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Influences on public support for green infrastructure: an examination of urban wetland restoration in post-Katrina New Orleans

Lynette C. Overholser
Louisiana State University and Agricultural and Mechanical College

INFLUENCES ON PUBLIC SUPPORT FOR GREEN INFRASTRUCTURE: AN EXAMINATION OF URBAN WETLAND RESTORATION IN POST-KATRINA NEW ORLEANS

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By
Lynette C. Overholser
B.S., The Ohio State University, 2000
M.L.A, Louisiana State University, 2008
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Abstract

The research examines patterns of likely support for urban wetland restoration in the Greater New Orleans area. Through multi-variate statistical analysis of responses derived from an original survey of homeowners in New Orleans, key factors are identified that explain variation in residents' willingness to accept such areas and their perceptions of ecological benefits associated with a theoretical wetlands restoration design for the Gentilly area. Further, the analysis determines the extent to which direct experience with Hurricane Katrina may influence public support for this and other green infrastructure projects. The results of the data collected show that many people in New Orleans understand the beneficial functions of wetlands overall, and in an urban setting. There is a trend that shows citizens would like to live in such created wetland/urban habitats. Those who went through the experience of Hurricane Katrina were more likely to have favorable inclinations toward urban wetlands. Implications of the results can be used by coastal planners and the stakeholders of coastal or flood-prone areas. Planners can design green infrastructure projects based on how the public views wetlands, especially following major disasters when the public may be more likely to support such changes.

Introduction

Many urban coastal communities have risks for flooding equal to that seen in New Orleans, Louisiana during and immediately after Hurricane Katrina. Risk factors include hurricanes, coastal land loss, and global sea-level rise (Clark et al. 1998; Dolan and Walker 2004).

The catastrophic flooding following Hurricane Katrina opened a new dialogue concerning green infrastructure in New Orleans. Experts agree that soft landscape solutions, such as restored hydrological systems, incorporated into the city, partnered with the traditional hard solutions such as levees and floodwalls would provide residents with greater levels of protection (Waltham 2005).

Urban areas need to include elements of nature in the urban fabric, both for the "ecological services" provided and the aesthetic properties. It has been found that green infrastructure provides services to improve the quality of life in urban areas through improved air quality, noise reduction, and carbon sinks. Wetlands also can provide important habitat to support biodiversity, even in urban areas (Bolund and Hunhammar 1999). The authors state that city planners and politicians need to understand the services provided by natural areas within the urban setting and the importance of incorporating protection and conservation within these areas into planning efforts. However, they did not examine the informational needs of the public, who are also stakeholders in the design of their city.

In recent years views on recovery and flood control have shifted within the scientific and political realms as well as among members of the public to consider alternatives beyond the traditional engineered projects (Brabham 2006).

Green infrastructure re-introduced into flood-prone cities shows promise for mitigating flood risks. There is a trend toward participatory design, with interdisciplinary solutions being a valuable tool for new design efforts in the post-Katrina era (Brabham 2006). Restored urban hydrological systems in particular can bring benefits to water quality, habitat creation and preservation, and increased recreational opportunities for residents.

The aforementioned analyses informed the research objectives of this study, to determine levels of likely support for urban wetland restoration among stakeholders in flood-prone coastal areas, specifically New Orleans post-Katrina. The research questions addressed by this study are as follows.

> What is the likely level of support among residents of New Orleans toward a hypothetical urban wetland restoration plan?
>
> What factors account for variation in support of such a hypothetical design?
>
> What kinds of specific benefits do these residents believe restored wetlands would bring to the area, and which benefits are seen as most important?

To find answers to these questions a hypothetical design was created for residents to view and help them consider how wetlands could be restored in the city. A survey about the design was administered to residents and results were analyzed.

Historic Need for Flood Protection

The catastrophic flooding following Hurricane Katrina created much discussion and debate on the issue of rebuilding the city. The debate includes how much should be rebuilt, who is to fund the process, and also how best to incorporate natural processes into the reconstruction. Many scientists and scholars have provided input into discussions of what went wrong with the levees and city planning for such flooding to have occurred (Fischetti 2001; Travis 2005; Waltham 2005; Kates 2006). Some even predicted future similar catastrophes (Burkett et al. 2003). The discussions opened a new dialogue concerning "green infrastructure" in New Orleans. As New Orleans will continue to use the current drainage system (Colten 2002), experts agree that "soft" landscape solutions for flood control probably should be incorporated into the city along with the traditional "hard" solutions such as levees and floodwalls. The proposed research will look at the public's support of a soft landscape solution of urban wetland restoration, using a survey based upon similar work concerning green infrastructure conducted in other major metropolitan areas of the U.S.

New Orleans faces problems with water management on a regular basis, not just when hurricanes make landfall. The historic "back swamp" of New Orleans was a wetland vegetated mainly by cypress, which was logged and drained for the timber and to make way for city expansion. The city overtime has also incorporated a system of levees and floodwalls to separate the urban infrastructure from the river and lake, to prevent storm surge and other natural flooding (Burkett et al. 2003).

According to Casagrande (1997) proposed restoration of wetlands (or any ecological habitat) must introduce benefits to humans, in order for the effort to be accepted by the public and ultimately successful. If only non-human species are considered, people will not support changes in the urban infrastructure and projects will fail. The failure to include human preferences will result in restoration being carried out mostly in areas with less population density (Casagrande 1997). One can see this already happening prior to Hurricane Katrina with restoration of wetlands occurring in places such as Barataria Bay, where there is little development (Day et al. 2000). Post-Katrina, wetland restoration schemes have been focused in undeveloped areas surrounding the city, such as Bayou Beinvenue (WRMP 2008) which is beyond the city limits. Wetland greenspace incorporated into the city can be beneficial for stormwater alleviation, water quality, habitat, and recreation purposes. However, will the public support restoration of such greenspace?

Related Research

Hydrology/ Wetlands

There still is no one exact definition of wetlands in the literature. Definitions often differ depending on the user, whether scientific or for litigation purposes for example. The widest recognized best definition is that of land having a presence of water during at least part of the growing season, soils that differ from surrounding land, and vegetation adapted to wet conditions. This definition encompasses many types and sizes of wetlands, many of which differ in function in the landscape. Wetlands in the United States have been lost, for various reasons, to the estimated amount of 53% from the time of European settlement to present day (Mitsch and Gosselink 2000). This can be explained as historically wetlands have been considered to have little to no or even negative value to society, this results in loss of wetlands from unchecked destruction (Turner et al. 2000). Land used for agriculture or urban development has been seen to have a higher value than that of wetlands, resulting in the drainage and conversion of wetlands to these other purposes (Adger and Luttrell 2000). Wetlands have also been seen as negative in value as they can harbor disease, such as malaria (Maltby 1991). In the past draining was the best protection available against spread of such diseases. It is for the above stated reasons wetlands have seen a major loss throughout the United States.

Presently, wetlands are known to have an important role in the environment, and a shift in attitudes shows they should be managed and conserved as such (Maltby 1991). Some of the values wetlands have to humans include fish and timber harvest, aesthetics and recreation, wastewater treatment, flood control, and buffers

to storm surge (Mitsch and Gosselink 2000). In urban areas, where many natural watershed systems have been changed and paved over, water must find a route. If the shape of a watershed is changed the route changes, but in urban settings water often only has the option of evaporation (Thompson and Sorvig 2000). Wetlands incorporated into the urban fabric would help alleviate the issues related to watershed changes. In an urban setting wastewater treatment (including runoff from oils and pesticides) and flood control should be the most important criteria for wetlands, but it is a societal determination of how much the value is weighed.

Wetlands can be utilized as a replacement for costly treatment of wastewater, agricultural runoff, and non-point source pollution. According to Mitsch and Gosselink (2000) "wetlands can be sinks for almost any chemical." This function can be of great value based to many in society. In urban zones wetlands are successful at assimilating phosphorus and nitrogen and can take in oils, salts and pesticides. They can also be used for wastewater treatment for urban areas, utilizing the high nutrients and organic matter that open water cannot (Mitsch and Gosselink 2000). In coastal Louisiana wetlands have been used as wastewater treatment systems and succeeded. Studies have also shown that these wetlands have stimulated vertical accretion, aiding in restoration. These wetlands can be a source of economic savings if used instead of traditional treatment facilities (Day et al. 2004).

With the values of wetlands now being seen in a more positive light it may be easier to gain consensus among stakeholders for increased wetland protection and restoration projects.

History of New Orleans Flood Control and Wetlands

New Orleans was originally settled on the high ground of the natural levee of the Mississippi River. The surrounding areas were inundated with wetlands and bayous. Well before 2005 the original settlement had expanded to Lake Pontchartrain, creating an urban grid with man-made canals to carry water out of the city (Colten 2002).

During the settlement of the city in the 1700's, health authorities proclaimed stagnant waters of the cypress swamps surrounding New Orleans brought disease to the inhabitants. Also, the low levels of the land did not allow for water to drain, from rains or floods, which the city wanted to change. By the 1840's the city had invested in drainage systems and canals (which have since changed location) to help drain the city of stagnant waters. These canals were created in order to move water from the urban infrastructure north to Lake Pontchartrain. However, winds and storms also brought water back through the canals from the lake (Colten 2005). This is one of the first examples of how a remedy to the problem of water in New Orleans created a similar problem to the one being solved. (Colten 2005)

By the turn of the 20th century, New Orleans had established a better drainage system. The city was able to reach further north into the low swamplands and urban structures followed. There still were problems for citizens concerning rainwater flooding and high groundwater levels. This changed in the 1920's when the drainage system was much improved and groundwater levels could be taken down even

more, allowing for the city to drain and proceed with greater development (Colten 2005).

From the 1920's to the pre-Katrina present New Orleans expanded and drained wetlands as technology improved and as the city needed. Wetlands were not seen as valuable until the late 1970's, by which time the city already stretched to encompass most of Orleans Parish (Lewis 2003).

During the entire history of New Orleans levees and floodwalls were expanded and raised higher with every new flood threat and flood (Hallowell 2005). Originally, private landowners had built levees by their own means to protect their property. This resulted in variation in flood control and flood creation from one property to the next. The government took over levee building in the early 1800's through the U.S. Army Corps of Engineers acting as the control (Colten 2005). The citizens of New Orleans came to rely on the levees as flood control of the river and lake and were complacent about potential risks. Historic expansion of floodwalls, loss of wetlands, and the massive force of Hurricane Katrina were the catalysts which caused breaches in the levees people relied so much on and created major flooding within the city (Waltham 2005).

Green Infrastructure

According to Benedict and McMahon (2002) green infrastructure is "an interconnected network of greenspace that conserves natural ecosystem values and functions." This is a step beyond the idea of open spaces and parks scattered throughout urban areas. It is one that can potentially create wildlife corridors and

functions, such as stormwater drainage. It utilizes more soft features in the landscape instead of hard, built features. It also is the idea of pairing development and growth with planning for environmentally sound connections. Green infrastructure can be natural or restored ecological features in the landscape.

Green Infrastructure can have many benefits for humans and wildlife. Introducing such systems into the urban fabric also can incorporate trees, other vegetation, and wetlands, which can promote cleaner air and healthier water systems. Such greenspaces can be very beneficial to human health, not only through the purification of air and water, but to psychological health as well (Benedict and McMahon 2006). Urban areas are still subject to the natural setting in which they were developed (Platt 2006). Incorporating green services into the city can help the city to be safer by working with the natural hazards and threats it faces. According to an American Forests (2002) report, since urban communities are always in a state of flux, planners need to incorporate green infrastructure, and when they do so the benefits to the health of the community may increase substantially. The question arises as to what factors may influence support for the creation or restoration of green infrastructure?

Attitudes Toward Green Infrastructure and Wetlands

One factor may be a more "pro-environmental" orientation toward community planning and policy issues. According to research conducted by Dunlap and Van Liere (1978, 2008) predictors of a general, more "pro-environmental" orientation include age, education, and political ideology. They found that younger and more

educated persons are more favorable in attitude toward pro-environmental issues. The researchers also found that persons with a liberal political attitude favored pro-environmental issues, versus those with more conservative political attitudes.

In a study conducted by Bright, et al (2002) it was found that positive attitudes toward restoration tend to be correlated with a person's values, and negative attitudes are correlated with emotions. This study was conducted in the greater Chicago area, to determine the public attitudes toward ecological restoration of native grasslands within urban and urban-influenced areas. The study involved three parts or goals of the authors, which they divided into cognitive, affective, and behavioral factors of attitudes toward ecological restoration. The authors created a set of criteria and a questionnaire, based on their other published works and research by other authors. It was found that correlation of media attention to the issues surrounding ecological restoration in the Chicago area around the time of the survey has had the potential to change the way people view the matter.

Concerning urban wetlands as green infrastructure, Joanna Burger (1998) conducted a study, via surveys, on resident's perceptions of environmental issues along the New Jersey shore. The goal of the study was to determine how people used the wetlands, specifically estuaries, and how they wanted to continue to use these public goods, in an effort to create a management plan for the area. The author sees value in public opinion for managing coastal ecosystems within an urban environment due to the large human populations that exist in coastal areas. Questions were posed under the headings of demographics, recreational use,

problems of the environment, and land-use issues to determine how people viewed the surrounding estuaries. In this case, fishing and hunting were the most popular uses for the estuarine environment. The author also found that the public is concerned with the health and well-being of the estuary and New Jersey shore. Overall the people surveyed wanted to be part of the planning process for this area and were concerned that it stays a healthy, functioning environment.

In the same time period as the study in New Jersey, surveys were being conducted in the United Kingdom about wetland restoration (Rispoli and Hambler 1999). Through their surveys, the authors found people to be more accepting to wetlands and restoration than had been in the past, specifically, "more substantial than previously thought". It can be concluded that the public may be willing to explore the alternative solutions for wetland restoration and/or the solutions for stormwater issues and other wetland strategies. The authors found that education on biological processes of wetlands influenced to public attitudes, and continued education probably would encourage more widespread acceptance of conservation and restoration of wetlands and greenspace.

A few years later the Hudson River Valley was a focus of a study of public support of restoration (Connelly et al. 2002). A random mail survey was conducted with 3000 residents of the Hudson River estuary receiving the questionaire. Questions in the survey fell into six categories as follows; level of knowledge of issues, human/nature relationships and beliefs, degree of public support, willingness to pay for restoration, environmental activism, and sociodemographic

characteristics. The results of the surveys found the broad goals of restoration in the area to be supported overall, more so than specific implementation plans which were discussed in the area. It is also of particular note the authors determined that individual's beliefs and past behaviors were more accurate indicators of their responses than sociodemographic characteristics.

Compare the above studies to those in Europe in the Syr Valley of Luxembourg (Schaich 2009),where the author surveyed people living in the riparian area of the Syr River in order to measure how people viewed riparian landscapes and restoration efforts. It was found that the majority of respondents supported conservation and believed that humans have primacy in the landscape [over nature]. The floodplains in this area were seen as slightly threatened by the survey respondents. The trend was that respondents were in favor of restoration of the floodplain. This trend toward support or restoration is consistent in the wetland restoration studies looked at above, as well as the greenspace study in the Chicago area.

The author of the study in Luxembourg also found a considerable portion of those surveyed who thought restoration would increase problems with mosquitoes or also that the restoration would be too expensive. This suggests that there may be fears held by the general population concerning wetlands. It also raises questions where the money would come from to enact restoration, in which the author did not speculate. Education is still necessary for persons to understand the benefit of greenspace, specifically wetlands, to human populations.

After Hurricane Katrina many studies were conducted in effort to help the population of the city of New Orleans to recover. The University of Wisconsin-Madison conducted a research project headed by Herb Wang in 2007 for such a reason (WRMP 2008). Students studied New Orlean's Holy Cross and Lower Ninth Ward neighborhoods for the purpose of helping the neighborhoods in future efforts of restoration to the Bayou Bienvenue Wetland Triangle. As a part of this project surveys were conducted with residents in the area to determine their knowledge and concerns. As stated in their report, only 36 persons completed the survey. Of interest to the subject of this paper, Wisconsin students asked, "How important do you think wetland restoration is for the long-term survival of New Orleans?" with the response being almost 49 percent answering important or very important. Another interesting question asked of the Lower Ninth Ward residents was if they felt there was anything negative with wetlands being close to their community. Only 11 percent of those asked had negative thoughts on neighborhood wetlands.

A Design for Restored Urban Wetlands in New Orleans

After Katrina laid siege to New Orleans, discussions centered on the failure of design of the city. Design encompasses more than just the physical infrastructure, but also the public protection, government involvement, and economics of risk abatement (Brabham 2006). Environmental degradation had occurred in the form of levying the river for protection, draining wetlands, and creating canals to carry water away from the city (Fischetti 2001). According to Costanza et al. (2006), "Prevention [of the flooding from Hurricane Katrina] would have been much cheaper and more effective than reconstruction." Reconstruction is what must be done now, and we can learn from this "mistake" to invest in preventative measures now rather than reconstruction again in the future. Prevention of future disasters will also protect against major loss of life as was seen during Hurricane Katrina (Costanza et al. 2006).

Due to the loss of wetland ecosystems as New Orleans grew, levees and floodwalls were constructed to replace to the function of flood control. As the wetlands continued to decline, flooding increased, and more flood control structures were created which grew larger in size, monetary commitment, and governmental control. Such structures are not as cost-effective as the natural system, but there is not a built-in method of value for wetlands in our economic system (Maltby 1991). As a result of urbanization in major cities water quality, flows, and health of the watershed are all changed negatively. Costly systems have been utilized to offset these effects, instead of a method following nature, which would be preferable (Platt

2006). New Orleans is no exception to this rule; in fact it has made its situation far from natural, creating much urbanized land in New Orleans, which is below sea level.

So how does the city determine what is the best means of natural disaster protection? One measure that was enacted quickly was the establishment of zones in which criteria governs how high homes must be elevated for homeowners to be awarded flood insurance. The government obviously is involved in the rebuilding, and the community should be as well. The environment, social structure, and engineered sector should all be incorporated with input from the citizens (Brabham 2006). Thanks to Mitsch and Gosselink (2000) we know "wetlands stabilize water supplies", which is good for flood and drought balance. They also cleanse polluted waters, recharge aquifers, and have rich species diversity. Because we know the properties, we also know that wetlands being restored in New Orleans would be good aid to future flooding problems, but do the citizens know and support this?

Huppes and Midden (1991) discuss different strategies to encourage wetland protection. One such strategy is communication. The authors note psychological experiments where communication aided individuals of groups to act in the best interest of the whole. In New Orleans, once the benefits of storm surge protection and pollution abatement can be widely communicated to the individuals, they will likely act accordingly to protect the resource that protects them. This can only work if the group of persons involved is small enough to feel a connection with others to work for the common goal. Due to the widespread loss to neighborhoods and

people, there is a point of interest to bind people to work for the common goal of survival and protection. In the study conducted of environmental issues on the New Jersey shore people surveyed expressed interest in being included in the planning process (Burger 1998). In that geographical area they were concerned with continued health and function of the estuarine environment.

In response to the issues created and highlighted by Hurricane Katrina a hypothetical design strategy was created to communicate an example of how wetlands could be reincorporated within the city of New Orleans. Research and design for the strategy was carried out under the assumption that New Orleans will have protection of floodwalls and levees, as well as pumping stations, which were in place prior to Hurricane Katrina, strengthened as per the Corps of Engineers plans.

Of interest for the strategy was the extent of former marshland and waterways of historic New Orleans (Appendix 1). Present elevation data and maps of the flooding that took place following Hurricane Katrina were studied to find areas that were and are most affected by deep water (Appendix 2). When the data was compared it was found that the areas flooded due to the hurricane were all areas that had been marshland. Studies of the city where conducted to determine which neighborhoods were most likely to repopulate. Elevation and flood maps were reviewed as well as a map of damaged structures from Hurricane Katrina (Centineo 2006; ESRI 2006) (Appendix 2 and 3). Also a section elevation of New Orleans was reviewed to see where low-lying areas could become an issue.

Through the aforementioned process of map and data study a planning area was decided upon in which to develop a wetland restoration design. The criteria for selecting the planning area was as follows:

1. The area needs to be in former wetlands or "back swamp" of the city.
2. It should be in an area that has at least some land below sea level.
3. It should have had a high percentage of damaged structures reported from Hurricane Katrina.
4. It needs to be large enough for a wetland strategy to be able to be a noticeable impact on the area.
5. It is preferred to not be the Lower Ninth Ward, due to the great amount of publicity and discussions of uncertainty of that area, which occurred directly after the storm, as well as the sensitivity toward the citizens to the damage and publicity.

The hypothetical design strategy, based on the above criteria, was determined to be in the area of New Orleans known as Gentilly. The area has the borders of Lake Pontchartrain to the north, the Industrial Canal on the east, I-610 on the south, and London Avenue Canal on the west. It fits very well with the criteria for an area of study, as can be noted in the following description. This area of the city had been described in historical maps as cypress swamp, and today contains some of the lowest lying areas of the city. Development of the area started in 1909 through World War II. Original development was along the Gentilly Ridge, the higher ground in the area built by bayou overflows (Campanella 2002). The neighborhood was

made more desirable by the means of floodwalls, drainage and lots being built up with soils (Lewis 2003).

Gentilly was hit hard by the storm surge from Hurricane Katrina. The area had flooding in excess of 10 feet. Preliminary data and maps prepared shortly after the event showed many of the homes and other structures to be "unsafe structures" (Appendix 3) (Centineo 2006).

Figure 1. Designation of Neighborhood for Study

Designs of the wetland features were based mainly on the topography, as well as connections with existing canals and current roadways where possible. For the purpose of this study, homes in the area were not inventoried as to whether they were razed, empty and occupied, or rebuilt after the flood, in other words the design of wetland placement was not influenced specifically by housing status. Design was influenced by research of wetlands, sustainable design theory, New Orleans history, and ecological principles (McHarg 1969; Ewel 1990; Hey and Phillipi 1999; Mitsch and Gosselink 2000; Thompson and Sorvig 2000; Turner et al. 2001; France 2002; Shubart 2004; Hallowell 2005; Howell 2005; Kelman 2006). The overall ideas compiled from other research and studies informed the design, other than the aforementioned related research, although there is nothing specific to be cited.

Land mass of the wetlands, as well as landscape features were designed as can be seen in figure 2 and 4. Sectional views and potential images of the interactions of design features to the existing landscape were also created as can be seen in figure 5.

The wetlands have two designations of deeper water areas that would stay wet consistently and a marginal wetland area that would fluctuate in wetness and vegetation depending on season. Buffers of wooded areas and the increased use of trees create visual and spatial transitions from city block to wetland. Major roadways are continued over the wetlands in the form of causeways, elevated roads, which South Louisiana is no stranger. Two semi-major roads will be connected

across the wetlands as pedestrian only access. All other roads end at the wetlands, with some rerouted when needed to keep connections to homes.

Figure 2. Urban Wetlands and Changed Roadways in Gentilly.

For this design certain streets in Gentilly will need to be removed or rerouted to accommodate the new urban wetlands. Homes also will need to be removed. Many of the homes in the areas designated for retention wetlands are deemed unsafe

structures, and are in need of removal according to maps developed post-Katrina (Centineo 2006). The assumption for design was that those houses would (or could) be removed by the funding for unsafe structures or eminent domain. The major roads in Gentilly will remain in their present course, although they will be elevated over the wetlands they cross. Major roads running in the north-south direction are St. Bernard Avenue, Paris Avenue, Elysian Fields Avenue, Franklin Avenue, and Press Drive. Major roads running in the general east-west direction are Leon C. Simon Drive, Robert E. Lee Boulevard, Filmore Avenue, Mirabeau Avenue, Gentilly Boulevard, and Chef Menteur Highway.

Concentrated sections of the design were determined for a focus study of the design in order to further examine the potential of urban wetlands in the area (as seen in Appendix 4). A portion of Gentilly, or a case-study, was selected for having properties such as considerable changes in topography, high density of homes, and interesting properties of major roads running through the area, figure 3. The section was designed first to deal with movement of roads through and around the wetlands. After the designation of wetland was determined soft landscape features were designated on the plan to give it a more tangible impression for those viewing the design, figure 4. Following the design of the case-study, a longitudinal section of landscape features was created to further illustrate connections to those observing the design, figure 5.

Figure 3. Map of Case-study Area Within Designated Area

Figure 4. Map of Case-study Showing Soft Landscape Elements

Figure 5. Sectional View of Interactions Between Humans and Wetlands

Data and Methods

Survey To Gather Information About Likely Support

A survey was created based on the hypothetical design to determine support for such a design. The survey was modeled after the survey found in the paper "Public Attitudes Toward Ecological Restoration in the Chicago Metropolitan Region" (Bright et al. 2002). In this study a large finding was that positive attitudes toward restoration were correlated with person's values, and negative attitudes were correlated with emotions. The conclusions of the authors shed some light on what to look for in a study of New Orleans. The survey in that paper looked at overall attitudes toward restoration, perceived outcomes, objective knowledge, value orientations, emotional responses, behavior pertaining to outdoor activities and conservation, and issue importance. Borrowed for this study of New Orleans were the general topics of perceived outcomes, objective knowledge, and issue importance. The other topics were omitted for the practicality of the survey and goals. Added to this study were questions pertaining to likely support of the hypothetical design. The authors' survey method influenced the design of the survey presented to those in New Orleans and was a major inspiration to its being carried out.

The study by Burger (1998) on New Jersey estuaries also was used to inform the survey. The author of that study found that people wanted to be part of the planning process to watch for a healthy environment. The persons questioned in New Jersey were a captive subset of the population, similar to that which would be found in New Orleans, post-Katrina. Findings in Luxembourg of participants wanting a

change in the riparian area back to a more natural state along with the recognition that humans had caused much change in the natural system guided the questions for those in New Orleans to see if persons living in this area also felt similarly.

Perceived outcomes were based on what the participants thought would happen if the hypothetical design were to come about. Questions were both positive and negative in outcome, asked in a yes, no, or not sure form. Objective knowledge questions were based on a true/false 5-point Likert scale. Those questions were designed to test what participants already knew about the topics associated with the hypothetical design. Issue importance looked at the issues of wetland restoration and green infrastructure, also based on a 5-point Likert scale, from not important to very important. Likely support also used a 5-point Likert scale and asked the participant how likely they would be to support the hypothetical design for different scenarios, such as raised taxes and home relocation.

The Louisiana State University Institutional Review Board approved the application for exemption of the survey, with the number E4702 in September of 2009, so the author was able to conduct the surveys as desired. This exemption approval can be seen in Appendix 8.

In the months of August, September, October, and November of 2009, neighborhood associations in New Orleans were contacted, via email by the author, requesting a place in their meetings for presentation of the design and for surveys to be completed (Appendix 5). All the associations that comprise the Gentilly area, a total of 20, were contacted as well as many more found outside the study area, but

few responded. Assumptions could be made as to why there was low response. Such as the associations are still too busy with recovery efforts, as one association member communicated. It could also be assumed they are not happy to be responding to yet another set of questions from someone outside their neighborhood, as was pointed out to the author by a community volunteer. In other areas of New Orleans it was found that there was tension and confusion when young students (as the author would be assumed from the emails representing herself as a graduate student with LSU) worked on redevelopment plans (Reardon et al. 2009). This may explain why some groups did not respond to the initial invitations to hear the presentation about restored wetlands and participate in the survey process.

Neighborhood Association Survey Participants

The associations that participated are Edgewood Park Neighborhood Association, Bywater Neighborhood Association, and Mid-City Neighborhood Organization. Edgewood Park is the only one of the three associations that is located in the Gentilly area of New Orleans. The other two associations are comparable in urban density and population. Mid-City has a similar risk from flooding as those associations found in Gentilly. Comparatively Bywater is on higher ground along the natural levee of the Mississippi River, so they are not at such risks as the other associations. A map with the three neighborhood associations and the area of Gentilly highlighted can be found in the Appendix 6, following the main text of this paper.

Edgewood Park is located in the south central region of the study area. Its borders are Gentilly Blvd., Clematis Ave., Peoples St., and I-610. In the late 1720's Mathurin Dreux was allowed a large of land for services to New Orleans as a militia officer. The land he chose covered much of the area of Gentilly along Gentilly Ridge, which was the desirable higher ground and was used as plantation land. The land passed through his family line for a few generations. It was not until the 1900's – 1930's that development of the area became concentrated. Pontchartrain Railroad, which ran from the river to the lake through the Gentilly area and Gentilly Terrace neighborhood (which includes Edgewood Park), created interest to develop along its corridor as well as the high ground of the ridge. At this time the pumping system was drying the wetlands, making more land available to be developed. (City of New Orleans, 2006a)

Edgewood Park is approximately 222 acres. The housing found in the area is mostly mixed single and double family homes. There is also a small bit of commercial development, mostly street-front smaller businesses. (City of New Orleans, 2006a)

This neighborhood has active meetings throughout the year. The presentation and survey were both conducted by the author at the September 2009 meeting on the fifth. There was a relatively small turnout of participants at the meeting, between 20 and 30, with only 11 surveys returned to the author for evaluation.

Bywater Neighborhood Association can be located at their website; http://bywater.org/. Physically Bywater is located along the Mississippi River, with

other boundaries being included in the area to Florida Avenue, and Elysian Fields to the Industrial Canal. Small bits of blocks and varying streets make it too many to report finite boundaries, but they can be seen in the map of neighborhood associations following the main text of this paper (Appendix 6).

The Bywater area was a plantation from 1794-1859. Then land was broken and sold into 795 lots, which created a neighborhood in that area. By 1836 the area was known as Fouburg Washington, renamed Bywater in 1947, which has remained the name to this day.

The neighborhood saw almost no flooding, due to it being in the area of natural levee along the river. Participants to this meeting had an assumed different perspective than those of Edgewood Park because of the lack of flooding in the neighborhood. This association is quite active. The author attended the October 2009 meeting on the thirteenth of the month, which had a large crowd, upwards of 50 participants. A total of 36 surveys were returned after the presentation of the plan.

Mid-City Neighborhood Association is found in the middle portion of the city midway between the river and the lake, which helps explain its name. Its boundaries are Orleans Avenue as well as Toulouse and St. Louis on one side, City Park Avenue, the Pontchartrain Expressway (I-10) and Broad Street. The association can be found through their website; http://mcno.org/about-mid-city/.

Until the 1890's Mid-City was known as the "back of town" of New Orleans. At this time pumping stations were incorporated into the fabric of the city, and

development followed in the Mid-City area. When the streetcar was built along Canal Street the neighborhood became an even more desirable place in which to live. This prosperity and strength of neighborhood lasted until the 1960's when the streetcar was taken out and buses were the mode of public transportation. The neighborhood went through a period of homes being subdivided and apartment buildings replacing older homes and facilities. The neighborhood has seen a revitalization (as many areas of the city and other large cities have) of single-family homes and the streetcar once again passing through on Canal Street. The neighborhood did experience damage and flooding due to Hurricane Katrina and has since been moving forward to restore and continue on the track of revitalization that began before the hurricane. (City of New Orleans, 2006b)

Mid-City has an active neighborhood association, as do the other associations, and were active prior to Hurricane Katrina. The author attended the November 2009 meeting on the second of the month with a large audience of around 30 or more participants. However large the attendance was, there were only 16 total surveys returned for use in the study. Mid-City had flooding during Hurricane Katrina comparable to that in the study area, whereas Bywater did not have much flooding during the storm.

Surveys Administered

During the months of September, October, and November in 2009, the design was presented to the three neighborhood associations in the Greater New Orleans area, by the author. The presentations took place during the general meetings of the

associations. Presentations were limited as much as possible to presenting the facts of the design. No potential benefits or harms were presented, so as not to bias the audience for the purposes of the survey. The design was presented as being based on topography and major roadway and human connections, as well as facts of what the symbols of maps represented. The design was described as an example of what could be done in any part of New Orleans, or any flood prone coastal area. The design was presented to the captive audience by the author, followed by the printed boards being passed around among the participants so each person had a non-obstructed view of the project. The audience was also allowed a question and answer session following the presentation. Some members brought up subjects of benefits and harm of the design, which the author attempted to answer without biasing the audience.

Following the presentation, the audience was asked to fill out a survey based on the design and modeled after the survey questions found in the paper "Public Attitudes Toward Ecological Restoration in the Chicago Metropolitan Region" (Bright et al. 2002). When the presentations were completed, a total of 65 surveys were used for the purposes of this paper. See Appendix 7 for complete set of survey questions.

Data Derived from Survey

Once completed, the presentations yielded 65 total surveys. Broken into the specific neighborhoods 11 were from Edgewood Park, 38 from Bywater, and Midcity contributed 16 to the total. The data from each survey was coded by number and

for the response to each question. Demographics were coded either in a fashion of one for yes and zero for no, or given a numerical weighting such, as in the case of higher education, depending on the form of each question. Those questions using 5-point Likert scales were weighted in the manner of negative end of the spectrum of responses equaling one and positive end of the spectrum equaling five. Negative and positive were determined by the author in terms of wetland success or attitudes. Non-Likert scale questions were also coded for positive and negative reactions, using number two for positive yes or no answers, one for answers of unsure and zero for negative yes or no answers.

Methods

In order to find answers to the research questions the data from the survey was analyzed using different methods. Data was processed using SPSS (Statistical Package for the Social Sciences) 15 and 17 in the months following the surveys. Some questions were aggregated from the survey by simple unweighted summation. For other responses frequencies were determined in order to give a better understanding of reactions to the hypothetical design. In order to construct a dependent variable, several questions from the survey concerning support for the hypothetical plan were tested for correlation and then aggregated. Independent variables were constructed from the survey responses. Once the independent variables were decided upon and aggregated if necessary, a multiple regression analysis was conducted to determine which potential influence factors are more associated with likely support for restored wetlands. Table 1 is a data table showing

the dependent and independent variables used in the multi-variate linear regression model.

Table 1. Variables Used in Multi-regression Model

Variable	Data Source	Indicated By:	How Coded
Dependent Variable			
Likely Support	Survey	Section 3, Questions 3-6 Section 5, Questions 3 and 4	Likert Scale, 1-5
Dependent Variable Index	Survey	Likely Support Questions above	Unweighted Summation
Independent Variables			
Demographics			
Age	Survey	Age Range	1 = 18-24, 2 = 25-34, 3 = 35-54 4 = 55 +
Highest Degree Earned	Survey	Educational Status	Indicated by 1 - 9 Low to High
Knowledge of Wetlands	Survey	Section 2, all Questions	Unweighted Summation
Connections with Nature	Survey	Demographics, Connection with Nature	Unweighted Summation
Extent of Katrina Experience	Survey	Demographics, Experience with Hurrican Katrina	Unweighted Summation, minus “no direct experience”
Belief the Plan is Practical	Survey	Section 5, Question 2	Likert Scale, 1-5

Findings

Research Question 1 Findings

The first research question toward understanding support posed "What is the likely level of support among residents of New Orleans toward an urban wetland restoration plan?" Six questions were determined to have wording strongly weighted toward support for wetlands, those answering positive on these questions would show support for urban wetlands. Those questions were the following:

> Do you think you would like to live in a neighborhood with green infrastructure and urban wetlands?
>
> How important are wetlands, or wetland restoration to you?
>
> How important do you feel wetlands are to human wellbeing or existence?
>
> How important is it to you that wetlands exist in an urban setting?
>
> How important is it to you that green infrastructure exists within the city so that future generations can enjoy the associated benefits?
>
> How important to you is green infrastructure in your neighborhood?

The six questions all were based on a 5-point Likert scale with one being the negative end of the scale, or "not at all" or "not important", and five representing the positive end of the scale, or "very" or "very important". An answer of three represents "somewhat" or "some importance" for a person's attitudes toward the questions. Based on the scale, respondents answering four or five on the questions are assumed to show support of the design or the idea of it. As can be seen in Table 2, many respondents were supportive of wetlands and greenspace in the city.

Dependent Variable:

To create a Dependant Variable for use in the regression model, the above six questions were combined to determine a support index. The resulting dependent variable index will also be referred to as “support for restored urban wetlands” from this point on. Using SPSS, Pearson correlations were run to determine if the questions were indeed answered in the same fashion by participants, and were found to be highly correlated.

Table 2. Frequencies of Response for Six “Support” Questions

Question	5 very important	4	3 some importance	2	1 not important
How important are wetlands, or wetland restoration, to you?	56.1	17.5	22.8	1.8	1.8
How important is it to you that green infrastructure exists in the city so that future generations can ejoy the benefits?	47.5	27.9	18.0	3.3	3.3
How important do you feel weltands are to human wellbeing or existence?	45.9	27.9	18.0	6.6	1.6
Do you think you would like to live in a neighborhood with green infrastructure and urban wetlands?	43.9	26.3	22.8	5.3	1.8
How important to you is green infrastructure in your neighborhood?	41.0	27.9	26.2	4.9	0.0
How important is it to you that wetlands exist in an urban setting?	28.3	25.0	38.3	3.3	5.0

valid percent used

Research Question 2 Findings

The second research question was posed "What factors account for variation in support of such a hypothetical design?"

Independent Variables

The dependent variable, support for restored wetlands, was used in a multi-variate linear regression model with several independent variables constructed from the survey to determine which factors are most associated with high likely support for restored urban wetlands. The independent variables are drawn from related research and are:

- Age
- Highest degree earned
- The sum of participation in nature activities
- The sum of all questions on knowledge of wetland (and New Orleans wetlands) issues
- Extent of experience with Hurricane Katrina
- Belief that urban wetlands are practical

The regression analysis found that experience with Hurricane Katrina and the belief that wetlands are practical were the two factors that were significantly associated with high levels of likely support. The other factors were not significant in explaining variation in support for urban wetlands.

As one can see in table 3, having experience with Hurricane Katrina and pro-environmental attitudes were found to have the most influence on support for the hypothetical design.

Table 3. Regression Model Output

Total Variance Explained

Independent Variables	Standard Coefficients (Beta)	Sig. (2-tailed)
Demographics		
Age	-.147	p = .436
Highest Degree Earned	-.226	p = .112
Knowledge of Wetlands	-.047	p = .765
Connections with Nature	.102	p = .558
Katrina Experience	.326*	p = .095
Plan is Practical	.494***	p = .001

Model Significance: p = .006
n = 65
R^2 = .414
Adj. R^2 = .305

*** p ≤ .025
** p ≤ .05
* p ≤ .10

The model is significant with a p value of .006. Factual knowledge of wetlands is not significantly associated with support for the design, as one might expect based on earlier research (Bright et al. 2002).

It is difficult to quantify responses by neighborhood, due to the amount per association participating in the survey were smaller than 50. There are, however, trends that start to form when looking at the responses of higher support for wetland restoration. Table 4 provides the example per association what percentage of participants showed high support in answering 5 or 4 on the survey.

Table 4. Percent of High Support by Neighborhood

Question	Association	High Support (5 + 4)
How important are wetlands, or wetland restoration, to you?	1	44.4
	2	76.5
	3	71.4
How important is it to you that green infrastructure exists in the city so that future generations can ejoy the benefits?	1	55.5
	2	76.5
	3	78.6
How important do you feel weltands are to human wellbeing or existence?	1	75.0
	2	72.2
	3	76.5
Do you think you would like to live in a neighborhood with green infrastructure and urban wetlands?	1	50.0
	2	51.4
	3	58.9
How important to you is green infrastructure in your neighborhood?	1	62.5
	2	83.3
	3	64.7
How important is it to you that wetlands exist in an urban setting?	1	51.0
	2	72.2
	3	70.6

Association; 1 = Edgewood Park, 2 = Bywater, 3 = MidCity

As can be seen in the table, there is a trend in three of the support questions, that group one, Edgewood Park, are clearly less supportive of the hypothetical design and idea of urban wetland restoration. The three questions are as follows;

1. How important are wetlands, or wetland restoration, to you?
2. How important is it to you that green infrastructure exists in the city so future generations can enjoy the benefits?
3. How important is it to you that wetlands exist in an urban setting?

The other three questions do not show this trend. Edgewood Park is within the boundaries of the hypothetical design, where the other two groups are not, which

may account for this trend. The table with full results per neighborhood can be seen in Appendix 9.

A summary of the dependent variable index using SPSS, comparing answers to demographics, of age, gender, home ownership, married vs. single, and highest degree earned, showed there were no significant differences when looking to the mean and median index responses. In other words, demographics do not appear to be associated with likely support for restored wetlands. No other tests were run with demographics.

Research Question 3 Findings

The third research question asked "What kinds of specific benefits do these residents believe restored wetlands would bring to the area, and which benefits are seen as most important?" To answer this question frequencies of positive thoughts of the hypothetical design were reviewed. A set of statements was established to determine how each participant thought the design would affect the area and persons living there. Such questions included "it would improve the quality of life of local residents", "it would increase property values in the area", and "it would alleviate stormwater flooding". Many of the statements were found to have a higher percentage of positive responses associated with them. The resulting data shows the portion of the post-Katrina population that feels wetlands have positive outcomes for the urban setting in which they live. Questions were asked for responses of "yes", "no", and "not sure". For data processing in SPSS the questions were coded two for yes, zero for no, and one for not sure. It was assumed that someone who is unsure of

their answer to be able to be more favorable to the design than those who are convinced of a negative answer to the question, such the weighted values assigned as they were. Looking at the questions that were positive in kind toward wetlands, frequencies were run in SPSS to find the data found in Table 5.

Table 5. Frequencies of Perceived Benefits of Urban Wetland Restoration

Positive Design Thoughts - statements based on hypothetical wetland restoration	yes	no	unsure
It would increase the amount of wildlife and their habitat.	80.7	5.3	14.0
It would create a healthy/healthier ecosystem(s).	78.3	5.0	16.7
It would provide much needed greenspace in the city.	70.7	8.6	20.7
It would make the area more visually attractive.	70.0	8.3	21.7
It would create places for people to engage in outdoor recreation such as fishing and boating.	66.7	6.7	26.7
It would increase local recreation.	64.4	6.8	28.8
It would alleviate stormwater flooding.	54.2	11.9	33.9
It would improve the quality of live of local residents.	52.5	11.5	36.1
It would increase property values in the area.	43.3	15.0	41.7
It would prevent ecological disasters.	40.7	13.6	45.8

As found by the frequencies, respondents had positive thoughts on what the wetland design could do for their city and neighborhoods. Those unsure of the outcome of the hypothetical design for each statement may be swayed with more exposure and education of the issues. Of note were the answers to the design creating a more visually attractive space and providing needed greenspace in the city. It was found that 70 percent of those questioned believed these two statements to be so, while only eight percent thought these statements to be wrong. While 20 percent of those surveyed were not sure if the statements were so, it is far more valuable to note the disproportionate numbers of those positive and negative in attitude toward the statements. As a comparative measure, the idea of the design

increasing property values in the area had quite a different outcome. Only 43 percent felt urban wetlands would increase the property values, 15 percent did not think property values would increase and 41 percent were unsure. This is quite a different response than those of the previously discussed questions. It shows that people are not sure that others will value wetlands or that they are truly as desirable.

Discussion and Conclusions

Wetlands restored in the urban fabric of New Orleans will not replace the function of the expanse of cypress swamps that once filled the area. The city will still be prone to floods from major catastrophes such as the flooding related to Hurricane Katrina. The design strategy for the Gentilly neighborhood in New Orleans was created to be an added benefit to the city for many different reasons. It is one option to help alleviate the reliance of the city on pumps to deal with flooding, stormwater runoff, and pollutants and excess nutrients. It could incorporate beauty of nature into the city, providing a habitat for animals and native plants as well as a place for humans to reflect and recreate. This type of strategy can be applied as an example to other areas of the city for rebuilding as well as other flood-damaged or flood prone coastal communities throughout the world. The design presents a viable alternative for greenspace to the people of New Orleans who wish to continue to make it their home. Overall the city may be a safer and more beautiful place to live if this strategy were to be implemented.

The results of the data collected show that many people in New Orleans understand the beneficial functions of wetlands overall, and in an urban setting. There is a trend that shows citizens would like to live in such created urban wetlands habitats. Those who went through the experience of Hurricane Katrina were more likely to have favorable inclinations toward urban wetlands. Based on the linear regression model it was found that education as measured by highest degree earned does not appear to be associated with support for restored urban wetlands as was supposed from other research on environmental issues. It was

found that individual's feelings that wetlands are practical in an urban setting are associated with support for the design. Public education will be necessary to continue to build support for urban wetlands among residents in coastal communities. The public must be educated concerning the benefits and services that wetlands can provide to themselves, wildlife, and the city as a whole in order to support restoration efforts. The other factor associated with higher levels of likely support of wetlands was that of living through the trauma of Hurricane Katrina. This suggests that given a catastrophic event, people may be more willing to support green infrastructure, possibly to mitigate damages from future large-scale disturbances. City planners then may have a window after catastrophes in which to gain public support for new or enhanced green infrastructure projects.

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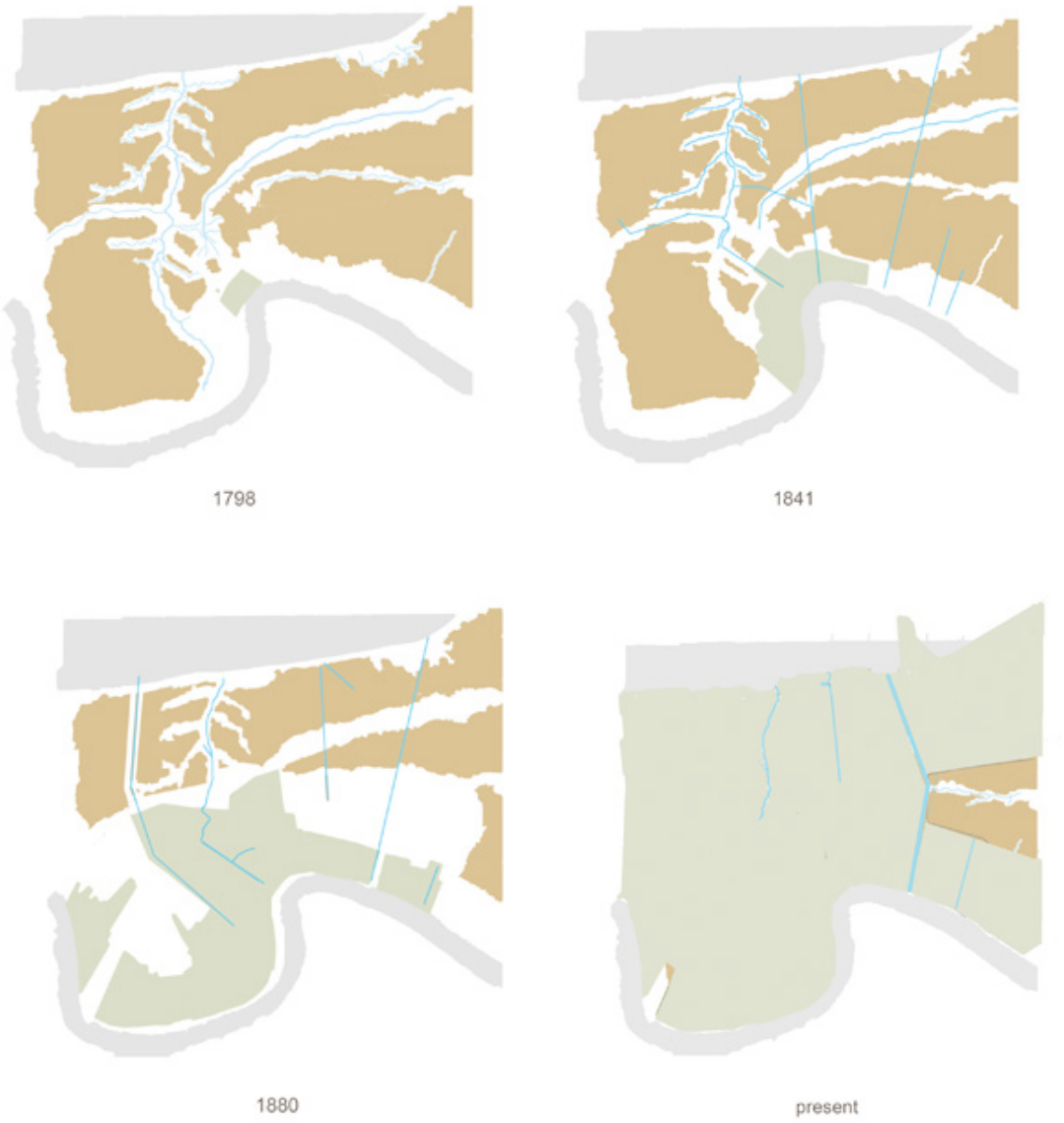
Appendix 1. Maps Representing New Orleans Development 1798 - Present

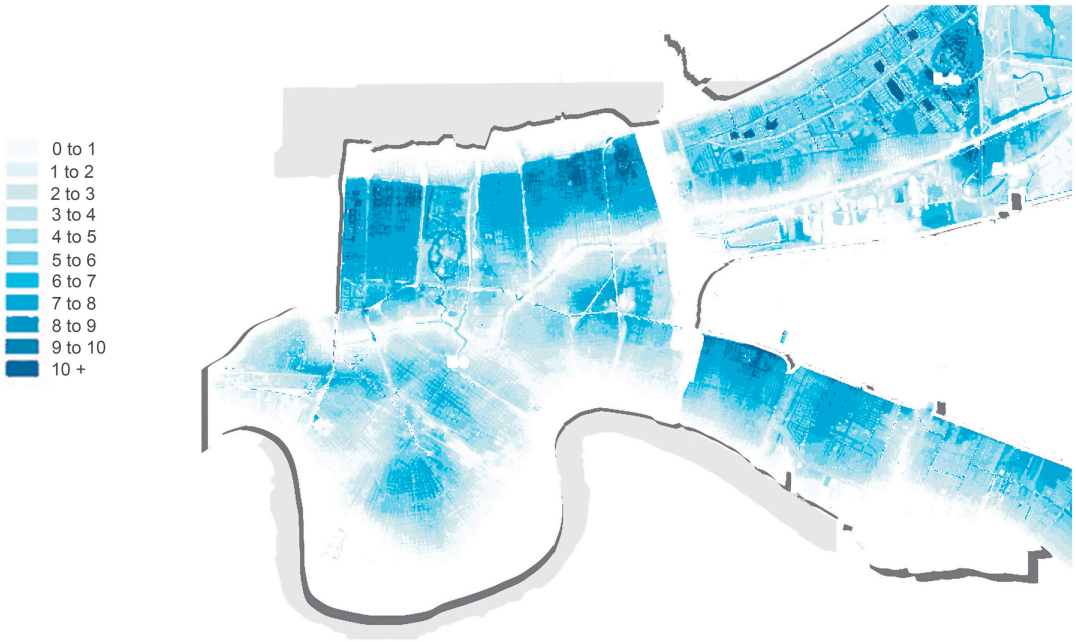


Brown = back swamp, blue = bayous and canals, green = developed land

*some areas on maps were not defined, therefore blank spaces are seen

Appendix 2. Maps of Elevation and Hurricane Katrina Related Flooding

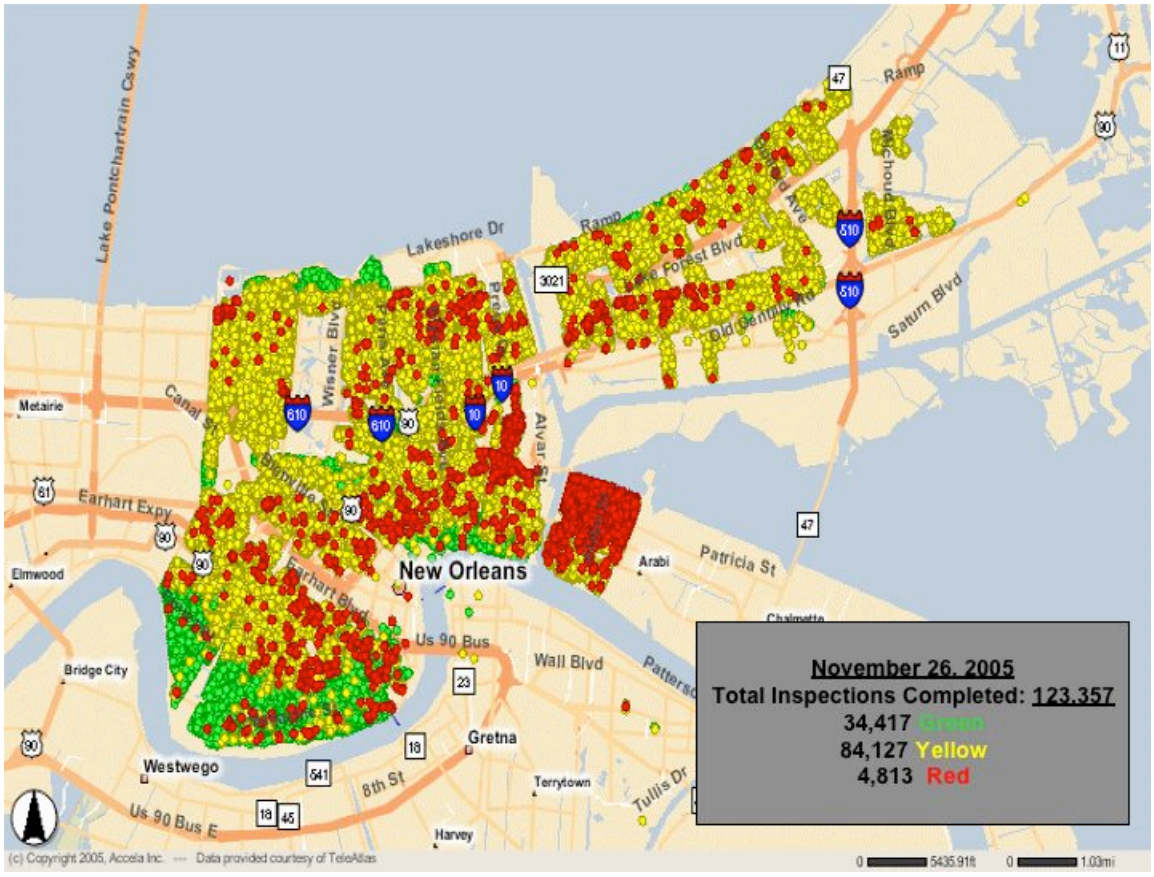
Elevation in Meters



Flood levels from Hurricane Katrina, in feet

*Differences of measure for elevation and flood levels reflect the availability of maps for reference, left as such for accuracy.

Appendix 3. Assessment of Damaged Structures in New Orleans Post-Katrina



green = structures with minimal damage, yellow = limited re-entry access damage, red = unsafe structures

* courtesy Mike Centineo, director of New Orleans Department of Safety and Permits, 2006

Appendix 4. Map Designating Case-study of Design

Area in red denotes the boundaries of the case-study for design.

Appendix 5. List of New Orleans Neighborhood Associations Contacted

*contact information as found on various New Orleans websites as of fall 2009.

Gentilly area – Contacted, no response.

- Burbank Civic and Improvement Association
  President: Meg O'Connell
  Email: mego_connell@hotmail.com
  Blogspot: http://groups.yahoo.com/group/NewOrleansBurbankGardens/

- Filmore Gardens
  Meeting Facilitator: Fay Kaufman
  Email: fydaka33@yahoo.com
  There was an interesting note on the website with this information: "Fay is spearheading the post-Katrina reorganization of the association. Please contact her to join." Assume the association was not reorganized yet.

- Gentilly Terrace and Gardens Improvement Association
  President: Daniel Falk (as listed on GCIA website)
  Email: president@gentillyterrace.org
  Website: www.gentillyterrace.org

- Lake Oaks Civic Association
  President: Ann Duffy
  Email: annduffy@bellsouth.net

- Lake Terrance Property Owner's Association
  Meeting info: Robert Drouant
  Email: rdrouant@yahoo.com
  President: Joe Hassinger
  Email: jhassinger@gjtbs.com
  Website: www.laketerrace.net

- Milneburg Civic Association
  President: Shannon Blue
  Email: sblue001@yahoo.com

- Mirabeau Gardens Neighborhood Association
  President: Laurie Watt
  Email: nolawatt@cox.net

- Oak Park Civic Association
  Two listings for president;
  Kim Henry – khenry@essential98.com
  Nikki Najiola – n_najiola@yahoo.com

- Pontilly Neighborhood Association, Inc.
  President: Victor Gordon
  Email: vic33@bellsouth.net
  Contact Offices: pontilly@aol.com
  Website: www.pontilly.com

- [Gentilly] Sugar Hill Neighborhood Association
  Community Liaison: Barbara Blackwell
  Email: bblackwell@lajao.org

- Virgil Park Neighborhood Association
  President: Peggy Braud
  Email: peggyb504@yahoo.com

- Vista Park Civic and Improvement Association
  President: Angele Givens
  Email: givensfamily@bellsouth.net
  Blogsite: http://groups.yahoo.com/group/rebuild_vista_park

Gentilly Area - Contacted and had some correspondence, but no response to the question of conducting a survey with their group.

- Gentilly Heights / East
  They declined due to meetings only being for rebuilding efforts.

- Paris Oaks Association
  Email was undeliverable and I could not find another email listing.
  Email used: akerry@bellsouth.net

- Seabrook Neighborhood Association
  President: Al Aubry
  Email: pgaubry@aol.com
  Contact: seabrookassociation@yahoo.com

- Gentilly Heights / Voscoville Neighborhood Watch
  Coordinatior: Gwendolyn Hawkins
  Email: gwenhawk59@yahoo.com
-
- Indian Village Neighborhood Association
  President Lynn Lee
  Email: llee@entergy.com

Other New Orleans, Louisiana Associations Contacted with No Response

- Lakeview Civic Improvement Association
  President: Brad Fortier
  Email: bfortier@lakeviewcivic.org
  Website: lakeviewcivic.org

- Lakewood Property Owner's Association
  Contact: lakewoodcontact@gmail.com (listed for all officers, etc.)
  Website: http://www.lakewoodns.org/
  Website has not been updating in quite awhile.

- Lake Vista Property Owners
  Contact: board@lakevistapropertyowners.com
  Website: www.lakevistapropetyowners.com

- Bouligny Improvement Association
  President: Nell Carmichael
  Email: nellcarm@hotmail.com
  Website: www.boulignyassociation.org

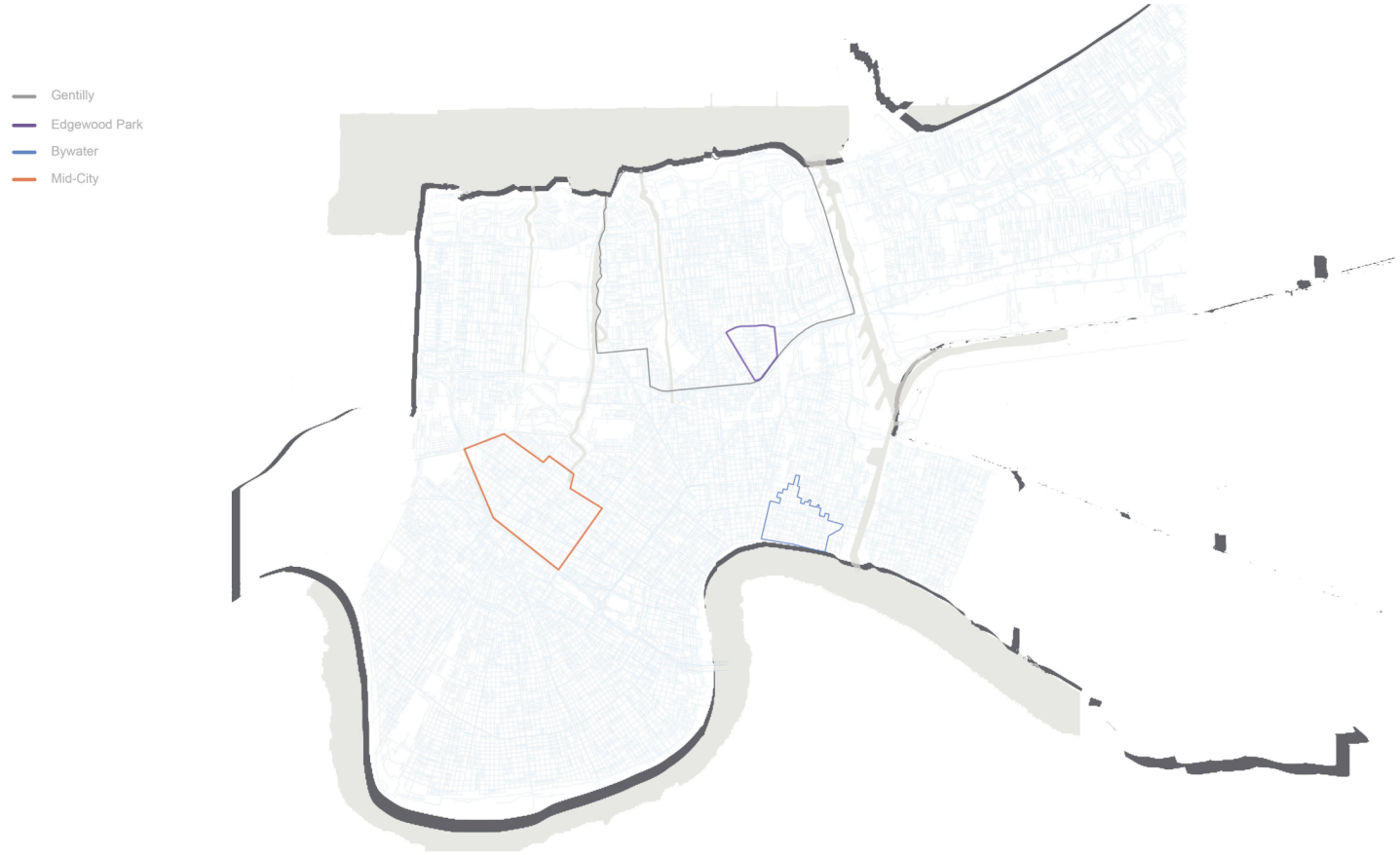
Organizations that responded in a positive manner and presentations were conducted.

- Edgewood Park Neighborhood Association
  Gentilly Area.

- Bywater Neighborhood Assocation
  Area along the river south of the French Quarter and Marigny.

- Mid-City Neighborhood Organization
  Central region of New Orleans.

Appendix 6. Boundaries of Neighborhood Associations Surveyed



Appendix 7. Survey Distributed to Neighborhood Associations

Please circle your answer for the following background information.

Age Range:
18 - 24 25 - 34 35 - 54 55 + over

Family / Household Status :

Marital Status:
single married or long term partners

Family Members living with you, please circle all that apply:
a. Dependent Children
b. Adult Children
c. Siblings
d. Parents

Home Ownership:
own rent

Gender:
female male

Ethnicity, please write in:

_____

Educational Status:
a. no diploma
b. high school diploma or GED
c. some college, no degree
d. Associate's degree
e. Bachelor's degree
f. some higher education, no diploma
g. Master's degree
h. Professional degree

Employment Status, please circle all that apply:
a. Not currently working
b. Part-time
c. Full-time
d. Volunteer
e. Student (please circle at least one from above also)

Time lived in the Greater New Orleans Area:
a. less than one year
b. 1 - 5 years
c. 6 - 10 years
d. 11 - 20 years
e. 21 -30 years
f. 31 + years

Experience with Hurricane Katrina, please circle all that apply:
a. No direct experience.
b. Stayed in New Orleans during the hurricane.
c. Evacuated New Orleans during the hurricane.
d. Suffered damage to home.
e. Lost a home.
f. Lost a home and rebuilt (or are rebuilding) on the same property

Connection with Nature, please circle all that apply:
a. Walking pets
b. Using urban park facilities
c. Camping
d. Boating, including canoeing and/or kayaking
e. Bird watching
f. Gardening
g. Hiking
h. Jogging

Please mark one answer for each statement from the following choices to the best of your knowledge.	definitely true	true	don't know	false	definitely false
1. Wetlands can filter wastewater.					
2. Wetlands reduce flooding and flood damage.					
3. Most of Gentilly was "cypress swamp" prior to European development.					
4. New Orleans is essentially bowl-shaped.					
5. Coastal wetlands help protect inland areas from storm damage.					
6. Wetland communities are highly productive ecosystems and support large numbers of plants, fish, and other wildlife species.					
7. Wetlands are not always wet.					
8. The confinement of the Mississippi River from levees contributes to increased flooding.					
9. Until the early 20th century, river control in New Orleans was by levees only.					
10. More than 70% of the world's population lives on or near coastlines.					
11. Wetlands can remove excess nutrients through their plants, which aids in the improvment of water quality.					
12. Levees keep rainwater within the city of New Orleans.					

Please mark one choice for each statement on your thoughts of the design.	yes	no	not sure
1. It would improve the quality of life of local residents.			
2. It would create a healthy/healthier ecosystem.			
3. It would prevent ecological disasters			
4. It would alleviate stormwater flooding.			
5. It would make the area more visually attractive.			
6. It would provide needed greenspace in the city.			
7. It would place too many restrictions on how land could be used.			
8. It would harbor disease.			
9. It would displace more people and/or homes.			
10. It would increase property values in the area.			
11. It would increase local recreation.			
12. It would increase the amount of wildlife and their habitat.			
13. It would create places for people to engage in outdoor recreation such as fishing and boating.			
14. It would raise taxes.			
15. It would create more flooding risk.			
16. It would dry up and not stay wet.			
17. It would increase traffic in the area once complete.			
18. A design such as this is not necessary as there are wetlands and wet spaces all around New Orleans.			
19. Restoring housing and infrastructure is more important, or more needed, that wetlands in this area.			
20. It should only be done if it would help prevent a disaster such as that associated with Hurricane Katrina.			
21. It should not be done if it would displace more people and/or homes.			

Please mark how strongly you feel about each item, based on the following scale; 1 being not important to 5 being most important.	1 not important	2	3 some importance	4	5 very important
1. How important is wetland restoration to you based on the following: a. Flood protection					
b. Water quality					
c. Recreation					
d. Aesthetics					
e. Species habitat					
2. How important is it to you that wetlands be preserved or restored so there is an option for their use in the future, even if there is no direct use?					
3. How important is it to you that green infrastructure exists within the city so that future generations can enjoy the associated benefits?					
4. How important is it to you that wetlands exist in an urban setting?					
5. How important do you feel wetlands are for human wellbeing or existence?					
6. How important to you is green infrastructure in your neighborhood?					

Please mark the following for how likely you would be to support the example in each case, based on the following scale; 1 being not at all and 5 being very.	1 not at all	2	3 somewhat likely	4	5 very
1. You would not need to do anything at all for such urban wetland restoration to occur					
2. Taxes would be raised.					
3. Construction would occur very close to your home.					
4. You would have to relocate your home.					
5. The neighborhood would be restructured.					
6. Traffic would be altered.					
7. Mosquito population would increase.					
8. Water quality would increase.					
9. Flood control would be better.					
10. There was habitat for wildlife that had not existed previously.					

Using the same scale as above, please mark your responses to each question.	1 not at all	2	3 somewhat	4	5 very
1. Do you feel it is more economical for wetlands to be sacrificed for urban and commercial development?					
2. Do you feel it is more practical for wetlands to be chosen over urban and commercial development?					
3. How important are wetlands, or wetland restoration, to you?					
4. Do you think you would like to live in a neighborhood with green infrastructure and urban wetlands?					

Appendix 8. IRB Application and Exemption

Application for Exemption from Institutional Oversight

Unless qualified as meeting the specific criteria for exemption from Institutional Review Board (IRB) oversight, ALL LSU research/projects using living humans as subjects, or samples or data obtained from humans, directly or indirectly, with or without their consent, must be approved or exempted in advance by the LSU IRB. This Form helps the PI determine if a project may be exempted, and is used to request an exemption.

Institutional Review Board
Dr. Robert Mathews, Chair
203 B-1 David Boyd Hall
Baton Rouge, LA 70803
P: 225.578.8692
F: 225.578.6792
irb@lsu.edu | lsu.edu/irb

- Applicant, Please fill out the application in its entirety and include the completed application as well as parts A-E, listed below, when submitting to the IRB. Once the application is completed, please submit two copies of the completed application to the IRB Office or to a member of the Human Subjects Screening Committee. Members of this committee can be found at http://www.lsu.edu/irb/screeningmembers.shtml
- A Complete Application Includes All of the Following:
  (A) Two copies of this completed form and two copies of parts B thru E.
  (B) A brief project description (adequate to evaluate risks to subjects and to explain your responses to Parts 1 & 2)
  (C) Copies of all instruments to be used.
  - If this proposal is part of a grant proposal, include a copy of the proposal and all recruitment material.

  (D) The consent form that you will use in the study (see part 3 for more information.)
  (E) Certificate of Completion of Human Subjects Protection Training for all personnel involved in the project, including students who are involved with testing or handling data, unless already on file with the IRB.
  Training link: (http://phrp.nihtraining.com/users/login.php.)

1) Principal Investigator: Lynette Overholser **Rank:** Graduate Student **Student*? Y/N** Y

Dept.: Environmental Sci. **Ph:** **E-mail:** loverh1@lsu.edu

2) Co Investigator(s): please include department, rank, phone and e-mail for each
* If student, please identify and name supervising professor in this space

Margaret A. Reams
Associate Professor
225.578.4299
mreams@lsu.edu

3) Project Title: Master's thesis title: Influences on public support for green infrastructure: An examination of urban wetland restoration in post-Katrina New Orleans

4) LSU Proposal?(yes or no) no **If Yes, LSU Proposal Number**

Also, if YES, either ○ **This application completely matches the scope of work in the grant**
OR
○ **More IRB Applications will be filed later**

5) Subject pool (e.g. Psychology Students) Louisiana adult residents

- Circle any **"vulnerable populations" to be used**: (children <18; the mentally impaired, pregnant women, the aged, other). Projects with incarcerated persons cannot be exempted.

6) PI Signature _____ **** Date** 09st. 2009 (no per signatures)

****I certify my responses are accurate and complete**. If the project scope or design is later changed I will resubmit for review. I will obtain written approval from the Authorized Representative of all non-LSU institutions in which the study is conducted. I also understand that it is my responsibility to maintain copies of all consent forms at LSU for three years after completion of the study. If I leave LSU before that time the consent forms should be preserved in the Departmental Office.

Study Exempted By:
Dr. Robert C. Mathews, Chairman
Institutional Review Board
Louisiana State University
203 B-1 David Boyd Hall
225-578-8692 | www.lsu.edu/irb
Exemption Expires: 9-9-2012

IRB# E4702 LSU Proposal# _____
☐ ☐ Complete Application
Human Subjects Training

Screening Committee Action: Exempted √ Not Exempted ___ Category/Paragraph 2

Reviewer Mathews **Signature** _____ **Date** 9/10/09

Appendix 9. Percent of Support by Neighborhood

Question	Association	5 very important	4	3 some importance	2	1 not important
How important are wetlands, or wetland restoration, to you?	1	11.1	33.3	55.6	0.0	0.0
	2	50.0	26.5	14.7	8.8	0.0
	3	50.0	21.4	21.4	0.0	7.1
How important is it to you that green infrastructure exists in the city so that future generations can ejoy the benefits?	1	33.3	22.2	33.3	0.0	11.1
	2	64.7	11.8	23.5	0.0	0.0
	3	50.0	28.6	14.3	7.1	0.0
How important do you feel weltands are to human wellbeing or existence?	1	62.5	12.5	12.5	12.5	0.0
	2	50.0	22.2	22.2	5.6	0.0
	3	29.4	47.1	11.8	5.9	5.9
Do you think you would like to live in a neighborhood with green infrastructure and urban wetlands?	1	50.0	0.0	50.0	0.0	0.0
	2	31.4	20.0	40.0	2.9	5.7
	3	11.8	47.1	29.4	5.9	5.9
How important to you is green infrastructure in your neighborhood?	1	50.0	12.5	25.0	0.0	12.5
	2	58.3	25.0	8.3	5.6	2.8
	3	23.5	41.2	35.3	0.0	0.0
How important is it to you that wetlands exist in an urban setting?	1	25.5	25.5	50.0	0.0	0.0
	2	50.0	22.2	19.4	8.3	0.0
	3	29.4	41.2	29.4	0.0	0.0

Association; 1 = Edgewood Park, 2 = Bywater, 3 = MidCity

Vita

Lynette C. Overholser grew up amongst the woods of Licking County, Ohio, where she gained an appreciation for the natural environment and its features. Particularly interested in wetland plants, Overholser sought and earned her Bachelor of Science in Landscape Horticulture from The Ohio State University in 2000. While there she earned a minor in natural resources and participated in wetland classes and limnological classes both on the main campus and at the Stone Laboratory facilities in Lake Erie. During this time she found there was a niche to be had in working with sustainable design to bring humans and wetlands together instead of keeping the two ideas separate. This realization brought Overholser to Louisiana State University in pursuit of a Master in Landscape Architecture, which she earned in 2008. While attending classes in that program, Overholser decided to enter a second program to pursue the degree of Master of Science in Environmental Science. She earned the degree in 2010 with concentrations in both wetland science and planning and management.