

WILDLIFE MANAGEMENT ON URBAN GOLF COURSES: THE CASE OF THE OTTAWA
HUNT AND GOLF CLUB

by

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An Undergraduate Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of
Honours Bachelor of Science in Forestry

Faculty of Natural Resources Management

Lakehead University

April 25, 2023

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A CAUTION TO THE READER

This HBScF thesis has been through a semi-formal process of review and comment by at least two faculty members. It is made available for loan by the Faculty of Natural Resources Management for the purpose of advancing the practice of professional and scientific forestry.

The reader should be aware that opinions and conclusions expressed in this document are those of the student and do not necessarily reflect the opinions of the thesis supervisor, the faculty or of Lakehead University.

ABSTRACT

Benner, T. 2023. Wildlife management on urban golf courses: the case of the Ottawa Hunt and Golf Club. 38 pp.

Keywords: Audubon International, certification, education, golf heritage, public greenspaces

Urban development has put increasing pressure on public greenspaces and the local wildlife populations encompassing them. Golf courses are an accessible way for the public to view the natural environment and wildlife within the limits of urban boundaries. The purpose of this thesis is to explore the environmental impacts of golf courses on urban wildlife and the relationship between the public among a few golf courses. Audubon International is an environmental group focused on preserving the natural environment while incorporating the heritage of the game of golf. The Ottawa Hunt and Golf Club is a certified course within this organization and has provided the urban community with multiple initiatives for protecting and promoting wildlife, water quality and conservation through outreach and education opportunities.

ACKNOWLEDGEMENTS

I first thank my parents for the encouragement throughout my schooling to continue to learn and educate myself on various topics that speak to me. I also thank Brian McLaren for advising my thesis and providing insight, guidance, and thoughtful encouragement throughout this process. Finally, I acknowledge the efforts of Eric Ruhs, Bobby Cook and all the staff, members and community of the Ottawa Hunt and Golf Club for providing data, experience and overall positivity towards me and my pursuit of this thesis.

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INTRODUCTION

The development of cities has put increasing pressure on public greenspaces. Golf courses are an accessible way for the public, or in some cases private members, to view the natural environment and wildlife within the limits of urban boundaries. Although golf courses cannot replicate the true beauty of a forest, they can provide an urban ecosystem for people and wildlife to use in harmony. Ottawa, Canada, is a city comprised of multiple subdivisions and urban areas. While the townships along the outskirts of the suburban core have more forested and agricultural land, the inner city is a concrete jungle.

I spent two years working at the Ottawa Hunt and Golf Club located in a suburb of Ottawa. The Hunt Club offers a remarkable experience for work, golf, and other recreational activities. I have observed the golf course act as a natural ecosystem located in the middle of an urban area. I have witnessed everything from trees being blown down in a large thunderstorm to coyote pups being born in our dump area. I believe that golf courses can serve as a recreational area, a natural ecosystem, and a protected zone for wildlife. In this thesis, I will collect data from the Ottawa Hunt and Golf Club golf course on wildlife species, the interactions between local wildlife inhabiting the course and the patrons at the club, and the impacts of golf course operations on wildlife. I will be exploring these relationships with an overview of two other locations.

My objective for this thesis is to examine how management of golf courses and public interaction with native wildlife can be improved. Public interactions with wildlife have varied across the game of golf. For example, when a coyote runs across the fairway and digs through sand bunkers for food or when birds chirp across treetops, players that are concentrating on their putts can be annoyed. Improvements to the relationships between

wildlife and people can benefit all parties through the support for animals and the public. Golf courses can improve urban wildlife habitats and can promote public knowledge and positive opinion of urban wildlife and habitats. Habitat management plans reviewed in this thesis include the Ottawa Hunt and Golf Club, a golf course in Scotland (St. Duke's Course), and a golf course in Phoenix, USA. Together, these case studies can provide solutions from different environmental landscapes. In the case of the Ottawa Hunt and Golf Club, developing a plan for canopy, riparian and terrestrial wildlife habitat was proposed to benefit the local canopy, terrestrial, and amphibious wildlife populations. Within the golf course community, those who do not otherwise interact with urban wildlife can be served by outreach and educational opportunities that generally improve the relationship between animal and human communities.

LITERATURE REVIEW

The objective of this literature review is to investigate the relationship between the public and wildlife on golf courses. The public is generally unaware of the diversity and behaviour of wild animals in suburban areas due to lack of knowledge and education. This unawareness can be an issue resulting in negative impacts on urban wildlife populations. Management plans and initiatives on golf courses were examined to aid in the formulation of proposals, recommendations, and concerns for habitat management in the Ottawa Hunt and Golf Club.

Urban environments

Major cities around the world have replaced natural landscapes with a concrete jungle of roads, buildings, and utility systems now ingrained in our daily lives (McComb 2016). Urban areas are increasing in size, while they negatively impact natural vegetation and biodiversity, causing the extinction of local wildlife through gradual impacts (Nguyen 2022). These threats include the rapid expansion of disease and other issues, water pollution, poor habitat management and unsanctioned development (Wilby and Perry 2006). The expanding nature of human growth causes urban environments to sprawl, further impeding rural and forested habitat zones (McComb 2016). On the other hand, urban ecosystems are highly variable in dynamics and can be pillars of information for other types of ecosystem management (Savard et al. 2000). Overall, a successful urban environment is based upon a well-maintained set of green spaces (Wilby and Perry 2006). Human decisions are the key to forming viable landscapes that support wildlife species within urban environments, and such decisions are regarded with high priority with the social, cultural, economical, and political interactions of the public, especially in North America.

In an excellent reference on managing urban habitat for wildlife, Brenda McComb (2016) offers the following clear suggestions. Elements in urban habitats can affect wildlife species populations through features including dead wood, burrows, shrubs, streams, and wetlands.

- Dead wood is the deceased branches that hang off trees, which typically get removed because it is a danger to the human population and their property.

If dead wood is removed from the urban setting, it limits the opportunity to benefit the wildlife populations. Instead of removing or chipping dead wood, logs or branches can be

relocated to forest stands in golf courses to provide habitats to terrestrial and riparian wildlife. Dead wood is also useful to the avian population in providing cavities and nesting spots.

- Burrows can be limited when humans pave with asphalt creating an impervious surface.

The compaction of the soil from vehicular movement and other heavy impacts also affects stormwater runoff, which when increased can destroy den sites for the burrowing animals.

- Shrubs are an extremely important feature in urban environments due to the multiple opportunities they provide for wildlife, for example, food sources, nesting, and cover.

Shrubs can be dangerous in public areas for people due to criminal activity, but necessary for habitat patches, therefore a balance needs to be maintained. Shrubs are typically managed heavily in urban areas due to the danger they pose, but in golf courses there are more opportunities to create shrub habitats.

- Streams and wetlands are some of most important urban landscapes as they provide opportunities for pathways between habitat patches that allow wildlife to traverse.

Riparian areas are beneficial for urban wildlife to protect pathways through streams and wetlands, as well as maintain the areas between aquatic habitats and the terrestrial forested habitat.

Cities have negatively affected evolution through restricted genetic flow and elevating genetic drift unpredictability, resulting in wildlife populations limited in size (Johnson and Munshi-South 2017). Cities are prime examples of the importance of sustainable practices as the pillars of sustainability: environmental, social, and economic (Van Bueren et al. 2012). Wildlife populations in urban environments create an impact on human health, quality of life, education,

and aesthetics. Encouraging the concept of wildlife conservation in urban areas can benefit our society sustainably (McCleery et al. 2014). Conservation to benefit the relationship between humans and wildlife is a priority in urban wildlife management (Magle et al. 2019).

Golf course as greenspaces in urban environments

Golf courses provide the necessities for a multitude of wildlife species within the habitat fragments of the urban environment (Wurth et al. 2020). Wildlife has affected the game of golf in different ways, historically with rabbit scrapes forming targets and sheep burrowing in the sand, which developed into the sand bunkers of today (Balogh and Walker 2020). Golf courses can maintain wildlife and preserve them to create a diverse ecosystem with the proper development and regard for the natural biodiversity. Food sources, cover, water, and a variety of vegetation are features of golf courses that wildlife utilize for their survival. Managers need to keep these features in mind when developing and managing courses as the importance of humans, wildlife and water resources are beneficial for all parties. Golf course design can affect the aquatic and terrestrial habitats (Jackson et al. 2011).

In southern Ontario, the sport of golf has been increasing in popularity and has resulted in the highest density of golf courses in Canada. Therefore, it is especially necessary for golf courses in southern Ontario to develop ways to support biodiversity. Wildlife diversity can vary between golf courses, some will be beneficial for conservation value by supporting populations of threatened species, but other golf courses will be inadequate to support anything other than the urban-adapted wildlife (Hodgkison et al. 2007). Designing greenspaces like golf courses can help educate urban residents on natural ecosystems; doing so also allows them an area to view wildlife they would not typically see (Adams 2005). Golf courses can provide opportunities of travel for wildlife through a system of connecting habitat patches from hallway shape

greenspaces or greenways (McComb 2016). The fairways and surrounding trees of the Ottawa Hunt and Golf Club provide habitat for coyotes, amphibians, and an interesting selection of bird species (Kucey et al. 2008). The design of the Ottawa Hunt and Golf Club has surpassed certifications of the Audubon Certifications since 2008 and certifications have continued until 2021, as per Eric Ruhs, club superintendent.

Audubon International, an organization based upon creating a sustainable environment where people live, work, and play. They believe in a balance between environmental, economic, and social systems, main factors to creating a sustainable quality of life (Audubon 2022). This organization supports environmentally sustainable areas. It has developed a relationship with golf courses to help them become more environmentally friendly and increase the value of natural ecosystems in urban environments. Audubon International even provides opportunities for golf courses to become wildlife sanctuaries, provide natural areas within the urban environment, support plants and wildlife native to the area, protect water resources, revitalize degraded landscapes, improve the moderate temperature and air quality, and educate the public on the natural environment. Becoming an environmentally friendly or naturalistic golf course is beneficial for public perception (Terman 1997). The Ottawa Hunt and Golf Club has been a pioneer in ecological activities; for example, in tree planting programs, bird survey reports, birdhouse program for unique species, and overall maintenance for a healthy ecosystem (Kucey et al. 2008). Golf courses built in highly urban or neighbouring suburban landscapes are extremely important to incorporate the key features of ecological sustainability.

According to the book by Ronald G. Dodson (President of Audubon International), *Managing Wildlife Habitat on Golf Courses*, there are multiple benefits to support basic habitat management through the uses of understanding a basic of fundamental wildlife and habitat

concept. Benefits for the golf course and overall habitat structure through the naturalizing of your property include:

- Reduced maintenance costs
- Reduced water and chemical use
- Enhanced visual diversity
- Greater habitat diversity
- Greater wildlife diversity

These benefits can provide a golf course with interesting opportunities to develop their community and enrich the urban wildlife.

Riparian habitat

Aquatic habitat quality is based upon the hydroperiods, biotic community structure, littoral habitats and water chemistry that support wildlife species that need these attributes (Jackson et al. 2011). The aquatic and terrestrial ecosystems are divided by an area that can impact the food web dynamics and overall functions between the two habitats; this area is called the riparian zone (Kupilas et al. 2021). The spread of urban areas and human activities are leading the charge in degradation of riparian habitats and affecting populations dependent on aquatic ecosystems. Amphibians affected worldwide through the destruction of riparian habitat (Puglis 2012). Eastern North American amphibians that use ponds for breeding are subjected to extinction due to intricate life cycles that adhere to specific hydroperiods (McDonough and Paton 2007). Ponds and streams located in urban landscapes like golf courses offer some of the only habitats for semi-aquatic animals, like turtles (Harden et al. 2009). Maintaining natural riparian habitat within an urban environment can benefit a variety of wildlife.

Canopy habitat

Urban environments have an impact on bird populations that increases when a city increases in size and density (Hostetler and Knowles-Yanez 2003). Naturalistic golf courses act as a satisfactory wildlife habitat for bird populations, including threatened species (Terman 1997). The Ottawa Hunt and Golf Club conducts bird surveys frequently. In 2021, through the support of the Audubon International organization, they noted that of the roughly 27-hectare bird sanctuary within the golf course, 38 different species of birds were observed during the late spring (Bird Survey 2021). Birds can be attracted or repelled from golf courses depending on the design and management of the environment, and it is important to maintain native vegetation for native bird species (Hostetler and Knowles-Yanez 2003).

Terrestrial habitat

Within fragmented urban landscapes, leaving natural forest habitats can benefit animal populations (Harden et al. 2009). Coyotes have adapted their natural range in North America to use green spaces like golf courses due to the limited human activity especially at night and during the off-season (Wurth et al. 2020). Terrestrial habitat is comprised of features that are used for breeding, development, foraging and refuge (Jackson et al. 2011). Habitat quality provided is needed for individual wildlife to sustain themselves for foraging, refuge, overwintering, movements between habitats, and shifts in habitats in forest stands after disturbance occurs.

METHODS AND MATERIALS

Study Area

The Ottawa Hunt and Golf Club is a high-end club in the heart of the Hunt Club suburb of Ottawa, Ontario, and home to many recognized members of the community, sports figures, and other professional golfers. This course is known for its tree lined fairways. The trees act as a boundary line, protecting the 27-holes from the neighbouring airport, shopping centres and suburban houses. Not only the staff, but also the long-standing members care a lot about the beauty and health of the course. Some members recall planting trees along the 1st hole of the west course. Having these small forest stands across the golf course brings the challenge of managing the accompanying wildlife. Throughout the years of the golf course, members have seen wildlife roaming the natural forested areas and open fairways within the boundaries of the course. Members have witnessed coyotes, squirrels, chipmunks, raccoons, white-tailed deer, Canada geese, ravens, red-tailed hawks, ducks, frogs, and a few turtles along the grounds of the course. The course incorporates food sources, nesting sites and wildlife dens like the coyotes on the 4th/5th hole of the North course. They also maintain over 70 nesting boxes and 3 Purple Martin houses directly on the course.

Two case studies are examined to present context for the Ottawa Hunt and Golf Club (Table 1). The Duke's Course in St. Andrews, Fife in Scotland is a premiere example of environmental conservation. Integrated pest management and education and communication that coincides with the values of the Scottish Nature Heritage are profiles of this course (Table 2). The Phoenix Open is an established stop on the PGA Tour, one of the top leagues in professional golf. The tournament organizers pride on environmentalism and sustainability. In this case study, sustainability initiatives focus on wildlife, urban ecosystems, and opportunities of education (Table 3).

Table 1. Summary of the Ottawa Hunt and Golf Club.

Case study title	Location	Wildlife & Habitat Management	Outreach and Education	Recommendations
Site Visit Recertification Status Report (June 2, 2020)	Ottawa Hunt and Golf Club, Ottawa, ON	<ul style="list-style-type: none"> – Installing and monitoring bird boxes (75) – Planting milk weed to attract pollinators – Establishing significant acreage of native preserve – Allowing brush piles to accumulate throughout the property to further enhance shelter for wildlife – Removing invasive vegetation – Allowing wildlife to roam freely via vegetative corridors – Conducting minimum maintenance throughout the course’s natural areas – Naturalizing shorelines that are not in play – Maintaining buffer zones around water bodies – Providing additional habitat for wildlife around water bodies (logs, rocks) – Programing cart GPS to disable movement in and around native areas – Establishing a tree nursery – Planting over 17,000 trees over the past 40 years 	<ul style="list-style-type: none"> – Developing an Audubon International awareness display and plaque – Posting informative information on the course’s website – Educating guests and members with newsletters and presentations – Hosting a local school group and allow them to construct nesting boxes, participate in scavenger hunts, build terrariums and tour the property – Establishing a nesting box program – Offering an internship program for Golf Course Management students – Establishing a bird inventory with the help of the Ottawa Field Naturalists – Adding the Audubon International logo to employee e-signature 	<ul style="list-style-type: none"> – Continue to remove invasive vegetation by hand (when applicable) – Continue to establish acreage for native vegetation – Installing sensitive habitat area signs to discourage golfers from disturbing delicate habitat – Consider allowing snag trees to stand that do not compromise employee or golfer’ safety – Avoid doing any sort of maintenance to trees/native areas during nesting season – Consider participating in speaking engagements on the realities of golf course management – Consider installing wildlife cameras to monitor wildlife found on the property – Consider installing a Monarchs In The Rough sign in front of your milkweed areas

Table 2. Case study from the Nature Conservation and Golf Course Development: Best Practice Advice

Case Study	Location	Wildlife and Habitat Management	Outreach and Education
The Duke's Course	St. Andrews, Scotland, Fife	<p>Fairways that are carved out of the woodland to create a more natural look compared to a straight edge.</p> <p>Achieving species diversity and habitat structure was due to development of the edge habitats</p> <p>Extension of the existing woodland is being improved through the planting of seedlings in selected woodland species over a varying amount of space</p> <p>Disturbed and unseeded soil in the area is filled with dominant invasive species. Dense growth of thistle and other ruderal weeds in some areas detracts from the aesthetics of the landscape and also restricts species diversity</p> <p>Overall policy is to minimize the use of herbicides through the manual removal of thistles at convenient times of course management routines.</p> <p>Feeding of several species of birds occur on the course, therefore flower heads are left of herbaceous species to permit winter feeding for finches. Raptors also hunt over the golf course, thus nest boxes have been encourage to be placed in the area. This is important for the owls, kestrels and sparrowhawks of the course.</p> <p>The policy for the invasive plant <i>Rhododendron ponticum</i> is a highly undesirable plant for species diversity in the woodland area, therefore reducing the spread will improve the more desirable flora for aesthetics and ecological functions.</p>	<p>Course managers work closely with the Fife Council Ranger Service and consultation with the Scottish Golf Environment Group</p> <p>Conservation is regarded as sufficiently important to merit production of promotional material which explains the conservation policy</p>

Table 3. Case study from the Phoenix Open 2022 environmental initiatives.

Case Study	Location	Environmental and Sustainability initiatives	Social and Economic Impact
WM Phoenix Open, PGA TOUR	Phoenix, Arizona, United States of America	<ul style="list-style-type: none"> • Zero waste tournament • Balanced carbon and water operational footprint • Use of energy, materials, and water <ul style="list-style-type: none"> ◦ Harmful greenhouse emissions • Committed to minimizing environmental impacts from tournament activities • Always working for a sustainable future <ul style="list-style-type: none"> ◦ Sustainability education 	<ul style="list-style-type: none"> • Provide access for a diverse set of organizers through the fan and local community • 87th annual WM Phoenix Open tournament (2022) • 1 of 5 longest established events on the PGA TOUR • Sustainability Education • Charitable donations • Certifications <ul style="list-style-type: none"> ◦ Golf Environment Organization ◦ UL zero waste

RESULTS

The Ottawa Hunt and Golf Club is producing significant benefits for urban wildlife populations. The data shows multiple factors for environmental initiatives and outreach/education opportunities for wildlife utilizing the golf course. Through the Audubon International organization, the Ottawa Hunt and Golf Club as provided multiple practices for sustainability and protection of the environment. Since 2008, this includes tracking 81 different woody plant species, 54 wildflowers species and 90 different bird species found on the course (Kucey et al. 2008). Golf is a global sport with an imperative for management to mitigate the impact of golf courses on land and biodiversity (Hammond and Hudson 2007). In 2007, 200 golf course managers were surveyed in East Anglia, UK where only 12% of the courses contained a wildlife survey. In the city of London, UK, the protection of nature and its conservation is highly important (Harrison and Davies 2002). Utilizing golf courses for urban wildlife habitat with wildlife surveys like the Audubon International certificates are beneficial for golf courses and the environment around the world.

In Scotland, the Scottish Golf Environment Group has implemented initiatives throughout 33 different courses that they deemed important for scientific research, with developments in essential areas for wildlife, habitat protection, utilizing aspects of the environment (Scottish Golf Union n.d.). The Duke's Course in St. Andrews developed in the early 1990s and officially opened in 1995 (SGEG Nature Conservation Guidelines n.d.). Issues involving this golf course development included an absence of ecological surveys, protection of habitats and their potential projects in developments of habitats. Their objectives for management of the course included developing and maintaining a diverse population of wildlife and flora. The course would like to develop the grassland, scrub and wetland habitats but in early

years, there were no ecologists in the team, neither were they addressed with the SNH (Scottish Natural Heritage). In the management plans, the vision and aims topics included a policy that was drafted in general terms, but implementation is dynamic and flexible, and continues to develop in response in particular challenges or issues. The overall aim of the plan is stated as “*To create, by careful management, a landscape which is held in high regard for both its beauty and its abundance of diverse flora and wildlife*” (Nature Conservation and Golf Course Development). In the integrated pest management topic of the chapter expressed several ecological reasons including expanding the woodland area, increasing fertility in the soil, feeding the bird species on the course, and reducing the invasive species *Rhododendron ponticum*. Finally, the education and communication topics of the chapter included consultation with Fife Council Ranger Service and with the Scottish Golf Environment Group with a regard for sufficient production of conservation policies for promotional material.

In the Phoenix metropolitan area, specifically Tucson, AZ, USA, uncovered the benefits of native vegetation to attract a diverse community of native bird species (Hostetler and Knowles-Yanez 2003). This creates opportunities for managers to utilize different vegetation patterns, management strategies, and design to incorporate the public in education and community programs to benefit the impact urban environments have of birds. According to a 2021 news article from Hunter Bassler, there has been “massive die-off” of songbirds in Arizona. The extreme droughts and wildfires in Arizona destroyed the natural food sources birds need to survive. Climate-change related issues like this are common throughout Arizona, and the need for areas like golf courses to become natural habitats for bird and other wildlife populations is well recognized (Hostetler and Knowles-Yanez 2003). The Waste Management Phoenix Open is a high-end golf course that host PGA tour events and they have committed to sustainable golf

practices. The WMPO is an example of a sustainable initiatives for eliminating greenhouse gases, encouraging water saving and recycling practices. While the tournament is sponsored by many different organizers for environmental initiatives and water conservation, the Audubon International organizer is not one of the sponsors, nor is the golf course TPC Scottsdale that hosts the tournament certified by the organization.

DISCUSSION

Comparing the three golf courses in this study has led to a positive reaction for my home club, as I believe the Ottawa Hunt and Golf club is progressive in its environmental and educational opportunities. Utilizing the natural area, man-made environmental features and other factors from the different habitat types found along the golf course. The Ottawa Hunt and Golf Club has been a historic golf course in the Ottawa valley region. Since its inception it has been supported with forestry and wildlife management-based knowledge and progressive ecological thinking for the future years. The initiatives that the golf course has implemented to benefit wildlife habitat in an urban environment are an effective source of the growing and sustaining local populations. This is due to multiple examples of different habitat features for example nesting and feeding boxes. These features are scattered across the golf course to benefit the entire area.

- 75 monitoring bird boxes that are installed and inspected,
- planting of pollinators, allowing for brush piles to accumulate for wildlife habitat shelter,
- allowing the local wildlife free range via vegetative corridors
- reducing the amount of maintenance activity in the natural areas of the course

- naturalizing shorelines that are not in play
- maintaining buffer zones around water bodies
- providing features like logs and rocks to add in habitat dynamics
- programming the golf cart GPS to disable electric engines when entering natural areas

These habitat features were recognized by the Audubon International during the Site Visit Recertification, a status report conducted every 3 years for golf courses to remain eligible to be an Audubon International representative. The Audubon International is an important organization due to the value of a having a certification. I believe in the environmental opportunities that golf courses possess through the certifications. The certification guarantees the golf course through education and technical assistance in providing different opportunities for the environment.

The Duke's Course in St. Andrews, Scotland is a pioneer in the game of golf and made strides in the mid 1990s for naturalistic golf course that can support wildlife and healthy ecosystems. The former farmland with scattered stands of trees, primarily birch, was used to create the Duke's Course, around 135 ha of total land. Development of the golf course from architects in 1992 started with no ecologists amongst the design team or consultation with the SNH. The mission statement encapsulates the balance between the game of golf and diversity of wildlife habitats, natural and wild landscapes as well as making the course aesthetically pleasing to play and look at. The design team was adamant on this type of style of golf course construction and management they pioneered Integrated Pest Management. This involved designing the fairways to be carved out of woodland to eliminate a straight edge, therefore creating a more natural look. Creating corridors of trees and other forested vegetation helped with species diversity and the habitat structure as it allowed for more movement between the

areas for wildlife species. Areas were extended with planting of seedlings selected from existing trees to maintain a native population of trees. Along the course there are several bird species that use the land to feed. Flower heads are left untouched for winter feeding for finches and the raptors of the area use the nest boxes. Nest boxes were extremely important for owls, kestrels, and sparrowhawks along the course, therefore the implementation of them along other golf courses like the Ottawa Hunt and Golf Club or the Waste Management Phoenix Open are beneficial for the bird population. Utilizing these can help repair damage bird populations for Phoenix and provide opportunities for community members to see species of birds in a more natural setting.

The Ottawa Hunt and Golf Club recertification status report covers initiatives for not only wildlife and outreach opportunities, but they value a lot on water conservation, water quality management and chemical use reduction and safety. Within the community, the members value on the natural beauty of our ponds, streams, and riparian areas. The 4th hole on the west course is an iconic par 3 hole. An elevated tee box with an intimidating approach to the green due to the large pond blocking the front. This pond is man made, but has hosted families of ducks, geese, and other amphibious wildlife within and the surrounding pond edges. This pond is the most aesthetically pleasing for a large amount members and employees, but it is not the only riparian/aquatic areas. The other two ponds are on the opposite side of the course along the north course and south course respectively. The ponds along the golf course are classified a hazard in the game of golf, but in the game of naturalistic golf courses, they are immensely important.

The water conservation efforts made from the Ottawa Hunt and Golf club are used to ensure efficient water release from irrigation heads, utilizing the weather to your advantage, apply wetting agents to hotspots, planting drought resistant turf and vegetation and overall attempts to

reduce water consumption through smaller details. These can include hand watering, reducing amount of land that needs water and blowing equipment off prior to washing. Audubon International had two recommendations for the Ottawa Hunt and Golf Club, increasing the number of natural areas and utilizing a closed-loop wash water recycling system to increase conservation of water. For water quality management, the Audubon International has recognized that the Ottawa Hunt and Golf Club has increased aquatic plant growth, mitigate erosion issues, establishing no-spray zones for chemical runoff, conducting annual water tests, improvement in the quality of water sources the golf course uses, removing unwanted vegetation surrounding water bodies, using biospheres to control algae bloom as well as removing silt from the ponds. These factors all influence the water quality of the golf courses ponds for the better, therefore improving the quality of habitat. Audubon did have a few recommendations for improving the water quality management for example, covering the drains in the fairways during spraying treatments, setting up buffer zones of 20 feet around all water bodies and/or changing the height of the mowers around water bodies. These recommendations would benefit the golf course wildlife population due to having better quality of water for the different species found across the golf course.

The Audubon International certification is an extremely important organization in my opinion. The developments that the Ottawa Hunt and Golf Club has accomplished can be influenced in other golf courses around the world. The PGA TOUR is the quintessential professional golf league in the world with the top golfers competing almost every weekend in tournaments across North America. One of my favourite stops on the tour is the Phoenix Waste Management Open, as it has an iconic course layout and an exceptional message of sustainable practices in golf, hospitality, and overall environmental conscience for life. Throughout their

campaign for the tournament, they emphasize heavily on reducing the greenhouse gas emissions in the community, during their tournament and providing sustainable ways for future tournament hosts ideas on helping this issue. The WM Phoenix Open sustainability report emphasizes the different practices they do and they do share similar interests with the Ottawa Hunt and Golf Club in regards to water quality and conservation management. They use a highly efficient water management system that optimizes water reuse. Optimizing the water management system is an excellent way of helping with water conservation and can be implemented to other courses through communication of different resources and strategies.

The Audubon International organization is an immensely important organization in my opinion due to the ability to regulate, certify, and maintain the naturalistic way golf courses can be developed and managed. Through the policies, regulations and following of their guidelines and practices can benefit your course as seen in the Ottawa Hunt and Golf Club. While other courses have pioneered naturalistic golf course development or made strides towards sustainability and limiting greenhouse gas emissions, the Ottawa Hunt and Golf Club in my opinion have been able to link urban ecosystems, wildlife, and humans to coincide with one another. This can lead opportunities to educate the public through outreach programs administered through the golf course.

CONCLUSION

The Ottawa Hunt and Golf Club is an interesting case as it transports your visual senses into a different world compared to the neighbouring urban development. You can still hear the vehicles rushing past and the airplanes landing in the airport across the street while playing 18 holes. Along the way through a 4-hour round you can see ducks swimming through the ponds, several different species of birds chirping through the tree tops or even one of the pesky coyotes' tip toeing across the fairways looking for its next meal. The Ottawa Hunt and Golf Club should continue their relationship with the Audubon International as it benefits the course immensely with proper guidance and opportunities. Development of a wildlife program to survey, maintain and track progress of the different habitats, next boxes and other areas of concern can be done to improve and understand more about the local wildlife. Installing and maintain habitat features are one thing, but properly understanding what wildlife is where and why can benefit everyone. The Ottawa Hunt and Golf club has proven to be overperforming in-terms of environmental stewardship compared to other clubs. Based upon this review, golf courses clearly occupy an important position in maintaining natural environments in an urban landscape. Golf has always been at the mercy of their environment; therefore, why not make that environment safe, beautiful, and habitable for every living species?

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