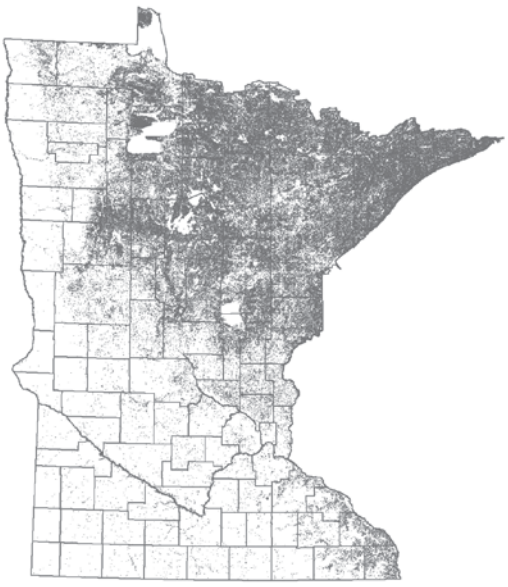
"In the emerging global economy, nations should be increasing, not decreasing, their dependency on wood fiber because wood is renewable, recyclable, biodegradable, and far more energy efficient in its manufacture and use than are products made from steel, aluminum, plastic, or concrete. Furthermore, growing forests and the lumber they provide store large amounts of carbon dioxide that would otherwise escape into the atmosphere, adding to the potential for global warming."
—Dr. James Bowyer, University of Minnesota

CHAPTER FIVE FORESTS TODAY

The trees and forests Minnesota travelers see today are a far different sight from that which greeted the earliest pioneers.

For one thing, there are fewer of them. Largely due to the clearing of the deciduous and southern coniferous forests for agriculture, total forested land in the state has dropped from the pre-European figure of more than 31 million acres to 16.3 million acres (about one-third of Minnesota's land area). Harvest is prohibited on about 1.1 million acres. Although much of this set-aside land is within the Boundary Waters Canoe Area Wilderness (960,000 acres), it includes areas in state and national parks and forests, scientific and natural areas, and corridors and setbacks. Total ***timberland*** (harvestable land)—forest that is considered useful for growing and harvesting trees—is about 15 million acres. More than half (54 percent) of this land is publicly owned.



Current forested land in Minnesota.

In the southeastern third of the state, farming dominates. Trees and forests found there are largely remnants of the extensive mixed deciduous stands that originally grew along the fringe of the prairie, windbreaks or shelterbelts around farmsteads, or urban trees gracing city streets and parks. However, thick deciduous forests still blanket much of the blufflands along the Mississippi River valley. In the northeastern third of the state, quick-growing aspen, birch, and red and jack pine that grew up after the great pine forests were logged, now dominate. Although shade-tolerant spruce and fir have invaded some of these forests, today more than a third (6.96 million acres) of Minnesota's forested acres are primarily aspen. Minnesota has more aspen than any other species of trees.

Forest management today is increasingly focused on stewardship, multiple benefits, and sustainability. Those who care for Minnesota's forests recognize that: 1) this resource is to be used, but not abused; 2) human needs are to be balanced with other goals; and 3) current demands must be compatible with our responsibility to future generations.

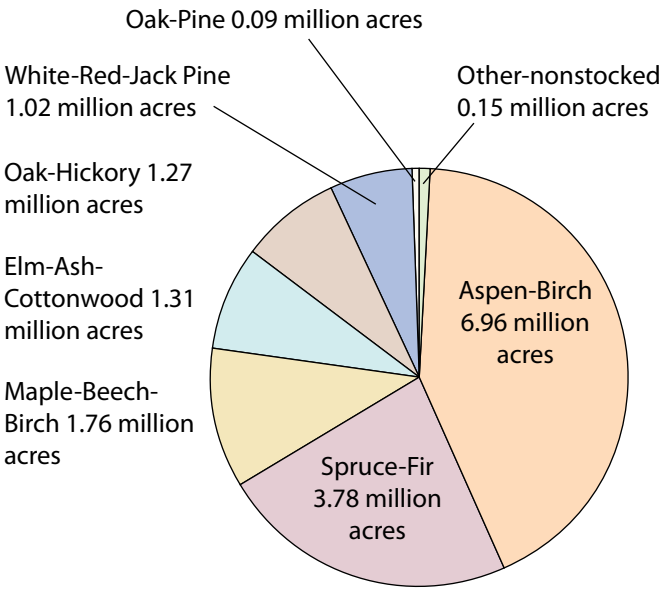
What do Minnesota's forests look like now?

As forests continue to succeed from the logging days of old and undergo active management today, they are also subject to future climate change, diseases, invasive species, and changes in human populations. Therefore, we expect certain species of trees to increase or decrease. Today, common Minnesota trees are aspen and other deciduous trees, whereas a hundred or more years ago conifers like pines and spruces were more common.

Some recent examples of ups and downs:

- Paper birch has declined since 1990 because many birches are old and dying, while others have suffered stress from periodic droughts. Since most birches are relatively old, more work is needed to regenerate birch for the future.
- Since 1990, forests of balsam fir have declined dramatically, by 34 percent. This is mainly because of damage from spruce budworm, which naturally occurs every few years.
- Jack pine forests have decreased by nearly 27 percent in recent years. Jack pine naturally reproduces (re-seeds) through fire and is considered old once it reaches 41 to 60 years. As of 2004, more than half of Minnesota's jack pine was more than 40 years old. To encourage future young jack pine, existing stands need to be harvested or burned, and replanted.

Forest type acres on Minnesota forest land



Forest Type: A classification system based on the most common tree species growing on the site. The forest inventory analysis is the U.S. Forest Service's "tree census."

Old Growth

Ambitious timber companies left few tracts of woodland untouched when they cut through Minnesota's forest lands a century ago. While the vast forests of towering pine that once crowned the state are mostly memories, there are still thousands of acres of mature forests today. The same is true for the once broad-ranging deciduous forests in the southern part of the state, which fell to the farmer's ax in the days of the settlers. Today, aspen covers much of the former pinelands and farms and scattered woods cover much of the former deciduous forest.

Old-growth forests have escaped ax, fire, or saw for a century or more, and survive as living reminders of Minnesota's past. These tracts, which total as much as 600,000 acres statewide, are among the oldest pieces of the patchwork quilt that forms the land around us. Their unique structure, with a mix of tree ages, standing dead trees, canopy gaps, and tip-up mounds and pits, makes them particularly valuable from scientific, educational, and ecological standpoints.

How big is your tree?

Trees are measured in both height and diameter. However, depending on tree species and other factors, the biggest tree is not always the oldest!

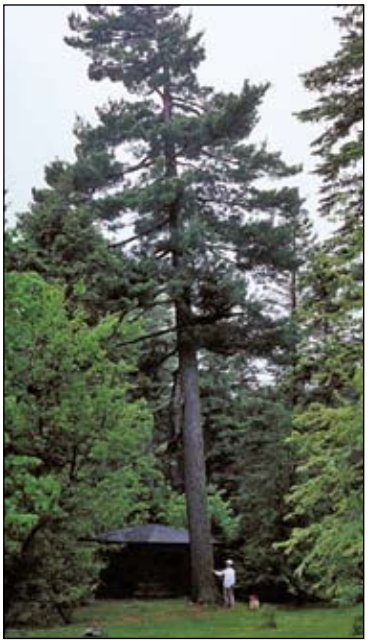
Instructions for measuring trees are in Appendix 4.

Today these forests are the subject of a land-use controversy that epitomizes the challenge of managing a resource with many possible—and not always compatible—uses. Many people view the old-growth forests as natural museums providing historic examples of the sights and sounds that met the very first settlers, as ecological showrooms, as rich and undisturbed habitat for forest wildlife, as a source of seeds for future generations of trees. Others, however, recognize their potential value as a source of timber, and suggest that selective cutting would actually benefit these tracts by keeping them vigorous.

Recognizing that a decision to harvest these areas for timber would permanently alter the forest, the Minnesota DNR has identified and temporarily set aside 38,400 acres of state land to be managed as old-growth forest. This means that the DNR will ensure that people will be able to enjoy and study acres of old-growth forest in the future. Inevitably, these stands must change (due to natural or human forces). But by that time, the DNR will have designated other lands to be set aside as old growth.

Renewing White Pine

In the late 1830s, loggers reached the pine lands of east-central Minnesota. During the next 80 years, most of the choice, large white pines across the state fell to the ax and saw. Agricultural development, urban growth, and extremely hot wildfires that fed on logging slash also took their toll, as did drought, disease, insects, pollutants, and animal browsing. In recent years, many Minnesotans have voiced concern about the loss of white pines.



Minnesota DNR

In response, the Minnesota Department of Natural Resources formed a White Pine Regeneration Strategies Work Group in 1996 to help ensure that white pine once again becomes a healthy component of Minnesota's northern forests. However, while the effects of logging have declined, more people, more deer, and nonnative white pine diseases continue to put pressure on white pine populations. Now, through the efforts of resource management agencies and individuals, white pine is no longer declining, and efforts are underway to allow the white pine to increase even more.

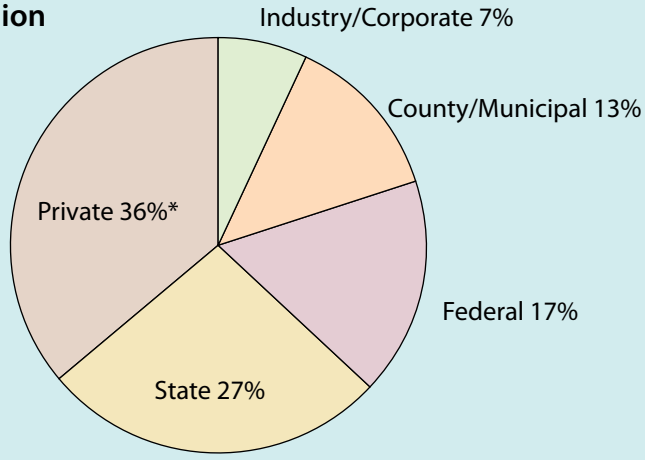
Forest Legacy Program

Congress established the Forest Legacy Program as part of the 1990 Farm Bill. This program protects environmentally important forests throughout the state that otherwise might be converted into something other than forest. Federal and local matching funds buy development rights and conservation easements in these targeted areas. Landowners still own the land and can still use it for timber, recreation, hunting, and hiking as long as they don't conflict with the terms of the easements.

Who Owns the Forests?

Who owns and manages Minnesota's forests today? Most of Minnesota's forest lands belong to you and me. As members of the public, we are responsible for the 57 percent of the 16.3 million acres of Minnesota's forest lands in the hands of state, federal, county, and municipal government agencies. Professional foresters manage these lands for us. Another 36 percent of Minnesota's forest lands is owned by private citizens. Only 7 percent of Minnesota forest lands is owned by industry.

Who owns Minnesota's 16.3 million acres of forest lands?



* Includes tribal lands

Source: Minnesota Forest Inventory and Analysis (FIA) 2005 data

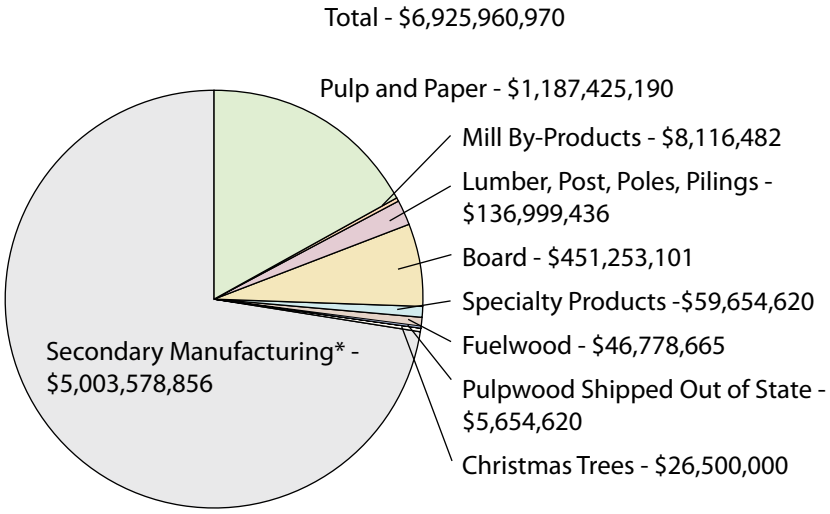
Multiple Benefits of Forests

Whereas in the past forests often were managed with a focus on timber production, today's forests are more likely to be managed for long-term sustainability and to provide a variety of benefits: timber, nontimber products, jobs, wildlife habitat, biological diversity, cultural resources, improved water and air quality, carbon sequestration, recreation, aesthetics, and energy from woody biomass.

Timber

Trees are still harvested for lumber as they were in the past, but other forest products such as paper, ***oriented strand board,*** and veneer are a bigger piece of the picture than they were a century ago, in part because of the changed mix of tree species. Today, more than 40,000 Minnesota workers get at least some of their income from the forest products industry, which produces between $6 billion and $7 billion worth of products each year. That's a lot of paper and lumber!

Value of forest products manufactured in Minnesota



* Secondary manufacturing is products produced after the primary manufacture of wood. For example, logs are first made into boards, then boards are secondarily manufactured into furniture, buildings, fencing, etc.

Source: Minnesota Forest Industries 2005.

Nontimber Products

In addition to timber products such as paper and lumber, forests can provide nontimber products, often made from tree parts such as: boughs, bark, cones, nuts, sap, and seeds. In addition to items made from trees, forests also provide berries, mushrooms, florals, botanicals, and other products. Such products are an important source of income for many people.

Some examples of tree species and the products made from them:

Tree Species	Timber Products	Nontimber Products
Aspen	Pulp and paper, oriented strand board, paneling	Walking sticks
Balsam fir	Pulp for paper, Christmas trees	Seasonal wreaths
Birches	Furniture	Aromatic oil, medicinals, bark products, canoes
Maples	Lumber, veneer, flooring, furniture	Syrup, charcoal, candy, baskets
Oaks	Furniture, cabinets, railroad ties	Firewood
Pine, red	Telephone poles, construction lumber, cabin logs	Pet bedding, decorative and Christmas swags, mulch, firestarters, wreaths
Pine, white	Lumber, doors, furniture, knotty paneling	Pet bedding, decorative and Christmas swags, mulch, firestarters, wreaths
Spruce, black Spruce, white	Pulp for paper	Aromatic oils, florals, sound boards for music instruments, wood, potpourri, gum, wreaths, spruce tops

Jobs

Many jobs depend on trees: forestry, logging, wood products manufacturing, pulp and paper products, furniture, printing, and more. In Minnesota, forestry creates more than 40,000 jobs and brings between $6 billion and $7 billion to the economy each year. The forest products industry is the fourth largest in the state! Most of the logging, pulp, and paper operations are in the north, and most printing and publishing operations are in the Twin Cities. *Source: Minnesota Forest Industries, 2005 data.*

Wildlife Habitat

Forests provide diverse food and habitat for a variety of mammals, birds, insects, reptiles, amphibians, microorganisms, and fish. This includes game species such as deer, ruffed grouse, and trout, as well as nongame species such as scarlet tanagers, Blanding's turtles, and bobcat. Large, shady trees help keep trout streams cool. They also provide acorns for squirrels and bears, fallen logs for toads and snakes, and nutrients for a multitude of insects and microorganisms, the food base for the insect-eating animals that depend on them.

Biological Diversity

Forests can be valuable reservoirs for biological diversity of plants and animals. Forests that sustain several plant and animal species are more diverse than forests with fewer species. The level of forest diversity affects how well a forest responds to disturbances like fire, diseases or insects, and the number of common, rare, threatened, and endangered species that live in it. Forests may also contain features identified and protected by the ***Natural Heritage Information System,*** such as rare plants or animals, animal breeding or nesting grounds, or unique geological features.

Cultural Resources

Forests contain important cultural or historic resources such as historic burial grounds or treaty-signing sites, large or very old trees, and tracts of old-growth forests. Archeologists identify these areas to protect and preserve them.

Water and Air Quality

Forests help keep water and air clean. The duff and vegetation on the forest floor slow water on its journey to streams and lakes, helping to minimize runoff, erosion, and pollution. Roots reduce soil compaction and trap pollutants that may reach rivers and groundwater. Trees remove carbon dioxide, ozone, nitrogen oxides, and sulfur dioxide from the air and release oxygen. Trees clean the air of particulate matter such as dust, pollen, and smoke by providing surfaces the particulates can cling to.

Carbon Sequestration

Through the process of photosynthesis, living trees and forests sequester or store carbon dioxide (CO_2) by absorbing it from the air and storing it in their roots, stems, branches, and foliage. Too much atmoshperic CO_2 contributes to higher global temperatures that could increase the frequency of extreme weather events and have a profound impact on human health. As trees decay, die, or burn, they release CO_2 back into the atmosphere. A tree harvested and reused as lumber, furniture, or other durable goods can hold its carbon for decades or longer. As long as yearly growth exceeds the amount of carbon removed during harvest, forests can slow the rate of CO_2 released into the atmosphere.

Minnesota DNR

Recreation

Forests provide opportunities for recreation and tourism, including hunting, horseback riding, hiking, fishing, birding, berry picking, camping, cross-country skiing, snowmobiling, and all-terrain vehicle use.

Fire: Enemy or Friend?

After commercial harvesting peaked in the late 19th century, by the early 20th century, huge fires fed by fuels left behind by loggers destroyed thousands of homes, businesses, and lives. As a result, the U.S. Forest Service's earliest policy was to suppress all fires.

This policy may have saved lives and property in the short term, but it had some unfortunate long-term consequences. It allowed dense undergrowth to fill in beneath the canopy, creating fuel. When fires did burn, they burned with tremendous intensity that scorched canopies and burned the soil, caused serious reductions in soil fertility, killed beneficial soil bacteria and fungi, killed overstory trees, increased soil erosion, and damaged wildlife habitat. Therefore, suppressing fires in fire-dependent areas may create old-growth forests that may be considered unhealthy.

Today, we recognize that small, low-to-the-ground, cool, frequent fires provide many environmental benefits, such as reducing competition, encouraging regeneration of trees, improving soil fertility, and increasing fire-loving species like blueberries and jack pine. We still suppress wildfires to protect human lives and property. But forest managers also work to replicate the beneficial fires of the past by controlling the amount of fuel in the forest through logging, allowing some fires to burn, and setting intentional fires called ***prescribed burns.***

Aesthetics

Forests also add beauty to our surroundings. Trees bring color and texture into the landscape, soften hard lines of buildings and paved areas, reduce vehicle noise, and provide feelings of peace and security. More than ever before, forest owners acknowledge not only the aesthetic value of the forest—but also the value of its nonmonetary existence—as having worth.

Energy From Woody Biomass

Biomass energy comes from any renewable organic matter (trees, plants, and associated residues) that can be burned to generate heat or electricity. Minnesota is looking into trees and other plants, along with wind power and other renewable sources of energy, to reduce our dependency on energy-derived nonrenewable resources like coal and oil.

Urban and Community Forests

When we hear the word *forest,* many of us think of wild settings, far-reaching stands of trees largely unbroken by human meddling. Some of the toughest challenges in forestry today, however, come from what is known as "urban forests"—the collections of trees that grow within city limits. City trees have to put up with more pollutants in the air than do rural trees. Their trunks and branches get gouged and broken. Their roots suffer from soil compaction, severing from construction, vandalism, and other problems. Urban foresters work hard to keep trees healthy in this challenging habitat by choosing the right trees for the setting and ensuring they receive the care they need to stay healthy.

Be careful when working around trees!

It is the fine root hairs of larger roots that absorb most of the water taken in a by tree. In many trees, most root hairs are 6–12 inches from the surface of the soil. Compacting soil with heavy equipment or covering a tree's roots with too much soil or mulch can actually cut off the tree's water and air supply enough to kill it. Intensive digging or rototilling around the base of a tree can also have drastic negative effects on the tree's health and ability to withstand future stress. Remember, much of the tree is underground!

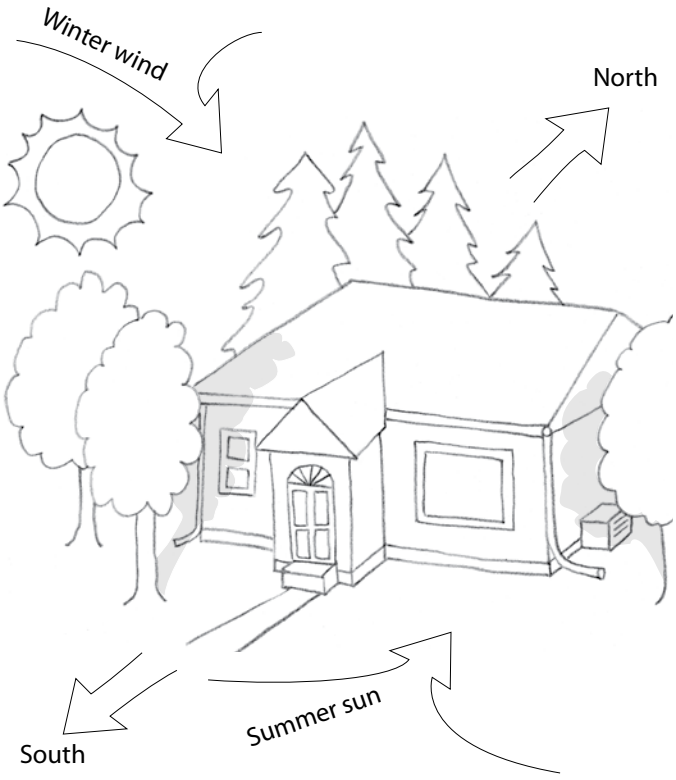
Why bother? Well, most people in Minnesota live in cities and towns, and trees are a valuable component of the urban environment for many reasons:

Economic Benefits

Trees add value to residential property. The U.S. Forest Service estimates that each mature tree "pays us back" from three to four times the cost of planting and maintenance over its lifetime. This payback comes in the form of cost savings due to preventing soil erosion, conserving energy, cleansing air and water, slowing and storing storm water, and increasing property values.

Energy Savings

By providing shade in the summer and shelter from the wind in winter, trees can reduce annual energy consumption in homes and office buildings by 20 percent or more. Many property owners in cities and suburbs plant trees strategically to shelter their homes and businesses from wind in winter and sun in summer, reducing energy demand for heating and cooling.



Properly planting trees around buildings saves energy costs from heating and cooling. Plant coniferous trees on north or northwest sides to block cold winter winds; deciduous trees on east and west sides to block hot summer sun and allow warm winter sun.

Clean Air

Trees release oxygen while trapping dust and removing pollutants. In fact, the average tree absorbs 10 pounds of pollutants from the air each year, including 4 pounds of ozone and 3 pounds of particulates. A single acre of trees uses up to 6 tons of carbon dioxide—the primary gas blamed for global warming—each year.

Clean Water

One hundred mature trees catch about 77,000 gallons of rainwater each year. Wooded areas and trees influence water flow, filtration, runoff, soil erosion, and sediment control, and provide clean water. Wooded areas also increase water percolation and infiltration, which is especially important to communities that depend on groundwater. Along streams, tree roots slow water flow and create pools where fish and other water creatures can lay their eggs.

Tree City U.S.A.

You may have driven into a town with a "Tree City" designation on its welcome sign. The National Arbor Day Foundation bestows this honor on communities that:

- Establish a tree board or department.
- Pass a tree care ordinance.
- Establish a community forestry program with an annual budget of at least $2 per capita.
- Organize an Arbor Day observation and proclamation.

Minnesota already has more than 120 Tree Cities. To learn more, go to www.arborday.org, or telephone 888-448-7337.

Health and Social Benefits

Trees' beauty and grace adds much to urban vistas, softening the harshness of cold, angular concrete and brick. Wooded areas in urban settings provide a place of mental and physical contentment. Research has shown that a walk in a wooded area can relieve psychological and emotional stress. Medical studies indicate that patients recover faster in facilities surrounded with trees and rooms offering views to wooded areas because they feel serene, peaceful, and restful. In addition, trees offer aesthetic values, recreational and educational opportunities, screening and privacy, and reduce noise and glare. Dr. Frances E. Kuo, and Dr. W. C. Sullivan at the University of Illinois at Urbana-Champaign found that trees in urban areas:

- Make people feel more calm and friendly
- Increase neighborliness
- Reduce symptoms of attention deficit hyperactivity disorder in children
- Help older teens resist negative peer pressure
- Reduce crime
- Reduce driving stress
- Slow traffic and make roads safe
- Improve physical health of residents

Vegetation has been shown to alleviate mental fatigue, one of the precursors to violent behavior. And because green spaces are used more, there's a sense that there are more eyes on the street, which may deter would-be criminals from committing crimes where they think they are being watched.

To sum up

Chapter Five: Forests Today

- Today, aspen is one of the most common trees in Minnesota.
- Today, there exists programs to preserve old-growth forests, regenerate white pine, and ensure a legacy of forests into the future.
- The public owns most of Minnesota's forests.
- Forests are used for timber, nontimber products, jobs, wildlife habitat; as reservoirs of biological diversity and cultural resources; and to improve air and water quality, carbon sequestration, recreation, aesthetics, and energy from woody biomass.
- Old-growth forests are designated and managed for long-term study.
- Urban and community forests provide critical benefits where people live.