

MARION COUNTY PARK AND LAKE

Marion County Park and Lake User Survey

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INTRODUCTION

Sustainable outdoor recreation on a lake requires the integration of knowledge regarding natural processes, human-caused environmental impacts, planning, and policy. Ecological processes such as sedimentation, erosion, and nutrient loading are essential to our understanding of lake ecosystems and how to best stabilize shorelines, prevent algal blooms, and protect biodiversity. However, we must also consider the environmental consequences of park visitor behavior and appropriate measures to mitigate the environmental harm caused by visitors without diminishing the capacity to engage in recreational activities. Further, lake management planning and policy implementation are key to establishing standards, requirements, and guidelines for how a recreation area will be sustained long-term. Balancing these complex, interconnected dynamics of recreation lake management is key to sustaining the environmental health and recreation capacity of a lake long-term.

Surveys dealing with visitors' and residents' knowledge and perception of the lake emerge as a beneficial way to understand these complex, interconnected dynamics of a recreational lake system. Therefore, with our project's focus on Marion County Park and Lake (MCPL) in Marion, Kansas, an online survey to visitors and residents of MCPL. This survey will not only aid in the development of a lake management plan, but also to add to our knowledge of how to successfully integrate research on lake management from multiple disciplines. The survey investigated visitors' and residents' perceptions, desires, and knowledge about MCPL and asked questions regarding preferred outdoor activities, experience with environmental issues, and policy preferences. The results of the survey indicate that visitors and residents of MCPL are aware of the environmental impacts on the lake such as algal blooms and

migratory geese. However, the survey results suggest that visitors and residents care most about issues that affect their personal rights to use the lake such as dock privatization.

LITERATURE REVIEW

To successfully develop a survey that appropriately examines the multiple dynamics of lake management, background knowledge from ecological functions, recreational uses, and human interaction with lake management policies must be considered. The following sections review literature on the topics of ecological processes in lakes, the effects of water recreation, park interpretation policies and strategies, lake management strategies, and lake planning policies. These topics work together to highlight the ecological processes happening in lakes, how recreation can affect those processes, and different strategies such as interpretation, lake management, and lake planning policies can protect those ecological processes while still promoting healthy recreational use of parks and lakes.

Lake Ecological Processes

There are several factors that lay the groundwork for a lake's ecological stability and maintenance, and when these factors are disturbed or set out of balance, they can create ripple effects that the natural system cannot adapt to quickly enough to recover. Sediment is one of these key functions because it stabilizes riparian vegetation which can provide habitat for many organisms (Severson, 2009). Nutrients are another key function, because the balance of nutrients can be harmful to fish and vegetation, resulting in algal blooms and causing a loss in biodiversity (Chen, 2014). Biodiversity is a crucial component of lake ecology to maintain and protect through management efforts that promote lake stability. When the lake dramatically swings between conditions, such as temperature stratification, sedimentation making the water murky after storm events, or other rapid changes, conditions may naturally select certain species over others. The more biodiversity there is, the more complex the food web is, and thus the more

resilient the system is to change. Greater resiliency equates to greater stability, allowing for the existence of a more reliable recreational site for residents and visitors as well as a more reliable home for the organisms living within this ecosystem (Straskraba, 1999).

Shoreline erosion is often a major culprit of suspended sediment and sedimentation in reservoirs (Severson, 2009). A longer term problem that can be observed is a decrease in lake storage capacity over time, as well as water levels becoming too shallow for desired recreational activities. Erosive patterns at a lake can be identified by steep banks, a lack of vegetation where the water is in contact with the bank, and increased levels of total suspended solids in the water, which can be measured in a lab setting (Ayana, 2015). Erosion and sedimentation can be prevented through decreased tilling, irrigation, and grazing, as well as promoting vegetation along banks, particularly where preferential flow paths may form as water enters the lake during storm events. Riprap implemented along shorelines can act as an alternative where it is difficult for vegetation to grow. However, this is not preferable as it takes away from potential littoral habitat (Severson, 2009). Dredging, or the periodic physical removal of sediment from a body of water, can be more cost-effective than proactive strategies since sedimentation occurs the most after large, infrequent storm events.

Algal blooms can be another problematic symptom lakes experience. Algal blooms are most likely to occur near the locations where flows, particularly run-off nutrients, are entering the lake. Thus, it is critical to identify any input points like these and to monitor them to watch for algal growth. There are Artificial Neural Network models that attempt to identify blooms as an early warning sign, using weather patterns as well as direct lake measurements for points of comparison (Chen, 2014). Oxygen levels can get be depleted if the bloom is intense enough (Chen, 2014). The oxygen level of a lake can be measured as COD and BOD. Chemical Oxygen Demand, or COD, is a measure of slowly decomposing organic matter, and Biological

Oxygen Demand, or BOD, indicates easily decomposing organic matter. Comparing these values give an idea of algae activity (Straskraba, 1999). Catching algal blooms early can be helpful to addressing them appropriately (Chen, 2014). This includes putting up signage if the algal blooms are creating a water quality that is unsafe for recreational use. Algicides have been used as a chemical algae weed whacker, but these treatments can accumulate in lake sediment and in lake organisms, resulting in health consequences for these organisms (Straskraba, 1999).

Water Recreation Impacts

While ecological processes are essential for understanding how to manage the health of a lake, it is also necessary to understand the specific environmental issues caused by visitor actions at recreation areas. This section reviews how water recreation can affect wintering birds, aquatic life and vegetation.

Wintering waterbirds often find themselves in recreational areas that suit their diet and habitat needs. As visitors participate in recreational activities, they can disrupt bird habitats and their ability to breed. When a bird gets stressed around humans, they feel forced to find another habitat, which can result in further harm. This additional stress can prevent waterbirds from breeding successfully (Le Corre, 2013).

Aquatic hitchhikers are pests that are typically transported by recreationists on accident. They can easily outcompete a native species and they can survive in various conditions (Manning, 2017). For example, in Voyageurs National Park, park employees are concerned about invasive species such as the spiny water flea, crayfish and a fish disease called viral hemorrhagic septicemia (VHS). The park is roughly 38% composed of lakes and the participation rates in water recreation has been popular (Manning, 2017).

Vegetation is an important source of food and habitat for aquatic species, which gives recreationists the opportunity to fish. They are also beneficial for absorbing nutrients and carbon dioxide from the surface; however, boating has been affecting their quality of life. Motorized boats can have a variety of impacts on the lake. A boat's propeller is often the cause of the sediments being suspended and are the cause of vegetation being destroyed (Sagerman, 2019). If vegetation is continually damaged, the biodiversity will slowly decrease from the lack of nutrients and growth. Not only are propellers an issue, moors and buoys can block sunlight from entering the water to the seafloor, which promotes a lack of nutrition. Their weight that holds them down can physically impact the seafloor and this forces aquatic life to move elsewhere (Sagerman, 2019).

To address these environmental issues, park managers have employed a variety of techniques. To manage visitor interactions with birds, park managers have closed off certain areas from recreational use that are important for birds. They can also educate visitors on overwintering birds and why it is important for them to be in the area they chose to be home for the winter. In order to prevent the spread of the spiny water flea, crayfish and VHS, the National Park Service enforced policies and regulations for recreational users to follow. The NPS are not allowing visitors to use their own personal watercraft, so visitors will have to rent their own boat through a program called "Boats on Interior Lakes" for \$10 per day. If users want to go fishing, they can only use artificial bait instead of the classic can of worms. Lastly, NPS prohibits float planes from landing onto the surface of the park's lakes because they may have been in contact with aquatic hitchhikers in other regions (Manning, 2017). There is a common slogan called, "Help Stop Aquatic Hitchhikers", which was established by the Department of Natural Resources of Minnesota. Under the slogan, there are steps provided: clean, drain and dispose

(Manning, 2017). This can be presented on signage near docking areas or a wash down station. Recreational users that have kayaks, canoes, motorized boats or some form of watercraft will need to do the steps in order to prevent transporting invasive species.

Interpretation Policies

While implementing park policies ensures that visitors have a new rule to follow, the act of interpretation in a natural area can both inform and persuade visitors as to why these policies are in place, and why they should be followed. Interpretation is defined by the National Association for Interpretation as, “A mission-based communication process that forges emotional and intellectual connections between the interests of the audience and meanings inherent in the resource,” (NAI, 2006). It relies on the visitors wanting to be actively engaged in the program developed by the Interpreter at the resource. By combining outdoor recreation, education, and thematic storytelling with a purpose, Interpretation has been shown to both lower visitor impact in natural areas, as well as increase the chance for visitors to return (Littlefair, 2004).

A study done in the Great Barrier Reef in 2010 had visitors fill out surveys on their own self-reported knowledge of the reef environment, basic reef ecology, and human impacts both before and after going through the interpretive program. The group who had gone through the interpretive program self-reported an almost 60% increase in knowledge on the reef environment, a 40% increase in basic reef ecology, and an almost 40% increase in human impacts, compared to the groups who had not gone through the programs (Madin, 2010). By increasing visitor’s knowledge of the general resource, as well as informing them of the impacts that humans make in an engaging way, visitors can develop “place attachment,” or an emotional

or spiritual connection to a place. Visitors who are the most informed, and most passionate of the area are generally the ones least likely to cause impacts to the surrounding area.

Next, a researcher in 2004 studied the impacts of 41 guided walks in Lamington National Park, Australia, taking careful note of three specific visitor actions: shortcuts, picking up litter, and noise levels. Five interpretive programs were created and the study determined whether interpretation truly reduces the impacts. The results of the study showed that interpretation (as well as verbal appeals and role modelling by the ranger) significantly decreased the environmental impacts made by visitors. With effective interpretation and role modelling, the visitors were significantly less likely to take a shortcut off trail and more likely to keep the noise down. However, the picking up of litter did not change (Littlefair, 2004). As a result, we can see that while interpretation is highly effective in some areas, it is not a catch all for every issue in a park.

Interpretation is a procedure that aims to influence how a visitor thinks about the resource they are currently in. While it does not explicitly force people to change their behavior, it often inherently gives them a reason to *want* to follow the rules. While these studies focused on guided hikes, interpretation can take many forms, from signage to displays to a visitor's center. Often the people travelling to a natural resource want to be there, meaning they are open to learning more, and will take away messages from the learning experience. By essentially getting visitors to care about the resource and what makes it special, we can help protect natural resource areas for many years to come.

Lake Management Strategies

In addition to understanding the measures recreation areas have taken to reduce the environmental impact of visitors, we must also understand how lake managers develop the plans and enact the measures that lead to reduced environmental harm. This section reviews the creation of lake management strategies with an emphasis on community engagement.

Community engagement is the process that local government agencies undergo to incorporate public input when planning for future development, and specifically in this case, future development of recreational lake amenities. For local leaders to be accountable to their citizens, they must make a sincere attempt to establish mechanisms by which public input is included in decision making (Popovicova and Gregg, 2010). Therefore, community engagement is a crucial aspect of the planning process because it allows citizen's opinions to be heard and integrated into plans.

A study of Lake Ziway in Ethiopia reveals how data collection geared toward a specific population can be used to examine the community's knowledge of the present conditions of the study area. The researchers at Lake Ziway specifically examine the knowledge of school students about the present conditions of the lake through a questionnaire. The questionnaire was developed and conducted to determine the level of understanding and perceptions of school students about the environment and social significance, human impacts, sustainable utilization, pollution levels, lake protection, school environmental clubs and future protection plan related to Lake Ziway (Desta et al, 2015). The questionnaire included questions about the importance of the Lake to the students, why the resources at the Lake were not being used in a sustainable manner, and why there was a lack of awareness by resource users and an absence of policy and governmental control over the utilization of lake resources (Desta et al, 2015). Thus, the case

study of Lake Ziway, Ethiopia revealed the potential of a questionnaire to reveal current knowledge, interpretations, and opinions of the lake of study.

A second study of another recreational lake's planning process reveals how facilitating and encouraging citizens' involvement in community workshops works to improve engagement. These types of workshops can take place after the community is engaged with initial questionnaires or surveys. Research on eutrophic lake management in Finland illuminates the benefits of involving the community of lake users and surrounding residents in the planning process, specifically through scenario planning and future-oriented workshops (Nygrén, 2018). This study discussed the findings of five scenario workshops arranged for stakeholders in the eutrophic lakes of study in Finland. The goal of these future-oriented workshops was to "gather stakeholder insights in order to produce knowledge of the future for the needs of decision-making on individual, organizational or societal level" (Nygrén, 2018). All of the workshops involved presentation of new research findings, a creativity-enhancing exercise, imaging of the lake's future, building scenarios, envisioning paths or actions to the scenarios, and then giving feedback (Nygrén, 2018). These workshops should focus on preferable scenarios and what it means to reach the scenario, the possible obstacles, and the roles of different actors in order to build inclusive scenarios, strengthen the participants' future consciousness, and create a pursuit of new ideas for development (Nygrén, 2018). The findings of these workshops suggest that scenario workshops can empower, enhance the future consciousness of the participants, and network people interested in the same topic (Nygrén, 2018). Therefore, involving the community in a recreational lake planning process can set the stage for successful lake management.

Lake management is more of a process than a product, therefore community engagement is a crucial aspect of lake management. A lake management plan as a product states how the

various recreational activities, their shoreline land uses, and infrastructure should be controlled and whether or not these [activities, uses, and infrastructure] are analogous to a land (and water) use plan (Jaakson 1984). Community engagement data from tactics like questionnaires and community workshops guide these planning policies. The management plan is also a document which sets down agreed-to policies which subsequently may serve as guidelines for the resolution of new problems (Jaakson, 1985). Therefore, beginning with community engagement processes and transitioning those results into concrete management plans sets the stage for the resolution of current planning problems and creation of a framework for future recreational lake management.

Lake Planning Policy

An important part of any land management plan is policy. The value of policy extends beyond that of its role as a device for implementing law and order. Policy can integrate and balance the needs of residents and stakeholders with the projected economic and ecological needs of the future. Implementation of land and water use policy plans, such as what was incorporated into the Calumet Area Land Use Plan, allows for the development of industrial facilities, public open space, habitat open space, recreational open space, and landfill/waste management open space. (Kellogg, 2007) Additionally, the planning and collaborative process involved with creating policies promotes the incorporation of environmental principles into the mindsets of the parties involved with development.

Further, policy-makers often try to consider the attitudes and perspectives of the residents and visitors of the area. Such information can be collected through the application of random, voluntary surveys. A survey based in the Heartland Region of the United States was developed

with the intention of establishing a system for presenting and negotiating divergent viewpoints of water quality issues between the public and agencies responsible for developing policies (Hu and Morton, 2011). The stratified random mail sample survey was sent to 1,042 residents of the region from which there was a 54% response rate. (Hu and Mortan, 2011). The survey consisted of questions relating to the importance and use of water resources, beliefs about water quality, environmental attitudes, and beliefs about who should be responsible for improving or maintaining water quality. The results of the survey indicated that the residents had an evident concern for water quality and felt that the governing agency should address these issues through policy. Surveys like these ensure that the interests of the residents and visitors are acknowledged and incorporated into the policies that directly affect them and their surrounding environment.

STUDY AREA

Marion County Lake and Park is situated about two miles southeast of the City of Marion, Kansas. The lake was constructed in 1936 by the Civilian Conservation Corps as the result of one of Franklin D. Roosevelt's New Deal programs to conserve natural resources. The lake and park facilities were built by members of a Black Veteran Company who served in World War I and is considered a national historic site. Marion County Lake and Park spans approximately 300 acres of land and the body of water covers about 153 acres with depths up to 40 feet. (*Marion County Lake and Park*). Marion County Lake and Park draws in thousands of visitors and campers each year and more than 235 residents live on the lake year-round. (*Marion County Lake and Park*). The park also offers a variety of recreational and educational services year-round such as fishing, hiking, camping, boating, and more. (See Table 1.a.).

FACILITIES	QTY	FACILITIES	QTY	FACILITIES	QTY
Land, acres	300	Water, acres	153	Fishing	Yes
Hunting	no	Hiking Trail	5 miles	Picnicking	Yes
Picnic Shelters	2	Swimming beach	1400 feet	Summer Programs	Yes
Museum	Yes	Boating Limits	Yes	Boat Ramps	3
Showers/Flush Toilets	Yes	Lake Concessions	Yes	Dump Station	Yes

Table 1: Facilities Available at MCPL

Overview of Policy

The term policy, for purposes of this paper, refers to the principles of action adopted and imposed by the governing body or agency upon the target lake and park. The scope and purpose of lake and park policies and regulations vary between federal, state, and private sites. Certain environmental and safety regulations enforced by federal and state entities are fixed, however, local policy and ordinances can address additional issues or concerns of residents and visitors. The State and Local policies that are imposed on residents and property owners as well as visitors are for the purposes of maintaining or improving environmental, water, and infrastructural quality.

Marion County Park and Lake Policies

The following authority is not an all-inclusive list of regulations and is specific to the questions included on the Marion County Lake and Park survey.

Land and Water Policy

Regulation 115-8-19, from the Kansas Department of Wildlife, Parks and Tourism, provides provisions, restrictions, and penalties concerning personal conduct of residents and visitors on the lands and waters of the park. The regulation prohibits the advertisement or solicitation of any unauthorized business or business-like transaction on park land or water. Additionally, all residents and visitors must refrain from engaging in conduct that would alarm, anger, or disturb others during the designated quiet time of 11:00 p.m. to 6:00 a.m. Violation of these provisions can result in immediate removal of person and property from the lake and park.

The Kansas Department of Wildlife, Parks and Tourism also provides regulations that are intended to prevent degradation of the aesthetic and environmental quality on the lands and

waters of the park. Such regulations address littering, construction, and other prohibited activities. Pursuant to regulation 115-8-20, the construction of any building, structure or roadway is disallowed on park land and water unless authorized by the department. It is prohibited to destroy, deface, or remove signs, real or personal property, geological formations, historical sites, archeological relics or ruins, vegetation (except for the non-commercial collection of wild plants), wild fruits, nuts, or fungi for human consumption. Further, the provision requires that trash, litter, and waste material be deposited in designated containers.

Recreational Policy

Marion County Lake and Park offers a variety of recreational activities for its visitors and residents to include camping, swimming, boating, hiking, and more. For the purpose of this paper, the regulations and policies pertaining only to the activities I have listed above will be addressed as they are the most frequented.

One of the most popular recreational activities associated with State lakes and parks is camping (Green 429). The large campground that now exists at Marion County Lake and Park was not a part of the initial construction of the lake but later became an addition upon increased interest and demand by visitors (*Marion County Lake and Park*).

The Kansas Department of Wildlife, Parks and Tourism has laid out general provisions for campgrounds and campsites as well as for the occupants of the same. The regulations essentially restrict the number of consecutive days that a visitor stays in a campground. A visitor and their personal property cannot stay at a campsite for longer than 14 consecutive days without a 5-day absentee interval or an approved, written permit. Upon approval of a 14-day extension permit, a visitor may stay for up to 28 consecutive days under the same provisions. A long-term permit can be requested and allows the visitor to reside at the campgrounds of a single State park

for up to 6 consecutive months. Additionally, any personal property, vehicles, or campsites cannot be unattended or unoccupied for a period of time exceeding 24 hours, and any of the same that is left or abandoned by the visitors is subject to removal by lake management (115-8-9 *Kansas Department of Wildlife, Parks and Tourism*).

Regulation 115-8-8 from the Kansas Department of Wildlife, Parks and Tourism provides a basic outline of provisions that apply to recreational activities at State lakes like Marion County Lake. The regulation states that swimming, as well as scuba diving and water sports, in department waters shall be allowed in areas designated by buoys or markers. Additionally, according to 115-8-7, any motorized vessel on state lakes must be operated for authorized purposes only, and cannot be operated at wake speeds while within 200 feet of a swimming area, boat dock or boat ramp.

Regulations on boating are not limited to State authority. Certain federal codes on boating that have been adopted by the State regulate the characteristics of boats allowed on department waters to include identification, maximum weight and capacity, horsepower, tanks and engine spaces and more. (115-30-6 *Kansas Department of Wildlife, Parks and Tourism*). Further, State lakes must comply with federal regulations pertaining to operating vessels with marine sanitation devices (toilets/sewage). These provisions include rules and instructions for operating discharge valves, locking devices, and disposing of waste (115-30-12 *Kansas Department of Wildlife, Parks and Tourism*).

Residential Policy

The residential district of Marion County Lake and Park consists of mainly trailer homes and is located on property owned by the Marion County Lake and the County of Marion. The residences are serviced by public water and sewer and any residential development must be

approved by the Marion County Improvement Committee to include requiring conditional permits for the construction of non-residential, non-single-family dwellings.

Pursuant to Article 7 of *Marion County Lake Lot Residential District Regulations*, there is no limitation on the dimensions or number of residential lots per family, however, there is a minimum of 1,600 square feet per lot. Additionally, the height of the buildings or structures as well as the dimensions of the front, side, and back yards within approved lots must comply with the minimal standards laid out by the regulations.

Marion County Lake and Park residential district is limited to designated plots of land on the northwestern side of Marion County lake. Some residences located along the eastern side of the plot are facing the water, however, none of the property lines of the structures reach the shoreline of the lake. This eliminates the need to include policies regarding resident compliance with waterfront maintenance or development in the Marion County Lake and Park management plan.

METHODS

To help inform a lake management plan that considers the complex needs of sustainability, our team modified and administered a survey developed by a previous NRES team. Based on our group's expertise, we removed and added in questions to best target current environmental, recreational, and policy concerns. Survey questions consisted of closed-ended and open-ended questions about visitors' usage of the lake and its features, awareness of environmental issues, and preferences regarding certain lake policies. We developed the survey in Qualtrics, and upon completion of the survey, submitted an application to the Institutional Review Board (IRB) and received approval (IRB #10302). Once approved, the survey was administered online by the land manager of Marion County Park and Lake, Isaac Hett. The manager advertised the survey through the MCPL Facebook page. The survey was open for two weeks, and Hett posted a reminder for the survey after one week. Responses were recorded and saved within the Qualtrics system. After the two week period, the survey was closed with a total of 122 responses. Closed-ended questions were then analyzed using Microsoft Excel and R programming software. Open-ended questions were read and coded into themes by hand. Multiple team members coded the question responses independently and then compared their findings to ensure consensus.

RESULTS

Closed-ended Questions

Descriptive statistics and graphic representations of closed-ended survey questions provided valuable insights into the lake activities and features, how visitors and residents value these activities and features, and the visitors' and residents' concerns about the future of the lake. When asked to rank lake and park activities from most important to least important, respondents, on average, ranked fishing (1), boating (2), and walking (3) as the top three important activities they participate in at the lake and park. Regarding ecological issues at the Park and Lake, residents and visitors of MCPL alike, but especially visitors, were divided on whether fallen trees should be removed (Figure 1). Further, 86% of survey participants either agreed or strongly agreed with the statement that water quality is important to them. Regarding algal blooms specifically, MCPL residents and visitors agreed that algal blooms affected lake goers' decision to participate in lake activities (Figure 2). This data indicates that lake goers are aware of the importance of water quality and may attribute water quality issues to algal blooms. The residents and visitors, in contrast, expressed varied views on whether migratory geese should be allowed to overwinter at MCPL. Survey respondents' answers ranged from "strongly agree" to "strongly disagree" (Figure 3).

Figure 1: MCPL residents and visitors share to what extent they agree that dead or fallen trees should be removed

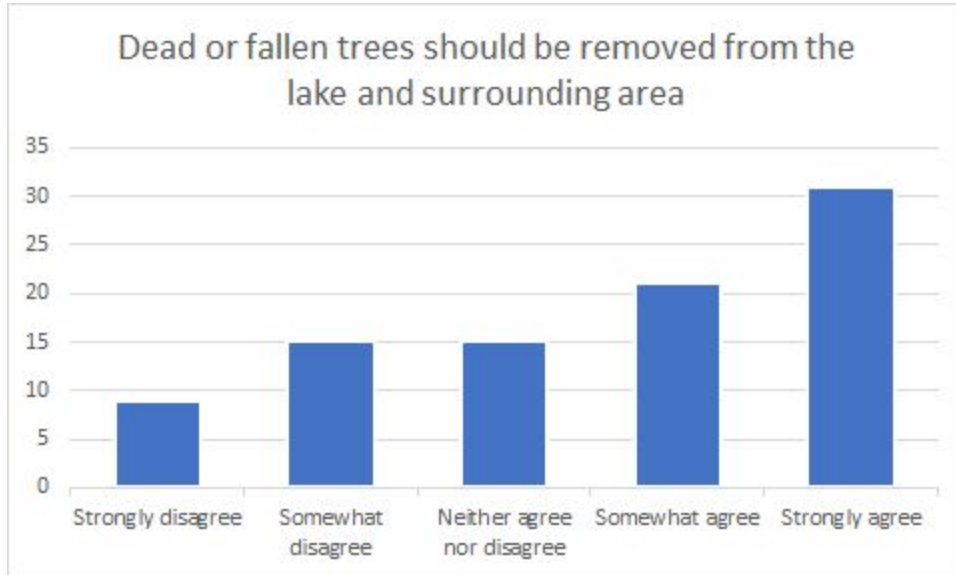


Figure 2: MCPL residents and visitors share to what extent they agree that algal blooms have affected their decision to participate in lake activities

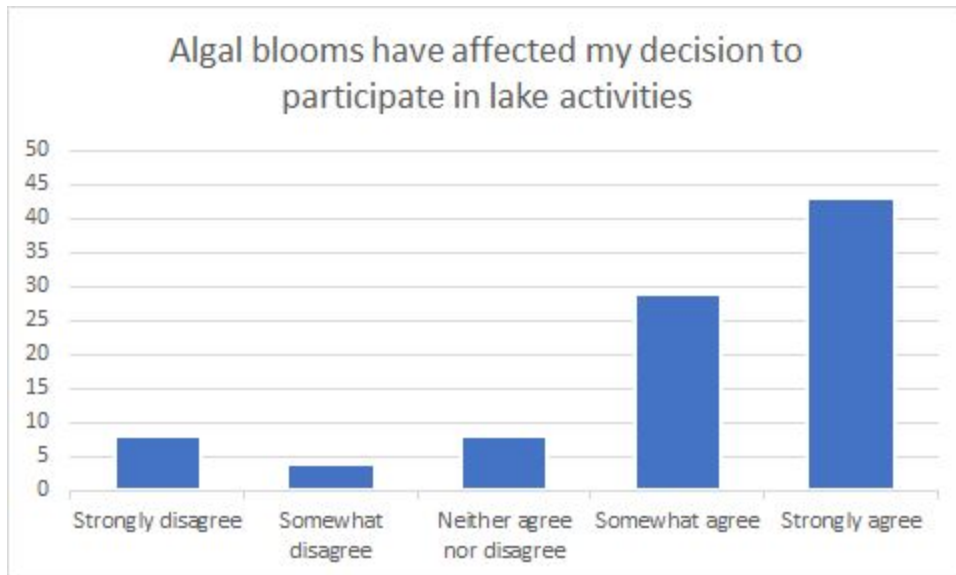
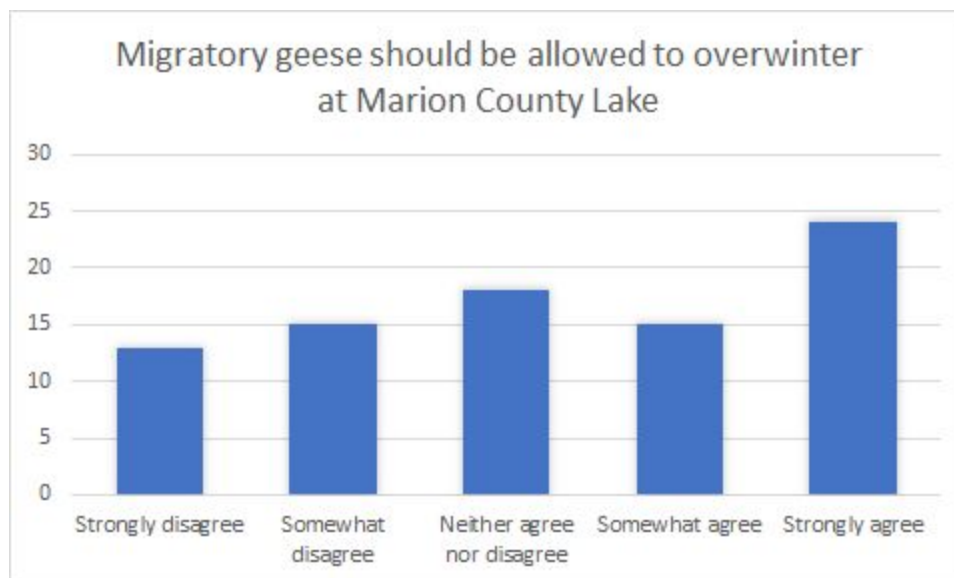


Figure 3: MCPL residents and visitors share to what extent they agree that migratory geese should be allowed to overwinter at the lake



When asked to rank lake and park features in order of importance, respondents, on average, ranked campsites (1), the heated fishing dock (2), and hiking trails and restrooms (3,4) as the four most important lake features, with hiking trails and restrooms nearly tying for third place. Although the heated fishing dock was ranked as one of the most important park and lake features, 58% of survey respondents perceived the heated fishing dock as being of terrible or poor quality (Figure 4). However, other elements of the Park and Lake received more favorable reviews than the heated fishing dock. The survey respondents largely perceived the hiking trails as average quality. Since 51% of survey participants selected “Do Not Know” for the quality of hiking trails, but walking is the third most-preferred activity at the lake, it is likely that any trails are either unofficial, unmarked, or just considered to be the road around the lake (Figure 5). Campsites and boat ramps received mostly average to good ratings (Figure 6), showing that these are relative strengths of MLCP. While answers varied regarding wake-causing boats, the most prominent opinion from both visitors and residents was that the current hours that wake-causing

boats should be allowed to operate on the lake should be maintained, rather than being extended or lessened.

Figure 4: Quality of heated fishing docks according to MCPL residents and visitors

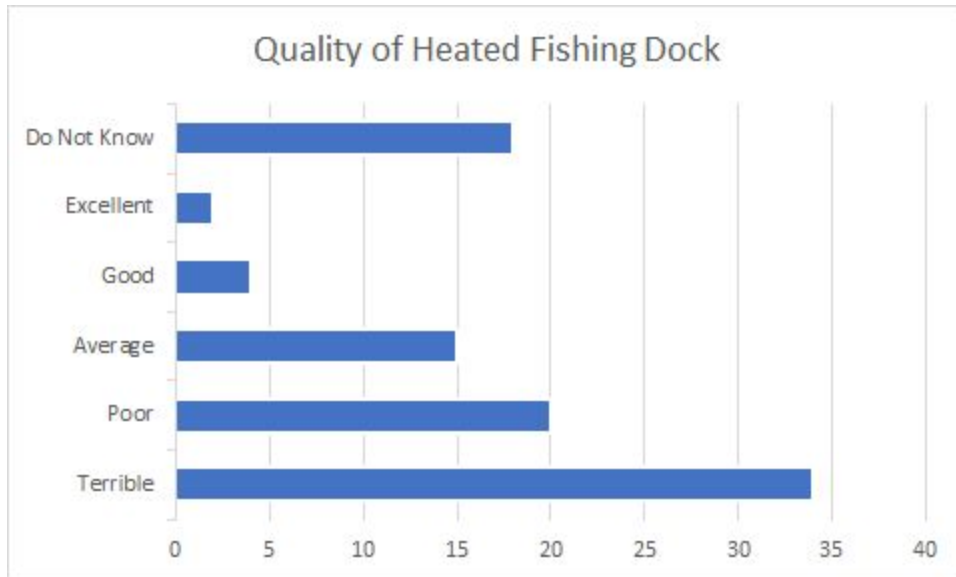


Figure 5: Quality of hiking trails according to MCPL residents and visitors

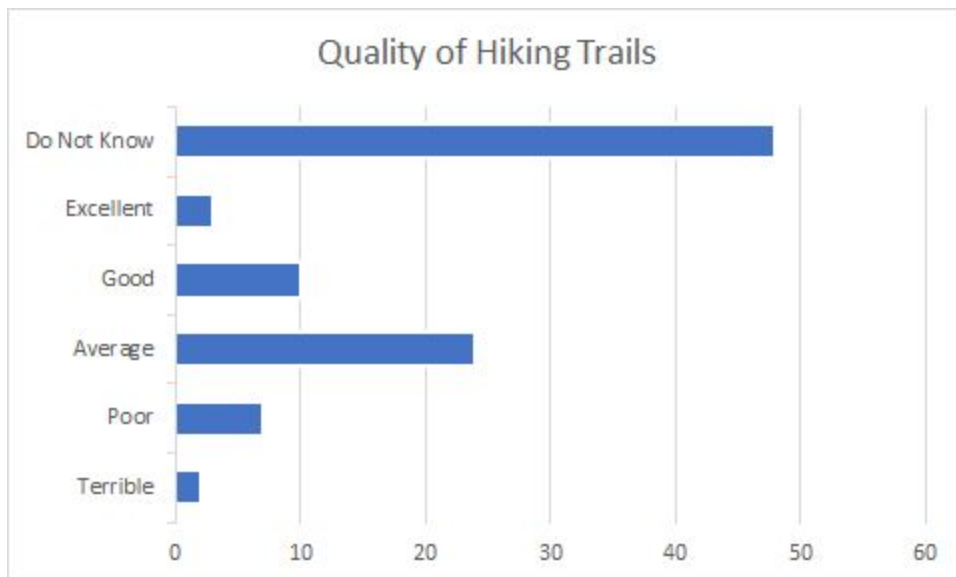
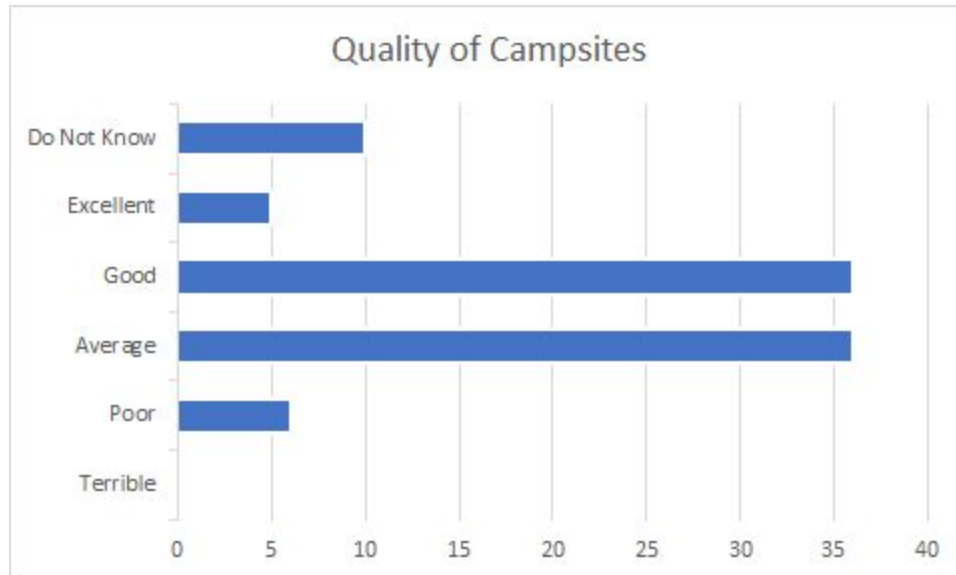


Figure 6: Quality of campsites according to MCPL residents and visitors



One survey question asked respondents in which types of educational opportunities they would be interested in participating: educational signage describing plants and wildlife, ranger talks, guided hikes/tours, and/or ranger-led community events. Respondents were able to select each type of educational opportunity, independent of their other selections. Several respondents did not answer this question, but 63% of respondents chose at least one education type. Table 2 below shows the percentage of respondents who indicated interest in each type of education opportunity.

Education Type	Respondents Interested
Educational signage	23%
Ranger talks	25%
Guided hikes/tours	23%
Ranger-led community events	27%

Table 2: Percentages of respondents having interest in educational opportunities by means of educational signage, ranger talks, guided hikes/tours, and ranger-led community events

Open-ended Questions

Analyzing and coding the open-ended survey questions reveals multiple themes regarding visitors and respondents concerns about the lake and park. These themes include the privatization of docks, the effect of algal blooms on swimming and fishing activities, and access to formalized lake rules and information.

Many MCPL residents expressed a desire to privatize their docks and stated that they would even be willing to pay an annual fee to do so. An example from the survey states,

“I would like to see an option for dock owners to be able to put up a gate and lock their docks up to be for personal use only!! We could pay a fee per year to help cover some cost. If not all just make it an option for some if they are interested. It is frustrating when you want to go fish and someone had been fishing your dock for hours already! Soooo no fish to be caught! And that’s why we bought a dock. So we would have our own place to go! Thanks for listening.”

Residents argued that because they have purchased and installed a dock, the public should not be allowed to make use of them. This sentiment is echoed by many residents as seen from their open-ended responses:

“Dock usage. My parents own the dock and have had some very disrespectful individuals using the dock upon our arrival.”

“We own a dock and constantly have to ask people to leave when we arrive to use it.”

“Private docks instead of public ones.”

The idea that residents should be given the opportunity to privatize their docks was a common theme throughout the survey responses and appears to be a source of concern and conflict among visitors and residents.

Additionally, residents and visitors emphasized trends in the closed-ended portion of the survey by expressing a concern for the effect of algal blooms on their fishing and swimming

activities. For example, this longterm resident expressed concern for the water quality of the lake and the effects of the same on recreational activities.

“My husband is a lifelong resident and I have resided here for over 20 years. We use to swim at the lake all summer and boat there, also. We no longer do these things because my husband becomes ill for several days after being in the water. The color of the water has become incredibly murky. Since we live very close to the lake, we see the over population of geese during the winter and the amount of waste that ends up in the lake is too much for the size, in our opinion. Now, we only walk around the lake, would love for our kids to be able to swim in it again someday”

Further, another participant indicated that blue-green algae has significantly contributed to poor water quality at the lake, and suggested that this will have long-term revocations.

“I’m afraid that if the blue-green algae continues at the rate that it has been going, that before too long the lake will be unusable for people wanting to participate in water activities. Every year it seems like it gets worse, and also shows up earlier, and lasts longer into the year”

Likewise, a frequent visitor of Marion County Lake shared similar perspectives on the impacts of algal blooms on fishing.

“The fishing opportunities used to be fantastic, and we used to come to the lake on a regular basis. The algae blooms have deteriorated the fishery, and it hasn’t been worth coming.”

Finally, the residents of MCPL expressed a desire for some kind of informative literature about the area to be provided by the County. One survey response stated,

“I bought property at the lake and we plan to use the lake a lot. It would be nice to have a location to understand the rules of the lake, how it operates, etc. maybe I’ve missed it but I would like to see a map of disc golf, understand requirements of use of lake, etc”

Others requested a newsletter, or even a booklet of the rules and regulations. The residents of MCPL have expressed concerns about being kept in the dark, and would like to be informed about upcoming park projects. The statement above is joined by others, stating,

“We have many people who are new to the lake and the area. It would be helpful for all residents to receive a booklet detailing ordinance and practices specific to maintaining an environmentally healthy lake for all. It would also be nice to have a resident directory, like we once had, to help us get to know our neighbors better.”

“It would be nice to have monthly lake newsletter . This could keep all residents informed of upcoming events and progress of lake projects.”

These comments emphasize the desire for more clear and accessible information regarding lake rules, amenities, and projects.

CONCLUSIONS AND DISCUSSION

As the intent of this survey was to collect visitors' and residents' knowledge and perception of the lake for a future management plan, recommendations for lake planning and management can be made from the survey results. Since residents strongly desire the opportunity to privatize their docks, we recommend they be given the opportunity to pay an annual fee to privatize their docks. These annual fees collected can be used to enhance fishing opportunities around the lake as fishing is a valued activity at the lake. Because the heated fishing dock is a highly important feature that is reported to be of low quality, using the money from private dock fees to install more public docks and improve the heated fishing dock would be ideal.

Additionally, previous groups have found that geese significantly contribute to the growth of algal blooms at the lake. Given the respondents had strong concerns regarding water quality and no strong or consistent views on geese, we recommend exploring strategies to get rid of the geese or significantly reduce the amount of geese, but educating residents and visitors as to how this benefits the lake. Lastly, the results of our survey indicate that there is a substantial demand for accessible information regarding lake regulations and activities and an openness to educational opportunities. Thus, tools such as interpretive signage, a MCPL newsletter, and regular updating of the Park and Lake's website are opportunities to educate visitors and residents on MCPL's ecology and rules. These recommendations derived from survey results can serve as a foundation for a future management plan that promotes ecological sustainability and health while maintaining visitor and resident experience.

REFERENCES

- Ayana, E. K., Worqlul, A. W., & Steenhuis, T. S. (2015). Evaluation of stream water quality data generated from MODIS images in modeling total suspended solid emission to a freshwater lake. *Science of the Total Environment*, 523, 170-177. Retrieved October 30, 2020.
- Chen, Q., Rui, H., Li, W., & Zhang, Y. (2014). Analysis of algal bloom risk with uncertainties in lakes by integrating self-organizing map and fuzzy information theory. *Science of The Total Environment*, 482-483, 318-324. doi:10.1016/j.scitotenv.2014.02.096
- Desta, H., Lemma, B., Albert, G., & Stellmacher, T. (2015). Degradation of Lake Ziway, Ethiopia: A study of the environmental perceptions of school students. *Lakes & Reservoirs: Research & Management*, 20(4), 243–255. <https://doi.org/10.1111/lre.12111>
- Hu, Zhihua, and Lois Wright Morton. “U.S. Midwestern Residents Perceptions of Water Quality.” *Water*, vol. 3, no. 1, 2011, pp. 217–234., doi:10.3390/w3010217.
- Jaakson, Reiner. “Recreation Planning for a Small Urban Lake: Conflict Resolution of Institutional and Site Constraints on Dow’s Lake, Ottawa.” *Town Planning Review* 56, no. 1 (January 1985): 90. <https://doi.org/10.3828/tpr.56.1.g35751mm8l3343p2>.
- Kansas Department of Wildlife, Parks and Tourism. “Regulations.” *Regulations / Law Enforcement / Services / KDWPT - KDWPT*, 18 Sept. 2020, ksoutdoors.com/Services/Law-Enforcement/Regulations
- Kellogg, Wendy. “Sustainable Waterfront Development in the Great Lakes Basin.” *Handbook of Globalization and the Environment*, by Khi V. Thai et al., CRC Press, 2007, pp. 311–331.
- Kuo, I. L. (2002, March 1). *The effectiveness of environmental interpretation at resource-sensitive tourism destinations*. Wiley Online Library. <https://onlinelibrary.wiley.com/doi/abs/10.1002/jtr.362>.
- Le Corre, N., Peuziat, I., Brigand, L., Gelinaud, G., and Meur-ferec, C. (October 2013). Wintering Waterbirds and Recreationists in Natural Areas: A Sociological Approach to the Awareness of Bird Disturbance. *Environmental Management*. Retrieved from: <https://search-proquest-com.er.lib.k-state.edu/docview/1434561900/abstract/3416B66F1A124859PQ/4?accountid=11789>
- Littlefair, C. (2004). Reducing Impacts Through Interpretation, Lamington National Park. Retrieved December, 2020, from <https://www.cabdirect.org/cabdirect/abstract/20043135906>

- Manning, R.E., Anderson, L.E. and Pettengill, P.R. (2017). Don't Pick Up Aquatic Hitchhikers in Voyageurs. In Manning R.E., et al, *Managing Outdoor Recreation: Case Studies in the National Parks* (pp. 118-121). Oxon, UK: CABI
- N. (2006). National Association for Interpretation: Definitions Project. Retrieved December, 2020, from https://interpnet.files.wordpress.com/2020/07/definitions_project.pdf
- Nygrén, Nina A. "Scenario Workshops as a Tool for Participatory Planning in a Case of Lake Management." *Futures* 107 (March 2019): 29–44.
<https://doi.org/10.1016/j.futures.2018.10.004>.
- Popovicova, J., & Gregg, A. L. (2010). Evaluating Approaches for Gathering Public Input in Master Planning Efforts for Future Development of a Recreational Reservoir. *Journal of Park and Recreation Administration; Urbana*, 28(4).
<http://search.proquest.com/agricenvironm/docview/1730175379/abstract/AFE4863915AF4127PQ/21>
- Sagerman, J., Hansen, J. P. and Wikstrom, S. A. (2019 July, 11). Effects of Boat Traffic and Mooring Infrastructure on Aquatic Vegetation: A Systematic Review and Meta-analysis. *Ambio*. Retrieved from: <https://link.springer.com/article/10.1007/s13280-019-01215-9>
- Severson, J. (2009). Shoreline stabilization using riprap breakwaters on a Midwestern reservoir. *Lake and Reservoir Management*, 25(2), 208-216.
- Straskraba, M., & Tundisi, J. G. (1999). *Reservoir Water Quality Management* (Vol. 9). Kusatsu: International Lake Environment Committee Foundation.
- Zoning Regulations, Marion County. "Article 7." "LL" MARION COUNTY LAKE LOT RESIDENTIAL DISTRICT REGULATIONS, 2011, www.marioncoks.net/Portals/ks-marion/documents/Plan-Zone/Article%2007%20-%20L%20-%20DY%20Version.pdf.