CITY OF SANTA BARBARA

PARKS AND RECREATION COMMISSION REPORT

AGENDA DATE: July 22, 2015

TO: Parks and Recreation Commission

FROM: Administration Division, Parks and Recreation Department

SUBJECT: Forestry Tree Maintenance and Watering Data Collection and Analysis Project

RECOMMENDATION: That the Commission receive a report on the forestry tree maintenance and watering data collection and analysis project.

DISCUSSION:

The Parks and Recreation Department (Department) is responsible for the care of over 23,000 street trees, 9,000 park trees, and a number of undocumented trees in open spaces. This resource has a replacement value estimated at over $120 million; street trees alone are estimated to provide over $2 million in annual social, environmental, and economic benefits. Currently, six field staff and two supervisors are the primary staff responsible for the active maintenance of this resource.

In July 2014, the Department initiated a data collecting and analysis project to better understand and quantify the existing resources required to maintain public trees. The Department was challenged with articulating quantifiably the benefits provided by additional or re-tasked staff, funding, or other resources that would expand tree care efforts as outlined in the Urban Forest Management Plan. In addition, drought conditions expedited the need for staff to better understand how, where, when, and what tree gets watered. Given these challenges, the project was developed to build confidence in what the Department can achieve with existing resources, and articulate the benefits of what the Department could achieve with additional resources.

Specifically, the purpose of the project is to better understand the:
1. Variety of factors that influence staff time spent on trimming and removing trees, conducting emergency response work, and performing other tree maintenance tasks; and
2. Tree watering regimen including gallons per tree, staff time, tree health during the drought, and watering routes.

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Methods

To acquire the data, data sheets were developed for tree maintenance and watering. Forestry field staff played a key role collecting and submitting the information daily while office staff was responsible for data entry into electronic databases and analysis. Data sheets record the following:

Tree maintenance data sheet
- Location- address number and street name
- Type of maintenance work- trimming, stump removal, tree removal, emergency work, planting, inspecting, picking up limbs, mulching
- Species of tree- helps determine if species is a factor that influences staff time
- Time on site- measured in minutes and includes only time spent onsite, i.e. excludes travel time.
- Number of staff- time on site multiplied by number of staff provides an accurate assessment of actual staff time to complete the work
- Diameter of tree- allows analysis of tree size as a factor that may influence time spent on site
- Additional factors of complexity- factors that contribute to the difficulty of the work and indicated as a number where:
    - 0 = nothing to inhibit work, no factors, the site is open
    - 1= normal conditions exist including cars/permanent structures
    - 2= added factors exist: light posts, signs and/or active pedestrians
    - 3= extremely busy location: corner, heavy pedestrian or car traffic and/or access to tree very limited
- Comments- space to record additional information necessary to understand a particular situation

Tree watering data sheets
- Location- street number and address
- Tree species- helps determine if species is a factor that influences staff time
- Additional Work performed- staking, mulching, light pruning, or basin improvements
- Time on site- measured in minutes
- Number of staff- time on site multiplied by number of staff provides documents actual staff time to complete the work
- Gallons used- water meters were installed to determine gallons used per tree
- Category of tree watered- indicated as young, historic, mature parkway, park tree

- Tree health score- helps determine tree health and watering needs:
    - 1= excellent, stop or taper off watering
    - 2= good, but keep watering
    - 3= poor, continue watering
    - 4= needs removal

Results

Tree Maintenance

Table 1 illustrates the type of information garnered from the data. Over the course of Fiscal Year 2015 (FY15), over 5,500 trees (460 trees/month) were worked on in varying capacities including: trimming, removal, stump removal, tree and stump removal, emergency response, planting, and other tasks such as picking up limbs/fronds and tree inspections. As is illustrated, trimming represents 87% of staff total work load, and consumes 74% of total staff time, with an overall average time of 1 hour to trim a tree. Tree and stump removal, which is less than 1% of overall staff work, represents 4% of total staff time and on average takes upwards of 20[1] hours per tree. Similarly, emergency work represents 1% of total workload, consumes 4% of staff time and averages 5 hours per occurrence. Emergency work typically includes large broken limbs and fallen trees. Staff response is often critical for public safety but diverts them away from planned work. Understanding these standard times allows staff to set targets, plan effective workloads within logical time frames and explain variances given unanticipated emergency work and/or tree removals.

Table 1 below includes the overall average time to trim, remove trees or perform emergency work, regardless of size or complexity. However, complexity factors allow staff to further analyze tree work. Cars, pedestrians, utilities, traffic, infrastructure, houses and buildings all add to the difficulty of accessibility and safety when it comes to tree work. Combining complexity with the size of the tree establishes a standard time for various work categories. For example, a young tree of "0" complexity may take 37 minutes, while a large, mature tree at a "3" complexity takes nearly 6 ½ hours. Understanding these factors further helps staff better plan and organize workloads and provide a safe environment while still getting the job done. In addition, this information will be utilized as a tool to compare staff work against contracted services.

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[1] Tree and stump removal during the data collection period included 13 trees, some of which were large historic trees located on a busy streets. More data in this work category is needed to have confidence in a standard time.

Table 1. Summary of tree maintenance for FY15

Work Category	Count of Trees by Work Category	Tree Work as Percentage of Total Work	Staff Time (hrs.)	Percentage of Total Time	Average Time spent per Tree* (hrs.)
Trim	4809	87%	5156	74%	1
Removal	162	3%	653	9%	4
Remove Stump	125	2%	214	3%	2
Remove Tree and Stump	13	<1%	266	4%	20
Emergency	60	1%	291	4%	5
Plant	3	<1%	7	<1%	2
Inspect or Pick up Limbs/Fronds	245	4%	238	3%	1
Other	128	2%	102	1.5%	1
Total	**5545**	**100%**	**6927**	**100%**	1

*This time provides the overall average taking into account various sizes and complexities, such that a general statement can be made.

Tree Watering

Table 2 provides a summary of tree watering information gathered over the past year. Although the total watering is over 6,400, the actual number of trees watered is roughly 3,000 (47%) due to some trees receiving more frequent watering. Young and historic trees are the primary trees being watered and have consumed 93% of total water applied, yet tree watering only represents approximately 0.3% of total Department water use. The number of trees staff is able to water per month is influenced by two primary factors: 1) the number of large trees being watered as they take more water and more time to apply the water, and 2) staff and resources available to apply water. During the data collection period, staff was able to identify areas that reduced staff time while still meeting watering objectives. This led to the installation of approximately 250 gator bags on young trees throughout the City and 56 irricades along East Anapamu Street to support most of the Italian Stone Pines. In doing so, there has been a 38% reduction in staff time needed to water trees with gator bags and a 77% reduction in staff time to water the Italian Stone Pines being serviced by irricades.

Although not shown in the table, tree health is recorded as part of the project and helps determine the level of care and watering needed for young tree establishment as well as removal of dead trees.

Table 2. Summary of Tree Watering in FY15

Tree Watered	Total Number of Waterings*	Sum of Usage (gal.)	Average Usage per Tree (gal.)	Average of Total Staff Time (min.)
Young tree (no gator bag)	4,020	84,831	23	21
Young tree (with gator bag)	975	14,781	15	13
Historic trees (no irricades)	435	43,394	105	71
Irricades	462	57,311	124	16
Mature parkway	181	7,346	41	17
Median	185	2,271	15	10
Park	111	5,429	50	23
Not Categorized	69	2,881	61	19
Total	**6,438**	**218,244**	**36**	**22**

*Total number of waterings includes a single tree, gator bag, historic tree or irricade receiving water more than once. For example, 56 irricades have been watered approximately 8 times.

Analysis

The acquisition and analysis of this data provides staff with the confidence to what is achieved now with existing resources, and what may be needed in the future to expand tree care efforts. Specifically, this information helps:

- Inform annual tree maintenance plans.
- Illustrate costs associated with tree care and watering.
- Serve as a tool to analyze contract negotiations with outside tree care companies.
- Develop management strategies and additional resources to extend tree care capacity.
- Advocate for and allocate funding toward Urban Forest Management Plan objectives and tree care during the drought.

Current capacity for tree maintenance with five designated staff average 462 trees per month. It is anticipated that with additional staff a number of objectives could be achieved, including: planting, additional trimming, water delivery, and special projects. Similarly, on average 1.5 designated watering staff now achieves 500 trees/month. With an additional water truck and staff member, the Department could achieve a more stable watering regimen to young trees still establishing, plus expand watering to trees not currently receiving water such as those in parks or mature trees along streets.

The data informs annual maintenance plans and contracted services. Staff can now develop and organize workloads applying standard times to complete a given task. For example, knowing it takes 30 minutes to trim king palms and 1.5 hours to trim jacarandas aids in setting achievable trimming targets for a given period. It also functions as a tool that allows staff to project the cost and time required for staff to perform a job, versus contracting the work out. For example, with available funds at year-end, staff was able to determine the most cost effective way to remove a number of backlogged stumps. The Department will also use developed standard times when comparing bids for city tree work to determine if bids are over or under the estimated time and cost to complete a job.

Staff can also demonstrate the impact emergencies and tree and stump removals have on planned workloads. While there are far fewer instances of these work categories, they do have the potential to disrupt daily or longer-term pruning cycles.

Finally, data collection and analysis helps maintain an up-to-date tree management database and is supported by the Urban Forest Management Plan. Ongoing comprehensive analysis of the urban forest is essential for implementation of resource management tools and cost/benefit analyses.

Next Steps

Staff will continue to collect and utilize the information provided. It is anticipated that staff will move towards more advanced data collection tools, such as tablets, to increase data entry efficiency. Currently, data is recorded by Forestry staff in the field on paper data sheets and then entered by two additional office staff into the appropriate electronic databases. Using a handheld electronic device in the field will likely reduce data entry errors, paper waste, and overall staff time required to perform data entry tasks. Staff is also currently reviewing tools that can assist in efficient route planning and will apply the information gathered here to reassign staff to watering with the purchase of a new watering truck.

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