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Land Use Analysis of the Milwaukee County Institutional Grounds: a Chronological and Spatial Depiction of Cultural Change

Sarah Klingman-Cole
University of Wisconsin-Milwaukee

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LAND USE ANALYSIS OF THE MILWAUKEE COUNTY INSTITUTIONAL GROUNDS: A
CHRONOLOGICAL AND SPATIAL DEPICTION OF CULTURAL CHANGE

by

Sarah Klingman-Cole

A Thesis Submitted in
Partial Fulfillment of the
Requirements for the Degree of

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ABSTRACT

LAND USE ANALYSIS OF THE MILWAUKEE COUNTY INSTITUTIONAL GROUNDS: A CHRONOLOGICAL AND SPATIAL DEPICTION OF CULTURAL CHANGE

by

Sarah Klingman-Cole

The University of Wisconsin-Milwaukee, 2015
Under the Supervision of Dr. Patricia B. Richards

This thesis uses GIS analysis of spatial data and historical documentation to determine land use change in the Milwaukee County Institutional Grounds (MCIG) located in Wauwatosa, Wisconsin. This chronological and spatial land use analysis specifically examined aspects of the grounds in relationship to historically documented changes taking place during MCIG operations from 1850 to 1980. The purpose of this thesis is to provide a more accurate account of the grounds throughout the timeframe. This thesis, featuring a GIS model, includes a series of digitized maps that provide for a more accurate account of the grounds throughout the timeframe studied. Results include a GIS model designed to facilitate future research of the MCIG. The chronological and spatial land use analysis conducted here may serve as a basis for researchers interested in using different sources of historical documentation in order to conduct a chronological and spatial analysis of a changing land area.

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TABLE OF CONTENTS

CHAPTER ONE: INTRODUCTION.....	1
Purpose of Study	3
Significance of Study	4
Chronicling Land Use Change	4
Creating Historical Maps	5
Thesis Overview.....	7
CHAPTER TWO: RESEARCH METHOD	8
Contribution of GIS.....	9
Constraints of GIS	10
CHAPTER THREE: OVERVIEW OF STUDY AREA.....	12
CHAPTER FOUR: DATA COLLECTION	15
Challenges	16
Production of Maps	25
Discussion	34
CHAPTER SIX: CONCLUSION	40
Summary	40
Limitations	41
Recommendations	42
REFERENCES CITED.....	44
APPENDIX A: MILWAUKEE COUNTY DATA	47
APPENDIX B: MCIG LAND USE DATA.....	48
APPENDIX C: MAP DATA ACCESS	52

LIST OF FIGURES

Figure 1. 2015 MCI Aerial Photograph (Photo Credit: Google Earth).....	2
Figure 2. 1937 Aerial Photographs (American Geographic Society Library).....	18
Figure 3. 1937 United States Department of Agriculture (USDA) Aerial Photograph	19
Figure 4. 1939 MCIG Water System Map (Milwaukee County Historical Society).....	20
Figure 5. 1958 MCIG Revised Water System Map (Milwaukee County Historical Society).....	21
Figure 6. 1963 Aerial Photograph (Milwaukee County Land Information Office).....	22
Figure 7. Circa 1980 MCIG Plat Map (Milwaukee County Historical Society)	23
Figure 8. MCIG Structural Land Use map ca, 1980.....	27
Figure 9. MCIG Structural Land Use Map 1954-1963.....	29
Figure 10. MCIG Structural Land Use Map 1939-1942.....	31
Figure 11. MCIG Structural Land Use Map 1910-1913.....	33

LIST OF TABLES

Table 1. Milwaukee County Population Information (1850 – 1980).....47

Table 2. 1980 MCIG Structural Land Use Area48

Table 3. 1954 – 1963 MCIG Structural Land Use Area49

Table 4. 1939 – 1942 MCIG Structural Land Use Area50

Table 5. 1910 – 1913 MCIG Structural Land Use Area51

Table 6. Paths to Map Data.....52

LIST OF ABBREVIATIONS

AGSL	American Geographical Society Library
GCS	Geographic Coordinate System
GIS	Geographic Information Systems
MCHS	Milwaukee County Historical Society
MCI	Milwaukee County Infirmary
MCIG	Milwaukee County Institute Grounds
MCLIO	Milwaukee County Land Information Office
MCMC	Milwaukee County Medical Complex
TB	Tuberculosis
WHAIF	Wisconsin Historical Aerial Image Finder

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CHAPTER ONE: INTRODUCTION

This thesis examines how land use on the Milwaukee County Institutional Grounds (MCIG) has changed over time and, specifically, how these changes reflect cultural and societal changes of the Milwaukee County community. Chronological and spatial land use analysis on the Institution Grounds provides a clearer understanding of the development and growth of the grounds. Through examination of the buildings constructed on the MCIG, study findings illuminate decisions made by authoritative stakeholders that were thought necessary to meet the needs of the Milwaukee community from 1850 to 1980. How the community utilized the MCIG during these years reflected larger societal issues of the time. A better understanding of these issues provides support for the notion that the MCIG may have been an important part of the Milwaukee County landscape.

MCIG Study Area

The Milwaukee County Institutional Grounds are located in Southeastern Wisconsin, in Milwaukee County. The County Grounds border the City of Milwaukee and Wauwatosa and are approximately 1,140 acres. As shown in Figure 1, the area of focus begins (East to West) east of Mayfair Rd (HWY 100), across the Zoo Freeway (45) to N. 87th, and (North to South) N Swan Blvd south to Bluemound Rd. Today, the grounds are a developed portion of land that maintains a large amount of open space in what is otherwise a dense urban landscape.

Purpose of Study

Reconstructing land use of the MCIG at various times from 1850 to 1980 provides insight into how land use reflected larger cultural changes taking place in Milwaukee. The beginning of the MCIG dates to the same time that Milwaukee population began to increase (Table 1). Events such as the urbanization and expansion of the Milwaukee sprawl influenced MCIG land use. The urban expansion of Milwaukee also reflected the influx of immigrants to the Milwaukee area and transition to a more industrialized community. The time period covered by this analysis coincides with a time during which Milwaukee went from very high levels of disease and death rates to earn the title of healthiest city in the United States by 1930 (Leavitt 1996: 41). Depicting the types of changes taking place on the MCIG over time helps understand increasing concerns for public health and wellness issues.

Just as material culture is an important facet to understanding the lifeway of individuals before us, individuals' use of space, and how societies occupy space, also reflect decisions made within the confines of cultural norms and changes in social values. Examining the MCIG from the time of its creation in 1852 through the beginning of the second half of the 20th century offers insight into the priorities of Milwaukee City and County officials during Milwaukee's development. The individuals who occupied the MCIG were not the elite people of the society. The individuals occupying the grounds could be considered outliers of the community. Not accounting for staff or nursing students living on the grounds, all of the individuals occupying the grounds were in need of help. An orphanage operating on the grounds provided safety, housing, and education for children. Many individuals occupying the grounds were in need of psychiatric and medical assistance. How individuals who lived on the grounds were treated, and

the assistance that the City and County provided, demonstrates concern for the individual, as well as public health and safety.

Significance of Study

This thesis provides four recreated maps of the MCIG at various times from 1852 through 1980. These maps provide a more accurate reference of these times for researchers' continued study on the MCIG than what was previously available. However, the utility of a chronological and spatial land use analysis of the MCIG reaches beyond the interest of the academic researchers currently working with this specific site. Others can use this research as a template for how to use current and historical documentation to move chronologically backwards to determine previous land use. The results from this analysis also provide comparative data that may then be utilized along with findings from further research of Milwaukee County. Furthermore, this project may serve as a reference for future researchers using historical documentation to conduct a chronological and spatial analysis on a land area that has seen much change over time.

Chronicling Land Use Change

While a comprehensive documentation of the land use change on the MCIG does not currently exist, previous analyses in other areas and regions of the world serve as references for the current land use analysis. Previous scholars have implemented techniques to chronicle land use change in their own research. The majority of previous methods used to conduct land use analyses are demonstrated on a smaller scale, or a larger area. The author's own previous experience with landscape analysis in Milwaukee County generally focused on particular regions of the City of Milwaukee. Specifically, the author's previous research in landscape analysis and matters of public health examined demographic change beginning in the late 1990s and

continuing to 2010, reflecting public health issues such as water and air pollution. Since this thesis focuses on, and refines maps, of a larger scale on a smaller land area, it was necessary to utilize, and adjust, various methods of analysis to meet the needs of this study.

Creating Historical Maps

Using computers to correct for errors and create historical maps is not a new method of analysis. Although the technology used to recreate historical maps has changed, and become more accurate over time, the steps to recreating an accurate map continue to follow the same general process. Thomas E. Davidson (1986) utilized historical maps as a context for cultural data to be geo-corrected onto more current and accurate maps. Because older maps do not have spherical coordinates, they tend to be drawn with straight lines, and are therefore generally inaccurate. Since the historical maps at his disposal were largely inaccurate, Davidson chose to pick an extant land feature, such as a building, with known coordinates to use as a reference point. Using an existing land or cultural feature as a reference point, the location of other pre-existing features located around the known coordinates could then be determined.

Geospatial documentation, such as historical and current maps, provide the data for a chronological and spatial land use analysis. A.G. Vaytens (2012) chose to begin his spatial analysis with the use of a master plan. A master plan is a map that documents each separate land parcel in order to accurately study the development of urbanization in a specific area. Vaytens suggests that obtaining a master plan aids in understanding the course of development during urban planning at a city level (2012:87). Obtaining a master plan is ideal for being able to create a historical map, and project the likely land changes in a spatial analysis. However, even when master plans are not available, chronological and spatial land use analyses can still be conducted through the scanning, digitizing, and geo-referencing of historical and current maps. For

example, Tucci et al (2010) used spatial analysis to determine the greatest land use change in Milan, Italy over the course of 250 years. Spatial analysis was conducted through the use of both historical city maps and current city maps. Even though Tucci et al. focused on a metropolitan European city, and the MCIG reflects a parcel of land much smaller, Tucci et al.'s approach can still inform the current analysis. As with Tucci et al.'s research, a goal of the current study is to recreate maps in order to see how major changes in the grounds reflect historical and cultural events.

Regardless of the scope of land being studied, analysis of land use can provide insight into cultural change. Etter et al (2008) used a regionalized approach to studying land use change over a period of 500 years in Columbia. Although the time frame is much longer and the area is spatially larger than the grounds analyzed in this thesis, similar approaches and methods can be used on differing land areas, scales, and time frames. Specifically, Etter et al recommended looking at current drivers of land use change in order to better determine significant socioeconomic, political, and cultural events that may impact land use (2008:5).

Finally, in order to address the historical-cultural change impacting the MCIG during the timeframe of 1850 to 1980, cultural codes are attributed to historical events. Uysal and Semerci (2014) utilized the cultural coding process to demonstrate how the changes in the functions of dwellings can be attributed to different time periods. Historical events demonstrate a relationship with the land use change over time. Uysal and Semerci (2014) used a cultural coding process as a way to demonstrate change over hundreds of years. This method is utilized on a smaller time-scale in this study, focusing only on events and influences significant to the Milwaukee area from 1850 to 1980. These events and influences include the effects of the industrial revolution,

increases of immigration to the region, and the evolution of public health policies. The next chapter discusses utilizing GIS for recreating historical maps.

Thesis Overview

With the purpose and significance of the study provided above, the rest of this thesis is laid out as follows. Chapter Two describes previous research into examining how land use changes overtime. Specifically, Chapter Two details recreation of historical maps, and methods of geospatial analysis. Chapter Three details the research method of this thesis, in particular relating to the contributions and challenges of Geographic Information Systems (GIS) to historical data analyses. Chapter Four then provides an overview of the study area, the MCIG. Chapter Five provides information on the data collection process for this thesis, and documents the challenges in retrieving historical data used for the purpose of recreating historical maps. Chapter Six provides the four created historical maps, details the land use analysis, and provides commentary on the study findings. Finally, Chapter Seven provides a summary on the contribution of the study to research on the MCIG, discusses limitations of the thesis, and suggests future research opportunities that could come from this thesis.

CHAPTER TWO: RESEARCH METHOD

Geographic Information Systems (GIS) provide a way for researchers to have spatial representation of information that will then initiate further questions used to develop the research project. DeBats and Gregory (2011:456) explain that GIS gives the researcher an opportunity to utilize spatial statistics and produce questions regarding the variation in spatial use. Many historical GIS professionals begin their projects with one large dataset that has a small specific area of focus and then, after generating specific research questions, seek out other information to answer those questions (DeBats and Gregory 2011:461). GIS assists in answering spatial questions and linear questions.

As mentioned briefly in the Chapter Two, Thomas E. Davidson (1986) utilized landmarks and key features with known coordinates to serve as reference points from which to build the other features of the recreated map around. Ideally, an object that is still present on the area of research interest, and is on the map, will serve as the main reference point of the analysis (1986:27). A main reference point is helpful when recreating maps as early maps are typically based on a flat surface with straight lines. However, as the Earth is not flat, the latitude and longitude calculations from older maps are likely inaccurate, as are the coordinates. The main reference point allows for there to be more accurate coordinates obtained, and therefore allows researchers to reproduce a more accurate map. As Davidson (1986:27) explains, comparing the coordinates to certain features to those of a more current map may give rise to a mathematical model of the displacement of other building locations on the older or historical map. GIS can assist researchers in recreating historical maps that are more accurate than any currently existing maps

Contribution of GIS

One of the advantages of utilizing GIS in recreating maps is the ability to provide a visual representation of the data. Onno Boonstra (2009) focus on how the incorporation of GIS into historical research has brought about the dimension of space to the research into the past across multiple disciplines. DeBats and Gregory (2011:456) also note that GIS allows the researcher to consider the impact space and location have on their study. Boonstra (2009:4) argues that the use of visual representation “can serve as a basis for reconstructions of historical events, landscapes and data, as well as for spatial modeling and spatial analyses of regional variations and developments in the past.” Furthermore, DeBats and Gregory (2011: 455) note that one of the most useful aspects of utilizing GIS is its ability to serve as a type of database to store information which will then in turn be able to produce a visualization of the data.

The ability to reproduce maps is also one of the main contributions of GIS. Having access to databases allows other individuals and stakeholders to be able to utilize the same data to create new maps or to recreate the same maps for their own personal use. The recreation of historical maps is possible because the location of the features is based on coordinate systems. The coordinate system also allows the data to be combined with other maps and datasets to produce new representation of an area (DeBats and Gregory 2011:456). DeBats and Gregory (2011) claim that an advantage to taking an urban historical approach to research is that there is a smaller area of study, with a larger selection of resources from which to draw spatial information. However, with more information at the researcher’s disposal it is still necessary to determine which variables provided by the resources should be narrowed to fit the scope of the research project.

Constraints of GIS

Utilizing GIS to recreate historical maps has several advantages, but there are also constraints to using GIS. Boonstra (2009:6) claims that one downfall to utilizing GIS is its reliance on historical data and the ambiguity and inaccuracies present within historical data. Because historical records are not always very accurate (Leavitt 1996:26), inaccuracies are able to appear in the process of creating the map, and also again within the process of map reproduction or copying. Another limitation to using archived information is it also leads to inconsistent, absent, or unequal amounts of qualitative and quantitative data. Etter et al. (2008:4) note that one of the major inconsistencies when working with historical data are the changes that will occur with political and census boundaries. The production of such maps provides the audience with a false sense of confidence in the maps in which they are viewing. Boonstra (2009:6) also notes the lack of a GIS data infrastructure as an issue in terms of access to maps. Most maps remain undigitized, and those historical maps that are digitized tend to lack any sort of metadata to accompany the digitized maps.

Another issue of GIS is the time commitment. It takes a lot of time to create a database and corresponding maps (DeBats and Gregory 2011:456). Not only is there a time commitment for creating the maps, there is also a large amount of time needed on the part of the researcher to learn the technological skills to use the software to create the maps (DeBats and Gregory 2011:456).

Furthermore, access to GIS software also is at a usually high monetary cost. The cost of GIS software can make it difficult for some individuals who do not have the budget to purchase the necessary tools needed to recreate maps. Therefore, individuals such as academics and professionals are usually the researchers who are able to gain access to the necessary materials to

recreate maps. Monetary costs can also be found in terms of limited access to the historical maps. For example, one of the challenges to obtaining MCIG data came from retrieval of information from the Milwaukee County Historical Society (MCHS), which required a payment of a small monetary fee to utilize their resources. The current chapter discussed using GIS to recreate historical maps, and laid out some of the positive aspects of GIS and some of the drawbacks of using GIS. The next chapter describes the study area, the MCIG, in more detail.

CHAPTER THREE: OVERVIEW OF STUDY AREA

This chapter provides a brief overview of the MCIG. According to Milwaukee County Institutional Administration documents provided by the MCHS, the Milwaukee County Medical Complex (MCMC) located on the MCIG dates back to November of 1852 when the County Board of Supervisors purchased 160 acres of farm land in Wauwatosa from Hendrick Gregg. There were likely two major factors that played a role in the decision on where to place the County Hospital. One of convenience, Hendrick Gregg was on the County Board of Supervisors and looking to sell his property; and one of strategic purpose, the area was rural farmland on the outskirts of Milwaukee, thus pushing mentally ill and poor sick to the edges of town.

Initially, the poor, the sick, and those deemed insane lived together in a farmhouse on the newly purchased land (Board of Supervisors of Milwaukee County Asylum for the Chronic Insane, N.D.). The 160-acre farm was most likely located where the Milwaukee County Infirmary (MCI) group was, south of Watertown Plank Road on the eastern side of the grounds (Olson 1987:25). After the initial purchase, subsequent purchases were made over time to expand the MCIG to about 1,140 acres.

In 1853, the County Poor Farm or Almshouse was constructed. Due to the substantial number of children living in the Almshouse, the Milwaukee County Board constructed a school house on the grounds in 1858 to help educate the children and reduce the chance of negative influence older residents may have on them. The number of minors that became the responsibility of the county continued to increase. Events such as the sinking of the Lady Elgin in 1860, which brought in a large influx of orphans to the grounds, as well as continued immigration, and the 1890s cholera outbreak increased the number of children on the grounds (Avella 1987: 206, 209). It was not until 1898 that the Home for Dependent Children was opened

to provide a suitable separate facility that could meet the needs of orphaned children (Avella 1987: 206, 209).

In 1861, the first County Hospital was built to provide care for County Poor Farm residents (Richards 1997). County Hospital began construction in 1868 and finished in 1869, with a 41 bed capacity. The year 1880 saw the opening of a new County Hospital which could accommodate more patients, and improve hospital conditions by providing hygienic, organized, and sterile conditions to accommodate the increase in surgical procedures (Avella 1987:204). This new hospital would reflect the progress within the medical field towards issues of public health following the discovery of germs and bacteria as the leading cause of most diseases. The building was expanded in 1903.

According to an undated post card image of the Milwaukee County Medical Complex (MCHS Archives F18, B2), as well as Avella (1987), the School of Nursing was established on the MCIG in 1886. This addition initiated nursing training in Milwaukee, with the Wisconsin Training School for Nurses. The addition of a School of Nursing appeared during the same time frame as the new County Hospital, which had standardized hygienic care for patients. The School of Nursing was continuously in operation from 1886 through the end of the timeframe examined in this study.

In 1888 the Milwaukee County Board of Supervisors adopted a resolution to build a county asylum to provide separate care for individuals diagnosed as chronically insane (MCBS Proceedings July 1888). Prior to this, individuals suffering from mental illness were often mistreated and kept in unsuitable conditions in the Almshouse (Milwaukee County Institute Administration, N.D.). The new Milwaukee County Asylum was responsible for the treatment of individuals deemed to have psychological issues who needed long-term care. In 1889, the

Asylum provided care for approximately 100 patients. However, by 1910 it was responsible for about 2,700 patients (Milwaukee County Institute Administration, N.D.). The Asylum took in individuals with illnesses that were deemed “chronic” cases, such as individuals suffering from senility, epilepsy, tuberculosis, and mental illnesses. Individuals were admitted into the Asylum only after previous treatment at the Hospital for Mental Diseases was unsuccessful (Milwaukee County Administration, N.D.).

In 1904, the National Tuberculosis (TB) Prevention Movement brought to Milwaukee an increased public awareness of the disease and needs for treatment (Avella 1987:224). Although not yet acquired by Milwaukee County until 1921, the Blue Mound Sanatorium for Incipient Tuberculosis was constructed south of Bluemound Road in 1907 (Avella 1987:224). An undated appraisal of the grounds provided by the MCHS notes that approximately 26 acres was dedicated to the Preventorium. Milwaukee County would eventually acquire the Preventorium to treat children suffering from TB.

The Milwaukee County School of Agriculture and Domestic Economy was established in 1912 for high-school aged individuals (Avella 1987:223). The school was closed in 1928 but the County Farm continued to flourish, providing work for residents on the grounds and supplying food for the Institutions (Avella 1987:223). As urbanization increased the farm still appeared as an important feature of the grounds.

CHAPTER FOUR: DATA COLLECTION

Conducting a historical chronological and spatial land use analysis of the MCIG required multiple types of data. As mentioned in Chapter Two, a master plan can be very useful in running a spatial analysis (Vaytens 2012). Unfortunately, no master plan could be identified or obtained for the development of the MCIG at any point from 1850 to 1980. Further, historical documentation concerning the use of the MCIG from the 19th century is sparse. No maps were found at a scale sufficient to provide a detailed account of the MCIG. Only maps of the City of Milwaukee, and Milwaukee County, that included the MCIG as part of the map could be found. Etter et al (2008:4) note that a thorough study of any land use change will require both quantitative and qualitative data. Therefore, different types of data, including land use records, aerial photographs, historical analyses of Milwaukee, and historical documentation and maps from the MCHS were utilized to create the maps. Land use records were then compared with historical documentation and mapping to provide a more accurate analysis and account of the grounds. More data was available on the grounds beginning in the early 20th century, so historical maps from that era provided adequate information for the land use analysis.

Historical aerial photographs and plat maps from the 20th century were obtained from the MCHS. A 1937 aerial photograph of the MCIG was joined together to form one image of the grounds (Figure 2). These photos came from the Milwaukee County Land Information Office's web mapping service. Another aerial photo from 1937 was provided by the Wisconsin Historical Aerial Image Finder (Figure 3). An aerial photograph taken in 1963 was provided by MCLIO through their web mapping service (Figure 6). A map of the County Grounds from 1939 (Figure 4) was obtained from the MCHS. The original maps were not available for digitization so, MCHS staff made a photo copy of the map in its original size. The same procedure was followed

for the 1958 County Grounds map (Figure 5), and the 1980 County Grounds map (Figure 7). The map in Figure 7, although undated, was estimated to be from sometime around 1980, due to the inclusion of Froedtert Lutheran Memorial Hospital on the map and Key

Land use and census data available from Milwaukee County was retrieved from the American Geographical Society Library (AGSL) located on the University of Wisconsin-Milwaukee campus. Aerial photographs of the grounds were also provided by the AGSL. Population data for the 20th century were available from the US Bureau of the Census (Forstall 1995). As previously mentioned, finding documentation from the 19th century was more difficult. Demographic data for the 19th century were obtained from Conzen's (1976) book *Immigrant Milwaukee, 1836-1860: Accommodation and Community in a Frontier City*, as well as from the Wisconsin State Department of Agriculture Crop and Livestock Reporting Service (1957). Population information for Milwaukee County from 1850 to 1980 appears in Table 1 (Appendix A).

Challenges

Collections housed at the MCHS are a primary source of data on the MCIG. However, access was hampered by a lack of staff, by the difficulty of retrieving resources from off-site storage facilities, and by malfunctioning equipment such as the single on-site microfiche reader. Another technical issue in the process of data collection arose when trying to determine a base map for using in the ArcGIS ESRI software. Due to compatibility issues concerning the computer operating system and the ArcGIS ESRI software, several different strategies were utilized to determine a workable base map. However, no pre-existing base maps fit the preferred coordinates system properly. Therefore, before starting the process of creating the historical maps, it was thought necessary to create an original base map in order to make all maps

consistent. However, the original base map was not used because the data frame was able to be set to the desired coordinate system, and new feature classes were created without the base map.

Finally, time always plays an important role in the retrieval of information and the analysis spent on the project. This project is no exception as there is always room for improvement. There is always more data that could be retrieved and other ways in which to analyze the information in order to provide more information on the datasets. Limitations and recommendations for future research are further detailed in Chapter Seven.



Figure 2. 1937 Aerial Photographs (American Geographic Society Library)



Figure 3. 1937 United States Department of Agriculture (USDA) Aerial Photograph

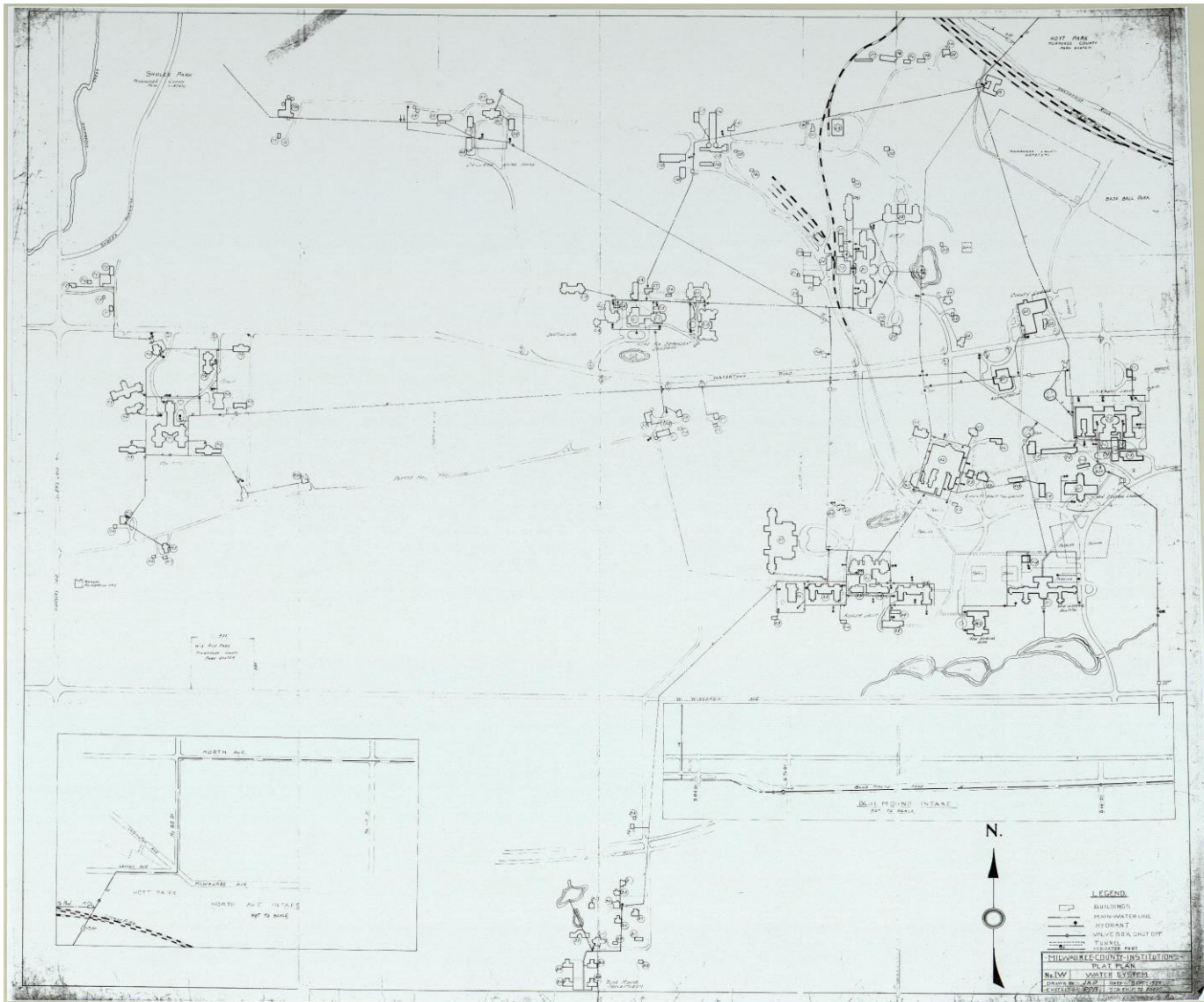


Figure 4. 1939 MCIG Water System Map (Milwaukee County Historical Society)

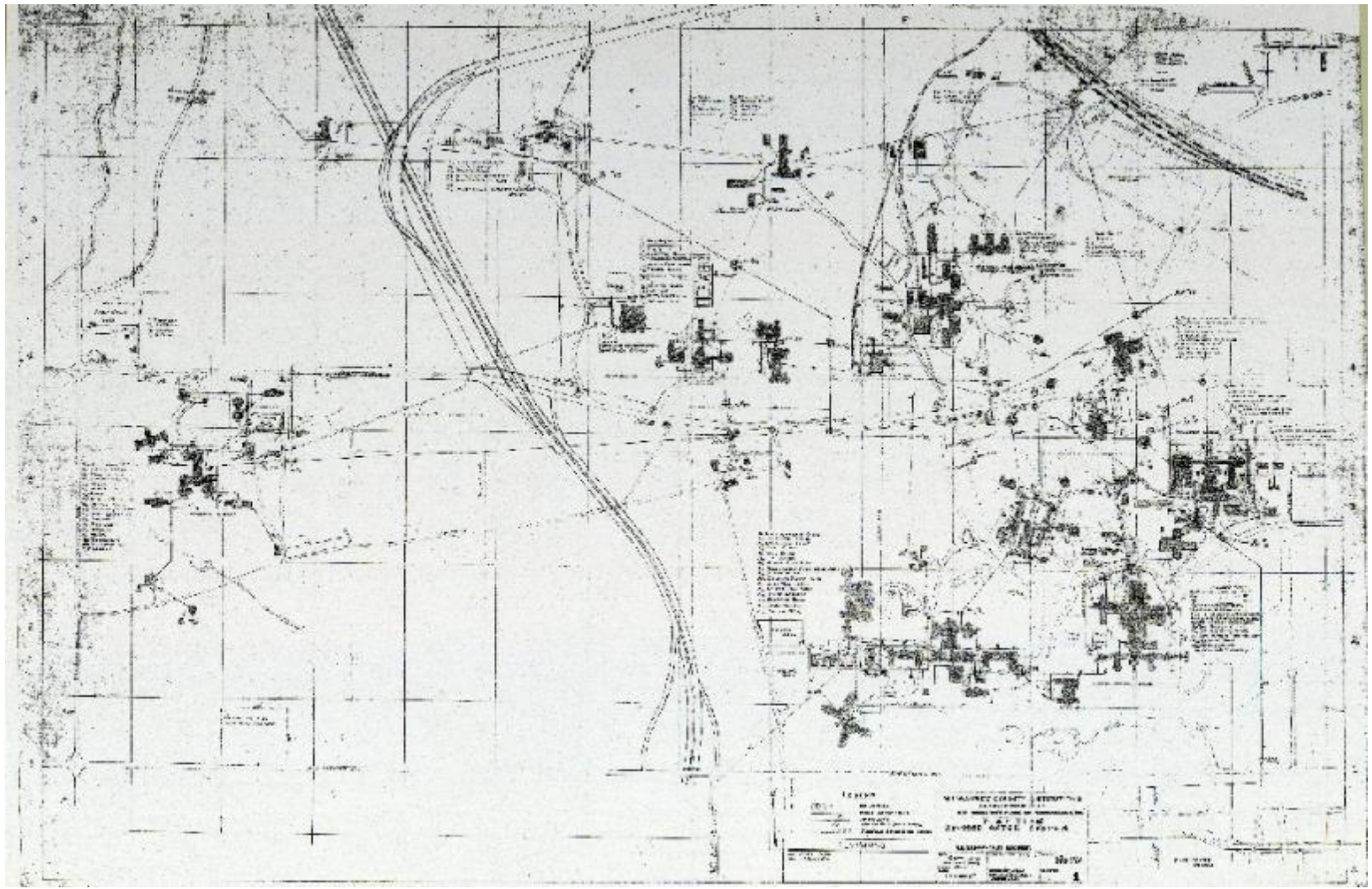


Figure 5. 1958 MCIG Revised Water System Map (Milwaukee County Historical Society)



Figure 6. 1963 Aerial Photograph (Milwaukee County Land Information Office)

CHAPTER FIVE: LAND USE ANALYSIS

A spatial analysis of the data was conducted to reconstruct the MCIG over-time. An attempt to determine the scale and projection of the maps and aerial photos was made prior to georeferencing. As mentioned in Chapter Five, ArcGIS ESRI software was used to georeference historical maps and aerial photographs, as well as create land use maps. Georeferencing provides land area reference points that increase relative accuracy of the various maps incorporated in the GIS (Davidson 1986). As the MCIG have changed greatly over time, several different known features were identified across different time periods for use as reference points. Reference points included natural and cultural features still present on the land. However, due to the extensive development of the MCIG over time, there was no single land or cultural feature identified that was unchanged from 1850 to 1980. For this reason, Davidson's (1986) method was revised to incorporate different landmarks as reference points during different points in time.

A series of maps were used to create an accurate overlay of land use in the MCIG. These maps were compiled with the same scale and projection to allow for better comparison of land use change over time as well as accommodating for overlay. The number of maps produced was restricted by the availability of historical maps, as well as the rate of change taking place over time. Since one of the objectives of this thesis was to provide a more accurate portrayal of the features on the MCIG over time, absolute accuracy of the location of cultural features (e.g., buildings) in the historical documentation was not necessary to conduct the analysis. Historical maps provided by the MCHS, as well as aerial photos, and County records assisted in determining the location of buildings.

Production of Maps

The three base maps of the MCIG housed at the MCHS are large paper maps. The 1939 map measures approximately 42" x 36"; the map with the latest revisions in 1958 measures approximately 44" x 29"; and the 1980 map measures 42" x 30". Photo copies of the maps at their original size were digitized as tiff files by the AGSL. After digitization, the maps were uploaded into ArcGIS ESRI to be georeferenced. The maps were georeferenced using land use data obtained from the Milwaukee County Land Information Office (MCLIO).

Land parcel data from 2013 was downloaded from the MCLIO interactive web mapping service. Prior to the georeferencing of the maps, one polygon shape file for structural land use needed to be created. The construction of one shape file was accomplished by combining multiple land parcel polygon shape files. After the files were combined, they were then clipped to only show structures within the MCIG. Then, a structural feature consistent between all the plat maps and the MCLIO shape file needed to be determined for use as a constant variable for georeferencing. By looking at the physical maps and the clipped shape file, the Agricultural School buildings, also known later as the Children's Home Annex, and what are now referred to as the Eschweiler Buildings, were determined to be the most constant buildings in size, shape, and location and selected for use as reference points. The maps were then uploaded into ArcGIS ESRI and the corners of the Agricultural School buildings were used as reference points for alignment. This allowed the maps to be accurately georeferenced to the MCLIO shape file.

To increase the accuracy of building placement in the structural land use maps, all of the data frames in ArcGIS ESRI were given the same spatial reference. All of the maps have a spatial reference set to have a projected coordinate system of NAD 1927 State

Plane Wisconsin South FIPS 4803, with a geographic coordinate system of GCS North American 1927. The state plane projected coordinate system provides the most accurate location of features based on the Earth's surface in southern Wisconsin. Accuracy of placement was based on the shape file data from the MCLIO. Although their data is subject to human error, it was determined that MCLIO would provide the most accurate current information. Despite the structural and land information provided by the MCLIO being from 2013, there is enough land use consistency between the 2013 information and the 1980 plat map to be able to use a regressive approach to work backwards in time to recreate previous historical maps.

A regressive chronological approach was used to create all the structural land use maps in ArcGIS ESRI. A regressive chronological approach requires the use of current information to work sequentially back in time. Therefore, though it was the last map chronologically, the first map created was the MCIG Structural Land Use map ca, 1980 (Figure 8). After the map was uploaded and georeferenced, a new shape file layer was created by drawing polygons based on the location of the buildings on the plat map. The new polygons were then matched to the location of the 2013 MCLIO structures. The creation of new polygon shape file layers for the MCIG Structural Land Use Map 1954 – 1963 (Figure 9), and 1939 – 1942 (Figure 10) followed the same process as the Structural Land Use of MCIG ca, 1980 (Figure 8) for creating new polygon shape file layers. However, with each earlier map, extra steps such as creating a new feature class and editing the existing building layers were necessary to ensure the accurate location of older buildings later demolished to make way for newer structures.

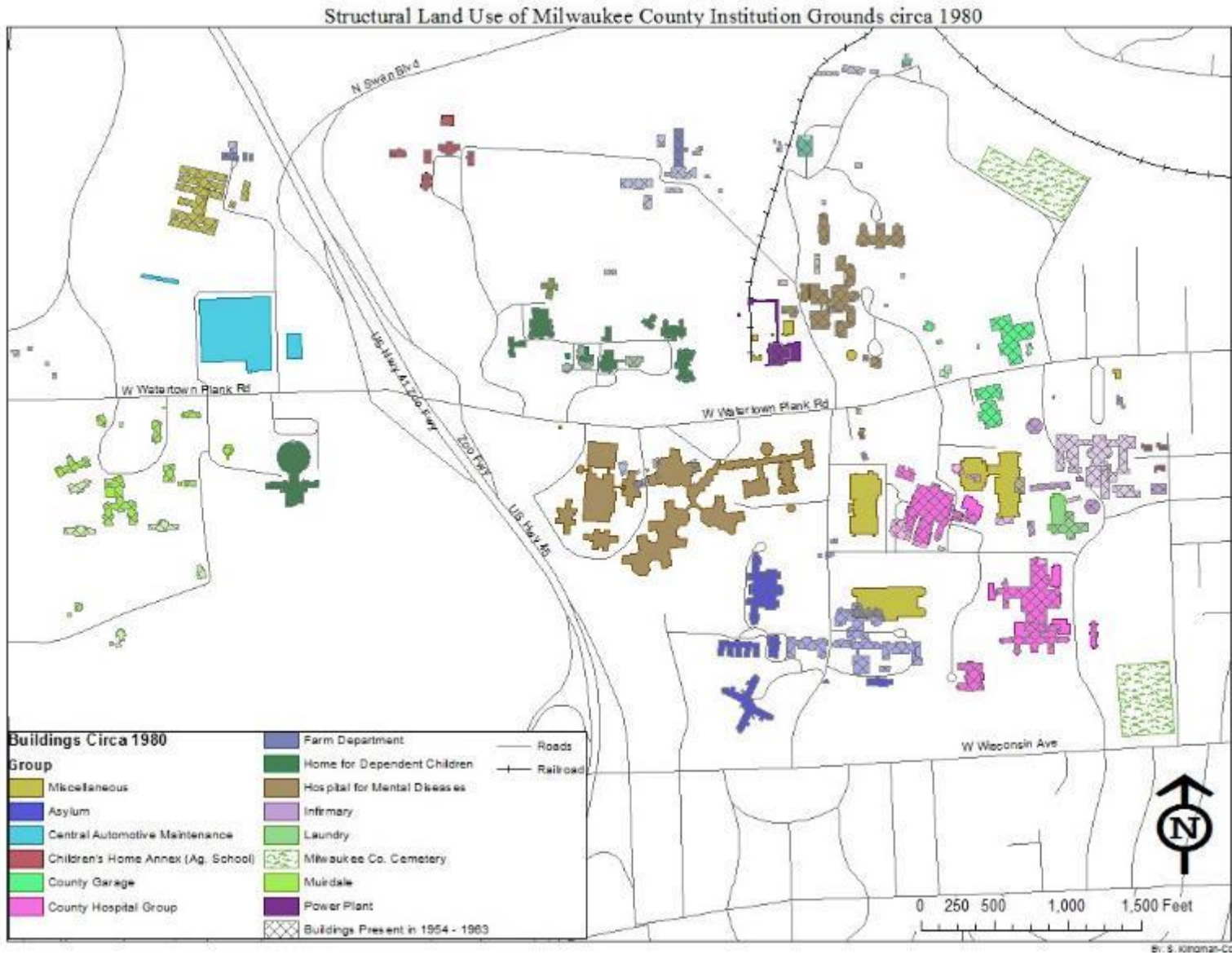


Figure 8. MCIG Structural Land Use map ca, 1980

The MCIG Structural Land Use Map 1954 – 1963 (Figure 9) was created with the use of an aerial photograph dated 1963 (Figure 6). The aerial photograph, downloaded from the MCLIO interactive web mapping service, matched up with the MCLIO shape file. The aerial photograph, the MCLIO shape file, and the 1958 MCIG map (Figure 5) allowed for the creation of new features on the land use map using the image. Some new structures not on the 1958 MCIG map, or in the shape file layer, were found on the aerial photograph. These new structures were then added to the new building layer. The new building layer then was compared to the 1980s building layer to determine consistency between maps.

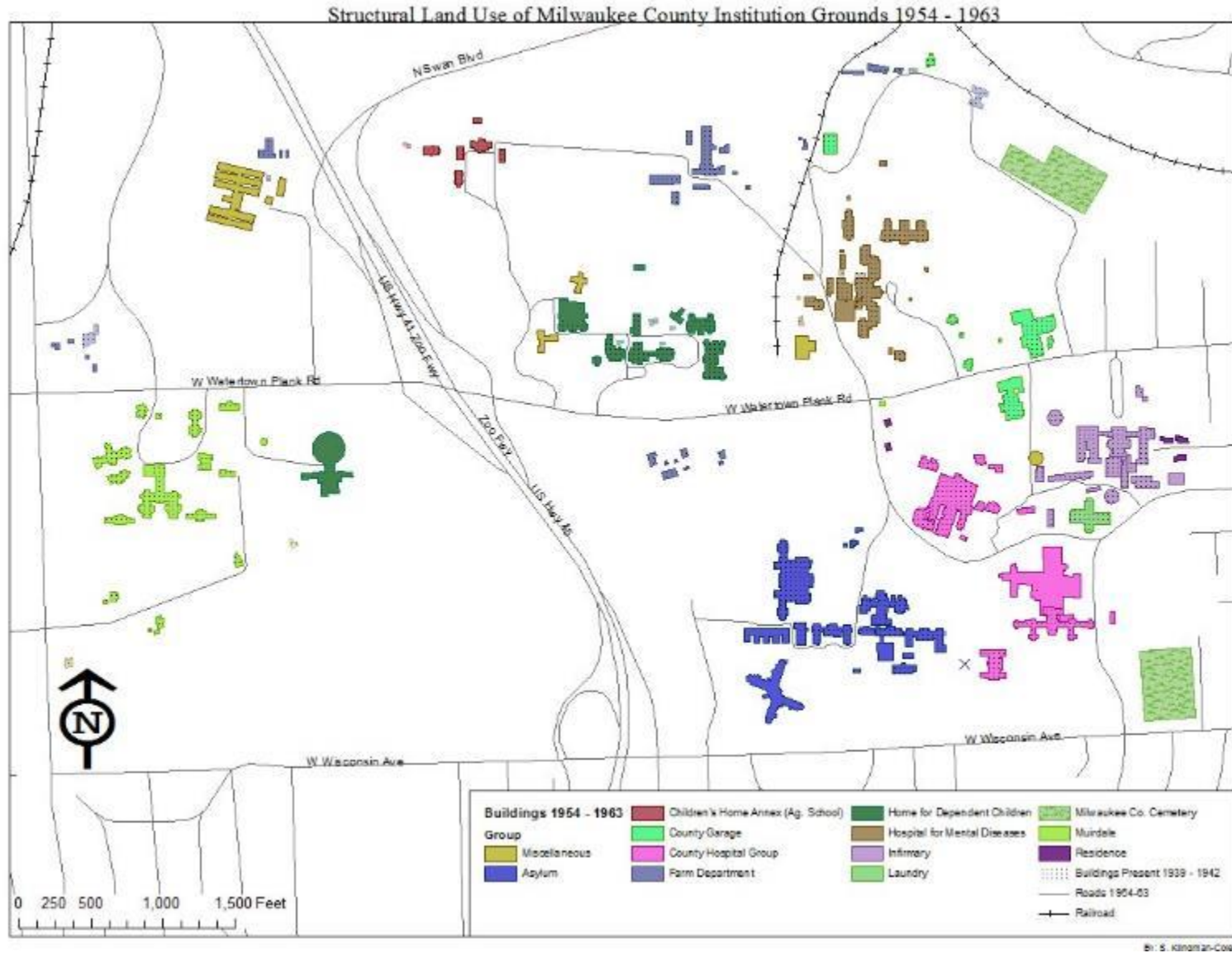


Figure 9. MCIG Structural Land Use Map 1954-1963

The MCIG Structural Land Use Map 1939 – 1942 (Figure 10) utilized a similar method to the MCIG Structural Land Use Map 1954 – 1963 with the use of aerial photography. The 1939 map was constructed by referencing the building shape file layer from 1954 – 1963, the 1939 MCIG map (Figure 4), land use inventory computation sheets of the MCIG in 1942, a 1937 aerial photo from the WHIF, and aerial photos joined together to form one image of the entire MCIG in 1937. The aerial photographs, as shown in Figure 1, although matching particularly well to each other did not match up well with the polygon shape files from the later building layers. Therefore, the aerial photos served as a reference point for the location of buildings in relation to each other and to major intersecting roads. The 1939 map (Figure 4), as with the previous maps, was used as a reference to create new buildings. The 1942 MCIG computation sheets were provided by the MCHS. The computation sheets have a list of buildings on the county grounds, divided into groups based on their primary function on the grounds. The buildings listed on the computation sheet were then compared to the 1939 plat map and the 1954 – 1963 building layer to help identify and create new structures during the 1939 – 1942 time frame.

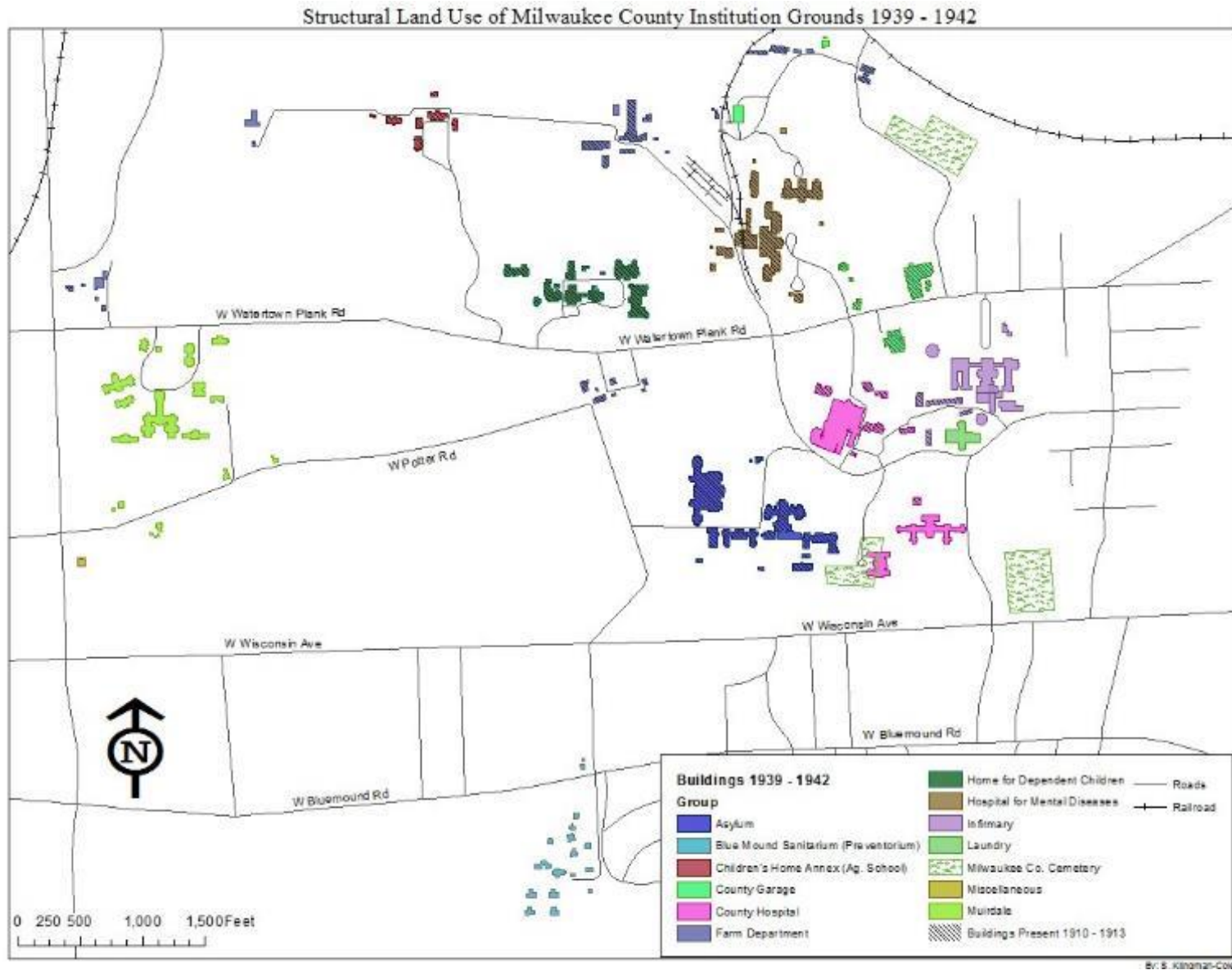


Figure 10. MCIG Structural Land Use Map 1939-1942

Finally, the process of constructing the MCIG Structural Land Use Map 1910 – 1913 (Figure 11) followed similar chronological regression processes. However, development of the 1910 – 1913 map was more dependent upon the use of historical documentation. The map only shows buildings that were mentioned in historical documentation (Avella 1987; Olson 1987) as having been constructed before or during the time frame of 1910 – 1913. Since there was no MCIG map available for this time frame, the 1939 MCIG map served the purpose of a building reference. The 1939 – 1942 building layer was copied and renamed the 1910 – 1913 building layer. Structures were then removed from the layer based on historical documentation that provided estimated building dates for MCIG structures (Avella 1987; Olson 1987). Buildings built after 1913 were removed from the shape file layer. Other structures that were modified in size after 1913 were also reduced to their original size.

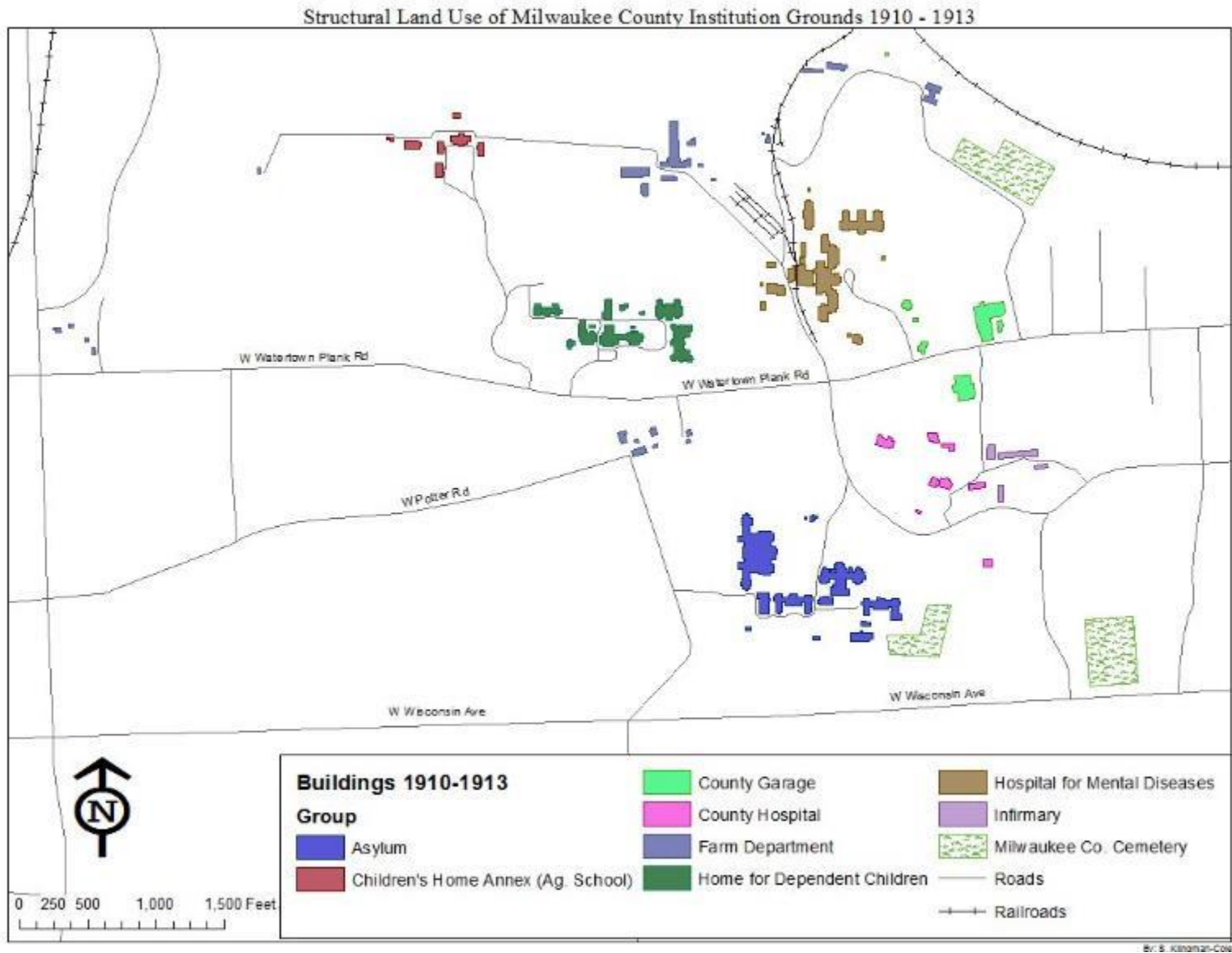


Figure 11. MCIG Structural Land Use Map 1910-1913

All of the building layer polygon shape files were placed into groups based on the categories in the 1942 computation sheets. The groups are identified by their main function and association with other major facilities on the grounds. As shown in Figures 8, 9, 10, and 11, buildings are broken down into the following 11 groups: Muirdale, Blue Mound Sanitarium (Preventorium), Home for Dependent Children, Hospital, Infirmary, Laundry, Asylum, Farm, Children's Home Annex (Ag. School), County Garage, and Home for Mental Diseases.

Road data from 2013 was downloaded from the MCLIO interactive web mapping service. Roads were then clipped, re-drawn, or deleted to reflect the roads on MCIG maps and aerial photography. The addition of some roads helped to serve as reference points for the location of buildings. Due to the small size of the buildings on the 1910 – 1913 and 1939 – 1942 Structural Land Use maps, only the major intersecting roads were used as reference points. Otherwise, the roads would have appeared to be the major focal point of the maps. Therefore, to keep the structures as the main focus of the maps, roads on the map were limited to those that served as major intersecting points for MCIG in each time-frame. After creating all of the land parcel data and roads chronologically backwards in time, the parcel data was then compared with historical information to move chronologically forward in time.

Discussion

The 1910 – 1913 Structural Land Use map (Figure 11) provides a visual representation of the established public health focus that Milwaukee County had come to be known for (Leavitt 1996). The 1910 – 1913 time frame was chosen to show how urbanization and public health was a major concern, as is demonstrated by the approximately 30 acres of land use of the County Grounds (Table 5). As with most records prior to 1900, records relating to the general location of the original farm house that served as the hospital for the physically and mentally ill were poor.

The Farm Department, which was still in its developing stages during 1910 – 1913, was expanding along with the establishment of the Agricultural School, referred to as the Children’s Home Annex (Ag. School) in Figure 11. By 1913 the Farm Department accounted for 2.24 acres and the Agricultural School for 0.76 acres (Table 5). The Agricultural School, established in 1911, met the needs of public health concerns by providing education to those who would then go into farming, and presumably provide Milwaukee County residents with greater accessibility to more food resources. More successful farms meant the ability to provide food to an ever expanding urbanized community. The Agricultural School and the Farming Department are located on the northern area of the MCIG north of Watertown Plank Road, and a small group of barns and residences located just south of Watertown Plank Road on Potter Road.

The decades following the 1910 – 1913 period saw a rapid expansion of buildings devoted to public health concerns. The increase in urbanization of the Milwaukee County landscape brought with it the development of specialized buildings responding to increases of public awareness in the treatment of illnesses. As shown in Figure 10, and Table 5, MCIG land use from 1939 to 1942 demonstrates an increase in building groups within the grounds based on their main function of treating illness. The increase in buildings groups from 9 in 1910-1913 to 13 in 1939-1942 (Table 4 and Table 5) is also associated with an increase in land use from 30 acres to 37.75 acres. The opening of the Muirdale Group, built and opened shortly after the Agricultural School in 1914, served the purpose of treating individuals with TB (Avella, 1987: 225). The location of these buildings was on the western side of the grounds, south of Watertown Plank Road and north of Potter Road. Continued treatment of TB caused the County to purchase the Blue Mound Sanitarium (Preventorium) in 1921 (Avella, 1987: 224). The buildings, located south of Bluemound Road, and approximately 0.96 acres in size, served the purpose of providing

treatment of minors suffering from TB. Though the appraisal of the grounds provided by the MCHS noted approximately 26 acres were dedicated to the Blue Mound Sanitarium (Preventorium), as seen in Table 4, only 0.96 acre appears to have been dedicated to structural buildings. By 1939, the full expansion of the Farm Department after the establishment of the Agricultural School was complete. However, by this time, the Agricultural School had been incorporated into the Children's Home Annex. Figure 10 also displays a large growth of the County Hospital and Infirmary groups. The County Hospital expanded from 0.79 acres to 4.04 acres and the Infirmary from 0.59 acres to 3.24 acres (Table 4 and Table 5). The large expansion of these two groups is affiliated with the New Central Laundry located between the two groups on the eastern part of the property. The increase in the number of facilities is likely responsible for an increase in the land and buildings devoted to the County Garage, or maintenance teams on the grounds. As shown in Figure 10, the groups that exhibited the least amount of physical change between 1913 and 1942 are the Asylum, Children's Home Annex (Ag. School), Home for Dependent Children, and the Hospital for Mental Diseases. All of the aforementioned buildings saw a decrease in structural land use (Tables 4 and 5).

By 1963, the changes to the grounds demonstrated not only a continued focus on the well-being of minors and individuals who suffered from mental diseases, but also an increase in expenditure on the overall health of community members. These attitudes are shown in Figure 9 and Table 3 through the increase in land development devoted to the Home for Dependent Children, expansion of the County Hospital and Asylum groups. The overall land use increased from 37.75 acres in the 1939-1942 map to 54.35 acres in the 1954-1963 map. The Asylum and County Hospital had the highest growth peaks of 7.25 acres and 7.81 acres, respectively. One of the major changes to the MCIG landscape as documented on the 1954 – 1963 Structural Land

Use map is the exclusion of the Blue Mound Sanitarium (Preventorium) on the map. Although the structures were still standing in 1963, they were no longer in use. The closure of the Blue Mound Sanitarium (Preventorium) may be why the buildings do not appear on the original MCIG maps. Their closure and exclusion demonstrates progress in terms of public health in Milwaukee County. The buildings' purpose, to serve minors suffering from TB, was met as the buildings' closures shows the eradication of the disease, different treatment options, and an increase in the standards of infection control.

The Structural Land Use map circa 1980 (Figure 8) also reflects the change in the landscape to a more urban focus than the previous years with land use increasing to 64.49 acres (Table 2). The continued development of the grounds and advancement in technology led to the development of a Central Automotive Maintenance department and a large independent power plant. The Central Automotive Maintenance department is located in the northeast corner of the MCIG north of Watertown Plank Road and west of Highway 41, and accounted for 5.5 acres of land use (Table 2). Increased urbanization is also reflected in the demolition of many of the barns, residences, and other structures associated with the Farm Department. By 1980 the Farm Department went from 2.45 to 0.84 acres. The 1980 Structural Land Use map also shows a reduction in the land and structures dedicated to the Asylum, County Hospital, Home for Dependent Children, Infirmary, and Muirdale groups. The Asylum saw a 3.83 acre decrease in land use, whereas the Hospital for Mental Diseases had the largest increase. According to the 1980 MCIG map (Figure 8), and data (Table 2), the buildings associated with the Hospital for Mental Diseases increased to 13.93 acres and occupied the center of the grounds, located south of Watertown Plank Road and east of U.S. Highway 45. The number of structures grouped under miscellaneous also increased from 2.40 acres in 1954 – 1963 (Table 3) to 9.28 acres by 1980

(Table2). These structures are associated with the Hospital Medical Complex; however, they are not associated with any of the already pre-existing groups. It is for this reason that they are considered part of the miscellaneous group.

All of the Structural Land Use maps show spatial patterns and the relationships buildings and cemeteries have to each other. The cemeteries are located on the southern, southeastern, and northeastern edges of the grounds. The two eastern cemetery locations were likely chosen for their far proximity from the Institutions. However, the third cemetery which is now part of the Nurse's Residence, given how close it was to the Asylum, may have been a burial site for individuals from the Asylum. Another relationship is the location of the TB treatment centers. The Blue Mound Sanitarium (Preventorium) and Muirdale are relatively isolated, located in the western and southern portions of the property. Although isolated from other buildings on the County Grounds, the Blue Mound Sanitarium (Preventorium) is located in a developing residential area (Figure 3). The residential development could have also been a contributing factor to its closure as the city sought westward residential expansion. The buildings closest to the Muirdale treatment center are associated with the Farm Department. Their close proximity would have provided semi-private open space for outside treatments away from the more developed area of the grounds. The Farm Department had lots of space, as is required for the cultivation of crops and to care for domesticated livestock. Its location on the northwestern portion of the grounds was far enough from the healthcare area of the grounds to not deter potential students from attending.

Perhaps one of the most interesting spatial relationships is the close proximity between the Home for Dependent Children and the Hospital for Mental Diseases. One possibility of their close proximity could be that some children living on the grounds were dependents of

individuals in the mental institutions. This would allow the children to reside near their guardians, but with limited access. However, given the fractured growth of the County Grounds, their placement may just be one of convenience. The County needed the land, so they purchased it and built out of necessity.

This chapter detailed the process of creating the four historical maps of the MCIG, and discussed how changes in land use over time reflected cultural and societal changes in Milwaukee. The final chapter summarizes these findings, describes limitations of this research, and offers recommendations for future research on the MCIG.

CHAPTER SIX: CONCLUSION

This thesis compiled four maps (i.e., 1910-1913, 1939-1942, 1954-1963, 1980) that should be of use to future researchers interested in the MCIG. This thesis and the chronological and spatial land use analysis conducted here may also serve as a basis for researchers interested in using different sources of historical documentation in order to conduct a chronological and spatial analysis of a changing land area. This chapter briefly summarizes the findings from this thesis, documents some limitations in the research, and provides recommendations for future research.

Summary

A chronological and spatial land use analysis can be used to demonstrate change in an area over time. Such an analysis can also reflect cultural and societal changes taking place during a particular timeframe. In this thesis, changes in the structures of the MCIG appear to correlate with changes in the urbanized landscape, the eradication of diseases, and advancements in medicine and public health. Overall, the MCIG land use maps from 1850 to 1980 reflect cultural and societal changes taking place in Milwaukee throughout the timeframe as the population increased (Table 1). As the Milwaukee population increased, urbanization and concerns about public health influenced MCIG land use. This is demonstrated by the increase of land use from approximately 30 acres in 1910 – 1913 to 64.49 acres in 1980. Though residents of the various MCIG facilities were likely considered by some to be outliers of the community, the use of the MCIG over time demonstrates Milwaukee community stakeholders' concerns for the health and wellness of an increasing population.

Although the MCIG began as rural farm fields, their purchase indicates a shift in the use of the environment ending, by mid-twentieth century, with development as an urban area. The

use of chronological maps provides a visual representation of changes on the MCIG over time. Using ArcGIS ESRI allows for efficient documentation and calculation of area usage. ArcGIS ESRI also allows for consistency between building location and size. For example, ArcGIS ESRI allows for the ability to create new layers from those already created. The same data are maintained between layers. Changes made to those layers are easily recalculated.

Limitations

This thesis focused on structural land use changes. One limitation of this thesis is that records could not be found to provide more accurate details of land use at the time the Grounds were purchased in 1852. Consequently, about 50 years of spatial information could not be documented. Although there is some documentation from that time frame, it does not provide location specific information concerning the grounds.

Another limitation concerns the location of cemeteries on the grounds. Much like the data prior to 1900, information on the location of cemeteries on the MCIG is lacking. The only cemetery with locational information on the historical MCIG maps is the existing Milwaukee County Poor Farm cemetery, located by railroad tracks on the Northeastern section of the property. The other two cemeteries, located on the Southeastern section of the property do not appear on any of the historical MCIG maps. The location of the cemeteries has been provided by information collected by University of Wisconsin – Milwaukee Cultural Resource Management. Although the focus of the compiled maps are limited to structural building changes, the cemeteries were included on the compiled maps because their presence has and will continue to effect the landscape and use of the grounds. Furthermore, previous and continued research of the County Grounds demonstrates an interest of the cemeteries and individuals buried there.

Another potential limitation concerns the roads featured in the compiled maps. The earlier compiled maps of 1910-1913 and 1939-1942 used major intersecting arterial and collector roads, and only some local, smaller residential roads which could be found on the 1937 aerial photographs. Therefore, not all of the local or driveways were included. If all of the roads had been included, the roads would have appeared as the focal point of the map, rather than the structures because the structures did not take up as much space. Therefore, for visual purposes, it was decided to only include the major intersecting roads.

A final potential limitation of this thesis was dealing with a lack of dates and authorship credit in historical documentation. Often this information was in the form of notes on the back of a picture or piece of paper. It was often difficult to confirm the dates, provide accurate authorship credit, or confirm the validity of this information. To address this limitation, the information was cross-referenced with other available documentation to try to determine its accuracy.

Recommendations

Future research on the MCIG could include a chronological land use analysis that expands the timeframe to 2013. There is a lot of data available on the grounds from the year 2000 on. This data would probably be more consistent than the data available before the widespread use of GIS, such as the aerial photographs and grounds maps like those used in this thesis. Future research could also examine the demographic information of individuals buried on the grounds. This information could be compared to Milwaukee County demographics, as well as the use of the grounds. The individuals buried there could be compared to the greater society as whole, as well as the structural use of the grounds. That type of analysis could show patterns in the type of individuals that were utilizing the grounds from the community.

A final recommendation for future research would be to include the use of newspaper articles, utilities, and land parcels in data collection. Newspaper articles can provide public documentation on the grounds, as well as provide insight into the community atmosphere during that timeframe. Utilities, such as water lines, sewer systems, and electrical lines could be added to provide a more comprehensive use of grounds. Furthermore using land parcels can also demonstrate the use of space and change over time. The County Grounds could be segmented into parcels, such as wooded, crop, residential, commercial, industrial, and healthcare. The rate of change in parcels could then be conducted and applied to the findings of this research project.

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APPENDIX A: MILWAUKEE COUNTY DATA

Table 1: Milwaukee County Population Information (1850 – 1980)

Year	Population
1850	31,000
1860	62,518
1870	89,930
1880	138,537
1890	236,101
1900	330,017
1910	433,187
1920	539,449
1930	725,263
1940	766,885
1950	871,047
1960	1,036,041
1970	1,054,063
1980	964,988

Sources: Wisconsin State Department of Agriculture Crop and Livestock Reporting Service (1957) & Forstall (1995)

APPENDIX B: MCIG LAND USE DATA

Table 2: 1980 MCIG Structural Land Use Area

MCIG Group	Area (Acres)
Asylum	3.42
Central Automotive Maintenance	5.5
Children's Home Annex (Ag. School)	0.78
County Garage	2.2
County Hospital Group	7.31
Farm Department	0.84
Home for Dependent Children	3.98
Hospital for Mental Diseases	13.93
Infirmery	0.98
Laundry	1.01
Milwaukee Co. Cemetery	12.34
Miscellaneous	9.28
Muirdale	2.06
Power Plant	0.86

Table 3: 1954 - 1963 MCIG Structural Land Use Area

<u>MCIG Group</u>	<u>Area (Acres)</u>
Asylum	7.25
Children's Home Annex (Ag. School)	0.72
County Garage	2.74
County Hospital Group	7.81
Farm Department	2.45
Home for Dependent Children	5.41
Hospital for Mental Diseases	4.18
Infirmery	4.20
Laundry	0.77
Milwaukee Co. Cemetery	12.34
Miscellaneous	2.40
Muirdale	3.67
Power Plant	0.42
Residence	0.29

Table 4: 1939 – 1942 MCIG Structural Land Use Area

<u>MCIG Group</u>	<u>Area (Acres)</u>
Asylum	4.08
Blue Mound Sanitarium (Preventorium)	0.96
Children's Home Annex (Ag. School)	0.62
County Garage	1.65
County Hospital Group	4.04
Farm Department	2.40
Home for Dependent Children	2.08
Hospital for Mental Diseases	3.1
Infirmery	3.24
Laundry	0.60
Milwaukee Co. Cemetery	12.34
Miscellaneous	0.07
Muirdale	2.57

Table 5: 1910 – 1913 MCIG Structural Land Use Area

<u>MCIG Group</u>	<u>Area (Acres)</u>
Asylum	4.95
Children's Home Annex (Ag. School)	0.76
County Garage	1.71
County Hospital Group	0.79
Farm Department	2.24
Home for Dependent Children	2.87
Hospital for Mental Diseases	3.81
Infirmery	0.59
Milwaukee Co. Cemetery	12.34

APPENDIX C: MAP DATA ACCESS

Table 6: Paths to Map Data

Layer	Hard Drive Path
1980 Buildings	G:\MCIG_Land_Use_Geodatabase\LandUseBLDGS
1954 – 1963 Buildings	G:\MCIG_Land_Use_Geodatabase\LandUseBLDGS_1958
1939 – 1942 Buildings	G:\MCIG_Land_Use_Geodatabase\LandUseBLDGS_1930s
1910 – 1913 Buildings	G:\MCIG_Land_Use_Geodatabase\LandUseBLDGS_1910s
Railroads 1910 – 1942	G:\MCIG_Land_Use_Geodatabase\Railroad_1910
Railroads 1954 – 1980	G:\MCIG_Land_Use_Geodatabase\Railroad_1954
Roads 1910	G:\MCIG_Land_Use_Geodatabase\Roads_1910
Roads 1939 – 1942	G:\MCIG_Land_Use_Geodatabase\Roads_1930s
Roads 1954 – 1963	G:\MCIG_Land_Use_Geodatabase\Roads_1954
Roads 1980	G:\MCIG_Land_Use_Geodatabase\Roads_1980
USDA 1937 Aerial Photo	G:\MCIG_Land_Use_Geodatabase\Milwaukee7261937_8_726_7x9
MCIG 1939 Map (Figure 4)	G:\MCIG_Land_Use_Geodatabase\MCIG_1939_WaterSystem_Map
MCIG 1958 Revised Map (Figure 5)	G:\MCIG_Land_Use_Geodatabase\MCIG_1958_Revised_WaterSystem_Map
1980 Building Index Map (Figure 7)	G:\MCIG_Land_Use_Geodatabase\MCIG_Building_Index_Map