FIGURE 15.1 A Set of Instructions

INSTRUCTIONS FOR FELLING A TREE

INTRODUCTION

Felling is the cutting down of trees. Forestry Service personnel fell trees for various purposes: to cull or thin a forested plot, to eliminate the hazard of dead trees standing near power lines, to clear an area for road or building construction, and the like.

These instructions describe how to remove sizable trees for personnel who know how to use a chainsaw, axe, and wedge safely.

When you set out to fell a tree, expect to spend most of your time planning the operation and preparing the area around the tree. To fell the tree, you will make two chainsaw cuts, severing the stem from the stump. Depending on the direction of the cuts, the weather, and the terrain, the severed tree will fall into a predetermined clearing. You can then cut the tree into smaller sections for removal.

WARNING: Although these instructions cover the basic procedure, felling is very dangerous. Trees, felling equipment, and terrain vary greatly. Even professional fellers are sometimes killed because of errors in judgment or misuse of tools.

Your main consideration is safety. *Be sure* to have a skilled feller demonstrate this procedure before you try it on your own. Also, pay close attention to the warnings in steps 1 and 4.

To fell sizeable trees, you will need this equipment:

—a 3- to 5-horsepower chainsaw with a 20-inch blade
—a single-blade splitting axe
—two or more 12-inch steel wedges

The major steps in felling a tree are (1) choosing the lay, (2) providing an escape path, (3) making the undercut, and (4) making the backcut.

REQUIRED STEPS

1. *How to Choose the Lay*

To "choose the lay" is to decide where you want the tree to fall. If the tree stands on level ground in an open field, which way you direct the fall makes little difference. But such ideal conditions are rare.

Consider ground obstacles and topography, surrounding trees, and the condition of the tree to be felled. Plan your escape path and the location of your cuts depending on surrounding houses, electrical wires, and trees. Then follow these steps:

a. Make sure the tree still is alive.

b. Determine the direction and amount of lean.

> **WARNING:** If the tree is dead and leaning substantially, do not try to fell it without professional help. Many dead, leaning trees have a tendency to split along their length, causing a massive slab to fall spontaneously.

c. Find an opening into which the tree can fall in the direction of lean or as close to the direction of lean as possible.

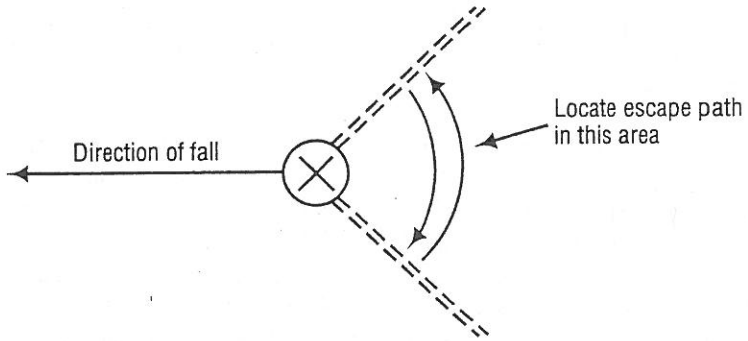
Because most trees lean downhill, try to direct the fall downhill. If the tree leans slightly away from your desired direction, use wedges to direct the fall.

2. *How to Provide an Escape Path*

Falling trees are unpredictable. Avoid injury by planning a definite escape path. Follow these steps:

a. Locate the path in the direction opposite that in which you plan to direct the fall (Figure1).

FIGURE 1 Escape-path Location



b. Clear a path about 2 feet wide for a distance beyond where the top of the tree could land.

3. *How to Make the Undercut*

Making the undercut is the cutting of a triangular slab of wood from the trunk on the side toward which you want the tree to fall. The undercut directs and controls that fall. Follow these steps:

a. Start the chainsaw.

b. Holding the saw with the blade parallel to the ground, make the first cut 2 to 3 feet above the ground. Cut horizontally into the tree, to no more than 1/3 its diameter (Figure 2).

FIGURE 15.1 A Set of Instructions *Continued*

FIGURE 2 Making the Undercut

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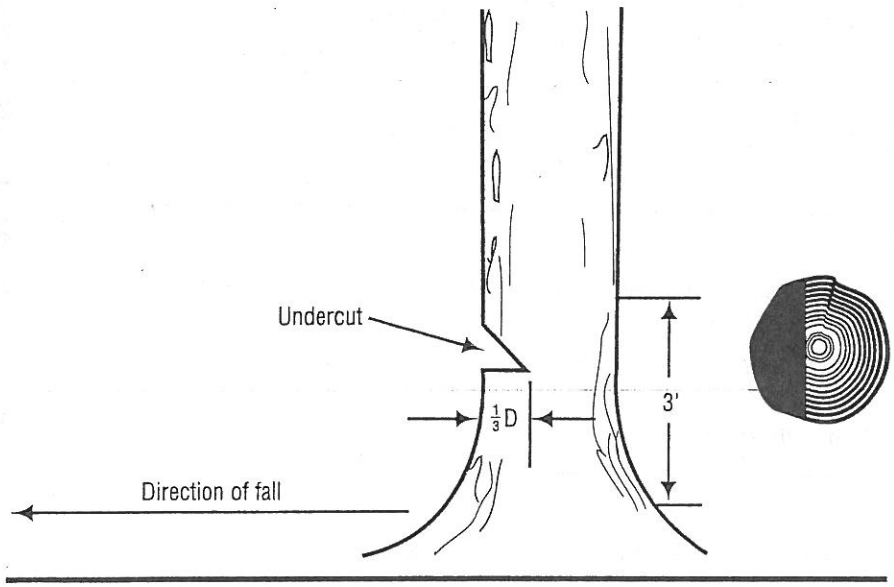


c. Make a downward-sloping cut, starting 4 to 6 inches above the first so that the cuts intersect at 1/3 the diameter (Figure 2).

4. *How to Make the Backcut*

After completing the undercut, you make the backcut to sever the stem from the stump. This step requires good reflexes and absolute concentration.

WARNING: Observe tree movement closely during the backcut. If the tree shows any sign of falling in your direction, drop everything and move out of its way.

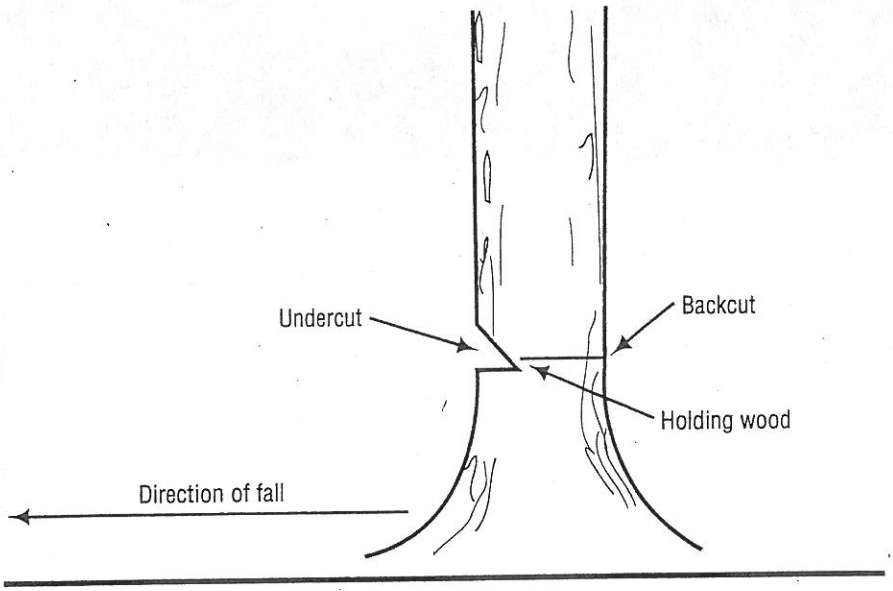
Also, do not cut completely through to the undercut; but instead, leave a narrow strip of "holding wood" as a hinge, to help prevent the butt end of the falling tree from jumping back at you.

To make your backcut, follow these steps:

a. Holding the saw with the blade parallel to the ground, start your cut about 3 inches above the undercut, on the opposite side of the trunk. Leave a narrow strip of "holding wood" (Figure 3).

FIGURE 15.1 A Set of Instructions *Continued*

EXHIBIT 3 Making the Backcut



If the tree begins to bind the chainsaw, hammer a wedge into the backcut with the blunt side of the axe head. Then continue cutting.

b. As soon as the tree begins to fall, turn off the chainsaw, withdraw it, and step back immediately—the butt end of the tree could jump back toward you.

c. Move rapidly down the escape path.

SUMMARY

Felling is a complex and dangerous procedure. Choosing the lay, providing an escape path, making the undercut, and making the backcut are the basic steps—but trees, terrain, and other circumstances vary greatly.

For the safest operation, seek professional advice and help whenever you foresee *any* complications whatsoever.

HOW ACID RAIN DEVELOPS, SPREADS, AND DESTROYS

Introduction

Acid rain is environmentally damaging rainfall that occurs after fossil fuels burn, releasing nitrogen and sulfur oxides into the atmosphere. Acid rain, simply stated, increases the acidity level of waterways because these nitrogen and sulfur oxides combine with the normal moisture in the air. The resulting rainfall is far more acidic than normal rainfall. Acid rain is a silent threat because its effects, although slow, are cumulative. This analysis explains the cause, the distribution cycle, and the effects of acid rain.

Most research shows that power plants burning oil or coal are the primary cause of acid rain. The fuel used to create energy is not completely expended, and some of the residue enters the atmosphere. Although this residue contains several potentially toxic elements, sulfur oxide and, to a lesser extent, nitrogen oxide are the major problem, because they are transformed when they combine with moisture. This chemical reaction forms sulfur dioxide and nitric acid, which then rain down to earth.

The major steps explained here are (1) how acid rain develops, (2) how acid rain spreads, and (3) how acid rain destroys.

The Process

How Acid Rain Develops

Once fossil fuels have been burned, their usefulness is over. Unfortunately, it is here that the acid rain problem begins.

Fossil fuels contain a number of elements that are released during combustion. Two of these, sulfur oxide and nitrogen oxide, combine with normal moisture to produce sulfuric acid and nitric acid. (Figure 1 illustrates how acid rain develops.) The released gases undergo a chemical change as they combine with atmospheric ozone and water vapor. The resulting rain or snowfall is more acid than normal precipitation.

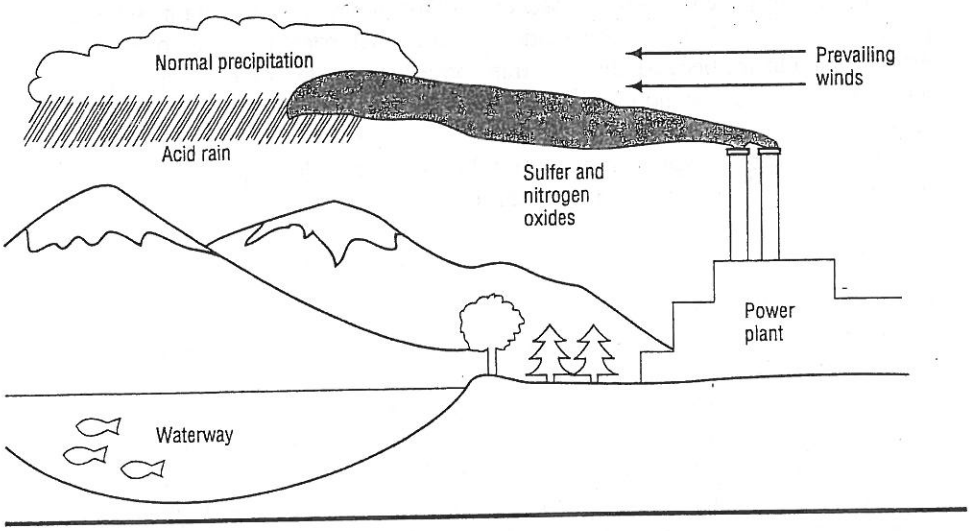
Acid level is measured by pH readings. The pH scale runs from 0 through 14—a pH of 7 is considered neutral. (Distilled water has a pH of 7.) Numbers above 7 indicate increasing degrees of alkalinity. (Household ammonia has a pH of 11.) Numbers below 7 indicate increasing acidity. Movement in either direction on the pH scale, however, means multiplying by 10. Lemon juice, which has a pH value of 2, is 10 times more acidic than apples, which have a pH of 3, and is 1,000 times more acidic than carrots, which have a pH of 5.

Because of carbon dioxide (an acid substance) normally present in air, unaffected rainfall has a pH of 5.6. At this time, the pH of precipitation in the northeastern United States and Canada is between 4.5 and 4. In Massachusetts, rain and snowfall have an average pH reading of 4.1. A pH reading below 5 is considered to be abnormally acidic, and therefore a threat to aquatic populations.

How Acid Rain Spreads

Although it might seem that areas containing power plants would be most severely affected, acid rain can in fact travel thousands of miles from its source. Stack gases escape and drift with the wind currents. The sulfur and nitrogen oxides are thus able to travel great distances before they return to earth as acid rain.

FIGURE 1 How Acid Rain Develops



For an average of two to five days after emission, the gases follow the prevailing winds far from the point of origin. Estimates show that about 50 percent of the acid rain that affects Canada originates in the United States; at the same time, 15 to 25 percent of the U.S. acid rain problem has its origin in Canada.

The tendency of stack gases to drift makes acid rain a widespread menace. More than 200 lakes in the Adirondacks, hundreds of miles from any industrial center, are unable to support life because their water has become so acidic.

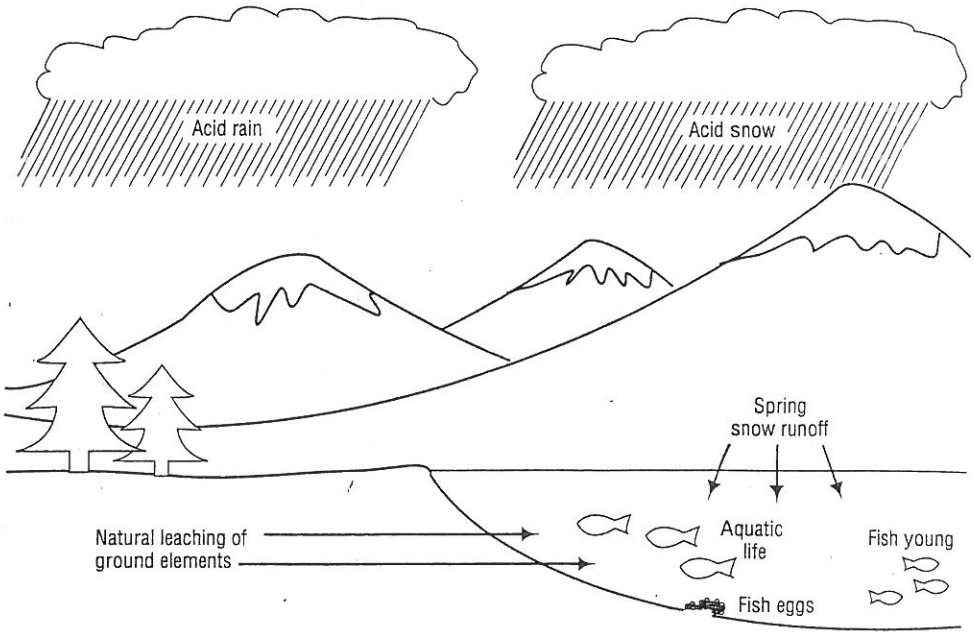
How Acid Rain Destroys

Acid rain causes damage wherever it falls. It erodes various types of building rock such as limestone, marble, and mortar, which are gradually eaten away by the constant bathing in acid. Damage to buildings, houses, monuments, statues, and cars is widespread. Some priceless monuments and carvings already have been destroyed, and even trees of some varieties are dying in large numbers.

More important, however, is acid rain damage to waterways in the affected areas. (Figure 2 illustrates how a typical waterway is infiltrated.) Because of its high acidity, acid rain dramatically lowers the pH in lakes and streams. Although its effect is not immediate, acid rain can eventually make a waterway so acidic it dies. In areas with natural acid-buffering elements such as limestone, the dilute acid has less effect. The northeastern United States and Canada, however, lack this natural protection, and so are continually vulnerable.

The pH level in an affected waterway drops so low that some species cease to reproduce. In fact, a pH level of 5.1 to 5.4 means that fisheries are threatened; once a waterway reaches a pH level of 4.5, no fish reproduction occurs. Because each creature is part of the overall food chain, loss of one element in the chain disrupts the whole cycle.

FIGURE 2 How Acid Rain Destroys



In the northeastern United States and Canada, the problem of excess acidity is compounded by the runoff from acid snow. During the cold winter months, acid snow sits with little melting, so that by spring thaw, the acid released is greatly concentrated. Aluminum and other heavy metals normally present in soil are also released by acid rain and runoff. These toxic substances leach into waterways in heavy concentrations, affecting fish in all stages of development.

Summary

Acid rain develops from nitrogen and sulfur oxides emitted by industrial and power plants burning fossil fuels. In the atmosphere, these oxides combine with ozone and water to form acid rain: precipitation with a lower-than-average pH. This acid precipitation returns to earth many miles from its source, severely damaging waterways that lack natural buffering agents. The northeastern United States and Canada are the most profoundly affected areas in North America.

REVISION CHECKLIST FOR INSTRUCTIONS

(Numbers in parentheses refer to the first page of discussion.)

Content

☐ Does the title promise exactly what the instructions deliver? (326)

☐ Is the background adequate for this audience? (328)