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An Analysis of Litter Management Strategies in Olmos Basin Park: Evaluating Problems and Solutions

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Abstract

Olmos Basin Park is historically significant, biologically diverse and centrally located, yet it is decimated by trash. The park is predisposed to trash accumulation because of its geography and municipal setting. There are currently a few different litter management strategies active in the park. They include a contracted clean-up, the potential installation of a Bandalong Litter Trap™ Device, various Volunteer-Led clean-up projects, education focused strategies, and legal strategies. None of these strategies have been effective in significantly reducing the trash problem in Olmos Basin Park. A plastic bag ban, especially on that works within the frame work of existing bans, is the most effective strategy San Antonio could implement to reduce litter in Olmos Basin Park. The ban should be formulated with special consideration to San Antonio's needs. Taking action on the litter problem in Olmos Basin Park will provide San Antonio's with a safe, functional and central outdoor urban space.

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Introduction

Quietly looking to the sky during a stroll through Olmos Basin Park allows one to absorb the beauty of this outdoor space. Old sprawling oak trees shade the trails and playscapes from a relentless Texas sun. Laughter and birdsongs ring out together over the steady hum of Highway 281. On the soccer fields, children proudly exclaim their victories, and their mothers cheer them on. In this public park, community thrives. A glance at the ground below, however, shows a disheartening scene. The flora and fauna of Olmos Basin Park lay gasping underneath long standing, grisly layers of garbage. Plastic bags are deeply entangled in trees, Styrofoam cups float in the greenish water, and old chip bags have marred the habitat. Mattresses and couches stop visitors in their tracks. Garbage lurks in all of the Park's nooks and crannies. A once lush and beautiful Olmos Basin Park has become a landmark for modern consumption and the desecration of natural spaces. Its central urban location, just north of downtown San Antonio, and rich history make the Park a meaningful space for outdoor play in the city. Understanding and fixing the litter problem is a crucial step for the prosperity of Olmos Basin Park.

Litter poisons waterways around the world, whether it is in Olmos Basin Park or the Pacific Ocean. Litter threatens ecological systems, human health and the economy. Floatable debris like plastic bottles and bags or Mylar and Styrofoam packaging are the most destructive. Plastics are especially a problem because of their durability, ability to travel and ever-increasing presence in the world ("The Clean Water Act and Trash-Free Waters," 2017). There has been a

nearly early twenty-fold increase in plastic production over the last forty years (Dias & Lovejoy, 2012. p. 26). Plastics are thrown out of car windows, tossed onto the ground, or blown out of landfills. They eventually meander down local rivers and streams before reaching their final destination: the ocean.

Litter alters the ecosystem by changing the physical composition of wildlife's habitats ("Toxicological Threats," 2017). Plastic debris poses chemical threats to marine and human life. Birds and fish mistake plastics and other debris for food ("Toxicological Threats," 2017). Toxins bioaccumulate and biomagnify, meaning they "concentrate and climb the food chain, ultimately to humans," proving to be a hazard to humans and wildlife (Seltenrich, 2015. p. A35). They can also be entangled in or suffocated by plastics.

Litter has grave economic consequences as well. Debris devalue outdoor public spaces and limit the public's ability to enjoy them. They hinder the ability to exercise safely outdoors. Litter hurts the tourism industry because of its negative aesthetic impact on spaces that would otherwise be visited. Moreover, litter management practices are costly. Combined, nine major cities in Texas spend over $50,000,000 on litter and illegal dumping management each year (Texans for Clean Water [TFCW], 2017. p. 2). Figures 1.1 and 1.2 depict the costs for litter and illegal dumping management in San Antonio and Texas. Better management practices will reduce this cost.

Olmos Basin Park is predisposed to litter accumulation, and the problem is uniquely difficult to address. This is due to the Park's geographic setting and municipal divide. The Park is bordered by Highway 281, the Alamo Quarry Markets and lavish Alamo Heights Residences. More specifically, it lies in between the lower reaches of Olmos Creek and the Olmos Dam. Water rushes into Olmos Basin Park from the upper reaches of the Creek, which extend to

Highway Loop 1604, during flood events. The water travel through developments, highways and shopping centers within the Basin and picks up debris along the way. Olmos Dam blocks the flood waters, and the Park becomes a holding tank for debris (N. Garza, personal communication, June 22, 2017). The overcrowding of invasive plants, like Cat's Claw, exacerbate the problem by trapping and entangling trash that enters the park (M. Hernandez, personal communication, June 8, 2017).

Olmos Basin Park is within the jurisdiction of both The City of San Antonio and The City of Alamo Heights. It also includes three large privately-owned plots of land. Any plan to clean up the park must be approved by both cities and private property owners (M. Hernandez, personal communication, June 8, 2017). The cities also divide monetary responsibilities. Alamo Heights City Manager, Mark Browne, affirms that dividing the cost is controversial for Alamo Heights residents (M. Browne, personal communication, December 20, 2017). Alamo Heights Councilmember Fred Prassel underscored this concern. At a city council meeting on December 11, 2017 he stated, "the trash pileup is coming from the City of San Antonio and it is not fair" for The City of Alamo Heights to administer its clean-up (City of Alamo Heights, 2017. p. 4). The perceived unfairness from residents and council members produces resentment between the cities.

The private property owners are an obstacle in executing cleanup or restoration projects. The property owners include Lynda McCombs, the Flannery family and St. Luke's Episcopal Church (Ortiz, 2016). Landowners must give rights of entry for restoration or clean-up projects to be executed on their property. In the past, efforts like the Olmos Creek Aquatic Ecosystem Restoration project have faltered due to Lynda McCombs' apprehension to allow a right of entry (M. Hernandez, personal communication, June 8, 2017).

The following analysis will highlight Olmos Basin Park's history, which distinguishes the Park as a place of critical importance in South Central Texas. The analysis will examine current litter management practices and give special attention to the successes and failures of each strategy. Said practices include education programs, engineered devices, contracted clean-up efforts, volunteer clean-up projects and litter policies. Existing plastic bag ban legislation will be considered by way of two case studies. The analysis will show that a plastic bag ban is an effective litter management strategy. Finally, this strategy will be applied to San Antonio and will result in a recommendation for plastic bag ban legislation.

Litter is seen as an issue by many, but it "is rarely a priority" (Benson, Crawford, & Weiler, 2013 p. 2). Litter must be prioritized in Olmos Basin Park to preserve its majesty and to protect all of the waterways that flow from Olmos Basin. Improving the way litter is managed in San Antonio will keep Olmos Basin Park and all of San Antonio's outdoor spaces safe and beautiful. Leadership is needed to set a positive precedent for other cities across the country. A plastic bag ban, that builds on and improves similar preceding legislation, is the best way to reduce the litter problem in Olmos Basin Park.

This research involved interviews of key players in Olmos Basin Park's management, tours of the Park, and tours of the connected water management systems. Each of the following individuals provided invaluable insight to the litter problem in Olmos Basin Park. Mark Browne and Buddy Kuhn, Alamo Heights' Fire Chief and Assistant City Manager, provided crucial information about Alamo Heights' role in the Park. Margarita Hernandez, Special Projects Manager and Nefi Garza, Assistant Director of Storm Water at San Antonio Transportation and Capital Improvements (TCI) provided long-term insight into current and future projects

operating in Olmos Basin. Nicole Koeninger, Engineer at San Antonio River Authority, provided valuable information regarding litter catchment devices and management strategies. Lastly, Lissa Martinez, an Alamo Area Master Naturalist offered an engaged citizen's perspective on the litter problem. I took tours of Olmos Basin Park with Lissa Martinez. She pointed out the most decimated spots, and gave me a greater understanding of the Park's geography. This tour allowed me to further understand technical reports on the area. I also toured the Olmos Dam and Tunnel Inlet/Outlet Controls with San Antonio TCI. The tour exhibited how water in Olmos Basin Park is integrated into the San Antonio River system.

Historical Overview of Olmos Basin Park

Olmos Basin Park has a rich and intriguing history. In fact, much of San Antonio's history is embedded in the soils of the Park. Its legacy is seen through artifacts from people who once lived there or the invaluable resources that it has provided for millennia. Ignoring the destruction of this land disregards its historical and present value. Unfolding the Park's historical story underscores its influence on San Antonio and a need for its preservation. The majesty of Olmos Basin Park's story motivates action on its litter problem.

Deep within Olmos Basin Park's soils are artifacts from when the land was deeply respected. The Park has provided refuge to visitors for thousands of years. They have come to appreciate its beauty and its resources. Olmos Basin Park's history stretches back to Paleo-Indian people. The Park's value weaved through the lives of Native people in the 18th and 19th century, it exemplified diversity to Spanish missionaries and Anglo colonizers, it provided employment during the Great Depression, and camping space for military men and girl scouts around World War II. It was not until 1955 that this long, attentive history faded away under Highway 281.

The literature on the early history of Olmos Basin Park is sparse because of the lack of scientific exploration in the area. Much of the archeological record comes from Charles David Orchard who excavated artifacts and remains of prehistoric peoples throughout the 1920s (Eckhardt, 2010). Orchard's interest piqued after working on the Olmos Dam project. He has published detailed accounts of the artifacts and remains he recovered and "collaborated with various archeologists…to report some of what he learned and found" (Eckhardt, 2010). Karen Stothert later compiled much of Orchard's work in a comprehensive account of the area's history entitled "The Archeology and Early History of the Head of the San Antonio River" (1989).

Paleo-Indian Period to the Historic Period

11,000 years ago Olmos Basin Park was a lush and diverse area within the semi-arid Texan landscape (Eckhardt, 2010). It's alignment with Olmos Creek and proximity to the San Antonio springs made it attractive for both early settlements and hunter-gatherers. Paleo-Indian sites, from as far back as 14,000 years ago, were destroyed during the construction of the Olmos Dam or Highway 281. The destruction of Paleo-Indian remains and the minimal archeological study of the area make any full and accurate depiction of the people's lives impossible (Stothert, 1989).

Sites that have been uncovered suggest a substantial variety of activities for Archaic people in the area. This period occurred after the Paleo- Indian period and ranges from 6000 B.C. to 600 A.D. Excavations show evidence of cooked food, hunting and building tools, a cemetery "personal ornaments," and various rituals (Stothert, 1989. pgs. 18-21). They show proof of a "substantial population" in this area during the Paleo-Indian and Archaic periods. Karen Stothert

points out that, “we have to admire a life that was so successful in satisfying human needs and avoiding negative environmental effects” (1989. p. 36).

Early records from Spanish settlers shed light on Native American groups present during the Historic Period, which begins in 1690 A.D. (Stothert, 1988). Olmos Basin Park was home to Coahuiltecans, Payaya, and the Siupam. The most evident group were the Coahuiltecan people (1989). The record emphasizes the contribution Olmos Basin Park made to the lives of Native people in San Antonio. Preservation of these societies will further the understanding of San Antonio’s story, but evidence cannot be investigated without mitigating the litter problem because the land is so entangled in debris.

European Colonization

During the era of Spanish colonization in San Antonio, there is a partial “hiatus in the archeological record in the Olmos Basin” because colonization was happening more prominently in southern San Antonio (Stothert, 1989. p. 50). A few journals from Spanish colonizers assure that the land did remain home to Native peoples and fellow explorers throughout the hiatus. The Basin began to be colonized by Spanish and Anglo settlers in the late 1700s and early 1800s (Stothert, 1989). Portions of it, specifically the headwaters, were still dominated by Native Americans. Some Anglo people would venture to the headwaters for an adventure (Eckhardt, 2010). Mary Maverick beautifully depicts and illustrates an undeveloped Olmos Basin Park: “We galloped up the west side and paused at and above the head of the river long enough to view and admire the lovely valley of the San Antonio. The leaves had mostly fallen from the trees, and left the view open to the missions below” (Stothert, 1989. p. 59). Imagining the Park,

undeveloped and fully flourishing is striking. Such beautiful language inspires a motivation to reinvigorate life into the currently decimated land.

Development from 1850-1950

During the mid-1800s the area was used as a military camp for Texas Rangers, Texas Army soldiers, and militiamen. Later, more prevalent land transactions began to take place in the area. Most notably were the developments of Alamo Heights by the Chamberlain Investment Company beginning in 1892 ("Chamberlain Invest. Co," 1892) and the purchase of the Head of the River Estate by the Sisters of Charity of the Incarnate Word (Stothert, 1989. p.70). It is this area where The University of Incarnate Word presently sits. In 1906, Clinton George, with the Live Bee Land Company, purchased the land where present day Olmos Basin Park is ("Alamo Heights Changes Hands," 1906). Clinton George had planned to convert the land into a park "and maintain it as a fashionable pleasure resort" ("Alamo Heights Changes Hands," 1906). This plan never came to fruition.

The Park's development was not revisited until after the devastating 1921 San Antonio Flood. Before the Olmos Dam, all of the water that flowed through the Olmos Basin rushed down the San Antonio River into downtown. The lack of flood controls left downtown San Antonio "under 10 feet of water" (Huddleston, 2015). The disaster was "the greatest…in the city's history," it and prompted the construction of Olmos Dam (Huddleston, 2015). The cost of the dam was $1.5 million. It was constructed between just north of the Blue Hole, between 1926 and 1928 (Allen, 2011). Figure 2.1 indicates the location of Olmos Dam.

In 1925, a "beautification plan" was constructed for Olmos Basin Park ("Olmos Basin to be Beautified," 1925). The creators of the plan were San Antonio's Mayor John Tobin, and the

Park Commissioner at the time. The two patterned the plan after improvements in Brackenridge Park. The team was hoping to activate the current Olmos Basin Park as a space for outdoor recreation. In the early 1930s, a Civil Works Administration improvement plan was implemented and later discontinued in the Park due to lack of funding ("35 CWA Works Go into Discard," 1934). In 1939 The Express-News announced that a Civilian Conservation Corps would take the project over ("CCC Camp for Olmos Due to Open in April," 1939). According to the article, the CCC workers were to "clear the basin of unnecessary brush, clean trees, and ball moss and institute soil conservation practices" ("CCC Camp at Olmos Mapped," 1939). In honor of President Franklin Roosevelt's support of the CCC camp establishment, the Park was renamed Franklin Fields in April of 1940 ("Olmos Basin Renamed to Honor F.D.R.," 1940).

Thirty acres of Franklin's Field were converted to a "nature study area for girl's organizations," or Girl Scout troupes ("75 Girl Scouts Take Daily Outing," 1941). The remains of the stone buildings from said camps are still present in the Park today near the San Pedro Golf Course. The daily activities of the girls included archery, crafts, cooking, wielding an ax and others ("Fair Scouts Sally Forth as Nature's Charms Beckon," 1926). "After a day's work and fun is done the girls gather around the camp fire, sing scout songs or listen for instructions to the next day's routine" ("Fair Scouts Sally Forth as Nature's Charms Beckon," 1926).

In December of 1941, The San Antonio Light announced that the CCC in Olmos Basin was to be dissolved because of World War II ("Olmos Basin Senior CCC to Dissolve," 1941) Any remaining improvement efforts were abandoned. The Final CCC Camp Site Liquidation Inspection concluded, it "regretted that services of CCC camp had to be terminated at a time when it was just getting underway with this development program" (Brown, 1943).

Throughout this time period, the Park offered employment and opportunity for people and officials in San Antonio. Each new development and use of the Park contributed to its history. All of the beneficiaries of Olmos Basin Park are critical in building the case for its preservation, as each of their stories magnify the Park's significance.

The Construction of Highway 281

1955 marked the prologue of a nearly decade-long fight between San Antonio Conservation Society and Texas Highway Department. In this year, the City of San Antonio urged the Texas Highway Department to construct a city highway: present-day Highway 281 (Giorgio, 1972 p. 882). Proposal routes for the highway were considered following this request. The first route option was one that cut through the City of Olmos Park. Officials soon realized that citizens of Olmos Park would never accept such construction ("Even Back in the 1960s," 1971) The state moved toward the secondary choice: straight through the Brackenridge-Olmos Parklands. This route option was approved by the state in 1961 (Giorgio, 1972. p. 882). Six years later, the feud between the Highway Department and the Conservation Society officially commenced.

In 1967, San Antonio Conservation Society began its battle to protect the Brackenridge-Olmos Parklands. They began in federal district court and attempted to prevent any highway construction (Giorgio, 1972. p. 883). Later, the Federal Secretary of Transportation committed to disprove "any construction through Parklands," but he did approve construction to "the north and south" of the Parklands (Giorgio, 1972. p. 883). In 1970, construction was authorized to begin. This was a clear violation of the requests of the Conservation Society, as the organization had requested a total halt on construction. The Conservation Society then continued with the suit.

The case went through the district and circuit courts both of which denied a stay. Eventually, the case proceeded to the United States Supreme Court.

Although the Conservation Society had "successfully petitioned the United States court for a stay" and a writ of certiorari, in December of 1970 the stay was vacated and the certiorari was denied (Giorgio, 1972. p. 883). In his dissent, Justice Hugo Black wrote:

> "After today's decision, the people of San Antonio and the birds and animals that make their home in the park will share their quiet retreat with an ugly, smelly stream of traffic pouring down a super six-lane 'North Expressway.' Trees, shrubs, and flowers will be mown down. The cars will spew forth air and noise pollution contaminating those acres not buried under concrete. Mothers will grow anxious and desert the park lest their children be crushed beneath the massive wheels of interstate trucks." (*San Antonio Conservation Society v. Texas Highway Department,* 1970*)*.

Highway 281 increases the volume of litter in the Park. Debris that individuals discard from their vehicle's window will ultimately appear in the trees and soils of Olmos Basin Park (L. Martinez, personal communication, June 9, 2017). The volume of litter present in the Park exemplifies this truth. Justice Black's harrowing prediction has become the Park's reality.

Olmos Basin Park's history is an extensive and complex South Central Texas story that commands attention. Centuries of life were influenced by the Park; its resources were utilized responsibly and defended when under threat. Past projects have already damaged Olmos Basin Park's history, and excess litter is destroying its present ability to flourish. Attention must be given to the Olmos Basin Park to preserve the stories and resources that compose it. Many strategies have worked to reduce the problem, but the persistence of unsightly garbage proves their ineffectiveness. Further action must be taken to mitigate the litter in the Park.

Current Litter Management Strategies

Texas does not prioritize litter management strategies that prevent litter problems. Across nine major Texas cities, $50 million is spent annually on litter and illegal dumping management. Less than 6% goes toward litter prevention or education and outreach efforts (Texans for Clean Water, 2017. p. 2). Litter prevention efforts include policies and incentives that stop litter problems from arising. Education and outreach and enforcement strategies are related to litter prevention. They foster a mindset that can contribute to a reduction in litter. Without prevention, Texas is in a static "reactionary mode" and never directly addresses the litter problem (TFCW, 2017. p.4).

San Antonio is also obtuse to preventative efforts. Litter management costs total $6,521,400 in the city. Of that, .25% is spent on litter prevention, .3% is spent on enforcement and 4% of funds are spent on education and outreach (TFCW, 2017. p.2). This is compared to the 32% of funds that are spent on litter abatement strategies such as "street sweeping, litter clean-up events, and city-staffed cleanup programs" (TFCW, 2017. p. 3). Cleaning up existing litter is crucial to improving the current aesthetic value of the Park. However, neglecting to prevent litter and educate the community will perpetuate a destructive litter cycle. Figures 1.1 and 1.2 display specific litter and illegal dumping management costs in San Antonio and Texas.

The litter management tactics in Olmos Basin Park include a recently contracted clean up effort, the installation of an engineered trash capture device, volunteer-led cleanup projects, education, and legal controls. Some projects have been active for years, while others are just recently progressing. Each strategy has benefits and downfalls, but none have successfully eliminated the litter problem thus far.

Contracted Clean-Up

One recently developed litter management project in Olmos Basin Park is a collaborative clean-up effort between the City of Alamo Heights and the City of San Antonio. San Antonio will contract Border Construction Services to thoroughly clean-up the Park. It will be the first major clean up of the area in 15 to 20 years (Lessin, 2018). Border Construction Services will rid a "9.2-acre stretch along Olmos Creek" of garbage with "specialized equipment for pulling out garbage and brush" (Lessin, 2018). Buddy Kuhn specified, "the brush will be mulched on site and garbage will be hauled off" (City of Alamo Heights, 2017. p. 3). Additionally, San Antonio's Horticulturalist will "consult on the entire project" to provide insight on the Park's vegetation (City of Alamo Heights, 2017. p. 3).

The project was spearheaded by The City of Alamo Heights after a resident, Sarah Reveley, raised concern to Bobby Rosenthal, Alamo Heights' Mayor. For over 10 years, Reveley has been advocating for the Park with Lissa Martinez, another active and concerned citizen. On December 11th 2017, the Alamo Heights City Council approved the allocation of $41,000 to go toward the clean-up project whose total cost is $59,800 (City of Alamo Heights, 2017. p. 3). The City of San Antonio, San Antonio River Authority and Sarah Reveley will also contribute monetarily to the project (Lessin, 2018).

Key stakeholders interfere with the project's progression. For example, there is hesitation from the public on the equity of this investment. The City of Alamo Heights is the primary funder of the project despite being a smaller entity than the City of San Antonio. Alamo Heights also does not contribute as much to the problem. Alamo Heights is located in the southernmost part of the Olmos Basin, but the trash that is coming in is primarily coming from the north and central parts of the Basin. These parts are both within San Antonio's city limits. Some Alamo

Heights residents do not believe it is fair to for their city to incur any costs related to the problem. Rosenthal urges that this opinion must be rejected to make any progress in restoring the Park as a beautiful and clean “entryway to the city” (City of Alamo Heights, 2017. p. 4)

Alamo Heights must also retrieve signed rights of entries from the private landowners: The Flannery's, The McCombs’ and St. Luke’s Church. This requirement was an issue in a previous project, eventually leading to the project’s demise (M. Hernandez, personal communication, June 8, 2017). Mark Browne, assured the City Council that if no right-of-entry is obtained from the private landowners, “the project will still proceed on all other properties” (City of Alamo Heights, 2018. p. 4).

The project should take about six weeks when it is executed (City of Alamo Heights, 2018. p. 4). After the cleanup, San Antonio and Alamo Heights plan to enter an inter-local agreement to maintain the newly cleared site (City of Alamo Heights, 2018. p. 4). Effective maintenance of the site will be critical to the long-term success of the project. Without a correlated maintenance program, the Park’s former trash levels will return after the first big rain event. In congruence with this contracted project, The City of San Antonio is pursuing an installation of a litter prevention device that will reduce trash flows into the area.

Bandalong Litter Trap™ Device

In 2014, HDR Engineering completed the "Best Management Practices (BMP) Study Regarding Lower Olmos Creek Trash and Floatables Mitigation". The study analyzed potential litter management solutions in Olmos Creek. It examined structural devices that could mitigate litter and potential installation locations. The study propelled San Antonio’s interest in one

device in particular: The Bandalong Litter Trap ™. The study concluded the Bandalong™ would be the most suitable control device for the Olmos Basin.

The Bandalong Litter Trap ™ was engineered by Stormwater Systems. It combines floating litter cages with a litter boom device. Bandalong™ devices typically "extend across a channel" (HDR Engineering, 2014. p. 2-2). Floatable trash is "caught by the boom as it floats downstream and becomes trapped in the net or cage" (HDR Engineering, 2014. p. 2-2). This device is a top choice because of its ability to float. Flotation prevents trash blockage that may further aggravate flooding (N. Koeninger, personal communication, December 20, 2017). Additionally, the device will "not impair fish passage" (HDR Engineering, 2014. p. 4-1). These thoughtful features prompted San Antonio River Authority to install a Bandalong Litter Trap ™ at Alazan Creek, near Woodlawn Lake. The Bandalong™ at Alazan was destroyed after a large rain event because of heavy wet thatch. The thatch strained the cages beyond their capacity. Since then, SARA has worked with StormWater Systems to manufacture a more reliable Bandalong™ that can withstand wet thatch. An improved Bandalong™ device was reinstalled at Alazan Creek in late 2017. It is currently working well but cannot be accurately evaluated until a large rain event (N. Koeninger, personal communication, December 20, 2017).

Olmos Basin Park is a prioritized location for the next Bandalong™ installation (N. Koeninger, personal communication, December 20, 2017). Holding that the current device at Alazan Creek remains effective. Based on the BMP study the device would be placed in Olmos Creek at San Pedro Avenue. This site would require a large Bandalong™ device with the same renovated features as the new device at Alazan Creek. This channel location is similar to Alazan Creek because it has ample wet thatch flows and similar water velocities (N. Koeninger, personal communication, December 20, 2017). The site is optimal for a few reasons, the first is its easy

accessibility. Easy accessibility is required for "construction and maintenance" (HDR Engineering, 2014. p. 4-5). The site is also secluded and within the golf course, so it has a low risk for vandalism. Lastly, the water velocities in this location are within the limits of the device (HDR Engineering, 2014. p. 4-5).

The Bandalong™ device is impressive, but there are deficiencies. According to the BMP study, only "25% of the litter generated in the watershed would be transported to and captured at the site" (HDR Engineering, 2014. p. 4-6). The amount of trash coming into the Park would be reduced by the device, but it would not be eliminated. There is a high cost for the device. The estimated Total Capital Cost for installation is $990,573 (HDR Engineering, 2014. p. A-6). This cost includes: site preparation, the device itself, contingency, engineering and permitting. The estimated annual cost is $115,404, and it includes the annualized capital cost and the annual operation and maintenance costs (HDR Engineering, 2014. p. A-2).

Engineered devices provide an alternative to tedious hand clean-up efforts, but they require a large investment and risk. The incident at Alazan Creek illustrated such risk. Nicole Koeninger urges that a balanced approach should be employed in litter management efforts. Namely, she recommends pursuing a "blend" of solutions, engineered devices and public outreach projects alike Public outreach projects are needed because they encourage residents to become "stewards" of their watershed (personal communication, December 20, 2017). Stewardship initiatives will limit the need for "huge capital improvement projects" Koeninger believes, public investment is the "ultimate investment" (personal communication, December 20, 2017).

Volunteer-Led Strategies

Addressing litter through hand pick up efforts is tedious and inefficient, but clean-ups led by volunteers do avoid extraneous costs. Litter clean-ups for all ages are facilitated in Olmos Basin Park. One of the most notorious volunteer clean-up efforts is Basura Bash. Basura Bash has around 2,000 volunteers participate yearly (Texans for Clean Water, 2017. p. 44). The event has teams spread across the San Antonio River, so many locations are addressed. However, the widespread effort leaves Olmos Basin Park without the volunteer base it needs. Because trash in Olmos Basin Park is embedded in the foliage and often difficult or dangerous to remove, it cannot be greatly affected by volunteers (L. Martinez, personal communication, June 9, 2017).

Lissa Martinez has advocated for Olmos Basin Park for ten years. She used to lead volunteer clean-up in the Park but has since retired from the responsibility (Gibbons, 2016). Trinity University Alpha Phi Omega service fraternity took her place when adopting the Park in 2016 (E. Lupo, personal communication, February 17, 2017). Lissa emphasizes how tricky litter cleanups in Olmos Basin can be, especially for young and inexperienced volunteers (L. Martinez, personal communication, June 9, 2017). She also points out the inefficiency in the litter tools provided by Parks and Recreation or other organizations. These groups do not have the budget for new, lightweight litter tools. They are left with clunky and tiring tools that wear down volunteers quickly (L. Martinez, personal communication, June 9, 2017). The work that has been done by volunteers and volunteer leaders like Lissa, Parks and Recreation, and APO generate priceless stewardship for the Park, but they can not solve a litter problem of Olmos Basin Park's magnitude.

Education

There are four litter oriented education efforts in San Antonio. Some are locally based and some are statewide. Remember the River and Watershed Wise are two organizations that provide public education programs within the county. Remember the River is a "comprehensive public education and outreach campaign" focusing on litter pollution in the San Antonio River (The City of San Antonio, 2014). The campaign employs an educator who presents pollution prevention strategies to audiences of all ages and backgrounds (Texans for Clean Water, 2017. p. 44).

Watershed Wise is a branch of the San Antonio River Authority. It "offers a comprehensive prevention, education, and outreach program for all watershed stakeholders" (Texans for Clean Water, 2017. p. 44). Like Remember the River, Watershed Wise provides educational presentations for diverse audiences on litter pollution. The programs each have an annual cost of around $120,000 (Texans for Clean Water, 2017. p. 44). These organizations embolden river stewardship amongst San Antonions. Outreach and education are long-term litter prevention strategies, but they materialize slowly. Therefore, their tangible impact on public behavior is difficult to observe.

Don't Mess with Texas is a statewide education effort. The campaign began in 1985, and it works to keep litter off of highways, public spaces, waterways and oceans. Its reputation was established through star-studded advertisements, education programs and recognizable red white and blue trash cans. In fact, 98% of Texas Residents recognize the slogan and are aware of its mission (Don't Mess with Texas, 2013. p. 2). The campaign transformed an environmental issue into a matter of Texan Pride. It was successful because it appealed "to individual's conscience or sense of community pride" (Hartley, Pahla, & Thompson, 2015. p. 210). This campaign is

grounded in prevention because it motivates Texans to stop littering and to hold their peers accountable for littering.

The Don't Mess with Texas campaign provides educational advertisements, online games with litter focused superheroes, a litter prevention-themed art contest, and opportunities for older students to advocate for campus clean-ups. The public is influenced by these efforts, but not with the necessary ferocity. A structured and universally required curriculum would magnify the program's power. Based on a Don't Mess with Texas survey, one-third of Texas residents admitted to littering in the past month Surprisingly, the individuals in the millennial age group were the most common perpetrators (Don't Mess with Texas, 2013. p. 3). Litter management leaders Nefi Garza and Nicole Koeninger acknowledge the success of Don't Mess with Texas' initial launch. However, they are aware of the campaign's decreasing influence, especially on younger generations (N. Garza, personal communication, June 22, 2017), (N. Koeninger, personal communication, June 2, 2017).

The Texas Essential Knowledge and Skills (TEKS) curriculum influences Texas litter education. The TEKS outline curriculum requirements for each grade level. They do not prioritize relevant environmental problems. The TEKS curriculum does not mention human alteration of the environment until grade four, and there is no litter-focused curriculum requirement within the TEKS (Texas Administrative Code, 2010). Schools are permitted to implement their own programs, but consistency is not guaranteed throughout the district. Educational presentations on litter require booking an outside organization, such as Remember the River. Not all schools in a given district would receive the same caliber of litter education. Additionally, not all children would be educated about litter at the best age. Some students would

not be educated on litter at all. Understaffed and underfunded schools are especially without the infrastructure to book a third party presentation on litter.

Statewide curriculum cannot be altered easily. Changes must be lead by the Texas Educators Association, the education arm of the Texas State Government. The group implements standards adopted by the State Board of Education, who receives ideas from "educators and other stakeholders" (Texas Educators Association, 2017). For new curriculum to be added, Texas educators must voluntarily pressure the Board. The needed energy is difficult to mobilize without tremendous support. Political bias also has a part in statewide curriculum decisions. Conservative leadership inspires the overall priorities of the Board. In 2010, the majority conservative State Board approved a curriculum change that urged nationalist and capitalistic ideals. The curriculum painted conservative politics with selectively positive strokes (McKinley, 2010). It is unlikely that this same Board would elect to implement a tedious and left-leaning curriculum item like litter prevention.

Litter education is important because it is a successful preventative tool. Hartley, Pahla, & Thompson (2015) conducted a study about the impact of marine litter education on children. The study found that after education, children better understood the topic. They were more concerned with the negative impacts of plastics, and they had greater background knowledge. Children educated on litter prevention were reportedly more motivated to act. They "reported encouraging family and friends to perform more litter-reducing behaviors after" the education session (Hartley et al., 2015. p. 214). Childhood education has a long term impact that contributes to litter prevention.

Legal Punishment

The Texas Litter Abatement Act specifies that littering a material 5lbs. and under is classified as a class C misdemeanor (Texas Litter Abatement Act, 2005). The associated punishment is a fine of up to $500 (Texas Litter Abatement Act, 2005). This policy is not as effective as it could be because it is not always enforced. In fact, "past month litterers and millennials" were not certain that littering was punishable by law (Don't Mess with Texas, 2013. p. 3). Texas House Bill 1884 (2017) recently revived the policy. The Bill allows a judge to order the perpetrator to complete up to 60 hours of litter clean-up service. Requiring litter clean up service, in addition to the already present fines, is a productive punishment. The policy allows some abatement costs to be avoided because the labor has been outsourced to litterers themselves (Texas House Bill 1884, 2017). This is a positive change, but the policy does not yet have the notoriety or enforcement to be effective.

There are many litter management strategies in San Antonio, but they do not make a substantial enough impact to alter the state of Olmos Basin Park. A new strategy must be taken to reduce the litter problem and revive the Park's spirit.

Litter Management Strategy Goals

Without litter, Olmos Basin Park would be an extraordinary outdoor urban space. It has functional amenities and a vibrant history. It is large, biologically diverse, and centrally located, so it can serve a wide array of people. Olmos Basin Park's prosperity is hindered by its overwhelming litter problem. It is an eyesore rather than an opportunity for wholesome outdoor recreation. The primary aim of this paper is propose a solution to improve the state of Olmos

Basin Park and to provide San Antonio residents with a gorgeous outdoor space. This will be done by eliminating or reducing the litter that depletes its value. Litter reduction is the overarching goal, but it is accompanied by subsequent goals. Each is necessary in the implementation of an effective litter management strategy.

The implemented litter management strategy and correlated education efforts should have a preventative focus. Strategies that prevent litter and reduce its perpetuation will eventually make the problem obsolete. All efforts should address the problem comprehensively. Effects on residents, San Antonio's ecosystems, and the local economy should be thoroughly considered in any proposed litter management strategy. Crafting the proposed strategies with a consideration of their full potential is critical. Although this paper lends special attention to Olmos Basin Park, excess litter in waterways is a problem around the world. San Antonio has the potential to be a worldwide leader in effective litter management strategies. Intersecting the preceding goals in a litter management strategy proposal will produce effective change.

Plastic Bag Ban Analysis

A plastic bag ban is a policy solution for the litter problem in Olmos Basin Park. The following section will provide background on plastic bag bans, discuss the successes and downfalls of two current plastic bag bans, and analyze the potential for a plastic bag ban in San Antonio. The analysis will prioritize the aforementioned policy goals and use them to guide future recommendations asserted in this paper.

Anti-plastic bag sentiments are gaining worldwide traction (Clapp & Swanston, 2009). Developing countries have led the shift away from plastic bag usage. Beginning in the 1990s Bangladesh, India, Taiwan, and South Africa began to implement plastic bag ban legislation

(Clapp & Swanston, 2009). The United States did not take legislative action on plastic bags until 2007. The U.S.'s limited action continues to be "more scattered and less stringent" than the anti-bag legislation of developing countries (p. 326). The "strong structural power" of the United States' industrial sector "prevents national-level policy" action (p. 329). Local municipalities must take the lead on anti-plastic bag movements in the United States.

Locally implemented anti-plastic bag policies can be flexible. They are able to consider the specific policy needs of a municipality. There is no detailed, universal description of a plastic bag ban. Most simply, the legislation requires some level of regulation on single-use plastic bags. Cities across the United States have implemented bans, and their successes and failures can be used to guide other municipalities in drafting similar legislation. Two of these municipalities are Austin, Texas and Los Angeles County, California.

Case Study: Los Angeles County, California

Los Angeles, like San Antonio, has an invaluable river flowing through it. The Los Angeles River runs 51 miles beginning at the Simi Hills and Santa Susanna Mountains, and it eventually ends in the Pacific Ocean at Long Beach, California. The River is inhabited by a variety of species. Some of which are endangered (California Water Quality Control Board, 2007). It provides aesthetic and recreational value for Los Angeles County residents, and its upper reaches serve as a "flood control basin" (California Water Quality Control Board, 2007. p. 7). In 1996, "excessive" trash crowded the waterway, impairing its value (California Water Quality Control Board, 2007. p. 17). Controls had to be taken to address the trash problem, and the city used tools from the Clean Water Act as a guide.

Section 305(b) of The Environmental Protection Agency's Clean Water Act "mandates a biennial assessment of the nation's water resources" (2002. p.1). To comply, states must indicate and prioritize impaired waters via a 303(d) list. According to §303(d) of the Clean Water Act, a state must address the impairment by establishing a total maximum daily load (TMDL) for the impairing pollutant (2002. p.105). A TMDL "establishes a target for a total load of pollutant the water body can assimilate and allocates the load to point sources and nonpoint sources" ("The Clean Water Act and Trash-Free Waters," 2017). This legislation was employed by Los Angeles County to correct the river's impairment.

In 2001, a trash TMDL was adopted for the Los Angeles River with a numeric target of "0 trash in the water" (California Water Quality Control Board, 2007. p. 20). The TMDL would serve to "improve the water quality" and protect the habitats of the species that live there. The River's value would be enhanced as a result (2007, p.16). Los Angeles was one of the first U.S. cities to implement a trash TMDL ("The Clean Water Act and Trash-Free Waters," 2017). The TMDL measure was indented to control other chemical pollutants, but trash TMDLs offer an innovative way to prevent trash-filled waterways.

Imposing a TMDL does not solve the problem. Strategies must be taken to ensure that the numeric target specified in the TMDL is met. A variety of different strategies such as policy controls, educational efforts, engineered devices and others can help a city reach the desired TMDL. These tactics are familiar because they are also present in San Antonio's litter management strategies. To ensure their numeric target was met, Los Angeles County proposed a different management strategy entirely: a plastic bag ban.

The ban was first proposed in Los Angeles County in 2007. In the initial overview report, it was revealed that "approximately 6 billion plastic carryout bags are consumed in Los Angeles

County" each year (Sapphos Environmental, 2009. p.2). Even worse, "less than 5% are recycled" (Sapphos Environmental, 2009. p.2). Prior to its adoption, both an Environmental Impact Report and a Socioeconomic Impact Analysis were completed and reviewed ("Notice of Determination," 2010). In November of 2010, Los Angeles County adopted the official bag ban ordinance which ordered, "no store shall provide to any customer a plastic carryout bag" (Environmental Protection of Los Angeles County Code, 2010. p. 5). Plastic product and produce bags are exempt from this legislation. The Los Angeles County Bag Ban was implemented slowly. Larger markets and pharmacies were to comply with the ordinance by July 2011, 8 months after the initial adoption. Smaller markets and pharmacies were given an extended transition period. Stores of this classification were to comply 6 months later, in January of 2012 (Environmental Protection of Los Angeles County Code, 2010. p. 7). The transitional period allowed businesses with fewer resources a longer period of time to adapt to the statute.

The ordinance mandates that stores must provide reusable bags "either for sale or at no charge" (Environmental Protection of Los Angeles County Code, 2010. p. 6). If a customer opts for paper recyclable bags, stores must charge 10 cents per bag (Environmental Protection of Los Angeles County Code, 2010. p. 5). This element disincentives shoppers to wholly switch from single-use plastic to single-use paper bags. Although paper bags are "less likely to become litter" than plastic bags, the majority are not recycled and their production requires ample resources (Sapphos Environmental, Inc., 2010. p. 14). Furthermore, stores must report the number of paper bags provided, the money received and demonstrate an effort to promote reusable bags as the preferred alternative (Environmental Protection of Los Angeles County Code, 2010. p. 6). If a report is not presented to the Director of Public Works, the business will incur a fine. The fine increases accountability and compliance across businesses.

One of the most important elements of the Los Angeles County bag ban is the exemption for customers in the California Supplemental Food Program for Women, Infants, and Children or the Supplemental Food Program (AECOM Technical Services, 2010. p. 23). This exemption is necessary to prevent the ordinance from having a disproportionate impact on low-income residents. Los Angeles County worked to distribute free reusable bags as a part of their educational transition period into the legislation. These initiatives helped empower low-income residents to participate in the bag ban because they received the necessary materials at no charge ("Implementation," 2012. p. 3).

The Director of Public Works has "primary" enforcement power over each required element of the legislation. Failing to comply can result in a fine. Fines are "deposited in the Solid Waste Management Fund" (Environmental Protection of Los Angeles County Code, 2010. p. 8). Consequences and consistent enforcement increase accountability for stores and customers and guarantee their active participation in the policy. Active participation secures the legislation's success. Los Angeles County's bag ban demonstrates a comprehensive and well thought out piece of legislation. As a result, Californians "adjusted quickly" to the new law (The Times Editorial Board, 2017).

Following the implementation of the ordinance, in September of 2012, Los Angeles County staff released an update on the progress of the ordinance. Most impressively, there was a "94% reduction in single-use bag usage at large stores and pharmacies" ("Implementation," 2012. p. 1). Also, paper bag usage went down by 25% ("Implementation," 2012. p.1). These statistics represent how effective anti-bag legislation is at eradicating plastic bags. Additionally, the economic burden per resident ended up being lower than predicted. It was anticipated that the "average cost per unincorporated resident would be $5.72 per year," but it ended up being only

$4.00 per year ("Implementation," 2012. p. 1). This low economic burden contributed to residents' swift assimilation into the policy (Times Editorial Board, 2017). The low yearly individual disproves any assertion that this type of policy will place an undue cost burden on residents. The costs were low at the institutional were "not overwhelming", as they are mostly related to staff time and compensation ("Implementation," 2012. p. 4). For this reason, it is difficult to generate an exact figure.

Compliance in submitting quarterly reports has been 100% for large stores; the majority of smaller stores have also adhered to the requirement ("Implementation," 2012. p. 2). As a result, businesses have avoided any unnecessary fines and set a strong example for community participation. Through the paper bag fee, businesses were also able to "offset the cost of the paper bags," so any concerns about the cost of paper bags became a non-issue ("Implementation," 2012. p. 2).

Business participation in the ban has been enthusiastic in Los Angeles County. Businesses are generating creative ways to motivate their customers to participate in the ban, and they are demonstrating an effort to progress their innovation as time passes ("Implementation," 2012. p. 2). Administrative individuals have also excelled at staying up to date. They consistently update the list of impacted stores as stores open and close across the County. Los Angeles County's bag ban was well-researched, responsibly implemented, and successful. The steps taken with this ban are certainly a good template to follow to produce strong anti-bag legislation.

Case Study: Austin, Texas

Austin's bag ban implementation process began in 2007 with resolution "directing the City Manager to evaluate and recommend strategies for limiting the use of non-compostable

plastic bags" (Resolution No. 20110804-021, 2011). In 2008 Austin implemented the Recycle the Bag Pilot Project. The Project was meant to "test the feasibility of a curbside plastic bag recycling program" ("Recycle the Bag," 2008. p. 2). The program was discontinued after the three-month trial because it was unsuccessful (City of Austin, 2011). It was based on voluntary participation, and the participation rates were low, and a "low volume of plastic bags were recycled" ("Recycle the Bag," 2008. p. 4). Finally, the collection costs for this project were high. Extra staff and time was needed to pick up, address contamination of, and treat the bags. As a result, there was "no cost benefit for curbside collection" in Austin ("Recycle the Bag," 2008. p. 4). The failure of this project led city officials to shift gears toward public outreach.

Simultaneously to the Recycle the Bag project, Texas Retailers Association and Keep Austin Beautiful launched the Austin's Got a Brand New Bag campaign (City of Austin, 2011). The 18-month initiative intended for a 50% reduction in the presence of plastic bags in the local landfill (Texas Retailers Association, 2009). The campaign involved "efforts to reduce bag consumption, issue free and sell low-cost reusable bags to patrons, and provide free plastic bag recycling to customers" (City of Austin, 2011). The campaign did provide meaningful insight from participating retailers on how to get customers excited about reusable bags, but it only "reduced the use of plastic bags by 20%, failing to reach the goal of 50% reduction" (Texas Retailers Association, 2009).

In 2010, Austin examined the burden that single-use plastic bags impose on the city. They found that single-use plastic bag management costs the city around $850,000 annually (Gedert, 2011. p. 1). The cost would rise to $2.7 million annually if curbside plastic bag recycling was made available. These numbers are underestimations because they lack indirect

environmental costs. Due to the expense, the Solid Waste Services department decided to explore single-use plastic bag mitigation options.

In the summer of 2011, a resolution that directed the city manager to produce an ordinance, "providing a comprehensive phase-out of single-use plastic bags offered at retail check-outs within the city limits of Austin" was approved (Resolution No. 20110804-021, 2011). In December 2011, the first draft was presented. The final and accepted version of the ordinance was presented in March 2012, and the Single-Use Carryout Bag Ordinance took effect in March 2013.

Austin's ban called for a year-long transition period beginning in 2012. During this period there was a "public education campaign to inform business establishments and citizens of the requirements regarding carryout bags" (The Code of the City of Austin, 2012). Unlike Los Angeles, Austin's Ordinance did not require a tiered implementation based on business size. Starting a year later in March 2013, the provision of single-use plastic carryout bags to any person or customer was prohibited on city property, at any city facility, at city-sponsored events and/or at any "business establishment within the city limits" (The Code of the City of Austin, 2012). Additionally, business establishments within the city were to "provide prominently displayed signage advising customers of the benefit of reducing, reusing and recycling and of the need to use reusable carryout bags" (The Code of the City of Austin, 2012).

Like Los Angeles, Austin attempts to account for those who would experience undue hardship from the Ordinance. Austin requires burdened citizens or businesses to complete and submit a hardship request application, which must be approved by the Director (The Code of the City of Austin, 2012). The ordinance does imply that the application could be completed by an individual or a business. Yet, upon further inspection, the application appears to be intended for

business use only. This is apparent because the application only addresses businesses in its inquiries. There are no other measures that consider the needs of low-income citizens, who could be disproportionately impacted by a ban as previously discussed.

The ordinance is enforced through fines. Punishment for noncompliance with this ordinance involves subjection to a fine that is greater than $100 but less than $2,000 (The Code of the City of Austin, 2012). Coupled with the statewide littering fines, this ordinance dissuades littering and the use of single-use plastic. This prevents a litter problem from arising across the city.

In 2015, two years after the ordinance took hold, Austin Resource Recovery and The Zero Waste Advisory Commission commissioned a report exploring the environmental effects of the Ordinance. The report comments on the environmental, social and economic significance of the Ordinance over the past two years. It pays special attention to the successes and failures of the Ordinance.

Like Los Angeles, Austin saw a massive reduction in the presence of plastic bags. In fact, six months after the ordinance's implementation, Austin Parks Foundation "reported a 90% reduction in plastic bag litter" (Waters, 2015. p.10). Reducing negative ecosystem, aesthetic and economic impacts. The ordinance shows progress toward Austin's Zero Waste Plan, an important movement toward sustainability for the city. The involuntary requirement of the ban produced "a greater reduction than the voluntary reduction's loftiest goals" (Waters, 2015. p.10).

There have also been some unintended consequences of the ban. Most notably, is the increased prominence of the four-millimeter reusable bag. Four-millimeter bags are heavier, thicker, reusable plastic bags with a high carbon footprint relative to single-use bags. They are made with virgin plastic, meaning there is no recycled content. They simply need more material

to be produced. Four-millimeter plastic bags have replaced single-use bags "as the go-to standard when the reusable bag is left at home" (Waters, 2015. p.22). To neutralize their environmental impact, these bags must be used 4-12 times. Their durability gives them a use value of 100 uses, but Austin shoppers are "not reusing them that often, if at all" (McGee, 2015). When these bags end up in the landfill, they take even longer to degrade than single-use plastic bags. Aaron Waters suggests amending the Ordinance to disallow four-millimeter bags (2015, p. 26). Los Angeles requires a much thinner 2.25 millimeters for reusable plastic bags. Austin should mirror this requirement.

A second unintended consequence is in the political realm. Despite general support from citizens, backlash from government leaders, such as Greg Abbott, has devalued the bag ban legislation. Abbott is concerned about protecting Texans' "unlimited liberty" (Tillove, 2015). He fears they threatened by an over-governing plastic bag ban. Others agree with his questioning of the legality of such legislation. In fact, a recent court case, *Laredo Merchants Association v. The City of Laredo* brings up this concern.

Laredo Merchant's Association asserts a recently proposed Laredo bag ban is illegal. Their argument is based on a pre-existing Texas state law that regulates solid waste disposal (Cobler, 2018). The City of Laredo appealed an August 2016 decision, in the San Antonio 4th court of Appeals, that ruled the ban illegal (Cobler, 2018). The Texas Supreme Court heard the case in January 2018, but the ruling is still undeclared. If the ban is ruled unconstitutional in Laredo, it could jeopardize other existing and potential anti-bag legislation in Texas.

Third, as Austin's ban is only citywide, surrounding cities do not have to participate. There are a few pockets within the city that are very close to neighboring towns. In the adjacent towns, there are grocery stores "which do not need to comply with the ordinance" (Waters, 2015.

p.27). Because of their proximity to stores outside of Austin, some customers choose to shop at stores that still provide single-use plastic bags. H-E-B "reported that upon the implementation of the Single-Use Bag Ordinance, [one] store lost between $60 to $70,000 per week in revenue" (Waters, 2015. p.27). In order to protect businesses within Austin, surrounding communities should be encouraged to take on similar initiatives (Waters, 2015. p.28). Los Angeles' ban was countywide, which prevented them from having similar issues. This is an apparent key difference that Travis County could emulate to strengthen the effectiveness Ordinance.

Although Austin's bag ban was successful at eliminating the presence of single-use plastic bags, it has some shortcomings. However, it is important to note that this impact report is a preliminary study. A comprehensive impact study is said to be completed in 2020 (SOURCE). Regardless, amending certain aspects of Austin's policy will improve its environmental impact, which will help it gain support. San Antonio can learn from the mistakes in Austin's plastic bag ban to produce a policy that avoids similar struggles.

Application and Recommendations

In San Antonio, a bag ban, especially one that builds on and improves the bans in Los Angeles and Austin, is an effective way of reducing the litter problem in Olmos Basin Park. A bag ban in San Antonio should also address concerns from within the city. A bag ban proposal was urged by previous San Antonio Councilman, Cris Medina, in 2014 (Loyd, 2014). The push failed because of the public's fear of disproportionate costs and inconveniences for low-income residents of San Antonio, concern for local business interests, and fear of lingering E. Coli in reusable bags. Elements of these fears are valid, but they are not substantial enough to disregard the positive impacts of a bag ban. The following section will explicate these fears, and provide

recommendations to remedy them. A plastic bag ban that adheres to these recommendations will yield positive results because it considers San Antonio's needs directly.

Disproportionate impact on low-income individuals

A bag ban has the potential to negatively affect low-income individuals by imposing burdensome inconveniences or costs. Texas Public Radio reported that reusable bags are "a burden to carry around without a vehicle," as bags must be brought with individuals on the bus, inside their work, and to the store (Loyd, 2014). However, reusable bags are lightweight and compact, so this inconvenience is not substantial. Everyone in the city would be affected by a bag ban, thus "people can work together to make it a success" (Loyd, 2014). Employers will be understanding about the extra cargo, as will other bus passengers because they must also adapt to the policy. The legislation will become the norm, and people will adapt, as they did in Los Angeles County (The Times Editorial Board, 2017).

In Austin, a slow transition gave the public sector time to adapt to the ban. Slow implementation will ensure low-income residents, employers and bus commuters comfortably adapt to the plastic bag ban. During the transition period, multi-lingual public outreach and reusable bag distribution should be implemented and focused in low-income neighborhoods. This will empower low-income or non-English speaking individuals with the information and materials they need to successfully and safely comply with the ban. Education efforts should also be aimed at employers and public transportation officials. This will prepare them for the heavier cargo loads that will be present with individuals traveling with reusable bags. The transition period will allow employers to be notified of their employees' added baggage.

The concerns of the costs for low income individuals is a second and important point. A bag ban requires individuals to purchase a reusable bag or pay a fee for a paper bag, thus a small cost is forced on to the consumer (Express News Editorial Board, 2014). Concerns about these costs were apparent and addressed in Los Angeles County, so there is an existing framework for reducing the burden. Los Angeles County's ordinance allowed for low-income residents to be exempt from fees by presenting proof of food assistance membership. Individuals must present their *Supplemental Nutrition Assistance Program* or *Women, Infants, and Children* card at checkout already, so it imposes no additional social burden. Granting exemption from any added charges at checkout in San Antonio would ensure low-income residents are not laden with extra costs.

Los Angeles County hosted public outreach events where they distributed reusable bags for no cost. San Antonio should implement similar multi-lingual education and outreach efforts. Especially in low income communities, as to equip these individuals with the materials and knowledge they need to successfully comply with the ban. Implementing the aforementioned strategies will make a bag ban more equitable. Critiques from those who frame the policy as burdensome on low-income people will be nullified. San Antonio will secure a position of national leadership in equitable environmental policy.

The imposed cost of the bag ban in Los Angeles was under $5.00 annually (AECOM Technical Services, 2010). Of course, a low-income family should not have to budget for any unnecessary spending, but the added $5.00 a year is a minimal cost. Especially considering the large environmental costs of plastic bag litter. Weighing the costs and benefits, it is clear that emphasizing bag ban costs is a distraction used by anti-ban operatives. Adhering to Los Angeles

County's successful bag ban framework will ensure that costs for a San Antonio ban are similarly low.

Concern for Local Business

The chance of a bag ban causing undue harm to businesses is small, if the ban is implemented properly. The ban must make an effort to avoid consumers from crossing city boundaries to go to a store outside of the ban's jurisdiction. To dissuade intercity competition, the policy should be implemented across the widest area possible. Because Austin's ban was only city-wide, it was very easy for residents to cross city boundaries and shop at a store without a plastic bag ban. To avoid this problem, San Antonio should work to get a policy passed across Bexar County. If that is unfathomable, it should at least work to encompass proximate cities, like Alamo Heights and Olmos Park. This measure works to protect businesses and makes them more motivated to participate, as seen by the businesses in Los Angles County (Environmental Protection of Los Angeles County Code, 2010).

Concern for the ability of businesses to reduce current stocks of plastic bags or adapt to the ban can also be nullified through a slow and tiered transitions period. The transition period leaves room for public forums and education efforts that empower business leaders to speak their concerns. Public forums would increase businesses' knowledge on why a ban is necessary and tips on how to make it successful. This step would also reduce a fear that businesses' liberties are being overstepped, as it includes them directly in the policy-making process.

A slow and tiered transition allows for businesses of different standing to adapt to the policy at their own pace. A tiered implementation, where smaller businesses are granted a longer transition period, worked well in Los Angeles County. It allowed smaller, resource-limited

businesses more time to implement the necessary education efforts and reduce their current plastic bag stock. Following a similar pattern will allow San Antonio's concerns about businesses to be mitigated.

Overall, Los Angeles saw their businesses express excitement for the ban once the County settled into it. The businesses became creative advocates, generating interesting educational materials and deals on reusable bags to get their consumer base engaged in the new policy. An effective policy can translate this positive business outlook to San Antonio as well.

Public Health Concerns

Fear of public health dangers from reusable bags is legitimate. A study on bacteria in reusable bags found E. Coli present in 8% of the used reusable bags in the sample (Gerba, Maxwell, Sinclair, & Williams, 2011. p. 510). 99% of the tested used reusable bags had some form of bacteria, however most were not contaminated with foodborne illness-causing bacteria (p. 513). Regardless, "hand washing or machine washing reduced the number of bacteria by > 99.99%" (p. 513). Strong education efforts should be pursued to eliminate public heath concerns. Reusable bags should have cleaning instructions printed on them, and stores should have signage indicating the risks and precautions needed to prevent bag contamination.

Requiring stores to provide multi-lingual educational materials about cleaning reusable bags is important for keeping people healthy. Due to the large Spanish speaking population in San Antonio, requiring education materials to be provided in Spanish would be crucial. Any proposed bag ban in San Antonio must include multi-lingual education efforts to guarantee safe and successful results. Education efforts were also proven to be a way for businesses to engage

with the ban in Los Angeles. It should be marketed the same way in San Antonio. Resounding support for the ban will increase its effectiveness and decrease the adaption period.

Despite previous hesitations and critiques of plastic bag ban legislation in San Antonio, there is current public and institutional support for the strategy. In July 2017, The Bexar County Young Democrats held a rally "calling on San Antonio City Council to ban single-use plastic bags" (Davila, 2017). The group was partially motivated by the environmental stewardship of San Antonio's newly elected Mayor, Ron Nirenberg (Davila, 2017). Although Nierenberg has not come out in support of a bag ban, he did lead a vote "supporting the Paris Climate Accord," so this type of legislation is not outside of his realm of interest (Davila, 2017). Much of San Antonio's City Council is left-leaning making this a good time to push for environmentally minded policy. Additionally, the SA2020 plan calls for San Antonio to be a "respectful steward of its natural resources" (SA2020, 2018). A plastic bag ban would be an on brand initiative for San Antonio. City Council is not the only supportive institutional force. Nefi Garza has been working to remedy the Olmos Basin Park trash problem for years. The Los Angeles County ban and its success piqued his interest. He has been an advocate for structural and non-structural solutions, like a bag ban, ever since (N. Garza, personal communication, June 22, 2017). As previously mentioned, Nicole Koeninger expresses similar sentiments (N. Koeninger, personal communication, December 20, 2017). A public strategy will help to enlighten and activate the whole city, so the problem can be solved collectively. During his campaign for a bag ban, Cris Medina noted VIA Metropolitan Transit is also "behind a ban" (Short, 2017). City leaders are aware of the importance of enacting long-lasting preventative solutions. Without them, money

will continue to be dumped into the litter problem every time a serious rain event occurs. Or worse, nothing is done, and this precious public space rots under Highway 281 for years to come.

A plastic bag ban that accounts for the aforementioned recommendations will fulfill the previously outlined policy goals. The initiative would be preventative because it eliminates the presence of a destructive and commonly littered material: plastic bags. If they are outlawed, they are unable to even arrive in recycling facilities, Bandalongs™ or on a litter stick. The measure tackles the problem at the source. The legislation solves the problem comprehensively. It considers economic, social and environmental concerns. Done correctly, this policy is impactful, cost-effective, lends special attention to underserved residents, reduces an environmental issue, improves public space and is constructed by the city, for the city. This initiative has potential to grow. If effective, San Antonio's policy will prove to influence other large cities across America. Other destructive materials, like Styrofoam and Mylar packaging can follow in this policy's footsteps. This policy will result in less plastic bag litter around the city and in Olmos Basin Park. This legislation will prove that San Antonio leaders know how to love and respect their outdoor spaces, and it will guide San Antonio citizens to do the same.

Conclusion

An effective bag ban in San Antonio would prohibit stores from providing single use plastic carryout bags. It would also act on known hesitations toward bag-bans. An effective ban must have a tiered transition period. The period would allow for significant education and outreach efforts to be pursued. It also addresses small businesses' limited capacity for change. An effective ban will offer exemptions, materials and outreach to low-income and non-English

speaking San Antonio residents. This attention ensures all individuals in San Antonio can safely and successfully comply with a bag ban policy. Implementation of the ban should be as extensive as possible to dissuade inter-city competition and increase overall impact. Olmos Basin Park has the potential to be a lush urban space. Addressing the litter problem through preventative measures, like a plastic bag ban, will secure this potential long-term.

Figures

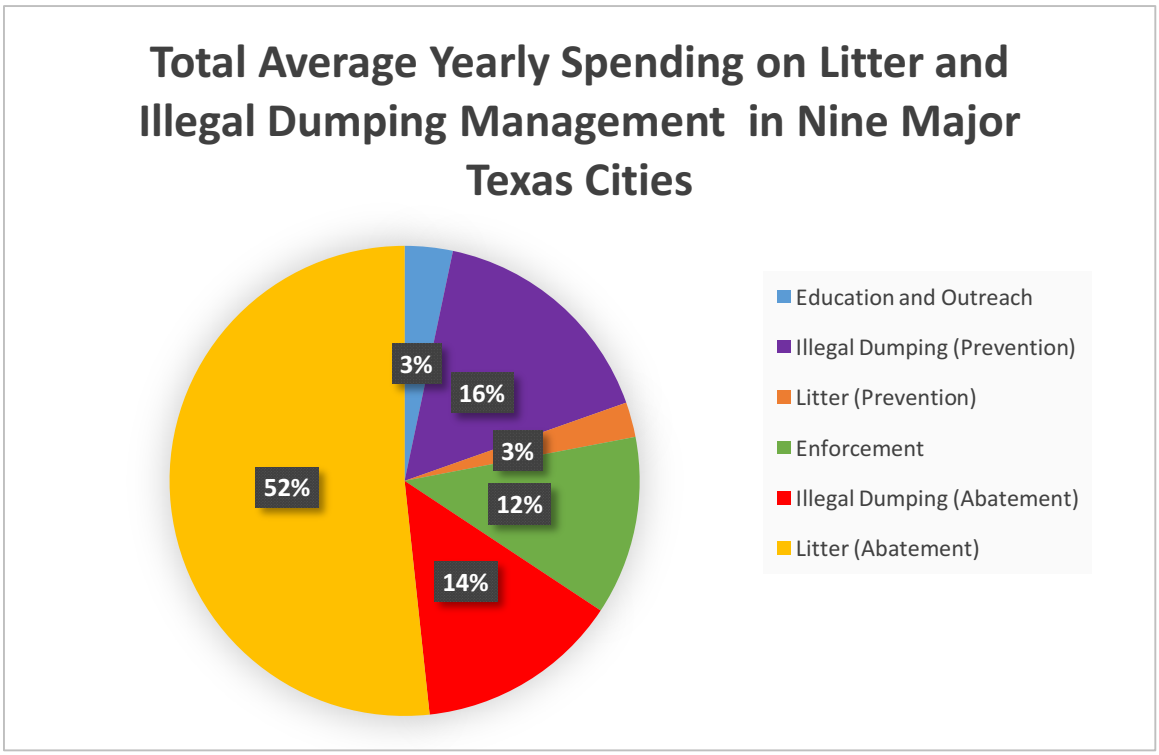

Figure 1.2 Total Average Yearly Spending on Litter and Illegal Dumping Management in Nine Major Texas Cities. Figure is originally produced. Data comes from:
Texans for Clean Water. (2017, February). *The Cost of Litter and Illegal Dumping in Texas: A Study of Nine Cities Across the State.* Retrieved from: http://www.texansforcleanwater.org/uploads/1/0/9/3/10936519/cost_of_litter_and_illegal__dumping_final.pdf

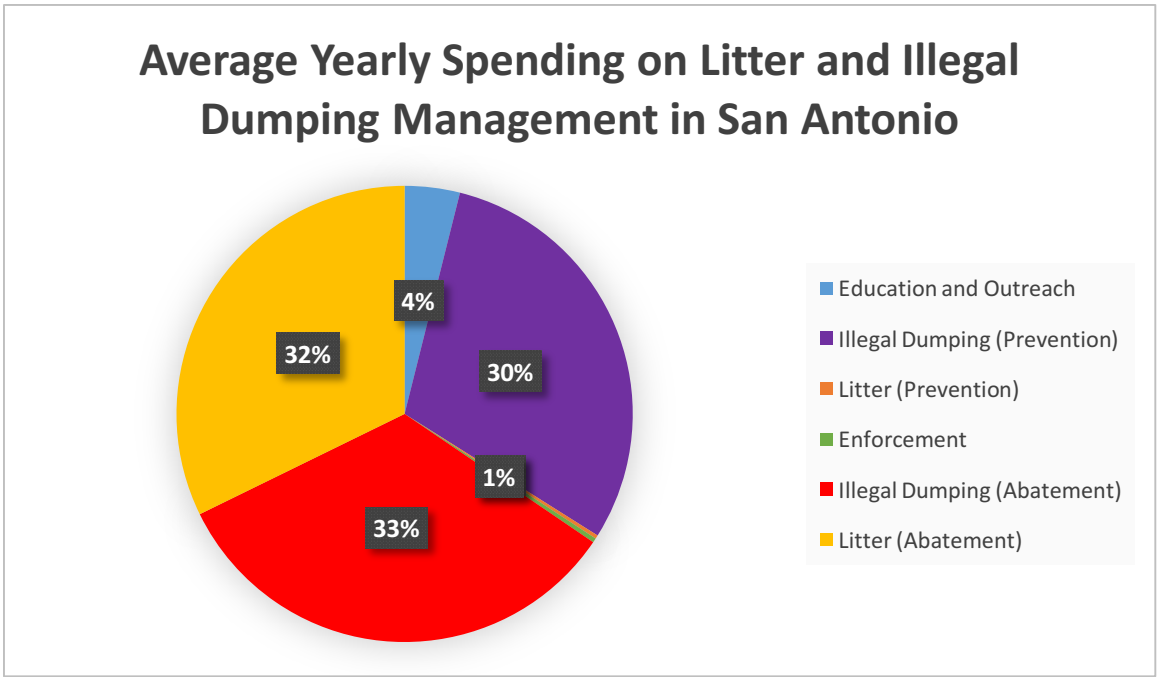

Figure 1.2 Total Average Yearly Spending on Litter and Illegal Dumping Management in San Antonio. Figure is originally produced. Data comes from:
Texans for Clean Water. (2017, February). *The Cost of Litter and Illegal Dumping in Texas: A Study of Nine Cities Across the State.* Retrieved from: http://www.texansforcleanwater.org/uploads/1/0/9/3/10936519/cost_of_litter_and_illegal__dumping_final.pdf

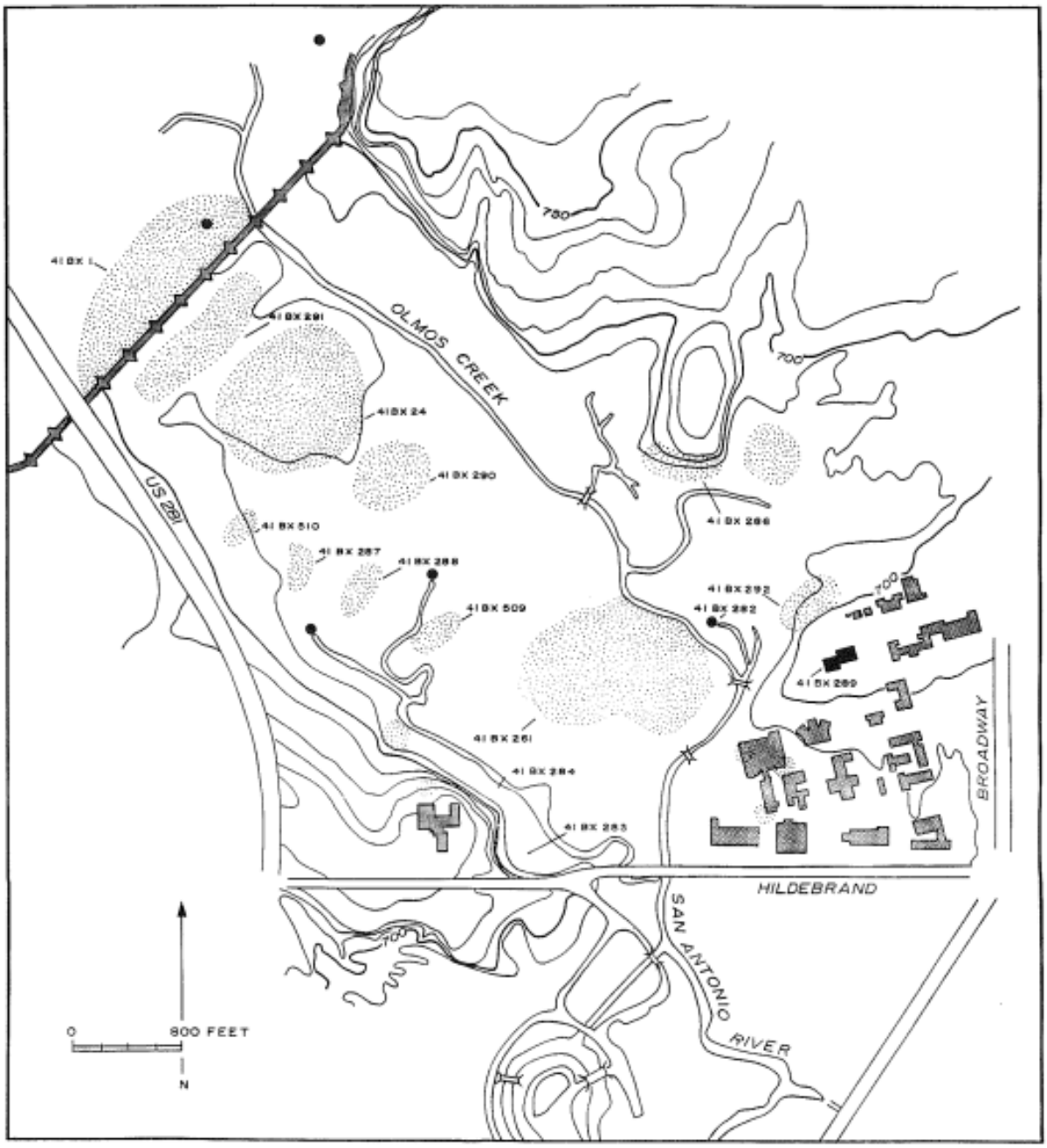

Figure 2.1 "Southern Portion of Olmos Basin." Map by Francis Meskill.
Stothert, Karen. (1989). The Archeology and Early History of the Head of the San Antonio River. *Southern Texas Archaeological Association* and *Incarnate Word College Archaeology Series.* Retrieved from https://www.karenstothert.org/uploads/7/0/6/2/7062502/archaeology_san_ant_river.pdf

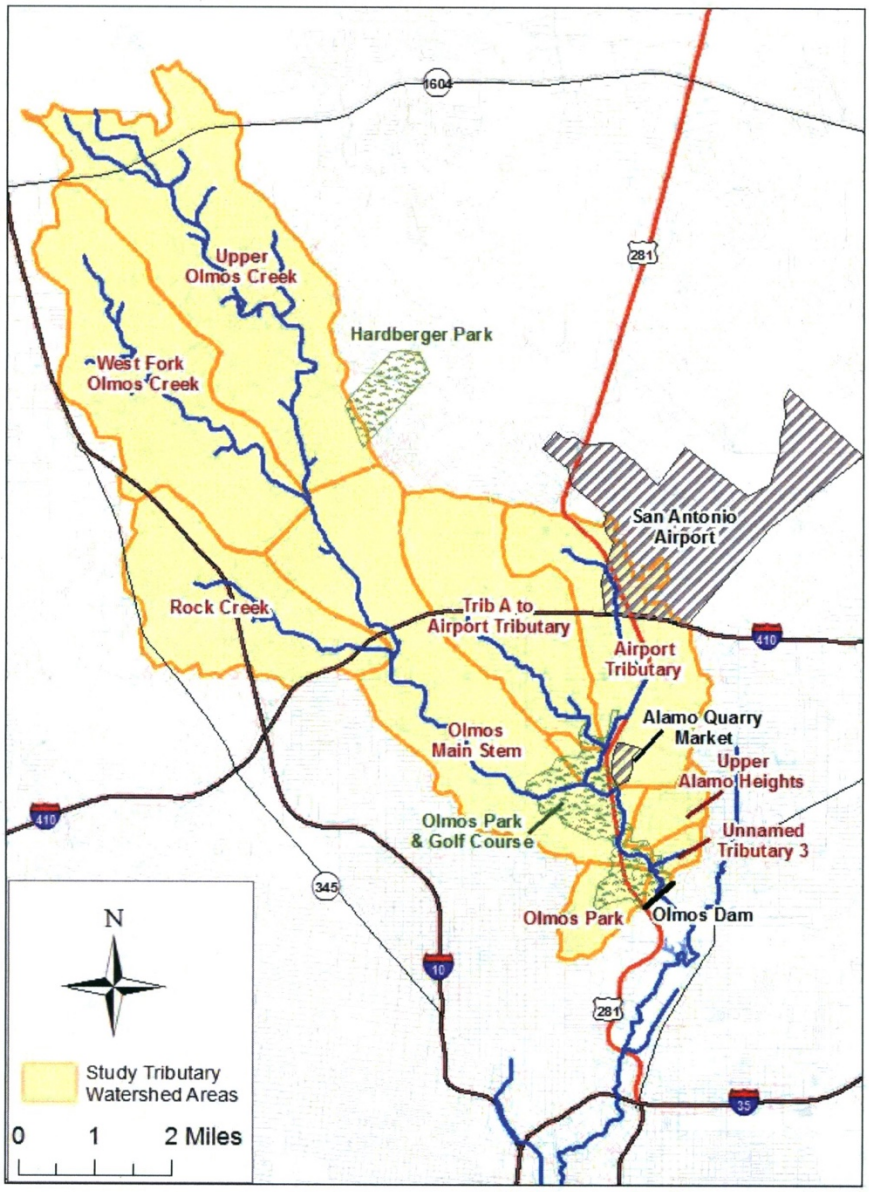

Figure 2.2 Map of Olmos Creek Watershed. HDR Engineering. (2014, September). *Lower Olmos Creek Trash and Floatables Mitigation BMP Study* (No. 218161).

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