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Cover Page Footnote
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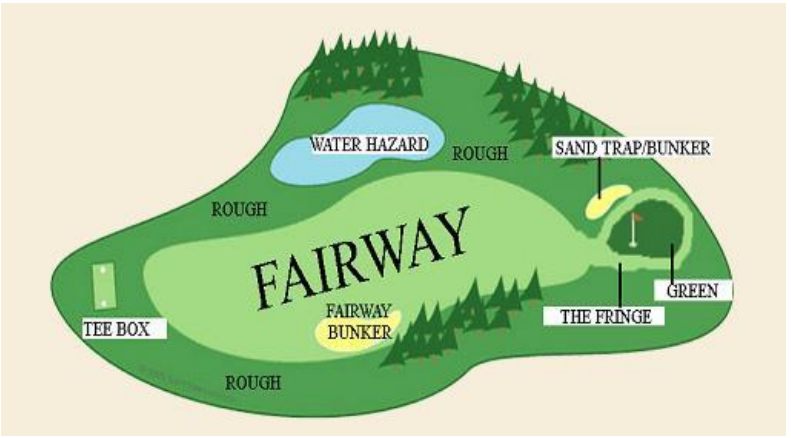
I. INTRODUCTION

Environmental protection has recently become a widely discussed topic throughout the golf community. With an increasing amount of research indicating which human impacts are harmful to our planet, there is a lot of effort from several different golf organizations to preserve safe and positive environmental techniques. However, there are areas that have been negatively impacting the environment. In turn, people have made incredible strides to minimize such impact. One of those areas is golf courses. Recently, golf course land usage has become a topic of debate among environmentalists and golf advocates alike. Environmentalists argue that golf course land is not only a waste of space, but also harbors harmful impacts to the earth and environment, such as pesticide use. This negative impact occurs by using large quantities of water and destroying habitats for wildlife species.

A golf course typically comprises of a tee ground, fairway, and green with various obstacles scattered throughout. There are many types of golf courses that one can play on depending on the location of the course. Some locations are all grass and trees, while others are in the desert where one finds sand instead of rough lining the fairways.[2] There are links styles with hills instead of trees. Some courses contain water hazards and wetland areas that ideally should be avoided. Despite these variances, the one common thing among golf courses is that they all require complicated maintenance.

[2] Rough is the area outside the fairway where the grass is much longer.



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Environmentalists have forced golf course organizations, such as the United States Golf Association (USGA) and the Professional Golf Association (PGA), to relook at practices for maintaining golf course land.[4] Together, these organizations and golf advocates are displaying the positive aspects golf course land can carry. In addition, they display the way golf courses are maintained in order to minimize their negative impact on the environment.[5] Although golf course land may be wasteful and harmful, it is positive for the environment because this land provides a safe space for animals, keeps land green, and protects natural areas.

Despite these positives that come from golf course land, changes are still required to further counter the negatives that come from building and maintaining a golf course. Specifically, wildlife

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[3] *Golf Course Layout*, Olympia Fields Country Club Caddie Program (Nov. 3, 2018), https://perma.cc/47LF-GBLV.

[4] The USGA'S Environmental Commitment, http://www.usga.org/course-care/the-usgas-environmental-commitment-21474852971.html (last visited Nov. 3, 2018).

[5] *See id.*

protection should be a priority for golf courses as well as making sure that the wildlife have a habitable space to reside. There should be efforts to conserve water usage in conjunction with incentives for golf courses to use these conservation techniques in order to minimize their negative impact on the environment. Additionally, there should be an increase in building golf courses on land that was formerly polluted, such as condemned land, as well as additional regulation checks done by the Environmental Protection Agency (EPA) as it relates to pesticide protection. Although golf courses have made incredible strides in the last decade to improve their environmental footprint, there is still more that can be done to address the remaining negatives that plague golf courses' impact on the environment.

II. RELEVANCE

This topic is relevant because of environmentalists' criticisms[6] that maintaining golf course land is harmful for the environment because of the chemicals used and the amount of water needed to sustain a playable course.[7] Many people overlook the importance of keeping the land green, especially in urban areas where there is limited greenspace. The trees and grass landscape also can provide a good habitat for animals.[8]

Years ago, people began looking at the impact that golf course land was having on the environment. In turn, the USGA and other golf organizations began cracking down on their environmental footprint by conducting research and making plans in order to figure out how to utilize golf course land in a positive

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[6] John Barton, *The Golf Course Architect: Mike Hurdzan*, GOLF DIGEST, (March 24, 2008), https://perma.cc/E6NA-XFTW.

[7] *See Golf Course Layout*, *supra* note 2 (depicting a payable golf course that contains a tee box, fairway, and green).

[8] James B. Beard, *The Benefits of Golf Course Turf,* USGA, https://www.usga.org/content/dam/usga/pdf/Water%20Resource%20Center/usga-wildlifelinks.pdf.

way that would not harm the environment.[9] The EPA published Guidelines for Water Use, and the USGA came out with Golf Course Management and Construction: Environmental Issues.[10] In the following years, the USGA began releasing guides on how to properly use water and look into land restoration.[11] In 1995, the First Conference on Golf and the Environment was held at Pebble Beach Resort in California.[12] The USGA then issued a grant to synthesize and publish all scientific research on turf grass, which was published in 1994 in the Journal of Environmental Quality.[13] These events began the quest to find out how to create an environmentally friendly golf course. Ideas, such as the Integrated Pest Management (IPM) program and the Best Management Guide (BMP), were put forth to offer guidance to golf course superintendents to improve their golf course management in order to reduce negative effects on the environment.[14]

There are also arguments that golf course land is a waste of space, and the land could be used for something else that has less of an impact on the environment. However, a golf course is a very beneficial choice to restore areas that were once damaged by landfill or mining operations: resulting in land that is green and safe again. Golf courses can also create an open, safe space for wildlife that would normally be displaced by condemned land.

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[9] *The USGA's Environmental Commitment*, (Jan. 2009), http://www.usga.org/course-care/the-usgas-environmental-commitment-21474852971.html.

[10] *Manual Guidelines for Water Reuse*, U.S. Envtl. Prot. Agency, (1992), https://perma.cc/G26J-6TB3.

[11] *Id.*

[12] *Id.*

[13] *Id.*

[14] *Id.*

A. Recent Examples

Recently, condemned land has been used as building grounds for new golf courses. For example, in 2017, the President's Cup was played on a golf course in New Jersey that was a past oil terminal infiltrated with petroleum, lead, and toxic waste.[15] The land was restored as a safe and green space in the form of a golf course.[16] In Washington State, Chambers Bay, the host of the 2015 U.S. Open, was another course that was built upon land that had been used for many industrial uses.[17] In 2007, Chambers Bay was certified by Audubon International as a Silver Signature Sanctuary, which is awarded to new developments designed, constructed, and maintained according to Audubon International's planning and environmental standards.[18] There are also examples of golf courses creating spaces for wildlife.[19]

III. BENEFITS ON THE ENVIRONMENT: HOW GOLF COURSES ARE CURRENTLY POSITIVE FOR THE ENVIRONMENT

A. Animals and Wildlife

Golf courses use roughly 150 acres of open, green space. Such space creates various benefits for animals and provides for conservation of wildlife on the golf course land because of a golf

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[15] Stephanie Hennessey, *Presidents Cup 2017: 9 interesting facts you should know about the construction of Liberty National*, GOLF DIGEST (Nov. 3, 2018), https://perma.cc/KY6Q-4TGA.

[16] *See id.*

[17] *See* Chambers Bay, *The History of Chambers Bay* (Nov. 3, 2018), https://perma.cc/BR9D-W5D4 (explaining that "[o]ver the years the area had been used as a location for a paper mill, a major industrial center, multiple lumber companies, a railroad center, a sand and gravel mine, a bus barn, a regional wastewater treatment plant").

[18] *Id.*

[19] *See* Peter Stangel, *Wildlife Links*, U.S. GOLF ASS'N, (2016) https://www.usga.org/content/dam/usga/pdf/Water%20Resource%20Center/usga-wildlifelinks.pdf.

course's specific architecture and care. Specifically, for birds, a golf course represents a quiet space to live without predators and other harmful variables.[20]

Moreover, while building a golf course alters the land, it can provide a safe haven for birds. Bird conservation is growing on golf courses, and researchers are finding that golf course land can actually mimic naturally occurring habitats.[21] In fact, the USGA funds research to discover more about the habitat needs of species that are commonly found on golf courses.[22] A study of twenty-four golf courses located in South Carolina researched how breeding birds use different kinds of golf course land designs.[23] The researchers found that there was an abundance of breeding birds and a diversity of species.[24] Another example of golf courses being a safe space for endangered birds is Pinehurst. Pinehurst is located in North Carolina and is one of the most prestigious courses in the U.S. Twenty-one colonies of red-cockaded woodpeckers make Pinehurst their home among the long-leaf pine trees that line the fairways; therefore, this species finds Pinehurst to be a safe space to live and prosper.[25]

Additionally, golf courses comprise more than 70 percent of rough grass and areas prohibited from playing. The prohibited areas consist of natural grasses, trees, and shrubs, which explains why

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[20] Gillihan, S. (2000). Bird Conservation on Golf Courses a Design and Management Manual.

[21] James B. Beard, *The Benefits of Golf Course Turf*, USGA, https://www.usga.org/content/dam/usga/pdf/Water%20Resource%20Center/usga-wildlifelinks.pdf.

[22] *Turfgrass and Environmental Research*, USGA (Nov. 3, 2018), http://www.usga.org/course-care/turfgrass-and-environmental-research.html.

[23] *Id.*

[24] *Id.*

[25] *Id.*

most golf courses are difficult to play for the novice golfer.[26] There are open areas comprising of the fairways and greens that, together with the non-playable areas, creates a wildlife habitat. This wildlife habitat is attractive to all sorts of wildlife depending on the climate of the specific course. The USGA and Audubon Society of New York State worked together to create the Audubon Cooperative Sanctuary Program for Golf Courses (ACSP).[27] This program works to enhance habitats for animals on golf courses by working towards its goal of helping golf courses make environmentally safe maintenance choices part of everyday golf course management.[28] The ACSP believes that the variation in golf course size, location, and architecture should be given attention when managing the maintenance of golf courses.[29] As different wildlife species have specific habitat needs, the layout of the golf course is important.[30] For example, having ponds and other water sources throughout the golf course allows for certain wildlife to create a habitat.[31]

An unlikely species that may benefit from golf course land are bats. Wildlife ecologist Kevina Vulinec of Delaware State University researched how the forest patches on golf courses were a

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[26] *See* Water Resource Center, *Golf Courses Benefit People and Animals,* USGA, http://www.usga.org/course-care/water-resource-center/golf-courses-benefit-people-and-wildlife.html (providing an example of what a prohibited area of a golf course could contain. These areas do not necessarily contain grass).

[27] Water Resource Center, *Golf Courses Benefit People and Animals,* USGA, http://www.usga.org/course-care/water-resource-center/golf-courses-benefit-people-and-wildlife.html (last visited, Nov. 3, 2018).

[28] *Fact Sheet: Environmental Management Practices for Golf Courses,* Audubon International, https://perma.cc/5TQU-4LHD.

[29] *Id.*

[30] *Id.*

[31] *Id.*

good habitat for foraging and commuting bats.[32] Vulinec found that "[t]he mosquito-rich and forest-edged environment is similar to what bats prefer in the wild . . . because local bat populations are threatened by habitat destruction and the fatal pandemic . . . golf courses could provide an important refuge."[33] Not only do bats benefit from the habitat created by golf courses, but also the groundskeepers benefit from the bats ingestion of the insects that plague the courses, creating, in Vulinec's words, a "win-win' situation."[34]

However, there are certain animals that are considered pests to golf courses and are not a priority for protection. For instance, geese are a common nuisance to superintendents from a golf course because of several factors. "Geese are considered a nuisance for golf course managers because of several factors, ranging from the more minor noise element to more serious issues, such as destruction of turf and the depositing of fecal matter," said Greg Lyman, the director of environmental programs for the Golf Course Superintendents Association of America.[35] Besides eating sensitive areas of grass around the course, geese excrement can pose health concerns for the golfers using the course.[36] Although running geese off the course may seem cruel, the health risks to golfers outweighs the concern of where geese may migrate.[37] Also, the practices of moving the geese off the course is not inhumane because trained

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[32] Yasmin Ogale, *Do Golf Courses Make Good Bat Habitats?*, SCIENCE MAG., Aug. 12, 2011, https://perma.cc/X2DF-M8MG.

[33] *Id.*

[34] *Id.*

[35] Lisa D. Mickey, *Chasing off Wildlife, With Course Etiquette*, THE NEW YORK TIMES, Sept. 1, 2013, https://perma.cc/SZ4E-VG65.

[36] *Id.*

[37] *Id.*

dogs accompany the superintendent and know how to chase them enough to inhibit nesting, not to kill or harm the geese.[38]

B. Reusing Condemned Land

Restoring land areas that have been damaged by landfills and mining operations by using turf is a great way to save the land. Turf grass has a dense root system that holds soil and rainwater, which reduces erosion. As the grass continues to grow, organic matter adds to the soil and allows it to absorb more water.[39] Communities have discovered that a golf course is a great way to restore damaged land. Many golf courses in existence today were once abandoned quarries, strip mines, or landfills.[40] This results in reclamation of land that benefits the community.[41]

Over the last forty years, at least seventy courses around the country have been built from former landfills.[42] A few examples of these courses are as follows: (1) the Chicago waterfront landfill in the industrial south side was transformed into Harborside International Golf Center, which is a prize winning golf course;[43] (2) the Liberty National in New Jersey was once filled with chemical sludge and toxic waste and was made habitable by filling it with more than 3 million cubic feet of soil and sand to create a protective

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[38] *Id.*

[39] *Id.*

[40] Water Resource Center, *Golf Courses Benefit People and Animals*, USGA, http://www.usga.org/course-care/water-resource-center/golf-courses-benefit-people-and-wildlife.html.

[41] *Id.*

[42] Dahleen Glanton, *Changing Course of Landfills*, CHICAGO TRIBUNE, July 6, 2003, https://perma.cc/FBY5-RCLT.

[43] *Id.*

cap allowing it to later host the 2017 President's Cup;[44] (3) the Stadium course at TPC Scottsdale, Arizona, was also developed from parts of an illegal dumping ground;[45] (4) the Home Course in Dupont, Washington, which was used to produce explosives until the late 1970s when the Weyerhaeuser Company acquired it.[46] Weyerhaeuser and the city of DuPont decided to clean up the land and remnants of the explosive manufacturing.[47] Today, this land is green with dynamite shaped tee markers that remind players of the land's history;[48] and (5) the New Jersey, Ballyowen, and Eagle Ridge Golf Club are built on old gravel mines.[49]

IV. CRITICISM OF GOLF COURSES: PROBLEMS THAT SHOULD BE ADDRESSED

A. Harming Ecosystems

Golf courses must be green free of weeds and certain pests that would harm the grass the majority of a golf course is grass. In addition, there has to be a clear fairway and green.[50] Unfortunately, in order to make golf courses green, many steps must be met to achieve this. Clearing away areas to make a golf course is a

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[44] Adam Schupak, *Now Hosting the Presidents Cup: A Former Polluted Dump*, N.Y. TIMES, Sept. 26, 2017, https://perma.cc/M4VC-U685.

[45] Jason Scott Deegan, *Grass Over Garbage: Golf Courses Give Landfill Sites a Second Life*, Golf Advisor, (Sep. 25, 2017), https://perma.cc/B922-2AMY.

[46] *About the Home Course*, The Home Course, https://perma.cc/Z6FB-EMCZ.

[47] *Id.*

[48] *Id.*

[49] Jeffrey Gold, *Golf Courses Multiplying on Formerly Unusable Landfills*, The Washington Post, (Dec. 7, 2003), https://perma.cc/D2QT-Z3R6.

[50] A clear fairway and green allows a golfer to be able to navigate where they should play their golf balls on the course.

common practice. The harming of wildlife and ecosystems is a current problem with golf course land.

Unfortunately, when a golf course is built, sometimes valuable space must be cleared. Typically, fairways do not have bushes or trees on them, meaning that these natural resources have to be removed. Anytime this happens, it can have harmful effects on the environment and surrounding habitats because it disturbs the land.

The 2016 Summer Olympics in Rio, Brazil saw the return of golf to the competition. A golf course was built to accommodate the competitors from all over the world, both men and women. The golf course land was within the Marapendi Environmental Protection area, which was a coastal habitat for "sandbank native vegetation and animal life, including endangered species."[51] This sandbank belongs to the Atlantic Forest, a registered site by United Nations Educational, Scientific and Cultural Organization (UNESCO) and is a threatened biome. This area is home to 238 registered species.[52]

In addition, the Marapendi EPA's sandbank had already been degraded from years of sand extraction.[53] The Group of Specialized Expertise on the Environment (GAEMA) believes that the golf course causes negative environmental impacts, such as fragmentation of the native vegetation and eliminating the salt marsh ecosystem.[54] The accuracy of the government report was called into question with misleading photographs which showed a

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[51] Carolina Torres & Paloma Savedra, *New Rio Olympic Golf Course Harmed Environment, Say Critics*, Mongabay (May 31, 2016), *https://perma.cc/B73A-WBJS*.

[52] *Id.*

[53] *Id.*

[54] *Id.*

small area of degraded land but did not show how well the sand banks were recovering. [55]

Specifically, caiman[56] sighted on the Rio golf course were causing worry that golfers may run into the lizards.[57] They were migrating into the course's ponds and were at an added risk of being exposed to pesticides.[58] The white sand lizard and cactus that inhabited the sandy dunes were threatened as the dunes were cleared for golf course space.[59] Further, the non-native grass, Zeon Zoyasia, which requires nitrogen fertilizers to maintain, it is not natural to the area.[60]

One way that golf courses arguably harm ecosystems is the cutting down of trees to make fairways and pave ways for different holes. Environmentalist Brent Blackwelder stated that cutting down a forest to build a course is environmentally harmful.[61] Golf courses are home to an abundance of green plants that add oxygen and remove carbon dioxide from the air.[62]

In 2009, WildEarth Guardians v. United States Fish & Wildlife Serv., challenged permits issued to a city under the Endangered Species Act regarding Utah Prairie Dogs.[63] These

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[55] *Id.*

[56] Member of the alligator family.

[57] Charles Vercillo, *Rio's 2016 Olympic Golf Course: City's Last Remaining Ecosystems Left "In the Rough",* 47 U. Miami Inter-Am. L. Rev. 221, 238 (2016).

[58] *Id.*

[59] *Id.*

[60] *Id.*

[61] M.L. Rose, *The Effect of Golf Courses on Global Warming*, Golfweek, https://perma.cc/Y9UY-7L9T.

[62] *Id.*

[63] *WildEarth Guardians v. United States Fish & Wildlife Serv.*, 622 F. Supp. 2d 1155 (D. Utah 2009).

permits allowed the city to live trap and relocate the prairie dogs that were damaging a local municipal golf course.[64] The WildEarth Guardians lost the case because they did not address parts of their brief, but this is an example of a negative solution to handling pests on a golf course because the city removed animals from their habitats.[65]

B. Water Usage

To keep a golf course green requires a lot of watering, which is another problem a golf course presents. Audubon International estimates that a golf course in the U.S. uses 312,000 gallons of water each day.[66] Water is essential to keep a golf course playable.[67] In 2015, California had about 1,140 golf courses and reducing the water use by a quarter would lower the water consumption by 37 million gallons per day.[68] Further, a typical golf course may have around 3,000 sprinklers dotted throughout the entire course.[69]

As conserving water has always been a focus of the U.S., this large use of water can be considered a problem that golf courses contribute towards. The many gallons of water that courses consume multiplied by the number of courses in the United States alone equals a lot of water going to keeping grass green instead of being used for other sources in need. This is a large reason why there is a push to limit golf course building and why many people believe golf courses are negative for the overall environment.

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[64] *Id.*

[65] *Id.*

[66] Frank DeFord, *Water-Thirsty Golf Course Needs to Go Green*, NPR (June 11, 2008), https://perma.cc/6BX8-3URX.

[67] Water keeps the grass green, which is essential to hit a golf ball, as it makes it easy for the average player.

[68] *Id.*

[69] *Id.*

C. Harmful Pesticides

The other concern many environmentalists have with golf courses is the pesticides and chemicals that are used to keep the land looking pristine and free of pests and weeds.

Jay Feldman, the co-founder and director of Beyond Pesticides, a nonprofit membership organization that works in protecting public health and leading the world into becoming a pesticide free place, has been involved with golf and its impact on the environment.[70] During an interview with Golf Digest, he stated that pesticides pose health risks and that golf course superintendents do not fully realize the impact of the pesticides they use.[71] "The typical response you get from superintendents is that they [are] using registered pesticide products, [that] they're using them in compliance with the label, [and that] their pesticide applicators are trained and certified, so what's the problem?"[72] Since these products are registered, many people do not think they are dangerous thinking they are safe to use, however, there are still risks such as runoff into water and streams as well as the chemicals that become airborne.[73]

V. SOLUTIONS: WHAT CAN STILL BE IMPROVED AND WHAT IS STILL WORKING

While there are arguments to be made that golf courses can negatively impact the environment, many solutions have been created to reduce the footprint on environment as well as moves to benefit the environment. However, there is always room for improvement. Each of the above problems (harming ecosystems, water usage, and pesticides) has more work to do in order to minimize the negative impact of golf courses. However, not all is

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[70] John Barton, *How Green is Golf?*, https://perma.cc/H8XW-MR6V.

[71] *Id.*

[72] *Id.*

[73] *Id.*

lost. There are many ideas to fix these problems and to continue to improve environmental impacts from golf courses.

A. EPA Regulations

The Golf Course Superintendents Association of America (GCSAA) works to be compliant with the EPA's regulations involving pesticides, water use, and any waste. The EPA has stated that these factors affect golf course maintenance. These regulations also give golf courses the opportunity to stay in compliance as well as come up with better ways to upkeep a golf course.

At the federal level, the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) requires all pesticides sold or distributed in the U.S. to be registered by the EPA.[74] For a pesticide to be registered in the U.S., the manufacturer has to conduct scientific studies that also follow the EPA's requirements.[75] Then, the manufacturer submits the data it is reviewed and either rejected or approved. This process makes it difficult to add pesticides to the approved as well as illegal to deviate from it. Therefore, at the very least, golf courses must be in compliance with the EPA's registered pesticides. This is an example of something that is currently working well. However, one improvement should be made.

In order to maintain the steady improvement of and creation of environmentally friendly golf courses, the local governments should get involved. Each golf course should submit an annual report of the pesticides they use to the government. Further, if a golf course is found to be in violation or is not complying with this new rule, someone from the GSCAA as well as the local government should put the golf course on probation and halt business until the course is found to be in compliance. In addition, a golf course

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[74] *Pesticide Registration*, Environmental Protection Agency, https://perma.cc/3J6Z-3EU4.

[75] Pesticides on golf courses keep the grasses healthy and keep away harmful pests, which would hurt the grass.

should also be responsible for trying to limit pesticide use to the bare minimum needed. An annual report can also be submitted showing this action to the government and be is made public to the community. The report should include what pesticides are in use on the golf course and how the superintendents have reduced usage from previous years. The golf course with the least amount of pesticide use could be given extra funding for operating costs, as well as a certification to be advertised to the public that the golf course is environmentally positive.

B. Increased Building on Condemned Land

Building on condemned land creates many benefits to the environment. Land that was once deemed uninhabitable is cleaned up and turned into a grass environment where wildlife and people alike may play.[76] However, currently there are no regulations requiring new golf courses to build on such condemned land. In the future, the USGA and EPA as well as other government and environmentalists should continue the trend of working together for the greater good and come up with a plan for new golf course development.

In order for increased building on condemned land to become more prevalent the USGA and EPA should work with local communities and governments responsible for the overseeing of golf course building and development. The local government should have a list of requirements for any developer planning on building a golf course.

First, when a developer comes forward with a golf course design, they should have a list of condemned land sites that would be used as an alternative. The developer should show that they have considered sites that could be reclaimed from contamination or land that was once hazardous. If the developer does not choose to build

[76] The land had to be cleaned up and made safe so that grass could be planted again. This also makes the land habitable.

on this sort of land, then the local government can impose higher costs or taxes associated with building. The local government can also have the option to deny the development if it is clear a condemned site would be feasible. However, if the developer has shown that building on condemned land simply is not an option, they can show alternatives for making the golf course environmentally friendly. For instance, if a golf course is being built in an area where rain is prevalent, the developer can provide a plan for a system for how to use recycled water instead of sprinkler systems or a way to protect wildlife. However, this is an expensive installation procedure, which deters many golf courses from implementing the system.[77] In order to make using a recycled water system on the golf course more attractive, the government can implement tax breaks as well as fund part of the construction of such a system. The benefits of using recycled water on a golf course will outweigh the high cost in installation with the amount of water conserved in the long run.

Developing golf courses on condemned land is much more expensive than developing on regular land. However, an incentive to do so could be that the EPA designate such a course as environmentally friendly, which would appeal to a larger spectrum of potential golfer. To further incentivize building on condemned land, certain tax breaks and special grants can be given to courses in order to help with the costs of building on condemned land.

C. Wildlife Sanctuaries

When a golf course developer decides to build a new golf course, many people do not realize the negative effect this can have on the wildlife habitats in the area to be developed. However, the effect doesn't have to be negative. Ray Semlitsch, Curators'

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[77] *Shouldn't Every Golf Course Be Using Recycled Water?*, USGA (May 4, 2014), https://www.usga.org/course-care/water-resource-center/our-experts-explain--water/should-every-golf-course-be-using-recycled-water-.html.

Professor of Biology in the MU (University of Missouri) College of Arts and Science said,

> There are more than 17,000 golf courses in the United States, and approximately 70 percent of that land is not used for playing…These managed green spaces aren't surrogates for protected land and ecosystems, but they can include suitable habitat for species native to the area, including salamanders. Golf courses could act as nature sanctuaries if managed properly.[78]

Using courses as sanctuaries would be a helpful solution to the problem of misplaced wildlife from golf course building and maintenance. Clearly, there is a lot of unused playing space on a golf course. Instead of letting them become useless pieces of land, the USGA should pose incentives for making sure that the unused space be used specifically for the preservation of native wildlife. Golf courses that decided to pursue this option could receive funding from the USGA in order to make a wildlife sanctuary on the golf course. In addition, the wildlife sanctuary would have to comply to standards set up by the USGA. For example, the USGA could specify that there must be a complete habitat for the wildlife prevalent in the area on the golf course. Further, the problems that migrating wildlife, such as geese, pose on the upkeep of a typical golf course could be solved if there was a specific area on the land for them to go.

Again, as stated in the above section, when a developer comes forward with plans to build a new golf course, they should also have a report stating that part of the course will be used for wildlife habitat. A designated area preserving this space should be a necessary requirement before anyone continues to build a course. The developer must also show that the building of the course will have a minimal effect on the local wildlife. The developers should

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[78] *Golf Course: Playing Fields, Wildlife Sanctuaries Or Both*, ScienceDaily, University of Missouri-Columbia. (Dec. 8, 2008), https://perma.cc/TPM8-BB3W.

be aware of the types of wildlife they will be dealing with and have a plan for how to allow this wildlife to stay on the golf course.

D. Using Lower-Quality/Recycled Water

Even though water is needed to keep a golf course green, it doesn't necessarily mean that it must be perfect or high-quality water.

Celebrities are bringing attention to environmentally beneficial and safe practices. In 2009, Justin Timberlake opened the first golf course in the U.S. to receive Leadership in Energy and Environmental Design (LEED) Platinum certification from the U.S. Green Building Council. The course, called Mirimichi Lakes in North Shelby County, Tennessee, has solar-powered golf carts and irrigation systems that use rainwater as much as possible.[79]

Some courses are adapting by using recycled or reclaimed water -- typically sewage water that has been cleaned -- while new forms of grass are being created that require less irrigation or will tolerate irrigation using seawater.[80] For example, Pelican Hill Golf Club in Newport Coast, California uses a system for capturing rain water.[81] The system in place allows rain that falls on buildings and pavement to go into one of the course reservoirs. Also, underground, the course has giant cisterns that hold millions of gallons of runoff water that comes from the course, such as drainage from the turf.[82]

While this is a definite improvement to water conservation, more still needs to be done. In addition to local governments having

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[79] M.L. Rose, *The Effect of Golf Courses on Global Warming*, Golfweek, https://perma.cc/944Q-ZVLH.

[80] *Id.*

[81] Sonari Glinton, *In Record Drought, California Golf Course Ethically Keeps Greens Green*, NPR (Apr. 16, 2015), https://perma.cc/Y5TE-AZPS.

[82] *Id.*

more say in the development of golf courses being built on condemned land and wildlife habitat conservation, in order for a developer to receive permits to build a course, they must show how they plan to conserve water. This is something that would be more prevalent in southern states such as California and Arizona. If a developer does not want to have a system for recycled water, then they must show how they are going to minimize the use of grass because of the amount of watering most golf courses require. For example, more areas of the local deserts and dry brush can be incorporated into the golf course design.

Further, as part of an annual report to local government, the golf course should show how much water they are using as well as plans to keep conserving and cutting back on this water usage.

E. Turf Grass Improvements

Water usage could further be reduced by changing the type of grasses used on a golf course. This is another example of something that helps reduce golf course environmental impacts. The USGA has been working on salt tolerant grasses so that poorer quality grasses may be used requiring less usage of fresh water.[83] In addition, changes in golf course architecture can cut down on water usage.[84] Replacing some grass areas for sand or cactus like shrubs can further decrease watering as this sort of ground would not need water.[85]

Turf also absorbs rainwater, which is a naturally occurring water source.[86] Another goal of keeping high quality turf is that good turf encourages as high as 300 earthworms per square yard, which means many tunnels in the soil that create more places for water to

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[83] *Id.*

[84] *Id.*

[85] *Id.*

[86] Turf is another name for grass here. In this case not artificial.

go.[87] This is a great and natural way to filter wastewater and use a recycled process to irrigate and water a golf course.[88]

In addition, the turf industry has been developing grasses that can tolerate droughts and bad quality water.[89] Turf grass breeders and scientists have teamed up to develop different turf grasses that require less maintenance and will, in the long run, have a beneficial impact on the environment.[90]

The USGA should make a goal that, in ten years, 75% of golf courses will have incorporated some of this alternative low unkept turf and watering requirements. As the USGA is the national governing body of golf in the U.S.[91] and is responsible for establishing the rules of golf and choosing where certain golf tournaments are located, they can use incentives for choosing golf courses to host their events.[92] Hosting a USGA event at a course known for its environmentally friendly practices brings a lot of attention to the golf course which is positive. The USGA can limit their choices to golf courses utilizing the alternative turf. The EPA should set this standard with the USGA and take the stance that if this goal is not met, a mandatory reduction or freeze on golf course construction. To meet this goal, the implementation of alternative turf grass would be a huge improvement to the impact golf courses have on the environment.

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[87] *Golf Courses Benefit People and Animals*, USGA (June 4, 2015), http://www.usga.org/course-care/water-resource-center/golf-courses-benefit-people-and-wildlife.html

[88] *Id.*

[89] J. Bryan Unruh, *Developing Best Golf Management Practices: 50 States by 2020*, GSCAA (January 2017) https://perma.cc/RXX5-ZYVG.

[90] *Id.*

[91] *Our History*, USGA, http://www.usga.org/about/our-history.html.

[92] *U.S. GOLF ASS'N ET AL., RULES OF GOLF* (33rd ed. 2016), https://www.usga.org/content/dam/usga/pdf/2015/2016%20Rules/2016-rulesofgolf-USGAfinal.pdf.

F. Advancements from the GCSAA - Their Profiles

A great example of solutions to golf course environmental impacts are what the GCSAA has already implemented. Golf courses rely on superintendents for the upkeep of the land. According to the Rutgers Professional Golf Turf Management School, superintendents are responsible for overseeing the care and maintenance of the turf and all wetlands and plants on the golf course land. They manage and track the water usage and they must be knowledgeable in the application of fertilizers and pesticides, making sure that they remain in compliance with federal regulations.[93]

In order to respond to the lack of data on golf course management practices in regards to water use, land use, and pesticide practices:

> The Golf Course Superintendents Association of America (GCSAA) and the EIFG[94] in 2006 initiated a project to conduct a series of surveys to document water use, fertilizer use, pest management practices, energy use, environmental stewardship and property profiles. Collectively known as the Golf Course Environmental Profile, the results were released from 2007 to 2012 and provided a baseline of information for use in the management of golf facilities as well as offering an opportunity to communicate golf's environmental efforts to the public.[95]

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[93] *Sample Superintendent Job Description*, RUTGERS https://perma.cc/PC2L-YRHB.

[94] EIFG (Environmental Institute for Golf).

[95] Golf Course Superintendents Ass'n of Am., Phase II, Volume III Pest Management Practices on U.S. Golf Courses III at 6 (2016), https://perma.cc/L8PB-FHA2.

To further develop safe and positive practices for golf course land, the GCSAA created Golf Course Environmental Profiles to assess the trends of land use and maintenance characteristics over the last decade. The surveys show that over the last decade, about 46 percent of golf facilities have increased the amount of natural and unmowed areas on the land.[96]

The pesticide practices that give golf courses a bad name in regard to the environment have been examined and changed. The GCSAA makes sure that modern pesticides and fertilizers are used to maintain golf courses.[97] These modern products have gone through more than 120 studies at a cost of $50 million before they are registered by the EPA.[98] In addition, most golf courses have at least one state licensed pesticide applicator who is trained in safe and environmentally sound pesticide use.[99] Another survey conducted by the GCSAA involved pest management practices on U.S. golf courses. The results showed that golf courses have increased non-pesticide pest control practices like cultural control, plant growth regulators, and biological control.[100]

In addition, Feldman also admitted that pesticides have come a long way. "Chemicals on the surface have gotten less toxic as a general rule…When pesticides were first introduced, the presumption was that there would be no secondary effects… So the heavy metals were replaced by the organochlorines, which were

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[96] Golf Course Superintendents Ass'n of Am., Phase II, Volume IV Land Use Characteristics and Environmental Stewardship Programs on U.S. Golf Courses at 16 (2017), https://perma.cc/5AJZ-LWP6.

[97] *Environmental Benefits of Golf Courses*, GCSAA, https://www.gcsaa.org/resources/research-information/secure/communication/golfcoursefacts/environmental-benefits-of-golf-courses.

[98] *Id.*

[99] *Id.*

[100] Golf Course Superintendents Ass'n of Am. *Supra note* 94.

replaced by the organophosphates..."[101] Feldman also believes that non-pesticide practices, such as using better quality grass seed, can help promote less weeds and reduce need for pesticides.[102]

The water use survey found that U.S. golf courses used an estimated 1.859 million acre-feet of water in 2013, a 21.8% decrease from 2.379 million acre-feet in 2005.[103] Recycled water was used by 15.3% of survey respondents in 2013, compared to 10.9% in 2005.[104]

The GCSAA has been putting its best foot forward in order to keep improving golf course management practices to lessen its environmental footprint. Florida is an example of one state using better environmental practices on their golf courses.[105] One such way to control pesticide usage is through the IPM, which creates a goal to manage pest populations and damage at a tolerable level.[106] The GCSAA has also developed BMP,[107] which they intend to help all 50 states by the year 2020 use this practice.[108] BMPs first explains that golf course superintendents are professional land managers who comply with all regulations concerning their golf

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[101] John Barton, *How Green Is Golf*, Golf Digest, https://perma.cc/85LJ-8T7E.

[102] Jay Feldman, *Golf, Pesticides and Organic Practices*, Beyond Pesticides, https://perma.cc/Z3EB-57DA.

[103] Golf Course Superintendent Ass'n of Am., Phase II, Volume I 2014 Water Use and Conservation practices on U.S. Golf Courses at 3 (2015). https://perma.cc/XME5-TQLR.

[104] *Id.*

[104] Unruh, *Supra note* 88.

[106] Peter Landschoot, *Developing an Integrated Turfgrass Pest Management Program*, PENN STATE, https://perma.cc/7755-XTK9.

[107] Howard Richman, *Target Practices*, GCSAA (May 2017), https://perma.cc/6D4C-BMUS.

[108] *Id.*

management practices.[109] Also, an BMP's purpose is to give all superintendents guidelines to follow in order to keep good golf course turf while still meeting regulatory requirements.[110] One example of a superintendent using these BMP guidelines to help his course management is Andy Jorgensen, a certified superintendent and a member of the GCSAA for 17 years.[111] Jorgensen has implemented solar power at his maintenance building and has begun using perennial ryegrass each fall, opting to use pigments to color the turf, as well as eliminating acres of maintained turf and replacing this with wildflowers.[112] Jorgensen maintains that this practice has reduced the course's annual water usage by 21 million gallons each year.[113]

The GCSAA has made large improvements in the last few years in order to minimize the negative impacts of golf the environment. However, there is still more that can be done. A certain percentage of profits made by the USGA should go towards research each year. This research could include further improving water recirculation and irrigation techniques to lessen the amount of water used. Also, the continuing trend of using and researching pest resistant turf could be further researched.[114] Pest resistant turf grass could have positive effects beyond golf course management; even regular neighborhood lawn use could benefit from further developments in this area. As the GCSAA works to research all environmental impacts of golf courses as well as solutions, this can be circulated to all of the golf courses in the country. This research can be used as the basis for which local governments give permits

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[109] *Id.*

[110] *Id.*

[111] *Id.*

[112] *Id.*

[113] *Id.*

[114] Pests include moles, gophers, insects, geese, etc.

to developers. The knowledge of what is normal water and pesticide use for a golf course, as well as how to minimize each of these impacts can serve as the basis for new construction requirements for building golf courses in the future.

VI. CONCLUSION

Golf is an increasingly popular sport. People can keep playing well into advanced age. We must think of the impact golf courses can have on the environment around us. In the last few decades, environmentalists have brought attention to the USGA and the GCSAA the harms golf courses were causing. Instead of putting this problem on the back burner, the USGA and GCSAA as well as individuals involved in golf course management decided to work proactively together with environmentalists and scientists to stop the negative golf course footprint.

They implemented research and practices in the nineties' and it can be seen today how much improvement has been made. Advancements in research for developing drought resistance turf grass as well as recycling water has helped make golf courses more environmentally friendly. In addition, the EPA pushed the golf course industry to keep a check on pesticide use and the GCSAA has looked into and implemented more natural solutions.

However, more can be still be done to keep improving the positive environmental impacts from golf courses. The EPA should regulate golf courses in regard to water usage and development. Continued development on condemned land is a positive move forward, as well as adding areas to a golf course that do not need to be maintained. Golf courses should be required to have a wildlife sanctuary located somewhere on the land that will keep any wildlife safe instead of harming their habitat or forcing them to relocate. Today, the USGA is continuing to research ways that golf courses can keep positively benefit the environment while also lessening

their negative footprint.[115] Over the last few years, the USGA Green Section has spent a large amount of time focusing on the environment.[116] Improvements as recent as 2018 in lawn mowers, better grasses, and improved irrigation systems have been helpful in conserving water.[117] Some golf course superintendents have even started using drones to better decide where to water and maintain the golf course.[118] It is clear from these examples that the USGA and superintendents across the U.S. have been taking the environment much more seriously than years ago.

Golf courses have made leaping strides in the last twenty years to make their land more beneficial than harmful to the environment. The trend is continuing with the increased focus on research to make golf courses less harmful to the environment. If this trend keeps moving forward, I see a future where golf will be completely "green."

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[115] *The USGA's Environmental Commitment*, USGA (Jan. 2009), http://www.usga.org/course-care/the-usgas-environmental-commitment-21474852971.html.

[116] *Environmental*, USGA, http://www.usga.org/course-care/environmental-da1db3ce.html.

[117] George Waters, *Robots, Drones, GPS: New Technology Is Transforming Course Care*, USGA (Oct. 16, 2018), http://www.usga.org/content/usga/home-page/articles/2018/10/robots--drones--gps--how-new-technology-is-transforming-course-c.html.

[118] *Id.*