Visitor Outreach to Address Conflict at Marion County Park and Lake

Isaiah Euler, Kat Erckert, Bryce Hermann & Molly Worm

Rachel Shively

Dr. Shawn Hutchinson

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Introduction

Residents and visitors at Marion County Park and Lake may have conflicting opinions on how the park is utilized and managed. Through talking with the park manager early in the project, it became evident that one of the largest visitor use management issues is the discrepancy between how residents and visitors at Marion county lake would like to see the park utilized and managed. Some of the main issues that disagreements occur over include blue green algae and feeding wildlife.

Included in this report is a comprehensive literature reviews, methods used for outreach and surveys, survey results with data and analysis, and the conclusion of our findings. The data collected included general demographics and different questions directed to visitor and resident input. Through various outreach efforts including interpretive signage with QR codes and an online survey posted on Facebook, this project sought to address conflicting the desires of visitor use management. Public outreach can be used to find a better understanding of each group's desires. The objective of this study was to understand the desires of both residents and visitors to establish best use and management practices and visitor outreach strategies for Marion County Park and Lake.

Literature Review

The following literature review investigates the topics of visitor use management, cyanobacteria and its impacts, interpretive theory and design, and concludes with visitor outreach and data analysis. Visitor use management provides the foundation for many current park management strategies as well as strategies to combat commonly occurring

environmental and social issues within the park. One of those problems parks commonly face is that of cyanobacteria. Understanding the sources of pollution and their impacts on the environment could help reduce the reoccurrence of these issues.

As a result of eco-tourism and increased visitor use, interpretive theory and design was formed. This method of visitor use management has become a common management strategy among parks as it can be applicable in many forms (i.e., ranger talks, signage, activities, etc.). Many of these forms are used in current visitor outreach strategies. While there are various applications of outreach, recently parks have been switching to online resources such as social media pages. All of these elements combine in the literature review to enhance the understanding of our methodology in the implementation of this capstone project while highlight the importance of each topic.

Visitor Use Management in Public Parks

What is visitor use management?

In relation to public parks, the article *The Evolution of the Concept of Visitor Use Management in Parks* by Paul F. J. Eagles, defines visitor use management as a broad overview of dynamic uses and problems that pertain to the management of the public parks. An important aspect to visitor use management is the value that people assign to the public parks. There is a broad range of reasons that people may see parks as valuable, the primary one being recreation. Recreation comes from the Latin root “recreatio” and “recreare” which means “to refresh” and “to restore”. In the article, *Recreational Values of Public Parks*, Robert Manning and Thomas More claim that “recreation is widely seen as

having value at the level of both the individual and society" (Manning and Moore 2002) emphasizing the idea that public parks are beneficial for the individual and the society as a whole.

History of visitor use management

A range of management tactics have been employed, beginning with an authoritarian approach that only the privileged get to use the parks and only under strict authority. In contrast, a completely laissez faire approach led public parks to become over-utilized and run down according to Eagles 2001 paper *The Evolution of the Concept of Visitor Use Management in Parks*. Societal prosperity brought a piqued interest to visiting public parks in the 1960's and with this interest, came an increasing concern for the negative impacts both socially and environmentally. This led to the creation of the concepts Limits of Acceptable Change (LAC) and Recreational Opportunity Spectrum (ROS) as management responses. These concepts sought to define a set "carrying capacity" for the parks and to establish areas of recreation with a core of wilderness. A defined carrying capacity helps keep parks from being overcrowded and mistreated or under-utilized and under-maintained. These US born management systems soon spread globally. The blossoming popularity of public parks created the need for better financial management. Things like permits and licenses and more government policy became necessary. This began to create enough complicated work for full-time jobs, so, universities began creating park management programs. Eagles also mentions in the article that the increased government policy encouraged public parks to be run more like a business so they can become self-sufficient. This inspired public parks to focus more on public satisfaction. The article concludes with the overview of how public parks have evolved over the years and why it is important to maintain them.

Why is it important?

Visitor use management has a lot of importance mostly stemming from the value and importance of public parks. Manning and More in their 2002 paper address how public parks have a value far greater than what meets the eye, relating the importance of the public parks to public healthcare and education. A study done by Hung-Ling (Stella) Liu et al. (2019) showed a broad range of benefits derived from public parks. The list included benefits such as increased property value within a community, decreased crime, the perception of open space and community to name just a few.

Manning and More add to this list in their paper the more broad and general benefits such as recreation, aesthetics, and advantages like the intellectual and spiritual benefits that some can derive from public parks. In a separate paper, *The Public Functions of Parks and Protected Areas*, also done by More and Manning (2004) includes the idea that public parks have been set apart not only for public enjoyment, but also to preserve the surrounding environment. Further reasons that visitor use management is important are displayed in the 2012 article *The Negative Effects of Tourism on National Parks in the United States* by Lauren Finnessey. One of the central reasons that national parks are needed is to preserve areas of undeveloped nature. National parks are a great way for the public to have healthy interactions with nature and the parks can generate large amounts of revenue for its host state.

Specific challenges public parks face

There are many challenges in managing public parks that have adverse effects on nature, the park, and the public perspective. One of the major challenges in managing public parks is overcrowding and ecotourism. In Finnessey's 2012 article, she splits ecotourism in to two

main groups “soft ecotourists” and “hard ecotourists” explaining how soft ecotourists are known for their more egocentric tendencies and lack of desire to interact with nature, while hard ecotourists have a strong connection with the environment and desire to enhance the environment around them.

Feeding wildlife

It is the soft ecotourists with a lack of thought and concern for nature that are most likely the ones responsible for feeding wild animals which lead to many of its own problems. J.L.Marion addresses some of the issues behind feeding wildlife in his 2008 paper *Wildlife Feeding in Parks.* The danger in feeding wild animals stems from the fact that behavioral changes occur in animals when they are attracted to human food. These behavioral changes can cause wildlife to be attracted to dangerous and deadly situations including being exposed to “recreation sites where they are vulnerable to predators, hunters, poachers, dogs, or collisions with vehicles” Marion et al. (2008). Feeding wildlife can also lead to a dependence on human food which can be unhealthy for the animals, can lead to starvation in the off season, and has the potential to leave wildlife populations with an inability to provide their own food. The study proves that behavioral changes caused by feeding wildlife can affect more than just nature but can also affect human visitors. It is explained that "animals that receive human food rewards lose their fear of humans and can become nuisances to visitors, aggressive, and cause human injury and death” Marion et al. (2008).

Other visitor use management issues

Overcrowding is a common problem in public parks. Too many people lead to an accumulation of litter, overly disturbed wildlife and nature, and in some cases a dissatisfied public. Hans-Peter Rusterholz conducted a study in 2021 proving that when trampling occurs plant height, vegetation cover, and species diversity are all negatively affected. Another common issue that can be found in many public lands, stems from the overuse of fertilizers, pesticides, and the presence of contaminants such as heavy metals. The article *Heavy metal content in urban residential and park soils: A case study in Spokane, Washington, USA* by Carmen A. Nezat et al. (2017) focuses specifically on the issue of heavy metals particularly within urban soils and public parks. A lot of the heavy metals contaminate the soils by past and present use of things such as fertilizer, pesticides, construction materials, and wood preservatives.

How visitor use management looks today

Visitor use management has become increasingly difficult for public parks as the park management begins to face more complex challenges of providing enjoyment to a more diverse group of people. The article Perspectives on Visitor Use Management in the National Parks by Zachary D. Miller et al. (2017) addresses some of the basics about the emergence of visitor use management (VUM) and the National Park Service (NPS). Many of the challenges that arise in management of these public parks are due the fact that public lands can be common pool resources (CPRs). Common pool resources can be described by when one person using the resource limits the use for others. The public lands are considered a CPR, because overcrowding and overuse deteriorates the integrity of the resource. The National Park Service came to the “realization that protected area capacities cannot be established without a clear designation of the purpose and objectives of a site” Miller et al.

(2017). This realization led to the management-by-objective (MBO) framework that helps guide the purpose behind a particular park or protected area. These frameworks are becoming increasingly important as challenges with park management become more prevalent due to the extreme growth of tourists they have been receiving.

Visitor use management has evolved quite a bit over pas the past decade. It is important to continually push our next generation to "furthering our understanding of how we can best provide for outstanding, transformational experiences while protecting valuable resources" Miller et al. (2017). Many of these issues surrounding the need for visitor use management begins with educating the public. This will help provide awareness to law makers, donors to the park, and the general public with the hope that visitor use management will evolve to meet the ever-demanding needs of public parks.

The Background of Nutrient Pollution and its Harmful Impacts:

Sediment Trapping to Reduce Cyanobacteria.

What is Blue-Green Algae?

Cyanobacteria is simply a small bacteria that is commonly referred to as blue green algae. There are several types of these cyanobacterium and some can be toxic. Although not all are toxic, it is good to know that you cannot tell the difference from a toxic and non-toxic blue green algae. Blue-green algae that is toxic can cause harm to nearly anything that comes in contact with it. Although not always posing a huge harm, it can be deadly in copious amounts. In smaller amounts it can cause diarrhea, nausea, vomiting, skin and eye irritation, and other flu-like symptoms. It can affect animals and your pets just as well. Animals will

avoid drinking water that is discolored or has an odor like algae because it makes them sick as well. The best thing to do for blue-green algae is avoid it. However, if you are exposed it is not a huge deal untless you stay around (Pilotto et al., 1997).

Why Do blue-green algal blooms occur?

Blue-green algal blooms are typically caused by a sudden nutrient supply of the limiting nutrient which is usually phosphorus or nitrogen. In a freshwater ecosystem the limiting nutrient typically seems to be phosphorus (Huang et al., 2017). When these nutrients come under warm, anaerobic conditions underwater, they readily begin to bloom. The ideal growth environment for blue green algae is a calm body of water with enough nutrient to supply growth on warm sunny days over the temperature of around 75° Fahrenheit.

Nutrient loading from Geese

Geese have been blamed for part of the nutrient loading in the nutrient pollution of Marion County Lake. In a short study, a group had lay-flat polyethylene laid out in a more of a controlled environment and used mesocosms to do their research. They performed six mesocosms and found that the nutrients have little impact on water quality nor phytoplankton. By using this food web they can catch all the droppings in a small area but not catch the entirety of the lake (Unckless & Makarewicz, 2007). The results of this study are valid but not large scale. Their results have shown that in a short amount of time the feces will not have great impact on nutrient loading but there is, however, a great deal of evidence that over the long-term, the droppings can affect algal blooms and phytoplankton. In a large number, geese, ducks, and any waterfowl can add to the nutrient pool in the lake and the effects will be noticed relatively later than sooner.

Erosion and Soil Losses

Erosion and the loss of soil are two of the greatest contributors to algal blooms. Although not always noticeable, soil can travel a long way through the flow of water. When rainfall events occur, the water has to go somewhere and usually it is all accumulates in a tributary downstream. These flows of water pick up a lot of soil through dilution and carry that water with it into the tributary. For this reason, buffer strips, which we reference later, can come in as a great use to slow down the water flow and allow the soil to set down along with the nutrients in it before dumping into the lake or body of water. Erosion can occur anywhere there is not a strong enough plant ecosystem to hold the soil and therefore is very common.

Runoff

Studies show that where the runoff goes, almost perfectly linearly the sediment and nutrient go with it (Kirkby, 2010). Runoff can travel fair distances and it should be considered around any body of water that any entrance of water to the system should have the upstream contributors evaluated. Even small events like the clippings from the mower can be full of nutrients that they had extracted from the ground and during rainfall events in an unmown area all the way down to the water, will wash straight into the water and be broken down for nutrient.

Buffer Strips

These strips of permanent, unmown vegetation are meant to reduce the degradation of the soil structure and allow for healthier water sources. They do this by trapping sediment filled water and giving the nutrients traveling in the waterflow the ability to be deposited and infiltrated into the soil structure. These natural structures can be implemented into a reservoir

or recreational lake to prevent or reduce the travel of limiting nutrients the body of the water needs to produce algal blooms such as blue-green algae.

In a study done in the late 90's and early 2000's, it was shown that buffer strips could reduce runoff by up to 78% (Borin et al., 2005). This research also found differences between buffer strips and no buffer strips in soluble nutrient form running through water. This study also found the average amount of the nitrogen remained in the water regardless of the presence of buffer strips. Buffer strips don't necessarily take the nitrogen out of the water so the water that does make it through is still nutrient rich.

The optimal buffer strip is said to be around at least 10m long for good pollution control (Borin et al., 2005). This can be going all the way down to the water source or if in the case that fishermen want to go down to the bank and fish as it is so at Marion County, maybe a pathway could be mowed at the edge of the lake or rocks could be put in place after the buffer so they have an access directly to the edge of the water.

In the same study in the early 2000's in Italy, a test was differentiating buffer strip components and using a collection system to catch water and nutrients in which they then dried and measured to show the impacts of different buffer strips. They attained very great responses to buffer strips in which upwards of 70% of soil was settled, 70-98% of phosphorous didn't make it through, and 70-95% of nitrogen was taken in by the buffer strip before leaving the 6 meters of grass, shrubs, and trees. The only time that buffer strips allowed anything through was in high intensity rainfalls. The nutrients in the rainfalls are correlated to the amount of runoff. As shown, the phosphorus has a direct relationship with the amount of water runoff because it is adsorbed tightly to the soil and the water carries that

eroded soil straight to the lake unless it goes through a buffer strip and is allowed time to settle into the topsoil (Borin et al., 2005).

Nutrient Infiltration & Sediment Trapping

The infiltration of water is very important in getting rid of nutrient pollution. This seems like the simple way of putting it, however, it is really a key concept. By trapping sediments before reaching the water means you are slowing down the flow of water and therefore allowing nutrients to drop and incorporate themselves into the soil while also allowing for the percolation of the water. These are the key concepts of the buffer strip and although buffer strips do not always work for stopping all of the nutrient and water flow, they can reduce it by a fair amount. They do this in the buffer strip by causing a block or wall for the water. With enough vegetation in the way of the nutrient filled water, the momentum of the flow is slowed down immensely and even stopped with smaller rainfall events or wider buffer strips. This allows the soil time to soak up or absorb that water and the nutrients in it.

Phosphorous Loss Control

Phosphorus losses in agriculture to bodies of water can be limited through several practices (Sharpley et al., 2000). Phosphorus binds to soil very tightly due to its charge and therefore moves with soil very readily, so if water moves soil, then the soil moves phosphorous. There are many ways to reduce the movement of soil and there are many ways to reduce the loss of fertilizer. In phosphorus fertilizing, it is all about how it is applied. If a fertilizer is applied all at once on the top of the soil, a simple rain can wash it all into the tributaries or surrounding bodies of water and it does no good for the vegetation intended to use it nor the water bodies health. Other methods like applying fertilizer subsurface around bodies of water reduce the risk of runoff greatly.

Effects on Recreation

Cyanobacteria can have several adverse effects on lake recreation. The first and most common downside to a blue green algal bloom is the musty smell that can appear to be moldy or like rotten grass. This will turn visitors away in a hurry. Other ways it can be detrimental to a small lake is by decreasing the desire of the public to be on the lake and their want to bring friends to the lake. It can be harmful to people and their pets, so they keep them away. Some fishers like the peace and quiet on the lake without recreational boaters but it can also affect them because an excess amount of algae can also thin fish populations. The chance of getting sick is simply too much for a lot of people.

Perception of Buffer Strips

Buffer Strips aren't always favored by the public. Sometimes they are looked at as more of an annoyance because they sometimes block the view of the lake and can have aesthetic downfalls. However, sometimes they are actually very pretty and can bloom in the spring and be more aesthetically pleasing. Other concerns can be when they block fishing areas or don't allow for a fisherman to get down to the shoreline. This can very well be the case but also a counter view would be that if there wasn't a buffer strip in an area that needed it to reduce nutrient flow, there would be higher chances for algal blooms and fish don't typically enjoy high levels of toxic algal blooms.

The natural look has been found in a study to be more aesthetically pleasing (Saha et al., 2020). Perhaps in the case of Marion County with the residents split on their preferences, a non-mowed area all around the lake with pathways down to designated fishing spots and docks to be mowed would be a solution.

There are many causes and faces to blame from the nutrient loading of the lake in Marion County but geese in the long term and sediment travel along with runoff could very well be a majority of the factors. A ten-meter buffer strip that has built up paths mown could allow fishermen of Marion County to enjoy their banks and prevent water from carrying nutrients quickly into the lake. The start of the paths would have to be built up and not at a low spot so the water would run through the buffer and not wash down the pathway. Other areas of buffer strips could be implemented around the tributaries so the upstream water and nutrient flow would not carry miles down at a time and create surplus' in the nutrient pool.

Buffer strips are not the only answer and there are preventative measures as well. Our examples in this review included different methods of tying up phosphorous or applying fertilizer in subsurface manners. The last area we studied was the long-term effect of waterfowl feces in the lake which is a hard problem to solve, however tame birds that stay year round are not the problem. The great populations that migrate through could add a lot of nutrients each year that will impact the lake later down the road. This long-term turnaround of a lake takes a lot of patience but the initial steps in this paper are of the first stepping stones to reach an algae free lake.

Interpretive Theory and Design

Interpretive Theory and Design

Interpretive theory came about due to the establishment of urbanization through the emerging economy. Urban areas started to become increasingly more important for tourists

resulting in a negative impact on the residents. As a result, the motivations to enrich the environment and allow for a ‘get-away’ area became more pressing (Tatarusanu, 2018).

Interpretation theory being the resolution to provoke the audience into favorable action towards the environmental state of their local (and global) natural areas, is now an important concept. The escape from the chaos allowed for the development of natural areas and increased favoritism towards interpretive programs.

By itself, interpretation is the act of taking in the surroundings and relaying the information to the audience in such a way that they can better understand and perceive the information. Interpretation is also “a tool for communicating ideas and feelings to visitors with the intent of enriching their understanding and appreciation of the world and their place in it” (Pan et al, 2020).

Visitor Experience

Visitor experience can be determined through a number of different observational techniques, questions, surveys, participation numbers, etc. Through our research project, we have developed an online survey platform that can be accessed through a QR code placed on each sign, brochure, board, and online platform available (i.e., Facebook). This allowed us to ascertain the effectiveness of signs and also gather the necessary information about our target audience for future data analysis. Although not a preferred acquisition method by interpreters nor a preferred interpretive experience for visitors, through questinnaires we were able to gather the much-needed information that may allow for future interpretive programs to take place and management plans to take effect.

It is shown that the personality traits of visitors are an important factor for the acceptability and perception of environmental changes and protection. However,

"interpretive services do not only increase satisfaction and enhance experience but also achieve outcomes of attitude and behavior" (Zhao et al, 2018). This study allows for the interpretation that through interpretive services, behaviors and attitudes can be changed resulting in a better understanding and exception of environmental practices.

Person vs. Interpersonal Interpretation

Personal Interpretation is the use of law enforcement, rangers, and other staff to interact, teach, and provoke the public. Inpersonal interpretation is the use of signs, trail deterrents, and other objects to teach and persuade the public. Both of these designs are often used as a counter action for the public's behavior within the park. Heavily trafficked areas will have a higher chance of having a park employee presence due to the high possibilities of unwanted behaviors. While places that are farther out of reach, or in locations where parks lack adequate staff funding, interpersonal interpretation objects such as signs are put in place to help prevent any unwanted behaviors done by visitors, as well as to provide essential information.

Research has shown that "interpretive programs designed to increase public understanding and appreciation of important environmental issues can provide critical support for management actions in protected areas" (Sharp et al, 2012). It is essential for our project that we gather through our survey the visitors and residents' opinions. Due to the lack of a management plan for the Marion County Park & Lake, the progress and future of the lake is undetermined but with the public's support and understanding progress can be made.

Although it is found that visitors prefer personal interpretation due to the face-to-face conversational pattern, our research is limited to the use of interpersonal interpretation due to a lack of funding and staff resources. However, even though it is unfavored by both the

public and the interpreters, interpersonal interpretation has the ability to reach further audiences and in much larger sizes. Due to the sheer size of the lake residents and visitors the better option would be interpersonal interpretation (Sharp et al, 2012) (Miller et al, 2017).

Multiple Intelligences

Table 1. Multiple Intelligences Table explaining the various types of intelligences to be considered when designing interpretive materials (Ahmad & Dzulkarnain, 2020)

Naturalist Intelligence	The ability to understand other features of the natural world such as plants, floras, faunas, other creatures, ground and environment.
Musical Intelligence	One's capability to recognize tone, sounds, pitch, noise, rhythm, and reverberation. This will contribute to music recognition, creation, and reproduction.
Logical-Mathematical Intelligence	The skill of calculating, quantifying, measuring propositions and hypotheses, and working with mathematical operations as well as arithmetic expressions. This kind of intelligence is not only found in mathematical geniuses, but those who are involved with engineering, scientific experiments as well as developing strategy for games and forensic purposes.
Existential Intelligence	This intelligence concerns life. Its ability to understand religions, empathy, and the relationship between life and death.
Interpersonal Intelligence	Those who possess this kind of intelligence are suitable to be a leader. They are very good in communication, which can have an effective interaction, verbally or nonverbally with other people. This intelligence has the ability to find differences among others, and is able to tackle conversation from different perceptions.
Bodily-Kinesthetic Intelligence	The ability to handle objects and possess various physical skills. This skill is able to perfectly use the mind to control the body movement/action in union.

Linguistic Intelligence	The capacity to work with language and text ideally. The ability to apply meta-linguistics for the purpose of composing or understanding language. People with this kind of intelligence love to read, write, or solve crossword puzzles.
Intrapersonal Intelligence	Intrapersonal intelligence people are self-motivated and have the ability to understand other people's thoughts and feelings.
Spatial Intelligence	The capacity to think in mental imagery, spatial reasoning, image manipulation, graphic and artistic skills, and an active imagination. Those who steering the ship for sailing, piloting an aircraft, or fostering the buildings exhibit spatial intelligence.

"Multiple Intelligences" is a distinct classification scheme designed to determine how one learns (Table 1). However, this is not limited to just one intelligence and a person can effectively perceive the world around them through a multitude of different intelligences. Within the parks and protected areas this table is used to determine the best suitable interpretive program to design based on how an audience would prefer to perceive information. Some visitors will enjoy stories and images associated with the park and nature, while others are more drawn to the statistical side. It is often suggested that an interpretive program or sign is made for a wide range of learners. "However, not all learners possess equally the same intelligences [and parks] should not be biased by assuming that all [visitors] will have the same ability and be able [perceive the same information]" (Ahmad & Dzulkarnain, 2020).

Sign Design

The research paper, *Comparative evaluation of the attention capture and holding power of novel signs aimed at park visitors,* experimented with four different sign designs as listed below (Hall, Ham & Lackey, 2010):

- H1: Treatment 1 (Moral, Empathetic Appeal) attention capture and holding power > Control (Existing Park Message).
- H2: Treatment 2 (Narrative) attention capture and holding power > Control (Existing Park Message).
- H3: Treatment 3 (Humor & Salient Beliefs) attention capture and holding power > Control (Existing Park Message).
- H4: Treatment 4 (Telegraphic Title) attention capture and holding power > Control (Existing Park Message).

In that study, each of these signs were placed strategically around the study area to obtain information and data to determine which sign gathered more attention and action. As a result, the popularity and perception of each sign rose in comparison to the 'normal'. It was found that interpersonal interpretation through signs is more effective if the signs are shown to be different than what is 'expected'.

Evidence is increasing that during the creation of interpretive signage, communicators should avoid messages that state an activity as socially disapproved but widespread. This can be understood through the understanding of descriptive versus injunctive norms. While injunctive norms involve "perceptions of which behaviors are typically approved or disapproved", descriptive norms involve "perceptions of which behaviors are typically performed" (Cialdini, 2003). This can be shown through the idea that if a sign uses language

that illustrates a behavior as a norm, then the visitor will repeat the action; however, if the sign uses language that rejects the notion of any repetitive norm, the visitor's behavior will change to reflect it.

In conclusion, interpretive theory is the idea of provocation in visitors to create a change in the surrounding environment. While it is preferred that interpretation is done through person-to-person communication and interpretation, it is not always an available option. The same could be said about Marion Park & Lake; while personal interpretation could help ensure the spread of information it may not be reasonable nor a suitable way to collect the opinions of the residents.

Visitor Outreach & Data Collection and Analysis

Visitor Outreach

Within the realm of conservation sciences, there are two categories involved in the implementation of information or research surveys. The first method is known as personnel-based management tools. This type of information typically involves staff from the park reaching out to visitors directly whether it be through their visitor centers, main offices, school programs, public meetings, or personnel located around the park. The second method is known as media-based management tools. These tools have increased in use over the years and include a wide range of mediums. Common mediums used today include interpretive signage, guidebooks, maps, brochures, and much more.

However, debate over which method is the most effective has become a topic of interest. Personnel-based tools can be effective to some visitors because it helps to emphasize the experience and expand their knowledge based. Having the park staff directly there to ask

questions and check their recreation plans can have a positive effect on visitors' attitudes. Overall, this type of method is moderately effective. Since it has an emphasis on personnel, sometimes credibility can be lost if they are unfamiliar with conservation principles, or it can be costly for the park. On the other hand, media-based tools can be effective to implement because they tend to be cheaper than personnel-based tools and have a quicker output to the public due to the variance in medium type. However, this method's effectiveness becomes more difficult to assess because each medium type is used differently. For example, Paul MacLennan (2000) investigates various methods and concludes that they vary in their effectiveness. This shows that media-based management tools only continue to expand, and the range of mediums progress providing more areas to explore this method's effectiveness.

Despite each management tool having its benefits, a common issue seen among both tools is that they can be victim to information overload which could become an area of concern in recreation settings (Cole et. at., 1997). If managers overload their visitors with messages, then low-impact messages or important policies could be overlooked, and their effectiveness decreased. Authors Bator & Cialdini, (2000), write "messages should explain precisely how behavior change should occur and this explanation should be vivid and involved without having vivid and distracting additional information" (p. 539). Moreover, this issue provides the opportunity for managers understand their audience and pull key points to reach them effectively. As more researchers investigate these methods, many have concluded that mixed methods prove to be the most effective in reaching the public. Typically, it has been seen that combinations of techniques are more effective than individual techniques (Paul MacLennan, 2000). An example of this conclusion can be seen in the research realm. A common methodology used is the combination of a survey followed by

focus groups. This mixture allows researchers to generalize the population, and then gain further understanding to explore areas of further research.

Quick Response (QR) Codes

As more media-based management tools have been explored, one medium provides potential for usefulness in visitor research and management. To give the quick response (QR) code a definition, researcher Cornelia et al., 2016, state "Robin Ashford believes that QR codes are hyperlinks, essentially pictographic, which can be incorporated into the physical environment" (p.175). Their study led researchers to conclude that QR Codes tend to have a more desirable usage to respondents and are easily applicable as we transition into the digital world. As smartphones continue to grow in popularity, the mass use of QR codes could become a more reliable method for researchers to implement surveys or other ways to gather information from the public.

Our team is implementing a usage of mixed management tools to help gather information for Marion County Park and Lake. Our team has created two interpretative signs, an identification brochure, and posted educational information on their bulletin board. On all these tools, there is a Quick Response (QR) code to a Qualtrics survey we created. Moreover, the link connected to the survey has been posted via Marion County Park and Lake Facebook page. This allows visitors to learn more about and become involved in the Park and Lake while also being able to provide feedback conveniently at their own pace.

Analysis of Variance Approach (ANOVA)

The data analysis technique our group intends on implementing has been coined Analysis of Variance (ANOVA). This technique provides a way to run multiple *t*-tests, tests comparing the means of two groups, at once, therefore providing the statistical difference

between groups. Moreover, this procedure can provide a higher degree of item integrity and scale content validity (Hinkin & Tracey, 1999).

However, according to researcher L. Connelly (2021), “ANOVA determines if a statistical difference exists among groups, but it does not determine which groups are significantly different” (p. 218). Connelly goes on to explain that to further understand the significance in the difference, additional tests must be run. One extension, or additional test, of this statistical technique is known as the one-way ANOVA. This technique provides a method of assessing item’s content validity by comparing the rating means on a conceptual and comparative dimension (Hinkin & Tracey, 1999). In this type, the independent variable has become categorical. Moreover, the statistical test, F ratio or F, explains “how much variability is *between* the groups compared to variability within the groups” (Connelly, 2021, p. 218). Often researchers have more than one group they want to compare while researching their areas of interest. However, while this might be the case, the different types of tests depend on the different types of situations the researchers are exploring.

Methods

Study site

We went into this project looking into what this lake really needed. To do this we had to figure out a background about Marion county park and lake. It is located in East-Central Kansas just North of Wichita specifically 38.3199° N, 96.9847° W. It was a lake built around recreational activity, so we based our research around the thought of keeping it in a clean healthy state for the public to readily enjoy. Our research was made simpler due to the fact that it is

managed by the county, so the regulations are a lot more open and it made for less hoops to jump through along the way.

As we looked into observing the concerns and knowledge of the attending population of the park and lake, we had to set up a plan. We started out by research about previous experiments and information about the lake and how it was managed. This gave us a background to go off of and allowed us to further the research rather than repeat it. We were able to then get certified to do public research and made signs, posters, and brochures. These were descriptive of blue green algae problems, the wildlife at the lake, and general public outreach and information about the lake that we managed to post around the lake on our visit to further understand what we were dealing with. We had our survey on all of these outreach strategies as well as a post on their social media pages to further extend our research population.

Once we got our data back, which had a great response rate, we analyzed the data and were able to calculate the statistical analysis and differences in the questions to see what was scientifically important. This was a rather interesting topic but after analysis we concluded our survey by looking into general trends of the responses along with the trends that differed from the visiting population and the responses that came from the residents to see the sway of answers.

Outreach methods

As previously discussed during the introduction to this paper, each member of our research group selected a topic to discuss in which a sign, brochure, or bulletin board design was created. Below are figure 1-4, two signs, a brochure, and bulletin board that were created and placed around the Marion County Lake.

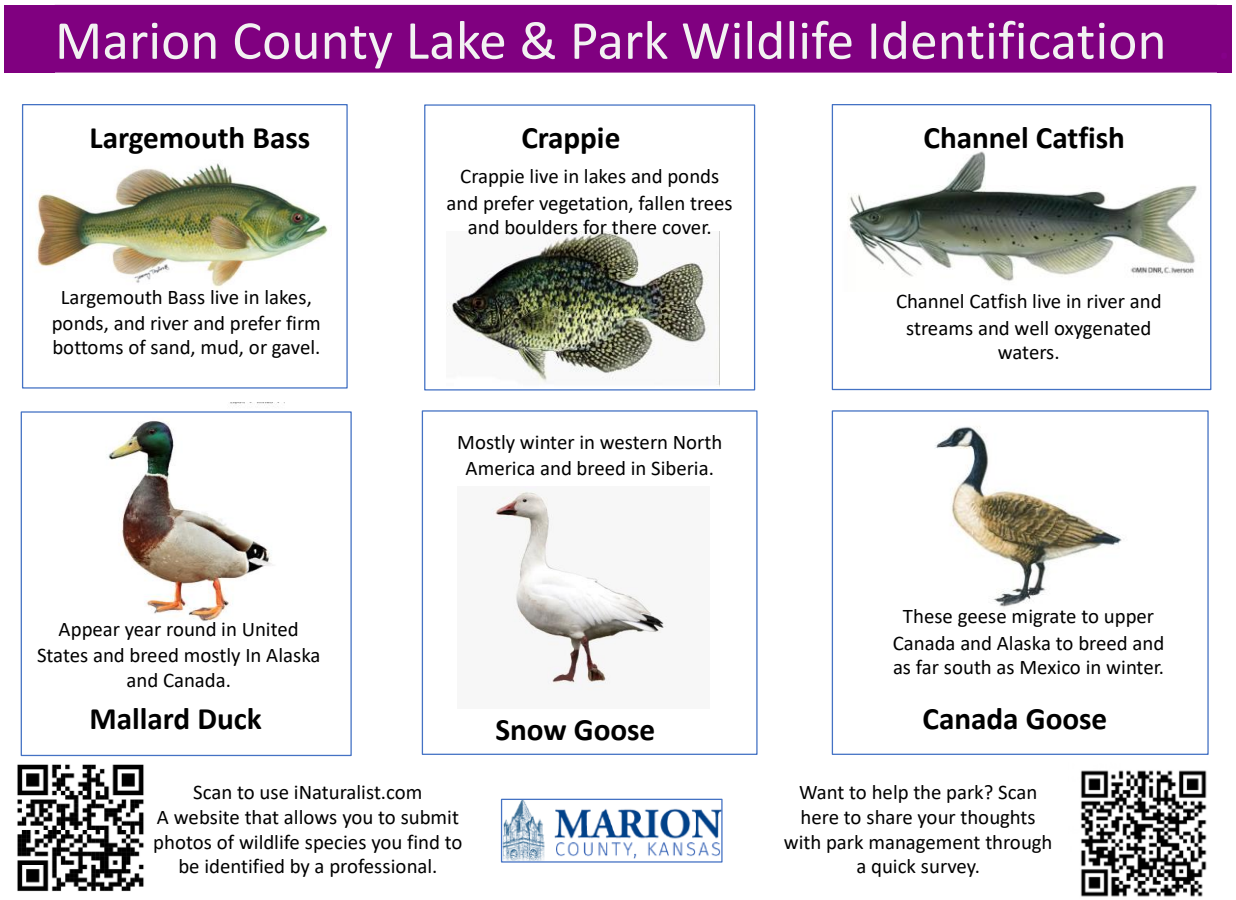

Figure 1. Sign providing information about species of fish and waterfowl present at Marion County Park and Lake along with QR links to iNaturalist and the study survey.

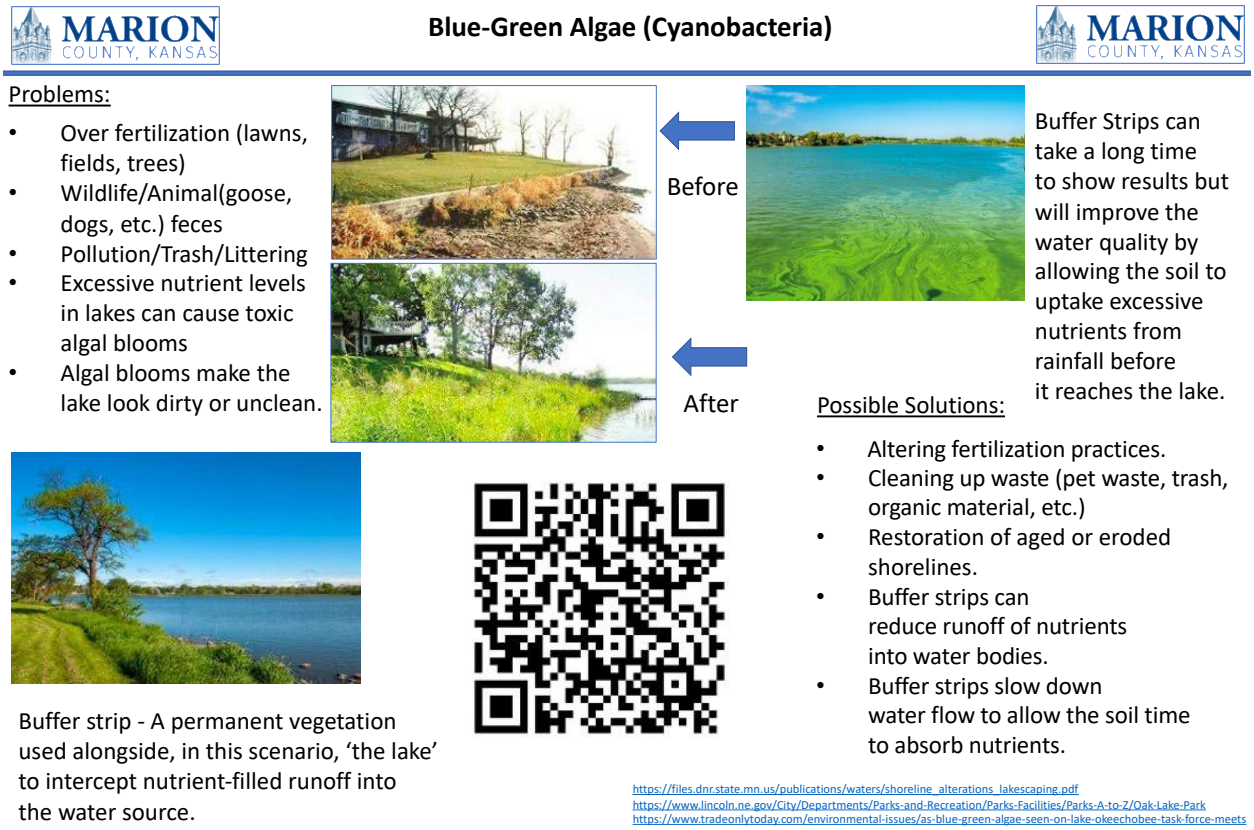

Figure 2. Sign providing information about blue-green algae and possible solutions along with a QR link to the study's survey.

MARION COUNTY, KANSAS

Invasive Species

Animals and/or plants that are not native to Kansas and threaten the ecology of the lake/river. These Species are prevalent in Kansas Lakes, Streams, and Rivers. It is up to visitors and residents of the lake to keep the Aquatic Hitchhikers from making themselves at home

Zebra Mussels

While native to the Caspian & Black Sea, they are an unwelcome guest in Kansas waters. Zebra ~~muscles~~ can lead to clear water resulting in algae blooms, and loss of fish eggs. Clogging pipes and diminishing fish populations are only some of the problems.

What can we do?

Following Prevention Techniques such as.

- Clean, Dry, Drain
- Recognize and Report
- Leave live fish
- Know where they are

Do you see me?

If so, please report me to Marion County Parks & Lake

(620-382-3240)

Clean, Dry, Drain

This is the practice of washing and drain your boat from kayaks and canoes to larger sail boats. Aquatic nuisance and invasive species will stick onto the side or within the drain of a boat, hitching a ride into a new river or lake.

Recognize and Report

Being able to recognize nuisance species can be extremely helpful when suspicions arise. Being aware ~~off~~ what they look like can change the name of the game are ~~give~~. Lake staff time to place counter measures.

Asian Carp

Imported from Asia for aquaculture, the Asian carp escaped into nearby waterways. Competing against fish for food, excessive growth speed, and causing physical damage to fishermen by with their leaping ability.

*Asian Carp specifically can eat up to 40% of their bodyweight every day.

Leave live fish

While using live fish is common, especially for fishing for larger fish, using local bait reduces risk. Using local fish or bait dealers will decrease the possibility of nuisance species making their way into the lake. While also supporting the local community through the purchase of bait.

White Perch

Native to the East coast, the introduction of white perch to Kansas waters is still unknown. White perch closely resemble the native white bass; however, the dorsal fins (top fins) are connected unlike white bass. They will out-compete native fish for food and space while having been associated with the decline of both walleye and white bass.

Eurasian Watermilfoil (left)

Curly-leaf Pondweed (right)

These nuisance plant species are native to Europe and Asia, arriving to the US around the same time. Although they may look like native species these plants will cause large plant mats, inflicting damage on native species. The plants themselves are often spread by clinging to boats and fishing gear.

Want to assist the Park?

Take this Survey!

Know where they are

Both plant and animal nuisance species are appearing in lakes and rivers across the state. While it may be safe to follow the clean, dry, & drain method of prevention, knowing their location can decrease the chances of spread.

Hydrilla

Native to Asia the aquatic nuisance species spread through attached fragments. Interfering with recreational activities, by reducing water flow; clogging both irrigation and flood-control canals. The plant shades out other aquatic plants resulting in elimination.

Cited Sources:

https://ksoutdoors.com/Fishing/Aquatic-Nuisance-Species

Figure 3. Brochure providing information about potential invasive species and how to prevent the spread along with a QR link to the study's survey.

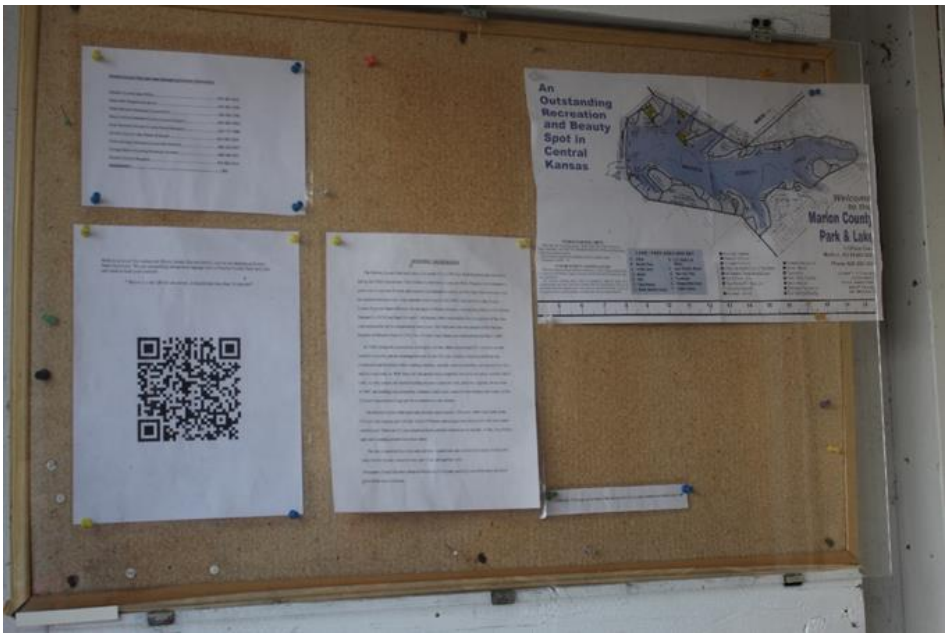

Figure 4. Bulletin board display providing general park information including emergency contact numbers, a map, history of the park, and a QR link to the study's survey.

Each sign was produced based upon the Marion County Parks and Lake Superintendent's preferred topics of interest. Marion County Lake & Park Wildlife Identification, and Blue-Green Algae are the topics respectively. Among the other topics of preferences outlined are Invasive species and Historical background of the area. As shown in Figure 3 above, a brochure was created that outlines the six topmost concerning invasive species around the area and introduction prevention measures. While figure 4 shows the finished creation of the bulletin board placed outside the Marion Lake Office, which includes, a historical outline, emergency contacts, a map of the lake, and the survey QR code.

As shown below, the signs and brochure have been placed strategically around the Marion County Park & Lake. While the signs were chosen to be made for temporary purposes,

the placement of the signs had to change due to the weekend structure. While Figure 5 shows the sign held behind a bench to support and brace it from the wind, the original position was next to a tree where the wind caused the sign to bend. Figure 6 shows the second sign being held against a tree with the extra support from a large rock found nearby. The brochures were placed safely inside of an older tour guide box located under the park entrance sign (Fig. 7).

Figure 5.

Figure 6.

Figure 7.

Survey design and data analysis

As we looked into observing the concerns and knowledge of the attending population of the park and lake, we had to set up a plan. We started out by research about previous experiments and information about the lake and how it was managed. This gave us a background to go off of and allowed us to further the research rather than repeat it. We were able to then get certified to do public research and made signs, posters, and brochures. These were descriptive of blue green algae problems, the wildlife at the lake, and general public outreach and information about the lake that we managed to post around the lake on our visit to further understand what we were dealing with. We had our survey on all of these outreach strategies as well as a post on their social media pages to further extend our research population.

Once we got our data back, which had a great response rate, we analyzed the data and were able to calculate the statistical analysis, including the use of t-tests and ANOVA, and differences in the response groups (visitors vs. residents) to see what was scientifically important. This was a

rather interesting topic but after analysis we concluded our survey by looking into general trends of the responses along with the trends that differed from the visiting population and the responses that came from the residents to see the sway of answers.

Results

Respondents and Demographics

The online survey was accessed by 240 people and received 180 complete responses. Of the respondents who completed the survey, 55% were visitors (Fig. 8). Nearly 50 respondents reported visiting the park multiple times a week and the majority reported visiting at least multiple times a year (Fig. 9). Of the residents, 60% reported living at the lake full-time (Fig. 10). Most of the residents have lived at the lake for more than 10 years (Fig. 11). Residents residing directly adjacent to the lake were 30% of the sample (Fig. 12). Visitors to the park and lake typically spend 2-5 hours or camp for 2-4 days (Fig. 13). Most visitors live less than 10 minutes away (44%) but 28% live over 50 miles away (Fig. 14). The majority of respondents were female (57%; Fig. 15). Ages of respondents ranged from 18 to 82 (Fig. 16). Economically, most respondents rated themselves as average or somewhat higher than average (Fig. 17). Most respondents have some college education and work full-time (Fig. 18 & 19).

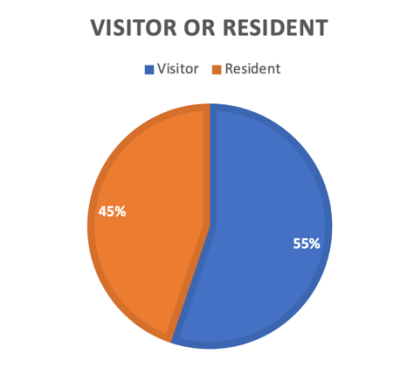

Figure 8. displays whether the survey participants were visitors of the lake or residents of the lake. Findings include that a simple majority of 55 percent of the survey takers are visitors.

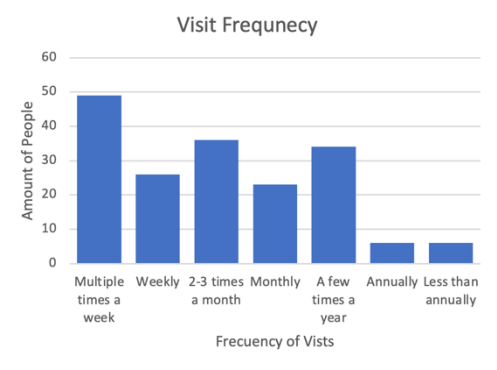

Figure 9. displays how often the participants visit the Park and Lake with a vast majority of them visiting somewhere between multiple times a week and a few times a year. Responses came from around 180 surveyed participants.

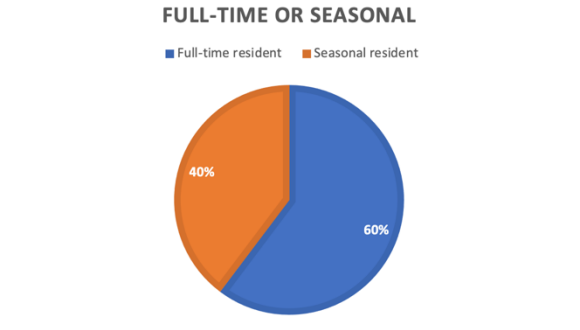

Figure 10. Of the residents at the lake 40 percent are seasonal while 60 percent are fulltime as shown.

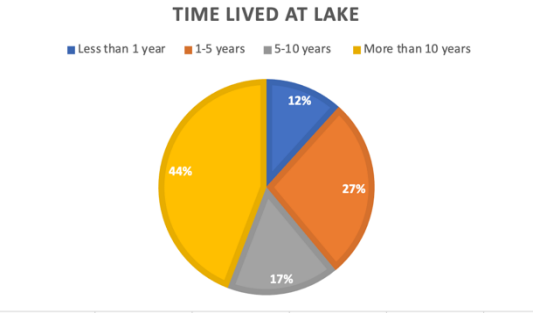

Figure 11. This displays how long the residents have lived at the Park and Lake displaying that a vast majority of the residents have lived there greater than 10 years.

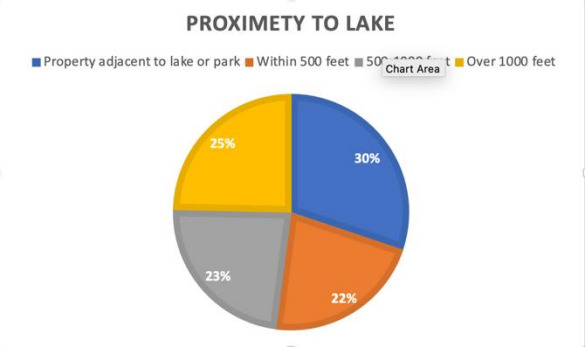

Figure 12. Residents proximity to the lake was spilt fairly proportional (of the 4 options) with a slight majority of 30 percent living in property adjacent to the lake or park.

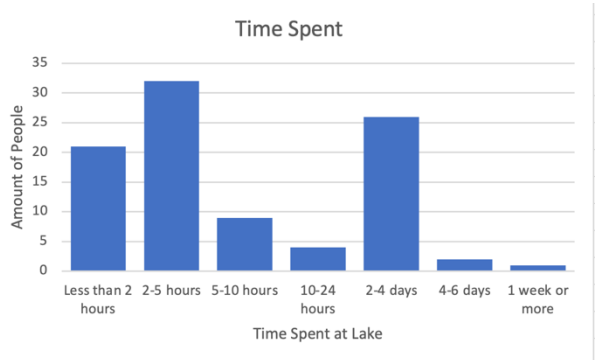

Figure 13. Of the visitors who responded, between 2-5 hours was the most common amount of time for visitors to stay at the park followed visitors that stayed 2-4days.

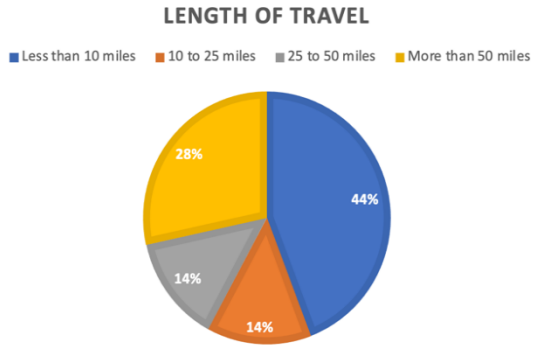

Figure 14. A large majority of the visitors lived less than 10 minutes away, while the next largest chunk of visitors came from greater than 50 miles away.

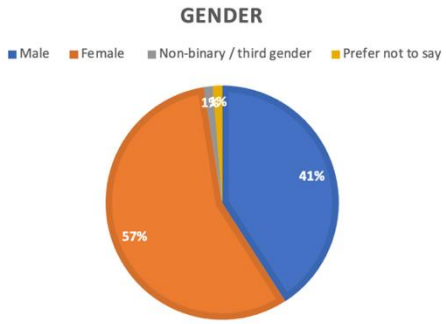

Figure 15. Of the respondents, 57% were female and 41% male.

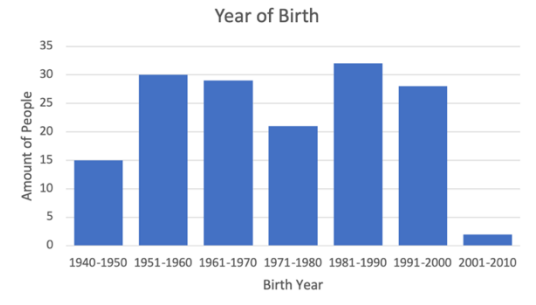

Figure 16. All but 2 of the survey takers were born sometime between 1940 and 2000.

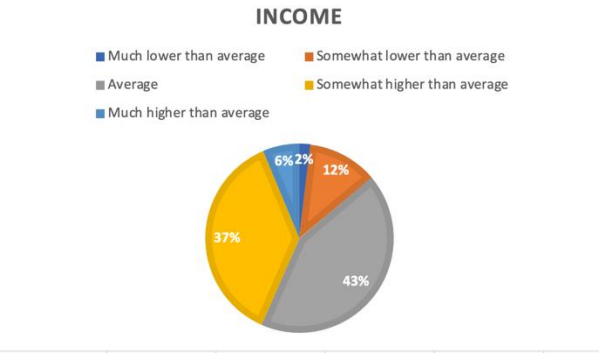

Figure 17. Of the respondents who chose to answer, 80% described their income as average or somewhat higher than average.

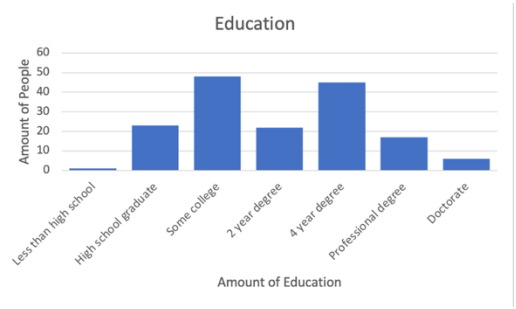

Figure 18. Survey takers have a wide variety of education with most having attended some college or having completed a four-year degree.

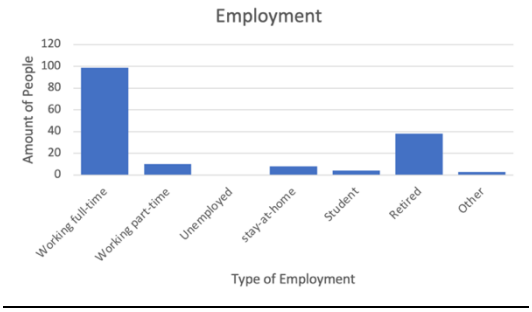

Figure 19. Most of the survey takers are either working full-time or are retired.

Visitor sources of information and information sought

Visitors and residents differed significantly in where the seek information on the park and the type of information sought (F (3, 659) = 131.2, p = <0.01). After running the Analysis of Variance (ANOVA) test, the data resulted in the F value= 131. 2372 and the F *crit* = 2.61842. Therefore, we rejected the null hypothesis that the respondent's group means are equal and conclude that there is a large variance between group means. This could be also concluded with our *P-value* =1.18E-66, which is lower than null hypothesis result of α=0.5.

Furthermore, after looking into the data collected, many respondents who hear about Marion County Park and Lake are a current/previous resident or have family/friends located there. Moreover, the information in which the respondents search for is extremely varied. A trend that formed presented respondents looking into special park events and water quality updates (i.e., blue green algae). However, general information about Marion County Park and Lake was commonly asked including park office hours, boat dock hours, fishing information, and much more. While the lake does have a billboard in use, the Marion County Park and Lake Facebook page is the familiar resource to the respondents and where they gather most of their information about the park.

Agreement on and knowledge of park issues

Respondents were asked to rate their level of agreement with a number of statements about park issues on a scale of 1 to 5 with 1 being strongly disagree and 5 being strongly agree. As we break down the data from the survey, we need to look at statistical values of each. If the two-tailed P value is above .05, it is insignificant and if it is below that then we can say the results are significant and that there is a difference between the visitor response and the resident response (Table 2). This means that the only three values that are significant are questions 4,5, & 6. These are a majority of the questions about the geese. The residents that have to deal with them on a daily basis show to not like them as much and think they are more of a disturbance than the visitors do. The rest we can look at as a whole and take the value into consideration for every poll rather than trying to distinguish the difference between them. The support in the use of buffer strips was averaging over a 4 for both the visitors and resident to show that they seem to be fairly supportive of them in a method of reducing the blue-green algae. Another data set question that had great support was the willingness of the participant to alter their behavior to benefit the management of the lake. The question that had the absolute most support was the belief that it is very important to preserve the natural state of the park. This one shows us that a majority of the people that attend the lake all agree that it should be kept clean and have little change in nature there. The next question that catches eye is the question had the least support was the people enjoying the opportunity to feed the geese. This is the only one that actually averaged under the middle mark of 2.5 which was neutral. This was also one that showed significance between visitors and residents. The residents enjoyed the opportunity less than the visitors although it appears the visitors themselves didn't all enjoy feeding the geese.

Table 2. Mean response level on a scale of 1-5 with 1 being strongly disagree and 5 being strongly agree for residents and visitors of Marion County Park and Lake. A t-test was run to look for significant differences in opinion and signal issues with the highest potential for conflict. T stat of items with significantly different levels of support between the groups are bolded.

Statement	Resident	Visitor	T stat	P value
I understand the causes of blue-green algae	3.67	3.68	0.03866548	0.47218907
I support the use of buffer strips to reduce blue-green algae as a long-term management strategy (buffer strip - an area of unmown grass along part of the lakeshore	4.19	4.07	-0.7974724	0.426336897
I enjoy seeing the geese at the lake	2.51	3.36	**4.11769623**	**6.08E-05**
I think the geese are too noisy	3.2	2.68	**-2.4991989**	**0.013443679**
I enjoy the opportunity to feed the geese	1.8	2.19	**2.1718843**	**0.031309575**
I think goose droppings are an issue at the lake	4.18	3.62	**-3.278379**	**0.001274749**
I believe fertilization practices of bordering lawns have a significant impact on blue-green algae blooms	3.79	3.72	-0.4474005	0.65517629
I believe fertilization practices of nearby agricultural land has a significant impact on blue-green algae blooms	3.89	3.72	-1.030482553	0.304378552
I believe it's important to preserve the natural state of the park	4.61	4.53	-0.720597947	0.47218907
I am willing to alter my behavior if I learn it will benefit the lake's overall health and management	4.41	4.4	-0.069999889	0.94427903
I am aware of current park programs and management strategies	3.23	3.11	-0.667176818	0.50560259
I would be interested in joining a park board or committee	3.71	2.44	**-7.1511468**	**2.80E-11**

General opinions of respondents

Towards the end of the survey, the question "Anything else you would like to share with us about Marion County Park and Lake?", was posed. Out of the 207 survey takers, there was 114 (or 55%) that responded. Out of that 55%, 21% replied with only positive feedback such as “It is a Treasure”, and “We love it” (Fig. 20). Out of the other 84% of responders to the

question gave emphasis towards the danger and problem of Blue Green Algae while other comments remained at lower percentage proportions.

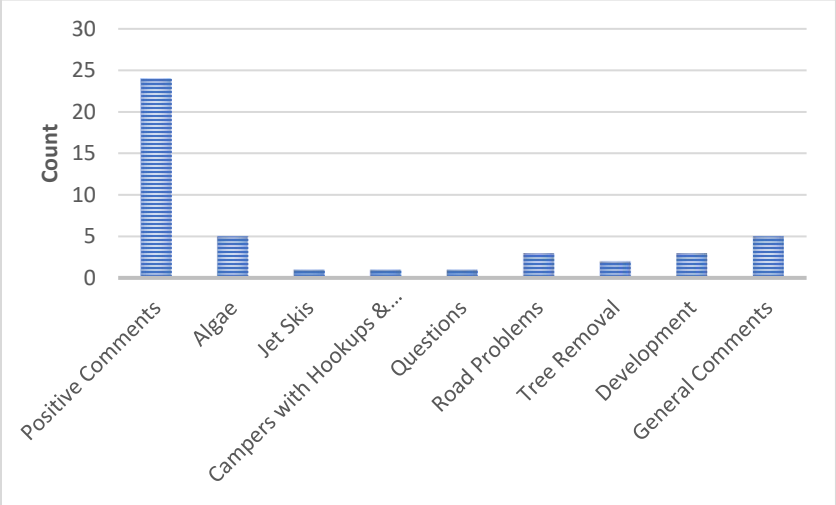

Figure 20. Categories of responses to the question “Is there anything else you would like to share with us about Marion County Park and Lake?”

In response to the question “Do you have any suggestions that would make Marion County Park and Lake more enjoyable?”, out of the 207 survey responses gathered, only 145 (or 75%) gave feedback. Out of the 75% that responded, 13% were concerned about the large amount of Blue Green Algae. While the other significant percentage of respondents were looking for further development for both camping options and park development, both equal 8% of the response numbers respectively (Fig. 21).

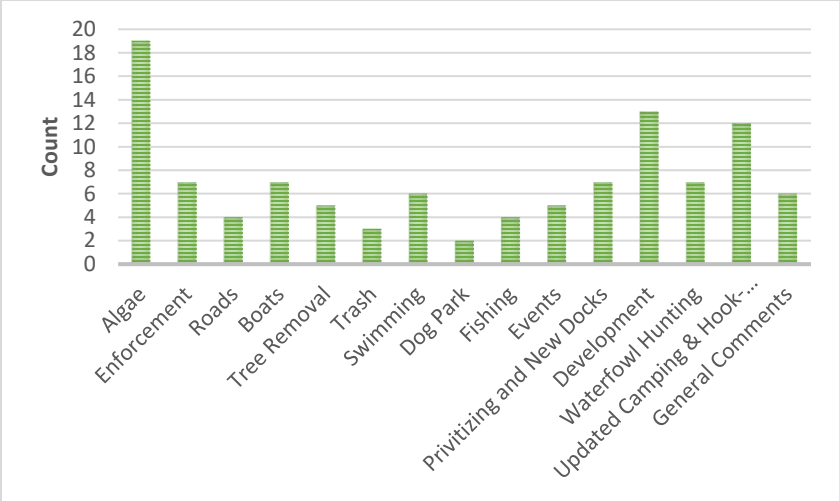

Figure 21. Categories of responses to the question "Do you have any suggestions that would make Marion County Park and Lake more enjoyable?"

Discussion

The objective of the research was to compile and analyze survey results detailing some of the major implications for friction between residents and visitors of the Marion County parks and lake, as well as to understand the effectiveness of public outreach strategies. While the survey was used to gather basic information such as population demographics, whether one is a visitor or a resident, and how often one visited the lake; there were also questions about geese, blue green algae, and park information to inform future outreach targets at potentially contentious issues. The survey was at first delivered through a Facebook post on the Marion County Park and Lake official Facebook page, where it received over one hundred responses before the signage was placed. It is understood that results detailing the effectiveness of signage are currently not well measured and would require a longer period of time for data collection because so many visitors and residents had already responded to the survey prior to placement.

The results of the survey showed that about 50% of respondents were visitors coming to the park (55% of respondents identified as visitors as opposed to residents), creating an ideal number of responses for each representative group to gather data. It was shown in the data that most respondents were concerned about the blue-green algae in connection to feeding geese at the lake. While visitors showed a more positive opinion, the residents were not found to be very positive or favorable to the geese, causing one of the major concerns between resident and visitor relations.

The effectiveness of the public outreach was shown almost immediately after the survey was sent out through the Marion County Park and Lake Facebook page. The use of the internet to reach a broader audience and reach farther was shown to be significant. Within the first few days there was almost a hundred responses recorded, which amounted to more than two hundred by the end of the study period, with only one response recorded from the wildlife identification sign.

Limitations on the project are restricted time, travel, and finances. The ideal duration for the project would have been a few months post project development with an additional month prior to gather read background literature. The allotted time would be used to allow for signage to be placed and an additional ending survey to be sent out to gather information on both outreach and the designed signage. However, the project was restricted to three months which included the creation of the project, background literature reviews, implementation, and analyzing the data. Travel was also restricted due to the nature of the project creation as part of a college course during the spring semester, and each researcher had a significant number of other time commitments. Had the project already been developed and time allocated for the data collection portion, a significant amount of travel could have

been incorporated through a specified time slot during the semester. While finances where not the majority of limitations on the project, the signs that where placed, required funding and the design (size and material) was based on the idea of limited funds.

The study shows that interpersonal interpretation is a highly valued public outreach strategy. While the data cannot ascertain the effectiveness of the signage, the use of the internet survey provided significant feedback in relation to the outreach of information. Both visitors and residents requested that there be more information available both online and at the park office supporting the use of the internet and the awareness of more physical park documents available to the public.

The potential for future studies is significant and was requested in a survey response. Given a significantly longer amount of time there is increased need for water quality and nutrient studies, as well as studies for geese mitigation. All of these are studies that could address the crucial problems within the Marion County Park and Lake. Within the survey it was determined that information such as water quality and algae solutions were requested, showing the public's want for further studies.

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