Chapter 4: Ten-Year Urban Forestry Management Program

Summary

This *Urban Forestry Management Program* details the activities that constitute a ten-year tree maintenance program for Goshen. The maintenance recommendations are based on the conclusions of the analysis and stakeholder input in combination with urban forest best management practices and current arboricultural standards. This information will allow Goshen to develop cost-effective strategies by assisting the City, Shade Tree Board members, and City residents with an accurate evaluation of current and future tree-related expenditures. These recommendations should be followed and used in the development of appropriate and realistic management goals, such as increased public safety and improved health of the City's public trees.

This chapter includes:

- Urban Forestry Management Program and Budget
- Priority Tree Maintenance Recommendations
- *Routine Pruning Program*
- *Tree Planting Program*
- Recommendations for Updating Inventory
- Recommendations for Evaluating Work Progress

Specifically, analysis and information will be provided for:

- Development of an urban forestry program that implements critical elements to achieve the long-term goals
- Pruning cycle strategies to ultimately establish a seven-year routine pruning cycle and a three-year training pruning cycle
- Tree planting to achieve 100% stocking level and optimum canopy cover on public rights-of-way
- Updating inventory, evaluating work progress, and revising plan to assure flexibility and respond to future changes in the community forest

Urban Forestry Management Program and Budget

The following section consists of a ten-year work plan for all pertinent urban forestry activities and is intended to provide an example of the relative costs that could be incurred by the recommended activities. In presenting this budget, Davey Resource Group is aware that the portion of Goshen's budget allocated to public tree-related functions might be stretched beyond its limits. We also recognize that the City's tree maintenance and planting works off of a 50/50 program discribed in Ordianence 4008. However, the budgeting recommendations are only estimates and are based on the application of sound urban forestry management principles to municipal forestry operations, and these estimates do not include how the 50/50 program would affect City costs.

The Urban Forestry Management Program is designed to address the highest Maintenance Recommendations and Priority Tasks first. This is intended to reduce potential elevated-risk situations for the public and all associated liabilities. The City may find it in its best interest to begin planning for this work in 2011 and implement the suggested work plan in 2012. As the City completes the highest Maintenance Recommendations and Priority Tasks (Years 2012 to 2017) identified in the 2010 inventory, the City will need to re-evaluate the recommended pruning cycle to capture trees pruned in previous years. The following sections of this Chapter provide a detailed description about the organization of recommended tree maintenance and planting activities.

Table 9 lists the estimated costs for tree removals, pruning, stump removals, fertilization, and mulching. Tree pruning and removal costs in this Management Plan are based on quotes from a large number of reputable North American tree care companies and are averages extracted from bids received by communities in the Eastern United States during the past few years. The figures are equivalent to average costs for the same activities by municipal in-house crews. These costs are averages and are used to estimate all Removals, Crown Cleans, other Priority 1 and 2 maintenances, Large and Small Routine Pruning Program, and Young Tree Training Program budget projections in this Management Plan.

Table 9. Cost Estimates Per Tree for Removals, Pruning, Stump Removals, Fertilization, and Mulching

Diameter Size Class (Inches)	Estimated Removal Cost/Tree	Estimated Pruning Cost/Tree	Estimated Stump Removal Cost/Stump	Estimated Fertilization Cost/Tree	Estimated Mulching Cost/Tree
1 – 3	$25	$20	$25	$5	$11
4 – 6	$105	$30	$25	$18	$11
7 – 12	$220	$75	$25	$22	$14
13 – 18	$355	$120	$40	$30	$14
19 – 24	$525	$170	$60	$50	$20
25 – 30	$845	$225	$85	$60	$20
31 – 36	$1,140	$305	$110	$90	$28
37 – 42	$1,470	$380	$130	$120	$28
43+	$1,850	$590	$160	$150	$28

The public tree inventory has provided Goshen with the opportunity to evaluate important information concerning the public tree population's structure, function, and value to the community. Goshen's tree inventory will continue to be a valuable tool in organizing, scheduling, and routing the needed work to be accomplished.

Table 10 provides an estimated budget for the Ten-Year Urban Forest Management Program for Goshen. This table should be used as a general guideline for implementation of the ten-year program, planning future tree care operations, and reviewing on-going City forestry operations. The Priority Maintenance Listing in Appendix E will help guide Goshen in attending to the trees needing removed and crowns cleaned in the first five years of the Management Program. Specific accomplishments should be measured in comparison to the Management Plan's goals and recommendations. In short, the Urban Forest Management Program discussed aims to alleviate all identified potential elevated-risk conditions within six years, establishes seven-year *Large* and *Small Tree Routine Pruning Programs*, and a three-year *Young Tree Training Program*. The Estimated Costs for Goshen's Urban Forestry Management Program (Table 10) has been provided on the CD-ROM of deliverables so City personnel can manipulate annual tree maintenance numbers and costs for the short term, if desired.

Table 11 provides a planning chart to help Goshen better organize the tree maintenance program described in this chapter. The success of most tree maintenance tasks, such as planting, pruning, or fertilizing, is dependent upon seasonal temperature and weather conditions. The maintenance tasks described in this Urban Forestry Management Program should be scheduled for, and performed during, optimal biological periods to sustain vigorous tree health and to ensure the best chance for survival of the City's trees.

Table 10. Estimated Costs for Goshen'sTen-Year Urban Forestry Management Program

Estimated Costs for Each Activity			2012		2013		2014		2015		2016		2017		2018		2019*		2020*		2021*		Ten-Year Cost
Activity	Diameter Class	Cost/Tree (dollars)	# of Trees	Total Cost	# of Trees	Total Cost	# of Trees	Total Cost	# of Trees	Total Cost	# of Trees	Total Cost	# of Trees	Total Cost	# of Trees	Total Cost	# of Trees	Total Cost	# of Trees	Total Cost	# of Trees	Total Cost	
Priority 1 Removals	1-3"	$25	0	$0	0	$0	11	$275															$275
	3-6"	$105	0	$0	0	$0	24	$2,520															$2,520
	6-12"	$220	0	$0	0	$0	93	$20,460															$20,460
	12-18"	$355	0	$0	116	$41,180	44	$15,620															$56,800
	18-24"	$525	0	$0	176	$92,400	22	$11,550															$103,950
	24-30"	$845	109	$92,105	20	$16,900	1	$845															$109,850
	30-36"	$1,140	43	$49,020	6	$6,840	0	$0															$55,860
	36-42"	$1,470	9	$13,230	0	$0	0	$0															$13,230
	42"+	$1,850	9	$16,650	0	$0	0	$0															$16,650
Activity Total(s)			**170**	**$171,005**	**318**	**$157,320**	**195**	**$51,270**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**$379,595**
Priority 2 Removals	1-3"	$25					0	$0	2	$50	4	$100											$150
	3-6"	$105					0	$0	2	$210	1	$105											$315
	6-12"	$220					2	$440	6	$1,320	1	$220											$1,980
	12-18"	$355					2	$710	0	$0	0	$0											$710
	18-24"	$525					2	$1,050	1	$525	0	$0											$1,575
	24-30"	$845					5	$4,225	0	$0	0	$0											$4,225
	30-36"	$1,140					0	$0	0	$0	0	$0											$0
	36-42"	$1,470					0	$0	0	$0	0	$0											$0
	42"+	$1,850					0	$0	0	$0	0	$0											$0
Activity Total(s)			**0**	**$0**	**0**	**$0**	**11**	**$6,425**	**11**	**$2,105**	**6**	**$425**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**$8,955**
Not Assigned Removals	1-3"	$25									3	$75											$75
	3-6"	$105									8	$840											$840
	6-12"	$220									8	$1,760											$1,760
	12-18"	$355									11	$3,905											$3,905
	18-24"	$525									15	$7,875											$7,875
	24-30"	$845									7	$5,915											$5,915
	30-36"	$1,140									5	$5,700											$5,700
	36-42"	$1,470									0	$0											$0
	42"+	$1,850									1	$1,850											$1,850
Activity Total(s)			**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**58**	**$27,920**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**$27,920**
Priority 1 Crown Cleans	1-3"	$20	0	$0	0	$0	8	$160															$160
	3-6"	$30	0	$0	0	$0	73	$2,190															$2,190
	6-12"	$75	0	$0	0	$0	42	$3,150															$3,150
	12-18"	$120	0	$0	0	$0	30	$3,600															$3,600
	18-24"	$170	0	$0	0	$0	70	$11,900															$11,900
	24-30"	$225	0	$0	11	$2,475	67	$15,075															$17,550
	30-36"	$305	2	$610	13	$3,965	22	$6,710															$11,285
	36-42"	$380	0	$0	9	$3,420	8	$3,040															$6,460
	42"+	$590	1	$590	6	$3,540	0	$0															$4,130
Activity Total(s)			**3**	**$1,200**	**39**	**$13,400**	**320**	**$45,825**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**$60,425**
Priority 2 Crown Cleans	1-3"	$20						$0	0	$0	21	$420											$420
	3-6"	$30						$0	3	$90	71	$2,130											$2,220
	6-12"	$75						$0	81	$6,075	120	$9,000											$15,075
	12-18"	$120					3	$360	340	$40,800	80	$9,600											$50,760
	18-24"	$170					26	$4,420	386	$65,620	9	$1,530											$71,570
	24-30"	$225					85	$19,125	164	$36,900	0	$0											$56,025
	30-36"	$305					68	$20,740	43	$13,115	0	$0											$33,855
	36-42"	$380					22	$8,360	2	$760	0	$0											$9,120
	42"+	$590					16	$9,440	0	$0	0	$0											$9,440
Activity Total(s)			**0**	**$0**	**0**	**$0**	**220**	**$62,445**	**1019**	**$163,360**	**301**	**$22,680**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**$248,485**
Not Assigned Crown Cleans	1-3"	$20									17	$340											$340
	3-6"	$30									48	$1,440											$1,440
	6-12"	$75									70	$5,250											$5,250
	12-18"	$120									46	$5,520											$5,520
	18-24"	$170									52	$8,840											$8,840
	24-30"	$225									52	$11,700											$11,700
	30-36"	$305									36	$10,980											$10,980
	36-42"	$380									30	$11,400											$11,400
	42"+	$590									15	$8,850											$8,850
Activity Total(s)			**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**366**	**$64,320**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**$64,320**
Other Priority 1 and 2 Maintenances	1-3"	$20									0	$0	39	$780									$780
	3-6"	$30									0	$0	73	$2,190									$2,190
	6-12"	$75									0	$0	91	$6,825									$6,825
	12-18"	$120									20	$2,400	41	$4,920									$7,320
	18-24"	$170									71	$12,070	0	$0									$12,070
	24-30"	$225									70	$15,750	0	$0									$15,750
	30-36"	$305									47	$14,335	0	$0									$14,335
	36-42"	$380									3	$1,140	0	$0									$1,140
	42"+	$590									7	$4,130	0	$0									$4,130
Activity Total(s)			**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**218**	**$49,825**	**244**	**$14,715**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**$64,540**
Large Tree Routine Pruning Program	1-3"	$20											0	$0	0	$0	0	$0	0	$0	0	$0	$0
	3-6"	$30											0	$0	0	$0	0	$0	0	$0	0	$0	$0
	6-12"	$75											241	$18,075	241	$18,075	241	$18,075	241	$18,075	241	241	$72,541
	12-18"	$120											238	$28,560	238	$28,560	238	$28,560	238	$28,560	238	238	$114,478
	18-24"	$170											169	$28,730	169	$28,730	169	$28,730	169	$28,730	169	169	$115,089
	24-30"	$225											84	$18,900	84	$18,900	84	$18,900	84	$18,900	84	84	$75,684
	30-36"	$305											28	$8,540	28	$8,540	28	$8,540	28	$8,540	28	28	$34,188
	36-42"	$380											8	$3,040	8	$3,040	8	$3,040	8	$3,040	8	8	$12,168
	42"+	$590											4	$2,360	4	$2,360	4	$2,360	4	$2,360	4	4	$9,444
Activity Total(s)			**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**772**	**$108,205**	**772**	**$108,205**	**772**	**$108,205**	**772**	**$108,205**	**772**	**$772**	**$433,592**
Small Tree Routine Pruning Program	1-3"	$20											0	$0	0	$0	0	$0	0	$0	0	$0	$0
	3-6"	$30											0	$0	0	$0	0	$0	0	$0	0	$0	$0
	6-12"	$75											18	$1,350	18	$1,350	18	$1,350	18	$1,350	18	$1,350	$6,750
	12-18"	$120											2	$240	2	$240	2	$240	2	$240	2	$240	$1,200
	18-24"	$170											1	$170	1	$170	1	$170	1	$170	1	$170	$850
	24-30"	$225											0	$0	0	$0	0	$0	0	$0	0	$0	$0
	30-36"	$305											0	$0	0	$0	0	$0	0	$0	0	$0	$0
	36-42"	$380											0	$0	0	$0	0	$0	0	$0	0	$0	$0
	42"+	$590											0	$0	0	$0	0	$0	0	$0	0	$0	$0
Activity Total(s)			**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**21**	**$1,760**	**21**	**$1,760**	**21**	**$1,760**	**21**	**$1,760**	**21**	**$1,760**	**$8,800**
Young Tree Training Program	1-3"	$20											536	$10,720	536	$10,720	536	$10,720	536	$10,720	536	$10,720	$53,600
	3-6"	$30											568	$17,040	568	$17,040	568	$17,040	568	$17,040	568	$17,040	$85,200
	6-12"	$75											154	$11,550	154	$11,550	154	$11,550	154	$11,550	154	$11,550	$57,750
Activity Total(s)			**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**0**	**$0**	**1,258**	**$39,310**	**1,258**	**$39,310**	**1,258**	**$39,310**	**1,258**	**$39,310**	**1,258**	**$39,310**	**$196,550**
Tree Planting	Purchasing	$110	100	$11,000	100	$11,000	100	$11,000	100	$11,000	100	$11,000	100	$11,000	150	$16,500	150	$16,500	150	$16,500	150	$16,500	$132,000
	Planting	$110	100	$11,000	100	$11,000	100	$11,000	100	$11,000	100	$11,000	100	$11,000	150	$16,500	150	$16,500	150	$16,500	150	$16,500	$132,000
Activity Total(s)			**200**	**$22,000**	**200**	**$22,000**	**200**	**$22,000**	**200**	**$22,000**	**200**	**$22,000**	**200**	**$22,000**	**300**	**$33,000**	**300**	**$33,000**	**300**	**$33,000**	**300**	**$33,000**	**$264,000**
Activity Grand Total			**373**		**557**		**946**		**1,230**		**1,149**		**2,495**		**2,351**		**2,351**		**2,351**		**2,351**		**16,154**
Cost Grand Total				**$194,205**		**$192,720**		**$187,965**		**$187,465**		**$187,170**		**$185,990**		**$182,275**		**$182,275**		**$182,275**		**$74,842**	**$1,757,182**

*** The routine maintenance for these years will need re-evaluated to include identified Removals, Crown Cleans, and other Priority 1 and 2 maintenances from the 2010 inventory.**

Table 11. Arboricultural Planning Chart for Tree Management Activities

ACTIVITY/ TREATMENT	YEAR*	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
REMOVALS													
Priority 1 (Inventory)	1	X	X	X							X	X	X
Priority 2 (Inventory)	3	X	X	X							X	X	X
Not Assigned (Inventory) and Other Anticipated	5A	X	X	X							X	X	X
Stump Removal	1A	X	X	X							X	X	X
PRUNING													
Priority 1 (Inventory)	1	X	X	X							X	X	X
Priority 2 (Inventory)	3	X	X	X							X	X	X
Not Assigned (Inventory) and other Priority 1 and 2 Maintenances	5												
Routine Pruning (Seven-Year Rotation)	6A	X	X	X							X	X	X
Young Tree Training Pruning (Three-Year Rotation)	6A	X	X	X							X	X	X
FERTILIZATION													
Macronutrient (N-P-K; Fair and Poor Condition Trees)	1A			X	X						X	X	
Macronutrient (N-P-K; Excellent and Good Condition Trees)	2			X	X						X	X	
Micronutrient (Fe/Mn Trunk Injection)	N					X	X	X	X				
Micronutrient (Fe/Mn Soil Treatment)	N												
PEST MANAGEMENT													
Scouting	1A				X	X	X	X	X	X			
Pesticide Treatments	N				X	X	X	X	X	X			
Pest Pruning	N												
TREE PLANTING													
Site Assessment	1A												
Ball & Burlap Container	1A			X	X	X				X	X	X	
Bare Root	1A			X	X	X							
Watering (New Trees)	1A			X	X	X	X	X	X	X	X	X	
Cabling and Bracing	N	X	X	X								X	X
Mulching	1A												
Weed Control	1A			X	X	X							
Watering (Older Trees)	1A							X	X	X	X		
INVENTORY													
Update Field Inventory	5-10	X	X								X	X	X
Update Computer Database	1A												

Notes:

Shaded areas indicate months where tasks can be completed operationally

*** = Year task is recommended to be initiated/completed**
A = Continue on an annual basis after task is initiated
N = Implement on an as-needed basis
X = Optimal biological time (or for cost-efficiency)

Priority Tree Maintenance Recommendations

Initially, Goshen should focus on reducing the elevated risks identified in the inventory. This Management Program is designed to abate all elevated-risk trees identified during the tree inventory in Year 6 (funds permitting) of the ten-year program. This means performing all 769 Removals, 2,268 Crown Cleans, and remaining 462 other Priority 1 and 2 tree maintenances identified by 2017, if the budget allows. The City will need to provide internal trained staff and correct equipment for the job or outsource tasks to implement the recommendations of this Urban Forestry Management Program.

Although it would be almost impossible to expect the City to perform all needed maintenance activities immediately due to budgetary concerns, an organized and systematic program will achieve the needed results in a timely manner and will demonstrate the City's sincere attempt to keep all streets and parks safe for its residents and visitors. Therefore, a prioritized list of tree maintenance work weighted by Maintenance Recommendation, Primary Task, Condition, and Diameter is provided in Appendix E. This list presents trees, identified as Removal or Crown Clean, in the order they should be managed to reduce risk in an efficient manner. Where numerous recommended Removals and/or Cleanings exist in the same area of Goshen, the work should be performed at the same time in order to reduce travel time and costs. Completing this work will greatly decrease the potential of injury to residents and visitors, damage to property, and possible liability litigation due to trees. The Priority Maintenance Listing also has been provided in an Excel™ spreadsheet format included on the CD-ROM.

The City must establish procedures for keeping the tree inventory information current. Keeping accurate records of work completed on specific trees and tracking removals and pruning will help accomplish this. Goshen's tree inventory database will prove to be a valuable tool in organizing, scheduling, and routing the needed work to be accomplished.

Table 12. Priority Tree Maintenance Recommendations by Size Class

Tree Diameter Size Class (Inches)	Removals	Crown Clean	Other Priority 1 and 2
0 – 3	20	46	39
3 – 6	35	195	73
6 – 12	105	313	91
12 – 18	178	499	61
18 – 24	216	544	71
24 – 30	142	377	70
30 – 36	54	184	47
36 – 42	9	73	3
42+	10	37	7
Total Number of Trees	**769**	**2,268**	**462**

Removals

At the time of Goshen's inventory, there were 683 public trees that were identified as Priority 1 Removal, 27 public trees that were identified as Priority 2 Removal, and an additional 59 public trees that were recommended Removals but Not Assigned a priority. There are 747 street trees Removals and 22 park trees Removals. The majority of these trees are silver maple (227 trees), sugar maple (180 trees), and Norway maple (104 trees). Their prompt removal is strongly recommended to reduce liability and improve safety.

Figure 7 shows the breakdown of Removals by Diameter Class and Maintenance Recommendation. All depending on site restrictions, after trees are removed, the remaining stumps and root plates should be ground and replaced with a tree or soil and grass. See Appendix F for an example of Street Tree Removal Specifications.

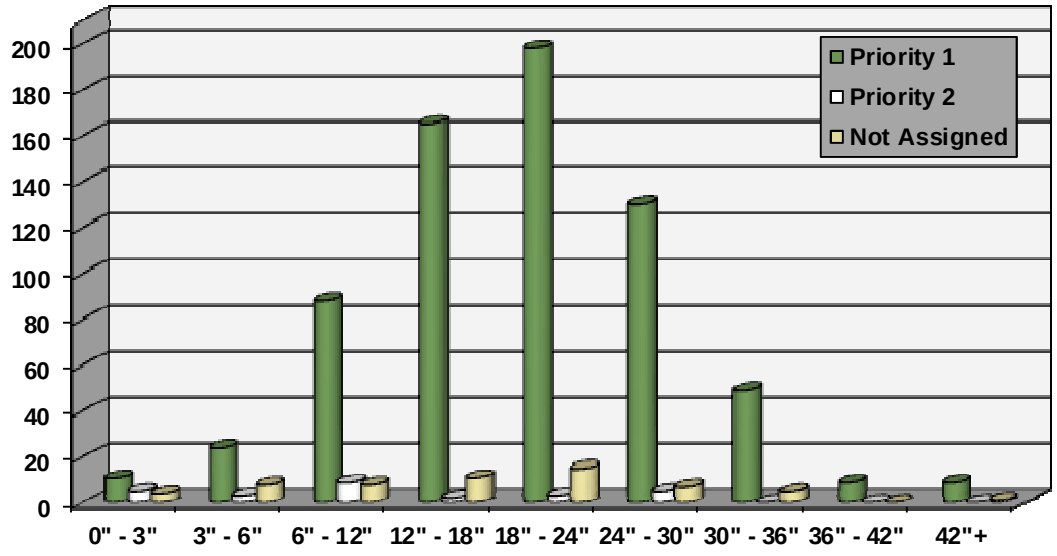

Figure 7. Tree Removals by Diameter Size Class and Maintenance Recommendation

Crown Cleaning

Crown Cleaning is the removal of dead, diseased, or obviously weak, heavy, or high-risk branches. There were 362 public trees that were identified as Priority 1 Crown Clean, 1,540 public trees that were identified as Priority 2 Crown Clean, and an additional 366 public trees that were recommended needing a Crown Clean but Not Assigned a priority. There are 2,019 street trees Crown Cleans and 249 park trees Crown Cleans. Silver maple (700 trees), sugar maple (335 trees), and Norway maple (203 trees) comprise the bulk of this Priority Task. The prompt mitigation of the defective part(s) is strongly recommended to reduce liability and improve safety.

Other Priority 1 and 2

There were 462 public trees that were identified as Priority 1 and Priority 2 with recommended maintenances other than Removal or Crown Cleaning. These maintenance include Crown Thin, Crown Reduce, Stake, Remove Vines, Other Maintenance Needed, and No Maintenance Needed. After all recommended Removals and Crown Cleans are attended to, the prompt mitigation of the defective part(s) is strongly recommended to reduce the liability and improve safety of these Priority 1 and 2 trees.

All trees identified as Crown Clean and other Priority 1 and 2 should be examined closely during pruning operations for severe internal and external decay and/or dieback. If, upon closer inspection, these trees are found to be severely decayed, they should be removed. See Appendix F for an example of Street Tree Pruning Specifications and Appendix G for Davey's Pruning Guidelines.

Routine Pruning Program

Routine Pruning is an activity that should take place on a cyclical basis because it is extremely beneficial for the overall health and longevity of trees. Through Routine Pruning, potentially serious problems can be avoided because trees can be closely inspected during these pruning cycles. Proper decisions can be made about declining trees and any trees that are becoming elevated-risks can be managed appropriately before any serious incidents occur. It is recommended that the *Large Tree Routine Pruning Program* and the *Small Tree Routine Pruning Program* described here be implemented beginning in Year Six of the Urban Forestry Management Program, shortly after all identified elevated-risks are complete. It is also recommended that the *Young Tree Training Pruning Program* described here be implemented beginning in Year Six. By periodically maintaining public trees, the potential for decay can be minimized and their vigor can be improved by retaining only strong, healthy branches. The City will need to provide internal trained staff, trained volunteers, and correct equipment for the job or outsource tasks to implement the recommendations of this *Urban Forestry Management Program*.

Routine pruning should be scheduled and programmed to ensure all established, maturing, and mature trees are pruned every seven years. Low priority problems can become high priority if they are neglected for an extended period of time. Thinning and Raising of tree canopies to improve branching structure and reduce clearance issues should also be completed at this time. Thinning reduces the potential for wind and ice-induced branch breakage and increases sunlight and air circulation within the crown.

Large Tree Routine Pruning Program

Large Tree Routine Pruning includes large- and medium-growing trees (greater than 6-inch DBH) requiring routine arboricultural pruning to correct growth patterns and remove dead, dying, and diseased branches. Additionally, crown raising and crown reduction pruning should be completed. Crown raising and reduction will allow vehicles to safely pass and park on streets or pedestrians to walk on sidewalks. Furthermore, the clearing of limbs away from signs and traffic signals can also be accomplished for increased public safety. Trees in this cyclical pruning program will likely require a bucket truck access or manual climbing gear, rigging gear, chain saws, pole saws, hand saws, chipper, and chip truck.

Once all identified elevated-risks are managed, the City of Goshen should implement a cyclical pruning program for large trees which will include the routine pruning of all remaining large- and medium-growing trees (approximately 5,387 trees) in the public tree population. Table 13 lists the number of trees in each diameter class and suggests that a seven-year cycle be implemented so that approximately 772 trees are pruned each year. Additionally, 2,244 large- and medium-growing trees were identified as Crown Clean or other Priority 1 and 2 maintenances. Once these trees' needs are met, they, too, will fall into the Large Tree Routine Pruning Program. This will potentially increase the total number of large trees requiring cyclical pruning to 7,631 and approximately 1,091 trees being pruned annually.

The *Urban Forestry Management Program* recommends that Goshen implement the Large Tree Routine Pruning Program in 2017. The City should develop an organized and documented approach to ensure cyclical tree maintenance. Centralized pruning will be most efficient, meaning that all trees within one of Goshen's predetermined tree management zones are trimmed at the same time. Goshen has 47 tree management zones. A certain number of City tree management zones should be designated for each year's work in order to meet the annual routine pruning goal. In order to know how many and what size trees are in each zone Goshen will need to update the current tree inventory to include tree management zone information. Currently, 89.9% of the inventory has management zone information.

Small Tree Routine Pruning Program

Small Tree Routine Pruning includes small-growing trees (greater than 6-inch DBH) that can be evaluated and pruned from the ground to correct growth patterns and remove dead, dying, and diseased branches. A two-person crew will be able to easily perform this work with equipment such as pole saws, hand saws, hand pruners, and a truck to carry away tree debris. This crew would be responsible for the cyclical trimming of all small-growing trees. Additionally, they can perform clearance-trimming work, including crown raising and reduction to allow for vehicle and pedestrian traffic and increased public safety from the clearing of traffic signs and signals.

Once all elevated-risks are managed, the City of Goshen should implement a cyclical pruning program for small trees which will include the routine pruning of all remaining small-growing trees (approximately 139 trees) in the public tree population. Table 15 lists the number of trees in each diameter class and suggests that a seven-year cycle be implemented so that approximately 21 trees are pruned each year. Additionally, 57 trees were identified as Crown Clean or other Priority 1 and 2 maintenances. Once these trees' needs are met, they, too, will fall into the Small Tree Routine Pruning Program. This will just slightly increase the total number of small trees requiring cyclical pruning to 196 and approximately 28 trees pruned annually.

Beginning in 2017, the *Urban Forest Management Program* recommends that Goshen implement the seven-year Small Tree Routine Pruning Program. Similar to the Large Tree Routine Pruning Program, this Program's approach should also be organized and documented to ensure cyclical tree maintenance. Centralized pruning will be most efficient here too. A certain number of City tree management zones should be designated for each year's work in order to meet the annual routine pruning goal.

Young Tree Training Program

Young Tree Training consists of the removal of dead, dying, diseased, interfering, conflicting, and/or weak branches, as well as selective trimming to direct future branch growth of young trees, including small-, medium-, and large-growing trees. The objective of Young Tree Training is to increase the structural integrity by pruning the tree to one dominant leader; however, it is species-specific since many trees, such as downy serviceberry (*Amelanchier arborea*), can have more than one leader. This applies to all trees less than 6 inches in DBH (or 20 to 25 feet in height). Based on the generally small size of trees, a crew of two properly trained personnel would be capable of accomplishing all work from the ground with assistance of a pole pruner, hand pruners, and a truck to carry away tree debris.

The proposed *Urban Forestry Management Program* recommends that the Young Tree Training Program should be implemented in 2017. There are approximately 3,772 trees needing training in the public tree population. Table 13 lists the number of trees in each diameter class and suggests that a three-year cycle (rather than the five-year cycle because of the faster average growth rates of younger trees) be implemented so that approximately 1,258 trees are pruned each year. Additionally, 429 trees were identified as Crown Clean or other Priority 1 and 2 maintenances. Once these trees' needs are met, they, too, will fall into the Young Tree Routine Pruning Program. This will increase the total number of young trees requiring cyclical pruning to 4,201, approximately 1,401 trees pruned annually.

Much like the *Large* and *Small Tree Routine Pruning Programs*, this Program's approach should be organized and documented to ensure cyclical tree maintenance, centralized pruning will be most efficient, and a certain number of City tree management zones should be designated for each year's work in order to meet the annual routine pruning goal. As these young, large- , medium-, small-growing trees grow larger than 6-inch DBH or taller than 20 to 25 feet in height, they will eventually become part of the Large and Small Routine Pruning Programs.

As the City continues to plant trees, all newly planted trees should receive their first Young Tree Training Pruning three years following planting. No training pruning should be performed when a tree is first planted. The tree is already under stress from transplanting and needs as much of its leaf canopy as possible in order to manufacture food and increase root growth for proper establishment in its new site. Only dead or broken branches should be removed at the time of planting.

Table 13. Large and Small Routine Pruning Program by Diameter Size Class

Diameter Size Class (Inches)	Large Tree Routine (Total Trees Pruned in 7 Years)	Large Tree Routine (Approximate Trees/Year)	Small Tree Routine (Total Trees Pruned in 7 Years)	Small Tree Routine (Approximate Trees/Year)
0	1	0	0	0
1 – 3	0	0	0	0
3 – 6	0	0	0	0
6 – 12	1,685	241	125	18
12 – 18	1,662	238	13	2
18 – 24	1,180	169	1	1
24 – 30	588	84	0	0
30 – 36	196	28	0	0
36 – 42	52	8	0	0
42+	23	4	0	0
Totals	**5,387**	**772**	**139**	**21**

Table 14. Young Tree Training Program by Diameter Size Class

Diameter Size Class (Inches)	Young Tree Train (Total Trees Pruned in 3 Years)	Young Tree Train (Approximate Trees/Year)
0	0	0
1 – 3	1,607	536
3 – 6	1,703	568
6 – 12	462	154
12 – 18	0	0
18 – 24	0	0
24 – 30	0	0
30 – 36	0	0
36 – 42	0	0
42+	0	0
Totals	**3,772**	**1,258**

Best Management Practices for Trees

Tree Crew Training

Proper training about how to properly prune trees should be required for all tree crew personnel. It is recommended that the City utilize volunteers for pruning small-growing and young trees. These volunteer crews should also receive proper training including pruning and safety along streets. All crews need an understanding of the growth-habits of the various species being planted, as well as an understanding of basic tree anatomy and physiology. It is imperative to emphasize proper arboricultural and horticultural techniques and practices. The tremendous aesthetic and financial benefits to be gained in the years to come from the proper pruning of large- and small-growing trees and training of young trees is a strong incentive for educating tree crews concerning proper pruning techniques.

Insect and Disease Control

Generally, trees do not have significant insect and disease problems if they are healthy and well cared for. However, some degree of insect infestation and disease incidence will always be present, as this is the norm for the natural world. It is only when particularly damaging insects are detected and the levels of insect populations are extremely high (such as emerald ash borer) or when particularly virulent diseases are diagnosed (such as oak wilt) that action must be taken. The type and extent of action depends on the type and extent of the insect or disease problem.

The array of insects and diseases that can threaten the health of forest and urban trees and their treatments are too numerous to completely encompass within the scope of this document. However, a basic discussion on the fundamentals of an Integrated Pest Management program, and specifically monitoring, is covered in this section.

Fundamentals of an Integrated Pest Management program are:

1. **Identification:** The proper identification of trees and their existing and potentially harmful pests is necessary to successfully manage a pest outbreak or occurrence. Additionally, understanding each pest's life cycle is important for a positive diagnosis. Knowledge of beneficial and incidental (non-threatening) organisms also plays an important role in the identification and diagnostic process.
2. **Monitoring:** Proactive, regular monitoring for potential threats is perhaps the most important part of an Integrated Pest Management program. Monitoring for pest activity can be done using a variety of techniques, including visual inspection, and, in some cases, use of specialized traps. Regular contact with state and local plant health care officials can help to focus monitoring efforts and increase awareness of emerging threats. In most cases, Indiana's State Forester, Purdue University extension services, Indiana Department of Natural Resources, or United States Department of Agriculture's state office can provide support for suspicions of potential pest infestations.
3. **Understanding the Economic Threshold Level:** The economic threshold is the level in which the costs involved in managing a pest infestation overshadow the value that a tree or plant is providing. In an urban situation, the economic value of a tree can be tied to the benefits that a tree provides. These benefits include, but are not limited to, aesthetic, environmental, and cultural benefits. This concept, on a general level, amounts to determining whether or not a tree is worth the costs of mitigating against a pest problem compared to its value to the community. The values of ash and oak are highlighted in Chapters 2 and 3.

4. **Selecting the Correct Treatment:** Once a pest problem has been properly diagnosed and the decision has been made to treat the problem, selection of the correct treatment is the next step. Selecting treatment is a decision that requires a solid understanding of all the options, chemical or otherwise, for pest management material.
5. **Proper Timing of Management Strategies:** Once an appropriate treatment has been selected, it is important to carefully plan the timing and implementation to maximize effectiveness.
6. **Recordkeeping:** To facilitate future pest management decisions, accurate records should be kept concerning information on pests, treatments, locations, timing, weather conditions, and any other useful information.
7. **Evaluation:** A successful Integrated Pest Management program must be evaluated based on experience, successes, and failures in order to focus efforts and resources for the future.

Fertilization

Mature trees should not be placed on a scheduled fertilization program without a documented need. If soil analyses show a distinct and serious nutrient deficiency, or if the tree's root system or growing area has been damaged or contaminated, then the time and expense of fertilization may be worthwhile to save the tree.

Irrigation

All trees need supplemental watering when there are drought conditions. Under drought conditions, the City, volunteers, and/or the abutting property owner would accomplish watering mature and young trees.

This supplemental irrigation can be accomplished for park and street trees with a water truck and hose and/or deep root watering lance, or with watering aids, such as the widely used Treegator® Drip Irrigation Bags. Citizens and abutting business owners should be encouraged to water street trees frequently during the summer, even when there are no drought conditions.

Cabling and Bracing

Rather than remove or severely prune a mature tree if a structural defect is discovered, the use of structural support can reduce safety risks. Cabling and bracing are the two most common forms of structural support for trees. Other, less common forms of structural support are guying and propping. Structural support is infrequently recommended, but trees with special or historic significance can be spared from removal by using such techniques as cabling and bracing. Generally, this involves installing flexible cables or rigid rods to reduce the chances of failure of defective unions.

If the decision is made that a tree needs structural support, there are a few basic considerations. First, only use a Certified Arborist who is knowledgeable and experienced in this area. Ask about the important technical aspects of correct cabling and bracing: the strength and material of the hardware; the arrangement of the cables (*e.g.*, simple, triangle, or box) or rods (*e.g.*, single or multiple); and the location, type and size of the entries made into the tree. Be sure to specify in writing "all work and materials shall be in accordance with ANSI, A300 Tree Care Standards (Part 3), 2005".

Tree Planting Program

Tree species and planting location designations are significant components of Goshen's tree care program because of the long-term impact of these decisions. The tree inventory contains information on the number of available vacant planting sites and allows residents, urban foresters, and public officials to make informed decisions about site location and species selection. Additionally, the City can assign a list of three to five available species for planting at that site, dependent on size of growing area and any constraints that should be considered. The adjacent resident can then have a choice of trees as preapproved by the City. Having information like this in the inventory allows for more efficiency in planning tree planting projects.

Goshen's tree inventory recorded 1,492 vacant planting sites and 747 Removals along city streets. All 769 Removals along streets and in parks are recommended to occur in the first five years of the *Urban Forestry Management Program*. Davey Resource Group recommends Goshen replace those street trees removed within seven years starting in 2012 and fill all identified vacant planting sites by 2028. This planting goal assumes that no other trees are removed and all new plantings survive. In order to accomplish such a goal, the City will need to provide trained staff or volunteers or outsource tree planting tasks. It is important to make sure all new trees are properly installed and the species characteristics of the planted tree are right for the location and site restrictions. Matching a species to its favored climate, soil, site conditions, and site restrictions are essential when planning for a low maintenance landscape.

It is important to develop an overall planting strategy, initially concentrating on streets and blocks with the greatest need for improvement. Planning for tree planting in Goshen will require careful consideration of species selection. The young size class should be composed of large-, medium-, and small-growing species. Large-growing trees will provide the most returned benefits. Species considerations in a well-developed tree planting program should address the need for less maintenance and the desire for characteristics such as spring flowers and fall color.

There are many new neighborhoods in Goshen with bare streetscapes. The street in this picture is White Oak Drive, taken at the corner of Sandlewood Drive. The City and its residents should work together in efforts to plant their neighborhoods with trees so they, too, can enjoy the environmental and economic benefits older neighborhoods in Goshen are receiving.

The success of a continuing tree planting program will be judged by the health of the trees' post-planting and the amount of money spent on planting and maintaining the new trees. With a small amount of planning, healthy trees with greater life expectancies can be established with minimal up-front investment and minor maintenance costs.

Full Stocking Potential

Full tree stocking is an elusive goal. The mortality of the young and old trees will continue to make planting sites available. National averages show an annual mortality rate of about 1% for street tree populations in U.S. cities. The mortality rate for Goshen's public trees may represent approximately 128 trees per year. Nevertheless, it is worth the effort because the goal of working toward full stocking can help make other less glamorous aspects of urban forestry more palatable, especially removals.

The City should establish a plan fill all 1,492 identified vacant planting sites, replant the 747 street trees removed, and continue inventorying vacant planting sites not inventoried in 2010 and fill those sites too. Full stocking would entail a planned program of annual tree plantings aimed at filling the amount of current and future vacant street tree planting sites. It will likely require more resources than are currently available to purchase and plant trees.

A formula for determining the planting rate for a 100% stocking goal comes from the textbook *Urban Forestry: Planning and Managing Urban Greenspaces* (Miller, 1997) and is written as:

$$\frac{N = R + (V/G)}{S}$$

Where:

N = number of trees to be planted annually
R = number of trees to be removed annually
V = existing vacant sites
G = years remaining to achieve full stocking potential goal
S = expected planting survival rate

Applying the formula above: Goshen has 1,492 available planting sites scattered throughout its existing ROWs. If it is known that approximately 172 trees per year will be removed (747 identified street tree removals plus 128 removals per year due to mortality for 17 years), the City needs full stocking in 17 years, and the planting survival rate over that period is 90%, the result is:

$$\frac{N = 172 + (1{,}492/17) = 289 \text{ trees/year}}{0.90}$$

The City should decide its desired stocking rate, number of annual plantings, and number of annual removals in order to set a specific goal. Davey Resource Group knows that budgetary constraints may prohibit the planting of so many trees per year so this formula can be manipulated until acceptable figures are created for the City.

Best Management Practices for Planting

The key elements for a successful tree-planting program are covered in this section and are primarily based on the exceptional reference, *Principles and Practice of Planting Trees and Shrubs* (Watson and Himelick, 1997).

Tree Fertilization

Any fertilization process should not be thought of as “feeding” or “energizing” the trees; instead, arboricultural fertilizers should be understood as essentially replacing soil elements or minerals that are lacking or in short supply for a variety of reasons. Nutrients may be in adequate supply, but be unavailable for uptake by the trees because of extreme pH conditions. Application of fertilizer may not improve the situation until measures are taken to alter pH levels or to replace the trees with a species better suited for the existing soil conditions.

Fertilization may not be necessary for the first growing season unless specific nutrient deficiencies exist. At the beginning of the second growing season, fertilizers can be applied to the root zone. Nitrogen is usually the limiting nutrient for plant growth. Soil analysis, particularly when combined with a foliar analysis, can determine when other elements are in short supply. Slow-release fertilizers applied in autumn will help root growth and will still be available the following spring.

Tree Mulching

Mulch should be applied to the surface of the soil around each newly planted tree. Mulch should never be piled up around the root collar (mulch “volcanoes”), but rather should be pulled away from the root collar. Mulch that buries the root collar provides shelter for insects, fungi, and small mammals that could damage the tree. Mulch should be applied to an area three times the diameter of the root ball to a depth of two to four inches. Mulch not only suppresses competition from grass and weeds, but also provides a zone where turf maintenance is not needed, thereby keeping lawn mowers and string trimmers safely away and thus preventing mechanical damage. Mulch also helps to hold moisture in the surface of the soil where most of the feeder roots are to be established.

Tree Planting Designs

A prioritization scheme can be developed to begin tree plantings throughout the City. Often, the downtown and business districts are selected as the highest priority in order to increase the beauty and attractiveness of the area. Tree selection for business and shopping areas must take into consideration the need for shoppers to view storefronts, as well as the need to provide enough shade for shoppers. Tree canopies should be open, as is thornless honeylocust (*Gleditsia triacanthos inermis*) and Kentucky coffeetree (*Gymnocladus dioica*), and the branching habit must be high enough to allow pedestrians to walk comfortably beneath the trees. Other options are tall, narrow-growing (fastigiate or columnar) species, such as upright European hornbeam (*Carpinus betulus* 'Fastigiata') and English oak (*Quercus robur*). These trees can provide beauty, a look of uniformity, and a formal appearance to the shopping district.

Tree plantings in residential areas can be selected to match the existing types of trees growing on each street or can be selected to begin to develop a uniform look for a given street. To create unity, balance, and beauty on a street, it is advantageous to plant the same species or species of similar form and size on both sides of the street, if possible. Often, in older neighborhoods, one side of the street has utility lines, which precludes the use of large trees. The primary aesthetic role that street tree plantings can play in a residential neighborhood is to visually link individual homes into a unified scene. It is this unified quality that makes older neighborhoods with large mature trees so attractive in many communities. Either formal or informal planting schemes are appropriate for neighborhood streets. In most instances, medium- or large-growing trees, spaced so that their canopies overlap, are desirable. As always, a street tree planting program must have the objective of species diversity in mind at all times.

Tree Planting Program Assistance

Creative means of which to solicit contributions and help for tree planting will need to found. As with any tree planting program, funding and participation can often be achieved by soliciting certain sectors of the community. Businesses, institutions, and corporations in the City are often willing to donate funds for tree plantings in exchange for recognition in some way (either through the media, Arbor Day ceremonies, or memorial marker/plaque). Currently, Goshen Hospital has been a big contributor to planting trees in Goshen. The City should find a way to formally recognize the hospital's donations and reason for donations. The City should also continue to seek other opportunities of partnerships like this.

It is fully understood that a Citywide program will require maximum effort in the form of public relations to gain the support of the community. The City currently uses a 50/50 program to help fund tree planting on residential areas. The policy of this program requires residents to pay half and the City to pay half of the purchased tree. This has become an issue if residents are not willing or unable to contribute. In light of the issue, Goshen can become more involved in its urban forestry program using solid public relations techniques. The Shade Tree Board or a select group of residents can be responsible for organizing and implementing a campaign of public relations, education, and community financial support. Volunteer organizations, such as a garden club, service organization, or Boy/Girl Scout troop, can be recruited to build a public campaign and do the actual planting and after-care watering and maintenance activities.

Tree Planting Process

As trees are purchased through local nurseries or grown in Goshen's City nursery, one of the most important considerations should be species selection. This will aid in increasing species diversity throughout Goshen. To maximize environmental and economic benefits, Davey Resource Group recommends that Goshen purchase and plant large-growing trees as much as possible where site restrictions allow.

The City of Goshen, with the help of many volunteers, is investing in the development of a Municipal Tree Nursery in efforts to reduce the purchasing costs of new trees. Volunteers weed, mulch, and move trees as needed. The seed source comes from City trees, state nursery, and Arbor Day overflow.

Once the appropriate trees have been selected for planting, the most important detail to ensure success is the preparation of the planting sites. Appendix H explains the proper method of excavating a planting hole. In general, the tree-planting holes should be relatively shallow (typically slightly less deep than the height of the root ball) and quite wide (three times the diameter of the root ball). Care should be taken so that the root collars of the new trees are at the same level or slightly higher than the surrounding soil grade. In most situations, it is not recommended to add soil amendments to the planting holes as this can lead to severe differences between texture and structure of soils inside the planting holes and the surrounding soil. Such differences can lead to water either being wicked away from or accumulating in the planting holes.

Tree staking hardware should only be installed when necessary to keep trees from leaning on windy sites or to prevent damage from pedestrians and/or vandals. Stakes should only be attached to trees with a loose, flexible material, and all staking material must be removed within one to two growing seasons.

Tree Pruning

If the proper trees have been selected for each site, pruning young trees to improve branch structure is the most effective method of reducing maintenance costs as trees mature. At the time of planting, the only pruning that should be done is the removal of broken or dead branches. In the second growing season, minor pruning can be performed to remove branches with poor attachments, but it is still best to wait until the third growing season to perform the first training prune. In subsequent years, selective pruning should be performed to achieve the proper spacing of branches. See Appendix G for more information on proper pruning techniques.

Tree Purchasing

Tree prices, of course, vary based on the species selected, but many nurseries offer trees of 2.0-inch to 2.5-inch caliper for $100 to $150. As the City works at planting more trees annually, obtaining a good price for quality trees will become more important. Saving money on the cost per tree will allow a greater number of trees to be purchased.

Davey Resource Group believes that a good working relationship with a local nursery is very beneficial, but it is equally important that good prices and wide species availability be considered. It is recommended that Goshen continue to explore local and regional sources for trees and discuss pricing with the current nursery source(s). Due to the requirement to work towards species diversity, it may be necessary to use several nurseries as sources for trees. See Appendix H for detailed information.

Tree Species Diversity

Tree plantings add greatly to the aesthetic appeal of neighborhoods and species diversity among those new plantings should be of major importance. Silver maple (18.0%) and sugar maple (12.5%) make up 30.5% of Goshen's total tree population and the genus maple make up 50.3% of Goshen's total tree population. The dangers (diseases, insects, etc.)

of planting monocultures have proven to be devastating throughout the United States. The goal should be to increase species diversity throughout the City such that no one species represents 10% and that no one genus comprises more than 20% of the total public tree population. Consideration should be given to large trees, such as northern hackberry and white oak, which provide shade and are aesthetically pleasing.

Tree Species Selection

Goshen occurs in Zone 5b of the USDA Hardiness Zone Map, which identifies the climatic region where the average annual *minimum* temperature is between -15^{o} F and 10^{o} F. All tree species selected for planting in the City should be appropriate for this zone.

In addition to considering site characteristics, such as availability of space, soil pH, and irrigation, species-specific features must also be scrutinized. A major consideration for street trees is the amount of litter dropped by mature trees. Trees such as willows (*Salix* spp.) have weak wood and typically drop many small branches during a growing season. Others, such as American sweetgum (*Liquidambar styraciflua*), drop high volumes of syncarps (fruits). In certain species, such as ginkgo (*Ginkgo biloba*) and osage-orange (*Maclura pomifera*), female trees produce offensive/large fruit; male trees, however, produce no fruit. Furthermore, a few species of trees, including black locust, hawthorns (*Crataegus* spp.), and honeylocust (*Gleditsia triacanthos*), may have substantial thorns. These species should be avoided in high-traffic areas.

Seasonal color should also be considered when planning tree plantings. Flowering varieties are particularly welcome in the spring, and deciduous trees that display bright colors in autumn can add a great deal of interest to surrounding landscapes.

Above all, tree species should be selected for their durability and low-maintenance characteristics. These attributes are highly dependent on site characteristics as well as species characteristics. Matching a species to its favored climatic and soil conditions is the most important task when planning for a low-maintenance landscape. Plants that are well suited to their environmental and site conditions are much more likely to resist pathogens and insect pests and will, therefore, require less maintenance overall. Refer to Appendix I for additional tree species and cultivars suitable for planting in Goshen.

Recommendations for Updating Inventory

Goshen's current inventory has incomplete planting site information and has several inconsistencies among tree record's attributes. Goshen should consider a complete GPS/GIS-based inventory of all street trees and planting sites and park trees located within mowed and maintained areas. A complete and accurate inventory is the best way for the City to monitor the progress and cost-efficiency of its tree care operations. Inconsistencies found in raw data pertinent to this Management Plan include records with missing values in address, zone, DBH, condition, maintenance, and maintenance priority data fields. There are inconsistencies in other data attributes not pertinent to this Management Plan. The primary benefit of an accurate tree inventory is that the community can budget, plan, and anticipate tree-related problems and situations in the most cost-effective manner possible.

The best way to update and maintain the inventory is to commit to regular, routine data entry. The City Forester could create a simple form for use in the field that contains similar data fields as the tree inventory. This form can easily be used to record new plantings, changes in tree conditions and maintenance recommendations, and work histories. On a daily, weekly, or monthly basis, the information collected should be entered into the inventory database. This task can be performed by the City Forester, Street Commissioner, administrative support staff, seasonal staff, Shade Tree Board members, or trained volunteers. Any changes that occur in the City's tree population (removals, pruning, installations, etc.) should be updated regularly in the tree inventory.

A Davey Urban Forester measures the diameter of a tree before recording the data.

It is imperative that the tree inventory be kept current at all times for the benefit of Goshen's, Parks and Recreation Department, Street Department, Tree Board, and City residents. The City must establish procedures for keeping the tree inventory information current. Purchasing tree inventory management software or developing a customized asset management software system will keep accurate records of work completed on specific trees and track removals and pruning. Goshen's tree inventory and management software will prove to be invaluable tools in organizing, scheduling, and routing the needed work to be accomplished.

It is further recommended that a thorough inventory be performed every ten years or more frequently if rapid changes in the urban forest occur, such as severe storms, serious insect and disease problems, or a dramatic increase in new tree planting. Tree inventories should be performed by a professional urban forestry consultant, a Certified Arborist, or by properly trained City staff, Shade Tree Board members, or volunteers. Involving volunteers may assist in the inventory process which will increase public awareness and ownership of the urban forest; however, only a highly qualified professional should make the determinations of condition, maintenance requirements, and safety risk.

Recommendations for Evaluating Work Progress

This Urban Forest Management Plan is intended to provide urban forestry guidelines for the next ten years. In order to measure its effectiveness of the program implementation in achieving the stated goals, a method for updating the inventory and evaluating the management program should be followed. Specific accomplishments should be measured in comparison to the Management Plan's goals and recommendations. By annually evaluating the progress of the program, adjustments can be made in areas that are not meeting the program goals. These include:

- The completion of all identified Removals and Crown Cleans by 2016.
- The completion of all identified Priority 1 and 2 additional maintenances by 2017.
- Beginning in 2017 of the Program, annually compare the number of trees pruned to the goal set for the cyclical Large and Small Routine Pruning Program.
- Beginning in 2017 of the Program, annually compare the number of trees trained to the goal set for the cyclical Training Pruning Program.
- Beginning in 2012 of the Program, annually compare the number of trees planted to the number of removals and desired number of plantings based on the goal set for reaching full stocking by 2028. This goal only includes Removals and vacant planting sites identified in the 2010 inventory.
- At the end of each year, compare the City's annual urban forestry expenditures and number of tasks completed to that projected in this Management Plan's Ten-Year Urban Forest Management Program.
- Every five years, conduct an i-Tree Streets analysis as to see the benefits produced by managing Goshen's public trees through the Urban Forestry Management Program.