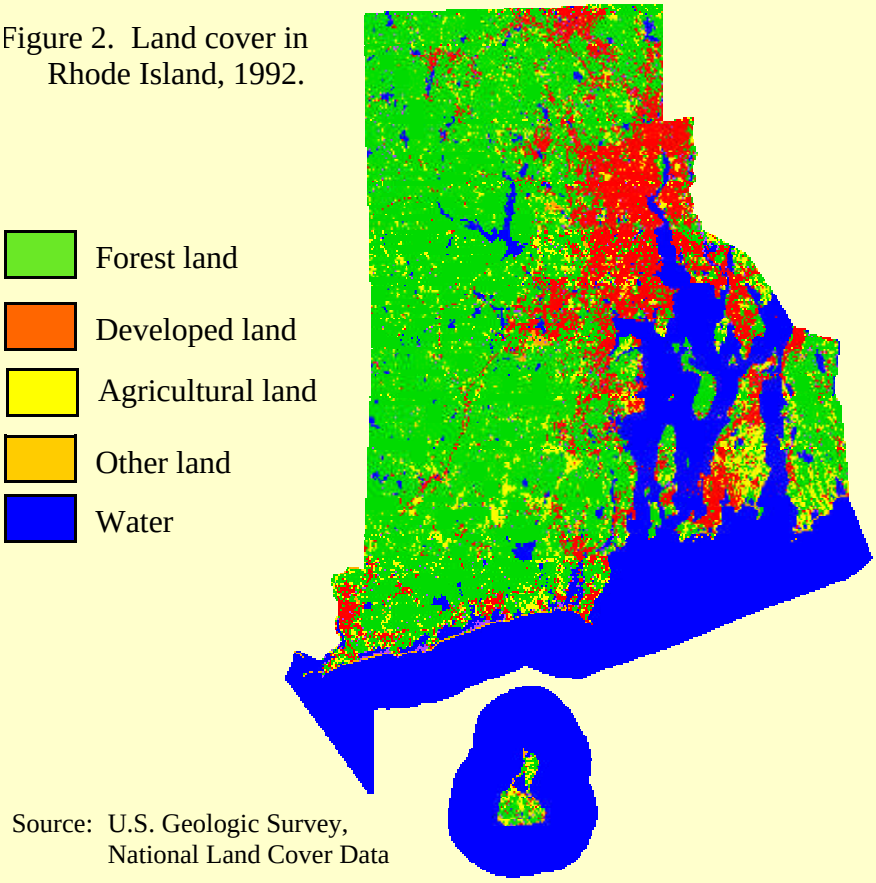
Mountain laurel
Kalmia latifolia

LAND USE

During the past 300 years, forest has covered between 90 and 25 percent of the land in Rhode Island (Fig. 1). The maximum forest coverage occurred prior to European colonization and the minimum corresponded with the height of agriculture in the state. Between the mid-1800s and mid-1900s, *forest land** reestablished to cover about 65 percent of the state's land. But since the 1960s, forest land has been slowly decreasing. Forests now cover 393,000 acres or 59 percent of the land in the state (Fig. 2). Forests are being lost to urban, suburban, and commercial land uses at an average rate of 6 acres per day. Most of these acres will never become forested again unlike the agricultural fields that were abandoned a century ago.

Figure 2. Land cover in Rhode Island, 1992.



Source: U.S. Geologic Survey, National Land Cover Data

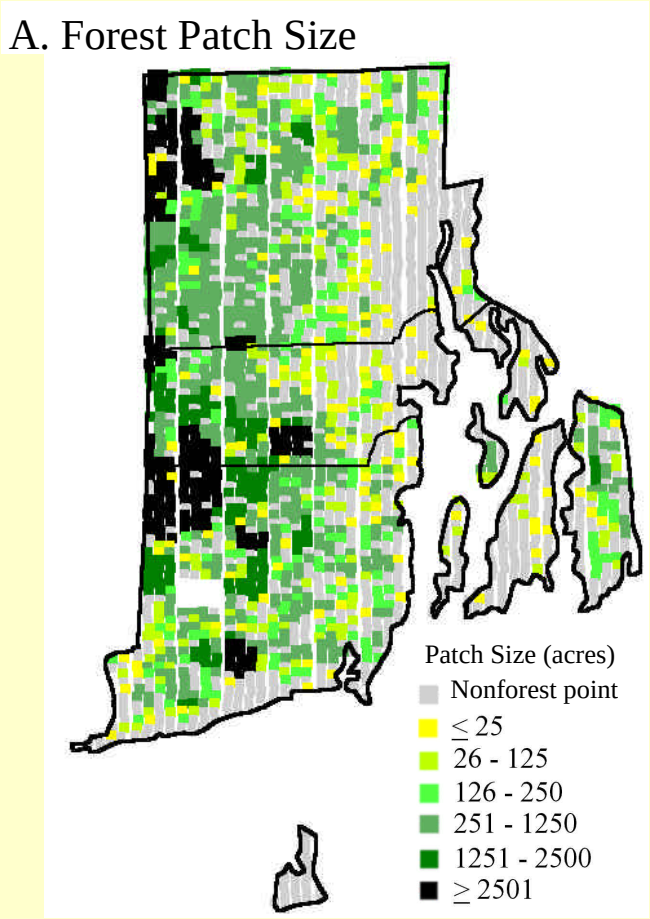
The fragmenting forest

Between 1990 and 2000, the population of Rhode Island increased 4½ percent. Population growth means more land being used for residential and urban purposes. There is much concern about the effects of this urban expansion on forest land. Forest *fragmentation*—the division of contiguous or adjoining forest land into smaller or more complex patches—is a growing concern because it has the potential to change local water cycles, reduce critical wildlife habitat, increase disturbances, and foster the invasion of exotic plant species.

In Rhode Island, areas of contiguous forest land, or forest patches, vary greatly in size and shape (Fig. 3A). The largest forest patches are concentrated along the western edge of the state and correspond to state-owned forest and wildlife management areas. Kent County in west-central Rhode Island has the greatest percentage of forest cover, more than 62 percent. These forests are also the least fragmented forests in the state. These large, contiguous, nonfragmented forest patches provide unique habitat for many animals and plants.

Nonforest land and smaller forest patches predominate in the area surrounding Providence and bordering Narragansett Bay, Block Island Sound, and Rhode Island Sound. The area around Bristol and Barrington has the least forest cover, with nearly 40 percent of the land in residential uses and a population density of more than 2,000 people per square mile. Forests in the eastern shore area, Bristol and Newport Counties, occur in relatively small patches, with much of the forest in patches of 2½ acres or less. Small forest patches have less interior forest habitat and may increase the forest's susceptibility to certain diseases and the spread of invasive,

* Words in italics are defined in the



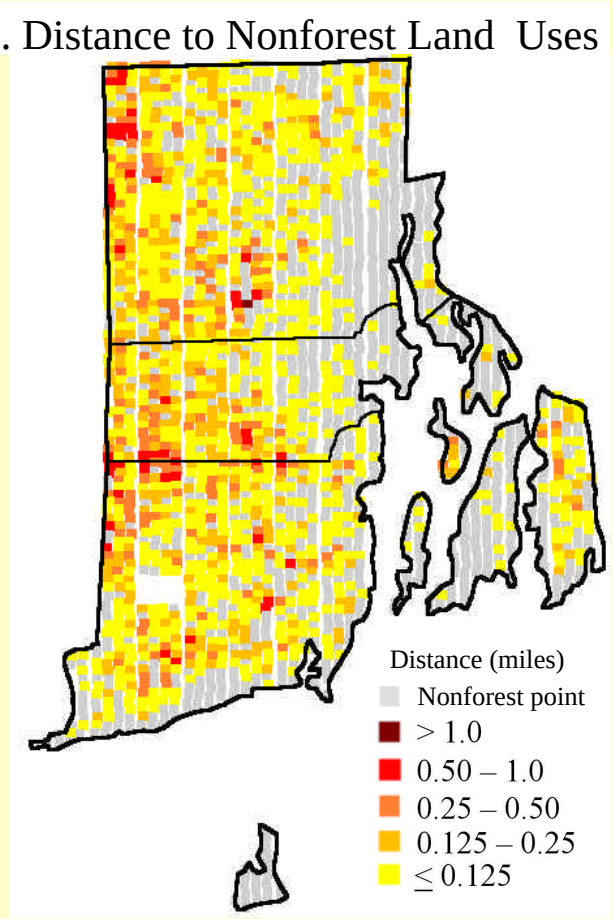


Figure 3. To assess forest fragmentation in Rhode Island, fragmentation statistics were measured at more than 2,000 points using aerial photographs. Two statistics that were measured at each point were (A) the size of the forest patch and (B) the distance to the nearest nonforest land use.

exotic plants.

The majority of forest land is within a quarter-mile of some other land use (Fig. 3B). This is true especially in Bristol County where most of the forest is within an eighth of a mile of another land use. The potential effects of this adjacent nonforest land on forest composition and structure depends, in part, on the type of land use encountered at the forest/nonforest interface.

Residential land was the most common land use found adjacent to forest areas and agriculture was the second most common. Urban and agricultural lands can influence bordering forest patches in different ways. The shape and abruptness of the forest/nonforest interface often is related to the type of adjacent land use. Seed dispersal by animals and wind, and local climate and moisture dynamics, may be affected by the nonforest land uses surrounding a forest patch. These and other factors affect the *forest composition* and *forest structure* of the patch. Studies have shown that forests in urban areas are less diverse, have lower tree densities, and greater proportions of non-native plant species than similar forests in rural and agricultural areas. Research is currently under way to better define the relationship between land use, forest fragmentation, and forest structure and health.

Clearing forest for a house lot in northwestern Rhode Island

Flowering dogwood
Cornus florida

WHO OWNS THE FOREST?

The major changes that are currently affecting Rhode Island forests are the result of people. It is people who decide where to clear land for houses and people who intentionally or unintentionally decide to allow land to revert to forest. If people were not present in Rhode Island, almost all of the state would be forested. But there are people here – more than 1 million people and growing.

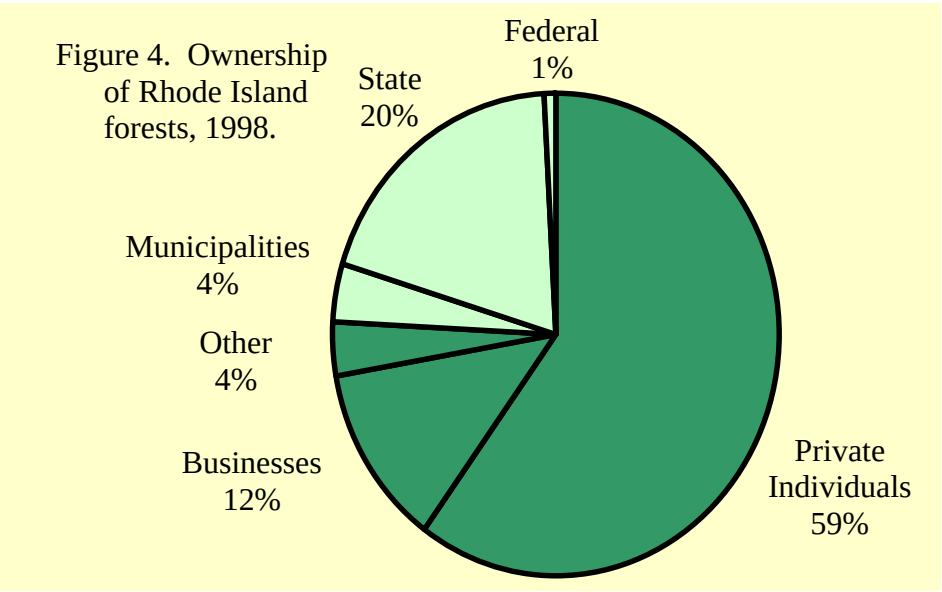


Figure 4. Ownership of Rhode Island forests, 1998.

Forest ownerships in Rhode Island range from the large public landholders, such as the State which controls more than 75,000 acres of forest land, to individuals with an acre of forest as part of their home lot (Fig. 4). The Rhode Island Department of Environmental Management manages most of the state-owned forest through the Forest Environment and Fish and Wildlife divisions. Watershed protection, wildlife habitat, and recreational opportunities are all important objectives of the State's land management. County and municipal governments own many small- to medium-sized forest parcels operated mainly as public water supply watersheds and parks. The small amount of federally owned forest land is wildlife refuges managed by the U.S. Fish and Wildlife Service .

Private forest land owners

Three out of every four acres of forest in Rhode Island are privately owned. There are about 27,000 private forest owners in the state (Table 1) ranging from individuals with 1-acre home lots to conservation groups that own thousands of acres.

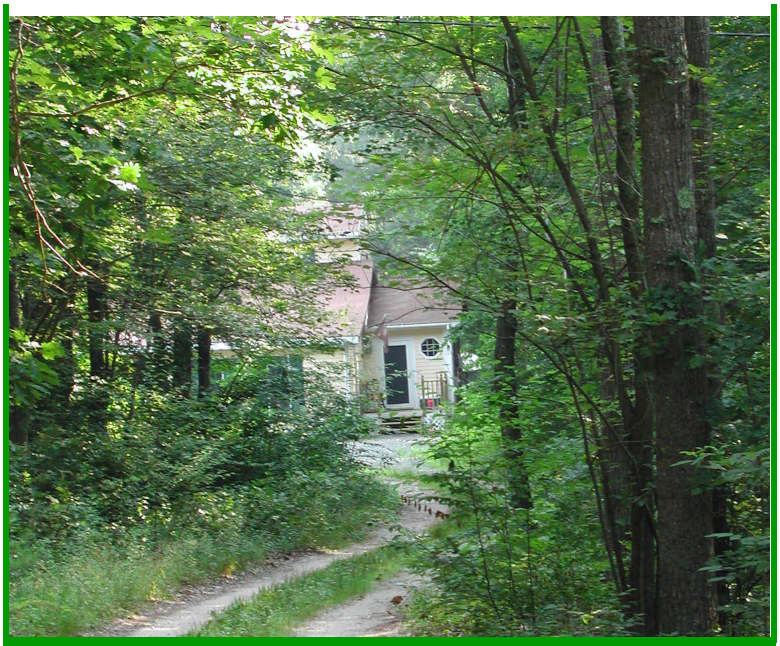
Between 1973 and 1993, the number of private owners in Rhode Island nearly doubled while the area that these people owned decreased. The average area owned decreased from 26 to 13 acres per owner. Holdings of less than 10 acres exhibited the greatest increase in number. Although the average size of forest holding in the state is decreasing, there are some landowners – primarily land trusts and conservation groups – that are acquiring larger tracts. Based on what has happening over the past couple of decades, medium-sized land holdings, between 20 and 200 acres, are most vulnerable to being lost.

Table 1. Number of private forest land owners and area of forest land owned in Rhode Island.

Size of Forest Land Holding (Acres)	Number of Owners	Area (Acres)
1-9	20,900	47,000
10-19	2,100	31,000
20-49	2,500	79,000
50-99	400	23,000
100-199	500	63,000
200-499	300	63,000
500+	< 50	32,000
Total	26,700	338,000

These trends of *parcelization*—more small parcels of land—and consolidation—more large parcels of land— are caused by pressures from a growing population.

Smaller forest parcels are being created, in part, because of increasing population densities, escalating land values and development pressure, and high property and inheritance taxes. Initiated in 1968, Rhode Island's "Farm, Forest, and Open Space Act" was passed to help private landowners retain their forest, farm, or other open space by taxing the land according to its current use instead of its "highest and best use" as is common under many property tax systems.

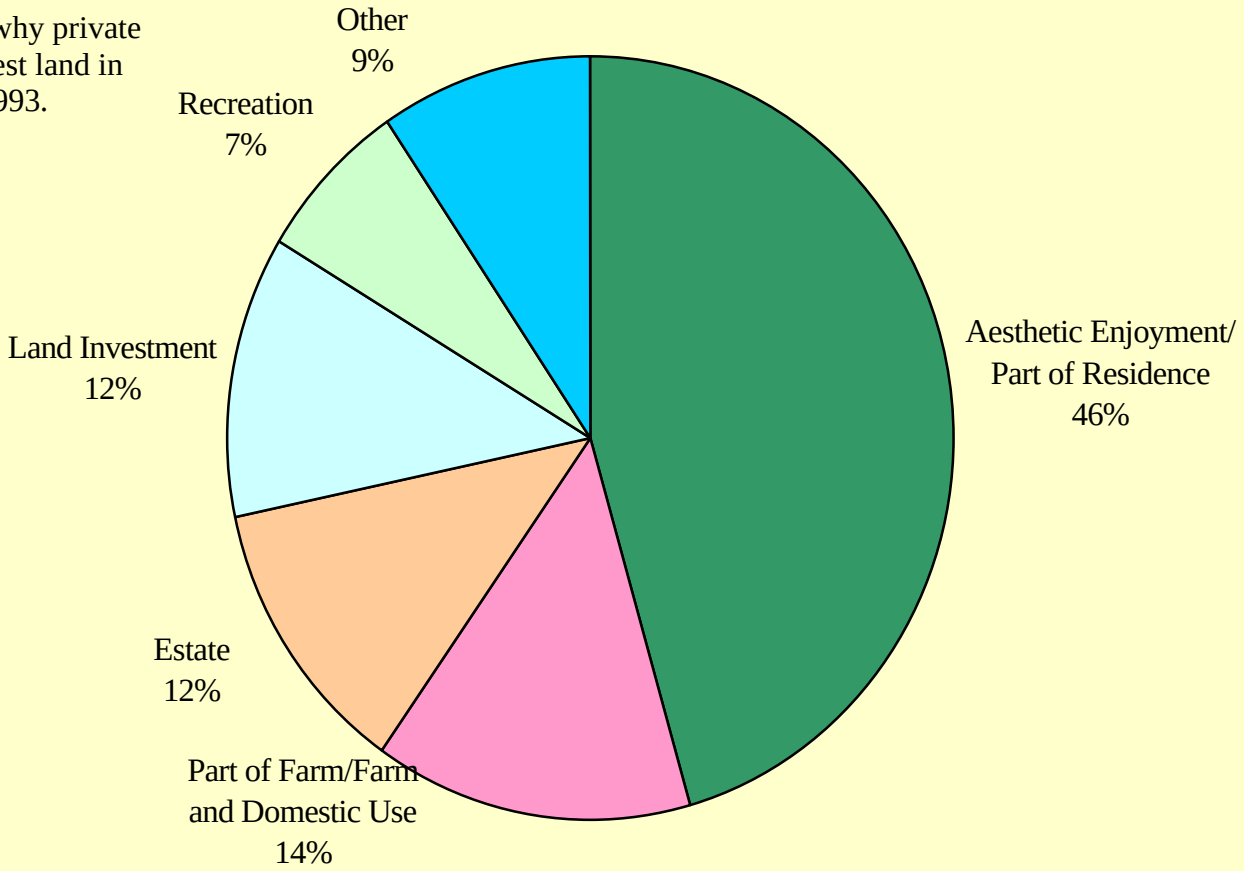


The home and property of a typical forest owner in Rhode Island

Reasons for forest ownership

A 1993 landowner survey found that the main reasons for private ownership of forests are that the forest is a part of the owner's residence and for them to enjoy the beauty that forests afford (Fig. 5). Other common reasons given for owning forest land are: to supply firewood or other products for the owner's farm or home; the forest occupies an unused part of their farm; the forest is a part of the family's estate; is owned as a land investment; or provides recreational activities for the owner, family, and friends. Owners of parcels of 10 acres or less commonly report that they own forests for two reasons: the forest is part of their residence, and for aesthetic enjoyment. Owners who cite other reasons for owning forests typically own parcels of 50 acres or more.

Figure 5. Reasons why private owners own forest land in Rhode Island, 1993.



Northern red oak
Quercus rubra

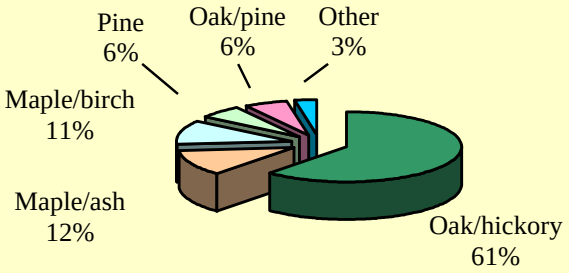
THE FOREST LAND

One common characteristic that helps describe the forest is the distribution of *forest types*. The forests of Rhode Island contain a remarkable variety of these forest types. The forest type distribution is determined by how well the species are suited to particular site conditions and past disturbances.

Site conditions include soil type, water availability and drainage, terrain, and competition from other plants. Conditions also vary by the numbers and types of animals present. Animals can be both beneficial and detrimental to tree growth. When deer, mice, and squirrels browse seedlings or eat seeds, it is detrimental. But when animals disperse the seeds to new locations, it is beneficial. Disturbance is caused by natural events and human activity and can include wind storms, fire, insect outbreaks, harvesting, and land clearing. These and other factors acting over time have shaped Rhode Island's forests.

Of the 393,000 acres of forest land, 61 percent is classified as oak/hickory forest type. Other forest types, by order of abundance, are: maple/ash, maple/birch, pine, and oak/pine (Fig. 6). All other forest-type groups account for 3 percent of Rhode Island's forest land.

Figure 6. Distribution of forest types in Rhode Island.



The oak/hickory forest type is dominated by northern red, white, and other oaks, and red maple. This forest type is the most common forest type throughout the state and is most dominant in the northern portion of the state. Here, oak/hickory forests account for 68 percent of the area, while maple/birch account for 19 percent – the highest proportion of this forest type in the state.

Most of the pine forest type, which is comprised mainly of eastern white pine, is found in the southern part of the state. This region also has the highest concentration of the maple/ash forest type.

The central part of Rhode Island is the transitional zone between the oak-dominated forests of the north and the pine-dominated forests of the south. Going from north to south, the abundance of oak/hickory forest types decreases and the abundance of pine forest types increase. The transitional forest type, oak/pine, is found in greatest abundance in the central part of the state.

Oak-pine forest in central Rhode Island

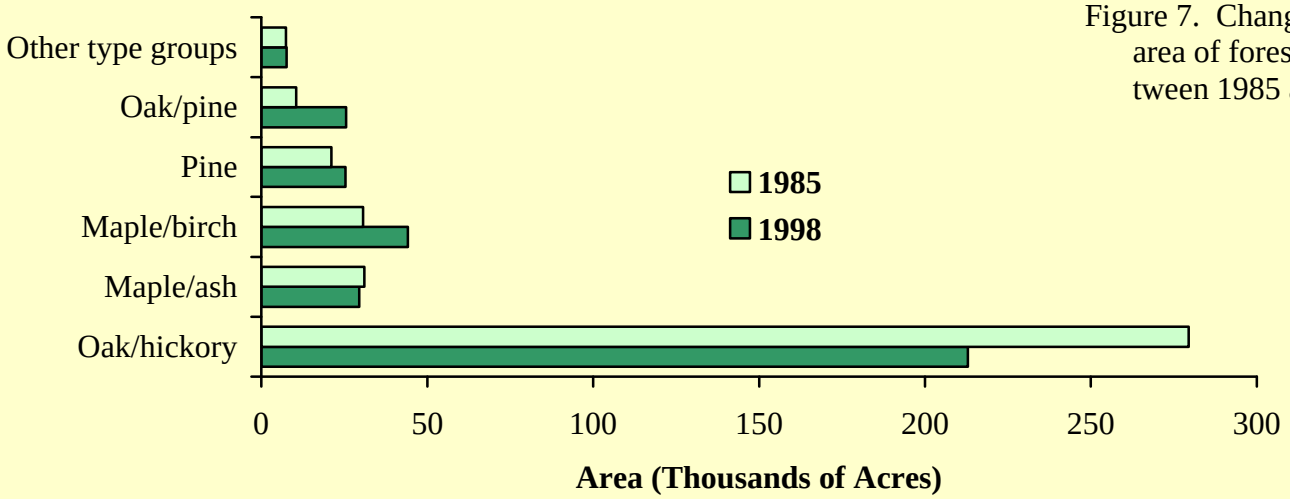


Figure 7. Changes in the area of forest types between 1985 and 1998.

Changes in forest productivity

Another way to categorize forests is by productivity, or how much wood a forest can grow. *Timberland* and noncommercial forest land are two categories that are commonly used. Timberland is forest land that is capable of producing commercial crops of timber and can be used to compare difference between inventories. Noncommercial forest land includes reserved forest land, unproductive forests, and urban forests.

In Rhode Island, timberland accounts for 86 percent of all the state's forest land. In 1972, there were 372,000 acres of timberland. That increased to 380,000 acres by 1985, but by 1998 had declined to 340,000 acres. In almost a quarter century, the amount of timberland had decreased by 32,000 acres.

Quaking aspen regenerating following the removal of red pines that were infested by red pine scales.

Changes in forest type groups

The composition of the timberland in the state has shifted dramatically (Fig. 7). The oak/hickory forest type has entered a period of decline. Between 1985 and 1998, the area of timberland classified as oak/hickory forest type decreased from 73 to 63 percent.

Though some oak/hickory forest has been lost to development, a significant portion has transitioned to the maple/birch and oak/pine forest types. Maple/birch increased from 3 percent of the timberland in 1972, to 8 percent in 1985 to 13 percent in 1998. Red maple and yellow birch dominate this forest type, but oaks—especially white oak—also are important components.

The areas of both oak/pine and pine forests are apparently increasing. Some of this increase has been due to the death of many oak trees in the state during the 1980s following gypsy moth infestaitons. The openings created by the dead oak trees allowed pines to accelerate their growth and become a more visible component of the forest. Also high grading (see sidebar) has favored the conversion of oak/hickory forests to oak/pine forests.

High Grading

High grading occurs when a timber harvest removes the highest quality trees in a forest. This is detrimental because the trees that are left behind are of poor quality and it could take decades to reverse the damage done. High grading can be avoided or, if it has already occurred, corrected through proper forest management and consultation with a professional forester.

White oak
Quercus alba

FOREST COMPOSITION

Rhode Island's forests are interwoven by a rich tapestry of biological diversity. This diversity supplies food and shelter for not only forest-dwelling wildlife, but also wildlife that inhabit the forest-dependent aquatic systems. Diversity provides the invaluable edge characteristics that exist between forest and other land uses.

Species richness is evident in the number of different species encountered. The forest inventory identified 51 different tree species (listed on page 24). Eastern white pine is the most common *softwood* tree species followed by eastern hemlock and pitch pine. Rhode Island's forests are flush with a variety of *hardwood* tree species that bring richness to the forest landscape, the most common of which is red maple (Fig. 9). The abundance of other hardwood species follows distantly, but if all oaks were combined, they would follow a close second.

Eastern white pine

The highest concentrations of eastern white pine can be found growing in the south-central part of the state (Fig. 8). It grows best on the deep, well drained sandy soils where competition from hardwoods is limited. Eastern white pine has played a prominent role in the conversion of abandoned agricultural fields to forests. It is often one of the first trees to occupy old fields. Though tree growth is relatively slow in the first few years, eastern white pine can grow more than 3 ft a year after they are well established. Left undisturbed, an eastern white pine tree can live for more than 200 years and grow to more than 3 ft in diameter.

After farm abandonment and the 1938 hurricane, many eastern white pine has flourished. Between 1985 and 1998, the volume of eastern white pine increased by 61 percent.

Red maple

Red maple is an appropriate state tree for Rhode Island since it is found so commonly throughout the state. The light weight, wind-dispersed seeds of this tree make it well suited for occupying newly abandoned lands or other places where there is little competition from other trees. Though red maple will grow across a wide range of sites, it is most prolific in swampy areas where it can form pure stands.

Red maple seeds provide a source of food for wildlife and its vibrant fall colors are enjoyed by Rhode Island residents and visitors alike, but the growth form and wood properties of red maple make it less desirable for forest products. Cutting practices that once removed more valuable species and left the less-valued red maple behind helped its volume increases more than any other factor. The volume of red maple increased 4 percent between 1985 and 1998.

Continued on page 14

Aerial view of forest abutting Block Island Sound