COURSE CODE:	FRM 510
COURSE TITLE:	URBAN FORESTRY (UF)
NUMBER OF UNITS:	2 UNITS
COURSE DURATION:	2 Hours per week

COURSE DETAILS:

Course Coordinator: Dr. M.F. Adekunle *B.For, MF, PhD*
Email: adekunlefm@yahoo.com

Office Location: COLERM
Other Lecturers: Prof. S.A. Oluwalana

COURSE CONTENT:

Introduction, UF through history, the values of UF, tangible benefits, environmental services, social benefits, urban tree benefits; urban trees, woods and health, urban heat island effects, air quality, biodiversity, civic amenity and economic benefits, tree planting guide, 4 P's of UF (pick it, plant it, pamper it and prune it).

COURSE REQUIREMENTS:

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This course is a core course and is required for all Forestry option students in the department of Forestry and Wildlife Management. In view of this, students are expected to participate in all the course activities and have minimum of 75% attendance to be able to write the final examination.

READING LIST:

Adekunle, M.F, Momoh, S.and Agbaje, B.M .(2008). Valuing urban forests: The application of Contingent Valuation Methods. *Ethiopian Journal of Environmental Studies and Management (published by ;Department of*

Geography, Bahir Dar university ,Bahir Dar ,Ethiopia) 1 (2) 61-67.
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3. Maas, J., Verheij, R.A., Groenewegen, P.P., de Vries, S. & Spreeuwenberg, P. (2006) Greenspace, urbanity and health: how strong is the relation? Journal of Epidemiological Community Health, 60, 587-592.

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14. NAA/ISA. 1991. The importance of large tree maintenance in mitigating global climate change. National Arborist Association, Amberst, USA.

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LECTURE NOTES

URBAN FORESTRY

Although trees have been an important part of human settlements throughout history, only recently has their full value to urban dwellers been recognized. Trees and green spaces play an important dole in improving city living conditions. In the past, urban forestry in developed countries was considered almost exclusively on the basis of its aesthetic merits. Now, a closer look is being given to the environmental services and quantifiable economic benefits they provide. This article discusses the role of trees in and around densely populated areas.

INTRODUCTION

Urban forestry has as its objective the cultivation and management of trees for their present and potential contribution to the environmental, social, and economic well-being of urban society. Urban forestry is a merging of arboriculture, ornamental horticulture and forest management. It is closely related to landscape architecture and park management. In its broadest sense, urban forestry embraces a multifaceted managerial system that includes municipal watersheds, wildlife habitats, outdoor recreation opportunities, landscape design, recycling of municipal wastes, tree care and the production of wood as a raw material.

Urban forestry includes activities carried out in the city centre, suburban areas and the "urban fringe" or interface area with rural lands. Forestry activities can differ significantly according to the zone. In central areas, the potential for significant new urban forestry efforts are relatively limited in most cities. Here, it is mainly an issue of maintaining or replacing trees planted long ago.

In the suburban areas, more scope exists for tree-planting, as the availability of land is greater than in the city centre. The land is more likely to be privately owned than in the peri-urban or fringe area and the people more settled, thereby having a greater vested interest in tree protection and care.

There are many differences between the management of trees in an urban environment and "traditional" rural forestry. In many cities, trees are a minor part of the landscape, particularly in the centre. Cities present harsh conditions for tree growth. Even in those which have large tree cover in their central urban area and/or suburban areas, management is complicated by the fragmentation of green space. The objectives of tree-planting, the location, the configuration of planting and the management of the trees in urban areas differ from those in rural areas.
Socioeconomic conditions and requirements can be quite different and more variable in a city than in the countryside. In addition, the availability of technical information on which management decisions on urban/peri-urban forestry can be based is still limited, particularly in developing countries (Kuchelmeister, 1991).

URBAN FORESTRY THROUGH HISTORY

The planting of trees in human settlements and as an integral part of landscape architecture is now new; it has its roots in ancient Chinese, Western Asian and Greek civilizations (Jellicoe, 1985). A number of ancient cities had highly developed parks, gardens and other green spaces – the most notable being Babylon, "the mother city of gardens," dating back more than 3,000 years. The Assyrian civilization and, much later, the classical Persian and Greek civilizations arising in the fifth century BC, also had such a tradition, based on amenity as well as cultural and religious beliefs. In Europe in the seventeenth and eighteenth centuries, municipal and crown forests were managed for recreational hunting. Later, the elite developed urban gardens and parks as visual amenities in many European cities, particularly Italy, France, Austria and England. The practice of urban amenity plantings subsequently spread to colonies in Africa and Asia. Spanish colonization introduced into Latin America the concepts of interior patios in houses and public plazas in urban centres. Throughout history, the planting and management of trees and forests has been based much more on aesthetic and spiritual values than on utilitarian benefits.

THE VALUE OF URBAN FORESTS

The list of goods and services that urban forestry can provide is impressive. Trees and green spaces help keep cities cool, act as natural filters and noise absorbers; improve microclimates and protect and improve the quality of natural resources, including soil, water, vegetation and wildlife. Trees contribute significantly to the aesthetic appeal of cities, thereby helping to maintain the psychological health of their inhabitants. Beyond ecological and aesthetic benefits, urban forestry has a role in helping resource – poor populations meet basic needs, particularly but not exclusively in developing countries.

TANGIBLE BENEFITS

Beyond their aesthetic and ecological value, trees can contribute to the satisfaction of energy requirements as well as the daily food requirements of urban dwellers, particularly in the case of the poorest elements of society.

- Food production Urban agriculture is common in many cities in Asia, Latin America and Africa (Yeung, 1987; Sanyal, 1985; Streiffeler, 1987; Ninez, 1985; Skinner, 1981). Who and how many people practice it as well as what form it takes differ greatly from place to place. It is most often practiced in the urban fringe area by low-income families but, in places such as Africa and the Pacific Islands, urban agriculture is widespread within cities. Although the production of vegetables, fruits and condiments, urban agriculture can contribute to the improvement of the nutritional value and variety of city dwellers' diets.

Fruit-trees are often an important component of urban home gardens. In some places, trees are planted to help supplement fuelwood and fodder needs and even to provide raw materials for handicrafts. The role of agroforestry in improving productivity and diversifying production should be examined – it is a field that should become much more important in the future.

In many developing countries, particularly in Africa and Latin America, about half the low – and moderate-income households moving into cities will be headed by women. Urban agroforestry will not only be important to household

nutrition but may offer a source of income while allowing women to stay at home.

- Fuelwood Wood fuel provides between 25 and 90 percent of urban household energy supplies; it is particularly important as a source of energy in smaller urban centres in developing countries, especially in dry zones (Kuchelmeister, 1988). Poor urban households spend a significant proportion of their cash income in obtaining wood energy. If the urban poor population continues to grow, an increase in the consumption of traded wood fuel is likely to be a consequence. Under favourable circumstances, fuelwood from non-rural forests and agroforestry systems can contribute significantly to fuelwood supply.

- Timber Availability of an adequate timber supply is a problem for a growing number of households in developing countries. Principle sources of timber in urban areas are plantations, street trees, shelterbelts or windbreaks and greenbelts, parks and gardens. In many cities timber harvesting is combined with intensive outdoor recreation activities. Systematic planting of street trees for timber production is widely practiced in China and Malaysia (Webb, 1998). Some cities in industrialized countries offset the costs of tree care through harvesting of trees.

ENVIRONMENTAL SERVICES

As a result of the predominance of concrete buildings, asphalt and metal as well as the concentration of transport systems and industrial activities in and around urban areas, the median temperature is higher (the "heat island" effect), the air is drier and often polluted, rainfall is less efficiently absorbed and the environment is generally noisier than in a rural setting.

- Cleaning the air One of the major problems in urban areas is poor air quality. Plants help remove pollutants from the air in three ways: absorption by the leaves or the soil surface; deposition of particulates and aerosols on leaf surfaces; and fallout of particulates on the leeward (downwind) side of the vegetation because of the slowing of air movement.

Research on the removal of airborne pollutants by vegetation shows that plants are effective sinks for pollution. Trees absorb sulfur dioxide very efficiently. Keller (1979) has quantified and 85 percent reduction in lead behind a shelter-belt of trees. Soil effectively absorbs gaseous pollutants, including carbon

monoxide, sulfur dioxide, nitrogen oxides, ozone and hydrocarbons. Trees intercept dust: a belt of trees measuring 30 meters in width has been found to intercept almost all dust in the air. Trees also often mask fumes and disagreeable odours by replacing them with more pleasing scents or by actually absorbing them. Trees also help to increase the relative humidity of urban air through evapotranspiration.

- Modifying temperature extremes Trees, shrubs and other vegetation help to control temperature extremes in urban environments by modifying solar radiation. The shade of one large tree may reduce the temperature of a given building to the same extent as would 15 air conditioners at 4000 British thermal units (BTU), i.e. 4220kJ, in a similar but unshaded building. Energy saving through tree-planting around houses ranges from 10 to 50 percent for cooling and from 4 to 22 percent for heating (NAA/ISA, 1991).

- Noise reduction Noise is often referred to as invisible pollution. Excessive noise levels in most major cities contribute to both physical and psychological damage. Trees can help both by absorbing and refracting or dissipating noise such as that produced by the heavy vehicular traffic which characterizes urban areas.

- Water use, reuse and conservation Urban forests can help in the protection of urban water supply, wastewater treatment systems and storm water management. Most poor cities face significant wastewater treatment challenges and could integrate stabilization ponds into park systems and reuse wastewater for urban forestry. Reusing city wastewater not only recharges aquifers but also reduces the demand exerted on scarce water reserves. The greatest potential of wastewater reuse is in arid zones in developing countries (Braatz, 1994; Kuchelmeister, 1998).

Protection of the suburban and rural areas that serve as the source of cities' water is a traditional urban forestry linkage, but to be successful such projects must be integrated into urban planning.

- Soil conservation Trees and forests are a means of soil conservation, preventing landslides in fragile ecosystems with steep terrain, little vegetation and harsh seasonal rains, and thus protecting people's lives and homes.

- Biodiversity Green areas have a vital role in urban biodiversity. Suburban wetlands can be some of the most productive natural ecosystems and can

provide important habitats for fauna. Incorporating green areas in networks will improve biological conservation and biodiversity; greenbelts and greenways (linear parks) can serve as biological corridors (IUCN, 1994).

SOCIAL BENEFITS

- Improving the aesthetic quality of urban areas it is the aesthetic and recreational value of trees, forests and parks that is most directly identified by most urban dwellers, in developed and developing countries alike. Trees fulfill certain psychological, social and cultural needs of the urban dweller (Dwyer, Schroeder and Gobster, 1991). They play a very important social role in easing tensions and improving psychological health; people simply feel better living around trees. One study has demonstrated that hospital patients placed in rooms with windows facing trees heal faster and require shorter hospital stays (Ulrich, 1990). When appropriately selected and placed, trees are effective in screening out undesirable views and ensuring privacy while permitting free visual access to the rest of the landscape. Parks provide easily accessible recreational opportunities for people.

- Health Parks and green areas provide opportunities for healthy physical activity. In addition, the passive benefit to physical and mental health of an urban landscape with trees has been documented in industrialized countries (Ulrich, 1984); enjoyment of green areas may help people to relax or may give them fresh energy.

Improving air quality through the planting of vegetation certainly has an impact on health, with such obvious benefits as decreased incidence of respiratory illnesses. Urban forests can also contribute to food security, as discussed above.

- Employment Tree planting and especially urban agroforestry systems can be labour intensive and provide work opportunities which may be especially important in poorer cities. In wealthier countries arboriculture is a significant business. Urban forests and green areas also provide opportunities for any kinds of formal and informal enterprise related to recreation.

- Education Urban forests are increasingly appreciated in environmental education. A number of cities both in industrialized and developing countries have botanical gardens, zoos, nature trials and visitor information centres that can inform people about flora and fauna. Easily accessible trees and woodlands provide a vital facility for both formal and informal learning.

- Recreation Urban forests greatly enhance outdoor recreation. Lower income residents tend to frequent city parks more than wealthier citizens do because they lack the financial means and leisure time to reach more distant recreation sites. To be useful to low income people, forests and green areas must be within an affordable traveling distance and must have the amenities that people desire.

- Community building and property value improvement Public involvement with trees in towns can help strengthen neighbourhood communities by providing people with an opportunity to work together for the benefit of the local environment (NUFU, 1998).

Studies have shown an increase in house price where property is associated with urban trees, for example up to 5 percent in Hong Kong (Webb, 1998) and in the Finnish town of Salo (Tyrvalmen, 1999) and up to 18 percent in the United States (Morales, Micha and Weber, 1983). In Singapore and Kuala Lumpur it has been recognized that a tree-rich urban landscape is an important attraction for new businesses and investors (Kuchelmeister, 1998).

URBAN TREE BENEFITS

INTRODUCTION

More than 80 per cent of us live in urban areas, and many more work or spend a substantial part of our lives in and around towns and cities. They are important for us socially and culturally, they are the places where we live and work, raise families, socialize and relax, from which we draw identity and pride. The quality of urban areas is of great importance.

Good architecture and design are clearly essential, but of equal importance is the quality of the green space. Public parks and gardens, the landscaping around buildings, street trees and highway verges, the wilder corners along river banks and canals, on railway sidings and industrial sites, and our own gardens.

Trees are often the dominant features of green space; their stature and beauty make them the defining elements of urban spaces. They cast shade in the heat of summer, provide shelter from the rain and wind, help to keep the air clean

and breathable, support wildlife, and add value to the culture and economy of our towns and cities.

URBAN TREES, WOODS AND HEALTH

Trees and woods are vital to health and wellbeing. There is a strong relationship between the quality of urban green space and people's health and wellbeing (1, 2, 3). Increasing tree cover mitigates some of the effects of a warming climate, reduces the impacts of poor air quality, and increases the opportunities for people to adopt a healthy lifestyle.

URBAN HEAT ISLAND EFFECT

Increasing tree cover in urban areas can help mitigate the 'urban heat island effect'. This occurs as the buildings, concrete and other hard surfaces such as roads act as giant storage heaters, absorbing heat during the day and releasing it at night. The resultant effects can be dramatic; on some days there is a difference of as much as 10°C between central London and its surrounding suburbs (4). Projections for our changing climate suggest this problem will get markedly worse.

Higher temperatures increase ground level ozone exacerbating the symptoms of chronic respiratory conditions. In addition prolonged high temperature can bring on cardiovascular or respiratory failure or dehydration, particularly amongst the elderly, very young or chronically ill (5). In the 2003 summer heat wave over 2,000 people died in Britain alone and more than 35,000 died across Europe as a result of the heat.

Green space, and trees in particular, provide both direct shade and reduce the temperature through the cooling effect of evaporation from the soil and plant leaves. One mature tree transpires up to 450 litres of moisture a day – equivalent to five room-sized are conditioners left on for 19 hours (6). Research at the University of Manchester using computer modeling has shown how increasing urban green space can mitigate urban heat island effect. Without any increase in green space, by 2050 the temperature in Manchester is projected to rise by 3°C. However if the amount of green space increases by just 10 per cent this could potentially eliminate the effects of climate change on

increasing surface temperatures. However, reducing tree cover by the same percentage could lead to an increase of 8.2^{o}C under some scenarios (7).

Reducing air temperature is only part of the picture. Radiant heat – direct sunlight – is often more important in terms of people's comfort, and carries a health risk when it results in sunburn. Children's skin is more sensitive to UV damage and the amount of sun expose during childhood is thought to increase the risk of developing skin cancer in adult life. Shading is particularly important in school grounds and where children play. Providing direct shade using trees in playgrounds reduces the risks from UV radiation (8).

AIR QUALITY

Trees and woodland improve air quality (9) by adsorbing pollutants such as sulphur dioxide and ozone, intercepting harmful particulates from smoke, and dust and of course release oxygen through photosynthesis. This helps to alleviate the problems caused by chronic respiratory disease.

Each year, 24,000 people in the UK die prematurely from air pollution (10). Research by the British Lung Foundation suggests that one in every seven people in the UK is affected by lung disease, almost 8 million people (11). The UK also has one of the world's highest rates of childhood asthma, with about 15 per cent of children affected and a higher prevalence in lower socio economic groups in urban areas (12). Columbia University researchers found asthma rates among children aged four and five fell by a quarter for every additional 343 trees per square kilometer (13).

Trees will have a proportionately greater effect in urban areas, where they are close to sources of pollution and nearer to people who might be affected. Street trees in particular, close to sources of pollution, can intercept particles from traffic and other emissions (14). It is important to remember that despite the significant benefits of trees on air quality, some people do suffer allergies to tree pollen, particularly in the early spring (15).

GREEN SPACE AND HEALTHY LIFESTYLES

Proximity of green space to people's homes increases the likelihood of the residents choosing walking over other forms of transport (16, 17, 18). With nearly a quarter of both men and women in the UK classed as obese, the Government is looking at the role of trees, woods and other green space in encouraging physical activity.

Over a third of people are on incapacity benefits because of mental health problems or muscular or skeletal disorders – both of which can respond to tailored physical activity programmes. If just one per cent of people on incapacity benefit could be helped back into the workplace through active lifestyles, it would save the country £67 million a year (19).

The Campaign for Greener Healthcare and the initiative to establish an NHS Forest (20) illustrate a growing consensus amongst health professionals of the importance of trees to people's health and wellbeing. With plans to plant a tree for every one of the 1.3 million NHS employees, the campaign endorses the role of trees in air quality, improved health outcomes and reducing negative environmental impact.

With 80 per cent of people living in urban areas, but fewer than 10 per cent having access to local woodland within 500m of their home (21), it is vital that the Government sets targets for new woodland that will meet the need near where people live.

MENTAL HEALTH

There is evidence that trees not only provide physical benefits but can also be important to mental health.

Trees and woods can have a restorative and therapeutic effect on the mind (22). Studies have looked at the beneficial effects of natural surroundings on children with Attention Deficit Hyperactivity Disorder (23). Trees have been found to enhance mood, improve self esteem and lower blood pressure. The quality of natural features and trees in the city helps reduce mental fatigue and stress (24), and has important benefits for child development (25).

Research in the Netherlands and Japan indicated that people were more likely to walk or cycle to work if the streets were lined with trees and feel better and live longer as a result (26).

It is hoped that in coming years there will be an increasing emphasis towards long-term disease prevention through adopting healthy lifestyles. Around £110 billion is spent each year in the UK on healthcare, equal to 8.5 per cent of all income. It has been estimated that if every household in England had good access to quality green space it could save around £2.1 billion (27).

TREES AND FLOODING

An increase in hard surfaces in urban areas, unable to absorb rainfall, often means drains are overwhelmed and water quickly collects on the surface rushing down streets and over paving. Following the 2007 flooding, paving over of gardens was identified as having a major impact on drainage of surface water in urban areas.

Around two-thirds of the 2007 flooding was a result of surface water, with 3.8 million homes in England susceptible (28, 29). The insurance cost of the 2007 floods was thought to have been around £3 billion (30), but the Environment Agency expects the regular annual cost of damage to property alone to be in excess of £1 billion. When the cost of further disruption, damage to infrastructure and loss of business is added this increases to £2.5 billion and could rise to £4 billion by 2035 (31).

Interception of rainfall by trees in urban areas can be critical in reducing the pressure on the drainage system 32 and lowering the risk of surface water flooding. Slowing the flow increases the possibility of infiltration and the ability of drains to take away excess water.

BIODIVERSITY

The world is losing biodiversity at an accelerating rate, due largely to a combination of habitat loss and climate change. Aside from any intrinsic value, biodiversity is important for helping to maintain the stability of natural systems and in the supply of a range of 'ecosystem services'. These include flood attenuation, pollination of crop plants, soil conservation and climate regulation. Native woods and trees in urban areas, including gardens can be vital to a wide range of wildlife, providing food, shelter and places to breed.

As well as remnant pockets of woodland and more natural space, urban areas have parks, private gardens and planted shrubberies which can support a large number of invertebrate and bird species, especially in the suburbs. These

include uncommon species, including for example juniper fauna which has adapted to garden junipers (39).

An important characteristic of urban areas is their mosaic of habitats. Industrial sites such as demolition sites, disused railway lands or unused industrial land can be rich in species. Later stages of succession through to woodland contain many uncommon invertebrates with files, bees and wasps, including some parasitic species and sawflies.

Trees in urban areas support a wealth of wildlife, from the common, such as robins, blackbirds and tits, to bats and bees, many of which are in decline. Native tree species are particularly important in supporting wildlife – native willows for instance may support over 450 species, many of which are insects that provide food for birds (40).

CIVIC AMENITY AND ECONOMIC BENEFITS

The beauty of towns and cities arises from a mix of good architecture and design, and the landscape of public spaces. There is strong evidence that improving green infrastructure and the urban environment help promote inward investment by creating a more attractive environment for businesses and their staff (41).

Trees are a vital element in providing structure and texture to green infrastructure, and yet this has been eroded in many places. Maintaining what we have, ensuring future generations of trees to replace those that are being lost, and imaginative creation of more places rich in trees is central to making towns and cities places people want to live in, visit and do business in. Trees are multi-purpose tools for urban adaptation and design. Any measures which undermine current levels of tree cover are likely to be damaging to adaptation, whereas well planned and well maintained urban tree cover can greatly increase the adaptive capacity and resilience of the city.

TREE PLANTING GUIDE

4 P's of Urban Forestry

1 PICK IT
….choose the right tree for the right place

2 PLANT IT
….the right way

3 PAMPER IT
….give it a hand when it's young

4 PRUNE IT
….only when necessary

1 PICK IT

WHAT DO YOU WANT FROM A TREE?
Color in the fall, flowers, fruit, shade, screen, barrier, a particular shape?

WHERE TO PLANT?
Three shade trees strategically planted around your building can decrease energy costs significantly. Look around – you donÕt want the tree to obscure signs and street lights. Always look up to check for utility wires and be sure to stay out of their way!

CHOOSE A TREE THAT IS THE RIGHT SIZE AND SHAPE AT MATURITY
The tree you plant will probably outlive you. With that in mind, pick the planting location and mark property boundaries. Stay 6 feet away from sidewalks, walls, neighbors, and underground cables. Stay 10 feet under overhead utility cables and power lines.

CONSIDER THE ELEMENTS
Don't fight Mother Nature. Consider sun exposure, prevailing winds, water availability and cost, soil drainage, common pests.

RECOGNIZE THE SIZE OF YOUR INVESTMENT
Mature trees will increase property values 10% to 20%. That's up to $20,000 on a $100,000 property! Trees will also help sell the property faster. Trees yield two to three times return on investment in purchasing and maintaining them. In the course of its lifetime, a tree is valued at about $50,000 in environmental and economic benefits. So when you select your tree, treat it like a $50,000, fifty year investment!

2 PLANT IT

HOW TO PLANT YOUR TREE
Adapted from a procedure recommended by California ReLeaf

Skin off, remove and discard grass and weeds from a 3 to 4 foot wide planting site. Dig to a depth of 8 to 10 inches in the centre of the hole, and 18 inches on the side, and remove the soil.

Carefully remove the tree's root ball from its container and, with your hands, gently loosen any outside roods from the sides and bottom, taking care not to break or damage the root ball. Cut large, circling roots to prevent future girdling.

Remove the nursery stake, if any.
Place the tree in the centre of the planting hole on undisturbed soil so the root crown (where the trunk meets the roots) is about _ inch above ground level. Determine the direction of the prevailing wind, and rotate the tree so that the strong branches are facing into the wind.

Place two stakes on opposite sides of the tree, approximately 18 inches from the trunk.

After discarding grass and weeds, partly back fill the hole with the soil you removed.

Place approximately 4 inches of compost into the hole and mix well with native soil. Finish back filling the planting hole (half compost/half native soil). Cover the root ball but **DO NOT COVER THE ROOT CROWN!**

Loosely tie the tree trunk to each of the stakes. Place the ties high enough to support the tree in an upright position, but loose enough for growth and movement. **DO NOT GIRDLE THE TRUNK!**

Build a berm around the tree, 3 to 4 feet wide and 4 inches high. This will conserve water and direct moisture to the root ball. Water thoroughly right after planting to soak the root ball, settle the soil and collapse air pockets.

Spread a 4 inch layer of compost over entire planting area leaving the root crown bare.

In active wildlife areas, use chicken wire or fencing to protect the trunk. In lawns, use protectors against week whackers.

3 PAMPER IT

To insure that your tree grows up strong and healthy, take good care of it while it is young until it gets established.

WATER is critical, because it carries nutrients from the root ball up the trunk to the leaves. In the heat of our dry summers, trees can become water stressed. Wilted and/or dark color leaves are indicators of insufficient watering. Severe water stress causes leaves to yellow and drop off. Trees can be planted at any time of the year in Kern Country, but be aware that Nature is more forgiving in the winter and early spring. Trees planted in late spring or in the heat of the summer are sure candidates for water stress. Here are some things you can do to help your trees get through their first few summers in Kern Country.

Be Efficient
BUILD A BERM around the tree 3 to 4 feet wide and 4 inches high. Be sure that you water inside the berm. A berm of this size will hold a large amount of water which will be directed to the roots.

CONTROL WEEDS in the berm to decrease competition for moisture.

FERTILIZE appropriately. A strong, vigorous tree and root system will make better use of available water.

DON'T FEEL GUILTY about watering your trees. Less than 4% of California's developed water supply is used for landscape, including homes and businesses, golf courses, public parks and roadways. It would take a 25% cut in landscape watering to save just 1% of California's water supply.

ADJUST STAKES as needed. Remove them as soon as the tree can stand straight on its own.

FERTILIZE with nitrogen regularly. Nitrogen is the element most lacking in Kern Country soil, and trees respond well to regular feeding. At time of planting, apply three-quarters of a cup of ammonium sulfate containing 21% nitrogen in a three foot area on the surface of the soil, staying 6 inches away from the trunk. Water thoroughly and repeat in six weeks, and according to manufacturer's instructions thereafter.

ADD MULCH to inside of berm to retain moisture and control weeds. **DO NOT COVER TRUNK WITH MULCH** and risk of rotting root crown.

4 PRUNE IT
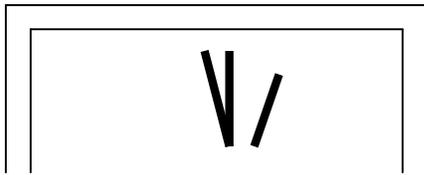
Pruning maintains a tree's natural
Shape while eliminating crowded,

Rubbing, weakly attached, or poorly formed branches. Correct pruning will help a tree develop proper structure, control its size, direct its growth, and remain healthy. Improperly done, pruning can seriously affect the health, safety and beauty of a tree. Here are some pruning tips to guide you.

Pruning that cannot be done from the ground or a short ladder should be done by a competent arborist. Don't just hire any person with a chain saw!

Remove dead, diseased, criss-crossed of competing branches with a clean cut. Use the thinning method as shown. Space branches evenly around the tree at least eight inches apart. Select branches with wide attachments to the trunk. Narrow crotches are weak and can split out. It is not necessary to use a wound dressing on pruning cuts.

Don't leave unsightly branch stubs. Cut an unwanted branch at the trunk or where it attaches to another branch collar (swollen base), not flush to the trunk. The collar protects the tree from disease and insects.

Do not stub tree branches. This is called heading or shearing and causes the growth of vigorous upright shoots. They are weakly attached, crowded and the natural shape of the tree is destroyed.

DO NOT TOP TREES! Topping (cutting the leader branch) weakens the tree, making it susceptible to disease. Topping destroys the natural shape of the tree, and promotes the regrowth of crowded, weakly attached shoots.

Do not prune branches near or directly under utility cables yourself. Call the utility company instead.

Prune when tree is dormant or in winter to minimize trauma. Never remove more than 30% of canopy because there will be insufficient leaves remaining to support life.