Chicago's transportation history: Informing the future of sustainable transportation planning

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Abstract: Chicago's rich transportation history results from a unique geography and continues to impact sustainable transportation today. Specifically, the historical geography of waterways, rails, and roads is analyzed to understand how urban planning can improve sustainable transportation now and in the future. The 1909 Burnham Plan and the 2008 Chicago Climate Action Plan are analyzed to determine the trajectory of sustainable transportation. Findings show how Chicago's transportation history is linked to the present and future, and what specific strategies need to be implemented addressing waterways, rails, and roads.

Keywords: urban planning, historical geography, Chicago, transportation, sustainability, cartography

INTRODUCTION

Throughout Chicago's history, urbanization has led to an influx of people migrating from the rural to urban environment, due to the increased economic opportunity in the city. With this influx of population, the role and capacity of Chicago to provide sustainable transportation becomes essential. During the mid 1800s Chicago experienced the largest population growth in the world, starting with 4,000 inhabitants and growing to over 90,000 inhabitants by the end of the century. Since then, Chicago has reached a more stable population of 2.6 million people today. The transportation history of Chicago is linked to this population growth and has significantly shaped the city into its current social and ecological state (Cronon 1992, 97).

The legacies of Chicago's transportation history include overcoming water obstacles, creating connectivity for urban sprawl, and designing aesthetically pleasing networks of open spaces. Today's need for sustainable transportation does not lend itself to any of these legacies, but must work within the existing framework. Sustainable transportation prioritizes efficiency, cleanliness, and compactness. Litman et al. (2006) outline the necessity for sustainable transportation and compares the conventional approach with the sustainable approach. The environmental impacts of transportation on sustainability include air and water pollution, habitat loss, hydrologic impacts, and depletion of non-renewable resources. Conventional transportation planning assumes that transportation progress is linear, an idea that has generally been used throughout time. For example, walking transportation improves to the bicycle, which improves to the train, which improves to the automobile. However, sustainable transportation planning assumes that different modes of transportation can be useful, and strives to create a balanced transport system to highlight each mode for its best utility (Litman 2006). A city's sustainable transportation adheres to sustainability goals, which leads to specific transportation objectives and solutions that will allow for ecologically and socially productive mobility.

Understanding the need for sustainable transportation in preserving urban livability, this paper asks, how does Chicago's transportation history inform the future plans of transportation in terms of environmental impact? And what can be done to address these historical impacts as we move into the future of sustainable transportation? Understanding this question is significant because Chicago's history has not previously been presented from an environmental transportation standpoint exclusively. Chicago's development over time involves significant

alternation to the environment, and its history of transportation is important to understand and acknowledge in creating future transportation developments. In current times this is especially important, as the transportation initiative is no longer to grow and develop innovative infrastructures, but rather to replace and utilize existing infrastructures to sustainable options. Historic needs for sustainability meant manipulating the environment to foster livability, which has led the city into its current built environment. Current needs for sustainability means maintaining the environment to foster livability.

THE FRAMEWORK

The topic of sustainable transportation and its relation to Chicago's history and urban plans will be analyzed through a combination of frameworks. Chicago's transportation history and its importance to the future can be viewed in many diverse ways, however this paper will look at the question through the two unique frameworks of historical geography and urban planning with an overarching emphasis on cartography.

Urban planning is the discipline of controlling the environment of cities to address the physical form, economic functions, and social impacts of the space and its activity. Planners are creators of their own ideas for urban change, assigning meaning to various actions (Uggla 2012). Currently, all major American cities engage in urban planning by formulating data, creating dialogue and then making decisions before engaging in changes and infrastructure implementation within a city. Planning should ideally aim to minimize the distance between people and their activities, to reduce the demand for long-distance traveling (Grazi et al. 2008, 634). Grazi et al. (2008) links urban planning to sustainability in terms of greenhouse gas emission reduction. Although not immediately effective, urban planning can be key to reducing urban greenhouse gas emissions in the long run (Grazi et al. 2008, 634).

Historical geography is the geography sub-discipline of understanding the changing nature of geography of a location over time (Naylor 2008). Beginning with the initial landscape, historical geography encompasses why and how the land has been transformed over time and its results. The framework of historical geography is especially relevant when understanding transportation because of its emphasis on place and movement, two elements that are key in the

development of transportation (Naylor 2006). Similar to urban planning, such a discipline can include the physical, economic, and social changes of the location, as well as its relationship to other locations. For the purposes of this paper, I will be focusing my historical geography analysis on transportation from an environmental sustainability perspective.

Historical geography is especially significant in relation to urban planning, because urban planning intentionally changes the geography of a location to suit its purposes. Historical geography reveals the background and story behind our built environment today. Using these two frameworks, one can answer the questions of how the landscape of what is now Chicago existed before transportation infrastructure, and how the landscape has changed over time as a result of the addition of layers of transportation infrastructure. This perspective of Chicago history coincides with the evolving needs of urban planning. As urban planning looks at efficient and productive control of the environment, a historical analysis of the landscape can reveal the interruptions and foreseeable consequences of urban planning. By intersecting these two frameworks, I am suggesting that historical geography can and should be used to inform urban planning. The utilization of a city's history in planning is the essential lead to a sustainable future (Uggla 2012, 78). The way transportation has developed over time and the way it is projected to develop into the future can be understood through the lenses of these two frameworks.

Historical Geography

An examination of Chicago from a historical geography perspective provides the groundwork for this paper's analysis. This paper utilizes two major sources for its history of Chicago, Miller's (1996) *City of the Century* and Cronon's (1992) *Nature's Metropolis*. Although neither book specifically takes a historical geography perspective, both books provide enough detail on the factors of transportation, environment, and history within Chicago, which allow for my analysis to extrapolate the historical geography from each source.

Miller (1996) approaches Chicago through a natural history of urbanization, including the context of its regional economy, culture, and ecosystem to explain the growth and result of growth of Chicago. Although similar to the framework of historical geography, the book takes on a more human centered and anthropological angle as it relates to the environment. The

book's dominating theme is "the two-way process of people making Chicago and of Chicago making people" (Miller 1996, 19), which will be utilized as a major component to the historical geography aspect that I am able to draw out of this source among others. Unique to this book is the emphasis on the cultural landscape that shaped Chicago's history (Spears 1996, 636). An acknowledgement of the cultural landscape of Chicago will help this paper understand the way Chicago's historical spatial dynamics relate to transportation.

Cronon (1992) approaches Chicago History by exploring Chicago's place in nature and the growth of the Great West. From the perspective of an environmentalist, he frames this exploration through the history of commodity chains and resource exchange in Chicago. Cronon makes the argument that few people understand or appreciate how much our modern landscape is a creation of nineteenth-century changes. It is exactly this type of argument that I am striving to avoid and eliminate, by analyzing through the two frameworks of historical geography and urban planning, which in combination will understand how history shapes the modern landscape. Cronon (1992) has been acclaimed for its perspective that encompasses history a variety of components including technology, environment, economics, and urbanism within his own unique explanation of Chicago's history (Cutcliffe 2010, 737), a holistic view that adheres to the needs of historical geography. The manipulations on geography as a part of Chicago's history lend themselves to the needs for urban planning, in order to allow the city to develop with such a concentration of people.

Urban Planning

Throughout Chicago's history, urban planning has facilitated intentional growth and mobility to the organization of the city. The way that Chicago has been planned over the years has been dictated by the historical geography of Chicago. Without the natural landscape and manipulation by the people, the needs for urban planning would have been different. Certain geographical events and linkages have led to and then resulted from Chicago's urban planning, including the initial early settlement, the Chicago Fire, the influx of people for the Columbian Exposition, and the dispersal of population into a sprawling city. The most iconic historical plan of Chicago is the Burnham Plan of 1909, which addressed a primary goal of improving the aesthetics of Chicago's geography in order to make it a functioning city. On the other hand, the plans that exist today are more efficiency and sustainability focused, with a strong emphasis on

remediating and addressing environmental and climate change concerns with the city. The issues that urban plans attempt to address are a result of urban planning history, and ultimately the historical geography of Chicago. The early plans of Chicago through the time of the Burnham Plan necessitated overcoming the environmental detriments to habitability, because early settlers chose to settle on the marshland and expected to foster transportation access. As a result, the early years through the beginning of the 1900s experienced dynamic structural changes. Since then, Chicago's layout and infrastructure has remained relatively static, and the city has now reached a new turning point, which calls for a different approach to change. Today's plans reflect the remediation needs of environmental effects of the early settlements and plans of Chicago, which include unsustainable pollution and degradation. In response, Chicago's governments and non-profits have come up with GO TO 2040, published in 2005 to address metropolitan Chicago plans; the Climate Action Plan for Nature, published in 2008 to address Chicago's biodiversity through development; and the Chicago Climate Action Plan (CCAP), adopted in 2008 to address Chicago's urban development and climate change. As urban planning looks to the future, the need for focusing on climate change mitigation is essential. Dual et al. (2011) concludes that urban planning, especially in the realm of transportation, can have a significant effect on the mitigation of climate change in the long run. Decreasing automobile dependability and improving conditions of mobility and compactness are integral goals to achieving decreased greenhouse gas emissions. This paper will specifically focus on the CCAP because of its holistic approach to climate change with specific attention to transportation. However in order to enact such sustainable urban planning, Chicago's historical geography must be accounted for in CCAP as well as all of Chicago's current plans.

Cartography

These two frameworks are better understood through analysis of cartography. Urban cartography provides us with visual evidence of how Chicago's layout has existed historically, and we can connect this to the way Chicago exists now. Being established as a city in 1837, Chicago's most remarkable growth occurred when new mapping technologies were inexpensive and growing. With this timing, historical maps provide the opportunity to visually link changes in geography with the maps of urban planning. Several authors have noted the importance of cartography to Chicago's history and development over time. Churchill (2004) notes, "there

seems little doubt that maps depicting Chicago's natural assets made a strong impression, and the notions and perceptions cultivated by those maps ultimately changed the territory, and coming full circle, the maps themselves" (Churchill 11). The circulation of Chicago's maps gave people some context from which to develop. Perceptions led to development, and development led to a changed perspective and new map. Maps are significant for urban planning and historical geography: provoking change, and also for their context in understanding history. Maps can reveal the geography of an area for which the map was created, which can lead to a certain trajectory of current and future trends (Hudson 2001, 95). The maps displayed throughout the analysis section will reflect this idea through a common transportation framework that is built upon over the years.

BACKGROUND

Chicago's historical landscape begins before human settlement. Landforms with uneven, low-lying land bordered Lake Michigan, and beyond that a flat oasis surrounded the rest of Chicago. Chicago was on the borderland between western prairies and eastern oak-hickory forests, adjacent to conifers of the north woods as well. This diverse fauna pared with its flat landscape made the region easily habitable. Figure 1 shows Chicago's natural landscape, which can be compared to other figures showing the landscape transformation over time. The map also shows bodies of water that allowed Chicago to be an easily accessible landscape for settlement. Lake Michigan links to the Chicago River, which links to the Mississippi River.

With the rich natural geography of Chicago initially, Native American, French, and British explorers and traders eventually made their way to the land over the course of several hundred years. Quoted from a newspaper editor in 1880, "He who is the Author of Nature, selected the site of this great city…and hence her future will not be subject to those causes which have paralyzed or destroyed many of the cities of past ages" (Cronon 1992, 35). Chicago was seen as the obvious place to settle considering its water connectivity. Explorers were confident in the ability of man to overcome the nature of Chicago. Floods of Europeans came to Chicago based on speculation for wealth, taking over Native American land. The prominent natural barriers included the low-lying marshland and the flowing water bodies, however they were

overcome by human development. As Chicago became increasingly populated, experiencing its most rapid growth during the late 1800s, the natural environment was manipulated into waterways, roads, and rails to facilitate urban development.

Waterways

The Chicago River was a "sluggish, slimy stream, too lazy to clean itself" (Cronon 1992, 33), that did not have the capacity to be a productive transportation route for settlers. This situation led to the building of the Illinois Canal, opened in 1848. The crucial connectivity between New York City, Chicago, and New Orleans would then be possible. In the first year of the canal, corn shipments increased eight times from the previous year (Cronon 1992, 64). The Illinois and Michigan Canal rapidly expanded Chicago's connectivity southward. This waterway was expanded into a network of three canals, completed in 1922, connecting the Chicago River flowing north and east, and the Des Plaines River flowing south and west. The canal reversed the flow of the water in the Chicago River towards the Mississippi River, which diverted pollution away from the city. In 1929, the Chicago River underwent a straightening project, to further improve the efficiency of the waterway.

Rails

Chicago's natural low-lying marshland inhibited travel until the Chicago Union Railroad initially overcame the barrier in 1848. Dirt roads drained poorly and therefore created muddy and slow travels. In 1848, Chicago completed a ten-mile railroad between Chicago and Galena. Residents and farmers along the route largely financed the project. The remarkable ease in mobility that came afterwards led to expansions in railroad connectivity, as agriculture commodities relied on trains to transport goods into the city. Chicago during the 1850s saw one of the most rapid railroad expansions in America's history (Cronon 1992, 68). This was the start of a network of transportation that created a new centrality approach to geography, existing at the heart of Chicago (Cronon 1992, 68). Railroads proved to break barriers of nature in several key ways. They could be implemented more flexibly with the natural landscape, without hinders of land gradients or water flow. Railroads also were less impacted by harsh winter conditions, able to function more dependably in snow and ice (Cronon 1992, 74). Figure 2 shows the network of

railroads and waterways in 1861, which began to converge in Chicago with many outward branches reaching to rural areas around the Midwest.

Chicago's downtown mass public transportation had a significant impact on the city's geography as well. The streetcar system began in 1882, and helped facilitate the concentration of commercial activity in the Loop, or Chicago's central business district. Marshall Field, a major department store owner, invested lots of money into the cable car system, as it brought many shoppers to his centrally located store. Electric streetcars eventually replaced the cable car in 1906. This system of public transit, along with the first elevated rapid transit line, which was completed in 1892, facilitated the idea of commuting into the Loop for work and then leaving at night for homes outside the city center. (Miller 1996, 266).

Roads

Chicago's inner-city road network was established as a grid system starting in 1830 at the junction of the north and south branches of the river, and basic infrastructures were built around this (Abbott 2004). In order to implement this despite the existing wetlands, Chicago elevated its street levels. Starting in 1849, the City Council mandated grade levels of streets and buildings must be elevated anywhere between 4 and 14 feet, since digging down to create sewage and drainage was impossible. Chicago was eventually lifted at least twelve feet out of the mud (Cain 1970).

Apart from the inner-city development, roads were not focused on as a primary transportation infrastructure until long after the expansions of waterway and railway transportation systems. Chicago's major highway system was not complete until the 1960s as a part of the Burnham Plan (Danzer 1998). After Chicago was able to mitigate for its natural geography barriers via railroads, street-raises, and canals, roads could be built to facilitate efficient movement. Automobile transportation became widespread in the 1920s, thus their infrastructures were integrated into the geography of existing transportation.

Transportation plans

The Burnham Plan

Although Chicago's transportation was initiated through a natural facilitation of the land (Cronon 1992, 36), urban planners progressed and expanded Chicago's transportation systems. Chicago's urban planning became necessitated after the Chicago Fire, and the interest in planning led to Chicago hosting the Columbian Exposition, a world fair in 1893. Chicago needed revitalization in order to successfully host the event. In efforts to create the world's greatest fair, haphazard elaborate architecture attempted to show the idealized Chicago of mobility and prosperity, while hiding the underlying scum and fire damage. As a result, visitors saw a new glorification of separating city and suburb, which allowed the urban sprawl phenomenon to expand after the Columbian Exposition.

After the fair, Daniel Burnham and John Root took a somewhat more organized route to urban planning. The two created The Plan of Chicago, also called the City Beautiful movement or the Burnham Plan, which was unveiled in 1909. Addressing city planning holistically, the plan embodied many aspects of transportation with the goals of aesthetics and functionality. The six major physical elements that the Burnham Plan focused on were improving the lakefront, developing a highway system, improving freight and passenger railway systems, developing an outer park system, arranging systematic streets, and creating a civic center of cultural institutions and government. The key aspects of the Plan include the grid system being utilized and expanded upon, highways encircling and radiating from the city, and public parks becoming a major component (Danzer 1998, 160). The plan highlights Lake Michigan as a space to bring together community. Figure 3 is a map from the Plan, showing topography, waterways, and the complete system of streets, boulevards, parkways, and parks. This is only one of the maps in the eight-chapter plan, complete with 140 sketch plates. Burnham and Root's development of an organized plan is to allow for an aesthetic and cohesive community, fostering a sense of civic duty (Danzer 1998, 171).

The Chicago Climate Action Plan

Chicago's government and urban developers are aware of the need for sustainable transportation, and have developed plans accordingly to maintain Chicago's development in a way that officials see as sustainable. But are these plans adherent to the needs of the built environment in this age of climate change? Human needs are simple enough to find, as most sustainable development plans adhere to human needs. However, the challenge lies within

linking the social needs with the ecological needs. Although several current urban plans are leading Chicago's transportation development including the GO TO 2040, Climate Action Plan for Nature, Bike 2015 Plan, and Chicago Pedestrian Plan, this paper chooses to focus on the Chicago Climate Action Plan, or CCAP. The CCAP is a holistic urban plan for Chicago with the ultimate goal of reducing its greenhouse gas emissions levels from 1990 by 80% with a deadline of 2050. The midterm goal of 25% reduction by 2020 is approaching. Because greenhouse gas emissions are linked to social and ecological stability, the goals of CCAP will reflect the ideals of sustainable transportation. The transportation plan within the CCAP outlines actions within the six areas including public transit, private transportation, fleet, fuel efficiency, intercity rail, and freight to mitigate greenhouse gas emissions. Figure 5 is a table showing the specific initiative plans within each of these six areas, derived from the CCAP itself. Initiatives include both physical structure changes and government regulatory changes.

METHODS

Bearing Chicago's historical geography in mind, the analysis will contextualize the present and future of sustainable transportation plans. I will take the historical geography of each the three transportation modes of waterways, rails, and roads and compare them with the current state and future projections of each, as dictated by the Burnham Plan and the CCAP. Maps will illustrate how the present has been shaped by the past within each of these transportation modes. Understanding the impacts of urban planning on the physical and cultural geography of Chicago's past will allow this paper to understand how CCAP's modern transportation plans has been and can be informed by the past, in terms of Chicago's historical geography and The Burnham Plan.

ANALYSIS

The priorities of Chicago exist as a result of Chicago's geography. The physical geography of low-lying marshland and flowing water bodies have been manipulated and are no longer forefront issues in Chicago's existence. Rather, humans and a wealth of goods imported

from surrounding farmland dominate Chicago's geography. This focus on people and goods overshadows the natural geography of Chicago, creating problems of resource depletion, sanitation, and water quality. By raising the city and building other infrastructures over natural landscapes, it seems that nature is no longer a barrier to human mobility in Chicago, however the tradeoff is that the cleansing ability of the natural environment fails to adequately functions. Pickett et al. (2008) recognizes the importance of ecological function in maintaining a clean urban environment. Maintaining microclimate stability, reducing pollution, and improving stormwater quality are key functions of revitalizing all environments (Pickett et al. 2008). Future urban plans must prioritize geographical, social, and ecological circumstances fitting into an urban environment, rather than simply overcoming nature to accommodate human mobility.

Maps are evidence of the changing priorities of development; also illustrating the control that urban planning has on urban dynamics, especially in Chicago. Figure 4 is a graph showing the shift in mapping content of Chicago over history. Maps of Chicago were initially made to facilitate real estate commerce at a time when speculators were flocking to Chicago to invest. Since the Burnham Plan introduced the idea of thoughtful, researched, and planned urban development, the content of maps has changed to reflect urban plans, and real estate maps have essentially become obsolete. The numbers on the graph reflect the shift in who has control over the city. Before the Burnham Plan, speculators and investors controlled development, but since the Burnham Plan urban planners control development (Churchill 2004, 14). This shift leads to a change in urban priorities as well. When real estate controls development, wealth and prosperity are developed extensively. The shift to planning allows for priorities of sustainable transportation to become forefront components to development (Dulal et al. 2012).

Waterways

Although Chicago was initially settled because of its waterway connectivity, road and rail transport have since replaced water transportation. As a result, Chicago's waterways have been neglected, resulting in pollution and adverse effects of climate change (Hayhowe et al. 2008). Examining Figures 5 and 6, the loss of waterway transport emphasis is evident. In Figure 5, a map from 1830, the infrastructures are developed around the waterways, where the waterways act as central features of the urban landscape. In Figure 6, a current Google Map snapshot of the same area, roads and buildings have been built right up to the water, and even overtop of the

water as well. One of the Burnham Plan's major objectives was to highlight Lake Michigan as a community focal point (Burnham 1909). The way land transportation was built around Lake Michigan and the Chicago River allowed for this to happen. However, no CCAP transportation initiatives address the importance of the lakefront or river as a part of development. Despite this lack of acknowledgement, the legacy of Burnham's incorporation of waterways remains. The present-day Wacker Drive along the Chicago River is one of the most famous products of the Burnham Plan (Danzer 1998). Wacker Drive would not have been feasible if it was not for the earlier changes to the Chicago River, the straightening and flow reversing. Lake Shore Drive is another famous product, a road alongside Lake Michigan that protects development from further encroaching on the waterfront (Danzer 1998). Although the CCAP does not recognize the significance of waterways in urban transportation planning, the existing infrastructure preserves some of their features.

Because of water's importance in the settlement of Chicago, and throughout all urban development through to the Burnham Plan, the CCAP's transportation strategies should acknowledge the effect of transportation on the city's waterways. The lack of waterway transportation today means that Chicago can better focus their planning initiatives on revitalizing and conserving water. Projected consequences of climate change include the decreasing surface level of Lake Michigan, as a result of warmer temperatures (Hayhoe 2008). Transportation can be regulated in a way to reduce the speed of this affect by mandating that transportation structures remain a certain distance away from the lake, to minimize the heating of the lake's microclimate. Currently, Lake Shore Drive acts as a barrier to this development, however governmental regulations can make this a more concrete guideline.

Rails

Figure 3 is a map of the greater Chicago area from 1861 of the railroad system leading to Chicago's city center. Figure 7 is a current map of the city of Chicago and its railway transportation. Chicago's city center has become an increasingly concentrated economic hub as a result of the initial railway framework, which began the trend towards centrality, which eventually resulted in the downtown Loop that exists in Chicago today. Chicago began as an economic center for the Midwest, a role that remains today. The Burnham Plan acknowledged the city center with an entire chapter entitled "The Heart of Chicago," focused on developing the

central business district, which is known as The Loop (Danzer 1998, 161). Figure 3 shows the beginning of Chicago as an economic hub. Figure 7 shows that the railway transportation hub still exists, with an increasing congregation of railways centralizing the Loop.

With such a concentration of rail in the center of Chicago, congestion has been a specific concern of The Burnham Plan and the CCAP (Danzer 1998, 161; CCAP 2008). Burnham approached this issue through building capacity and creating an infrastructure that would attract more commerce, whereas CCAP is looking at collaboration amongst existing rail infrastructures (CCAP 2008). Specifically, the CREATE Program is a partnership between various rail organizations to improve the railroad transportation infrastructure throughout Chicagoland (CCAP 2008). Since public transportation in Chicago was initially invested in privately, the maintenance and coordination between the transportation organizations, Pace, Metra, and CTA in a cohesive manner poses a challenge now since they have become the responsibility of the government. This change is important to acknowledge because it eliminates the problem of a lack in deliberate coordination, which results in inefficiency and overlapping and competing routes (City of Chicago).

Chicago's trajectory of rail transportation has led the CCAP to anticipate population and economic growth and attempt to expand to accommodate current populations. Although this may seem to be the progressive trajectory over history, it does not best account for Chicago's added goal of environmental sustainability and rehabilitation. Bearing this in mind, goals should reflect a more constrained and controlled approach to transportation growth, allowing for projected population growth however not facilitating urban sprawl, which has been the historic role of rail transportation.

Roads

Chicago's grid system has allowed its urban road infrastructures to remain consistent throughout the centuries. Looking at figure 8 as compared to figure 7, it is clear that the grid system set up the city for a lasting plan that adheres to the efficiency ideal of sustainable transportation. The Burnham Plan and CCAP have utilized this existing framework in their own goals to improve road transportation. The CCAP articulates a goal of creating mobility through walking and biking infrastructure (CCAP 2008). Historically, Chicago's road transportation

attempted to shield its passengers from the elements. As a wet, polluted, and industry-heavy city, transportation options strived to mobilize passengers without being exposed to the outdoors (Cronon 1992, 78). A shift towards incorporating a variety of transportation options within roadway spaces is the revised transportation goal in the CCAP. To address this, complete streets, or roads that are not dominated by automobile transportation, but instead dictated by foot and bike traffic are being built (City of Chicago 2012). This solution involves bike lanes, wide sidewalks, and narrow automobile lanes. The goal is to manipulate roadways to encourage walking and biking while discouraging driving. Since Chicago experienced major transportation growth at the time of the automobile's growth in popularity, auto-centric roads are prominent. However, shifting the boundaries and flow of automobile traffic to accommodate other modes of travel can be cost and time efficient since the road infrastructure has already been built into the landscape.

CCAP's strategy regarding roads involves improving existing infrastructures, rather than creating something new (Lessons Learned 2012, 12). Using existing structures is beneficial for reducing waste and cost to the city, and encouraging less disruption of nature during development. Complete streets are a revitalization of the traditional roads, which do not currently serve the sustainable purpose needed. Outlined as one of the major goals of sustainable transportation, accommodating for various transportation modes will decrease unsustainable transportation usage. The strategies of accommodating for a variety of transportation methods, as well as reutilizing existing structures can be useful not only for road transportation, but for other transportation means as well.

CONCLUSION

Joining the frameworks of historical geography and urban planning reveal a unique yet important perspective on how Chicago's transportation history can dictate it's future transportation. These two disciplines are evidently interlinked in cause and effect, as can be illustrated in Chicago's maps that have been produced over time. Through these frameworks, the history of transportation and the environment lend themselves to understanding the future of sustainable transportation**.** Specifically in terms of Chicago's waterways, road, and rail, the

historic infrastructures have created lasting, infrastructures that allow for the CCAP to work within such boundaries to initiate new and sustainable transportation developments. Examining the historical geography with the Burnham Plan and CCAP, waterways seem to deserve more focus. Rails need controlled growth with a compact, urban concentration. And roads need restructuring of existing infrastructure. Although certain geographies and infrastructures can prove to be barriers to creating sustainable urban transportation, as a whole Chicago's trajectory of historical geography has set itself up with lasting frameworks within which to innovate sustainable transportation options. As a unique city, Chicago's urban plans can work within the built environment to highlight these advantages and foresee a sustainable transportation future.

APPENDIX

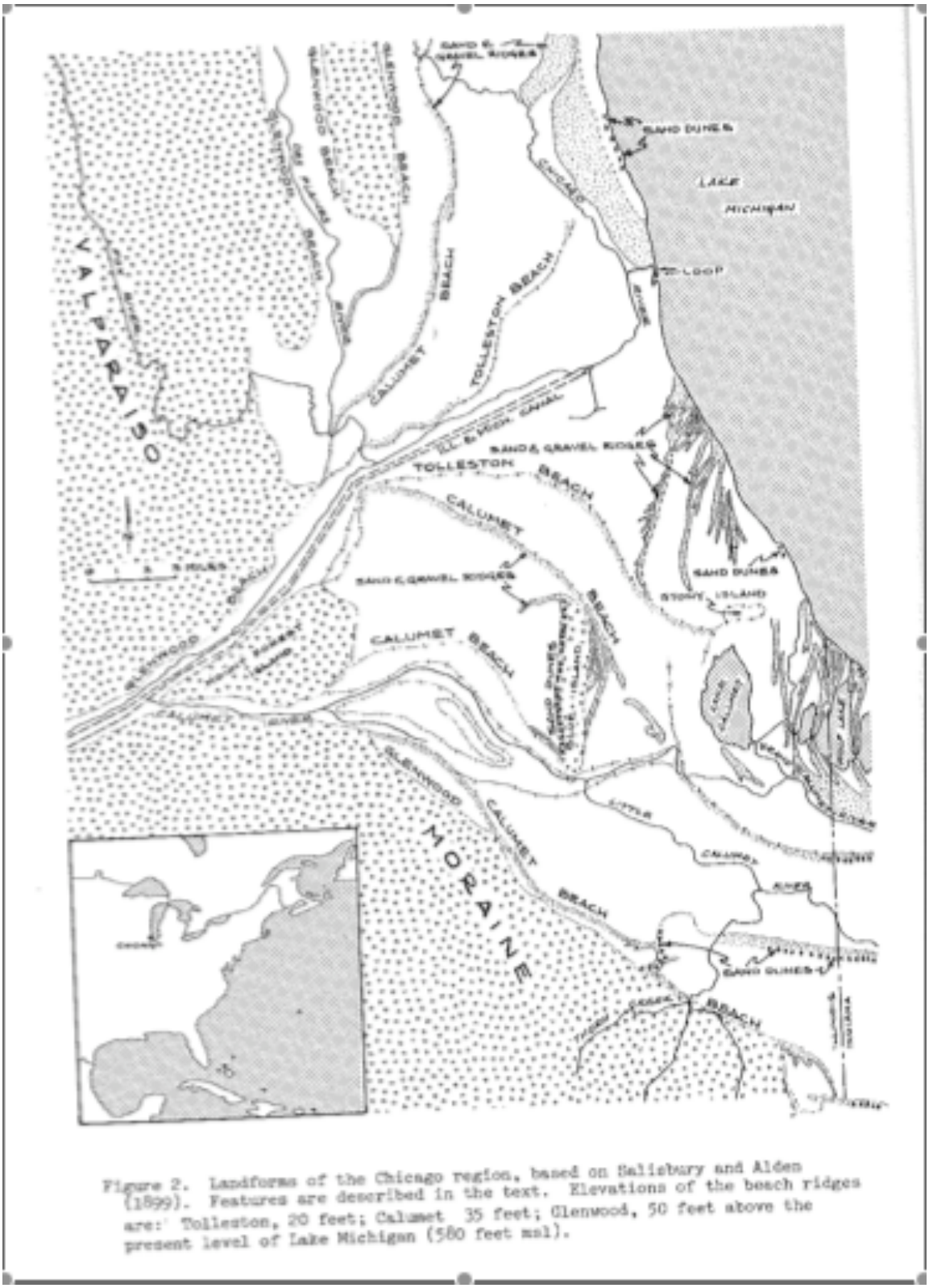

Figure 2. Landforms of the Chicago region, based on Salisbury and Alden (1899). Features are described in the text. Elevations of the beach ridges are: Tolleston, 20 feet; Calumet 35 feet; Glenwood, 50 feet above the present level of Lake Michigan (580 feet msl).

Figure 1: (Schmid 6). This map shows the landscape of Chicago before any development.

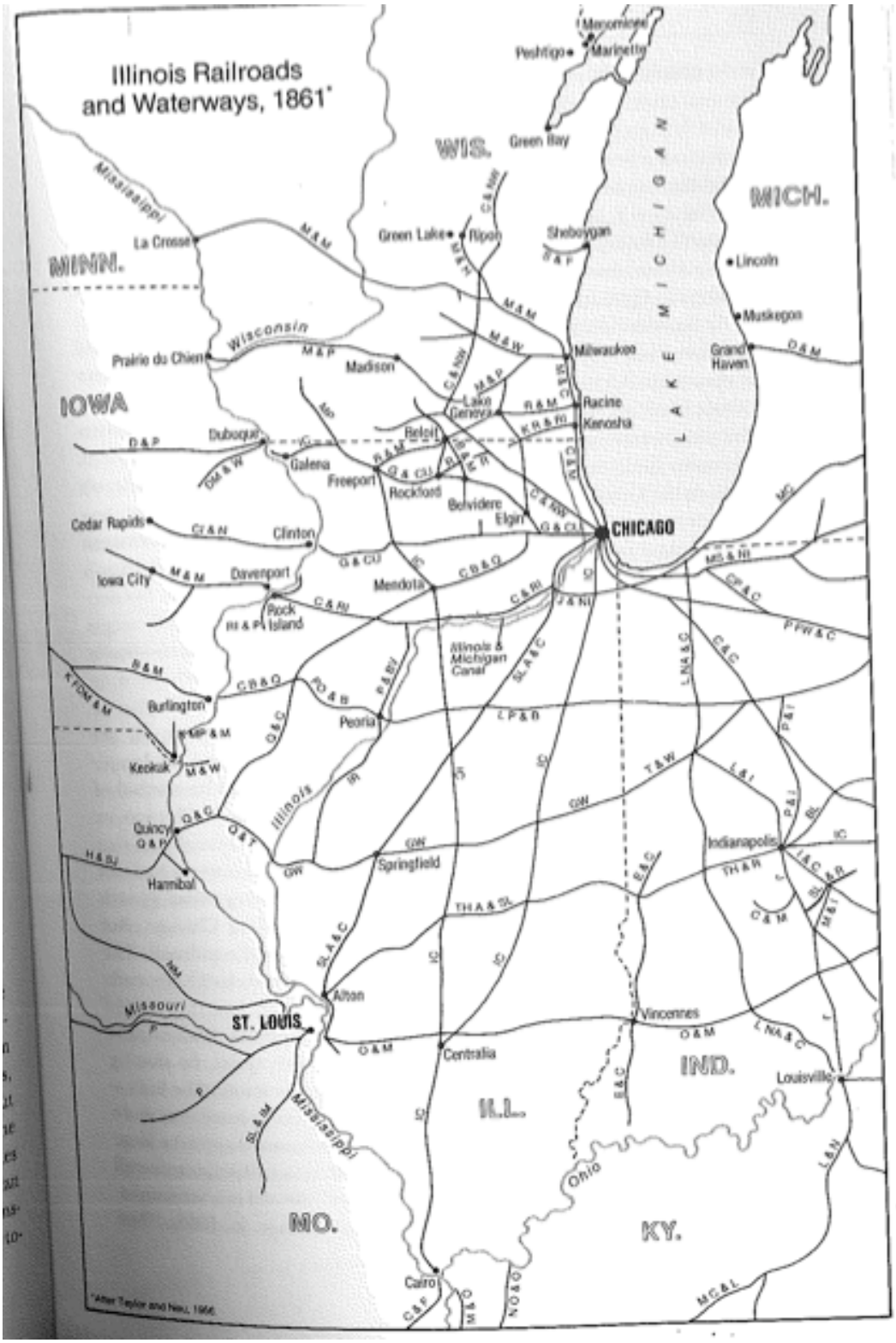

Figure 2 (Cronon 1992, 68) This map shows the waterways and railways of Chicagoland, all leading to the city center.

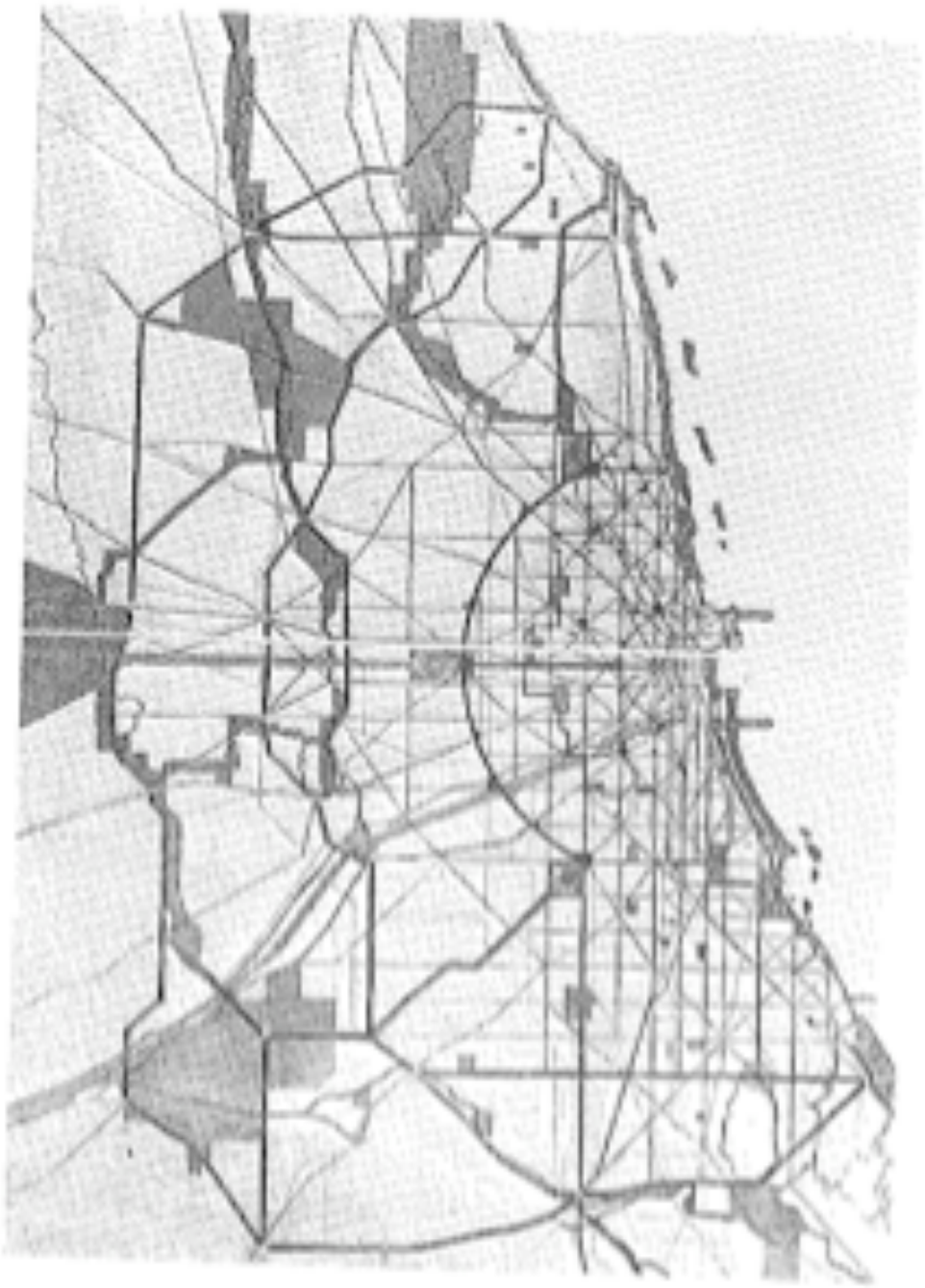

FIGURE 6.5. Chicago: General Map Showing Topography, Waterways, and Complete System of Streets, Boulevards, Parkways, and Parks. (*Plan of Chicago*, plate 44)

Figure 3 (Danzer 1998, 161) This map was a part of the Burnham Plan, encompassing the topography, waterways, and street system of the city.

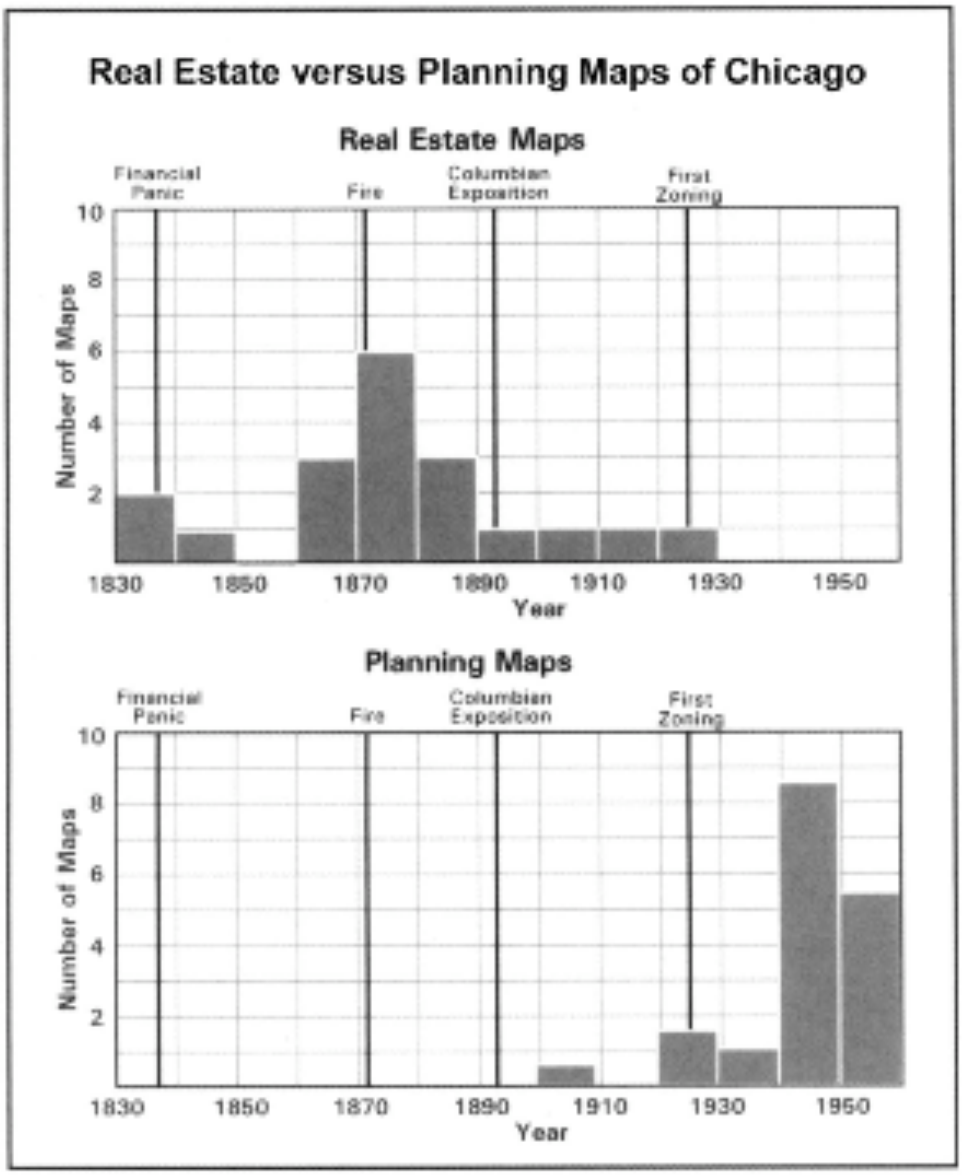

FIG. 7—Real estate versus planning maps of Chicago. Real estate maps here refer to maps primarily intended to show ownership of parcels or plats, whereas planning maps are prescriptive and change based. The graphs are derived from tallies of maps in the collections of the Newberry Library and the University of Illinois at Chicago; although they do not reflect a complete count, they do depict the marked emergence of a concern for planned development.

Figure 4 (Churchill 1975, 14) This chart shows the shift of mapping content of Chicago from real estate based to planning based maps. Real estate maps essentially became obsolete around 20 years after the Burnham Plan, and planning maps became common during that time as well.

Area	Initiative	Description
Public Transit (Ridership)	Install Transit Signal Priority (TSP) systems	Various technologies that give public transit priority over general traffic (e.g., early green, red truncation)
	Install Bus Rapid Transit corridors and/or bus lanes	Variety of methods to reduce bus travel time (e.g., bus lanes, bus stop re-spacing)
	Increase the availability of real-time transit information	Improve systems that provide riders with real-time transit service information (e.g., online tracker, at-stop displays)
	Explore fare incentives	Explore methods to smooth peak demand and incentivize off-peak usage (e.g., peak and off-peak fares, weekend discounts)
Public Transit (TOD)	Expedite developers' approval process for TOD projects	Expedite license approval and reduce fees for TOD projects within the city
	Increase aldermanic awareness	Various mechanisms to gain aldermanic support for TOD in their wards (e.g., seminars, brochures)
	Create TOD awards & project recognition	Annual recognition for outstanding TOD projects in Chicago; publicize award among city stakeholders
Private Transportation	Develop Voluntary No Driving Day program	Participants volunteer not to drive one day each week. Self-selecting program—no tracking, fees, or incentives
	Develop and expand bike sharing network	Push forward third-generation program in Chicago: city built, vendor operated; user fees, advertisement and city funded
	Develop employee Commute Trip Reduction program	Require employers to offer a menu of options to employees to reduce commute trips
Fleet	Purchase hybrid vehicles	Convert fleet at will or when life cycle supports incremental cost
	Implement eco-driving programs	Utilize variety of driving techniques to increase fuel efficiency (e.g., avoid idling, maintain steady speed)
	Switch to biodiesel blends	Substitute diesel for biodiesel blends without exceeding threshold that would require vehicle changes
Fuel Efficiency & Standards	Implement traffic signal retiming program	Match signal timing to current traffic patterns to optimize traffic flow and reduce fuel consumption

Figure 5 (CCAP 2008) This table shows the six areas of concern in regards to transportation changes within the CCAP, and outlines the relevant initiatives and descriptions.

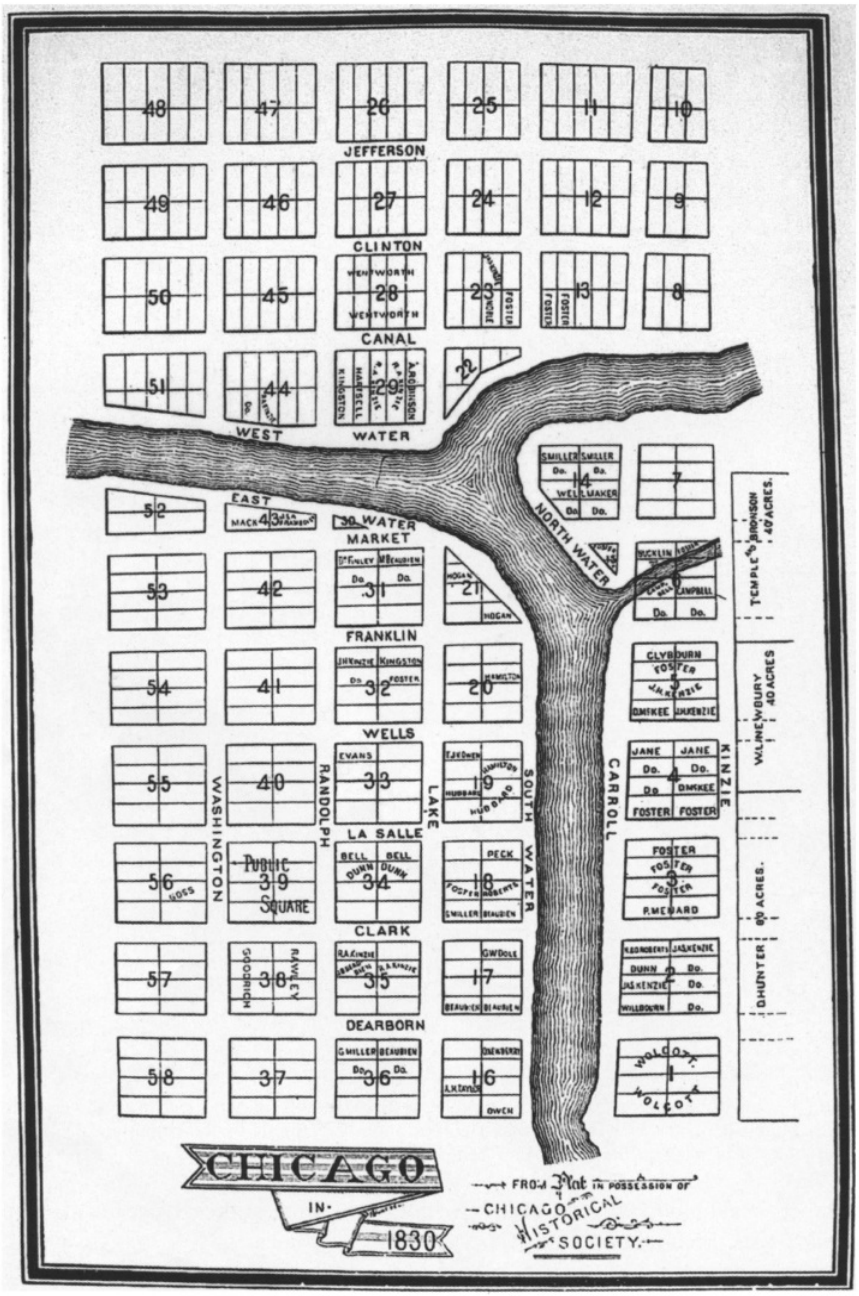

FIG. 5—James Thompson's 1830 survey of Section 9, in Chicago. (Reprinted courtesy of the Chicago Historical Society)

Figure 5 (Churchill 1975) This map from 1830 shows the central role of waterways in Chicago.

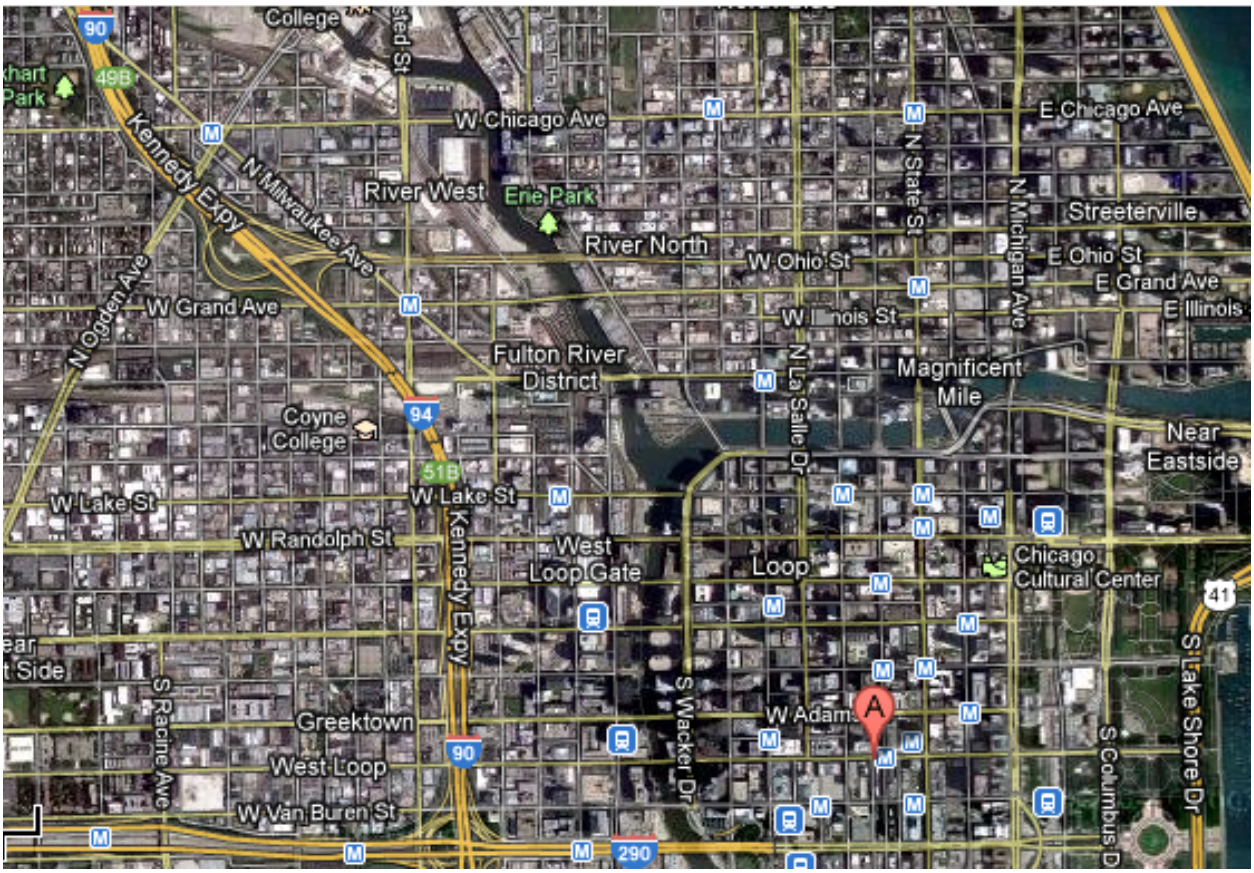

Figure 6 (Google Maps 2012) This current aerial view of Chicago shows the current development over the Chicago River.

Figure 7 (CTA 2000) This map shows the current road and rail infrastructure in Chicago.

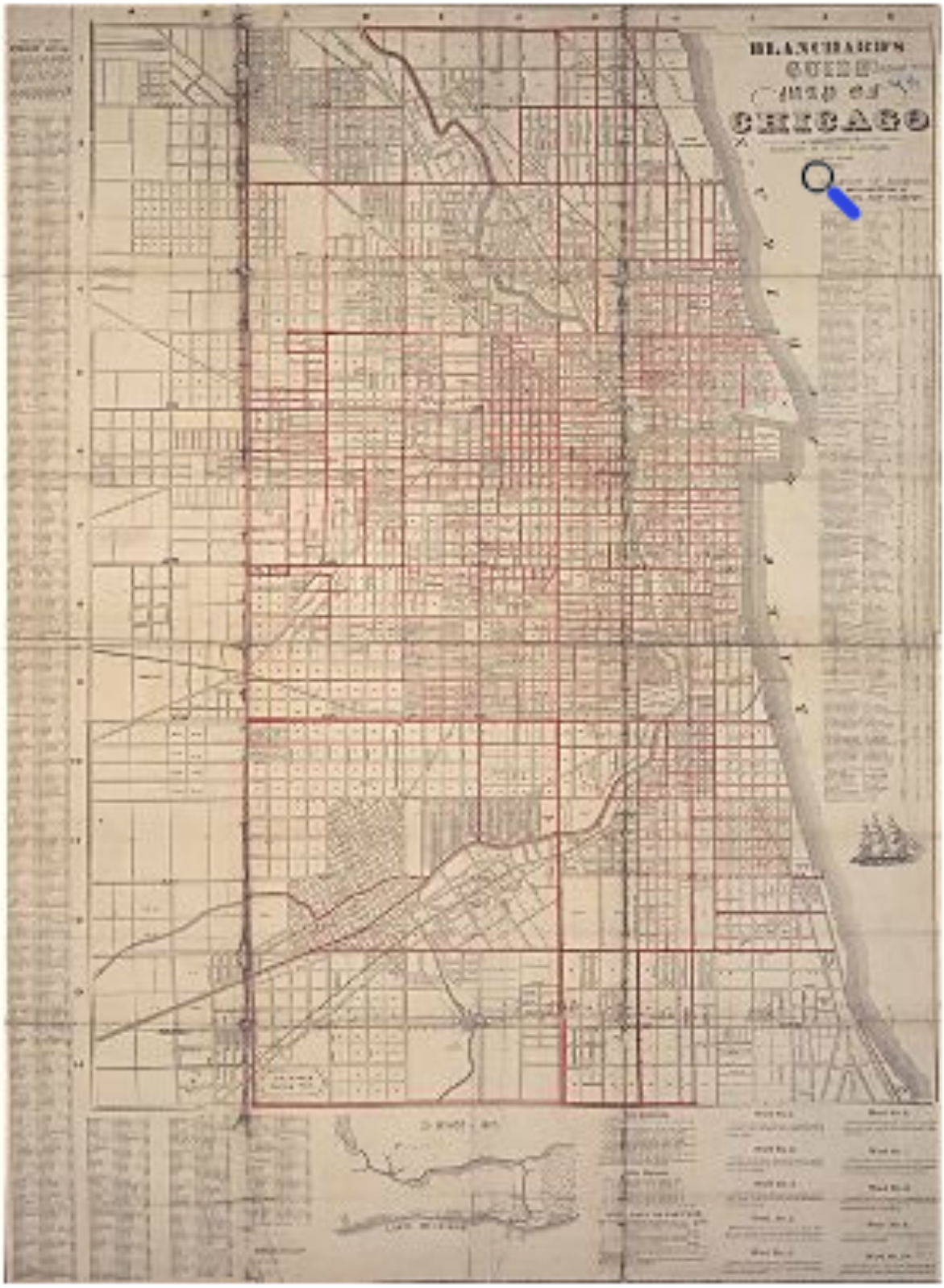

Figure 8 (Blanchard 1862) This tourist map created in 1862 shows Chicago's grid system.

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