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PLAYGROUND SAFETY IN GALVESTON PARKS: A DESCRIPTIVE ANALYSIS

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PLAYGROUND SAFETY IN GALVESTON PARKS: A DESCRIPTIVE ANALYSIS

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PLAYGROUND SAFETY IN GALVESTON PARKS: A DESCRIPTIVE ANALYSIS

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Public playground safety is a major public health issue. The foundation of the playground safety movement is grounded by a public demand for safe parks and playground equipment. Significant morbidity and cost is associated with park playground injuries annually. Most playground injuries were attributed to falls. This report provides a descriptive analysis of playground composition and safety using the National Program for Playground Safety safety report card survey instrument for each of the 12 Galveston public park playground areas. All Galveston park playgrounds were found to score "A's" on these safety surveys. The composition of playground equipment of Galveston parks is primarily climbing equipment, which accounts for 52 percent of the total equipment type. Climbing equipment means more fall risk and potential injuries. Appropriate fall surfacing and maintenance is a key feature in mitigating this risk at Galveston parks.

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Chapter One

Specific Aims

The specific aim of this capstone is to evaluate the current safety status of public park playground areas in the city of Galveston and provide this information to the Galveston Parks and Recreation Department. The report will provide a descriptive analysis that will focus on the National Program for Playground Safety (NPPS) safety report card and the composition of playground equipment by type and material construction in each of the 12 Galveston public park playground areas. The NPPS derives its safety report card from the national guidelines for playground safety by the Consumer Product Safety Commission (CPSC).[1]

The NPPS safety report card is a survey instrument with four safety categories, 24 survey items, and an overall scoring system.[2] This survey was used and provided the basis for the evaluation of the current safety status of park playground areas. The playground equipment composition included the number, type, and material of slides, climbing equipment, spring rockers, seesaws, swings, composite structures, and surfacing materials. The NPPS survey instrument and the playground equipment composition data was collected and summarized to give a clear picture of the current safety status of park playground areas in Galveston. The report provides a baseline for further safety evaluations and to help identify safety hazards and injury risk factors that could be mitigated or modified to prevent or minimize future injuries in the park playground areas in the city of Galveston. It provides recommendations to improve the public park safety for the Galveston Parks and Recreation Department.

Significance

In the United States, over 200,000 children are treated for playground-related injuries in emergency rooms annually.[3] According to the National Electronic Injury Surveillance System (NEISS) data for nonfatal unintentional injuries from July 2000 to June 2001, playground injuries were the most common injury for girls younger than 10 years old and boys younger than 5 years old.[4] Playground injuries remained in the top eight causes for injuries until 15 years of age for both sexes.[4] Supervision is critical due to the young age of the at-risk population to prevent injuries. Although young children are at highest risk for injury, everyone that visits a park playground area is at risk. Public playgrounds represent about 75% of nonfatal injuries sustained by children using playground equipment.[3] The Office of Technology Assessment[5] estimated a cost of $1.2 billion spent on playground-related injuries in 1995. The cost has ballooned to approximately $7.5 billion in 2000.[3] Although there is significant morbidity and cost, the death of approximately 17 children annually from preventable playground-related incidents is most disturbing.[6]

Public playground safety is a major public health issue with the significant morbidity, cost, and preventable mortality. Galveston is a major tourist destination bringing an influx of families and visitors to its beaches and public parks. Specifically, visitors as well as the local residents are using the public park playground areas. Review of the literature is devoid of any information about the safety of these park playground areas. This capstone will provide this data and analysis to evaluate the safety and composition of playground equipment to promote increased public safety in Galveston.

Chapter Two

Background and Literature Review

Playground safety has been recognized as a major public health problem. Significant levels of morbidity and financial costs have been steady over the years. In the United States, over 200,000 children are treated for playground-related injuries in emergency rooms annually.[3] This trend may worsen with increased exposure to unsafe playground environments in the future. Increased playground use may result from nationwide campaigns encouraging increased physical outdoor activity to combat the childhood obesity epidemic in the United States. Financial restraints may continue to reduce funds available for public health and park programs. Decreased park funds could lead to inadequate maintenance of public playground areas and lead to an increase in injuries. Due to decreased property tax revenues in low-income areas, public playground areas and equipment may not be maintained as well as higher income areas.

Data regarding playground injuries is primarily through the NEISS, which monitors emergency room only. Children treated in the primary care setting and those who do not report to emergency rooms are not counted and may contribute a significant amount of morbidity as well. The public has been aware of the dangers of playground areas to public health for many years. Public consumers petitioned for the creation of playground equipment safety standards to the CPSC in 1974.[6] The CPSC has published a "Handbook for Public Playground Safety" since 1981 with revisions and republications in 1991, 1994, 1997, and 2001.[7] The American Society for Testing and Materials (ASTM) is a not-for-profit organization that provides consumer safety performance specifications for playground equipment, which is integrated into the CPSC playground safety handbook.[7]

Even with the creation of the CPSC playground equipment standards, prevention of playground injuries has not had any significant decline. The CDC funded the creation of the NPPS in 1995 to facilitate research and prevention in the area of playground safety to help bring a decline in playground injuries and to provide safer playground areas for children.[6] Texas has adopted these guidelines into law as standards for state funded playground equipment and areas.[6] These guidelines are applied to the Galveston park playground areas to be evaluated to these standards in this capstone.

The literature review has identified much information regarding playground safety and the prevention of playground-related injuries. These studies have identified groups at risk for playground injuries. Younger children (ages 5 to 9 years old) are at higher risk of injury than any other age group.[8] Females (55%) were found to have sustained more injuries than boys (45%) did.[3] A study in New York City found more maintenance-related hazards in low-income areas versus high-income areas.[9] This study highlights the potential socioeconomic influences on playground safety environment that may put children at risk. Material safety and maintenance of playground equipment and environment play a vital role in playground hazards with rusty equipment, damaged fall surfaces, and more trash noted in the low-income areas in the New York City study.[9] Climbing equipment and swings are responsible for most injuries found at public and home playground areas, respectively.[3] 80 percent of injuries are related to falls.[6] Construction and maintenance of playground surfaces with materials such as shredded rubber, sand, wood chips, or wood fiber have been found to help reduce injuries from falls.[10] Mahajan and Beine[11] found that impact-absorbing materials might reduce the likelihood of head injury from as high as eight feet. This demonstrates the importance of

knowing the composition of playground equipment and the safety hazards in the playground environment. These provide the basis for the CPSC playground safety handbook and the NPPS safety report card survey instrument that is was used to evaluate the Galveston park playground areas in this report.

A review of the literature revealed no published data regarding any specific safety evaluations of the park playground areas in Galveston or other similar Texas cities. In a conversation with Mr. John Armstrong (Galveston Parks and Recreation Superintendent; March 2007), he stated that park playground inspections are completed frequently but no formalized reports or safety surveys have been completed. The NPPS has published the summary of its national playground safety report card surveys for the years of 2000 and 2004 for all states and the overall United States.[1] The park grade for Texas dropped slightly during this time period from B to a B- on a standard 10 percent interval 100-point grading scale.[1] The overall grade from the NPPS survey for the United States improved slightly from C to C+ during this time period.[1] This capstone study was designed to add to this information and begin to fill the gap between the state and local data that is missing from previous evaluations done by the NPPS. The data then can be used to identify areas of hazards and injury risk and allow for them to be addressed.

Chapter Three

Methods and Data

This capstone is a descriptive study designed to provide an analysis of the safety and equipment composition of all park playground areas in the city of Galveston. All the public park playgrounds in Galveston were visited to cover the entire population of interest, which removed any sampling bias or error. The descriptive analysis is based on the park safety survey instrument called the safety report card derived by the NPPS. The composition of playground equipment areas by type and material construction in each of the 12 Galveston park playground areas were collected as well. The NPPS safety report card is derived from the national guidelines for playground safety by the CPSC. The CPSC national guidelines provide the standards for Texas public playground environments and therefore Galveston. The 2001 CPSC Publication No. 325, "Handbook for Public Playground Safety" provides the operational definitions and measurement standards for the NPPS playground safety survey and playground equipment composition data.

The NPPS safety report card is a survey instrument with four safety categories, 24 items, and an overall scoring system.[2] The safety categories and survey items are shown in Table 1. The four categories include supervision, age-appropriate design, fall surfacing, and equipment maintenance. The survey instrument has 24 items, which are all nominal dichotomous variables. The "yes" responses to the 24 items (independent variables) are summed up to create an overall safety score (dependent, interval-level variable). The supervision category contains four items, which are all clear objective data. The next category is age-appropriate design with six items. The first item

regarding separate areas for the children 2 to 5 years of age (pre-school) versus 5 to 12 years of age (school-age) states that a "buffer zone" must exist between play areas. This "buffer zone" is defined as a distance of at least nine feet between play areas or separated by landscaping such as shrubs, trees, or benches.[7] The item under "appropriate guardrails" is defined as use of guardrails for any elevated surface greater than 20 inches above the ground but not over 30 inches for pre-school children.[7] The guardrails for pre-school children should be from 23 to 29 inches above the platform.[7] The use of guardrails for school-age children is greater than 30 inches above the ground but not over 48 inches.[7] The guardrails for school-age children should be from 28 to 38 inches above the platform.[7]

Fall surfacing is the next safety category with six items. The first item regarding "suitable surfacing material" is defined as loose fill (wood fiber, sand, pea gravel, or shredded tires) or unitary surfaces (rubber mats, rubber tiles, or poured in place rubber).[2] Height is measured in feet and inches from the ground to the highest platform or ladder rung.[7] The "appropriate depth" of loose fill material is selected from the loose fill material table located in the CPSC handbook, which is based on the material used and if compressed or uncompressed and the critical height of the structure.[7] The height and appropriate depth of loose fill was measured in inches to the tenth at the interval level. The height will be measured in feet and inches to the nearest tenth. The last two items of this category were measured to the interval level recording the number of defects encountered.

The final category, equipment maintenance, contains eight items. All items have clear objective criteria and will be measured at the interval level based on the number of

defects noted except for rust and splinters. The playground equipment composition includes the number, type, and material of slides, climbing equipment, spring rockers, seesaws, swings, merry-go-rounds, composite structures, and surfacing materials. The number of these various playground equipment components is interval level data. The type of equipment, surfacing material and construction material is nominal. Each type of equipment was counted and categorized based on the definitions in the CPSC handbook.

The data was collected on each park playground area in the city of Galveston. All the park playground sites were surveyed by myself and thus eliminated any inter-observer variability. The location and date of survey was recorded along with the research variables described above. Each composite structure was evaluated by the NPPS survey instrument and the composition data. The data was recorded on paper survey checklists and transferred to an Excel database. Review of data entry correctness was done at time of entry and rechecked after entry. The park playground areas were subdivided into A, B, C, etc. to designate multiple composite structures in a single park playground area. "A" designates the composite structure that is the farthest north. "B" designates the next composite structure that is south or east of "A". This process was applied to assign all composite structures for each park playground areas with multiple composite structures. The park playground surveys were completed from April 10, 2007 through April 20, 2007. The loose fill depth was measured with a 12-inch long metal circular three-sixteenth inch diameter flat-headed tree stake that was pushed into the loose fill by hand. Three most critical fall areas, i.e. tallest and climbing areas, were selected for measurement for each playground composite structure and averaged to create final depth. All playground structures were photographed as well for further future confirmation or

comparisons. Individual playground structures, such as slides, swings, seesaws, etc., were counted independently and evaluated by NPPS survey with the closest composite structure of age-appropriate design.

The data analysis is used to provide a clear descriptive picture of the park playground equipment and current safety status based from the NPPS safety report card instrument for the city of Galveston. The playground equipment composition data were counted and converted to frequencies of types of equipment and materials. The interval level data was summarized by means and standard deviations for each of the playground areas. The nominal data from the NPPS was combined into frequencies and percentages for all the composite structures and park playground areas. The data is summarized into descriptive statistics utilizing frequencies, means, and percentages and presented in graphs of the frequency distributions of composite structure make-up and safety report card scores. No severe structural deficiencies or extreme hazards at the park playground areas were noted and thus no reporting was required to the Galveston Parks and Recreation Department.

A total of 26 composite structures were surveyed in all 12 Galveston public park playground areas. A total of 624 safety items were evaluated with 591 items scored and recorded for the 26 composite structures. The 591 safety items were placed into an adapted NPPS safety report card table format shown in Table 1.[2] The NPPS grading scale is used in Table 1 based on percent of safety items scored matches a standard 10 percent interval scoring scale with grades from “A” to “F”, i.e. “A” equals 90 to 100 percent and “F” is lower than 60 percent.[2]

Table 1: Report card data from 591 safety items for Galveston playgrounds

Safety Report Card Category	Scored/Total points	Percent	Grade
Supervision			
1. Adults present	20/23	87	B+
2. Easily viewed	22/23	95.7	A
3. Crawl spaces	22/23	95.7	A
4. Supervision rules listed	2/26	7.7	F
Age-Appropriate Design			
1. Separate areas	26/26	100	A+
2. Guardrails present	26/26	100	A+
3. Change of direction present	26/26	100	A+
4. Signs for age group play	7/26	26.9	F
5. Prevent climbing out of design	26/26	100	A+
6. Prevented climbing on structure	26/26	100	A+
Fall Surfacing			
1. Suitable materials provided	26/26	100	A+
2. Equipment height less than 8 ft.	19/23	82.6	B-
3. Appropriate loose fill depth	21/23	91.3	A-
4. Suitable surface for use zone	25/26	96.2	A
5. Concrete footing were covered	26/26	100	A+
6. Free of foreign objects	26/26	100	A+
Equipment Maintenance			
1. Free of noticeable gaps	23/23	100	A+
2. Free of head entrapments	26/26	100	A+
3. Free of broken parts	23/23	100	A+
4. Free of missing parts	23/23	100	A+
5. Free of protruding bolts	22/23	95.7	A
6. Free of rust	15/23	65.2	D
7. Free of splinters	26/26	100	A+
8. Free of cracks/holes	23/23	100	A+

Chapter Four

Results

Galveston Island has 12 public park playground areas that are dispersed throughout the island. All the parks are located from the central portion of the island to the east side. Sand Hill Crane Park is the farthest point west with Lindale Park the farthest point east. Most of the public parks are independent parks, but Morgan Park is shared with the public school. This arrangement was used to combine financial resources to be able to upgrade the previous school playground and add another public playground area for children in the community to use. San Jacinto and Alamo Park used to be school playgrounds but were converted to public park playgrounds after the schools closed. Each park was surveyed with the NPPS instrument, which found an overall average score and standard deviation of 21.5 +/- 1.3 points out a total of 24. These calculations did not include the scores from Menard Park because it was closed for renovations and all parts of the survey could not be assessed. The items that could be evaluated were scored and the others were left blank thus falsely lowering the total combined point total for Menard Park. The overall average score was at the "A" level for the park playgrounds evaluated.

Although the overall score was very good, there were areas that scored poorly. These are represented in Table 1 of the data section. Under the supervision category, the overall finding was only 7.7 percent of parks had appropriate signs for supervision rules in the park playground areas. Under the age-appropriate design category, the overall finding was only 26.9 percent of parks have appropriate signs stating the appropriate age for playground use. The fall surfacing category received good marks overall. The equipment maintenance category had a finding of rust at 65.2 percent of playground

areas. All the open park playground areas scored high marks for safety on the NPPS survey with all receiving an “A”.

The composition of the playground equipment was the other area to define what potential hazards are present on Galveston park playground areas. Galveston playground areas are primarily composed of climbing equipment followed by slides, swings, and spring rockers/see-saws. Climbing equipment comprises 52 percent of the type of playground in Galveston. Slides contributed approximately 27 percent. The composite structures were mainly metal frame with plastic equipment. Schreiber Park was an exception because it is an entirely wood-based playground structures. Metal slides and climbing structures were noted at Morgan Park, which accounted for the older playground equipment left after renovation. Falls surfacing at the playground areas was predominantly wood chips accounting for 93.3 percent of the surfacing. The other two areas were surfaced with pea gravel and sprayed rubber matting. The specific composition of each park will be addressed in the figures below in more detail.

The following pages contain figures that outline the data gathered from the 591 safety items surveyed on the NPPS survey and the 375 playground equipment items detailed for the 26 composite structures covering the 12 Galveston public park playgrounds. These figures summarize graphically the results obtained from the NPPS safety surveys and data obtained from the collection of the equipment composition for the park playgrounds in Galveston.

Figure 1: ***Adoue Park Safety Report Card Scoring***

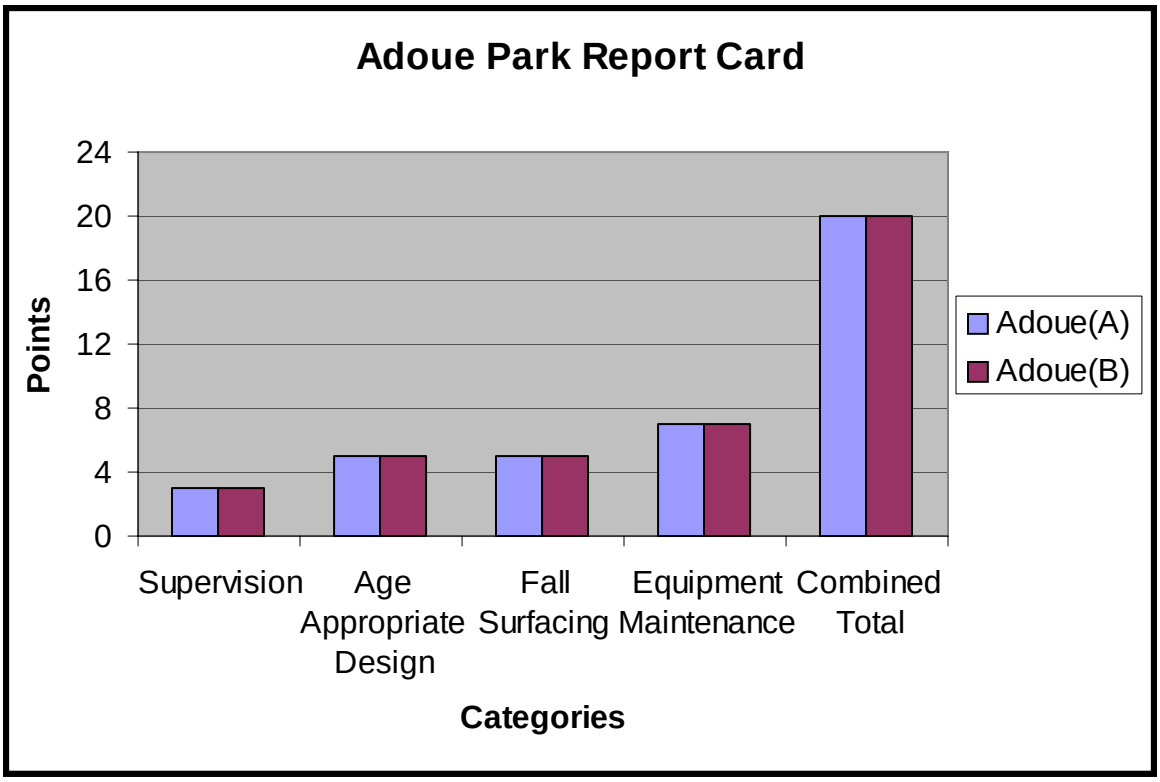

Figure 1 depicts the NPPS safety report card scoring on the survey of Adoue Park. The park was surveyed on April 18, 2007. This park has two composite structure areas. Adoue(A) lost one of four points under the supervision category for lack of signs posted regarding behavior. One out of six points was lost under the age-appropriate design category for lack of signs indicating appropriate age for use. One out of six points was lost under the fall surfacing category for a critical height over eight feet. One point out of eight points was lost secondary to rust under the equipment maintenance category. Adoue(B) scored the same demerits except in the fall surfacing category where it lost one point of six points for inappropriate loose fill depth at 7.5 inches (8 inches required) of wood chips. Overall, Adoue Park scored 20/24 points for an "A" grade.

Figure 2: ***Adoue Park Playground Equipment Composition***

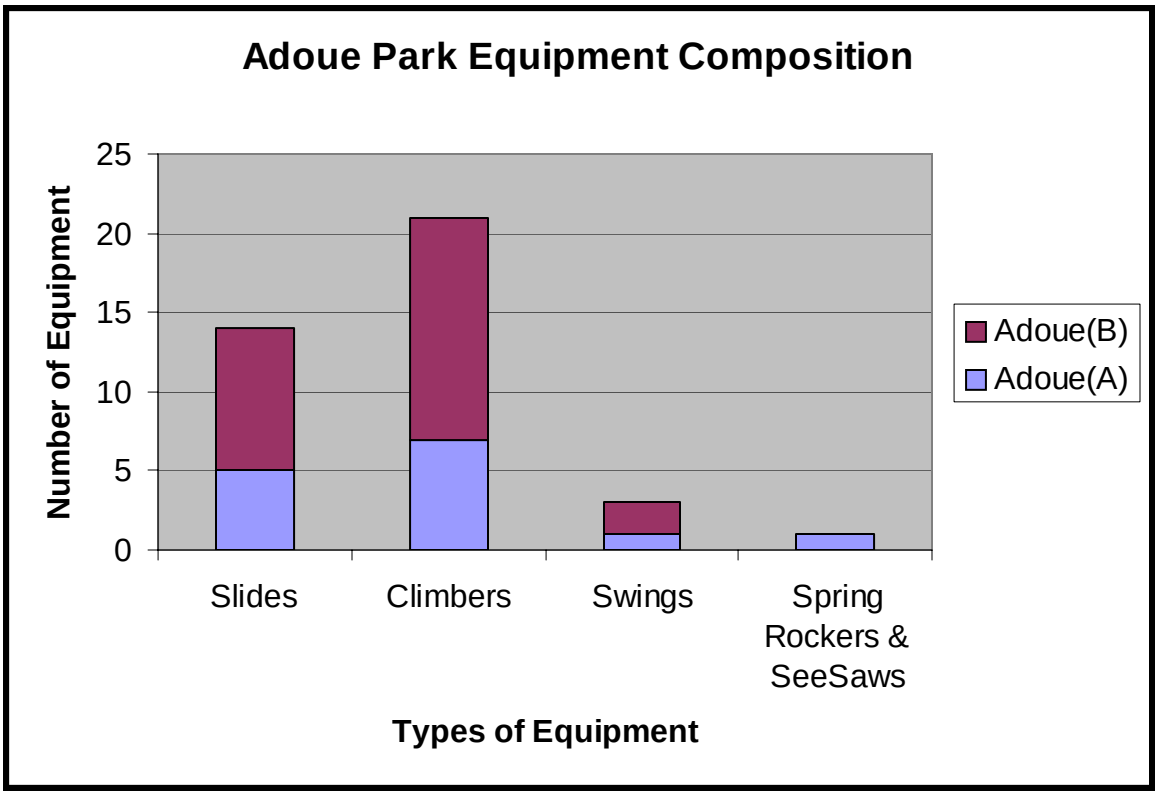

Figure 2 demonstrates the distribution of the types of park playground equipment for Adoue Park. Adoue Park is located at Twelfth Street and Ball Street. Adoue Park has compacted wood chips for fall surfacing throughout. The composite equipment is made of metal frame with plastic components such as slides. Climbing equipment is the primary equipment with slides secondary. Climber equipment includes horizontal ladders, sliding poles, climbing beams, overhead rings, arch climber, ladders, walls, and non-rigid climbers. All slides were plastic with 10 open slides and four closed tubes. There are two toddler swings and one child swing and one seesaw.

*Figure 3**:*** ***Alamo Park Safety Report Card Scoring***

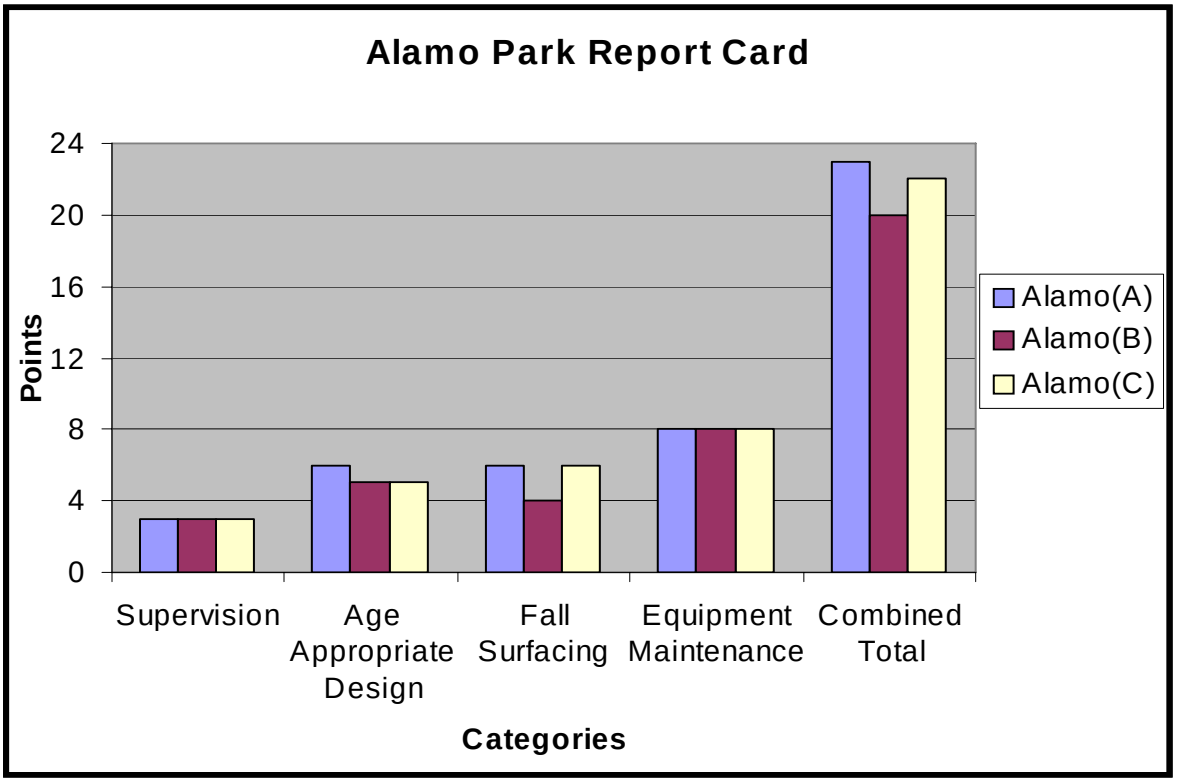

Figure 3 illustrates the NPPS safety report card scoring on the survey of Alamo Park. The park was surveyed on April 20, 2007. This park has three composite structure areas. All Alamo structures lost one of four points under the supervision category for lack of signs posted regarding behavior. One out of six points was lost under the age-appropriate design category for lack of signs for age, except for Alamo(A). One out of six points was lost under the fall surfacing category for a critical height over eight feet for Alamo(B). No deficits were noted in the equipment maintenance category for Alamo Park. Overall, Alamo Park scored 22/24 points for an "A" grade.

Figure 4: ***Alamo Park Playground Equipment Composition***

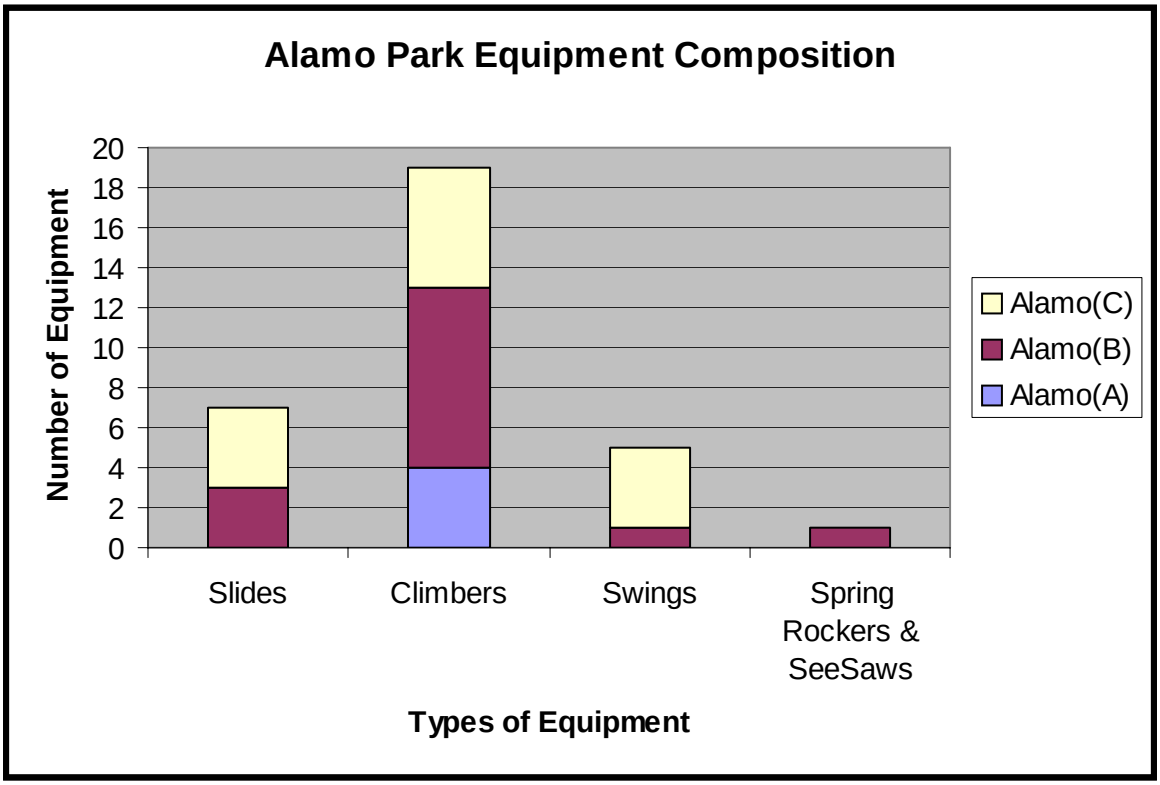

Figure 4 displays the composition of the park playground equipment for Alamo Park. Alamo Park is located at Fifty-first Street and Avenue M 1/2. Alamo Park has compacted wood chips for fall surfacing throughout. The composite equipment is made of metal frame with plastic components such as slides. Climbing equipment is the primary equipment with slides secondary. Climber equipment includes horizontal ladders, sliding poles, climbing beams, overhead rings, balance beams, ladders, walls, and non-rigid climbers. All slides were plastic with six open slides and one closed tube. There are a total of five child swings and one seesaw.

*Figure 5**: Crockett Park Safety Report Card Scoring***

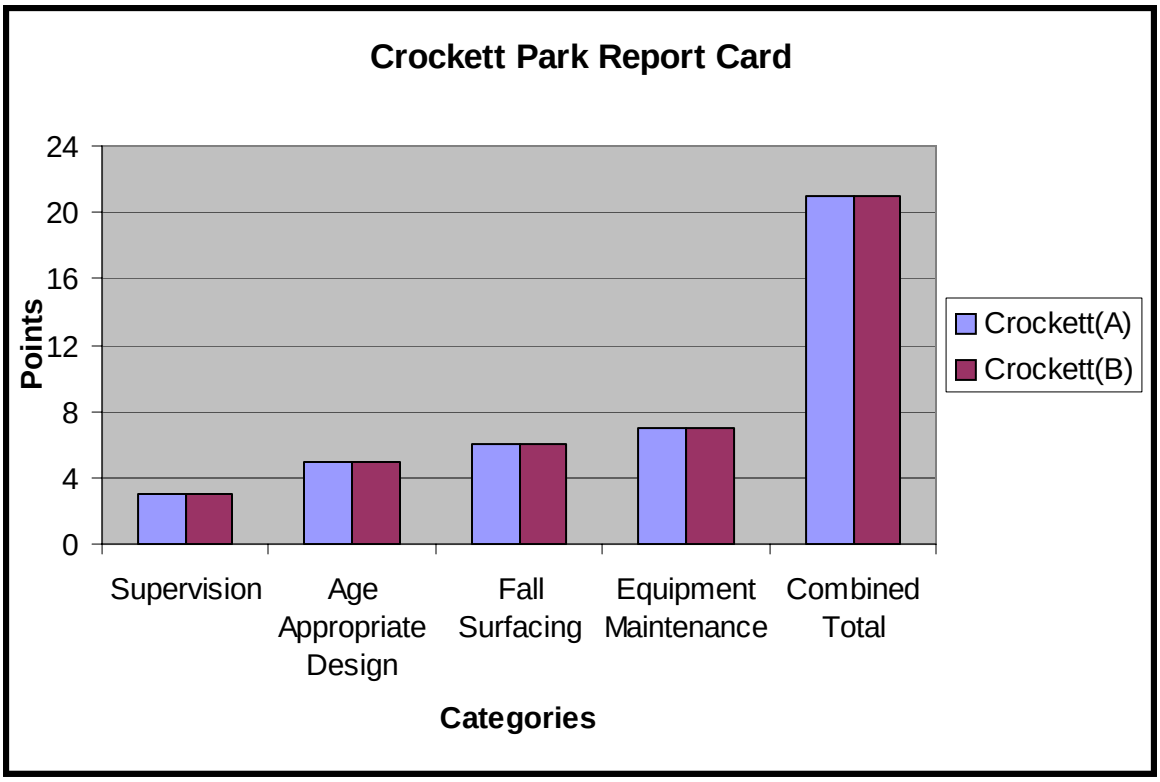

Figure 5 shows the NPPS safety report card scoring on the survey of Crockett Park on April 19, 2007. This park has two composite structure areas. All Crockett park structures lost one of four points under the supervision category for lack of signs posted regarding behavior. Both structures lost one out of six points under the age-appropriate design category for lack of signs for age. No deficits were noted in the falls surfacing category for Crockett Park. Crockett(A) lost a point for rust in the equipment maintenance category. Overall, Crockett Park scored 21/24 points for an "A" grade.

Figure 6: ***Crockett Park Playground Equipment Composition***

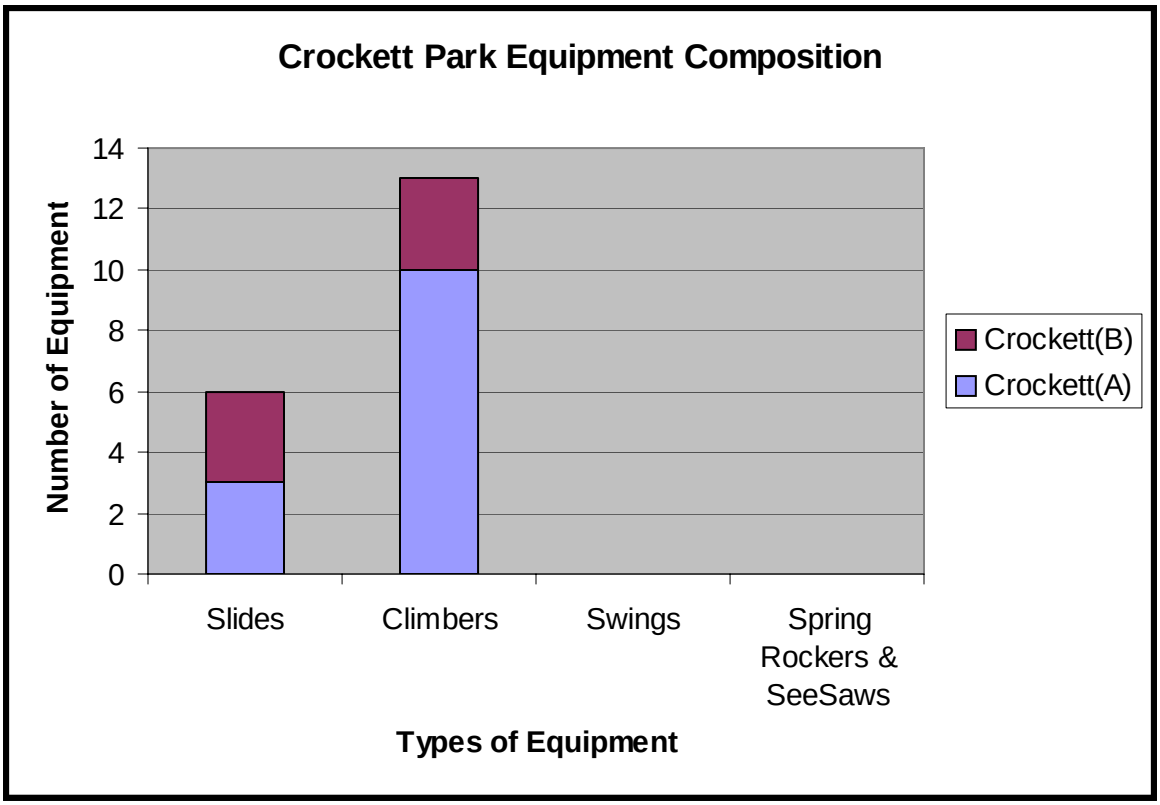

Figure 6 represents the composition of the park playground equipment for Crockett Park. Crockett Park is located at Fifty-third Street and Avenue S 1/2. Crockett Park has compacted wood chips for fall surfacing throughout. The composite equipment is made of metal frame with plastic components such as slides. Climbing equipment is the primary equipment with slides secondary. Climber equipment includes horizontal ladders, climbing beams, overhead rings, ladders, walls, and a non-rigid climber. All slides were plastic with five open slides and one closed tube. There are no swings, seesaws, or spring rockers.

Figure 7: ***Gus Allen, Sr. Park Safety Report Card Scoring***

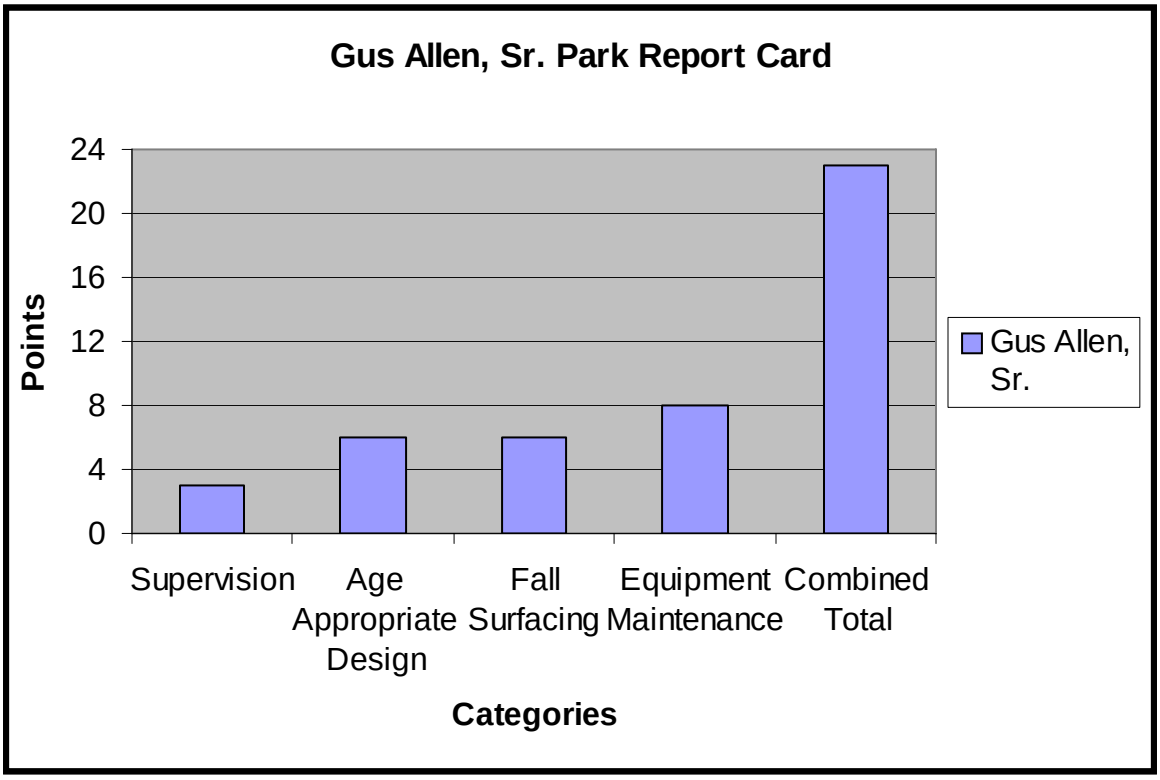

Figure 7 shows the NPPS safety report card scoring on the survey of Gus Allen, Sr. Park on April 19, 2007. This park has only one composite structure area. Gus Allen, Sr. Park lost only one point under the supervision category for lack of signs posted regarding behavior. No other deficits were noted. Overall, Gus Allen, Sr. Park scored 23/24 points for an "A" grade.

Figure 8: ***Gus Allen, Sr. Park Playground Equipment Composition***

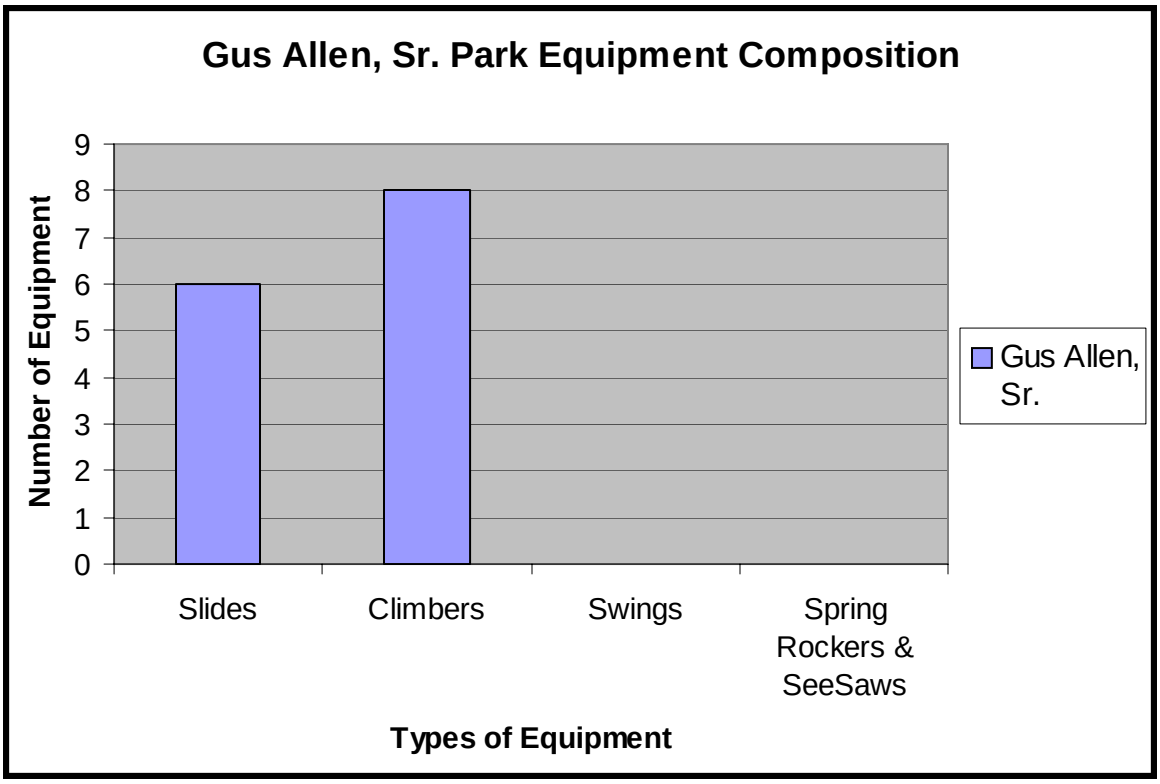

Figure 8 depicts the composition of the park playground equipment for Gus Allen, Sr. Park. Gus Allen, Sr. Park is located at Twenty-eighth Street and Church Street. Fall surfacing is with wood chips. The composite equipment is made of metal frame with plastic components such as slides. Climbing equipment is the primary equipment with slides secondary. Climber equipment includes horizontal ladders, arch climber, ladders, overhead rings, walls, and a non-rigid climber. All slides were plastic with five open slides and one closed tube. There are no swings, seesaws, or spring rockers.

Figure 9: ***Jones Park Safety Report Card Scoring***

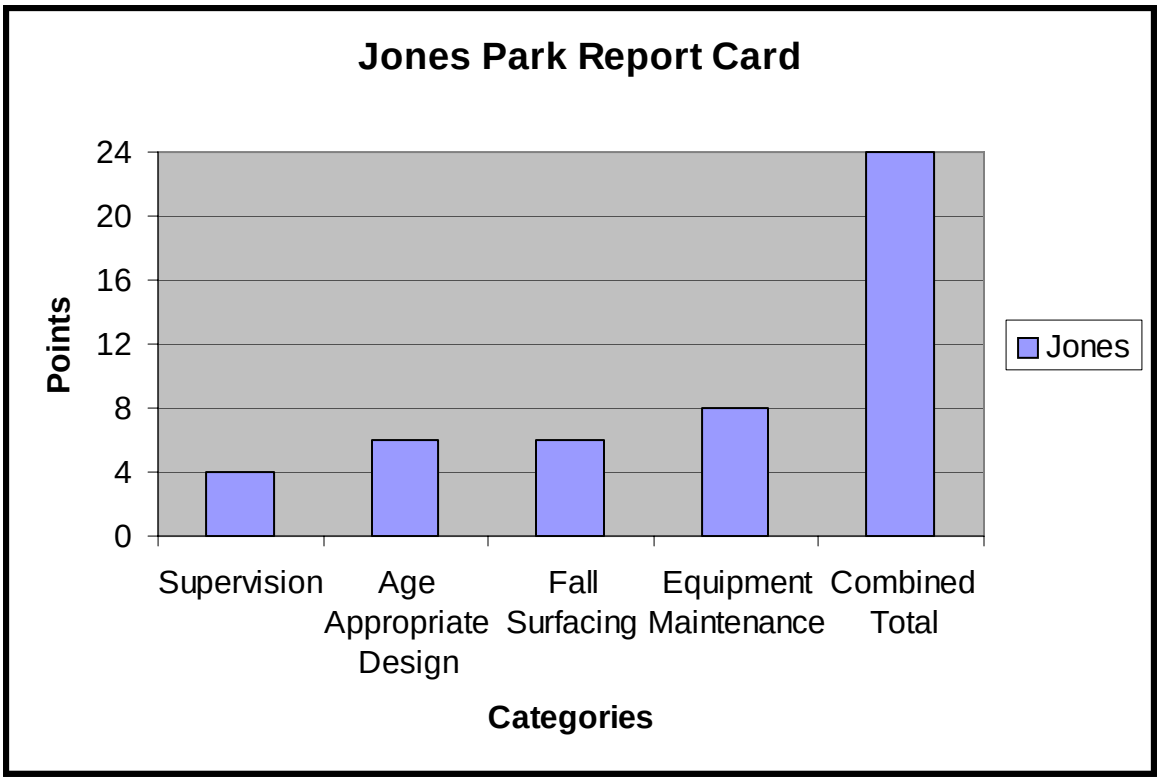

Figure 9 represents the NPPS safety report card scoring on the survey of Jones Park on April 20, 2007. This park has one composite structure area. Jones Park scored a perfect score without any deficits on evaluation. Overall, Jones Park scored 24/24 points for an "A+" grade.

*Figure 10**:*** ***Jones Park Playground Equipment Composition***

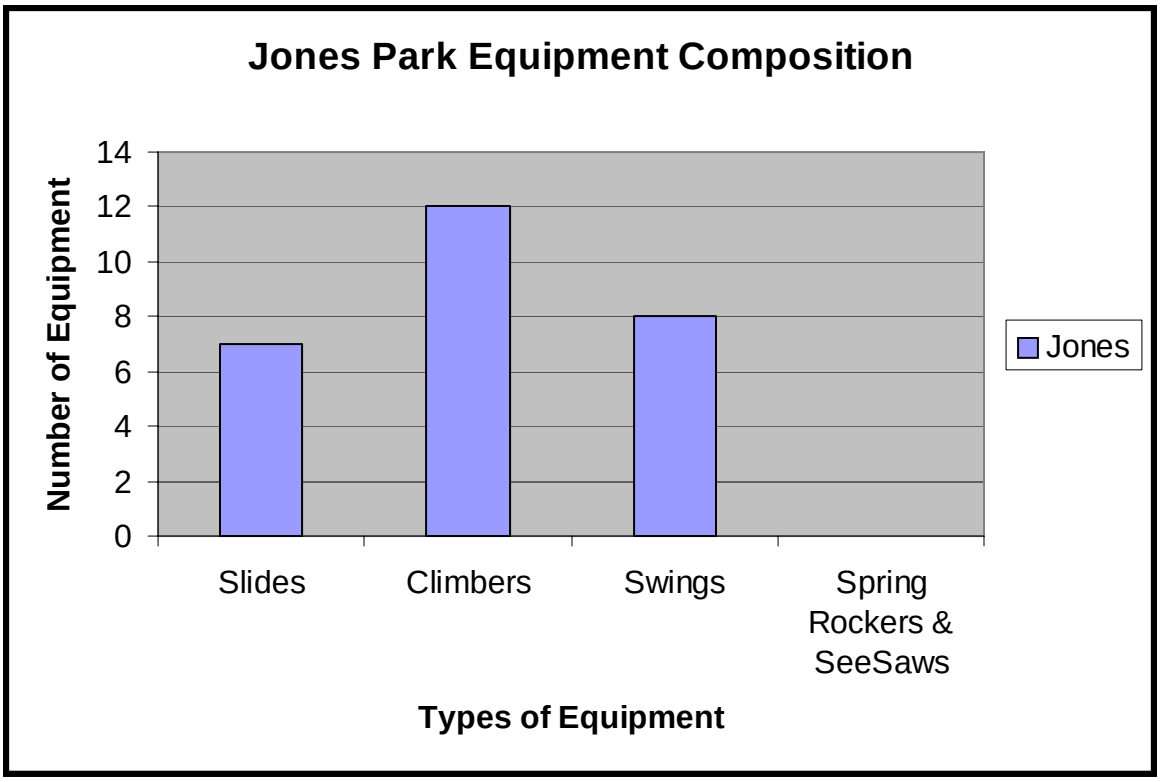

Figure 10 illustrates the composition of the park playground equipment for Jones Park. Jones Park is located at Seventy-first Street and Jones Drive. Jones Park has compacted wood chips for fall surfacing. The composite equipment is made of metal frame with plastic components such as slides. Climbing equipment is the still primary equipment, but swings edge out slides at this park. Climber equipment includes a sliding pole, overhead rings, arch climbers, and a ladder. All seven slides were plastic and open. There are a total of six child and two toddler swings. No seesaws or spring rockers.

*Figure 11**:*** ***Lindale Park Safety Report Card Scoring***

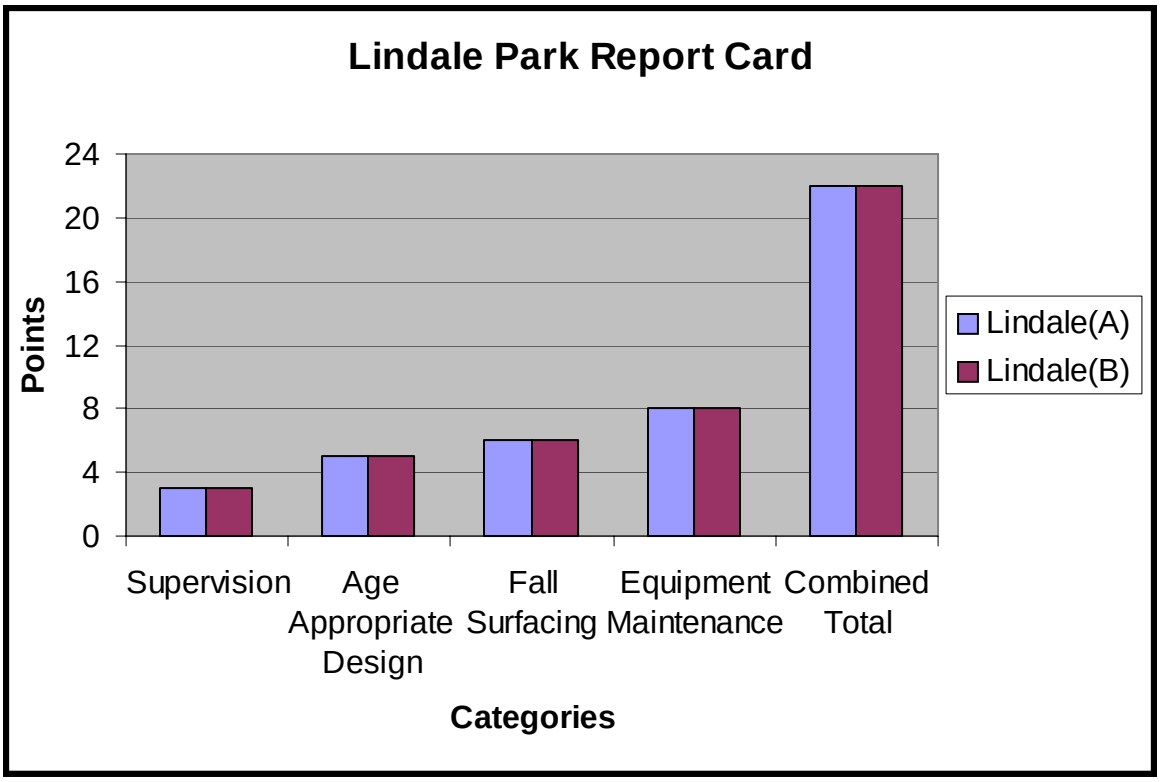

Figure 11 displays the NPPS safety report card scoring on the survey of Lindale Park on April 10, 2007. This park has two composite structure areas. All Lindale park structures lost one point under the supervision category for lack of signs posted regarding behavior. Both structures lost one out of six points under the age-appropriate design category for lack of signs for age. No deficits were noted in the falls surfacing or equipment maintenance categories for Lindale Park. Overall, Lindale Park scored 22/24 points for an "A" grade.

*Figure 12**: Lindale Park Playground Equipment Composition***

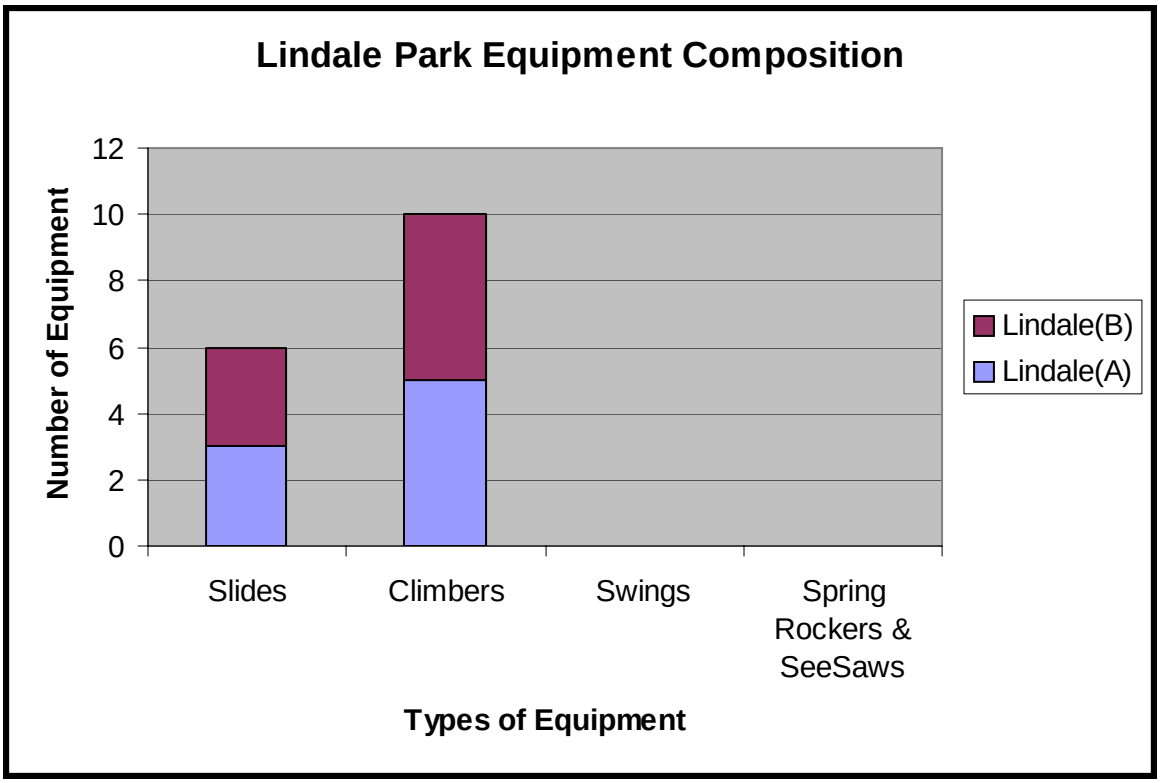

Figure 12 displays the composition of the park playground equipment for Lindale Park. Lindale Park is located at Fourth Street and Marine Street. Lindale Park has compacted wood chips for fall surfacing as well. The composite equipment is made of metal frame with plastic components such as slides. Climbing equipment is the primary equipment with slides secondary. Climber equipment includes a horizontal ladder, an overhead ring, arch climbers, ladders, and a non-rigid climber. All slides were plastic with three open slides. No other types of equipment were available.

*Figure 13**: Menard Park Safety Report Card Scoring***

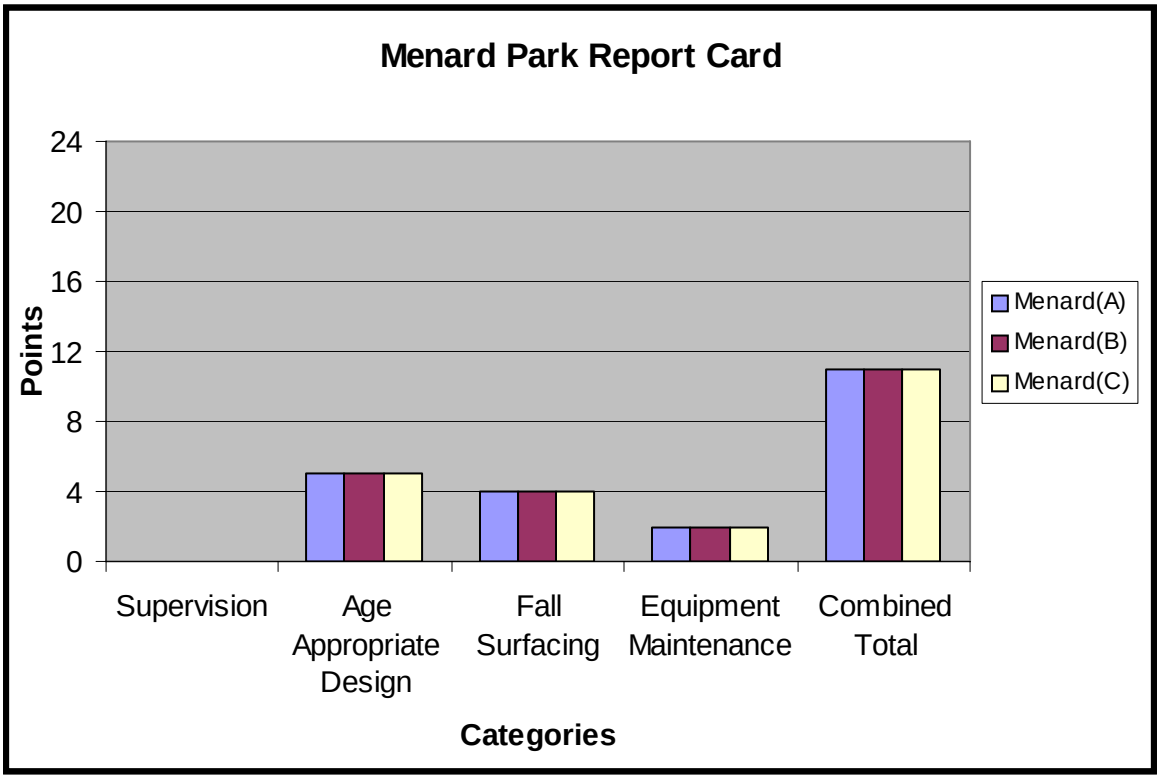

Figure 13 demonstrates the NPPS safety report card scoring on the survey of Menard Park on April 19, 2007. This park has three composite structure areas. Menard Park is currently closed and fenced off for renovation, so only visual data could be obtained. Three of the four items in the supervision category, two of six items in the fall surfacing category, and six of the eight items in the equipment maintenance category could not be evaluated. A full survey could not be accomplished secondary to these restraints. All Menard park structures lost one of four points under the supervision category for lack of signs posted regarding behavior. All structures lost one out of six points under the age-appropriate design category for lack of signs for age. No other deficits were noted on limited exam in the falls surfacing and equipment maintenance categories. Overall, Menard Park scored 11/14 points, but could not complete overall scoring.

Figure 14: Menard Park Playground Equipment Composition

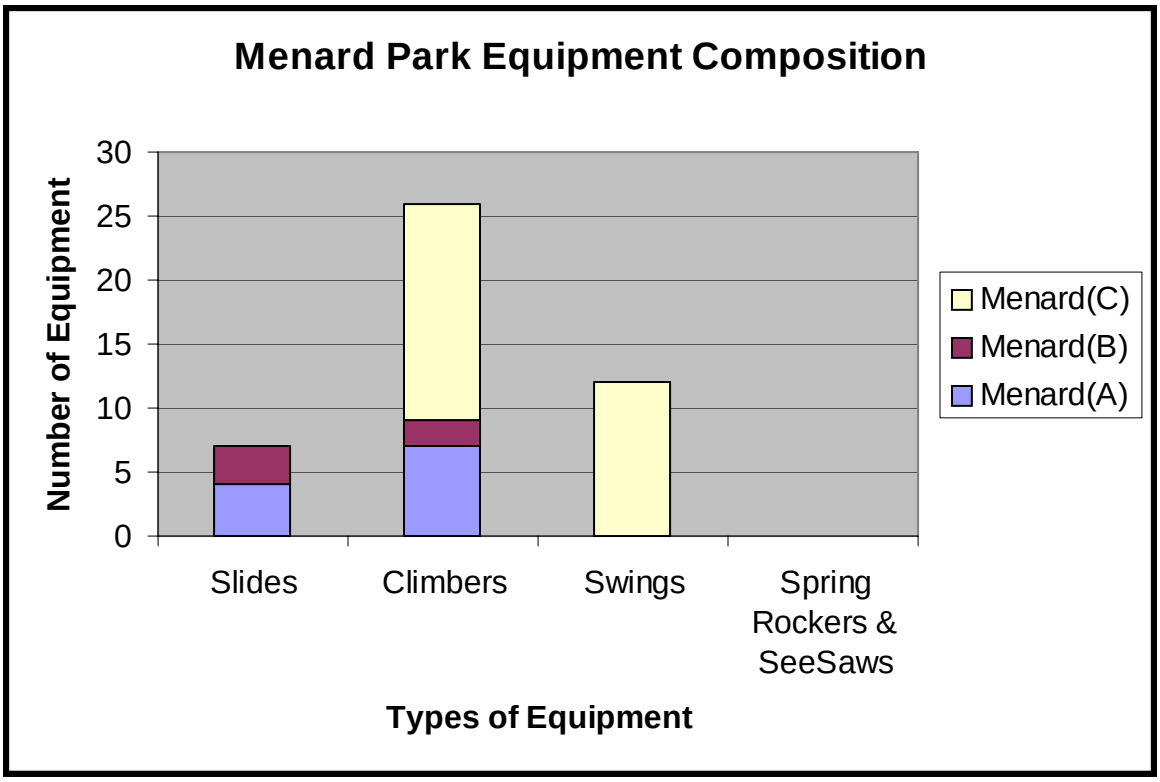

Figure 14 shows the composition of the park playground equipment for Menard Park. Menard Park is located at 2119 Twenty-seventh Street and Seawall Boulevard. Menard Park is currently closed and going under renovations. Menard Park has compacted wood chips for fall surfacing. The composite equipment is made of metal frame with plastic components such as slides. Climbing equipment is the primary equipment with swings secondary. Climber equipment includes horizontal ladders, overhead rings, an arch climber, a balance beam, ladders, a wall, non-rigid climbers, and metal workout equipment components. All slides were plastic with six open slides and one closed tube. There are a total of eight child and four toddler swings. No spring rockers or seesaws at this park.

Figure 15: ***Morgan Park Safety Report Card Scoring***

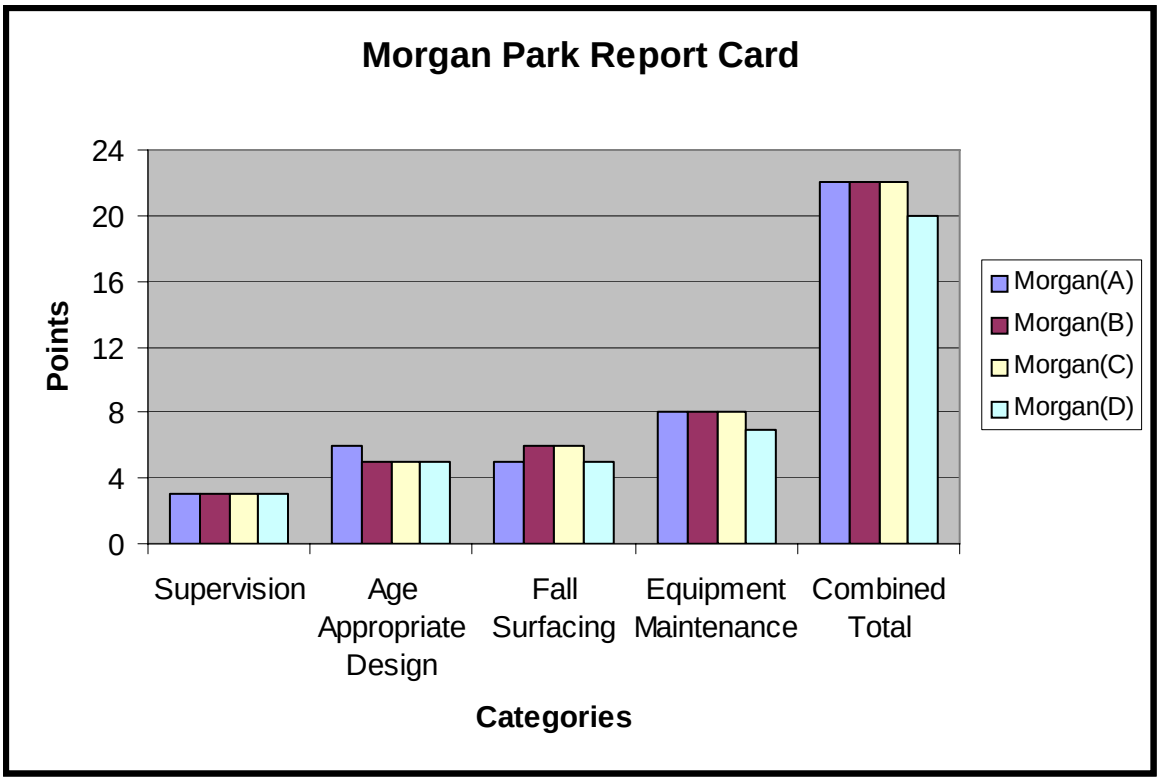

Figure 15 displays the NPPS safety report card scoring on the survey of Morgan Park on April 20, 2007. This park has four composite structure areas. All Morgan park structures lost a point under the supervision category for lack of signs posted regarding behavior. All structures, except Morgan(A) lost a point under the age-appropriate design category for lack of signs for age. Morgan(D) lost a point for lack of six-foot use zone in the falls surfacing category. Morgan(D) lost a point for rust in the equipment maintenance category. Overall, Morgan Park scored 22/24 points for an "A" grade.

*Figure 16**: Morgan Park Playground Equipment Composition***

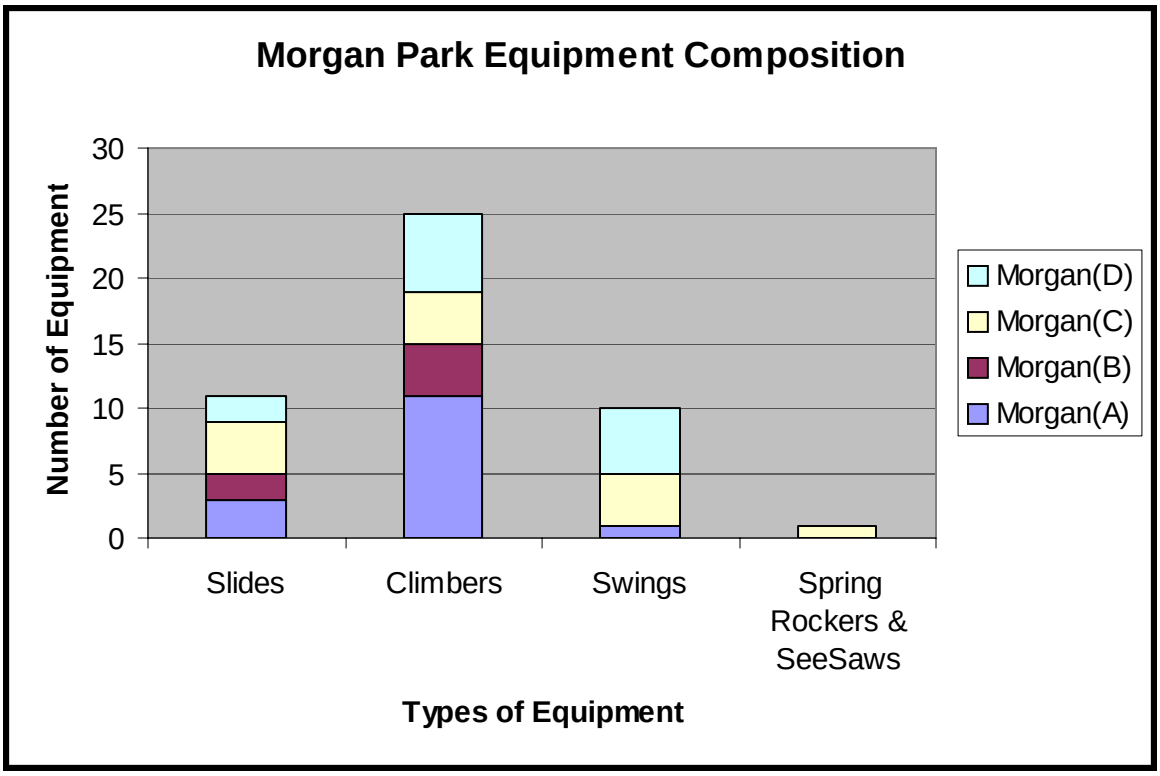

Figure 16 shows the composition of the park playground equipment for Morgan Park. Morgan Park is located at Thirty-fifth Street and Avenue M 1/2. Morgan Park wood chips for fall surfacing except for Morgan(D) that has pea gravel. Morgan Park is a hybrid of public park playground and school playground. The composite equipment is made of metal frame with plastic components such as slides. Climbing equipment is the primary equipment with slides secondary. Climber equipment includes horizontal ladders, a sliding pole, a climbing beam, overhead rings, an arch climber, balance beams, ladders, a wall, and non-rigid climbers. Nine open slides including two independent metal slides and two closed plastic tubes. 10 child swings and one seesaw were also present.

*Figure 17**: San Jacinto Park Safety Report Card Scoring***

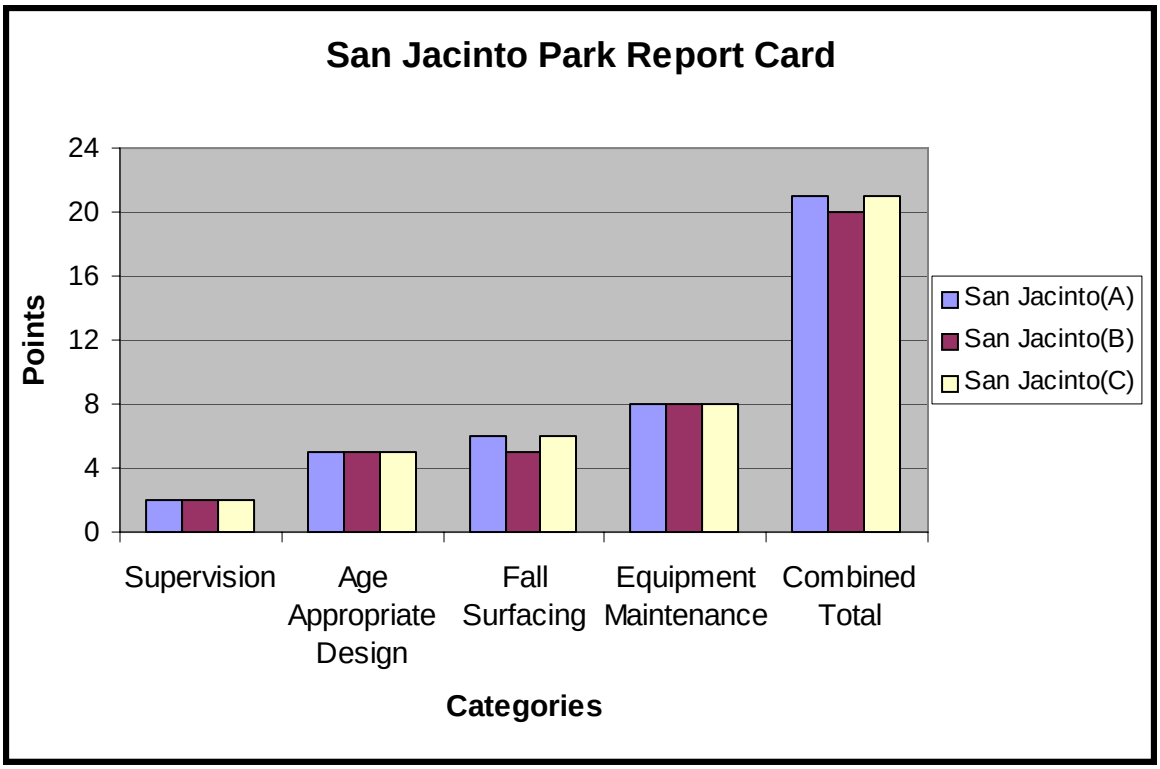

Figure 17 represents the NPPS safety report card scoring on the survey of San Jacinto Park on April 19, 2007. This park has three composite structure areas. All San Jacinto park structures lost two points under the supervision category for lack of signs posted regarding behavior and lack of adult supervision. All structures lost a point under the age-appropriate design category for lack of signs for age. San Jacinto(B) lost a point for critical height violation in the fall surfacing category. No deficits were noted in the equipment maintenance category for San Jacinto Park. Overall, San Jacinto Park scored 21/24 points for an "A" grade.

*Figure 18**:*** ***San Jacinto Park Playground Equipment Composition***

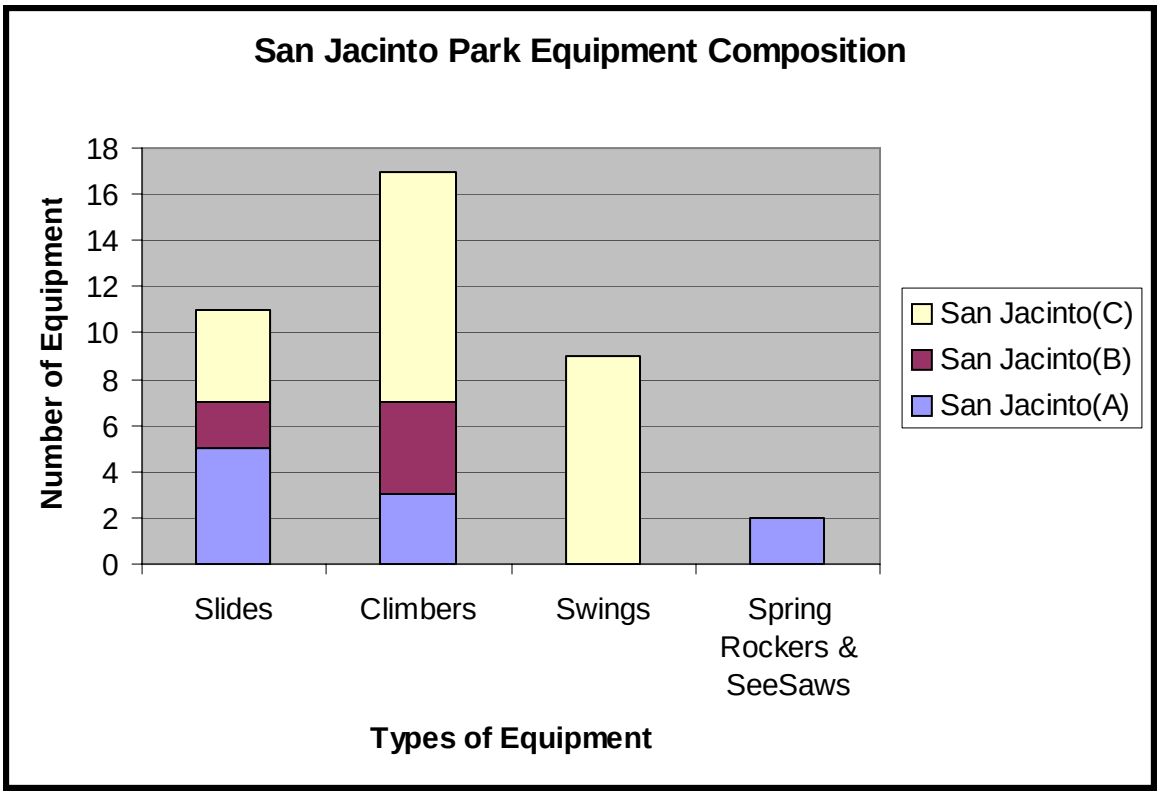

Figure 18 depicts the composition of the park playground equipment for San Jacinto Park. San Jacinto Park is located at Nineteenth Street between Avenues K and L. San Jacinto Park has wood chips throughout. The composite equipment is made of metal frame with plastic components such as slides. Climbing equipment is the primary equipment with slides secondary. Climber equipment includes sliding poles, climbing beams, an overhead ring, an arch climber, balance beams, ladders, a wall, and a non-rigid climber. All slides were plastic with nine open slides and two closed tubes. There are a total of seven child and two toddler swings with a seesaw and a spring rocker as well.

*Figure 19**: Sand Hill Crane Park Safety Report Card Scoring***

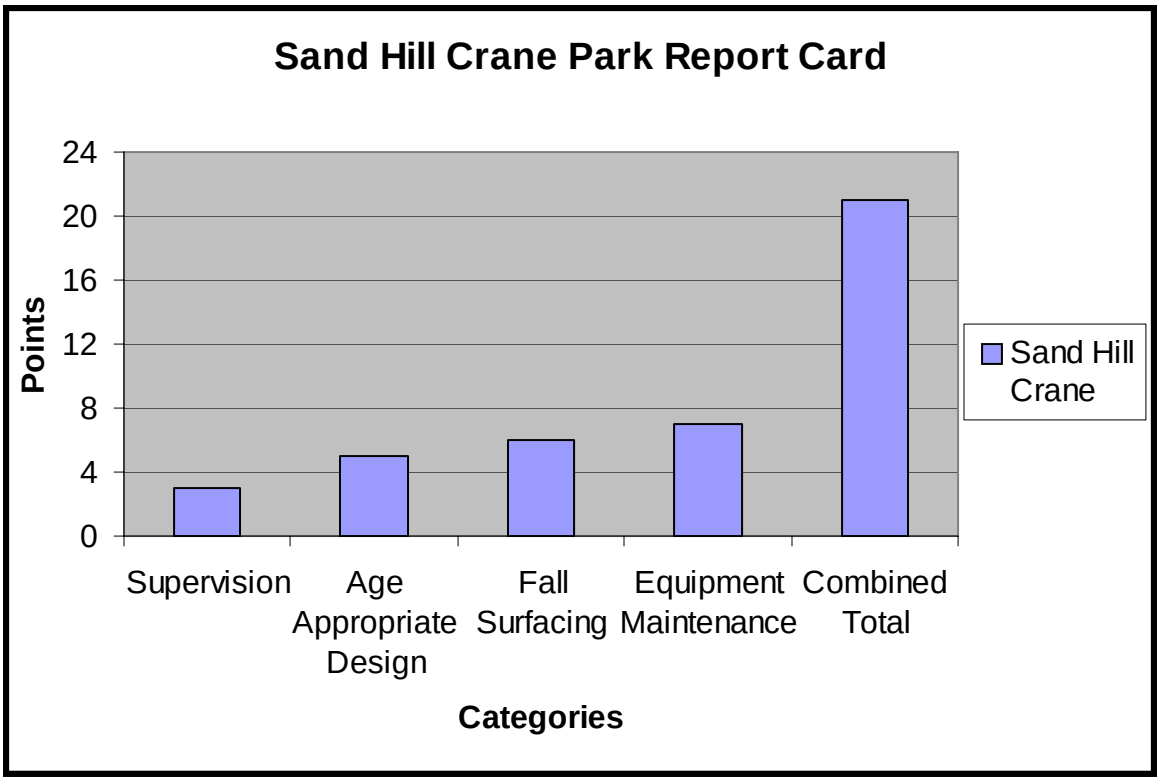

Figure 19 illustrates the NPPS safety report card scoring on the survey of Sand Hill Crane Park on April 20, 2007. This park has only one composite structure area. San Hill Crane park structures lost a point under the supervision category for lack of signs posted regarding behavior. Sand Hill Crane Park also lost a point under the age-appropriate design category for lack of signs for age. No deficits were noted in the falls surfacing category. The park lost a point for rust in the equipment maintenance category. Overall, Sand Hill Crane Park scored 21/24 points for an "A" grade.

*Figure 20**:*** ***Sand Hill Crane Park Playground Equipment Composition***

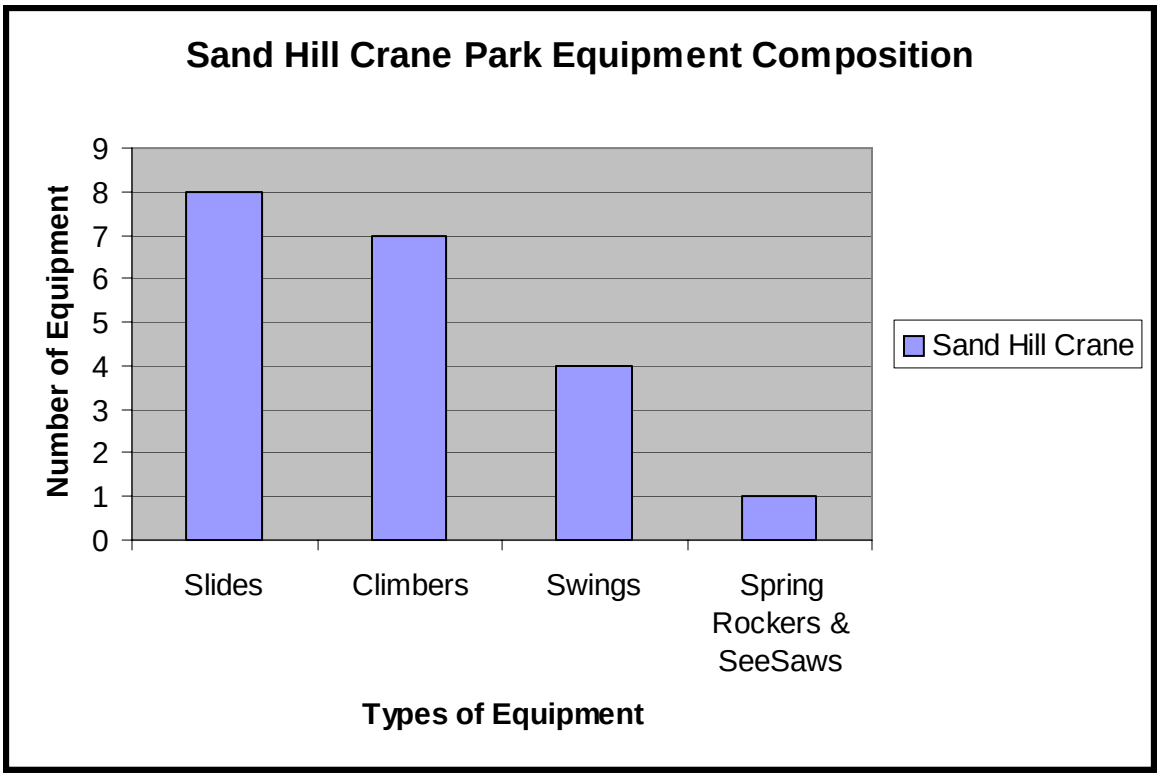

Figure 20 displays the composition of the park playground equipment for Sand Hill Crane Park. Sand Hill Crane Park is located at Stewart Road and Seven Mile Road. Sand Hill Crane Park has compacted wood chips. Unlike most of the parks, this park has primarily slides with climbers secondary. All eight slides were plastic and open. Climber equipment includes a sliding pole, a balance beam, ladders, and a non-rigid climber. There are also two child and two toddler swings and one seesaw.

*Figure 21**: Schreiber Park Safety Report Card Scoring***

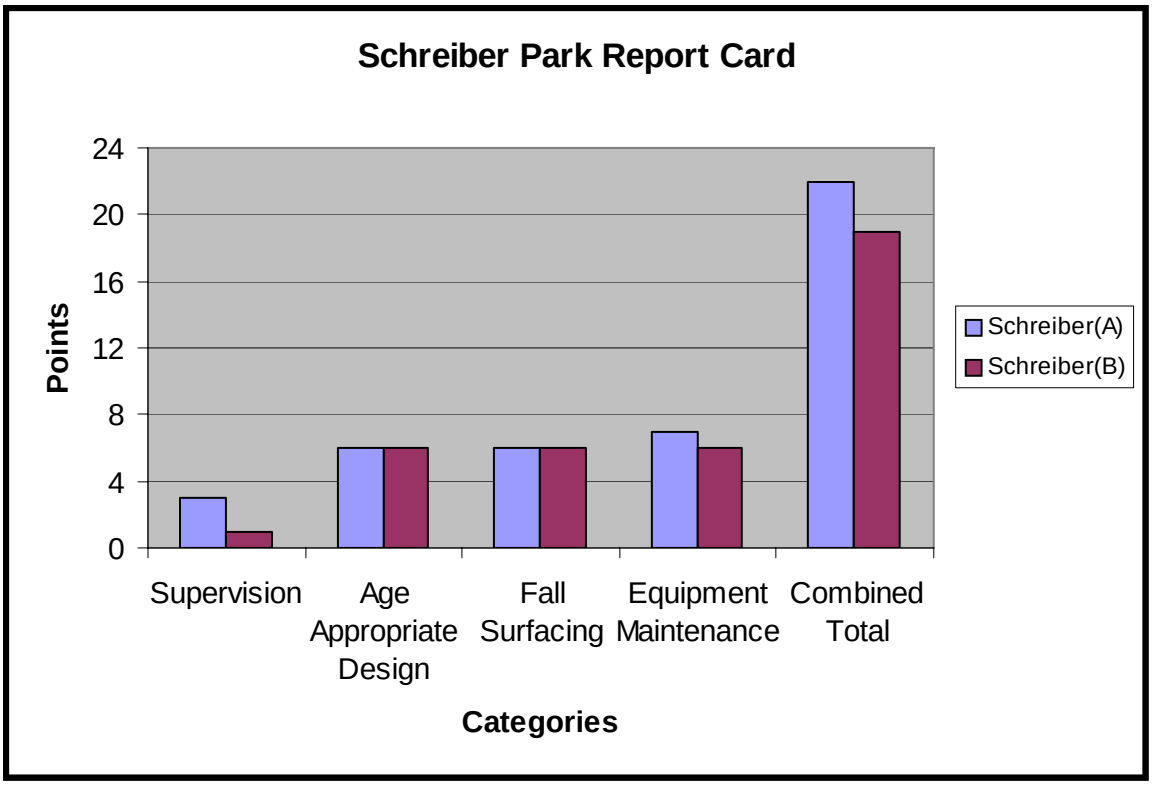

Figure 21 displays the NPPS safety report card scoring on the survey of Schreiber Park on April 20, 2007. This park has two composite structure areas and is the only entire wood-based playground. Both park structures lost one of four points under the supervision category for lack of signs posted regarding behavior and Schreiber(B) also lost a point for visualization of crawl spaces. No deficits were noted in the age-appropriate design or falls categories. Both structure lost a point for rust and Schreiber(B) also lost a point for a protruding bolt in the equipment maintenance category. Overall, Schreiber Park also scored 21/24 points for a grade of "A".

*Figure 22**: Schreiber Park Playground Equipment Composition***

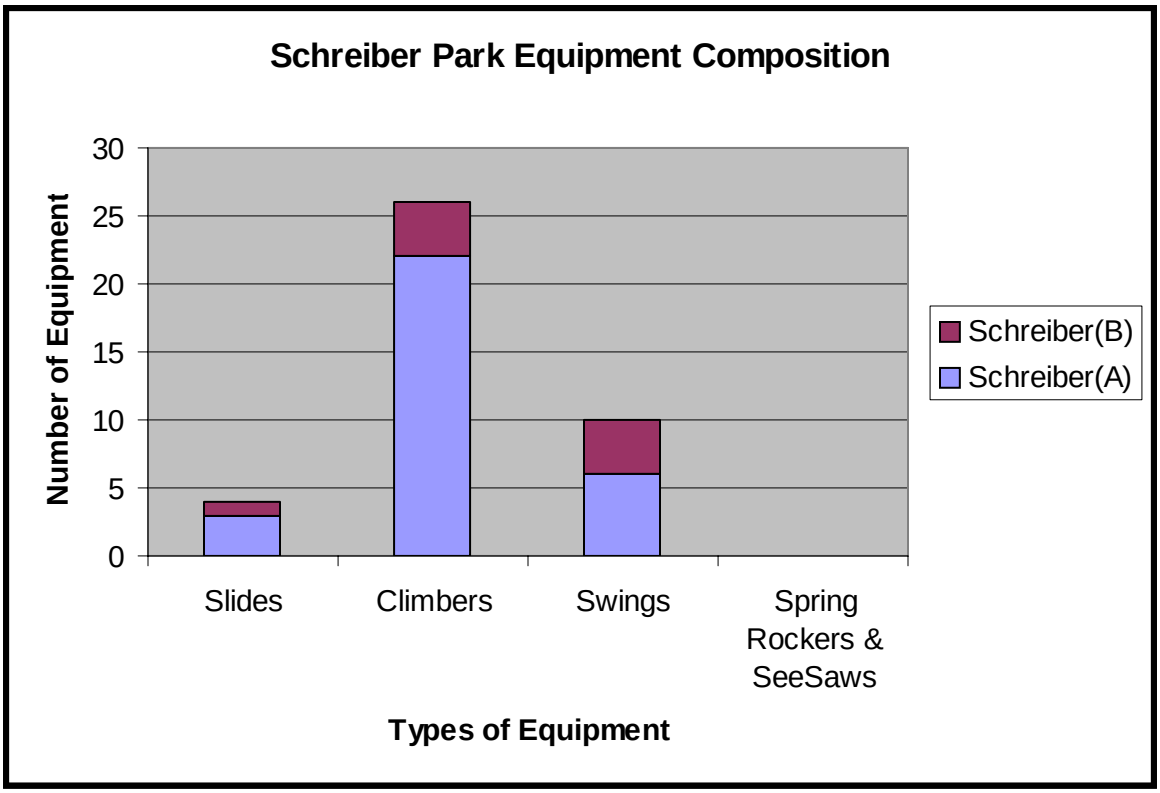

Figure 22 represents the composition of the park playground equipment for Schreiber Park. Schreiber Park is located at Eighty-third Street at the Airport Complex. Schreiber Park is unique in that the composite equipment is all wood-based. Fall surfacing is mainly wood chips but on the outer border is covered with rubber spray matting. Climbing equipment is the primary equipment with swings secondary. Climber equipment includes horizontal ladders, a sliding pole, a climbing beam, overhead rings, balance beams, ladders, walls, and non-rigid climbers. All slides were plastic with three open slides and one closed tube. There are also five child and five toddler swings and a sandbox.

*Figure 23**:*** ***Wright Cuney Park Safety Report Card Scoring***

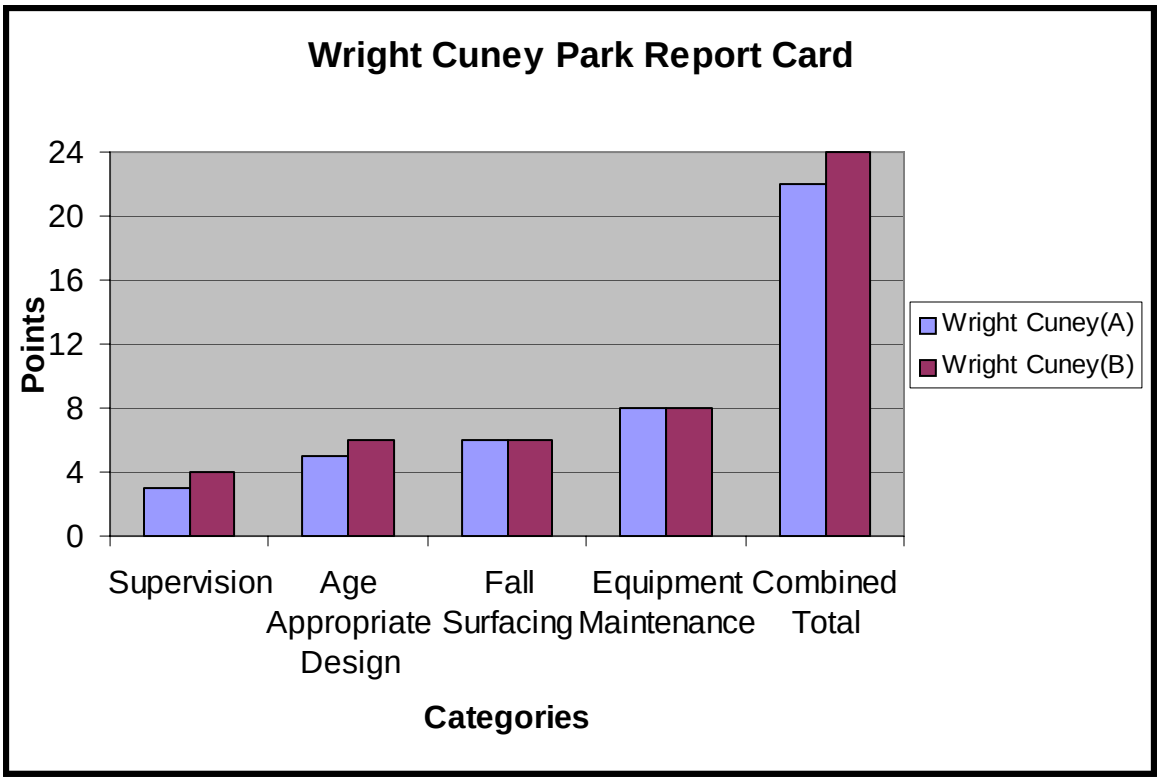

Figure 23 depicts the NPPS safety report card scoring on the survey of Wright Cuney Park on April 20, 2007. This park has two composite structure areas and is the central office for the Galveston Parks and Recreation office. Wright Cuney(A) lost one point under the supervision category for lack of signs posted regarding behavior. Wright Cuney(A) lost another point under the age-appropriate design category for lack of signs for age. No deficits were noted in the falls surfacing or equipment maintenance categories for Wright Cuney Park. Overall, Wright Cuney Park scored 23/24 points for a grade of "A".

*Figure 24**:*** ***Wright Cuney Park Playground Equipment Composition***

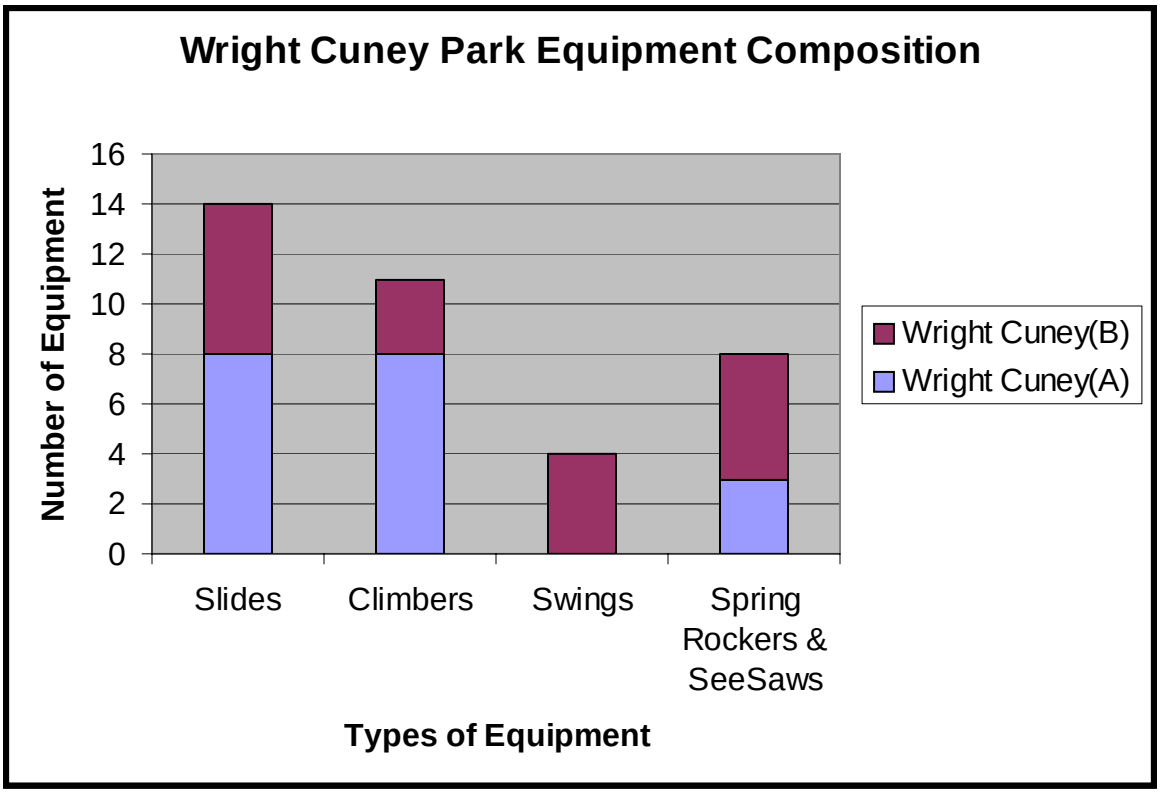

Figure 24 displays the composition of the park playground equipment for Wright Cuney Park. Wright Cuney Park is located at 718 Forty-first Street. Wright Cuney Park has compacted wood chips. The composite equipment is made of metal frame with plastic components such as slides. Slides predominate as the primary equipment present with climbers in second. 13 open slides and one closed tube comprise this park. Climber equipment includes a sliding pole, a climbing beam, and climbing walls. There are a two child and two toddler swings with seven spring rockers and a seesaw.

*Figure 25**: Galveston Parks Safety Report Card Scoring***

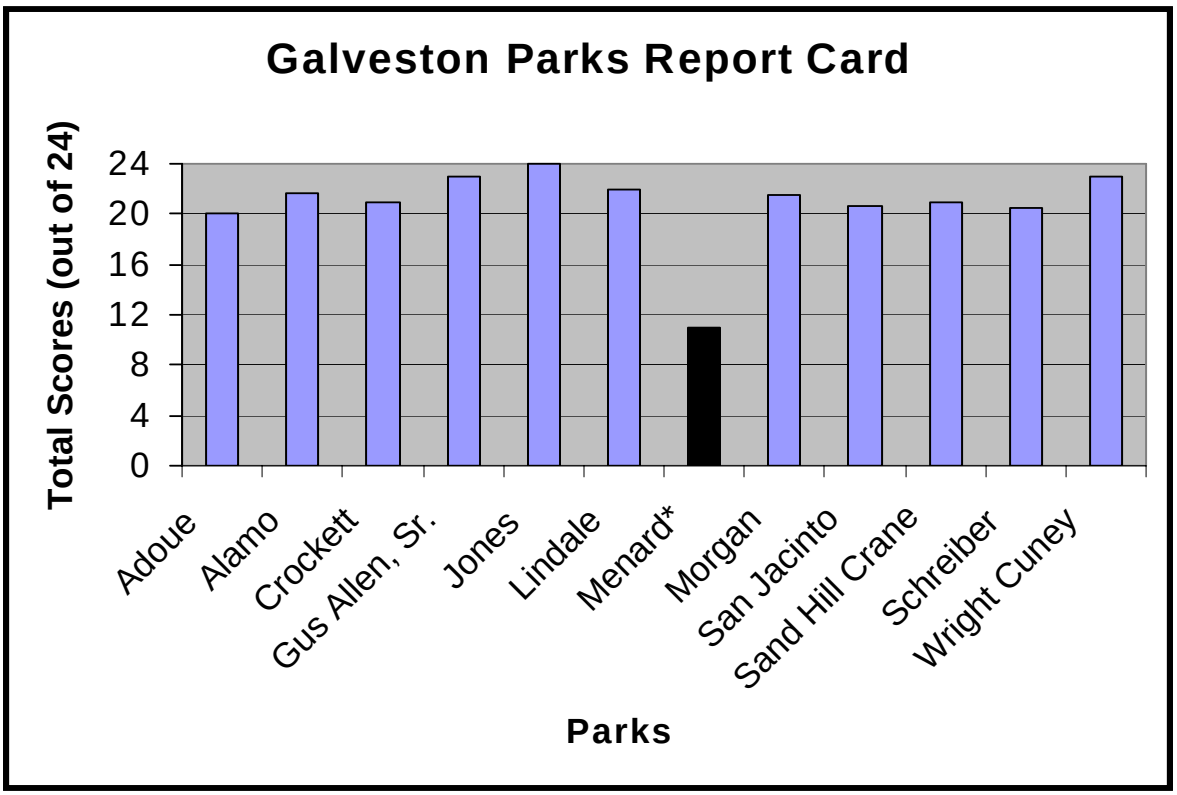

Figure 25 summarizes the scoring of the Galveston park playground areas according to the NPPS scoring system. The NPPS scoring system states that a combined overall score of 20 or higher is an "A". All the blue lines represent a score of "A" for the park. The black line and asterisk for Menard Park are to denote that an incomplete survey was done because the park was closed for renovations. No score could be assigned for that reason. All open Galveston parks scored extremely well on the NPPS scoring system. Most points were lost on lack of signs to explain appropriate behavior and rules of the playground and what ages are appropriate to play on the playground equipment to prevent injury. Rust was also another common theme under the equipment maintenance category.

*Figure 26**: Overall Galveston Parks Playground Equipment Composition***

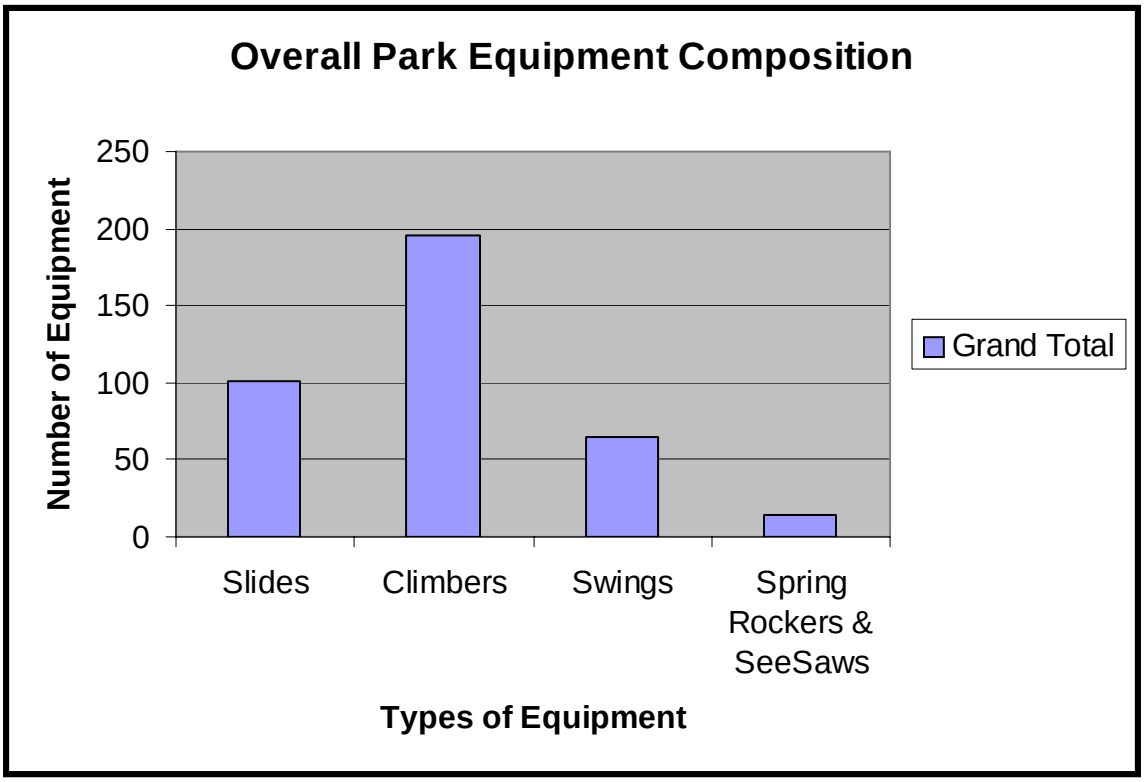

Figure 26 illustrates the composition of the overall park composition in Galveston. The predominant type of equipment was climber equipment followed by slides. This is seen clearly in this graph. The fall surfacing is most important for climbing equipment where falls are most frequent. Wood chips were by far the preferred method for fall surfacing. The composite structures are mainly metal with plastic components. Schreiber is the only unique park because of it is wood-based. The slides were predominantly open and plastic.

Figure 27: ***Cumulative Percentage of Galveston Playground Equipment Composition***

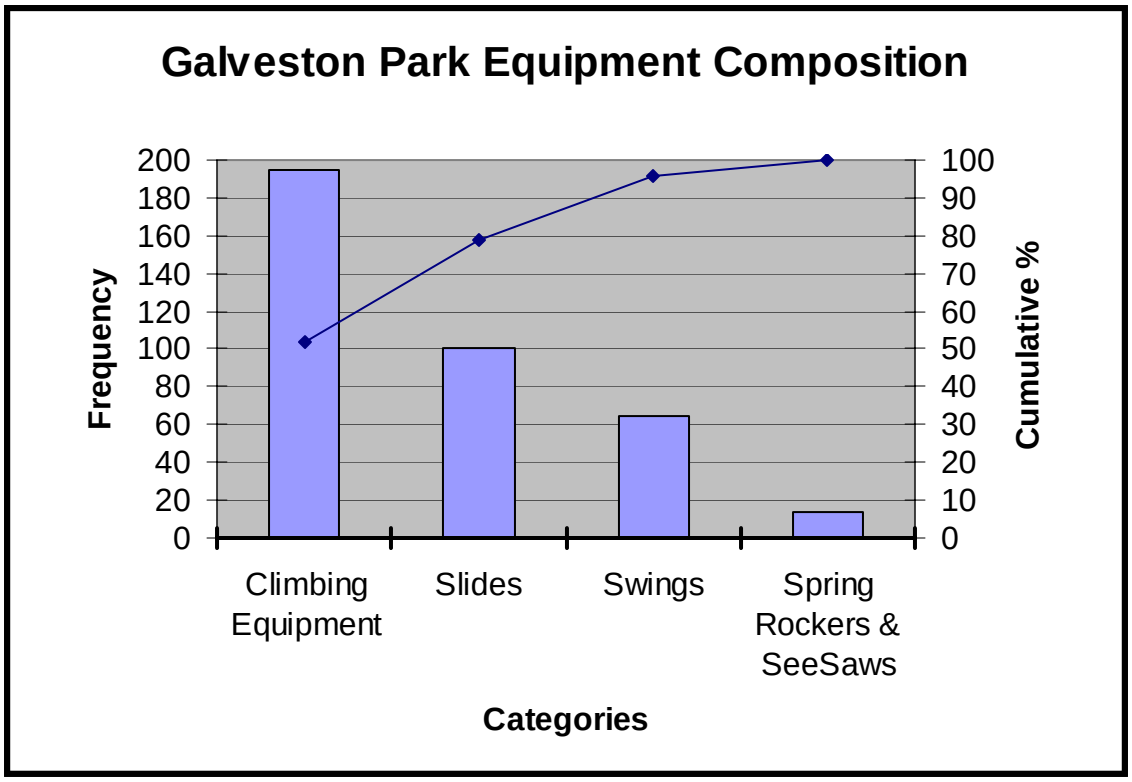

Figure 27 shows the overall cumulative percentage of playground equipment composition in Galveston. The blue bars represent the frequency of park equipment by category with the left vertical axis denoting the amount. The blue line and points represent the cumulative percentage with the right vertical axis denoting the percentage. Climbing equipment accounted for approximately 52 percent of the overall composition of Galveston park playgrounds. Slides, swings, and spring rockers and seesaws combined accounted for 27, 17, and four percent, respectively. Other than Sand Hill Crane Park and Wright Cuney Park where slides predominated, the rests of the parks were mostly populated with climbing equipment.

Chapter Five

Discussion

This study provides a clear view of the current status of the 12 Galveston park playground areas and the composition of the playground equipment on these parks. The data collected and analyzed shows that the every open park playground area in Galveston scored an "A" on the NPPS survey. Although the park playgrounds of Galveston received high marks, there were areas where significant improvements could be made. The overall composition of the Galveston parks was predominantly climber equipment by over 50 percent. Climbing is important part of child play but also leads to more falls and injuries. Falls constitute the largest proportion of injuries to the emergency room with 73 percent in one retrospective study.[12] In a Canadian playground injury and surfacing study, this study found that injuries were as much as three times greater with a decrease in surface absorption of 50 g.[13] These studies reiterate the importance of maintaining fall surfacing in Galveston with the high prevalence of climbing equipment in its park playgrounds. As mentioned previously, only 7.7 percent of Galveston park playground areas had appropriate signs for supervision rules and only 26.9 percent of parks have appropriate signs stating the appropriate ages for playground use. Also, rust was noted at 65.2 percent of playground areas.

Galveston parks have some problems as do all playground areas. Galveston park playgrounds scored very high safety scores for every park. It is clear that the Galveston Parks and Recreation Department and city of Galveston puts great effort to create and maintain a safe playground environment. Based on the data from this study, the following recommendations are given. Since Galveston park playgrounds are

predominantly climbing equipment based and falls are the most common injury with climbing equipment and playgrounds, the recommendation for signs at every entrance to a composite playground structure should be present to notify the parents of the risk of inappropriate behavior and the appropriate age level of play. This will satisfy the primary deficits noted on the NPPS surveys that were completed for the parks. Also, Maintenance with recurrent spray painting to prevent rust in the humid environment is critical to prevent injuries and to extend the life of the playground equipment. The final recommendation is to continue to monitor and to maintain the wood chips for fall surfacing for the majority of the parks. This is critical in mitigating injuries related to falls of the playground equipment. As seen in Table 1, Galveston parks scored high marks for most of the 24 items of the NPPS survey. Currently, Galveston public park playgrounds are very safe and outscored both the state of Texas and the United States park playgrounds for safety in their 2004 survey.[1]

This capstone provided the current safety status of Galveston public parks and the composition of playground equipment to understand injury risks. This capstone provided some recommendations to improve the safety of Galveston public parks, which will be provided to the Galveston Parks and Recreation Department. This study provides the preliminary groundwork to do more research to look at interventions in the reduction of playground injuries. The NPPS survey data for Texas and the United States were from 2004 and this data is from 2007 so direct safety comparisons are not possible. The NPPS survey instrument is not validated in the prevention of injury, but is a commonly used tool that summarizes the bulk of literature and expert opinion about safe playground design and issues. This would be an important area of research to validate the NPPS

survey for injury prevention. The NPPS does not release its complete data set and thus statistical comparisons could not be made. This capstone can be the foundation for future research into injury prevention and as a tool for maintenance of the park playgrounds by providing a baseline for comparisons. Injury data could be correlated with the parks and the composition of the playground equipment could be used to evaluate for injury patterns or injury incidence. There is much prospective research that needs to be done to validate much of what is safest for park playgrounds. The capstone has provided some recommendations that will provide safer parks immediately and provides the foundation for future research inquiries.

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Vita

Jon Morris Johnson was born 18 August 1971 in Fort Knox, Kentucky. He graduated from Widefield High School in 1989. He graduated from the United States Air Force Academy in 1993 with a Bachelors of Science in Biology. He then graduated from medical school at the Uniformed Services University of the Health Sciences in 1997 with a degree of Medical Doctor. He then completed an Air Force residency and became board certified in Family Practice in 2000. He continues to enjoy a distinguished career in the Air Force as a Family Practice physician and currently is an Air Force Flight Surgeon completing a residency in Aerospace Medicine.

The author typed this Capstone.