4-H FORESTRY PROGRAM Unit C-4

Urban Forestry

member's manual
and
leader's guide

Contents

Acknowledgments

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The 4-H Forestry Program

Educational aids in the National 4-H Forestry Program consist of three parts. Unit A - Trees - explains what trees are, how they grow, why they are important and what characteristics identify them. Unit B - Forests - is about trees as part of the forest ecosystem, what values people hold for them, and how they are managed. Unit C - Forestry - discusses how people manage the forest resources which provide forest products, recreation, water supplies. wildlife shelter, jobs and other needs.

This sub-unit is only part of a much broader presentation of forestry interests contained in Unit C. In all there are eight publications in Unit C designed to give you an overview of various aspects of the forest industry. You will be advancing from general concepts, as presented in Unit B, to more specific topics, such as

*C–1 The Tasks of Tree Farming
*C–2 Forest Recreation
*C–3 Managing the Forest for Water, Wildlife and Forage
*C–4 Urban Forests
*C–5 Careers in Forestry
*C–6 The Dollar Value of Forestry
*C–7 Timber Harvesting
*C–8 Great Plains Forestry

The Value of Urban Trees

Trees are an essential part of the landscape in almost every American city. Trees not only beautify their surroundings, but also improve the quality of life for urban dwellers in many other ways, too. You can plainly see the value of urban trees just by comparing a boulevard lined with well-groomed trees to a windswept highway or street that is barren of any vegetation.

Urban trees have many of the same values as forest trees, which you learned about in Unit B. For example, park and greenbelt trees prevent rapid runoff of rain and resulting erosion, and also play a vital role in the urban water cycle. Other tree values that become even more important in an urban setting include pollution control, wind reduction, temperature moderation, snow barriers, highway safety aids and wildlife cover, all of which are needed for a decent quality of life in our cities. Following is a discussion of these crucial urban tree values and ways in which they can be enhanced.

1. **Beautification** Trees can soften the hard and straight lines of office and residential buildings. They help arrangement from the mixture of natural and artificial environments. Ugly dumps and junkyards can be hidden by strategic tree plantings. Trees with exceptionally attractive flowers, fruit, fall color or form are often placed in a prominent location to become a focal point in the landscape. Private property owners can use trees for the same purpose.

2. **Pollution control** Noise pollution has recently been increasing in urban and industrialized areas. Construction, traffic, industrial activities, home and garden equipment and many other sources contribute to this increase. However, by planting trees and shrubs in the right places, we can reduce the total noise by six to eight decibels, which is a significant amount. Park ways produced by plantings along highways have reduced noise by as much as 50 percent. Parks, playgrounds and other recreational areas, and rail lines can all benefit from this strategy.

   Trees further aid infighting pollution by collecting dust and other particles from the air. As dust-laden air blows through the crowns (upper parts) of the trees, many particles are dropped as wind speed is reduced. Particles with moisture or hairy leaf surfaces stick to the leaves. Trees also act as a filter by mixing their own pleasant fragrances with many disagreeable odors from the urban environment. Studies are now underway to determine which trees are most effective in removing pollutants from the air.

3. **Temperature moderation** To understand the effect of trees on temperature, walk from a paved parking lot into a wooded park on a summer afternoon. You will find an astounding difference in temperature! The temperature difference between a hot open area and a cooler wooded area could be as high as eight degrees (Fahrenheit) on a warm summer day. At night the woods would be about six degrees warmer than the open area. This moderating effect becomes more obvious in comparing a wooded area with a treeless desert, which is scorching during the day and freezing at night.

4. **Windbreaks** The powerful force of the wind is a problem in many parts of the United States. To combat the wind, people plant windbreaks to protect homes, orchards, playgrounds, industrial sites and other valuable property. A dense planting of trees and shrubs can reduce 25 mile-per-hour winds by about 75 percent on the other side of the windbreak. Even at an altitude 20 times the height of the windbreak itself, the wind may be reduced by as much as 20 percent.

With better planning for city expansion or renovation, larger areas can be designated for multi-purpose "city windbreaks".

5. **Snow fences** Trees may serve as living snow fences. A single row of trees and shrubs planted parallel to a drive or highway will hold snowdrifts on fields rather than blocking highways, thus reducing the problem of snow removal.

6. **Highway safety** Tree plantings that divide highway traffic lanes have proved quite helpful to highway safety. Not only do they add to the beauty of the highway environment, but also reduce headlight glare of oncoming traffic and serve as a barrier to cars accidently crossing over the median. Studies have shown that both driver fatigue and the total number of accidents are reduced in areas with highway plantings.

7. **Wildlife cover** There is an amazing number of wildlife species that live in urban areas. Trees provide these animals and insects with food and shelter. Among those species helped most by trees are squirrels and a variety of birds who use trees both as their homes and as their major source of food. In some parks and greenbelts you may find rabbits, raccoons, opossums, chipmunks, muskrats and other small animals. The most important tree fruits to these urban wildlife species are acorns, nuts and fleshy fruits. Also, some creatures will use hollow trees for dens. From these examples alone it is easy to see how wildlife depends on wooded areas or even individual trees for many or most of their environmental needs.

Urban Tree Problems

Trees not only have additional values in the urban environment, but also face unique problems not found in a forest setting. Urban tree management is made more complex by higher values placed on individual trees and by increased difficulty in growing healthy trees. Urban trees in general have less growing space above and below ground and may be shaded out by tall buildings so that the total amount of sunlight received is much less than that of trees in the forest. Urban trees also must face increased air and water pollution from automobiles and factories, mechanical injuries, wind velocity and their inability to enrich their own soil with fallen leaves, which are often swept away.

Many trees are quite sensitive to certain air pollutants, and should not be planted in hazardous areas. On the other hand, some trees may be used as natural indicators of air pollution problems. Sensitive trees may be planted in potential trouble spots, such as industrial areas, to act as monitors. Should air pollution problems grow worse, their leaf discoloration would be a reliable indicator, thus saving the cost of more expensive monitoring equipment.

Another problem for urban trees during the summer months can be heat. Trees receive direct sun rays as well as reflected heat from buildings and paved areas. As a result, trees can develop scorched foliage. Those tree species that are more tolerant of heat should be planted where intense heat could prove a problem.

Perhaps the greatest threat to street and shade trees is the reduction of a tree's root system. Roots are lost in many ways. Ditching, grading and electrical wiring are common causes of mechanical loss. Aeration and absorption of moisture are reduced by injury to root systems, which are often paved-over. Compaction of the soil by pedestrian or vehicle traffic will have a similar effect. Root loss, regardless of cause, upsets the delicate balance between the crown and the roots. Healthy trees can withstand small root losses, but weakened trees may lose some branches or perhaps even die.

The addition of fill soil over existing root systems is another cause of urban tree death. While constructing roads,

buildings and homes, leveling machines will often push soil over existing tree roots. This limits their ability to find the water and air they need to grow. Soil that is moved by heavy rains from a construction site may be deposited over roots, causing the same problem. To prevent this type of damage, a dry-well drain tile system should be constructed prior to filling. Construction site managers should plan to plant grass on exposed soil to further protect the roots.

Tree wounds are much more common in urban areas than in forests, simply because there are more people around to damage trees. When trees are not protected by fences or barriers around construction sites, they are often bruised or scraped by tractors, trucks and other types of equipment. The greatest threat to young trees in a lawn area is the lawn mower. After a bump or two on all sides, the bark is bruised and the circulation of water nutrients can be cut off. If other attacks follow, the tree cannot adequately mount its defenses to cure itself. Similar damage can occur to trees near uncurbed parking areas or driveways. Initial-carving, nail-driving or knife-throwing all cause problems that can shorten a tree's life.

Despite these disadvantages, trees living in an urban environment have some distinct advantages as well. They receive less competition from other trees for light and space, fewer animals to feed on their bark and leaves, richer soil and climate (if the city is typically located in a fertile area) and more care given by thoughtful people. Some cities have enacted ordinances, or local laws, that prevent mistreatment of trees by developers, utility workers and even private property owners. Some ordinances include regulation, testing and licensing of tree service companies that operate in the area to assure that quality work will be done on trees throughout the city.

Managing Urban Trees

The science of forest management is not restricted to large expanses of rural wooded areas, but applies to urban trees, too. In fact, unique urban tree problems and values can make management decisions much more complex than on a thousand-acre forest tract.

Which trees should be encouraged for urban areas? This is a complex question, and has no set answer. Among the many considerations to be made are the size of the area, soil conditions, size of the trees when mature and resistance of trees to diseases, insects and pollution.

Existing native trees are usually preferred because they have already proven their ability to live under local climatic and soil conditions. Existing trees, which usually range in age between 50 and 100 years old, have an advantage over potential replacements, especially given the time needed to reproduce a specimen such as a large shade tree. Further, native trees normally have built up some resistance to local insect pests and disease.

On the other hand, people are often attracted to unusual or exotic plants, and urban trees are no exception. The problem is that trees which grow well in their native habitat often find it difficult to adapt to different soils, climates, elevations and pests. Foreign trees and trees from other regions should go through a trial period to prove how well they can adapt to local conditions. In general, if plantings were limited to native or proven species, we would have fewer problems with newly planted trees.

As we all know, trees vary in stature. A dogwood, for instance, will never reach the size of a redwood. But when people first plant trees they may fail to consider how large the tree can actually grow. Buckled streets and sidewalks, cracked retaining walls and tree-damaged buildings are all evidences of this fact. For example, oaks have been planted in spaces that will hardly accommodate a dogwood or other small tree. The lesson to be learned here is that the size of a tree at planting is no indication of its full growth potential.

Some trees become less desirable because of their fruit or flowers. A tree such as the *ginkgo* has fruit with an undesirable odor. Trees with fleshy or otherwise abundant fruit create messy

situations when the fruit falls on streets and sidewalks. Even the flowers of some lovely trees, such as the *ailanthus* (or tree-of-heaven) impart very unpleasant odors. Although we may not appreciate these features, they often contribute to the tree's ability to survive in an urban environment without special human care.

Other trees are discouraged for various reasons. The elm, for instance, would be discouraged in those areas where Dutch elm disease is present. Any tree shown to have chronic insect problems would not be recommended, either. Trees that are wind-pollinated instead of insect-pollinated sometimes produce allergies or other respiratory ailments. People with such ailments would prefer trees like basswood, tulip-poplar or other insect-pollinated trees around their home. Lastly, short-lived trees or those with brittle branches normally are not planted around homes or in urban areas.

Common Planting Problems

There are many potential problems that could occur with any tree planting. One very common urban tree problem in this regard is *monoculture,* or planting an entire area in only one species. Monocultural species are more susceptible to widespread destruction caused by disease or insect attack. For instance, in recent years many city streets with most of their trees in elm became almost treeless after Dutch elm disease attacked. Trees in other cities have been struck by chestnut blight, oak wilt or southern pine beetles. This danger is minimized if a wide variety of trees are maintained so that specific insects or diseases will not destroy all of them at once.

Lone trees are more likely to be damaged by lightning, wind, reflected heat, cold and air pollution. Whenever possible, trees should be planted in groups. This is not to say that such trees should remain there forever, for urban trees may begin crowding each other as they grow larger, just like forest trees. The practice of thinning those trees with overlapping or intermingling branches will relieve the surrounding trees of some of their competition for sunlight, moisture and soil nutrients.

When planning for new tree plantings, keep walkways and vehicle traffic as far away as possible from tree trunks. Most feeder roots are near the soil's surface and can be easily damaged by compaction if nearby this traffic. Granted, unsightly or diseased trees presenting a threat to buildings, traffic or pedestrians should be removed. On the other hand, some tree cavities are used by wildlife species as homes, so retain as many "den," trees as you can.

On the subject of wildlife, sometimes bird life is lacking in our park and wooded areas in the city, due to the lack not of trees themselves but of open and brush areas nearby. These habitats are essential to certain phases of the life cycle of some birds. If these areas are separated from city parks by broad expanses of streets and buildings, these birds will rarely visit the city park areas, even if the areas are wooded. If city planners provide for rows of trees and shrubs extending from the inner city to the, open areas by means of greenbelts and parkways, this problem could be eliminated.

Things To Do

1. **Tree root activities**

    a. Most people do not realize how extensive a tree's root system actually is. To see for yourself, select a tree in a large open area or on the edge of an open space. Walk away from the tree trunk and stop at the crown spread's outer edge (the end of the outer branches). Upon obtaining prior permission from authorities, dig a shallow hole or two, which you will fill again, replacing the sod when you finish. Look for tree roots as you dig. If you use a shovel, face the bough of the tree as you insert it so you can easily detect the roots as the soil is removed. If you find extensive roots, back up a few steps and check again. If you do

not find any, move closer to the trunk of the tree and dig another hole. Once you discover the radius of the root system, you might consider the harmful consequences of digging a ditch under the canopy of a tree.

b. Another commonly misunderstood concept is how deep tree roots extend. If you think that a tree's root system is formed like its crown spread in reverse, you are mistaken. Even taking into account the fact that root systems do vary according to tree species and soil conditions, most "feeder roots" are actually near the soil surface, where there is more fertility, moisture and aeration. Roots used for anchoring the tree are larger and deeper, but not nearly as massive as the feeder root system.

Visit a freshly-cut ditch near a tree. Observe the level of the roots. With some nails for anchor points and some string, stretch a line every six inches of depth and count all of the roots at each level. Find out what percentage of the roots are in the first six inches, the first foot, and so on.

2. **Soil compaction** When soil particles are crushed together, the soil becomes more dense and loses its ability to allow air and water to pass through. To test the extent of soil compaction on your street or in a nearby park or wooded area, you will need the following equipment: a dowel rod about 10 inches (25 cm.) long, sharpened at one end; a #5 juice can with the top and bottom removed and the lip cut off on one end, then dulled with sandpaper; a one-quart (or liter) measuring container; and a watch with a second hand.

Find at least two areas where you suspect soil compaction around trees, such as a well-traveled footpath or a construction site. Push the sharpened end of the dowel into the ground, exerting a force with the flat palm of your hand. Measure the depth the dowel rod can be pushed in at each site you visit. Next, twist the can, sharp end down, into the soil until it extends below the surface. Pour one quart (liter) of water into the can. Record how much time it takes for the water to sink into the soil in each instance.

Which types of soil allow the fastest and slowest infiltrations? Think about what could be done to minimize soil compaction around trees near well-traveled footpaths or around construction sites featuring heavy equipment. Contact your local forest and park recreation officials to learn what remedies are now being used.

3. **Environmental contributions activities**

Some of the environmental contributions of trees mentioned in the text may be confirmed by simple field tests.

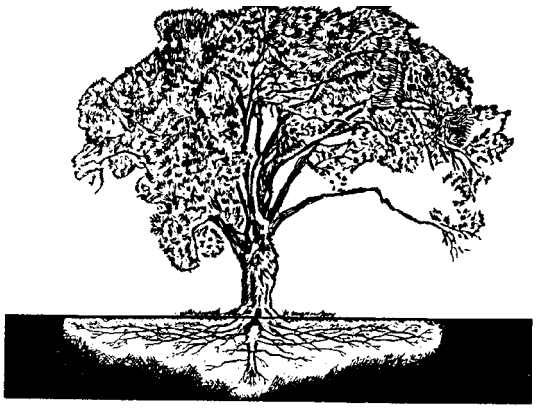

Fig. 1. Tree root system

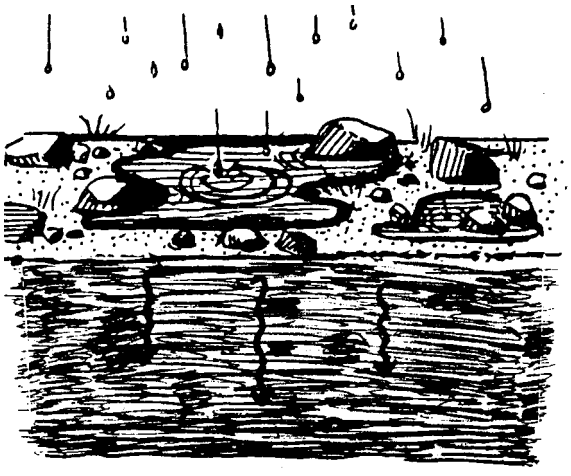

Fig. 2. Compact soil allows little air and water to filter through

a. **Trees and temperature** differences in open and wooded areas in the warmer months can be compared easily. The greatest contrast in temperature between the two areas should be around noon or in the afternoon. Take your temperature readings with a thermometer that is attached to an umbrella's handle (to keep it out of direct sunlight). Take further readings at these same locations several hours after sundown to see how they compare then.

b. **Noise absorption** can be measured with a sound meter or with a tape recorder. (Your leader might check with an industrial or safety inspector to borrow a sound meter.) Record the relative volume of noise along heavily traveled roads, both where there is little or no vegetation and where a row of trees or shrubs is growing along the roadside, at some given distance that is the same for both locations. Be sure to take into account the type of traffic, your distance from the road's edge, the wind direction and velocity and the type of vegetation.

   If you identify a location suffering from noise pollution that could be improved by a vegetational noise screen, take action! Report your findings to local officials, presenting them with the data from your experiment along with an expert's recommendation of vegetation to be planted and the value it will have for the community.

c. **Natural air conditioners,** that's what trees are! They successfully evaporate much of the moisture in the air, which makes our weather a bit cooler. To calculate how much, tie a plastic bag around a leaf or tree. Weight the bag with a small, clean pebble so that it hangs down, thus allowing moisture to collect. Secure the bag tightly on the stem of the twig and leave the bag there for a 24-hour span. The next day remove the bag carefully so that none of the water spills out. Measure the water by volume and weight. Then estimate how much water was evaporated on the entire tree by counting its leaves and multiplying your volume by that number.

4. **Ailanthus experiment** Learn how the plant stem of an urban tree carries water to the leaves to help this tree grow rapidly. Place the end of an ailanthus branch in a container of water. The branch should be green, not brown, and should therefore feature at least one compound leaf. Make sure you have cut the end cleanly and at an angle. Next, add some food coloring, preferably red or black, to the water. After a few hours cut off the top of the branch and see how much of the colored water has been carried up the stem by the pith (the styrofoam-like material in the center of the stem).

5. **Neighborhood tree survey** Select an area of at least 10 blocks or a park that you can survey. Determine the total number of trees according to species, noting which trees are native and which are exotic. Make a leaf, twig and fruit collection of all your trees. Next, present a survey report to your group, including what values the different species have in their urban environment.

   You may want to expand this report into a Cassette Tour by writing and then tape-recording a script that can be used as a tour narrative by younger members or others in the community. Such tours could provide a needed community service and might also serve as a fund-raiser for other student projects.

   If you need help in identifying any of the tree species, either obtain an identification guide or ask your 4-H leader to help you locate an arborist or other tree expert.

6. **Tree wildlife inventory** Make an inventory of the different kinds of

animals that live in trees in your neighborhood. This inventory will help you appreciate the value of urban trees to wildlife. Many of the animals will be easy to identify, but you may need binoculars and a good field guide to identify some of the birds. As you identify different species, note what kind of tree they interact with and what activity they are doing, such as eating tree fruit, or building a nest. If possible, repeat your inventory during each of the four seasons, since many of the birds seen in urban areas are migratory.

Some members may want to use this information either to make a slide presentation on the interaction between trees and urban wildlife or to build birdhouses or feeders appropriate to the species that are present.

7. **Urban tree problems survey** Prepare a checklist of potential tree problems you may encounter in your neighborhood or park. Then survey an area at least 10 blocks long and check off each tree problem you observed, all the while adding to the list any new problems you have not thought of previously. Here is a sample checklist showing some of the problems you may observe:

   - **S** wounds on trunk (how was it injured?)
   - **S** restricted root system (what was the cause?)
   - **S** broken or drying branches (not including lower branches)
   - **S** soil compaction over tree roots resulting from human activity
   - **S** fill-dirt areas over existing roots
   - **S** signs of insects (holes in trunk, gum patch, sawdust-like material present) signs of disease (conks, wet area on bark, deformed leaves) signs of pollution (discoloration around leaf margins or on needle tips that is not due to moisture stress or other foliage disease)
   - **S** root loss due to ditching
   - **S** exposed roots

Upon completing your survey, share the results with your group, then take the combined results to a tree surgeon *and* to a city parks tree specialist to see how you might correct any of the problems cited on your list.

Leader's Section

To work with members on this unit you are not expected to be a professional tree expert. Through some of the publications from local and state Extension offices and other sources you should have enough background information to handle the subject well. Further, there are usually foresters, arborists or other tree experts available to assist you in any city. Check under city, county or state government or under arborist, forester or street and parks departments in the phone directory. These professionals present talks or slide lectures on such subjects as selecting trees for city use and common urban tree problems. They may conduct tours, assist with tree identification or help with other planned activities.

To conduct many of the activities in this unit, you should be able to recognize tree species. Tree identification should be the first subject covered in the initial meetings. Have members collect, dry, mount and label leaf specimens for each tree species in the area. Some authority on tree identification could check the labeled leaf collection for accuracy. It could then serve as a reference to assist in identifying other trees. The local or state Extension office should have some identification booklet or guide which you could obtain for your members. In case a guide is not available locally, suggest that members purchase a field guide at a book store or news stand. One caution: most field guides include only native species. Do not be surprised if you encounter a strange species that is not mentioned in the book. Local urban foresters or arborists should be helpful in identifying exotic or otherwise unusual trees.

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