

EXECUTIVE SUMMARY

Odessa and Its Urban Forest

The Urban Forestry Program in Odessa, Texas is a new program which began in February 1995. An Urban Forester was cooperatively funded with City money and Federal money administered through the Texas Forest Service. Its purpose is to notify and advise Park Staff of the Urban Forest's condition and devise a management plan to adequately maintain and enhance City grounds.

Condition of the Urban Forest involves the assessment of each individual tree's size, health, species, and location. These four factors are the standards established by the Council of Tree and Landscape Appraisers in identifying monetary values.

A monetary value and the knowledge of the Urban Forest's condition will provide a means to develop a long term plan to sufficiently maintain the forest physically and financially.

Physical maintenance will include installation of trees, pruning of trees, fertilization, irrigation, and the application of pesticides. A monetary value will notify Odessa's Parks and Recreation Management of the Urban Forest's worth concerning improvements, in response to damages (natural and man-made) and renovations. Improvements can entail replacement costs and maintenance. A monetary value will provide a parameter for budgeting.

The following goals will substantiate the current Urban Forestry Program:

1. To determine the size and health of trees in conjunction with environmental and physical conditions.
2. To observe future needs in reference to pruning, fertilizing, insect control, disease control, utility clearance, etc.
3. To establish maintenance classifications in regard to pruning and tree conditions.
4. To estimate the monetary value of the Urban Forest utilizing appraisal standards developed by the Council of Tree and Landscape Appraisers.
5. To determine future tree planting needs and tree placements.
6. To enter field data into the appropriate computer software for better management of the Urban Forest and its expenditures.

Status as a Tree City USA is an additional goal. Recognition by the National Arbor Day Foundation of the City of Odessa would become national and be accredited to tree and environmental awareness. Also, more information should become available concerning programs and funding.

Four items are necessary to become a Tree City USA. An intact tree board, a positive minded tree ordinance, \$2 per capita for maintaining the Urban Forest, and a yearly scheduled Arbor Day celebration.

The Urban Forester is responsible for conducting an inventory and establishing a Tree Management Plan for Odessa in conjunction with the comprehensive Parks and Recreation Master Plan. The Urban Forestry Program will assess the present condition of the City's forest, recommend ways to improve its maintenance, assign a monetary value to the forest using the Guide to Plant Appraisal by the Council of Tree and Landscape Appraisers, and install the necessary tree data into computer software for future monitoring.

In the future, the Urban Forester is to implement the Management Plan, supervise tree management practices, train personnel according to the International Society of Arboriculture's (ISA) pruning guidelines, monitor conditions of the Urban Forest, maintain records of the Urban Forest, conduct community programs, and locate sources for additional funding.

INTENT AND PURPOSE

The Urban Forestry Program was piloted in Odessa in February 1995 in the City's Parks and Recreation Department and has resulted in an Urban Forest Management Plan. An Urban Forester, who is a Natural Resource Manager, was employed to develop the Management Plan under the Urban and Community Forestry Grant, administered by the Texas Forest Service. The Urban Forest Management Plan is to notify and advise the Odessa - Parks and Recreation management of the current conditions of the urban forest and suggest recommendations for the next ten years.

Odessa's Urban Forest includes shade and ornamental trees within their environment in and around the community. The Urban Forest Management Plan addresses a portion of the Urban Forest, which focuses on city trees on City property. Forty-seven areas consisting of 7 medians, 31 parks, 8 specialty areas, and the city's Tree Farm were inventoried systematically by the Urban Forester. Every area addressed has a corresponding map, developed by the City of Odessa's Engineering Department, to reference.

In reference, City maps indicate the number of trees and the species for an area. Trees are given a site number and each one is coded for its particular species.

In addition, computer software from the Davey Tree Expert Company/Resource Group, called TreeKeeper Jr. Plus has been obtained. Continual and easy monitoring of the Urban Forest is enabled by the computer software. Software capabilities include the Urban Forest's structure, composition, recognition of potential hazards, the classification of maintenance, and the storage of work records. Usage of the maps and the computer software are essential factors in adequately monitoring and updating changes in the Urban Forest for demands in Odessa.

METHODOLOGY

The completion of the Urban Forest Management Plan entailed several stages; 1. Field Reconnaissance, 2. Conduction of the Inventory, 3. Evaluation of the Inventoried Data, and 4. Development of the Management Plan. Each stage consisted of many steps.

A field reconnaissance was undertaken to familiarize and acclimate the Urban Forester to Odessa and its surroundings. The collecting of soil samples, a preliminary tree count, an initial species identification, preliminary research, and the examination of the City of Odessa's Engineering maps were performed in the operation.

A soil sample was extracted from each City median, park, and specialty area. Samples were collected in February and March of 1995, within or near the drip line of a tree. Most samples were within the drip line of a Siberian elm or Afghanistan pine. A soil probe was utilized to extract 4 - 6 plugs with a length of 6 - 8 inches. Samples were collected in soil sample bags and small ziplock bags. Each sample was labeled with the Location Number of the City area. The location of each sample was recorded under a Tree Site number on the Davey Tree Expert Company/Resource Group software, called TreeKeeper Jr. Plus. Each soil sample is recorded on a map of the City area provided by City of Odessa's Engineering Department.

The most current City maps from 1993 were examined to locate trees in the field and determine tree numbers in regard to removals and plantings. The number of past removals and plantings needed to be known for a comparative ratio.

Standards, forms, and a systematic method were devised to conduct the inventory. A tree's trunk diameter, height, crown spread, and percentage of existing canopy that is dead are measurable standards. Also the species, the presence of potential hazards (broken limbs, low overhanging branches, butt rot, tree cavities, and utility interferences), insects, diseases, exposed roots, the general condition of the tree, and special comments were noted. Other standards considered reflect prioritization of tree maintenance. Four classifications were developed to segregate trees by condition; Priority 1 - Minor pruning, Priority 2 - Preventive pruning, Priority 3 - Hazardous pruning, and Priority 4 - Tree Removal. A further explanation is illustrated in Appendix D.

Various forms were manufactured by the Urban Forester to sufficiently complete fieldwork (Appendix E); two forms to record standards needed in the inventory, a form to quickly inventory species in the City Tree Farm, a tree removal form, and a tree planting form. These forms are intended for use by park personnel to adequately monitor and update the work done and the conditions in the City of Odessa's Urban Forest.

City areas maintained by Odessa's Parks and Recreation Department were systematically inventoried. City Parks were first addressed, City Specialty Areas, secondly, and finally City Maintained Medians. A 100% tally was performed of existing trees planted at each City area, with the exception of Comanche Trail Park. Comanche Trail Park was divided into two sections; planted trees and naturally regenerated trees.

Recording each tree's trunk diameter was necessary for several reasons. A diameter provides a figure to reference in the field, a means to monitor vigor, and is essential in quantifying a monetary value per tree. Diameters were measured with a diameter tape, which is calibrated in conjunction to circumference. Measurements were taken at a height of 4.5 feet, unless the trunk forked at or below this level. If so, a measurement was taken 6 inches below the fork. In this way, the measurement reduced time in the field and provided a conservative number for appraising a tree's value. If a tree forked at ground level, each stem was measured at 18 inches from the ground. Measurement of the largest stem was maintained and half the total Measurements of the remaining stems were added to it. In concluding, diameters were taken between 18 inches and 4.5 feet in height.

Tree height is another measurement for future field reference, as well as, a means to determine vigor and an average height attained by a tree species in Odessa. Assessment of a tree's height required a 6 inch utensil and the knowledge of pacing in reference to chains. A chain is a means of measurement and is equal to 66 feet in length A pace equals 2 man-steps and is a subunit of a chain. Each person needs to calibrate his pace in reference to 66 feet, because every person's pace varies in length. Pacing was chosen as a quick and easy means to obtain tree height. The height of utility poles in the field were used to calibrate the Urban Forester's pace. Light poles for general lighting were approximately 25 feet and the baseball field light poles were about 40 feet. Utility pole heights were obtained from the City of Odessa's Engineering Department.

Tree height determination was recorded in the field to the nearest foot. The forester faced the tree in question, placed the 6 inch utensil about 2 feet from his eyes, and visually matched the utensil's ends with the top and base of the tree. The distance from the tree was determined from pacing. On the Davey Tree Expert Company/Resource Group software, the heights are recorded in ranges of 10 feet (ex. 0-10, 11-20, etc.).

Crown spread was assessed in the inventory to visualize a tree species size, the area shaded, and provide a means to determine water consumption. Assessment involved averaging 2 distances to the nearest foot; a north - south direction and an east - west direction. Within the TreeKeeper Jr. Plus software, crown spreads are coded in ranges of 5 feet (ex. 0-5, 6-10, 11-15, etc.).

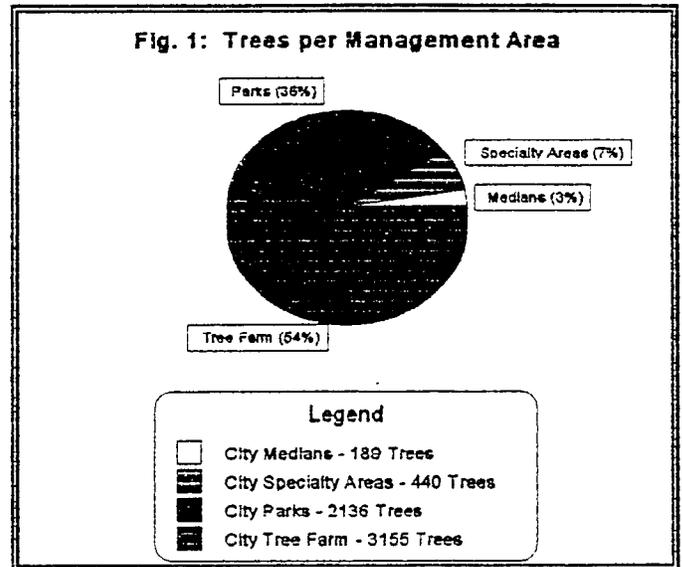
The percentage of each tree's canopy that is dead was determined to more effectively classify tree maintenance. Canopy death is an indication of a tree's decline and health and can largely quantify the level of attention each should receive. This measurement is very objective and is a highly visible estimation. The entire canopy (alive and dead) was taken into account for this measurement.

After the essential field data was collected, it was evaluated. City maps of areas maintained by Odessa's Parks and Recreation Department were updated by the City of Odessa's Engineering Department. Data was compiled and appraisals completed. Finally, the result is the existing Urban Forest Management Plan for Odessa, which provides recommendations.

RESULTS

The Parks and Recreation Department of Odessa conducted a tree inventory of public property, consisting of 47 management areas. An Urban Forester was utilized and funded jointly by the City of Odessa and with the Urban and Community Forestry Grant, administered through the Texas Forest Service. City property inventoried included 7 medians, 31 parks, 8 speciality areas, and the city's Tree Farm.

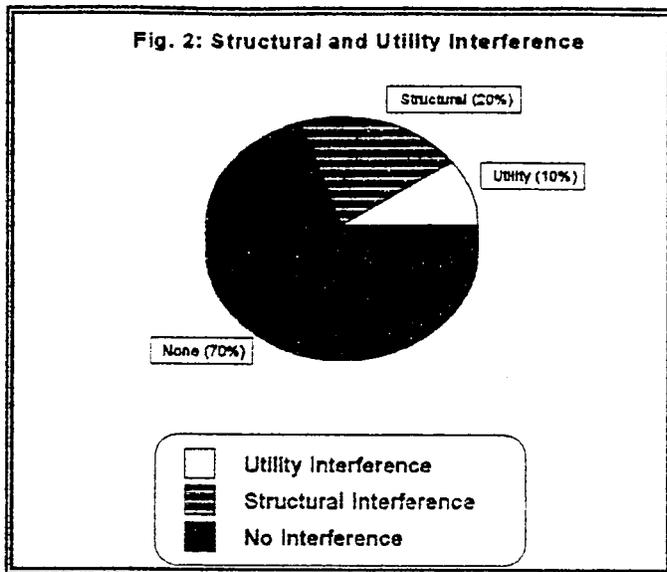
Utilizing a computer database, City Engineering, various state agencies, and personal resources, many aspects of the Urban Forest were reviewed for 1995. Total number of trees planted in the 47 areas was 5920. This excludes Comanche Trail Park's naturally regenerated region, called Monahans Draw. As of December, 1995, the various management areas contain 2136 trees in the city's parks, 440 trees in the city's speciality areas, 189 trees in the city's medians, and 3155 trees in the city's Tree Farm (Figure 1). Fifty-six tree species were found on city property. The city's Tree Farm has only twenty-five species, one-third of which are Afghanistan pines. Honey locust and Afghanistan pines compose 53% of the city's Tree Farm (Table 7.3).



The top four tree species with the most number of tree stems are the Siberian elm, Afghanistan pine, Southern live oak, and Honey locust (Table 7.2). Tree appraisals were calculated for the first ten tree species with the most number of stems (Table 7.7), which compose 85% of the total Urban Forest.

An average size tree on city property in Odessa is 10 inches in diameter, 25 feet in height, and has a 25 foot canopy spread. Overall, city trees are 94% in fair or good condition and the remainder are in decline or are dead. Many of the Siberian elms in decline are approximately 45 years old, suffer from the Wetwood disease, Elm Leaf beetle infestations, and pruning neglect.

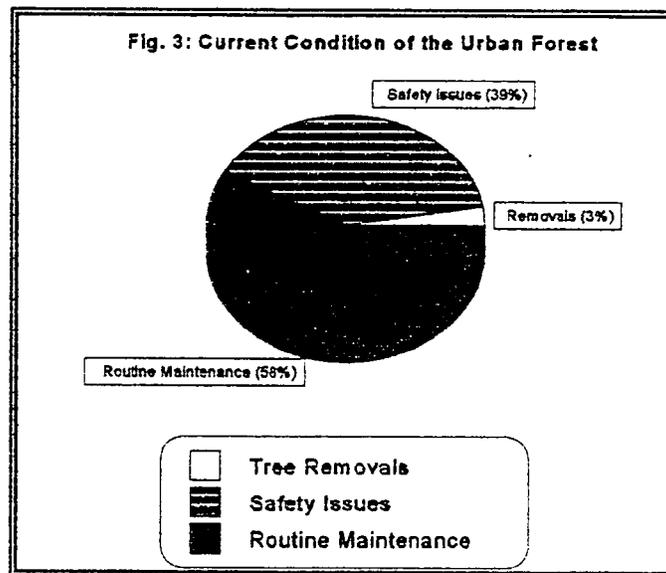
Insects, hanging broken branches in the canopy (hangers), leaf scorch, and trunk wounds were problems often noticed in the Urban Forest. These accounted for 60% of tree health problems. Troublesome insects include the Pine Tip moth on immature Afghanistan pines, foliage-feeding aphids on oaks, the Elm Leaf beetle, the Cynipid wasp, and boring insects. Leaf scorch is the result of heat stress, lack of water, and salty water. Trunk wounds are a result of grass trimming and ruptured Cambium cells from freezing temperatures. Other important problems include



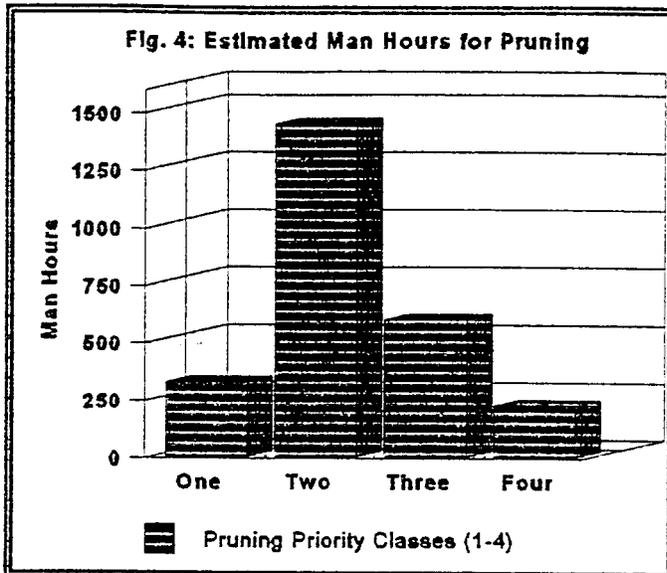
structural (building, sidewalk, road, parking lot, fence, utility pole, playground, picnic tables, and athletic courts) clearance and utility (power lines) clearance. Interference concerns involve 30% (834 trees) of the trees in the Urban Forest (Figure 2). One-third of those trees involve utilities.

Identifying problems and classifying the overall condition of each tree in the Urban Forest allows prioritization of tree maintenance. Maintenance revolves around improving aesthetics, through alleviating hazards by pruning, fertilization, and pesticide applications. Odessa's Urban Forest has a little over

1600 trees that require minor pruning or preventive pruning. Another 1065, involve safety circumstances, such as hangers and utility clearances. Finally, 82 trees await removal in 1996 (Figure 3 and Table 7.8). To quantify the maintenance classifications, man hours were assigned to each of the four priorities (Figure 4). The following hours are approximate lengths of time for pruning in 1996. Priority 4, the most crucial, needs an estimated 225 man hours. Priority 3, trees in decline, has an estimated 600 man hours. Priority 2, the majority of the trees, needs to receive approximately 1450 man hours, and Priority 1, requiring minor



pruning, needs about 325 man hours. Total estimated man hours for pruning, in order to improve tree conditions and health, is 2600. Man hours were calculated from a number of tree stems multiplied by an average length of time per stem. An example is the removal of 31 Siberian elms each in four hours, resulting in 124 man hours. Another 51 trees of various species are to be



The tree inventory was conducted on approximately 483 acres, of which 142 acres has a naturally regenerated forest (Comanche Trail Park). A 100% tally was performed on planted trees in each management area maintained by the city's Parks and Recreation Department. Average trees per acre was determined with 2765 planted trees found on 341 acres, which excludes the city's Tree Farm and the naturally regenerated region of Comanche Trail Park. Each acre averaged 8 trees (Table 7.1).

An assessment of shade coverage was performed for trees in the city medians, city parks, and city specialty areas.

Canopy spread permitted this determination. Total surface area shaded in city management areas is approximately 31 acres or 9% of 341 acres (Table 7.4).

The Tree Farm is more than adequate to replace the number of stems in each management area, but it lacks in species diversity. In the past (January 1993 - April 1995) 28 months, Odessa's Parks and Recreation Department has removed 254 Siberian elms (Table 7.5). During the same 28 months, the city's Parks and Recreation Department planted 293 trees from 8 species at 8 different management areas (Table 7.6). Data was derived from updating management area maps and field checks. Ail tree plantings, but 40 were funded with SBA grant money. Afghanistan pine is the most heavily planted tree species (134). Growth rates of this species in Odessa, average approximately 2 feet per year. The following 7 tree species are arranged in descending order, according to the number of stems planted; Desert willow (41), Aristocrat pear (39), Honey locust (28), Arizona cypress (19), Southern live oak (15), Mexican redbud (10), and Texas red oak (7). These results are to illustrate and notify management of circumstances that pertain to the Urban Forest of Odessa and were a basis to form recommendations.

RECOMMENDATIONS

The following List of Statements are intended as suggestions for managerial consideration. Each recommendation is accompanied with a brief explanation. The List of Statements will be subdivided into sections. These sections signify management practices for Odessa's Urban Forest. Recommendations will terminate with a Time Line of Operations.

Plantings

1. Double the number of Trees/acre.
Trees/acre should be between 16.
*Increase shade, beautify park, increase usage, protect turf in summer months.
2. Double staking of small trees for one year, using stakes and material to safeguard trunk chafing. (Apply to trees below 6 feet and/or 2.5 inches in diameter at breast height).
*Provide stability during windy conditions until roots are established.
3. Application of mulch above soil surface and incorporate 1-2 inches into soil at drip line to stabilize during windy conditions.
*Retain moisture, reduce weeds, lower temperature, provides organic matter (nutrients), allows for aeration, may filter salt from water, and can provide an environment for microorganisms.
4. Holes dug for transplantable trees, need to be 12 inches wider and deeper than the root ball of the tree and filled with soil, as well as, loosening the surrounding soil.
*Provide area for root expansion, to lessen shock.
5. Soil conditioner should be added when trees are replaced in existing holes if not done in two years.
*Add nutrients and increase soil porosity, because composted cotton burrs decompose in two years.
6. Tree should be transplanted from the City's Tree Farm to management areas when approximately 3 inches in trunk diameter is measured at 18 inches in height, the tree is 6-8 feet in total height, or the tree is 4 years of age.
*Reduce vandalism
*Increase survival rate.
7. Tree spacing between individual and structural facilities in the various City Management Areas, excluding the growing practices in the City Tree Farm, should be preferably 25 feet. Medians, parking lots, and heavily developed areas with several structures may demand site discretion in reference to species, root expansion, and future hardscape problems.

*Provides an adequate growth area, because of moderate tree growth rates and the average size tree in Odessa's Urban Forest.

*Provides sufficient area to maneuver turf mowers.

8. Tree plantings near utility corridors, especially permanent ones maintained by an electric company, should be preferably 15 feet from the powerline. Trees planted under a powerline, need species consideration and site discretion (small and medium sized trees at maturity, 25 foot and less in height).

*Prevent future liability negotiations with an electric company.

*Reduce future pruning maintenance by the electric company or by the City of Odessa.

9. Street Tree characteristics should include the following; deciduous, drought tolerant, cold hardy, fruitless, and thornless.

*Alleviate visibility problems.

*Reduce tree debris on roadways.

*Reduce injury to persons.

Suggested Tree Species:

Live oak

Raywood ash

Little walnut

Western soapberry

Cedar elm

Mexican elderberry

Thornless honey locust

10. Characteristics of Tree Species in Utility Corridors should include the following; small to medium sized trees (25' and less) and deciduous or evergreen species.

*Reduce utility interference.

*Reduce maintenance.

*Reduce need to alter/misshapen tree form

Suggested Tree Species:

Live oak

Mexican elderberry

Cedar elm

Western soapberry

Chaste tree

Pinon pine

Tree Farm

1. Increase number of deciduous tree species. (Refer to Taxonomy section of Management Plan for potential species to introduce.)

*Lessen number of evergreens.

*Diversify the tree species in the Urban Forest.

*Reduce the potential of insect and disease problems in epidemic proportions.

*Reduce concentrations of one species in an area.

2. Obtain more tree stock from western sources (Midwest to California).
 - *Tree qualities are more adept to Odessa's climate than eastern stock
 - *May reduce maintenance costs.
 - *May improve survival rates.

3. Expand the Greenhouse facilities.
 - *Accommodate tree seedlings to be transplanted into the tree farm.
 - *Relieve facilities used to propagate horticultural materials.
 - *Provide an area to germinate seed and propagate seedlings.

4. Tree spacing between rows is suggested at 10 to 12 feet for tree spade activity.
 - *Ease accessibility.
 - *Reduce soil compaction.
 - *Reduce tree damage.
 - *Allow for plowing soil.

5. Tree spacing between trees in a row is suggested at 8 feet for tree spade activity.
 - *Ease accessibility.
 - *Reduce tree damage.

6. Tree plantings in 1996 for various City areas, utilizing 77 trees from the City's Tree Farm.

12 Afghanistan pines	Sherwood, Floyd Gwin
15 Arizona cypress	Comanche Trail, Central, Saunas
6 Bur oak	Crump, Casa Bella, McKinney, U.T.P.B.
2 Cedar elm	4th and Grant, New Developments
1 Chinese pistache	New Developments
15 Desert willow	Comanche Trail, Lions Club, D. L. Murphy
14 Honey locust	Optimist, Southside Ballfield, Woodson, U.T.P.B.
1 Live oak	New Developments
11 Pinon pine	Central, Woodson

Support Services

1. Add a 486 or better IBM computer work station with a database for the tree inventory (TreeKeeper, Jr. Plus), with capabilities in word processing, spreadsheets, graphing, and Auto CAD Light for landscape designing.
 - *Computer access to Assistant Director of Parks and Operations Supervisor without interrupting secretaries or putting in overtime to update the Tree Inventory Database.

2. Extend Urban Forestry Program by cost-sharing with another Department within the City of Odessa, such as Public Works, Building Inspection, or Community Development.
 - *Increase funding.

- *Share departmental duties.
 - *Increase focus in Beautification and Risk/Hazard maintenance.
3. Design and publish a tree planting guide as a brochure, which provides proper planting techniques, illustrations, and a list of tree attributes. A cooperative effort with Keep Odessa Beautiful and other organizations is suggested.
 - *Promote tree planting.
 - *Increase environmental awareness.
 - *Provide a public service.

Computer Database

1. Upgrade TreeKeeper, Jr. Plus.
 - *Increase capabilities with work orders, especially in documenting work completions to a Work Request Number.
 - *Expand configuration of particular database fields.
2. Update tree inventory data and work records for TreeKeeper Jr. Plus at the end of each month.
 - *Provide current and accurate records and reports.
 - *Provide monthly and annual reports.
 - *Indicate relatively current conditions of the Urban Forest in Odessa.
3. Track work completed in Urban Forest using the Forest Management Forms (Appendix E).
 - *Documented work records for entry on database.
4. Suggest a work record be developed on TreeKeeper Jr. Plus or hand written, then filed for every Tree Site Number which was replaced in a city management area.
 - *Allow a Site Number to be edited, according to present conditions of the Newly Planted Tree without compromising records of past site conditions.
 - *Allow easy modification of initial tree inventory.
 - *Allow easy and accurate interpretation of reports, without misrepresenting the number of trees in an management area.
 - *Alleviate unnecessary modifications to the Tree Site Numbers on the Urban Forest Maps in the future.

Urban Forest Maps

1. Update maps, annually, and submit changes to the City of Odessa's Engineering Department in October and/or November.
 - *Provide time for changes.
 - *Utilize current maps at the beginning of new years, especially with tree removals and tree plantings.

Pruning

1. Incorporate into Departmental practices as a year long project, except in the months of spring.
 - *Increase amount of time used to improve City property aesthetics.
 - *Increase health and longevity of the Urban Forest.
 - *Allow personnel to evaluate the condition of Urban Forest regularly.
 - *Allow personnel to methodically update computer database in accordance with maintaining current records.

2. Follow appropriate practices illustrated by the International Society of Arboriculture (ISA) in the publication, Tree-Pruning Guidelines (Figure 9.1). More extensive pruning guidelines may be found in the publication, ANSI 300 Pruning Standard, available through ISA.
 - *Prevent the practice of leaving branch stubs.
 - *Reduce insect infestations.
 - *Reduce the occurrence of decaying and rotting wood.
 - *Properly train branching of young/juvenile deciduous trees.

3. Initially address City areas highly visible by traffic, areas heavily utilized, and areas containing many Siberian elms.
 - *Improve aesthetics.
 - *Increase community visitation.

NOTE: These groups arranged in descending order are intended as a guide in addressing the pruning needs for each Management area.

Group A. Floyd Gwin, Jim Parker, McKinney, San Jacinto, Sherwood, and Woodson.

Group B. Central, Crump, Eastside, O'Conner, Polyantha, and Royalty.

Group C. Freedom, Murry Fly, Optimist, and U.T.P.B.

Group D. Medians and Specialty Areas.

Group E. Bellaire, Comanche Trail, Mark Henderson, Noel Plaza, Progressive, Saunas, and Slator.

Group F. Buchanan, D. L. Murphy, Frederick Douglass, Lions Club, Modern Gardeners, Southside Ballfield, and Western Manor.

4. Summer, fall and winter are the best seasons to prune.
 - *Tree growth and sap flow are reduced.
 - *Fewer insects.
 - *Fewer tree sprouts to form at pruning wounds.

5. Use black pruning paint on oak trees on wounds 1 inch and larger, if wound occurs between the months of February and June. Especially, if many Texas red oaks and live oaks are located near each other in a Management Area.

*Prevent an occurrence of oak wilt, as Midland, Texas has reported.

*Mask a tree's pheromones by exposed sap at wound that may attract insects transporting the oak wilt fungus.

6. Create a full-time crew, responsible for pruning cycles and city liabilities. (Tree removals and hangers.)

*Alleviate hazards.

*Improve tree health.

*Beautification of Management Areas, especially Comanche Trail Park.

Pruning Cycles

1. Each year, scheduled pruning should follow this order:

a. Priority 4

c. Priority 2

b. Priority 3

d. Priority 1

*Alleviate the most hazardous conditions first.

2. Over the next 10 years many tree species need to be pruned, either annually or every so many years.

Cycle 1: Prune annually.

Priority 4

Dessert willow

Priority 3

Redbuds

Siberian elm

Purple-leaf plum

Russian olive

Crape myrtle

*Reduce city liabilities.

*Reduce the number of tree suckers (sprouts), improving species aesthetic qualities.

Cycle 2: Prune every other year.

Pecan

Ashes

Little walnut

Cedar elm

Honey locust

Mulberries

*Reduce crowding of branches, inhibiting tree health.

*Reduce dead limbs.

*Most species are Priority 2.

Cycle 3: Prune every third year.

Oaks

American sycamore

Ornamental pears

Common hackberry

Chitalpa

Deciduous holly

Chinese pistache

Yapon holly

- *Most species are Priority 1 or 2.
- *Pruning is low maintenance.
- *Most have slow to moderate tree growth

Cycle 4: Prune every fourth year.

Goldenrain tree	Pines
Honey mesquite	Western soapberry

- *Tree health is good.
- *Minimum pruning maintenance.

Cycle 5: Prune every fifth year.

Arizona cypress	Bald cypress
Arborvitae	Eastern red cedar
Ashe juniper	Italian cypress

- *Most are evergreen.
- *Tree growth is slow.

Soil Samples

1. Collect a sample from each Management Area every third year.
 - *Determine if soil nutrients are adequate for tree growth.
 - *Determine soil pH.
 - *Determine if change in fertilizer is needed, especially in phosphorus, potassium, and chelated iron.

Tree Species

1. Refer to the Taxonomy in Appendix A, especially species to introduce.
 - *Tree stock located west of the Permian Basin.
 - *Few new species have been developed and marketed. Many species survival and growth are unknown in West Texas.

Irrigation

1. Water deeply (at least moisten soil to a depth of 1 foot) and infrequently (2 to 3 times in a week in the summer and less in the cooler months) with a bubbler system.
 - *Reduce root rot.
 - *Reduce chlorosis.
 - *Reduce mineral displacement by salts.

Test Plots

1. Apply iron as a granule or foliar spray, on trees with chlorotic symptoms.

Target these city management areas with chlorosis:

Floyd Gwin (Slash pine)

Noel Plaza (Afghan pine)

Optimist (Afghan pine)

U.T.P.B. (Live oak)

Hwy 80 and Pkwy (Texas red oak)

Species to observe for chlorosis:

Texas red oak

Slash pine

- a. Iron as a granular form, should be applied in the winter months as a chelate (example Sprint Fe 138) or as a 1:1 mix of iron sulfate to sulfur. Applications should be applied below the soil's surface and could be placed in a number of holes around the tree and water in deeply.

Chelate: (expensive)

*More available to tree, once applied to soil.

Iron sulfate to sulfur: (least expensive)

*Mixing sulfur with iron sulfate will help lower pH, therefore make iron in compound more available to the tree.

- b. Iron as a foliar spray, is the most expensive method to correct iron chlorosis. Sprays should be applied in the spring to lessen the yellow color of new foliage. More than one application may be necessary. Affects only sprayed foliage, fastest acting, and may stain sidewalks.

Suggested products:

Iron sulfate sprays

*Least expensive foliar spray, but may stain sidewalks and burn foliage if applied during the heat of the day.

Iron chelate sprays

*Very expensive and do not burn foliage.

2. Apply pesticides to reduce insect populations in the evening (5 to 10 p.m.) or early morning hours (5 to 7 a.m.), because of less wind turbulence and reduced public usage.

- a. Sevin: Apply 3 weeks before foliage appears. Approximately late March. To treat the Elm Leaf beetle in its egg and larva stages.
 - b. Dursban: Apply on trunk and lowest limbs in March. To treat egg and larva stage of Elm Leaf beetle.
 - c. Malathion: Apply from mid-May to early June. To treat Elm Leaf beetle in adult stage. Use at Comanche Trail Park only.
 - d. Orthene: Apply in spring on Southern live oaks and Pecan with aphids and lacebugs.
 - e. Borasol: Mix with dormant oil. Apply in spring (April - June) and Fall (September - October). Treat for boring insects. Use on the trunks of the Aristocrat pears in the median of Grant Avenue, because tree species is in harsh conditions and suffers sun scald. Use on the trunks of Honey locust trees that are less than 10 inches in trunk diameter, because of exposed sap flows and great susceptibility to boring insects.
 - f. Summer weight oil: Apply in spring on Southern live oaks and Texas red oaks that suffer from wasp galls, because these galls are aesthetic deformities. Apply in spring and fall for aphids.
3. Apply soapy water in spring to Southern live oaks as a substitute to Orthene and Summer weight oil, to treat the deforming results of various wasp galls and to treat aphids.
*Less cost.

Comanche Trail Park

- 1. Spend 3 to 4 months on clean up efforts.
*Perform sufficient clean up.
- 2. Mulch deadwood and the tops of dead leaning trees after workers fell them.
*Recycle and reuse for organic matter in open spaces along trail.
- 3. Incorporate refined mulch (twice mulched) into soil by plowing.
*Increase organic matter.
*Prepare soil for seeding with wildflowers.
- 4. Reduce the number of stems that are 2 inches in trunk diameter and less, 20 feet on either side of the paved walkway, especially between Southside Ballfield and McKinney Park.
*Increase visibility.
*Create an open vista.
*Create open areas to plant wildflowers.
*Alleviate hazards.

5. Sponsor a Wildflower Seed Toss for parents and toddlers, during the March of Dimes walk or during the Arbor Day celebration.
 - *Increase aesthetics.
 - *Increase community involvement.
 - *Increase environmental awareness.