinnati has a similar percentage. “Regular” blocks, being the ones that were most common in size and orientation, were far more likely to survive. Salt Lake did not really have “irregular blocks”, except for public spaces and all of Providence was irregular, so comparison here is difficult.

Block size varies greatly across the four cities, from Salt Lake’s very large blocks, to Waco’s very small ones. Providence had a variety of block sizes, which varied from 200 feet x 200 feet to 700 feet x 300 ft. Block sizes were not a dominant reason that particular blocks did or did not persist, except perhaps in Salt Lake, as stated above.

We observed that the most prominent loss of the integrity of early plans had three causes:

- With the exception of Providence, the building types rapidly evolved in the other three cities, so that by the late 19th century, all the original lots had been subdivided and built out with a much higher density than apparently anticipated in the original plans. These three cities developed as “downtowns” while this part of Providence developed as a residential area, and still has houses intact from 1840 and earlier. The density of commercial land uses was apparently not anticipated in any of the three places – the lots were usually large, as if for individual houses or buildings, not an urban layout with abutting buildings.

Table 1. *Comparison of four cities.*

	Providence	Cincinnati	Waco	Salt Lake City
Date of foundation/plat	1636	1802	1846	1847
Age in 2019	383	217	173	172
Blocks:				
Block size (not street)	varies	400 x 400	50 x 165 (x2)	660 x 660
Number total	118	53	69	113
Regular blocks	N/A	28	58	109
Regular blocks preserved	N/A	22 (38%)	20 (34%)	86 (79%)
Irregular blocks	118	25	11	4
Irregular blocks preserved (Percent)	69 (58%)	3 (12 %)	2 (18%)	3 (75%)
Extent of original plat	416 ac	288 ac	117.6 ac	1415 ac
Grid Orientation degrees	5 NW	30 NE	45 NE	0 N
Location	Harbor/bay	River- navigable	River – navigable	Mountain Valley

- The blocks along the edges of the waterfront or the edge of the plat itself were far more vulnerable to change. In Salt Lake, some of the blocks with steep elevations were never built out as regular blocks, despite the plan. In Cincinnati and in Waco, the blocks on the riverfront were vulnerable, especially in Cincinnati, where topography and flooding also provided opportunities for rapid change of the street and block network. In Providence the topography was also an issue, with lower areas next to the waterfront suffering the most disruption. Similarly, blocks in the center of the plat were more stable.
- Regular blocks were more stable than irregular blocks, that is those that were not the standard size for whatever reason. Areas in Waco that were most vulnerable were blocks surrounding the old City Hall Square, which was egregiously destroyed. Public squares in Salt Lake were also changed.
- A fair number of the property lines in the three gridded cities -- Salt Lake, Waco and Cincinnati – are still readable as the background to further subdivision. In Providence, there are many blocks where property boundaries have been preserved, again, in residential circumstances.
- Interstate highways and railroads were overlain on cities without regard to the patterns of lots and blocks beneath them. They constitute a genuine “disruption” of the fabric and plan matrix wherever they occur, although they skirted the boundaries of the original plan in three of the four cities (not the waterfront of Cincinnati).

All four of these cities developed with a geometric order, although Providence was more fluid and irregular. Despite this regularity, there was a good deal of shuffling around in the 175-200 years of urban development – streets closed, streets created, block and street fabric disappearing entirely for new development. The only pattern that seems more stable is Salt Lake, with its huge dimensions accommodating the 20th c development that created hollowed out density, high rise towers, parking lots and garages, where a dense fabric had once been.

The blocks in these cities, except for residential Providence, now host new typologies, with many blocks under one or two owners rather than the 30 or forty that might be common in the late 19th c. Most do not have continuous block faces as they once did (or twice did). The lessons for contemporary planning are not clear – how do we plan for the rapid change we might expect? How can we return to walkability in cities which already have the block infrastructure to support it?

References

- Caniggia G. (2001), *Architectural composition and building typology: interpreting basic building*, Alinea, Firenze.
- Conzen M.R.G. (2004), *Thinking about urban form: papers on urban morphology, 1932-1998*, Peter Lang, New York, Oxford.
- Fields E. (1902), *State of Rhode Island and Providence Plantations at the End of the Century: A History*, Mason Publishing Company, Rhode Island.
- Moudon A.V. (1986), *Built for change: neighborhood architecture in San Francisco*, MIT Press, Cambridge, Mass.
- Nelson L. (1952), *The Mormon village*, University of Utah Press, Salt Lake City.
- Reps J.W. (1965), *The making of urban America: a history of city planning in the United States*, Princeton University Press, Princeton, N.J.
- Scheer B.C. (2010), *The evolution of urban form: typology for planners and architects*, American Planning Association, U.S.
- Scheer B.C. (2016), *The epistemology of urban morphology*, in *Urban Morphology*, 20, pp. 5-17.
- Southworth M., Owens P. (1993), *The Evolving Metropolis: Studies of Community, Neighborhood, and Street Form at the Urban Edge*, in *Journal of the American Planning Association*, 59, pp. 271-287.

WACO History Project (2019), <http://www.wacohistoryproject.org>.

City of Waco GIS Services: <https://wacogis.maps.arcgis.com/apps/webappviewer/index.html?id=ecd0c145c0934ab1bd97ee8ef34b8cd0>.

Google Earth Pro Maps <https://www.google.com/earth/>.

University of Texas Library Collection <https://legacy.lib.utexas.edu/maps/historical/waco1898.jpg>.

Sanborn Fire Insurance Maps, Library of Congress.

Cincinnati:

Cincinnati Area GIS: <https://cagis.hamilton-co.org/cagisonline/>.

University of Cincinnati Map Collections: From *Natural and Statistical View, or Picture of Cincinnati and the Miami Country* by Daniel Drake. <https://libraries.uc.edu/arb/collections/urban-studies/cincinnati-maps.html>.

Google Earth Pro Maps. <https://www.google.com/earth/>.

Sanborn Fire Insurance Maps. Library of Congress. <https://www.loc.gov/collections/sanborn-maps/>.

Salt Lake City:

Salt Lake City: Utah Council of Land Surveyors. <https://www.ucls.org/utah-surveying-history>.

Sanborn Fire Insurance Maps. Library of Congress. <https://www.loc.gov/collections/sanborn-maps/>.

Google Earth Pro Maps. <https://www.google.com/earth/>.

Salt Lake City GIS. <http://gis-slcgov.opendata.arcgis.com>.

Providence, R.I.

Rhode Island Historic Society: Map of Providence 1823 <https://i1.wp.com/rihs.org/wp-content/uploads/2013/01/Map-of-Providence-1823.jpg>.

City of Providence GIS. <https://pvdgis.maps.arcgis.com/apps/webappviewer/index.html?id=1700e1cf7228491d962973cdc9924484>.

Google Earth Pro Maps. <https://www.google.com/earth/>.

Getty Images: Rhode Island 1870 Map. <https://www.gettyimages.com/detail/illustration/rhode-island-providence-city-map-rhode-island-state-stock-graphic/114521115>.