Benefits and Costs of The Urban Forest

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Overview

Urban forests are all the trees and other vegetation that grow in places where people live, work and play, from small communities in rural areas to large metropolitan cities. This includes trees on public and private land, along streets, in residential areas, parks and commercial developments, and in other locations within a community. They may be planted by design or grow by accident (Miller 1988). This unit will help you understand and communicate the many advantages of and the expenses associated with the growth and management of urban forests. The major benefits are discussed in the first section of the unit, although it is impossible to list all the values received from trees. The costs of urban forestry are included in the next part with suggestions on how these costs can be reduced through education and proper planning.

Longer Than a Lifetime

Who Will Sit in the Shade?
Bill is an urban forester in the piedmont section of the Southeast, where hardwoods are the most common trees. Whenever possible he encourages homeowners to plant hardwoods, and is particularly likely to recommend white oak. Although it grows quite slowly in some parts of the country, this beautiful tree thrives in the warm, humid climate of this area. It can become a prominent feature of the landscape within 10 to 15 years.

Fifteen years is a small part of the life span of a white oak, but many of the people that Bill assists are well past 60 years old. They point out that this length of time may be more than they have left on this planet themselves. Being over 50 years old, Bill does understand this concern, but he always falls back on a favorite saying to counteract the doubt. He is not sure where the quotation came from, but he reminds them that "the person who knows the true value of life is the person who will plant a tree, knowing full well that he will never sit in its shade."

Will urban sprawl spread so far that most people lose all touch with nature? Will the day come when the only bird a typical American child ever sees is a canary in a pet shop window? When the only tree he touches is the cleverly fabricated plastic evergreen that shades his gifts on Christmas morning?

Frank N. Ikard, North American Wildlife and Natural Resources Conference, Houston, 1968

Before You Begin

This manual has been developed to provide you with both technical information about individual trees and management practices for urban forestry. The benefits and costs of the urban forest are a good place to start before exploring the content of the other units in detail. First, take a few minutes to think about and answer these questions about the urban forest in your area:

- How would you describe the urban forest in the communities where you work?

- What do you think are the most important benefits of the urban forest?

- What are some of the expenses of having trees in communities?

- You have been asked to meet with a community's Planning Board and a group of local developers who are building a new industrial and commercial park. With your knowledge of the community, what information would you want to give them about the benefits and costs of protecting the existing trees on the site?

On a separate piece of paper describe your ideas about the benefits and costs of the urban forest, and think about how this information will assist you in your job.

The Important Question

Trees are an important part of our communities, but tree planting, maintenance and protection require an investment of resources, including time and money. Are the benefits that trees afford our communities greater than their costs? The answer is yes. A study of future benefits and costs of a tree planting program in Chicago found that the projected value of trees, when measured by such things as increased property values and decreased energy use, is nearly three times greater than the projected costs (McPherson 1994a). The best way to achieve a net benefit from planting a tree is to select the right tree for the right location and take care of it.

There are many ways to help communities maximize the benefits and minimize the costs of the urban forest. State forestry agencies can work with communities in several ways - providing educational and technical information, offering planning support, and working with specific groups and members of the community - to achieve the goals of urban forestry. This information can be communicated to people in the community through workshops, demonstrations, publications and other educational programs. There are different ways the State forestry agency can provide assistance related to the benefits and costs of the urban forest (table 1).

Table 1. Examples of ways to provide assistance and potential recipients

Technical/Educational Assistance	Planning Assistance	Potential Recipients
· Tree selection · Tree maintenance and care · Urban forest assessment · Urban wildlife habitat protection and enhancement · Storm water control · Soil erosion control · Noise and glare reductions · Tree protection · Construction site evaluations	· Urban and community forestry planning · Recreation site management · Air and water quality management programs · Economic development plans · Storm water management · Urban wildlife management · Urban development plans · Conservation management programs	· Local governments · Policy makers and elected officials · Developers and builders · Community and civic groups · Homeowners and neighborhood associations · Non-profit groups · Local business · Urban forest councils

Benefits of the Urban Forest

Trees benefit communities in a number of important ways. Working with individuals and communities you will be able to increase their awareness of these benefits.

- Increase in property values
- Decrease in energy costs
- Improvement in air quality
- Reduction in storm water runoff
- Decrease in soil erosion
- Improvement in water quality
- Creation of wildlife habitat
- Increase in community pride
- Positive impact on consumer behavior
- Increase in recreational opportunities
- Improvement in health and well-being
- Reduction of noise levels
- Creation of buffer zones

Increase in Property Values

Urban forests contribute to the economic vitality and stability of a community by increasing property values. Most people think that neighborhoods with trees are attractive places to live. The values of houses in these neighborhoods are usually higher than those of comparable houses in neighborhoods without trees (Morales 1980; Morales et al. 1983; Anderson and Cordell 1988). Neighborhood green spaces or greenways typically increase the value of properties located nearby (Kitchen and Hendon 1967; More et al. 1983; Correll et al. 1978). Developers may profit when they receive a higher price for a property with trees. In many instances, careful preservation of existing trees during construction may actually cost less than clearing the land (Seila and Anderson 1982). The cost of preserving trees, such as the extra time needed for planning and using special techniques to protect the trees, should be looked at in relation to the immediate and long-term benefits of increased property values. Mature trees are especially valuable in areas where old housing or buildings have lost value. This is important to keeping downtown neighborhoods vital.

Trees can have a great impact on the appearance and the value of housing developments.

Decrease in Energy Costs

Trees can help reduce heating and cooling costs by shading buildings, acting as windbreaks, and cooling the air through the evaporative process of transpiration. When planting a tree to reduce energy costs, the species of tree, site location, type of building, and year-round climate should be considered. Reducing the need for electricity or gas energy also conserves fossil fuels and reduces carbon emissions. However, planting the wrong tree in the wrong place may increase energy costs.

Contact the U.S. Environmental Protection Agency or U.S. Department of Energy for more information on reducing energy costs.

Shade

Trees properly placed around buildings and air conditioning units can help reduce cooling costs (McPherson 1994b). Trees reflect and absorb solar radiation before it heats the dense building and pavement materials of a home or office. Usually, trees planted to the west of a building reduce air conditioning costs the most by blocking the afternoon summer sun when it is the hottest. There are times when trees located to the east and south of a building also provide this benefit. In tropical climates an evergreen tree offers protection from the sun throughout the year (Harris 1992). In colder climates, trees located south of a building should be avoided because their winter shade increases heating costs more then summer shade reduces cooling costs. The shade from trees can also reduce exposure to ultra-violet radiation which increases the risk of some types of skin cancer.

Windbreak

Properly placed trees can reduce heating costs for a building by blocking the wind (McPherson 1994b). Although both conifers and deciduous trees reduce wind speed, conifers tend to have a greater impact during winter months. The density, or compactness, of the trees and the planting location determine the amount of wind

reduction that occurs (Harris 1992). In cool and windy climates, windbreak trees should be planted to the west and north of a building.

Evaporative cooling

Urban areas typically are warmer than rural areas because of the urban "heat island" effect (Figure 1). Buildings, paved areas, and sparse tree canopy in an urban area contribute to the higher temperature. Trees help to reduce the air temperature around them through the evaporation of water from their leaves, acting as nature's air conditioner.

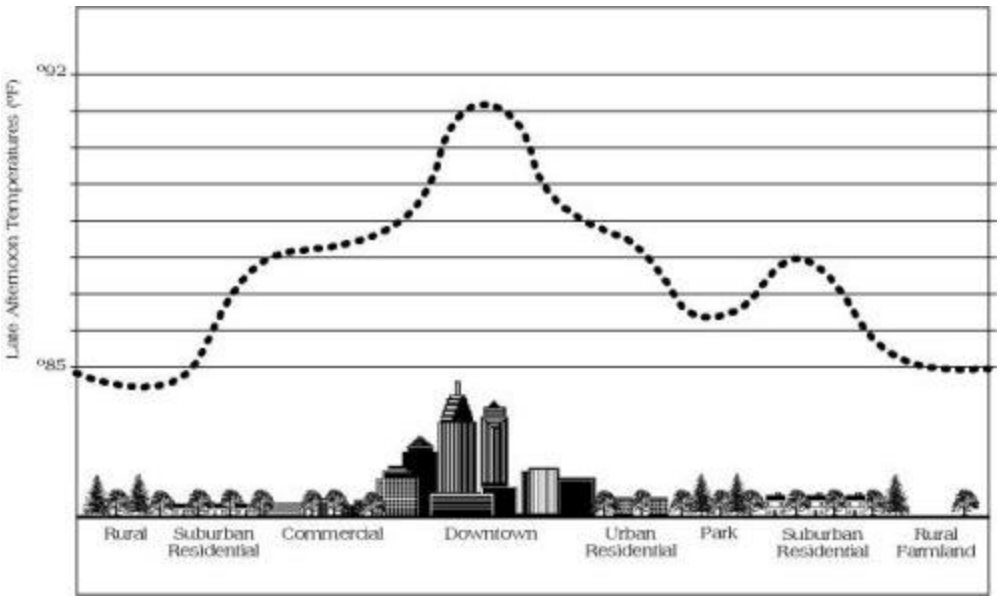

Figure 1. Summer temperatures in a city are higher than those in suburban and rural areas and this is called the urban "heat-island" effect (Akbari and others 1992, p.9, fig. 1-4)

Improvement in Air Quality

Air pollution is not only a major human health risk, but also reduces visibility and damages vegetation and man-made materials. Some species of trees do release chemical compounds (biogenic emissions) that are air pollutants. The amounts of these chemicals produced depend on the species and size of the tree. Because high temperatures increase the production of these chemicals, urban "heat islands" cause this type of pollution to increase. Urban trees, however, contribute less than 10 percent of total pollution emissions in urban areas (Nowak 1992), and the advantages they provide in reducing air pollution are much greater (Figure 2). Trees and vegetation improve air quality in three ways:

Absorption and reduction of airborne pollutants

Trees, especially those with large leaf-surface areas (Nowak 1994), absorb and trap airborne dirt and chemical particles, such as nitrogen oxide, sulfur dioxide, carbon monoxide, and ozone. Trees also help by reducing wind speed so that heavy particles settle out (Harris 1992). Communities benefit not only from cleaner air, but also from the reduced cost of implementing air pollution controls.

Absorption of carbon
Carbon dioxide, a by-product of burning fossil fuels such as gas and coal, is one of the primary chemical compounds that influences global warming (Akbari et al 1992). Urban forests in the United States store millions of tons of the carbon from this compound annually, helping reduce the level of carbon dioxide in the atmosphere (Rowntree and Nowak 1991). However, their effect on the carbon dioxide levels in cities is being studied.

Reduction of carbon emissions
The "cooling effect" of trees, including shade and evaporative cooling, decreases the demand for electricity. This results in the reduction of carbon emissions from power plants supplying the energy. Trees, therefore, provide the double benefit of not only storing carbon, but also helping to reduce carbon emissions.

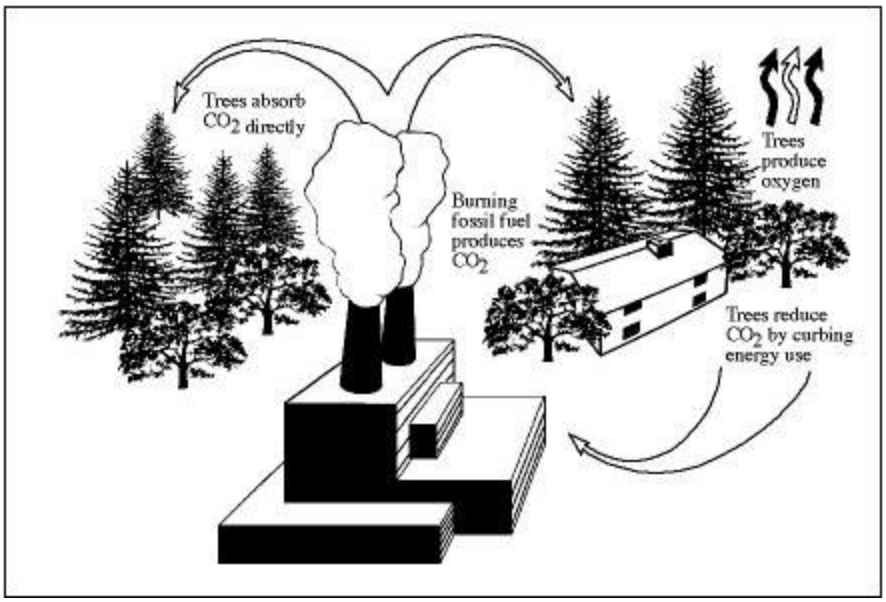

Figure 2. Trees can help improve air quality by absorbing carbon dioxide, which is produced during the photosynthesis process, and by shading buildings which results in reduced amounts of carbon dioxide from the production of energy (Akbari and others 1992, p.35, fig. 2-10).

Improvement in Water Quality

Waterways and lakes in and near urban areas can be polluted by soil erosion and water runoff that contains fertilizers and pesticides from landscaped lawns and trees, oil, and raw sewage. Trees and vegetation can help solve water quality problems in communities by reducing storm-water runoff and soil erosion. Trees also absorb some of the nutrients in the soil that would be washed away. Communities can have cleaner water by managing existing natural vegetation, planting additional trees, and reducing the use of pesticides and fertilizers.

Rate and volume of runoff
In many communities, the rate and volume of storm-water runoff have increased beyond the capacity of existing storm-water drainage systems. This is caused by continued

development of hard, impermeable surfaces such as roads and parking lots that cannot absorb water, thus changing natural drainage patterns. These impervious surfaces also reduce the amount of natural absorption of water by the soil and trees. Many urban forestry activities, such as creating open spaces, saving trees on construction sites, and planting trees after construction, can help reduce the amount of storm-water runoff that enters the drainage system.

Raw sewage spillover
During heavy rainstorms problems occur when storm water floods into the sanitary sewage system. If the sewage treatment facility cannot handle all the storm-water runoff, raw sewage spills over into natural waterways. This can cause a dangerous increase of bacteria in the water. Communities with this problem may be charged large fines, suffer lawsuits from downstream users of the waterways, have to make costly improvements to the sanitary sewer system, or stop further development until water-treatment facilities are improved. Trees, vegetation, and wetlands can help prevent this problem by interrupting and absorbing storm-water runoff.

Find out if the storm water drains into the sanitary sewer system.

Soil Erosion
Trees can limit soil erosion by helping control storm-water flow. Fibrous root systems hold soil in place so that it is not washed away by rain or flowing water (Harris 1992). Erosion can be especially severe at construction sites in urban areas. Research has found that while forested land can lose about 50 tons of soil per square mile per year, developing areas can lose 25,000 to 50,000 tons (Lull and Sopper 1969).

Contact your local Soil and Water Conservation District for more information on improving water quality.

Creation of Wildlife Habitat

Urban forests serve as wildlife habitat, supplying food, water and cover for a variety of animals, such as deer, squirrels, rabbits, reptiles, and birds. These animals enhance the recreational and educational opportunities of the community. Wildlife habitats range from streamside buffers and storm-water detention ponds to backyards and parks. Corridors of trees and other vegetation connecting natural areas in the urban environment add to the wildlife habitat and increase wildlife diversity.

For more information refer to the "Urban Wildlife" unit.

Increase in Community Pride

Trees are a significant part of a community, offering important benefits not easily measured.

Community image

Imagine what a community would be like without any trees. Trees and other landscaping add beauty to an urban area. Retailers often landscape their premises to improve community image and attract customers. A visitor's first impression of a community is greatly influenced by the trees and other landscaping.

Sense of place

Neighborhoods with attractive landscapes foster a sense of community and belonging (Dwyer et al. 1991). People often identify with their own community by its tree-lined streets and historic groves of trees. Trees may also be associated with specific places, such as palm trees at a beach or memories of past events or times, such as a favorite tree climbed as a youth.

Community involvement

Community pride increases when neighborhood residents participate in local tree-planting programs. Such activities enhance a sense of ownership and an ongoing interest in developing and maintaining trees. This participation increases the success rate of the planting program. However, without local involvement in the planning and planting of the trees, the efforts may be viewed negatively by the residents (Miller 1988).

How do people feel about trees?

Historical trees

Many communities have historical trees that have become landmarks. They may also be a focus point in the community's identity, such as the live oaks or magnolias that are part of the culture in many southern cities.

Decrease in violence

Less violence occurs in urban public housing where there are trees. Researchers, Sullivan and Kuo (1996), suggest that trees afford a place for neighbors to meet and get to know each other. Their research showed that friendships developed into a network of support.

Positive Impact on Consumer Behavior

Research from the University of Washington indicates that in business districts "...healthy and well-maintained trees send positive messages about the appeal of a district, the quality of products there and what customer service a shopper can expect" (Wolfe 1998).

Visit the University of Washington Center for Urban Horticulture - Human Dimensions of the Urban Forest web site .

Increase in Recreational Opportunities

Many city residents appreciate the recreational benefits urban forests provide. With the growing emphasis on physical fitness, urban forests, parks, and open spaces have become increasingly popular as places to walk, run, bike, and hike. Urban parks are often sites for large community events, such as art and music festivals. Some festivals are centered around trees such as the Cherry Blossom Festival in Macon, Georgia and the Dogwood Festival in Paducah, Kentucky.

Urban greenspaces provide recreational opportunities such as this bike path through an urban park.

Improvement in Health and Well-being

Life in a bustling urban setting can be both physically and mentally stressful, but there are indications that trees and other plants help improve human health.

Physical and mental health

The soothing influence of trees can help reduce stress levels and increase enjoyment of everyday activities. Trees also contribute to cleaner air and water.

Recuperation rates and therapy

One study of recuperation rates after surgery found that patients whose windows offered a view of a wooded landscape recovered faster and with less medicine than patients who could only look out on brick walls (Ulrich 1984). Therapists are now using trees and other plants to help people with physical and mental problems.

Part of nature

Trees bring urban residents closer to nature. A healthy urban forest is the most effective way to re-establish this sense of being part of the larger natural environment. Some

people have a strong emotional attachment to trees. The "People-Plant Council" at Virginia Tech University, Blacksburg, Virginia is one group that studies the ways that trees improve our health and well being.

Reduction of Noise Levels

Trees and vegetation can form a barrier that partially deadens the sound from traffic, lawn mowers, and loud neighbors. To be effective, the landscaping should be dense, tall, and wide, and planted close to the source of the noise. Trees also create "background" noise of rustling leaves and wind through the branches that can help muffle other noises (Harris 1992).

Trees provide a screen from the noise and view of a busy highway.

Creation of Buffer Zones

Trees serve as "screens" by hiding unattractive areas and objects, such as junkyards and dumpsters. With proper design, tree plantings can also re-direct attention away from unsightly areas. Planting designs can be used to "direct" automobile or pedestrian traffic.

Costs of the Urban Forest

A healthy urban forest requires an investment of money. The cost of urban trees varies widely and depend upon such site factors as location, species, and maintenance needs. Each of these factors needs to be considered when deciding to plant, maintain, or remove a tree in an urban area, whether it be an individual tree or a large-scale planting. With careful planning and coordination, these expenses can be minimized. Some of the costs involved in urban forestry are:

- Planting
- Maintenance and removal
- Infrastructure repair
- Litigation and liability
- Storms
- Program administration
- Allergies

Planting

The cost of planting depends on the species, size, site location, site preparation, and labor. Planting costs include purchasing the trees themselves and paying for site preparation, installation, and initial care. McPherson (1994a) found that planting and establishing a tree often represents a large percentage of total cost. Usually, the larger the tree, the higher the planting cost. Many problems and future costs can be avoided by tree selection, site preparation, and planting techniques.

For more information, refer to the "Site and Tree Selection" and "Tree Planting" units.

Maintenance and Removal

Maintenance costs vary tremendously and depend on the species and site location. It is important to know what funds and personnel are available for maintenance work. By providing regular maintenance, future costs can often be prevented while increasing the tree's value. Some of the major maintenance costs are:

Pruning

All trees require periodic pruning, but the frequency depends on the species, age of the tree and location. Young trees need frequent pruning to develop a strong branching structure. The amount of pruning needed is also related to the site location. Trees located near overhead utility lines or sidewalks need more frequent attention. Choosing a species that is compatible with the site will help reduce pruning costs.

Irrigation
In some locations, irrigation systems are needed to supplement rainwater. The cost of installing the irrigation system and supplying water are part of the maintenance cost. Irrigation can keep the tree from being stressed during droughts. However, the soil moisture needs careful monitoring to prevent overwatering, which can also cause stress. Generally, species native to the area do not need irrigating after establishment. Selecting a drought-tolerant species can help reduce irrigation costs.

Insect and disease control
There are times when trees need to be treated for insects and disease. Costs of insect and disease control can be reduced by selecting a species that is resistant to insects and disease, planting a variety of species, matching species to the site and proper planting techniques.

What insects and diseases are common in the communities where you work?

Tree removal
Trees need to be removed in urban areas for many reasons. Hazardous trees, which are trees that have potential to fail and hit a target, can cause injuries or death and damage personal property. A tree may also need to be removed if it is interfering with water and sewage pipes or utility lines. However, it may be cheaper to relocate utility lines than remove the trees. Many trees need to be removed because of storm damage. Usually, the larger the tree, the more it costs to remove. Matching the growth habits of a tree to site conditions will increase its vitality and life span and avoid its untimely removal.

Tree residue from pruning and removal
When trees are pruned or removed the residue must be recycled or disposed of. Sending the residue to the landfill is a costly option for some communities. Many communities, homeowners, and utility companies now recycle tree rsidue into mulch, firewood, compost, and boiler fuel instead of sending it to the landfill. These alternatives may reduce costs and even generate revenue.

Fire protection
As cities and communities continue to grow, homes are often being built in wooded areas adjacent to urban centers. These urban/rural interfaces create the potential for wildfires with the possibility of loss of life and property. Fire management involves fire prevention, fire suppression, and prescribed burning (using fire as a management tool), all of which cost money. Local ordinances can help ensure acceptable protection from naturally caused fires. The hazards of wildfires can be diminished by reducing dense vegetation and trees within 30 feet around homes and businesses and creating a greenspace (Harris 1992).

Check with local fire officials concerning regulations and recommendations.

Infrastructure Repair

Tree growth can damage the infrastructure of a community, such as utilities, sidewalks, curbs, and sewer and water pipes. Sometimes repairs can cost less than removing and replacing the trees. Proper site and tree selection can prevent or minimize future infrastructure conflicts.

Sidewalk damage can often be avoided by selecting an appropriate site and species.

The Center for Urban Forestry Research conducts research on tree roots and infrastructure damage.

Litigation and Liability

There can be legal costs when trees are damaged or when trees cause damage. Property owners may sue when trees are harmed by construction on adjoining property, or when trees die after underground utilities lines are installed. Trees are sometimes stolen, especially unique specimens or rare species. The damage caused by falling trees or limbs, such as during storms or from hazard trees, can also result in legal action. Sidewalks damaged by tree roots can cause trip-and-fall accidents, a common source of liability claims. Careful planning can preclude many of the costs related to the damage of trees during development and construction projects. Selecting an appropriate species for the location and assuring proper maintenance can decrease the injuries to people and damage to property caused by trees.

Storms

Storms, such as hurricanes, tornadoes, ice, snow, and wind, can cause major damage to the trees and property in a community. Costs of planning for storms, cleaning up and repairing the damage after storms, and planting new trees can be minimized by diligent maintenance.

Program Administration

Managing the urban forest requires planning and a trained workforce to carry out those plans. Communities must pay the costs of the people and materials used in these programs.

Allergies

Trees produce pollen that causes allergies for some people. Individuals have the expense of doctor visits and medication. Cities, in an effort to lessen the problems by controlling or regulating the type of trees planted may incur additional management expenses.

Maximize the Benefits and Minimize the Costs

A community receives many benefits from the urban forest however there are also costs associated with having a healthy urban forest. Working towards the common goal of managing the urban forest to maximize the benefits and minimize the costs helps communities grow and develop while maintaining a healthy environment for current and future generations. McPherson's (1994a) cost-benefit research in Chicago indicates that a tree needs to live 9-18 years before the benefits outweigh the costs to the community. This serves as an incentive to use preventive techniques that will extend the life of a tree. There are several things that can be done to help maximize the benefits and minimize the costs of the urban forest, however these are the most important.

- Selecting the proper site and tree
- Using proper planting techniques
- Providing long-term maintenance
- Monitoring and protecting the health of the tree

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Refer to "Site and Tree Selection", "Tree Planting", "Tree Maintenance", "Tree Diagnosis and Treatment", and "Trees and Construction" units for more information.

Checking Your Understanding about Benefits and Costs of the Urban Forest

On a separate sheet of paper, answer these questions about the important points you need to remember:

1. What are the four economic benefits of urban trees?

2. How can urban trees improve air quality?

3. Does the urban forest have a direct effect on the well being of the people who live in the city? If so, how?

4. Maintenance costs can be a factor in the upkeep of urban trees. What are some of the major costs involved? What are five things you can do to minimize these costs?

Answers are at the end of the unit.

Case Study

A Place for the Children

Hopkins Elementary School is bursting at the seams. This had been a quiet, rural area not too many years ago, but the city has been growing rapidly in this direction, and new housing developments now cover much of the land. The school has built additional classrooms, but this meant using land originally intended for outdoor activities. The Parent-Teacher Association (PTA) has finally persuaded the developer of the land next to the school to donate several acres of wooded land between the school and one of his housing developments. The land has not been developed because of the small stream and marshy area on one side of it, but there is more than enough space for some playing fields and playground equipment. The PTA has also agreed to be responsible for developing this area, including the cost for doing it. An architect has volunteered to develop a site plan. The owner of a small construction company has offered to bring in a crew and equipment to clear the entire area and level the site.

The PTA has created a committee representing all the groups in the community interested in developing this land. The PTA has asked four parents, plus the architect, construction company owner and the school principal to serve on the committee. They also asked a representative of the homeowners' association from the neighboring development, a staff member of the local parks and recreation department, and an employee of the local State forestry office to work with the committee to look at all the needs and possible means for developing the area.

Dan, a forester at the local State forestry agency office, told the PTA when they called that he would be glad to provide assistance and would attend the next meeting. At the committee meeting Dan hears two very different opinions about how this land should be developed. One group wants to clear the land completely so they can make full use of the space, with separate areas for each sport and a general activity area. They also think it will probably cost less to do it this way. The other group wants it developed with at least some of the natural vegetation in place, because the students use the stream area for an outdoor classroom. And then there are the homeowners who are not happy at the prospect of suddenly seeing the school's playground in their backyards. After everyone stated what they wanted or did not want, they asked Dan for his suggestions.

You and the Committee and the School Yard

Put yourself in Dan's place, sitting at this committee meeting. Think about what you would say to the other members of this committee. Write your suggestions on a separate piece of paper and then see how your answers compare with the recommendations that Dan actually made.

- What would you suggest as the best way to turn the land into an area for the children and still address the concerns of the community members?

- What benefits and costs of clearing the wooded land have not been mentioned by these committee members? How can some of these considerations make the recreation area a better or worse place to play?
- Are there environmental benefits or costs that need to be considered if the land is cleared of all of the trees?
- What about the costs for the PTA?
- Can an outdoor classroom area be compatible with the other recreational needs of the school?
- What will you suggest to give the homeowners some protection from the noise and possible lights in this area?
- How will you reconcile the differences about clearing the land among the various groups on the committee?

The Rest of the Story

Let it Be
Thinking carefully for a moment, Dan decides he may be able to offer some suggestions that will help solve several of the problems. First off, he feels there are some important issues about clearing the land that have been overlooked. All of the opinions expressed by the committee members were forthright and legitimate, so he wants to be positive in the way he answers the question.

Dan begins by commending parents for volunteering their time and services to create this area for the school. He said that it was obvious some of the land had to be cleared for playing fields, but that it is also important to keep trees on other parts of the land. He will be happy to assist the architect and construction company owner with the plans, helping identify those trees that should remain on the site.

Dan explains several reasons for wanting to leave some of the area's trees. First, the land around the stream is soft and marshy, which was one reason the developer had not built there. With the addition of some paths, it can make a nice outdoor classroom. It can also serve as a natural way for reducing the storm water runoff that had become a problem when the last addition to the school was built. By leaving part of the land in trees and other vegetation there will also be less soil erosion, and the runoff that does occur will probably not affect the quality of water in the stream. The trees can also enhance the enjoyment for those using the area, providing shade and cooler temperatures for spectators on the side of the fields and shaded areas for the some of the playground equipment. Leaving a stand of trees across the back of the area may also reduce the homeowners concern by providing a natural screen between their lots and the playground. Dan thinks the costs of following these suggestions might even be less than removing all the trees and adding new landscape plants. Few additional plants will be needed and maintenance costs for the woodland trees would be minimal. With careful planning, it will take less time to clear the land, a saving for the construction company. While these suggestions do not give each group everything it wants, the committee thinks the plan is fair enough to present at the next PTA meeting for approval.

A Balancing Act

- Did you take the same approach to answering the committee's question that Dan did? Why or why not?
- Are your suggestions about developing the land similar to Dan's? How are they different?
- Did you list other benefits or costs that Dan did not? Does this change the results of the project?
- Are there other educational benefits or expertise from your State forestry office that that you can offer the school?

Next?

Understanding the many benefits an urban forest provides is the first step in developing and implementing a long-term management plan for the trees in a community. It is also important to know what costs are involved and ways to control them. How will the information in this unit help you communicate the importance of the urban forest to the citizens in your area? Answering the following questions can help you focus on how to use this knowledge in your job:

- What types of technical assistance or information can you offer to property owners and local organizations to encourage and help them protect the urban trees? Why do you think this may be important?

- What additional facts should you know about the urban forests in your area?

- What other information about the benefits and costs of the urban forests might be helpful to know? What are the best ways to find out?

- What are some of the ways you would like to be involved with both individuals and organizations in the communities where you work?

For More Information

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Web Sites

Center for Urban Forestry Research

University of Washington Center for Urban Horticulture - Human Dimensions of the Urban Forest

Checking Your Answers

Checking Your Answers about the Benefits and Costs of the Urban Forest

1. What are the four economic benefits of urban trees?

- Urban trees provide the following economic benefits:
- An increase in property values for both residential and business locations
- An increase in the tax base for the community because of increased property values
- A reduction in heating and cooling costs for homes and businesses by providing shade, windbreaks, and evaporative cooling effects
- A reduction in the cost of improving air quality for cities, businesses, and individuals by reducing airborne particles, absorbing carbon dioxide from the atmosphere, and reducing the amount of fossil fuels for heating and cooling
- A reduction of the costs of maintaining or improving water quality by decreasing soil erosion and reducing storm water runoff that may affect the local sewage system

2. How can urban trees improve air quality?

- Trees can improve air quality in three ways:
- The leaves on trees can collect and absorb particles of airborne pollutants, such as sulfur dioxide, and they also store carbon absorbed from the carbon dioxide in the air.
- The physical presence of trees can reduce wind speed, which allows heavy particles of air pollutants to settle to the ground.
- Burning fossil fuels for electricity is a major source of carbon emissions in the air. Properly placed trees can reduce the energy needed for heating and cooling, reducing the need for electrical power.

3. Does the urban forest have a direct effect on the well-being of the people who live in the city? If so, how?

The urban forest affects the well-being of people in several direct and indirect ways. Direct benefits of trees include:

- Stress reduction from being exposed to a more natural setting
- Recreational opportunities in urban parks and open green spaces
- Cleaner air and water
- Reduction in noise
- Faster recuperation when sick
- There are also less obvious ways that people benefit from the urban forest:
- A sense of identity with the community and other favorite places
- Increased involvement with other members of the community

- Reduction of violence in the area

4. Maintenance costs can be a factor in the upkeep of urban trees. What are some of the major costs involved? What can you do to minimize these costs?

The primary maintenance costs for urban trees are:

- Pruning, depending on the species and location. Trees planted in public areas and near utilities require frequent attention.
- Irrigation, if supplemental water is needed.
- Controlling insects and diseases for the health of the trees and for public safety.
- Removing trees to prevent injuries to people and damage to property.
- Recycling tree residue from pruning and removal.

There are many things that can be done to minimize the cost of the urban forest, however these preventative techniques are the most important:

- Select the proper site and tree
- Plant the tree properly.
- Assure long-term maintenance.
- Monitor the tree on a regular basis.