Lake Wingra: Changing Perceptions and Land-Use Decisions of Madison Wetlands
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Abstract
Madison, Wisconsin is characterized by the presence of the University of Wisconsin and the Wisconsin State Capitol. Surrounded by a beautiful chain of fresh water lakes, the scenic nature of Madison's surroundings have always played an important part in the policy decisions that have formed the city. This paper uses the historical discourses centering around our study area of Lake Wingra, on the East side of Madison, as examples of the dynamics surrounding landscape-forming decisions. Analysis of wetlands extent over time confirms that the majority of wetland reclamation in the study are occurred before 1959. A detailed analysis of discourses about wetlands suggests that wetlands were regarded as useless and ugly, contributing to local dispositions in favor of dredging and filling. Most filling took place before accurate scientific understanding of the value of wetland-provided ecosystem services could inform policy decisions. Most land reclamation in the state occurred for agricultural purposes, but wetland filling in Madison was carried out for institutional purposes. A comparison between institutionally-owned land and privately-owned land suggests that institutional use such as parks are less damaging to the health of fresh water lakes than private free-market use.

The city of Madison was well known for its four lakes even before it became an established city. For both the Native Americans and the settlers, the lakes and wetlands of the area contributed heavily to the sense of place experienced there. The area around Lake Wingra, the third smallest lake in the chain, has seen interesting developments throughout recorded history. The physical environment around Wingra has affected the development of the adjacent neighborhoods and perceptions of the area. An in-depth look at the Lake Wingra wetlands through time reveals the changing perceptions and land-use practices throughout Madison. Historically, people have viewed wetlands in the United States as a nuisance, a source of disease and unproductive. These views have affected the development and health of Lake Wingra in
Madison, Wisconsin. Using Lake Wingra as a case study for the entirety of Madison, we can trace how the landscape changed and developed, and with them, local opinion of these wetlands, resulting in more support for conservation.

Lake Wingra is a shallow, spring fed, eutrophic lake with deep soils and a large drainage basin (see figure 7). Glacial till makes up the majority of the soils in the area, and two major aquifers serve the springs that feed Lake Wingra. Located in an urban area of Madison, WI, the lake once had shores of sprawling marsh. The eastern, southeastern, and western shores have mostly been drained. To the north sits Henry Vilas Zoo and park, as well as Edgewood Drive, and in the southwest, the Nakoma Golf course. As the smallest lake in Madison, Lake Wingra has generally been used as a source of recreation, and generally considered the most ‘pristine’ of the Madison area lakes. While this is true, it does not mean that this lake is untouched. Many of the thirty-five springs that once fed Lake Wingra have been filled or rerouted for agriculture or wells, making the hydrologic budget for the lake only a fraction of its historical values (Brown, 1927). Most of the wetlands surrounding the lake have been drained and filled in as well. All of the land that is now Henry Vilas Zoo and Park, and the Nakoma Golf Course was once marsh (Brown, 1927).

**Literature Review and Methods**

Several journal articles detail the physical landscape of Lake Wingra and how it has changed through time. An article by Watson et al. compares the health of Lake Wingra and a New York lake by looking at nutrient budgets and hydrologic outputs of the two lakes over time. Although written in 1979, the article provides a good assessment of modern Lake Wingra for us to use in our research. The comparisons between the two helped determine differences between eutrophic and oligotrophic lakes and also to find how these aspects have changed since pre-
settlement times. Charles Brown’s article about the springs of Lake Wingra illustrates the historical changes affecting the drainage area, although the paper was more fact listing than research based. However, Charles Brown details the perceptions Native Americans had of the springs feeding Wingra, which is very useful for our purposes. The names of the springs derive from Winnebago words, and the area was viewed as a sacred place where animals come into being (Brown, 301).

In addition to researching the landscape change of Lake Wingra over time, we also looked at the bigger trends of change in the state of Wisconsin. A study by Ross E. Freeman et al. asked how the spatial distribution of land use and land cover in the floodplains of the Wisconsin River has changed from the 1930s to the 1960s and to the 1990s. They searched to explore the changes of habitat connectivity during these same time periods, as well as asked how various conservation scenarios influence connectivity. Written in 2011, this article provides current data in assessing the changing landscape of Lake Wingra.

The research design of Watson et al. consisted of modeling both lake watersheds as they would have been in pre-settlement years, and then comparing these models to the modern measurements. To construct the pre-settlement budgets they used the modern rainfall measurements, but calculated less runoff because the lakes would have had less impervious surface. The researchers added more evapotranspiration due to more vegetation. Modeling the pre-settlement nutrient budget was more difficult for them, but they took into account the added nutrients that modern septic tanks would produce into these lakes and from urban runoff. Then the researchers monitored stream flow, surface runoff, and rainfall for four years to create a monthly hydrologic budget. They also monitored nutrient output of both lakes to create a budget. Their results were compared to their pre-settlement constructions in order to draw conclusions.
Results showed that land use may have little to do with hydrologic and nutrient budgets. Although Lake Wingra is in the middle of an urban settlement, its budgets were much healthier than those of Lake George. They believe that soil type, slope, and climate is more important to a lake’s health than urban development. This conclusion will be important in our study of the effects of historical urbanization on Lake Wingra.

The research of both groups were very thorough, taking into account lake depth, volume, watershed area, water chemistry, period of ice cover, trophic status, and land-use in their calculations. Their comparison between a lake that was in a fairly natural state and one in a very developed area was useful in determining whether urbanization had an impact on hydrologic budget and nutrients. The Freeman group defined their study area the spatial extent of 100 year floods and focused solely on the lower half of the river from Stevens Point. They then located nine study reaches and grouped these into three categories: northern, central and southern, based on similarities in location, topography, geology and flow modifications. In order to evaluate land cover changes three spatial datasets were developed based on orthocorrected aerial photos. Four landscape metrics (number of patches, mean patch size, patch density and edge density) were also used to assess the connectivity of the four most common land-use types (deciduous forest, grassland, agriculture and open wetland). In addition, two realistic conservation scenarios were developed to reflect real life agendas with the results assessed by their ability to increase flood plain forest connectivity.

During the 1930s land cover was dominated by deciduous forest and agriculture with wetlands and grasslands comprising less than twenty percent of the flood plain (Freeman). Freeman et al. found that land cover change over the 60 years was largely characterized by an increase in deciduous forest and decrease in agriculture and grassland in all three regions (north,
central and south). Much like the Watson et al. article, they found the change in wetlands did not follow a common trend amongst the three regions but varied greatly from one another. However, Freeman et al. did not only produce numbers as their final result but also evaluated the possible social influences behind their found trends. They hypothesized that the possible reasoning behind a large increase in wetlands in the southern region could be due to the economy forcing farmers to abandon agricultural parcels that were once originally wetland, allowing these parcels to revert to their watery conditions. Resource management practices and general increase in conservation consciousness were also cited as plausible causes.

Watson’s pre-settlement models of the two lakes, and their comparison categories could be improved upon. It is impossible to estimate what an undisturbed version of Lake Wingra or Lake George may have been like because there are no modern analogs. Instead of trying to create pre-settlement constructions, the researchers could have focused on the time period in which measurements of hydrologic budget and nutrient outputs were first taken, and then compared them to modern times. That data may not exist, but if it were possible, it would make their conclusions more precise. Before drawing conclusions about the impact of developments on lakes, more research must be done. This study compared two completely different lakes—one oligotrophic in a natural setting, and one eutrophic in an urban setting. This paper could have incorporated two more lakes—one eutrophic lake in a natural state and one oligotrophic in an urban area.

The methodology used in Freeman et al.’s study is logical and reasonably easy to understand. Although some of the trends were not what they were expecting, Freeman et al. took the opportunity to briefly explore related social issues that could be of cause, allowing the article to take not only a spatial science perspective but a post structuralist one as well.
Perception resources

Through newspaper articles and other historical documents, we can assess public perceptions of the wetlands through time. Understanding of the thought processes that the public has on these wetlands is in the field of environmental perception (Gomez and Jones, 248). Common perceptions often play a large role in decision making. While researching the relationship between wetlands and the development of Madison, it is imperative to understand the changing perceptions of wetlands and their influence.

A study by Joan Nassauer explored the larger social issues as to why one landscape type is accepted by society and given a place in the neighborhood and another is rejected. It is argued that landscape designs that improve ecological quality may not be maintained or appreciated if recognizable landscape language does not communicate human intention. She argues that this “recognizable landscape language” (Nassauer, 161) carries from culture to culture. Although, in her paper she mainly draws examples and studies from the United States. Nassauer argues that certain social cues in a landscape allow society, or the neighborhood, to accept and appreciate it. In North America these cues involve neat and tidiness (Nassauer, 162). The look of a well mowed lawn and strategically placed flowers and shrubs indicates human intent and care for this area, a theme that is later strengthened through her studies. A landscape can be used as a communication device and popular perception says that a neighbor will understand a language of orderly form.

Denise Schieberle suggests in her article, “Moving Toward Community-Based Environmental Management”, that community-based wetland management programs are key to the enforcement of wetland protection. While Schieberle’s case study focuses on Door County, Wisconsin, nearly a four hour drive away from the site of Lake Wingra, the study shows a
community’s perception of their local wetlands and how policy (or a lack thereof) affects the development of the community.

Nassauer pulls multiple examples from neighborhoods where owners have picked and chosen what landscapes to destroy (usually wetlands) and what to keep (usually woodlands). She also conducted her own studies in which she interviewed Midwestern farmers and asked them to describe what made fields attractive as well as interviewed non-farmer countryside resident and asked them to describe what made home landscapes attractive. Both these people and the farmers tended to use the same words that portrayed the same concept of care and human intent to describe both their fields and their yards. Other studies found residents of a third-tier Twin Cities suburb rated video imaging of seven home landscapes ranging from entirely conventional, to covered in weeds to five frames of indigenous plant gardens of increasing area. Once again, this study returned similar results to that of the other two. The urban residents initially preferred the conventional yard then preference followed a gradient from the most neat looking lawn to theed least (the yard covered completely in an indigenous garden). The article presented itself in a convincing way however the research process and design could potentially leave room for argument in a humanism versus spatial science debate. This article can contribute a lot to our research in inspiring questions as to why people are so eager to destroy wetlands and in what sort of context wetlands may be, or have been, accepted.

There never seems to be a win-win situation for protecting wetland areas versus developing wetlands, “Given all this high – level attention, it would seem that communities ought to jump at the chance to protect the environment their citizens enjoy” (Schieberle 2000, 566). Whether through financial incentives or interest in preserving the land, choices have been made, resulting in the way that local communities and their landscapes (wetland areas) appear.
As Hugh Prince states, land investors made the decisions that led to beginning agricultural practices on wetlands (Prince 1997, 161). Land use decisions tend to be made by investors and/or the government, but the issue of wetland protection has not always been addressed. In some cases, like Door County, the lack of federal and state regulations on the development of wetlands fell on the local community, while in the past, wetlands or “the third rate land” (Prince, 143) was used for less favorable purposes. In the case of Lake Wingra, the public perception changed the landscape through choices of what would or would not be developed.

Negative perception of wetlands overall dominated the Midwest in the early nineteenth century. Hugh Prince examines this study in “Wetlands of the American Midwest”. While he describes the positive qualities and resources (game, plants) Native Americans found in the wetland landscape, he continually reinforces that “wetlands repelled most newcomers” (Prince, 118). Perceptions about wetlands remained negative as investors arrived into new territories and states were formed. As space for railroads and agricultural lands were needed, this sentiment changed (Prince, 161). He gives a detailed historical account of the public’s shifting views towards wetlands through the decades. Perceptions changed in the 1980s, from development and usage of the land to viewing wetlands as a natural feature to be enjoyed (Prince, 328). In relation to the Door County study, Schieberle learned that an increase in public awareness and education about wetlands would lead to protection or careful development strategies in the future. This sentiment, in relation to Lake Wingra, can be historically traced through accounts of the different development projects that have occurred over time.

An exploration of long dead planning policies presents a challenge to our research into the reasoning behind large-scale public projects and land use trends. We want to understand the social contexts that affect specific planning decisions (Harvey 1984, 2). In our analysis of
wetlands-related planning policy in Madison, we have attempted to take heed of the national context of the time frames in question.

Law resources

Laws and regulations passed by the legislature in the past are often a product of national attitudes. Legislation in the United States has an odd cause/effect relationship with National perceptions about its subject issues. The legislation considered in this paper served both a response to perceptions about wetlands and as a reinforcing agent of damaging representations of them. Often, legislation beneficial and damaging to wetland health are promulgated concurrently. These laws and regulations often translate directly into physical realities (Dahl et al).

A regional analysis provides a good background for the though processes behind smaller-scale local planning decisions on open private (and often public) lands, but cannot account for the decisions made by cities and citizens in the urbanized areas of the Midwest. A state-wide inventory of wetlands draining procedures in the state of Wisconsin in the early twentieth century suggests that the motives behind planning decisions on a state scale differ in focus from the thought processes that brought about similar changes in the city of Madison (Mai 1995).

The majority of the urban planning data used in this project came directly from publications written or edited by the original Madison City planners themselves, or from other similar influential people in the realm of Madison politics (Nolen 1911) (MPAPDA).

Development resources

Todd J. Hawbacker et al in Road Development, Housing Growth, and Landscape Fragmentation in Northern Wisconsin: 1937-1999, sought to improve the understanding of the
dynamics of road networks over time and their effects on landscape patterns. They hoped to identify significant relationships between road changes and other land use changes specifically from 1937-1999. In our study of the relationship between the urban development of Madison and the surrounding natural landscape, the knowledge of past impact of roads in similar eco-regions will prove to be helpful.

Hawbacker et al asked three specific research questions. For our study we will be predominantly interested in his first question, “How do road density and landscape pattern change over time?” (Hawbacker et al, 1223). Their study area consisted of seventeen townships in three ecological subsection in northern Wisconsin. Townships were chosen because of their extensive characteristics and their ability to contain large, road less areas. Ecological subsections are regions that are relatively homogeneous in soil type, vegetation and land use. However, each subsection differs from one another in the previously mentioned categories. Using this sampling scheme, they measured differences in road density and pattern across time and tested for significant differences between the ecological subsections. To do this they used orthorectified historical aerial photos from time periods between 1937 and 1999 and digitized the visible roads. Habitat fragmentation was measured using maximum, median and mean patch area.

The results showed that significant changes in road density and landscape patterns created by roads occurred over the six decades. Across all seventeen townships the proportion of road area doubled, there was a reduction in the largest road less patch size by a factor of two, and a reduction of mean and median road less patch size by a factor of four (Hawbacker et. al, 1232). They also found that environmental conditions had a great effect on the density of roads and the shapes created by them. The ecological subsection that consisted of predominantly
wetlands experienced increases of road density at a lower rate than the other subsections. Wetlands proved to constrain road development and necessitated circuitous routing of roads. Since Hawbacker et al used aerial photos it is possible roads could have been excluded in their analysis due to shading or topological features obscuring a road.

**Methods of historical land use research**

Many key figures in the city of Madison’s formative years took pains to ensure that records were kept of events and conditions affecting their beloved city. Thanks to the prevailing institutional character of the city from the very days of its conception, administrative aids and officers were never in short supply. Land-use and aesthetics of the city apparently became issues of particular importance to the legislative class of gentlemen -the wealthy businessmen and politicians of the day- who kept detailed records concerning them. Our project draws greatly on a wealth of data found in these records and other historical sources referring to the extent of wetlands in Madison.

A preliminary look at the data collected allows us to make a comparative analysis of the land use changes in the area around Lake Wingra. Starting with diary entries and written descriptions of the land pre-1837, we make a rough recreation of the landscape and its uses by the Native Americans that lived there. Then, turning to later descriptions of the landscape, we attempt to describe the arrangement of farms that began production around the Wingra area and the other land uses that occurred on the north and east banks of the lake in connection with the spread of the city of Madison. Drawing on period planning data and industry analyses, we are able to approximate the areas that were developed for rail and other industry.

In the 1890s, the marshy areas around Lake Wingra really began to draw the ire of city planners and politicians. Around this time the Madison Park and Pleasure Drive Association
began to form, and by the end of the nineteenth century the influential group of citizen-planners began publishing annual reports of the association’s proceedings. From these reports we were able to track the amount of wetland filling occurring in the city of Madison for recreational purposes, in addition to important political discourses occurring at the time. We extracted raw acreages of wetland converted by the MPPDA for the parks (Vilas and Wingra) that make up much of the North Shore of the Lake, as well as cubic feet of material moved to complete the ambitions projects and the origins of that material. We take the data extracted from the historical sources and map the extent of wetlands before and after the completion of the recreation projects.

A body of government publications, particularly from the United States Geologic Survey, has provided us with a good overview of laws and regulations that affect the status of wetlands in the United States and in Wisconsin. We list a number of policies and describe them and their effects in order to illustrate the irresolute nature of government actions. Such insight is necessary to understand the relationship between the governing bodies of America and the landscape. To enrich our overview of national attitudes, a number of written descriptions from early settlers and researchers have been included in our analysis, as well as technical publications produced by the United States Department of Agriculture.

**Regulations**

In order to understand why people treated wetlands in Madison the way they did, it is necessary to understand greater National trends in wetland use. No source better illustrates the changing understanding of the value of wetlands better than US law.

Regulatory action in the United States regarding wetlands has been a tug of war between development and agricultural interests and conservation and resource management interests. The majority of federal language condemning wetlands and promoting their destruction has come
from the Department of Agriculture and similar branches. However, over the span of the
twentieth century the amount of pro-wetlands language coming out of the federal government
has increased dramatically, and in recent decades much work has been done to protect wetland
resources. It is useful to briefly go over the arc of regulatory thought from the 1890's to the
1990's because it roughly follows the major social and scientific movements that inform public
perceptions of wetlands and decisions of officials in Madison towards the cities wetlands areas.

1850s

In 1849, the US Congress passed the Swamp Lands Act, which placed marshy areas in
Louisiana under federal control and provided a mechanism for those lands to be sold to private
developers cheaply for the purpose of reclamation. One year later the Swamp Lands Act was
expanded to fourteen other states, including Wisconsin. In Wisconsin, 3,360,786 acres of low
lying lands deemed “unfit for cultivation” were placed under government control (Dahl 1990).
Most of these lands were sold off to private developers for reclamation, and the proceeds were
placed into a public trust fund for public education. The Board of Commissioners of Public
Lands still hold some unsold land in trust for the public education fund under provisions in the
State Constitution.

The Swamp Lands Act is a product of an expanding country's priority for settling new
lands. Besides being unfit for agricultural production, wetland vegetation usually did not include
any hard woods for building purposes, and the wet soils often proved to be a hindrance for
transportation. Public health was also an issue, and wetlands were often seen as the cause of
little-understood but deadly diseases such as malaria, cholera, and typhoid. The filling of a
wetland was seen as a necessary duty and a triumph of settler's power over the adverse nature of
the frontier.
1900s

As the country became settled, some people began to see the value that wetlands provided. During the early 1900's sportsmen's clubs sprang up across the country. Hunters understood the value of wetlands as habitat to game birds, and were effective in lobbying for preservation of marshes for sporting purposes. The 1929 *Migratory Bird Conservation Act* provided the federal government a mechanism to acquire wetlands areas deemed especially important for the life cycles of game birds for conservation purposes. One of the most well-known and lasting conservation act is the *Migratory Bird Conservation Stamp Act*, under which hunters must purchase duck stamps in order to harvest birds. The funds from the stamps are then used for the acquisition of easements on tracts of ecologically important wetlands. Duck stamps have become a nationally beloved symbol of American natural resources and hunters and non-hunters alike collect original duck stamps every year. (see Figure 1).

While there was some concern for the well-being of wetland resources in the early 1900's, wetland filling and land reclamation continued largely unabated well into the 1950's. What wetlands regulations were introduced followed from an environmental pragmatist approach embodied by natural thinkers such as Aldo Leopold. This is evidenced in the regulatory language of the 1958 Amendment to the *Fish and Wildlife Coordination Act*, which requires aspects of wildlife conservation be considered in all decisions regarding water resource development across all federal agencies and has given the Fish and Wildlife Service authority to attempt to limit adverse effects on fish and wildlife habitat. Other acts such as the *Federal Aid to Wildlife Restoration Act* of 1937 and the *Federal Aid in Fish Restoration Act* of 1950 provide federal funding for state wildlife conservation measures.

1960's and 1970's: The Environmental Movement
During the 1960's a new movement of environmentalism, spurred by young activists and influential works such as Rachel Carson's *Silent Spring* (1962) and Paul R. Erlich's *Population Bomb* (1968), began to catch the attention of the federal government. In 1970, President Richard Nixon started the United States Environmental Protection Agency (EPA) by executive order. The main purpose of the new agency was to regulate environmental pollutants. The main authority by which the Agency does this is through the *Clean Water Act* (1972) and *Clean Air Act* (1970). Sections 402 and 404 of the Clean Water Act (CWA) are particularly important to the health of the nation's wetlands. Section 404 of the CWA gives the Army Corps of Engineers (Corps) regulatory authority over the deposition of “fill” into “waters of the United States”. This provision is often referred to as the “dredge and fill” provision of the CWA. The EPA and FWS each have interpretive and regulatory authority under section 404 as well. There is disagreement among the agencies about their role in regulating wetland fill under this provision. The Corps does not interpret 404 CWA as a provision for the protection of wetlands, while the EPA, FWS and many environmental groups argue that the provision requires the Corps to consider wetland habitat damage caused by dredging and filling. (OTA) There are major limitations to sec 404's regulatory power over wetlands. The provision only regulates the deposition of fill into wetlands, and does not consider drainage, clearing, or flooding of wetlands. Furthermore, the Corps lacks the resources necessary to effectively investigate the effects to all wetlands being filled, and will often grant general permits that allow developers to go ahead with minimal or no monitoring and enforcement.

The legacy of the environmental movement is apparent when recent regulations and acts are considered. The motivation for protecting wetlands has become increasingly more for intrinsic value in addition to more quantifiable aspects such as wildlife habitat and ecosystem
services. This development reflects growing public support for conservation programs and the growing influence of environmental education. (see Figure 2)

*Wisconsin Acts and Regulations*

Laws concerning Wisconsin’s waters must take into account the “public trust” doctrine of the state regarding waters of the state. Established by doctrine found in Article IX, section 1 of the state constitution, the public trust doctrine states that the waters of the state are held in public trust for the citizens of the state, with the waters being the body of the trust and the state being the trustee. This means that any action affecting access to or the quality of navigable waters must not harm the public's rights under the trust agreement. Riparian land owners may not claim ownership of any part of navigable waters of the state, nor may they do anything affecting the hydrology or quality of surface waters without a permit. A number of Wisconsin Supreme Court Rulings have found that private land owners may not take action in wetlands if the wetlands are connected to waters of the state. The ruling in Just v. Marinette 56 Wis. 2D 7 (1972) stated in part:

Swamps and wetlands were once considered wasteland, undesirable, and not picturesque. But as the people became more sophisticated, an appreciation was acquired that swamps and wetlands serve a vital role in nature, are part of the balance of nature and are essential to the purity of the water in our lakes and streams (1972).

By this ruling, state agencies can use police powers to prevent the harm of public waters by activities in adjoining wetlands.

Another seminal State Supreme Court ruling, Hixon v. Public Service Commission 32 Wis. 2D 608 (1966) recognized the cumulative effects of gradual fill may be adverse to the
public's water rights. This ruling is widely used to guide the enforcement of Wisconsin's strict wetland regulations.

Under the CWA, states have the right to implement their own water quality standards if they are at least as strict as the federal regulations. The State of Wisconsin has implemented a stringent water quality program under the authority of the CWA and Chapters 281 and 283 in Wisconsin statutes. The main enforcing agencies of state water quality standards are the Wisconsin Department of Natural Resources (DNR) and the Wisconsin Public Service Commission. In 1981, Wisconsin adopted NR 291 of the Administrative code for the water quality permitting process, and in 1991, NR 103 Wisconsin Administrative code provided standards for wetlands water quality regulations. These regulations included not only those connecting to state waters, but were extended to all wetlands, including isolated areas not associated with navigable waters. Wisconsin wetland conversion rates dropped dramatically because of the stringent state implementation program. The Wisconsin DNR reports that in before 1991, an average of 1440 acres of wetland was filled under CWA 404 with Corps approval. After the implementation of NR 103, the acreage of wetland filled in per year has steadily dropped to below 100 acres. Despite the significant effects of NR 103, 96% of permit applications are approved by the DNR (Cain, 2008).

The majority of changes made to Madison's wetlands occurred long before any regulation of wetlands use had been implemented. The wetlands around Lake Wingra followed a national narrative of filling in wetlands for the public good. Although over eighty-five percent of wetlands loss in the United States can be attributed to agricultural reclamation projects, the majority of Madison's wetland loss does not fall into this category. Our case study, Henry Vilas Park was considered for recreational use. The protections placed upon remaining wetlands stem
from University institutional policy and were put in place in the spirit of natural resource conservation and research.

**A Case Study: Lake Wingra**

Although the health of the lake itself has not changed dramatically over the years, Lake Wingra’s area, depth, drainage patterns and adjoining wetlands have been extensively altered by the activities of man. Early development in the Lake Wingra watershed languished because of its marshland characteristic and its distance from the city center. It was not until the early 1900s that Madison grew to a point where additional land adjacent to already existing neighborhoods was needed. This increased need for space caused an increase in Lake Wingra’s surrounding property values and in 1903 a public suggestion was made by U.S. Congressman H.C. Adams and Dr. Edward Kremers for a twenty-five acre public park along the north shore of Lake Wingra. The plan was immediately accepted by the Madison Park and Pleasure Drive Association who raised $10,000 for the construction with an additional $18,000 donated by the affluent William Vilas, and wife, who would later name the park Henry Vilas Park after their deceased son (Heggland, 1991).

Construction began in 1905 with the dredging of Wingra Creek and the infill of the extensive surrounding marshlands. This event is believed to mark the permanent transition of the Lake Wingra watershed from extensive marsh and wetlands to a developed land. Initially, fifty acres of bog were converted to park and over thirteen years of work, sixty-five acres of park were created (Heggland 1991). Fill was used to construct the peninsular part of the park. Removal of groundwater by new wells combined with dredging and filling destroyed five springs in the original marsh. The depth of Edgewood Bay rapidly decreased as materials eroded from the shore, decreasing from four meters to about one and one-fifths meters (Baumann 1974).
Effects on lake health

The presence of the park lead to an increase in population in the area and thus an increase in development along and surrounding the Lake Wingra shores. Twentieth century development included the removal of wetlands, and construction of buildings, streets and sewers. Along the north shore alone, the replenishment of groundwater was reduced leading to the destruction of sixteen springs. Runoff from the northern and western regions of the drainage basin primarily reached the lake by storm sewers. By the 1970s, twenty percent of the watershed was altered to the extent that it was impervious to water, greatly contrasting its original wetland landscape. Sixty-three percent of the watershed was comprised of lawns, parks, golf courses and cemeteries. The selection for fast growing grasses and tree species increased productivity by thirty percent when compared to the natural forests located within the Arboretum, which lead to a dramatic change in natural vegetation and landscape. Landscaping of lawns, gardens and parks and the use of fertilizers also increased the nutrient load of runoff that entered Lake Wingra via storm sewers (Baumann 1974).

The removal of marshland for development had a vast number of effects on Lake Wingra and its surrounding area. By the end of the twentieth century Lake Wingra had a deeper maximum depth and only covered half of the extent it originally did. When including marsh and wetlands with lake area, the original extent of Lake Wingra was nearly three times greater than that at the end of the century. These changes were directly caused by dredging, draining and construction of dams and dikes. Other changes to the watershed include alterations in soil, surface runoff patterns, vegetation and groundwater sources (Baumann, 1974).

Lake Mendota in Madison has also been drastically affected by land use change and development. Unlike Lake Wingra, Mendota has undergone dramatic degeneration. Lake
Mendota is the northern most and largest of the four lakes near Madison, Wisconsin and defines the northern border of the isthmus upon which Madison was built (see **Figure 7**). Similarly to Lake Wingra, Lake Mendota experienced a large amount of development along its shorelines and changes in the landscape were shortly followed by changes in the lake. In 1832 Lake Mendota’s water was reported to be incredibly clear, with light colored sediment (Magnuson et al. 2006), but with the increase in settlement, development and agriculture over the years, this soon changed. Agricultural runoff soon increased the productivity of Lake Mendota and by the 1880s blue-green algae blooms were common, a sure sign of lake eutrophication. As farmers switched from the cultivation of wheat to the cultivation of corn, exposing soil to erosion for longer periods of time, and with the increase use of fertilizers after WWII, phosphorous loading increased. Between the increase of phosphorous and the eutrophication of the lake, Lake Mendota was a host to a series of changes including lower transparency, algal blooms and oxygen depletion. These changes in turn lead to health concerns, decrease in recreational use and an increase in the cost of water use (Riera et al., 2001).

Unlike other natural resources that are often exploited for a profit, aquatic ecosystems have rarely been accounted for in market terms. They are often not recognized until the society is forced to pay to restore services (recreational, biological and aesthetic) that previously had not been given. The effect of the fill and removal of wetlands and development along the shores of Madison’s lakes were not considered until the lakes began to suffer and that which society once took for granted was deteriorating or gone.

*Actors in Madison*

The Madison Park and Pleasure Drive Association Annual Reports from 1899 through 1929 provide us with information as to how the local community of Madison viewed their parks
and natural landscape. The land use decisions made in a variety of Madison public lands, including wetlands, show the changing perspectives towards the land in the early twentieth century. For instance, public criticism is documented in the report from 1902:

The plan adopted by the directors for the improvement of the park has been criticised [sic], particularly that portion between the avenue and the lake. ‘Why was not this portion filled in instead of wasting money excavation a lagoon? What do you want of more lagoons? Is not Lake Mendota lagoon enough?' (MPPDA 1906, 25).

This sentiment during the turn of the century is felt throughout the city. Preserving the landscape is not the priority for most of the citizens at this time. While people slowly learned the importance of wetlands, the emphasis was on development and profit within the city. Through an organization like the Madison Park and Pleasure Drive Association (MPPDA), the natural landscape of the Madison community began to change not only for development but also for preservation and usage of those natural lands.

While park projects and wetland preservation were faced with criticism during the beginning of the century, attitudes slowly started to change. With the creation of Henry Vilas Park, the perception of Lake Wingra and its surrounding area changed. As stated by one citizen:

Sometimes this lake has been called Dead Lake. It will be called Dead Lake no longer. ... As the tradition ran, among the Indians this lake was doomed; and as it should gradually disappear the last remnant of the Indian tribes would also pass away” (MPPDA 1904, 61).

The perception of Lake Wingra had been negative to many, but with an organization like the MPPDA and the emergence of funding allocated to the creation of parks, the wetland area previously viewed as an unimportant swamp, full of mud and dead organisms, began to change.
As stated by Mr. Olin, speaking on the conditions of Madison in regards to the importance of beautifying a city:

One of the amazing things is that we allow the worst forms of ugliness to exist side by side with the highest forms of beauty. The street ends, some of them, are places for weeds and refuse, and yet you are obliged to look over this to see the beauty of lake and landscape beyond (MPPDA 1904, 81).

In this same year, the planning of Henry Vilas Park started. In order for the area known as ‘Dead Lake’ to fuse naturally with the surrounding areas, the landscape surrounding Lake Wingra changed into an established park area where recreation in a modified natural setting occurred in addition to further development in the area.

Maintenance and development of the Lake Wingra and Henry Vilas Park area continued throughout the first half of the century. For example, the park was “well cared for and freely used” and continued construction of roads around the park occurred between 1919 and 1921 (MMPDA 1921, 9). As stated in 1925, “[Henry Vilas Park] continues to be the park of great popularity, partly because of the beautiful views, broad and pleasing lawn, shaded nooks, the zoo, the playground’s equipment, the lagoons and canoe service” (MPPDA 1925, 21). Of the desired attractions at the park everything had been added to the area to attract every age group. In twenty five years, this area changed immensely. The additions and attractions of the playground and Henry Vilas Zoo as well as the maintenance of the lawns brought in community members to enjoy the space once perceived negatively in the past. Lake Wingra and the Henry Vilas Park area became a place of gathering and recreation for local community members as well as people from all over the state of Wisconsin. It has continued to be utilized in that way into the twenty-
first century, well after the Madison Park and Pleasure Association was handed over to the Madison Parks Foundation in 1929.

*The Health of the Lake*

Due to the negative legislation and perceptions in the past, the Lake Wingra watershed area has lost a large amount of its original wetlands. Using maps from the USGS in 1904, 1906 and 1959, we attempted to find an approximation of how much of these wetlands were lost. On these maps, the Illinois Railroad line and the Lancaster Galena Railroad line cross twice, creating a bubble around Lake Wingra and its surroundings (see Figure 7). We estimated the amount of marsh indicated in this area. Our efforts found that at least 650 acres of wetlands have disappeared between 1904 and 1959. We also planned to calculate the more modern changes in landscape. Because the lake and park have been set aside for recreation and conservation the area has only changed minimally in recent times. Several sources indicate that, while the physical landscape adjacent to Lake Wingra has drastically changed since the earlier 1900s, the overall health of the lake may not be severely affected.

Wingra has always been a eutrophic lake, unlike Mendota, which has converted from oligo-mesotrophic waters to extremely eutrophic (Magnuson 2006). Original descriptions of Lake Wingra illustrate the area as solely a wetland that drained into Lake Monona. A dam was built in the early 1900s and formed the wetlands into a shallow lake (Magnuson 2006). Wingra has also been subjected to agriculture and storm runoff, and wetland filling. Despite all of this, a scientific research paper by Watson et al. suggests that Lake Wingra’s health is not very different from pre-settlement conditions. In a comparison between Lake Wingra and Lake George in New York, Watson et al. analyzed the differences in hydrologic and nutrient budgets through time. They found that Lake Wingra’s overall health (in terms of hydrologic inputs and outputs, and algae
content) was not greatly affected by the nearby urbanization. Lake George’s health, on the other hand, has drastically diminished, even though this lake has no nearby development or urban areas (Watson et al. 1979). This lead to the researchers’ conclusion that urbanization may have less to do with a lake’s health than previously believed. Lake Wingra has a large drainage basin, deep, rich soils, and these aspects have kept the lake at its natural eutrophic level, despite the development of Madison around it.

Other articles also suggest that Lake Wingra has not been devastated by urban development, especially in comparison to Lake Mendota, a larger Madison lake. Raymond Murray’s research on sediments in Wisconsin lakes has found that sediment in Lake Mendota has changed from a marl (lime rich sediment) to a black sludge due to oxygen deficiency (Murray, 1956). However, Lake Wingra’s sediment samples have remained consistent through time. Unlike Lake Mendota, Wingra is not at threat for many invasive aquatic species. Transport boats in Lake Mendota threaten to introduce species such as carp or zebra mussels (Magnuson 2006). As a small lake for recreation, Wingra is not so subjected to non-local boats and recently diversity in the lake has increased, due to a drop in the invasive Eurasian milfoil (Magnuson 2006).

_A Changing Landscape_

Our own personal observations confirm this idea. Through repeat photography we were able to analyze changes in the area over a sixty-one year time frame. The Vilas Park Beach on Lake Wingra has not changed much over time, or at least at first glance. The older picture (**Figure 4**) was taken by Arthur Vinje in 1950 for the Wisconsin State Journal in August. Since the photo was taken for a newspaper, the photographer probably chose a day where many people occupied the beach, to encourage other Madisonians to visit as well. The second picture (**Figure**
was taken by our group in October of 2011. Sixty-one years have passed between the times of the photographs, and the scene is much the same, with one major difference. The beach appears to be the same size, the wooden lifeguard chairs remain in their place, and the trees of the Arboretum still stand in the background, although they are fewer. The lack of swimmers at the beach in the modern photo could be attributed to the cool fall day it was taken on. Lewis mentions the pressure on people to change a landscape (Lewis, 3), but in the case of Vilas Beach, people were under pressure not to change it. Groups such as the Madison Park and Pleasure Drive Association and the Friends of Lake Wingra have advocated for the conservation of Lake Wingra, and the area immediately surrounding the lake has been used mainly for recreation since 1904 (MPPDA 1904).

Although the modern picture was taken in the fall, if it had been taken in the summer, the amount of people on the beach would not be nearly as many as the photo from the 1950s. The beach has fallen into disuse, and a sign on the lifeguard chair now says “No lifeguard on duty. Swim at your own risk”. The beach is also now roped off from public use because of algae and bacteria build up in Lake Wingra. Accumulation of weeds and slime can be seen on the shoreline of the current picture and the inordinate amount of geese that inhabit Lake Wingra and Henry Vilas Park may be to blame for the poor health of the beach. Since this area has been preserved since the turn of the twentieth century, the current condition of the beach’s health might be caused by urbanization and agriculture of the lake’s drainage basin, and not by disregard for the park and lake itself.

Lake Wingra has represented an area of recreation for the city Madison for over a century. The Madison area defines itself by its lakes, with many business names such as “4 Lakes Driving School” and “4 Lakes Plumbing”. The cultural meaning of this beach defines the
regional identity of the Madison area. This may be why Lake Wingra has been set aside, as a
preserve. Instead of filling the lake and marsh in, pride for Madison’s wetlands kept the area
relatively intact. The buildup of algae and bacteria is a cause of surface runoff, from the Wingra
watershed being urbanized, before Henry Vilas Park was established. Currently groups such as
the Friends of Lake Wingra are dedicated to preserving Wingra’s health and restoring the area to
its natural state.

Don Mitchell (2008) suggests that a landscape is formed by its use as a commodity or a
social act. The photographer, Arthur Vinje, made Vilas Beach into a recreational commodity by
framing the picture as he did. Vinje contributed to Madison’s social identity by advertising Lake
Wingra has a recreational area that the locals should be proud of. Perhaps our cultural identity
based on the lakes is a reflection of journalism and legislature specific to the area. A similar city
surrounded by many lakes may not identify with their wetlands, if the beaches and lakes are not
as well kept and highly promoted as Lake Wingra and Henry Vilas Park.

**Edgewood Drive**

Another important area on the banks of Lake Wingra is Edgewood Drive, a trail that has
been used since the late nineteenth century. A photograph taken of Edgewood Drive circa 1911
can be seen in Figure 5. The image shown in Figure 6 is approximately the same stretch of
Edgewood Drive in 2011. A landscape analysis, such as what Richard H. Schein writes about in
Research Methods in Geography (2010), was carried out and gives us some valuable ideas about
how land use strategies have changed over the past 100 years, even though the functional
infrastructure on that area did not.

First, the biological aspects of change. The species composition of the forest in the area
has changed from oak savannah to deciduous forest and shrubby undergrowth. The old oaks are
almost completely gone. The grasses present in the old photograph are not present in the new one, and have been replace by shrubs and woody plants. Some of these are invasive species are colloquially known as buckthorn. The road is now paved, and traffic signs mark the bridge. Not present in the new photograph is the cyclone fencing that has been erected to the right of the road to separate the drive from a nature trail that goes from the edge of road to the water of Lake Wingra.

Applying Lewis’s axioms for reading the landscape allows us to find potential cultural meanings embedded in this landscape. The mere presence of a bridge and a road through this place reflects both aesthetic and practical utility for the people that travel it. When the older picture was taken, this scene was on the outskirts of Madison. Travellers to the area most likely came by horse-drawn carriage, contributing to the wheel tracks visible in the dirt road. This was not a landscape meant for direct use. It is a place where people pass through; a peripheral landscape providing seasoning and backdrop to the well off people of Madison. It was most likely the point of first entry into the city by many travellers, who were welcomed to the city with vistas of one of it’s famous lakes. The surrounding area was prevented from burning, and so the oak savannahs were filled in by hard the wood deciduous forest visible there today.

Don Mitchell tells us to be mindful of the power inherently visible in certain landscapes. Not many landscapes could be more powerful than a municipal park/pleasure drive. This is an area where development is not allowed. It has been set aside for the people, much like Henry Vilas Park at the drive’s eastern terminus. If we consider the history of Edgewood Drive, we can see a story of shifting power balances within the city and neighborhood power structure. When the old photograph was taken, the drive was not surrounded by the urban areas that it is today (the Vilas and Wingra neighborhoods), and so it had no advocates besides the wealthy members
of the Park and Pleasure Drive Assn. After the automobile became very widely used and up until relatively recently, the pleasure drive was open to motor vehicle traffic. Motorists often used the drive as a shortcut between the Vilas neighborhood with its outlets to South Park street and the Monroe Street Neighborhood with its access to Highways 12 and 14. Traffic became too heavy for pedestrians to safely enjoy the drive. Since the drive was previously designated as a parkway, it was re-designated as such and motor vehicle traffic was prohibited. So we see a continuum of power in the city: 1. the Park and Pleasure Drive Association, with their considerable political clout, creates a parkway 2. industry and consumerist forces rise to power under a developmental paradigm, and the parkway is paved for motor vehicle use. Eventually the traffic becomes too heavy for pedestrians to safely use the parkway and 3. motor vehicles are banned from the drive by city authorities and preservationist/recreationists and recreational users flock to the area—it is now in the middle of a very family-oriented neighborhood and the drive and parallel nature trail and boardwalk is used by outdoor enthusiasts of all types.

Because of the dedication of several environmental conservation groups, Lake Wingra is currently a site of preservation of natural restoration. The Friends of Lake Wingra group advocates for the restoration of previously filled springs. An increase of natural hydrologic input into the lake would help sustain native aquatic life, and balance out the surface runoff that pollutes Wingra. Other goals of the Friends of Lake Wingra include reduction of the goose population, an increase in native plant life, and the elimination of carp (Friends of Lake Wingra, 2009).

It should be clear by now that a disproportionate amount of wetland degradation in Madison, and indeed, in the country as a whole, occurred before the emergence of reliable scientific understanding about the services and values wetlands provide for the ecosystem and
for nearby humans. National and state policies encouraged deleterious attitudes toward wetlands with subsidies and tax incentives for filling in potentially valuable wetland ecosystems. Ecology as we know it did not begin to appear in scientific and policy-decision discourses until at least three decades after some of the wetlands in our study area had been permanently destroyed. The local attitudes towards wetlands were congruous with national trends and regarded wetland areas as nuisance areas in need of reclamation for commercial purposes. The important difference between the position of Wingra wetlands and others in the area is the prevalence of institutionally owned land in the area. The numerous parks along the north shore of the lake were built in a spirit of altruism and civic pride in order to beautify the city. The “unattractive” land that was wetlands was converted to attractively-designed parks and recreation areas, and used as an asset for the residents of Madison. On the South shore of Lake Wingra, the University of Wisconsin Arboretum precludes most potentially damaging development actions. The progressive ideals of the University in having a research area and nature reserve in the Arboretum are writ on the land and in the relatively healthy state of the Lake.

**Fit with National Narratives**

The arc of narratives that shaped the landscape around Lake Wingra fit well with the known evolution of National attitudes as reflected by an analysis of federal and state regulations over time. The city was founded during a time of westward expansion and pioneering spirit, when wetlands appeared to be unproductive wastes of land. During this period, filling in wetlands to utilize the land was a noble cause, and many went about the task with great enthusiasm. In the 1920s, a new land management ethic began to form, mostly around use of wetlands for recreational hunting. The science of ecology began to inform how people regarded wetlands, and began to suggest that wetlands may be useful as they were. In the 1960s, amid a
burgeoning Environmental movement, a more informed respect of natural ecosystems began to emerge, culminating in policy protections of wetland areas for public health and safety. Today, many wetlands have been degraded by actions of a scientifically unsophisticated past, and many restoration projects are put in the position of fixing mistaken decisions of earlier generations.

_A Tale of Local Narratives_

While local narrative generally brought about similar actions in the end, the motives for carrying them out were different than the motives behind wetland-adverse regulations. We have traced back the narratives surrounding the Lake Wingra Wetlands to pre-settlement times, when the marsh beds were and important hunting and wild rice production area for Native people living in the area. Settlers moved into the area with characteristic exuberance for improving the land. The Wetlands may have had a different fate if not for shrewd political maneuvering to declare the city the capitol of a newly minted state. As the city filled with intellectuals come to work at the State University, and wealthy industry leaders and politicians to settle around the gleaming new capitol building, a distinct planning policy began to form around the unusual geography of the city. In a spirit of city beautification and altruism, a powerful group of wealthy gentlemen worked tirelessly to put aside the most scenic lands near the city, creating parks and scenic areas for the use of all of Madison’s citizens. These scenic areas were greatly loved and respected by citizen and foreign dignitary alike. The wetlands that were filled around Wingra ultimately did become useful to the inhabitants of the city, but not in an ecological sense. The landscape around Lake Wingra is one of institutional power and decision-making; most is set aside for non-industrial use, and the place is richer and more loved for it today. Now the focal point of many rime neighborhoods in the city, the institutional preservation of aesthetic rather than economic ideals has paid off, creating a landscape that nearby residents have great pride in.
Many of the formative changes in the landscape in our study area occurred before some very important scientific discourses could provide alternative evidence for the utility of wetlands. Now, we are put in a position of adjusting our policy and landscape to something that fits better with current understandings about the value of wetlands. Our results suggest an aspect of landscape production that is not often considered; the aspect of temporal context. Any number of landscapes could realistically have been overlain on the wetlands. The discourses at the time dictated all too well a narrative of reclamation for economic production. If the state had not been admitted to the Union when it had, and the capitol city started growing up adjacent to Lake Wingra, the landscape might very well be composed of cornfields and barnyards, or of rail yards and factory grounds. Likewise, if a scientific understanding of the ecological services provided by wetlands had emerged in time to inform city development, there may be a wider extent of marshy areas within the study area today. As it stands, the Lake and surrounding area is no worse for the landscape forming decisions made long ago, but it is important to remember that our everyday landscapes are largely products of the influential power of time, and Lake Wingra is an excellent example of that principle.
Figures and Illustrations

Figure 1. 2011-2012 Duck Stamp

“White-fronted Geese” by artist James Huntsman.

Federal Duck stamps have become collector's items due to their artistic merits.
Figure 2: Timeline

Trends in Federal and State Regulations Regarding Wetlands

“Swamps and wetlands were once considered wasteland, undesirable, and not picturesque. But as the people became more sophisticated, an appreciation was acquired that swamps and wetlands serve a vital role in nature, are part of the balance of nature and are essential to the purity of the water in our lakes and streams.”

- 1972 Supreme Court Ruling in Just v. Maricote, 1972

1850 Swamp Lands Act

1929 Migratory Bird Conservation Act
1934 Migratory Bird Conservation Stump Act
1937 Federal Aid to Wildlife Conservation Act
1950 Federal Aid in Fish Restoration Act
1972 Clean Water Act
1981 NL 391 (WI) 1981
2001 NR 101 (WI) 1981

1850 Reclamation
1930 Conservation
1960 Restoration
1980
2000

“The states have come to view drainage, when it extend beyond the boundaries of the private land owner, as a public function. If the 77 million acres [east of the Rockies mountain] of wetlands were drained, they would provide homes for 1925,000 families.”

-Hen. James Wilson, US Sec. of Agriculture 1897-1913

Damaging to wetlands
Figure 3. Vilas Beach 2011. Holly Elmer.

Figure 4. Vilas Beach 1950. Wisconsin State Journal (Wisconsin State Historical Society)
Figure 5. Edgewood Drive circa 1911, From Nolen

Figure 6. Edgewood Drive 2011. Holly Elmer.
Figure 7. Map of the extent of our study area
Resources and Bibliography


Hawbaker, Todd J., Volker C. Radeloff, Murray K. Clayton, Roger B. Hammer, Charlotte E.


Lewis, Pierce K. Axioms for Reading the Landscape; Some Guidelines to the American Scene. 1-12.


Madison Park and Pleasure Drive Association. *Reports of the officers of the Madison Park and Pleasure Drive Association for the year ending April 15, 1902 with report of the annual meeting and banquet held April 15, 1902*. 1902. 15 Nov 2011.

<http://digital.library.wisc.edu/1711.dl/WI.ParkDrive1902>.

Madison Park and Pleasure Drive Association. *Annual reports of the officers of the Madison Park and Pleasure Drive Association for the years ending December 31, 1920, and December 31, 1921, respectively, with reports of annual meetings held May 16, 1921,
and April 25, 1922. 1921-1922. 15 Nov 2011.

<http://digital.library.wisc.edu/1711.dl/WI.ParkDrive192021>.

Madison Park and Pleasure Drive Association. Annual reports of the officers of the Madison Park and Pleasure Drive Association for the years ending December 31, 1924, December 31, 1925, and treasurer's report to November 15, 1926 with reports of annual meetings held May 5, 1925, and May 12, 1926. 1924-1926. 15 Nov 2011.

<http://digital.library.wisc.edu/1711.dl/WI.ParkDrive19242526>.

Madison Park and Pleasure Drive Association. Reports of the officers of the Madison Park and Pleasure Drive Association for the year ending April 14, 1904 with report of the annual meeting and banquet held May 2, 1904. 1904. 15 Nov 2011.

<http://digital.library.wisc.edu/1711.dl/WI.ParkDrive1904>.


<http://digital.library.wisc.edu/1711.dl/WI.ParkDrive1906>.


*Wetlands: Their Use and Regulation* (Washington, D. c.: U.S. Congress, Office of Technology
