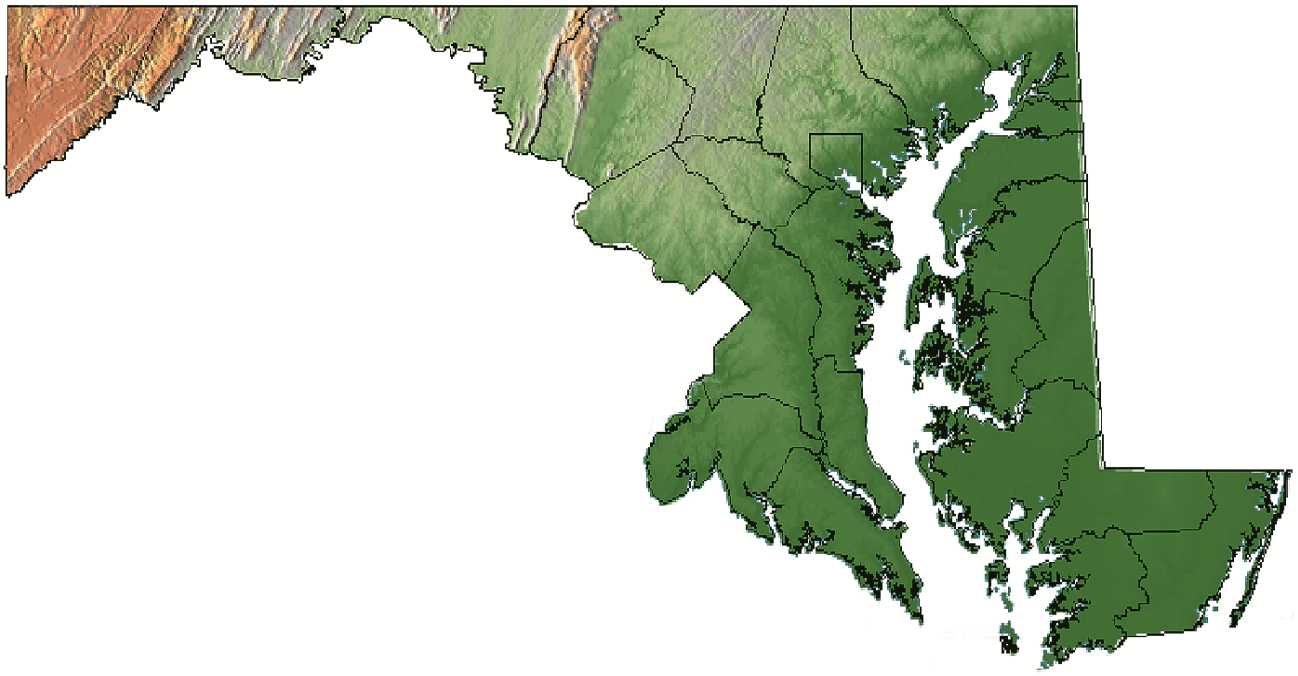

PARKS AND GROUNDS OPERATION REVIEW
CITY OF BOWIE, MD

UNIVERSITY OF MARYLAND 18 56

INSTITUTE FOR GOVERNMENTAL SERVICE AND RESEARCH

Parks and Grounds Operation Review
City of Bowie, MD

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Preface

Founded in 1948, University of Maryland's Institute for Governmental Service and Research (IGSR) provides research and consultation services to Maryland local governments and state agencies. The Institute's mission is to improve the well-being of individuals and communities by undertaking applied research, technical assistance, and education projects in areas such as organizational effectiveness, leadership and governance, fiscal and land use management, public health, and justice administration.

The City of Bowie's Parks and Grounds Division is part of the Department of Community Services, which also houses activities related to recreation, human services, neighborhood preservation, historic properties, and public buildings. Parks and Grounds was formed in 1967 under the Department of Public Works, and was then relocated to the Department of Community Services in 1995 to achieve more focus on parks and grounds maintenance activities. The Parks and Grounds Division, which is the largest organization under Community Services, is not only responsible for maintaining Bowie's parks and the grounds of all City buildings, but also stormwater management maintenance.

At the request of Bowie's City Council, this study was undertaken to conduct an operational and performance review of the Parks and Grounds Division that compares the Division's performance to similar jurisdictions and includes recommendations for performance improvements. The findings and recommendations documented in this report are intended to assist city officials in their ongoing effort to improve public services, streamline processes, and reduce costs.

The authors wish to thank everyone who participated in this project by providing information on maintenance operations in the parks and grounds area. We especially thank the employees, managers, and superintendent of Bowie's Parks and Grounds Division for their thoughtful and honest feedback while being subject to the scrutiny of the study. We also thank the city administrators who provided comparative information from other Maryland jurisdictions.

Methodology

This study organized responsibilities of Bowie's Parks and Grounds Division into the following eight areas, each with their own section in this report: Ballfield Turf Maintenance; Non-Ballfield Turf Maintenance; Park System Activities; Horticulture; Forestry; Seasonal Activities; Equipment Maintenance; and Stormwater Management. Each section examines workload and performance and, to the extent possible, draws comparisons to other jurisdictions and industry standards relevant to the tasks carried out in that area.

Information on workload and performance was obtained from questionnaires, interviews, and analyses of City documents. To compare Bowie's Parks and Grounds Division to other jurisdictions, city administrators were surveyed and interviewed from the following benchmark municipalities identified by the City of Bowie: Annapolis, Frederick, Gaithersburg, Greenbelt, Laurel, and Rockville. The City

of Frederick did not participate in this study. Because of differences in organizational structure, the director or superintendent of the department or division responsible for most of each jurisdiction's parks and grounds maintenance activities was sent the set of eight responsibility area questionnaires to complete or have completed by the appropriate staff, which resulted in some municipalities returning multiple questionnaires. Each questionnaire was developed based in part on Parks and Grounds Division's existing workload and performance indicators and also on industry standards resulting from the literature review conducted on performance measurement of parks and grounds operations. A list of city public officials who contributed to this study is in Appendix A, and an overview of the benchmark municipalities' parks and grounds maintenance services is in Appendix B.

Performance Measures

Performance measurement has become an important part of management practice as a way to determine progress. Performance measures are designed to quantify the amount of resources required to accomplish a certain task and thereby enable local governments to allocate resources most efficiently. In his book, *Municipal Benchmarks: Assessing Local Performance and Establishing Community Standards*, Dr. David Ammons categorizes performance measures in local government into four types: workload; efficiency; effectiveness; and productivity, the last of which was not employed in this study.[1]

Workload is a commonly used indicator of performance and is expressed in terms of amount of work done. While workload measures enable comparisons of the volume of work performed and can help identify jurisdictions that are comparable, such measures do not impart how well the work was done. The number of annuals planted per year is an example of a workload measure used by the City of Bowie.

Efficiency measures are designed to express whether work performance generally exhibits a high ratio of output to input with minimum waste or unnecessary effort. Such measures therefore relate the work performed to the amount of resources required for the work to get done. Efficiency measures, which can be calculated by dividing a workload measure by the amount of resources used, enable comparisons across organizations to determine whether one performs the same task with fewer resources than others. This study used a common efficiency measure involving amount of work per FTE to make comparisons between Bowie's Parks and Grounds Division and the benchmark municipalities. The number of acres mowed per month per FTE in the non-ballfield turf maintenance area is an example of an efficiency measure used by the City of Bowie.

Effectiveness measures are designed to express whether work performance achieves the desired result by meeting the objectives that were set. Such measures therefore are typically subject-specific indicators that reflect the quality of the performed task, like percentage of all equipment repairs returned for rework. Ammons notes that measures of service quality such as response times are often included among effectiveness measures because of their indirect relationship. The frequency of playground inspections is an example of an effectiveness measure used by the City of Bowie.

While the scope of this study included a literature review of performance measurement and comparative bench-marking in the areas of parks and grounds operations, it is important to note that

performance measures alone will not improve results; they must be integrated with other organizational strategies to affect change and should be viewed as an informational tool useful in a variety of management processes, including planning, control, and program evaluation.[2] Sources used in this study are documented by section and found under "References" at the end of this report.

Summary

At the request of the City of Bowie, University of Maryland's Institute for Governmental Service and Research (IGSR) reviewed operations of the City's Parks and Grounds Division and compared them to those in six similar cities: Annapolis, Frederick, Gaithersburg, Greenbelt, Laurel, and Rockville. IGSR obtained information from interviews and analyses of City materials, and also from questionnaires completed by public officials in the benchmark cities. This study organized the responsibilities of Bowie's Parks and Grounds Division into eight areas. Each responsibility area is summarized below along with key recommendations.

Ballfield Turf Maintenance

The Ballfield Turf Maintenance Crew is responsible for turf maintenance, grooming, and upkeep of ballfield facilities for the City of Bowie's 65 athletic fields, totaling 130 acres, and Bowie compares well to the other cities in this study. The City's irrigation systems, which are computer controlled to optimize performance and improve efficiency, water more than twice as many fields as do those in the benchmark cities. This report recommends that the Division:

- Investigate ballfield mowing frequency to determine if it is lower as a result of higher quality performance or other factors.

Non-Ballfield Turf Maintenance

The Non-Ballfield Turf Maintenance Crew is responsible for maintaining 102 acres of rights of way and parkland in the City of Bowie, and Bowie compares well to the other cities in this study. Bowie surpasses the benchmark cities with its exceptionally well-certified staff, whose credentials enable them to better understand and manage the City's turf maintenance program. This report recommends that the Division:

- Attempt to differentiate between high- and low-use non-ballfield turf. Defining fields by usage levels could help the City ensure that more park users enjoy extremely well-groomed turf, while low-use turf goes a longer time between maintenance.

Park System Activities

The Division is responsible for a variety of tasks across the City's parkland. Refuse collection, carpentry projects, and maintenance of playgrounds, pavilions, dog parks, skate parks, and trails are among these tasks, and Bowie compares well to the other cities in this study. Bowie surpasses the benchmark cities in playground inspection where it performs brief inspections frequently between formal inspections and exceeds the U.S. Consumer Product Safety Commission's playground maintenance standards. This report recommends that the Division:

- Track usage levels for its 24 miles of trail to determine efficient maintenance scheduling.
- Explore involving the community in taking care of the City's trails by way of a volunteer trail maintenance program.

Horticulture

The Horticulture Crew is responsible for landscape, beautification, and gardening efforts involving flowers, plants, and trees on all property owned by the City, and Bowie compares well to the other cities in this study. Horticulture is a major contributor to the City's overall aesthetic, and Bowie surpasses the benchmark cities with its excellent, centrally-automated irrigation system. This report recommends that the Division:

- Look for opportunities to expand its centrally-automated irrigation system to further improve efficiency.

Forestry

The Arborist Crew is responsible for pruning, removing, and planting trees in the City's rights of way, parks, and other City properties, and Bowie compares well to the other cities in this study. Despite having to share the City's only bucket truck with other departments, Bowie's program cycle, which maintains 17,000 trees at least once every five years, surpasses Gaithersburg and Rockville in terms of tree maintenance frequency. This report recommends that the Division:

- Explore the benefits of an additional certification in the area of tree risk assessment.
- Investigate the difference in tree maintenance workload per square mile as compared to Rockville.

Seasonal Activities

The Division is responsible for several major tasks that are seasonal, including snow removal around city buildings, residential leaf collection, and installation of outdoor decorations. Other seasonal responsibilities involve special events, landscape plan reviews, and major storm cleanup. Bowie compares well to the benchmark cities and achieved good and excellent ratings on leaf collection from 89 percent of the respondents in its last city-wide satisfaction survey. This study made no recommendations in this area.

Equipment Maintenance

The Division's sole mechanic is responsible for repairing and performing preventive maintenance on 89 percent of the City's over 200 inventoried pieces of equipment, and Bowie compares well to the other cities in this study. This report recommends that the Division:

- Consider hiring a mechanic's apprentice to begin training on maintaining the Division's equipment.

Stormwater Management

The Stormwater Management Crew is responsible for grounds maintenance of the City's 78 stormwater facilities. The Crew ensures that Bowie's stormwater sites are maintained to meet state and federal regulations, in addition to the aesthetic upkeep preferred by the City. Bowie surpasses the benchmark cities in terms of mowing frequency and inspection frequency. This report recommends that the Division:

- Implement a computerized system for tracking stormwater maintenance schedules and work performed at each facility.

Introduction

The mission of the City of Bowie's Parks and Grounds Division is to "...provide park patrons and City residents with accessible, safe, clean, visually appealing and environmentally sound parks and City-owned property and to provide service to evaluate and maintain stormwater facilities." The Division carries out its mission by providing a wide array of maintenance, improvement, and beautification services on Bowie's 1100 acres of property. In the City's 2006 satisfaction survey, 89 percent of respondents rated parks maintenance as excellent or good, and 97 percent of respondents rated it at least average.[1] The Division is also involved in snow removal, residential leaf collection, stormwater management, and emergency storm damage clean-up.

Budget

Parks and Grounds Division, the largest unit in the Department of Community Services, comprised 5.71 percent of total City expenditures in FY11.[2] Of the Division's $2.27 million budget in FY11, 56 percent paid for the salaries and wages of its 31.4 FTEs, a stable number since FY09. Since FY06, Parks and Grounds Division's share of total City expenditures has decreased slightly while expenditures per capita have slightly increased. While the Division's workload has changed somewhat since FY09, it is expected that workload will be impacted in the near future by annexation and occupancy of Bowie's new City Hall.

Organization

The Division comprises ten work crews organized into four sections under supervisors who all report to the Division's Superintendent. One parks maintenance supervisor is primarily responsible for ballfield and non-ballfield turf maintenance while the other is primarily responsible for stormwater and park maintenance. Both parks maintenance supervisors have four work crews. The Forester has two work crews. The supervisor of each work crew plans the work, coordinates duties, and completes various administrative and reporting tasks. The Division's sole mechanic handles equipment maintenance. Parks and Grounds Division is assisted by an administrative office associate who performs a wide variety of administrative functions and also reports to the Superintendent.

Staffing

Parks and Grounds Division is staffed by 28 regular employees, in addition to 3.4 FTEs performing part-time summer and seasonal work. Two temporary seasonal workers are on the ballfield maintenance crew, two on the horticultural crew, and one each on the forestry, stormwater management, and park maintenance refuse crews. In terms of workforce size, Bowie's Parks and Grounds Division employs .59 regular workers per 1,000 city residents, while the median for the benchmark jurisdictions is .55 workers in equivalent functions.

Ballfield Turf Maintenance

The Parks and Grounds Division's Ballfield Turf Maintenance Crew is responsible for turf maintenance, grooming, and upkeep of ballfield facilities for the City of Bowie's 65 athletic fields, totaling 130 acres; eight of these fields are owned by the Prince George's County School Board. These fields consist of softball and baseball fields as well as linear fields used for soccer, football, and other organized field sports. This crew is comprised of four regular employees and two temporary seasonal workers, and is also assisted by two other regular employees from the Non-Ballfield Turf Maintenance Crew. The Ballfield Turf Maintenance Crew reports to a parks maintenance supervisor.

Workload

Ballfield mowing is performed by two wide-area mowers during the playing season of March through November. Non-irrigated fields represent 17 percent of field workload and are mowed once per week; irrigated fields represent 83 percent of field workload and are mowed twice per week. Softball and baseball fields are raked and lined three times a week during playing season, and soccer fields are prepared twice a week. Softball and baseball fields are inspected for damage three times per week, and soccer fields are inspected twice a week. Inspections look for any damage to fences, bleachers, backstops, bases, goals, and restrooms. Bowie has the largest ballfield workload of any city in this review, largely because of its 40 linear fields. Bowie also mows the most acreage per month, which is calculated by multiplying the frequency of field mowing by the total acreage. Table 1 provides the data for this analysis.

Performance Measures

Ballfield maintenance is one of the most fundamental tasks facing any city's parks crew, yet it is also one of the most challenging. In addition to regular turf maintenance issues, ballfields tend to have very high use and visibility, with many field users demanding perfection. Parks maintenance crews must complete difficult, time-consuming processes on these fields in accordance with a games and events schedule that is often maintained by a separate recreation entity.

Turf maintenance starts with turf selection. Cool season turfs include bluegrass, fescues, and ryes, while warm season grasses include bermuda and zoyzias.[1] The turf selection decision must also take into consideration soil type, mowing requirements, irrigation and fertilizer needs, as well as community preference and wear tolerance.[2] Available budget and available man hours also play into the decision since the most desirable turf is not necessarily the most cost-effective to maintain. Fields that have already been installed need regular mowing, fertilization, aeration, over-seeding, and pest management.

Desirable grass height depends on the species used. With certain grasses used in the mid-Atlantic region, such as tall fescues used in Bowie, Gaithersburg, and Rockville, maintaining short, playable turf preferred by sports users[3] can contradict the objective of cities in raising tall, aesthetic, healthy turf that requires less irrigation, pesticide application, and mowing. Height is also dependent on mowing frequency as blades of grass should not be cut more than 1/3 of their length at a time.[4,5] Typically

warm season grasses will need to be cut shorter than cool season ones.[6] Major League Baseball guidelines suggest the following heights: bluegrass: 1-1.5 inches; tall fescue: two inches; and both zoysia and bermuda: 0.5-1 inch,[7] but these heights are typically not feasible for city maintenance crews.

Skinned infields require special maintenance using rakes and drags, especially before games. Rocks and weeds should be removed during regular maintenance, and special attention should be given to preventing the formation of lips around the grass line.[8] Benches, bleachers, and other structures must be maintained in good repair for park users. Cleaning and safety inspections, which ensure hardware is secure, should be conducted before and after major events. Additionally, while it is difficult to maintain 100 percent lamp operation, lighting equipment should be regularly checked to ensure full and safe field lighting.

Irrigation is critical for healthy turf. One to two inches of water per week are required.[9] Thorough watering, which allows fields to absorb large amounts of water deeply, encourages root growth, and is preferred over frequent "shallow" short duration watering.[10] Additionally, automated irrigation systems improve the effectiveness of irrigation and save time.[11]

Fertilization needs vary by grass type. Fertilizer should be carefully applied to account for the nutritional needs of the grass used.[12] Frequent light application is preferred to occasional heavy application. Ideally, annual soil testing should be completed to determine any nutritional deficiencies.[13] Field aeration helps to ventilate the soil and increase rooting, and is especially important on high-use fields. Crews should plan to aerate one to three times per year, depending on field use. Overseeding, which should be done frequently and year round, is important in maintaining field density and healthy turf.[14]

Pesticide treatments should be completed only when necessary, and environmentally friendly methods should be employed. Chemicals should be used as rarely as possible, and application of chemical pesticides and herbicides must strictly adhere to manufacturer recommendations.[15,16]

Efficiency

Ballfield maintenance efficiency involves maximization of resources. Once desired maintenance levels are achieved, an efficient crew frees up manpower and resources for use in other tasks. Thus, efficiency involves the amount of work completed by each available employee over a given period of time. In Bowie, 62 percent of ballfields are mowed four times per month and 38 percent are mowed eight times per month, which yields 718 acres (315 fields) mowed per month. Dividing this number by the average number of FTEs dedicated to ballfield turf maintenance gives a per employee efficiency of 143 acres (63 fields) per month. A higher number may indicate more efficient employees, while a lower number may indicate that employees give greater attention to detail. For example, Rockville's workload is slightly lower than Bowie's, but their employees maintain more turf per month.

Ballfield maintenance crews can improve their efficiency by maximizing resources. For the purpose of this report, irrigation is used to measure resource maximization. Irrigated fields tend to be healthier, and can require fewer man-hours to produce equivalently healthy turf to non-irrigated fields.[17] Larger percentages of total irrigated fields indicate greater efficiency. While Gaithersburg has the largest percentage of irrigated fields, Bowie

irrigates a much larger number of fields. Greenbelt is the only city reporting no irrigated ballfields, while Annapolis and Laurel irrigate three and four ballfields respectively. Gaithersburg and Rockville both irrigate ten ballfields, but this represents a much greater percentage of Gaithersburg's workload (71 percent) than Rockville's (18 percent). Bowie utilizes a system that improves on drip irrigation technology by detecting recent rainfall levels and soil moisture to determine the appropriate amount of water that a field should receive. This system is more effective than a drip irrigation system that operates on a timer for a set amount of time regardless of recent rainfall. Bowie's automated system, however, does not extend to its entire workload.

In Bowie, ballfield crews have weekly mowing routes to improve their workflow, and they always load their trailers at the end of the day so that work can begin immediately in the morning, both of these improve efficiency in the Division. Table 2 provides the data for this analysis.

Effectiveness

Effective ballfield maintenance refers to the success of the program in maintaining healthy turf and playable fields. Effectiveness can be measured by looking at frequency of grooming and reseeding, as well as turf height. This study found that the comparison cities mow their grass to about two inches. Laurel mows slightly higher, while Bowie and Greenbelt mow to three inches. It was also found that turf is generally aerated once or twice each year and fields sprayed once per year for weeds; pesticides are used only as needed.

Additionally, average mowing frequency of each acre of turf is a useful measure to help determine effectiveness. This number is taken by combining total acreage of ballfields and dividing by the average frequency of mowing per month. Of the four comparison cities for which this number could be calculated, Bowie is second lowest at 5.5 mows per month, only ahead of Laurel, which mows each field about four times per month. Gaithersburg has a considerably smaller workload, but mows their acreage on average eight times per month, and Rockville mows each acre an average of six times per month.

The effectiveness of ballfield maintenance crews rests on their ability to produce program-ready turf in a timely manner to groups who are scheduled to utilize the fields. Because grooming must take game and event schedules into account, cities in this study recognize that coordinated efforts with recreation scheduling offices are critical to performance. Bowie utilizes a ballfield allocations database which is accessible to schedulers and maintenance crews to achieve this level of coordination. In the results of the 2006 resident satisfaction survey, 90 percent of respondents rated Bowie's ballfields as excellent or good.[18] This is evidence of an effective ballfield crew that coordinates well with its recreation department and citizenry.

Staff training can also positively impact effectiveness. Training opportunities allow crews to gain experience and help them stay current with techniques and practices in turf and field maintenance. Table 3 provides the data for this analysis.

Recommendations

Bowie's ballfield maintenance compares well to other cities in this study, even though Bowie has more ballfield acreage than any other city. To help maintain this turf, they have installed irrigation systems over more than twice as many fields as any of the benchmark cities.

Additionally their irrigation system is computer controlled to optimize performance.

Rockville has the most efficient employees in ballfield maintenance in terms of amount of turf maintained per month per FTE. To determine whether Bowie's efficiency is the result of higher quality performance would require an investigation beyond the scope of the current project. During interviews however, Bowie employees noted a dedication to quality and attention to detail held by supervisors. The Parks and Grounds Division is committed to the pursuit of efficiency, and has made strides to improve in this area by implementing mowing routes and loading trailers at the end of the day.

The average number of times each acre of ballfield turf is mowed per month in Bowie is lower than in Rockville and Gaithersburg, which may be the result of the Division's large workload. Bowie may want to investigate if additional efficiency improvements can be made to free up man power and increase mowing rate.

There is variability among the benchmark cities in mowing height with Bowie, Rockville, and Greenbelt at three inches and Gaithersburg, Annapolis, and Greenbelt lower. While three-inch grass may reduce playability on fields for certain sports according to a local turf expert,[19] cities must balance providing the best product possible given limited manpower and resources.

Table 1 - WORKLOAD

	Bowie	Gaithersburg	Rockville	Annapolis	Greenbelt	Laurel
Total Acreage	130	19	84	~25	30	22
Softball/ Baseball Fields	17	9	29	7	10	5
Linear Fields	40	9	27	5	12	4
Acres Mowed Per Month	718	152	504	-	-	88

~ Data is an approximation made by the jurisdiction.

Table 2 - EFFICIENCY

	Bowie	Gaithersburg	Rockville	Annapolis	Greenbelt	Laurel
Monthly Acres Mowed Per FTE	143	76	158	-	7.5	-
Monthly Fields Mowed Per FTE	63	36	105	16	5.5	-
% Fields Irrigated	38%	71%	18%	19%	0%	44%
Number of Irrigated Fields	25	10	10	3	0	4

Table 3 - EFFECTIVENESS

	Bowie	Gaithersburg	Rockville	Annapolis	Greenbelt	Laurel
Grooming Frequency	SB fields, every other day; synthetic fields, monthly	Per game schedule	Programmed fields, daily; others weekly	Daily	-	Weekly
Reseeding Frequency	Yearly	Twice yearly	1-2 times per year	Yearly	Yearly	Yearly
Height Mowed	3 in.	2 in.	2.75 & 3.5 in.	2 in.	3 in.	2.5-2.75 in.
Avg. Time Each Acre of Turf Mowed Per Month	5.5	8	6	-	-	4

Non-Ballfield Turf Maintenance

Parks and Grounds Division's Non-Ballfield Turf Maintenance Crew is responsible for maintaining 102 acres of rights of way and parkland in the City of Bowie. This crew is comprised of nine regular employees and three temporary seasonal workers during the summer months. As noted, two of these nine employees also assist the Ballfield Turf Maintenance Crew. The Non-Ballfield Turf Maintenance Crew reports to a Parks Maintenance Supervisor.

Workload

The Non-Ballfield Turf Maintenance Crew is organized into three, 3-man trim crews with equal acreage responsibilities. A temporary seasonal worker is assigned to each trim crew from June through September. The mowing season for rights of way and parkland begins the first week of April and runs through October. Grass is mowed on a weekly basis to three inches in height. Grass is fertilized annually, and herbicide applied two or three times per season. Table 4 provides the data for this analysis.

Performance Measures

Non-ballfield maintenance involves categorizing turf into one of three non-sports usage levels: natural, passive, and intensive.[1] Natural areas receive only enough maintenance to ensure safety, and are allowed to grow freely. Passive areas are commonly used for picnics, exercising, and relaxation, and include public lawns and gardens. Intensive areas can include vehicular traffic, heavy foot traffic and regular informal athletic activities. Intensive areas require the most maintenance and natural areas require the least.[2, 3]

Turf maintenance starts with turf selection. Cool season turfs include bluegrass, fescues, and ryes, while warm season grasses include bermuda and zoyzias.[4] The turf selection decision must also take into consideration soil type, mowing requirements, irrigation and fertilizer needs, as well as community preference and wear tolerance. Available budget and available man hours also play into the decision, since the most desirable turf is not necessarily the most cost-effective to maintain.

Mowing heights for grass depend on available resources, usage levels, and local preferences. Typically, three inches is the tallest acceptable in all passive and intensive use areas.[5] Warm season grasses need to be cut shorter than cool season grasses.[6] At no time should mowing cut more than 1/3 of the blade.[7,8]

Irrigation is critical for healthy turf. One to two inches of water per week is required. Thorough watering, which allows grass to absorb large amounts of water deeply, encourages root growth, and is preferred over frequent “shallow” short duration watering. Additionally, automated irrigation systems improve the effectiveness of irrigation and save time.[9]

Fertilization needs vary by grass type. Fertilizer should be carefully applied to account for the nutritional needs of the grass used. Frequent light application is preferred to occasional heavy application. Ideally, annual soil testing should be completed to determine any nutritional deficiencies.[10]

Pesticide treatments should be completed only when necessary, and

environmentally friendly methods should be employed. Chemicals should be used as rarely as possible, and application of chemical pesticides and herbicides must strictly adhere to manufacturer recommendations.

Efficiency

Non-ballfield turf maintenance efficiency has two dimensions. One is the amount of work per available FTEs over a given period. The other is the ability to maximize manpower and resources to free up employees for other tasks once desired maintenance levels are achieved. In Bowie, turf is mowed once per week on average, which yields approximately 408 acres mowed per month. Dividing this number by the average number of FTEs gives a per employee efficiency of 38.08 acres per month. A higher number may indicate more efficient employees, while a lower number may indicate that employees exercise greater attention to detail. This efficiency measure varied widely between cities. Acreage mowed per month per FTE in Gaithersburg is considerably lower than in Bowie, and is considerably higher than in Annapolis.

Efficient parks maintenance divisions are able to differentiate between usage levels of park areas and assign appropriate maintenance frequency based on usage level. The National Recreation and Park Association refers to different maintenance levels as "modes," and specifies different performance expectations and maintenance standards for each mode.[11] Gaithersburg and Rockville take usage levels into account when determining mowing frequency for non-ballfield turf. Cities that utilize usage levels for maintenance schedules allow for intensive-use turf to be well-trimmed, and avoid spending manpower and resources on over-maintenance of passive- and natural-use turf. Table 5 provides the data for this analysis.

Effectiveness

Effectiveness of non-ballfield turf maintenance refers to the success of the program in maintaining healthy, beautiful grass. Effectiveness can be measured by looking at frequency of pesticide and fertilizer application, number and type of certifications held by employees, and the height to which grass is cut. Bowie applies fertilizer to non-ballfield turf, while no other comparison cities report doing so. All jurisdictions that report using pesticides do so occasionally and as needed, and employ a certified pesticide applicator. Bowie's non-ballfield turf maintenance employees hold various certifications in park and turfgrass management in addition to pesticide application. Grass height varies between cities, from two inches in Gaithersburg and Annapolis to 3.5 inches in Rockville. Bowie's standard is three inches. Table 6 provides the data for this analysis.

Recommendations

Bowie's performance in non-ballfield turf maintenance compares well to that of other cities in this study. Bowie has an exceptionally well-certified staff. Although pesticide certification is required for any jurisdiction using these services, the Parks and Grounds Division employees hold certifications from North Carolina State, the Maryland Nurserymen's Association, and University of Maryland's Turfgrass Management Program. These certifications allow staff to better understand and manage the City's turf maintenance program, and thereby improve effectiveness. Bowie particularly excels in its efforts to achieve healthy grass through the use of fertilizer on non-ballfield turf, a practice not employed

by other cities in this study. Additionally, Bowie shows a commitment to efficiency. For example, they fuel vehicles on a schedule, and at the end of work days to minimize delays at the fueling station. They also service mowers according to worker schedules to minimize downtime. The desire and drive to improve service in the Division is exemplary.

The City of Bowie does not differentiate between high- and low-use on non-ballfield turf. By defining different park areas at different usage levels, the City could ensure that more park users enjoy extremely well-groomed turf, while turfgrass that receives little use goes a longer time between maintenance. Using such an approach may increase mowing frequency in some park areas and decrease frequency on others. It may also free up manpower to complete other work outside of non-ballfield turf maintenance.

Table 4 - WORKLOAD

	Bowie	Gaithersburg	Rockville	Annapolis
Non-Ballfield Turf Acreage	102	~100	-	~160
Mowing Season	April - October	April - Early November	April - November	Late April - October
Staff Per Mowing Crew	3-4	5-10	Varies	2-4
Mowed Grass Height	3 in.	2 in.	3.5 in.	2 in.

~ Data is an approximation made by the jurisdiction.

Table 5 - EFFICIENCY

	Bowie	Gaithersburg	Rockville	Annapolis
Acres Per Month Per FTE	38.08	11.50	-	80.00
Usage Levels	No	Yes	Yes	No

Table 6 - EFFECTIVENESS

	Bowie	Gaithersburg	Rockville	Annapolis
Pesticide Certifications	Yes	Yes	Yes	No
Pesticide Use	As needed	Occasional	Occasional	-
Frequency of Fertilization	Annually	None	None	None
Height Mowed	3 in.	2 in.	3.5 in.	2 in.

Park System Activities

The Parks and Grounds Division is responsible for several maintenance tasks that span the City of Bowie's parkland. These tasks are comprised of refuse collection as well as carpentry projects and maintenance of playgrounds, pavilions, dog parks, skate parks, and trails. The Park Maintenance Refuse Crew, which consists of two regular employees and one temporary seasonal worker, handles trash removal and reports to a Parks Maintenance Supervisor. The Carpentry Crew consists of two regular employees; one is the carpenter who reports to the same Parks Maintenance Supervisor as the Park Maintenance Refuse Crew, and the other is the carpenter's helper who reports to the other Parks Maintenance Supervisor. Maintenance of the 24 miles of trails is assigned and spread across the Division's three trim crews.

Workload

The Park Maintenance Refuse Crew is responsible for emptying all trash receptacles in the park system and picking up the litter that patrons leave behind. They empty receptacles every day in the major parks and rental pavilions and remove trash from athletic fields after play. They also pick up litter along streets and roadways. As winter approaches and park usage decreases, the Crew works around the largest city park, filling low areas with topsoil, raking leaves, cleaning playground areas, and performing general park maintenance.

The Carpentry Crew is responsible for maintenance of all City-owned property and in-house construction projects. Regular carpentry maintenance can include painting, roofing installation, bleacher repair, and park bench repair. Recent examples of in-house construction projects include dugout covers and aesthetic brickwork. Such projects are completed based on the availability of the budget.

The carpenter, who is certified in playground safety, performs playground installation and inspection and ensures that playgrounds are safe for children. Bowie maintains fewer playgrounds than the other cities because the Montgomery National Capital Parks and Planning Commission maintains the playgrounds on county parkland in Bowie. Bowie also has a relatively low number of pavilions compared to Gaithersburg, possibly for the same reason. Like the comparison cities, Bowie has special parks such as skate parks and dog parks. Trash is picked up from the special parks daily and the skate park is blown free of debris each day. The dog park has its wood surfacing raked once per month, and additional wood surfacing is added two or three times annually as needed.

Bowie has a large trail system, surpassed only by Rockville. Maintenance of trails requires mowing every two weeks and trash pick-up weekly. Fallen trees and pruning of limbs are performed on an as needed basis. During autumn, workers blow leaves from all trails on a weekly basis. Snow is removed from trails after all other snow removal duties are completed. Table 7 provides the data for this analysis.

Performance Measures

According to the National Recreation and Park Association, refuse collection should be completed at least once per day at high-traffic parks, and no less than five times per week at less popular parks.[1] Typically, both refuse collection and

restroom servicing should conform to varying need, based on day-to-day activities and events.

Many jurisdictions use playground maintenance standards from the United States Consumer Product Safety Commission's (CPSC) Publication 325, which includes basic inspection tasks such as checking for cracks and rust and removing glass and trash from play areas.[2] The CPSC publication emphasizes following manufacturer inspection and maintenance recommendations in addition to using pre-defined checklists and archiving inspection records. To facilitate setting maintenance goals and raising safety standards, some jurisdictions find it helpful to note the percentage of playground equipment in their city meeting or exceeding CPSC guidelines.[3] It is important to recognize that playground design is as large a factor in safety as is maintenance. Thus even the most meticulously maintained play area may still be inherently dangerous.

Trail maintenance standards vary by area, trail type, surface material (asphalt, gravel, dirt), terrain (rocky, mountainous, flat), traffic density, and traffic type (foot, bike, horse). According to the New York/New Jersey Trail Conference, thorough trail inspection should be made twice annually at a minimum, but some jurisdictions do trail inspections quarterly or more frequently. Work should be completed on a set schedule and completed efforts should be documented and archived.[4] Trail maintenance must include safety inspections, blazing, tree pruning, plant removal, mowing, edging, removal of trash, and erosion control.[5,6,7] Occasionally snow removal and repairs are needed. For gravel trails, rainwater can cause ruts and soft spots, which are susceptible to smooth surface damage.[8,9] Ruts and surface problems can require many man-hours to fix, and occasionally require access to special equipment. Asphalt trails are susceptible to root invasion, and will buckle as a result of temperature changes particularly in the winter, which will necessitate patching and eventually repaving.[10]

Efficiency

The Division's Refuse Crew clears trash from Bowie's parkland daily. Refuse collection should be performed on a usage level-determined basis, which means determining sites that accumulate high, medium, and low levels of trash. Allocating resources to sites with higher use warrants a higher frequency of inspection or maintenance, whereas directing the same amount of resources to sites with lower use may expend resources unnecessarily. Bowie matches refuse collection frequency to pavilion and picnic area rentals, and by examining ballfield allocation schedules provided by the Recreation Department in order to ensure clean and well kept park spaces before and after scheduled events. Gaithersburg and Rockville also report that they direct resources by taking into account usage levels.

Similarly, jurisdictions may benefit from basing the frequency of trail maintenance on usage levels. All trails should be inspected at least twice a year and high use trails should be inspected quarterly.[11] Bowie and Rockville employ usage levels in trail maintenance as indicated by their frequency data. For example, Bowie performs more frequent refuse collection on high-traffic area trails, in parks, and adjacent to schools.

Another indicator of efficient trail maintenance is the effort to mobilize volunteers to take ownership and perform basic maintenance tasks, such as annual blazing and trash clean up, on public trails.[12,13] Trail volunteers are often easy to locate by founding a trail organization. Volunteer programs allow residents to feel

more connected to their community while saving the city maintenance costs. Gaithersburg and Rockville utilize volunteers in performing basic trail maintenance tasks. Table 8 provides the data for this analysis.

Effectiveness

Bowie's formal playground inspections compare well to the other cities in this report. These inspections involve frequently checking specific parts of the playground as dictated by a pre-defined checklist and documenting the status of such components. CPSC standards recommend that playgrounds should be inspected as frequently as possible. Bowie achieves this standard by performing brief inspections frequently between formal inspections. Bowie also has the capacity to install playgrounds in-house, whereas Annapolis and Gaithersburg outsource that responsibility.

Like refuse collection, pavilion inspection should be performed on a usage-determined basis according to pavilion reservation schedules. Bowie's pavilion inspection frequency compares well to the other cities.

Data on effectiveness measurement for refuse collection were not available for this review. According to the City's 2006 resident satisfaction survey, however, the fact that 89 percent of respondents rated park maintenance excellent or good suggests that overall cleanliness was satisfactory.[14] Table 9 provides the data for this analysis.

Recommendations

The Parks and Grounds Division's park system activities compare well to the other cities in this study. Bowie particularly excels in playground inspection. The Division is also able to differentiate between usage levels of park areas based on reservation schedules, and vary maintenance frequency based on usage level. Cities that utilize usage levels for maintenance schedules allow for playgrounds and pavilions that enjoy frequent use to be maintained often, while not spending manpower and resources on over-maintenance of low-use sites. Bowie may want to explore developing a volunteer trail maintenance program that engages the community in taking care of trails.

Table 7 - WORKLOAD

	Bowie	Gaithersburg	Rockville	Annapolis
Park System Acreage	232	~119	-	200
Playgrounds Maintained	9*	21	53	12
Pavilions	4	12	-	3
Special Parks (skate, dog, mini-golf, etc.)	2	4	2	1
Miles of Trail	24	9	>30	5

*The Montgomery National Capital Parks and Planning Commission maintains many of Bowie's playgrounds; this number reflects only those playgrounds maintained by the City of Bowie.
~ Data is an approximation made by the jurisdiction.

Table 8 - EFFICIENCY

	Bowie	Gaithersburg	Rockville	Annapolis
Refuse Collection Frequency	Daily	Daily / Multiple times per week / Weekly	Daily / Weekly	Daily
Volunteer Program	No	Yes	Yes	-
Trail Maintenance Frequency	Weekly and bi-weekly	Bi-weekly	Inspected monthly; maintained quarterly or as needed	Quarterly

Table 9 - EFFECTIVENESS

	Bowie	Gaithersburg	Rockville	Annapolis
Playground Inspection Frequency	Formal inspections monthly; 2-3 brief inspections weekly	Monthly	Monthly	Formal inspections twice yearly; brief inspections weekly
Pavilion Inspection Frequency	2-3 times a week and before scheduled events	Inspected monthly; maintained daily	Yearly	Daily
Special Park Maintenance Frequency	Skate - daily; Dog - monthly	Skate - daily; Dog - monthly	Skate - weekly; Dog - weekly	Skate - bi-weekly; Dog -N/A

Horticulture

The Parks and Grounds Division's Horticulture Crew is responsible for landscape, beautification, and gardening efforts involving flowers, plants, and trees on all property owned by the City of Bowie. The Horticulture Crew is comprised of two regular employees who report to the Forester.

Workload

The Horticulture Crew maintains two acres of bedspace comprised of 36 beautification projects across the City. Maintenance takes place year-round and includes watering, mulching, and weeding, as well as seasonal plantings. The Crew plants 3,000 to 4,000 annuals in the spring and replaces them in September with 3,000 to 4,000 fall color annuals. While this number is much lower than the number of annuals planted in Gaithersburg and Rockville, Bowie leads in planting perennials, with 300 to 400 in the past year. The Crew is trying to incorporate more perennials into its cycle as perennials do not require replacement as frequently. Both Laurel and Annapolis reported low annual and perennial plantings compared to the other cities. Table 10 provides the data for this analysis.

Performance Measures

Horticulture standards vary according to community preference and available resources. Some jurisdictions may have vast planting operations with dozens of flower beds requiring frequent replanting and greenhouse support, while others have only flower patches in front of their city hall.

Plant selection tends to be a matter of community preference, and the decision to plant perennial or annual beds relates to available resources and cultivation capabilities. Generally, since annuals provide more colorful and long-lasting blooms, but last only one season, a mix of annuals and perennials is often preferred.

When first establishing the flower bed, it is important to ensure plenty of sun coverage, good drainage to improve water control, and loose soil to encourage root growth.[1] A drip irrigation system can be used to bring speed, efficiency, and time savings to the watering process.[2]

Existing flower beds must be watered when needed. The frequency of watering depends on local weather conditions and the immediate needs of the plants. Flower beds should be inspected for signs of wilting and excess soil moisture.[3] In areas receiving less frequent maintenance, long-term perennials should be used since they can become more drought resistant over time.[4]

Mulching helps improve the aesthetics of a garden while holding in moisture and slowing weed growth.[5] Fresh mulch is especially important on perennial beds just before winter, as it insulates roots from temperature fluctuations.[6]

Deadheading (removing spent blooms and cutting back certain plant growth) can help plants save energy and encourage additional blooms. Additionally, identifying sick leaves for removal can prolong the life of certain plants.[7] Using fertilizer around mid-season to replenish soil nutrients can restore energy and encourage late season growth.[8]

Weed control must be completed frequently as successful flower beds need

weeds removed before they grow large enough to seed.[9] Various products are available for weed and pest control. These products should only be used when necessary, and those which are safe for the environment are always preferable. Special care should be given to following the directions on the label in order to maintain the safety of the plants and the community members who will be enjoying them.[10,11]

Efficiency

Efficiency within a horticulture program can be measured by calculating the amount of work per available FTEs over a given period. With respect to the planting of annuals, a major horticultural component, Bowie's number falls between that of Gaithersburg and Rockville.

Bowie's performance in watering is also a good measure of efficiency. While drip irrigation is known to contribute to a healthy product, the Division utilizes a system that improves on drip irrigation technology. Bowie's automated irrigation system detects recent rainfall levels and water moisture to determine the appropriate amount of water that a bed should receive. This system is more effective than a drip irrigation system that operates on a timer for a set amount of time regardless of recent rainfall. Bowie's automated system however does not extend to its entire workload, the remainder of which is completed by hand with a hose. Table 11 provides the data for this analysis.

Effectiveness

Effective horticulture maintenance refers to tasks completed that contribute to healthy and beautiful flower beds. These tasks include weeding, watering, and pesticide application. Frequency of weeding is a performance indicator in this area and a higher weeding frequency contributes to a healthy product. Compared to the benchmark cities, Bowie weeds frequently.

With respect to pesticide application, Bowie and most of the comparison cities apply pesticide only on an as needed basis. Laurel applies pesticide routinely, four to five times a year. Table 12 provides the data for this analysis.

Recommendations

Bowie's overall horticulture maintenance performance compares well against the benchmark cities. Horticulture is a major contributing factor to a city's overall aesthetic. Bowie achieved an excellent or good rating from 82 percent of respondents on overall cleanliness and City appearance in the City's 2006 resident satisfaction survey.[12] Bowie particularly excels in its watering method, though it does not extend to the entire horticulture workload. Bowie should look for opportunities to expand its centrally automated irrigation system to further improve watering efficiency. Bowie may also want to increase the number of annuals planted in addition to the number of perennials, which is already being explored.

Table 10 - WORKLOAD

	Bowie	Gaithersburg	Rockville	Annapolis	Laurel
Bedspace Acreage	2	6-7	2	<1	<1
Annuals Planted Yearly	6,000-8,000	20,000	23,000	>250	960
Perennials Planted Yearly	300-400	~50	<50	Minimal	Minimal

~ Data is an approximation made by the jurisdiction.

Table 11 - EFFICIENCY

	Bowie	Gaithersburg	Rockville	Annapolis	Laurel
Annuals Planted Yearly	6,000-8,000	20,000	23,000	>250	960
Annuals Planted Per FTE	2,000-2,667	1,818	3,286	-	-
Irrigation	Automated system adjusts to rainfall	2 dedicated water trucks	Irrigation in two small parks	Drip irrigation in one bed	Above-ground watering

Table 12 - EFFECTIVENESS

	Bowie	Gaithersburg	Rockville	Annapolis	Laurel
Weeding Frequency	Weekly	Bi-weekly	Weekly	Monthly / as needed	4-5 times per year
Pesticide Application	Minimal due to chemical concerns	As needed	As needed	-	4-5 times a year

Forestry

The Parks and Grounds Division's Arborist Crew is responsible for tree maintenance in the City of Bowie. They prune, remove, and plant trees as needed in the City's rights of way, parks, buildings, and other properties. This crew is comprised of three regular employees and one temporary seasonal worker and reports to the Forester, who also oversees the Horticultural Crew and is a Certified International Society of Arborists Forester and State of Maryland Roadside Tree Expert.

Workload

The Arborist Crew has inventoried a total of 17,650 trees on City property that require maintenance. Bowie's inventory of maintained trees is between Gaithersburg's 8-10,000 trees and Rockville's 30,000 trees. Due to the variation in city sizes, workload comparisons were made using the number of maintained trees per square mile, which considers the number of trees maintained (not total trees) on a standard land area. Based on this measure, Bowie has a slightly higher workload than Gaithersburg and less than half the workload of Rockville.

The Arborist Crew removes 200 to 400 trees a year using a combination of both in-house staff and contractors, depending on the size of the tree. The proportion of trees removed versus the total maintained tree population is comparable among Bowie, Gaithersburg, and Rockville. Laurel maintains a small number of trees in comparison to these larger cities.

The Forester arranges and manages the annual City of Bowie Arbor Day Celebration and takes service requests from residents and other public agencies such as Baltimore Gas & Electric and Prince George's County regarding tree-related issues. During major wind storms the Parks and Grounds Division is the City's lead agency for emergency and cleanup efforts involving damaged trees. Table 13 provides the data for this analysis.

Performance Measures

Forestry maintenance standards depend on the specific area being maintained, as well as the preferences of the community and maintenance organizations. Standards for tree care have been adopted by the Tree Care Industry Association.

The most overt measurement of forestry maintenance performance is pruning and pruning frequency. Typically pruning frequency is dictated by the species of tree being maintained.[1] For street pruning, resident preferences and other town schedules are taken into account. Another measurement of forestry maintenance performance is the pruning of trees to ensure safety, particularly after storms.

The Arbor Day Foundation's Tree City USA program recognizes communities that have a strong commitment to healthy and plentiful tree growth. Standards for qualifying as a Tree City include granting legal responsibility to a city "Tree Board" for the care and management of trees, giving the Tree Board the legal responsibility to implement a forestry work plan, allocating at least $2 per capita to forestry maintenance, and observing Arbor Day. Bowie, Gaithersburg, Rockville, and Laurel have all been recognized by the Arbor Day Foundation as Tree Cities USA.

Efficiency

Efficiency for tree maintenance was calculated by dividing the total number of trees maintained per year by the total maintenance workload. In Bowie, each of the 17,650 trees receive regular treatment every five years. The Arborist Crew prunes 2,500 to 3,000 trees in-house annually and outsources remaining work in order to stay within the 5-year program cycle. Bowie's Forester noted that a barrier to the tree maintenance program is the Division's obligation to share the only City-owned bucket truck with other departments. The Crew's program cycle maintains trees more frequently than Gaithersburg or Rockville; Laurel maintains trees at least annually, but has a very low workload.

Another efficiency measure is customer responsiveness. Bowie's Arborist Crew contacts customers within 24 hours of the request, and strives to complete the requested service within one week. Table 14 provides the data for this analysis.

Effectiveness

Effective forestry maintenance refers to the adequate pruning, removal, and planting of trees. Effectiveness was calculated using the ratio of customer requests to the total workload with the assumption that as a forestry program performs less effectively, the number and ratio of customer requests will increase; each request represents one tree. The percentage of customer requests relative to the total maintained tree population is comparable across the three larger cities at about two percent, and at 21 percent in Laurel, indicating that Bowie's effectiveness in maintaining trees is on par with the comparison cities.

Bowie replaces removed trees by planting 100 to 200 annually, yielding a 50 percent replacement rate, compared to Gaithersburg's 133-200 percent, Rockville's 100 percent, and Laurel's 250 percent replacement rates. Trees requiring immediate maintenance are addressed on an as needed basis, as brought to the Arborist Crew's attention by an estimated 400 customer requests per year.

Bowie, Gaithersburg, and Rockville all have Certified Arborists and Maryland Roadside Tree Experts on staff. Unlike Gaithersburg and Rockville, however, Bowie lacks a certified Tree Risk Assessor on staff. Having a certified Tree Risk Assessor will give Bowie's forestry program a higher level of competency in understanding tree biology, tree mechanics, tree structural defects and the interaction of all factors in determining failure potential. The certification may also facilitate the development of tree risk management strategies.[2] Table 15 provides the data for this analysis.

Recommendations

Bowie's overall forestry maintenance performance compares well against the benchmark cities. Bowie performs especially well in regards to its tree maintenance program cycle, though the number of trees it maintains is less per square mile than Rockville. It is possible that Bowie either has a lower tree population than Rockville, that Bowie has not identified as many trees as Rockville has for regular maintenance, or another factor. The Division should continue to monitor and revise the identification of appropriate trees to maintain and increase its workload as appropriate. The Division should work towards improving its tree replacement rate, as it is the lowest among the comparable cities. While tree replacement rate is by no means a direct indicator of performance, exploring this area may reveal opportunities

to better Bowie's image as a 'Green City' and further beautify its grounds.

The Division might improve the capacity of its Arborist Crew through continuing to seek training programs for its employees. In particular, the City of Bowie has a Certified Arborist and Maryland Roadside Tree Expert but does not have a certified Tree Risk Assessor. The Division should consider allowing for the development of such an expert as their counterparts in Gaithersburg and Rockville.

Bowie should also continue to seek the most efficient ways to maintain its workload. This includes regular monitoring and revision of the in-house/contract balance of work to achieve a shorter tree maintenance program cycle and to increase the long-term tree canopy goals of the City. Another way to increase efficiency, as suggested in an interview with the Forester, is to send horticulture and forestry employees to classes or have them participate in on-the-job training to learn to operate heavy equipment. Doing so may offer the division greater flexibility in assignment of duties, and thus a greater capacity.

Table 13 - WORKLOAD

	Bowie	Gaithersburg	Rockville	Laurel
Trees Maintained	17,650	8-10,000	30,000	60-70
Trees Maintained Per Square Mile	1,096	793-991	2,230	16-19
Trees Removed Annually	200-400	<75	400-500	20
Trees Planted Annually	100-200	100-150	400-500	50

Table 14 - EFFICIENCY

	Bowie	Gaithersburg	Rockville	Laurel
Trees Maintained	17,650	8-10,000	30,000	60-70
% Trees Maintained Annually	14-17%*	15-19%	10%	-
Program Cycle	5 years	5-6 years	10-12 years	1-2 times a year

*Does not include contracted tree maintenance

Table 15 - EFFECTIVENESS

	Bowie	Gaithersburg	Rockville	Laurel
Annual Customer Requests	400	~200	600	15
Customer Requests as % of Workload	2.26	~2.22	2	21
Tree Risk Assessor	No	Yes	Yes	-

~ Data is an approximation made by the jurisdiction.

Seasonal Activities

The Parks and Grounds Division is responsible for several major tasks that are seasonal, including snow removal, residential leaf collection, and outdoor decorations. Other seasonal responsibilities for the City of Bowie involve special events, landscape plan reviews, and major storm damage. Rather than a crew of regular employees with designated seasonal responsibility, many Division employees contribute to getting these tasks done.

Workload

The majority of the Division's seasonal work occurs in the winter months. Employees on the turf maintenance and horticulture crews are assigned to complete various tasks during these months, as the workload in their areas is reduced. Bowie's leaf collection program began in 1998 and is comprised of two pickups for each residential address. The program is a collaborative effort with the Department of Public Works. The Parks and Grounds Division manages four crews totaling 28 employees and the Streets Division within Public Works manages two additional crews totaling 14 employees. The Division also arranges for the rental of the 12 trucks used, and purchases all of the equipment for the program, such as leaf vacuums, leaf container boxes, rakes, and tarps. In the event of snow, the Division is responsible for clearing all City-owned facilities' parking areas, sidewalks, and trails.

Performance Measures

Seasonal work depends on the particular needs of the jurisdiction and can include assisting with city festivals, holiday decorations, and community events. This workload varies widely across jurisdictions. Leaf collection is also seasonal work and it varies by geographic region, with some areas requiring more leaf pick-up than others. Leaves can be picked up either using city-operated leaf vacuums and/or backhoes or in bags with other yard refuse. Leaf vacuums afford greater convenience to residents who do not need to bag their leaves, but rather rake them to the curb for pick up. Cities that use vacuums tend to schedule pick-up one to three times per year, and normally also allow for disposal of leaves with bagged yard waste. While cities using bagged leaf programs normally have more frequent pick up schedules, vacuum pickups are of added convenience.

Parkland snow removal and removal of snow from city-owned facilities are considered secondary to clearing through roads around the city. Generally, park roads should have snow cleared by noon of the day after the snow stops falling.[1] High traffic areas should receive treatment as soon as snow reaches ½ inch.[2] Local law and severity of snowfall have obvious impacts on the speed of snow removal.

Effectiveness

Seasonal work effectiveness varies by type. Leaf collection is most effective if it is frequent and uses leaf vacuums. Since leaf vacuums are costly to run, and often require more man-hours, many jurisdictions choose not to use them at all, but yard waste collection effectiveness is highly improved when vacuums are employed. Seasonal decoration effectiveness is determined by the aesthetic appearance of the town. Some communities prefer lively and frequently

changing decorations, while others enjoy a more modest approach. If the community is pleased, then the program is effective. Snow removal around parks and city facilities widely varies between the comparison cities examined, and workloads are not comparable. Table 16 provides the data for this analysis.

Recommendations

Bowie compares well against the benchmark cities in terms of seasonal work. In terms of leaf collection, Bowie does not reach Gaithersburg's high weekly frequency, but Bowie's collection method and frequency do closely match those in other cities not directly examined in this report, which call for one to three vacuum pick-ups per year. Thus modifications to leaf pickup are not recommended. Additionally, in the City's 2006 resident satisfaction survey, 89 percent of respondents reported that leaf collection in the City was good or excellent.[3]

Table 16 - EFFECTIVENESS

	Bowie	Gaithersburg	Annapolis
Leaf Collection Method	Vacuum & bag pickup	Vacuum & bag pickup	Bag pickup only
Leaf Collection Frequency	Twice yearly	Weekly	Twice monthly

Equipment Maintenance

The Parks and Grounds Division has one mechanic, the Parks Equipment Maintenance Technician, whose responsibility is to repair equipment when it fails and to perform preventive maintenance (PM). This position reports to the Division Superintendent.

Workload

The Division has over 200 inventoried pieces of equipment with an asset value of $1.7 million. Equipment ranges in size from the largest motor grader to the smallest hand-held power tool. The mechanic services 89 percent of the Division's inventoried equipment. Preventive maintenance and truck inspections are outsourced to FLEETpro, a national provider of PM-based services. The Division's mechanic does perform repairs on trucks cited by FLEETpro during scheduled six-month inspections.

Performance Measures

Performance indicators for equipment maintenance can include the following: preventive maintenance schedules; inspection frequency; promptness of repairs; turnaround time; repairs returned for rework; equipment availability; replacement schedules; and customer satisfaction.

Jurisdictions typically take care of equipment and have preventive maintenance programs. Variation exists as a result of labor and budget available to do the work. PM programs should operate according to manufacturer recommendations

Although work schedules vary, all mowers need regular oil changes, oil filter changes, blade maintenance and spark plug replacements generally every 100 hours of mowing or less, and particularly before winter storage.[1,2] Regular lubrication and blade maintenance are also necessary for good mower operation.[3] Keeping mowers clean can also help lengthen mower lifespan.[4] Preparation for winter months should involve draining oil and gasoline, or using a stabilizer in the fuel tank.[5] Additionally, mowers should be stored indoors or under tarps over the winter to prevent water damage.[6] Attention should always be paid to manufacturer recommendations for mower and other equipment maintenance.

Preventive maintenance on heavy vehicles is essential to prevent breakdowns at inconvenient times and to keep the vehicle working efficiently. Maintenance guidelines recommended by the vehicle's operating manual should be consulted because recommended intervals of service vary widely between vehicle types.[7,8] Generally, periodic inspections and maintenance activities should be scheduled. PM programs should have a method for determining when the wear of a component indicates it should be replaced or repaired. Such programs also need to pay particular attention to vehicle components whose deterioration directly affects vehicle control, such as the braking and steering systems, couplers, tires and wheels, and suspension. An additional PM program component involves training vehicle operators to detect maintenance and repair needs by conducting brief inspections. Vehicles should pass the minimum periodic inspection standards set out by the Federal Motor Carrier Safety Regulations (FMCSR).[9]

Efficiency

The Division employs one mechanic to maintain $1.5 million of its $1.7 million worth of equipment. The remaining $187,000 worth of equipment is outsourced for maintenance. Though asset value was not available, Rockville and Annapolis also employ one mechanic, while Gaithersburg employs close to two mechanics. Table 17 provides the data for this analysis.

Effectiveness

Maintenance standards recommend that equipment be stored indoors or covered by a tarp, which protects equipment from natural elements and helps extend its life. Bowie meets this standard, as they have secure garage bays to store all equipment aside from trucks. Rockville and Laurel also report storing all equipment indoors or outside under tarps, while Gaithersburg and Annapolis leave some equipment outside without tarp cover.

Preventive maintenance is an important part of an equipment maintenance program. Bowie's mechanic performs preventive maintenance as a two-fold process. Throughout the year, the mechanic performs PM on all equipment except for trucks, which keeps equipment maintained according to manufacturer recommendations. The mechanic keeps track of scheduled maintenance through the use of databases and logs that track equipment working hours. Additional inspection and maintenance on all seasonal equipment, such as tractors, mowers, sprayers, and ballfield equipment, which are not in use between the months of December and March, are examined, cleaned, and prepared for winter storage so that they are ready for operation come spring. For example, when necessary, the mechanic replaces parts on the equipment, such as belts, valves, pulleys, and bearings, which can extend the equipment's lifespan.

The mechanic performs weekly maintenance on mowing equipment on a specific day per crew schedule during peak season. Peak season maintenance, which ensures that mower blades are clean and sharp for effective performance, is less intensive than during the off-season. The Division's mechanic also performs daily inspections for miscellaneous issues on equipment.

All cities in this study report having brief inspections to check over equipment before use, as well as providing training in this area. More formal weekly inspections were reported by Bowie and Rockville, while Annapolis performs them yearly. Like Bowie, Gaithersburg and Rockville operate PM programs according to manufacturer recommendations. Table 18 provides the data for this analysis.

Recommendations

Bowie's performance in equipment maintenance compares well to that of other cities in this study. Bowie's PM program ensures that equipment is properly maintained, and in the case of seasonal equipment, Bowie ensures equipment readiness for immediate operation in spring. Based on the City's equipment replacement schedules, the Division's thorough maintenance program has resulted in increases in projected lifespan for some equipment.

Bowie should consider hiring a mechanic's apprentice to begin training on maintaining the Division's equipment. The Parks Equipment Maintenance Technician explained that during mowing and leaf removal seasons, his workload is near capacity due to regular repair and weekly preventive maintenance of mowers, leaf vacuums, trucks, and other equipment. In

addition to his mechanic duties, he is on call to complete on-site field repairs when crews encounter equipment problems away from the garage. This obligation occasionally extends his work duties beyond his capacity as a single employee. The mechanic also indicated he would be retiring in few years, and believes that having a second mechanic as an apprentice would benefit the effectiveness of the Division's equipment maintenance program over the long term.

Table 17 - EFFICIENCY

	Bowie	Gaithersburg	Rockville	Annapolis	Laurel
FTE	1	1.92	1	1	-
Asset Value	$1.7m	-	-	-	-
Trucks and Heavy Vehicles	23	79*	35**	10	9
Tractors	13	-	10	4	3
Mowers	28	25	21	4	7

* Number includes all trucks and heavy vehicles owned by the City of Gaithersburg

** Approximate number of all trucks and relevant heavy vehicles operated by Recreation and Parks

Table 18 - EFFECTIVENESS

	Bowie	Gaithersburg	Rockville	Annapolis	Laurel
Equipment Storage	All equipment except for trucks in a secure garage bay	Small equipment under cover; large equipment outside	Equipment in covered trailers, open storage bays, and 2 secured garage bays	Small equipment in garages; other equipment outside	Equipment in maintenance shop
Brief Inspections	Daily	Daily	Daily	Daily	Daily
Formal Inspection Frequency	Weekly inspection of mowers; yearly for other equipment	-	Weekly	Yearly	-
Preventive Maintenance (PM) Program	According to manufacturer recommended schedule	According to manufacturer recommended schedule	According to manufacturer recommended schedule	-	-

Stormwater Management

The City of Bowie's stormwater management program is a function of the City's Public Works Department that is housed and managed by the Parks and Grounds Division. The Stormwater Management Crew is responsible for grounds maintenance of the City's 78 stormwater facilities. The Crew ensures that Bowie's stormwater sites are maintained to meet state and federal regulations, in addition to the aesthetic upkeep preferred by the City. The Stormwater Management Crew is comprised of four regular employees and one temporary seasonal worker, and they report to the Parks Maintenance Supervisor, who is also responsible for the carpenter, the Parks Maintenance Refuse Crew, and one of the Non-Ballfield Turf Maintenance Crews.

Workload

Bowie is unique in that it is the only city in Prince George's County that performs stormwater maintenance (SWM) for all of its own stormwater facilities. The County's Storm Drainage Maintenance Division, located in the Department of Public Works and Transportation, has responsibility for stormwater maintenance on public and government-owned property, except for the stormwater facilities within Bowie's city limits and a few select stormwater facilities in Greenbelt. Both Bowie and Greenbelt provide such grounds maintenance to ensure attentive and regular care.

The Stormwater Management Crew's workload involves 104 acres of basins, outfalls, and drainage areas. Their work consists of mowing, rip-rap cleaning and repair, erosion repair and stabilization, tree removal, and fence installation and repair. Table 19 provides the data for this analysis.

Performance Measures

Stormwater management is a regulated area and adherence to maintenance standards for stormwater management facilities is important, given the risks of neglect. Flooding and property damage, injury, odors, mosquitoes, depleted and/or polluted groundwater supplies, and public health problems may result from failure to maintain these facilities appropriately.[1,2] In Maryland, many SWM facilities drain into the Chesapeake Bay and when neglected, these facilities can contribute to sediment and chemical pollution in this and other aquatic resources.

Environmental Protection Agency (EPA) regulations require owners and operators of SWM facilities to "implement inspections and maintenance programs and have penalties in place to deter infractions."[3] They do not, however, specify frequency of maintenance required, but do suggest adhering to a schedule. EPA's suggestions for maintenance include both inspection via checklists and documenting and archiving condition, damage, and work completed over time. Stockpiling materials, like shovels and sandbags, can help in dealing with emergency post-storm repairs.

The EPA notes that not only does proper maintenance ensure a well-working SWM infrastructure, but also an attractive and pleasing environment around such facilities. Thus, the best SWM maintenance teams will take aesthetics into consideration when completing their work. The EPA website provides additional maintenance

advice, as well as typical costs for maintaining various SWM structures.[4]

Maryland has strict codified regulations for SWM maintenance. The Code of Maryland Regulations (COMAR) 26.17.02.11 mandates that all facilities be inspected by counties or municipalities no less than once every three years, and that the inspecting jurisdiction maintain archival reports of the findings. Inspection points include vegetation state, embankments, and slopes surrounding the facility.[5]

Typical regular maintenance practices should involve mowing, clearing debris and refuse, checking structures for safety problems or blockages, monitoring sediment, and reducing animal infestation (mosquitoes, groundhogs, etc.).[6] Ensuring code compliance, especially prior to inspections is of critical importance. Since stormwater facilities are interconnected, adequate maintenance of privately owned facilities must be performed by land owners as well, and education campaigns can help to encourage this practice.[7]

Efficiency

According to the EPA, a good records management system is critical for stormwater management maintenance. This study found that while all of the comparison cities have implemented electronic record-keeping systems, Bowie utilizes a paper checklist system and has no digital records. During interviews, comparison city administrators expressed that they found a comprehensive electronic database was necessary for stormwater management. Table 20 provides the data for this analysis.

Effectiveness

The effectiveness of stormwater management maintenance involves the frequency of actual maintenance tasks like mowing, as well as inspection frequency to find and eliminate problems. While the state requires one triennial inspection, frequent inspections are preferable, especially at SWM facilities that are easily accessible to the public, or are prone to damage. Bowie inspects their SWM facilities monthly, which is more often than most of the comparison cities. Rockville inspects some SWM facilities more or less than once monthly and differentiates facility inspection frequencies based on various facility characteristics.

While code enforcement will penalize land owners for serious infractions following the infrequent triennial inspections, proactive cities like Rockville make efforts to educate land-owners on the importance of adequate stormwater management maintenance to prevent code infractions from occurring in the first place. Bowie's Public Works Department engages in an education campaign, but a specific analysis of this campaign's effectiveness was outside the scope of this report. Table 21 provides the data for this analysis.

Recommendations

The City of Bowie compares well with the other cities in this study regarding the aesthetic care given to their stormwater management facilities. Mowing occurs more frequently for Bowie's SWM facilities than for any other city examined. Bowie also has a higher inspection frequency than the comparison cities.

Unlike the comparison cities in this study, Bowie does not have a computerized system for tracking stormwater maintenance schedules or work performed at each facility. Administrators in these cities noted that such systems are invaluable in determining which facilities require more frequent maintenance and which facilities can go longer periods without inspections,

thereby contributing to greater efficiency in the organization. Additionally, this form of historical and searchable records tracking makes predicting maintenance needs at each facility easier, thus improving the budgeting process and overall performance. Bowie has included the development of a database and documentation for all city-maintained stormwater maintenance properties as an FY12 budget objective.

Table 19 - WORKLOAD

	Bowie	Gaithersburg	Rockville	Prince George's County	Annapolis
Ponds/Basins	78	94	30	476	5

Table 20 - EFFICIENCY

	Bowie	Gaithersburg	Rockville	Prince George's County	Annapolis
Records Management System	Paper tracking; computer database in development	Computer database	Computer database	Computer database	Computer database

Table 21 - EFFECTIVENESS

	Bowie	Gaithersburg	Rockville	Prince George's County	Annapolis
Inspection Frequency	Monthly	Yearly	Frequent / varies	At least once every 3 years	Twice yearly
Mowing Frequency	3 weeks	12 weeks	1-2 weeks	24 weeks	8 weeks

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Appendix A: Contributing Public Officials

Name	Position	City	Department
Bob Couchenour	Services Superintendent	Annapolis	Public Works
LeAnn Plumer	Director	Annapolis	Recreation and Parks
Marcia Patrick	Assistant Director	Annapolis	Public Works
Mike Bunker	Engineer	Annapolis	Public Works
Rob Savage	Environmental Compliance Inspector	Annapolis	Neighborhood and Environmental Programs
Jan van Zutphen	Environmentalist	Annapolis	Neighborhood and Environmental Programs
Roelkey Myers	Director	Frederick	Parks and Recreation
Wally Debord	Maintenance Director	Gaithersburg	Public Works
Julie McHale	Director	Greenbelt	Recreation
Kenneth Hall	Director	Greenbelt	Public Works
Lesley Riddle	Assistant Director	Greenbelt	Public Works
Michael J. Lhotsky	Director	Laurel	Parks and Recreation
Joseph Ajayi	Tree Maintenance Director	Laurel	Public Works
Jeff Dehan	Assistant Associate Director	Prince George's County	License and Inspection Division OHM/DPW&T
Karen Morland	Chief Inspector	Prince George's County	Storm Drainage Maintenance Division OHM/DPW&T
Dan Rybak	Section Head	Prince George's County	Environmental Services Division
Burt Hall	Director	Rockville	Recreation and Parks
Craig Simoneau	Director	Rockville	Public Works
Colleen McQuitty	Manager	Rockville	Special Events
Heather Gewandter	Stormwater Manager	Rockville	Public Works
Pat Stroud	Fleet Manager	Rockville	Public Works

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Appendix B: Parks and Grounds (P&G) Maintenance Services Overview*

	Bowie	Annapolis	Gaithersburg	Rockville	Laurel	Greenbelt
Population	53,417	36,879	59,986	62,105	22,672	21,439
Square Mileage	$ 16.10	$ 6.73	$ 10.09	$ 13.45	$ 3.78	$ 5.98
City Budget ($000s)	$ 41,803	$ 75,158	$ 44,194	$ 104,934	$ 27,628	$ 31,431
City Budget Per Capita	$ 783	$ 2,038	$ 737	$ 1,690	$ 1,219	$ 1,466
FTE Total	405	602	262	600	186	220
Name	Parks and Grounds Division	Parks Maintenance	Parks Maintenance Division	Parks and Facilities Division	Parks Maintenance	Parks and Grounds Division
Reporting Location	Community Services Department	Recreation and Parks	Public Works Department	Recreation and Parks Department	Parks and Recreation Department	Public Works Department
P&G Budget ($000s)	$ 2,268	-	$ 2,844	$ 4,830	$ 368	-
P&G Budget Per Capita	$ 42.46	-	$ 47.41	$ 77.77	$ 16.23	-
P&G % City Budget	5%	-	6%	5%	1%	-
P&G FTE	$ 31	$ 21	$ 31	$ 49	$ 6	-
P&G FTE Per 1000 Residents	$ 0.59	$ 0.57	$ 0.52	$ 0.79	$ 0.28	-
P&G FTE as % City Budget	8%	3%	12%	8%	3%	-

* Excluding Stormwater Management

NB:

1. A dash (-) indicates that no data was available.
2. Population data from *US Census Annual Estimates of the Resident Population for Incorporated Places in Maryland: April 1, 2000 to July 1, 2009*.
3. Square mileage data from *US Census 2000 Gazeteer*.
4. Total budget information from FY 2011 adopted budgets. P&G budgets are calculated estimates based on work area, except in Bowie where P&G budgets reflect relevant work areas identified in this report.
5. FTE totals were provided by human resources departments in each city. P&G FTEs were provided in surveys completed by city administrators for this report.

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