Vegetation

Vegetation is the total plant cover of an area, including all individuals of every plant species present. Patterns of vegetation are determined by the physical features of the landscape, climate, hydrology, soil, wildlife, and human influences, as well as by chance and competition among plant species. Vegetation, in turn, provides food, lumber, and fuel, moderates the climate, buffers the hydrological cycle, helps form and protect the soils, and creates wildlife habitat. It also reduces the velocity of flood waters, absorbs noise, detoxifies certain pollutants, helps filter sanitary wastes, and enhances the visual environment.

The vegetation chapter was prepared by Erik Kiviat, an Ecologist with Hudsonia Limited of Annandale, New York.

The interrelationships among vegetation and other natural resources are reflected in plant communities, which are recognizable patches of plant cover characterized by one or a few predominant species that recur wherever the influencing factors are similar. The field corn community that occurs on many farms and the red oak - chestnut oak community common on the county's hills are examples of plant communities. Each acts on, and is acted on by, all other natural resources and forms part of Dutchess County's resource base.

There is no comprehensive list of the county's flora. Many of the references included in the bibliography include species lists for small areas of the county. The scientific and common names of plants mentioned in this chapter are provided in the appendix.

History

Vegetation began to take hold of and modify the county's environment after the glacial ice melted about 10,000 years ago. Before Europeans arrived, oak-dominated forests and white pine probably covered 50

to 75 percent of the county. Indian tribes located along major streams and the Hudson River used fire to clear land for crops and settlement sites. This practice restricted fire-sensitive trees, such as hemlock, to ravines and wetlands.

The Dutch, German, and English settlers of the 17th century altered the county's vegetation by damming streams, clearing land for crops and pasture, logging extensive areas, and introducing grazing livestock. The older forests found today were probably cut once early in this period and not again.

During the 19th century more than 90 percent of the county was cleared and planted or grazed. Intensive wheat cultivation eroded soils on the slopes and hilltops, in some places exposing bedrock that remains exposed today.

Small-diameter wood was cut and burned to produce charcoal needed by the iron smelters in the eastern and southern portions of the county. The demand for wood to heat homes and fuel steam engines put additional pressure on the forests.

Agriculture began to decline in the late 19th century. American chestnut probably took over many of the drier pastures that were no longer grazed. The same sequence of cultivation, grazing, and abandonment encouraged American elm to grow on moist lowlands. Small wetlands formed in silted mill ponds and where road construction blocked drainage outlets.

The turn of the century was a time of vegetation change. Agriculture began to give way to homes and industries in the western part of the county but persisted in the eastern lowlands, while forests reestablished themselves on the hillsides. Abandoned farmlands that were not developed were taken over first by brush, and then by forest. Many wetlands were drained or filled for building sites and new types of agriculture.

Early in the 20th century chestnut blight killed the stems of the American chestnut trees; red oak and chestnut oak apparently replaced them. Root sprouts of a few chestnut trees can be seen today, especially in the eastern part of the county. During the droughts of the 1930s and 1940s forest fires burned many areas littered with dead chestnut trees.

Today, timber cutting takes place in all parts of the county except for the densely-settled residential southwest. Seven to ten million board feet are cut annually, selectively harvested on about 5,000 acres, or one per-

cent of the county's land. Red oak is the most important commercial species, but white and chestnut oaks, white ash, sugar maple, red maple, and black birch are also harvested.

Few statistics are available on the amount of wood cut annually for fuel in Dutchess County. This harvest is known to be increasing, however, due to the increased use of woodstoves for heat. The small-scale cutting of timber and fuel wood continues to produce woodlots characterized by many-stemmed trees grown from stump and root sprouts.

Agriculture remains an important activity in the county. More than 20 percent of the county's land is producing food crops, fruit, pasturage, or fodder. Wild animals such as deer and beaver, however, have gradually replaced cattle as a major selective force in vegetation development. Deer and beaver were extirpated from Dutchess County in the 19th century, but since then have returned in significant numbers. Beaver dams create ponds and wetlands. Selective feeding by deer and beaver discourages some plant species while encouraging others.

The present mixture of conifer and hardwood forests, oldfields, and active farmland provides abundant habitat for wildlife that favor forest edges and open lands. Cavities in dead and large live trees are especially important to many birds and small mammals. The diversity of vegetation also contributes to the county's scenic qualities. Flowering dogwood and mountain laurel in the spring, purple loosestrife, asters, and goldenrod in the summer and early fall, and the multicolored leaves of autumn immeasurably enhance the beauty of the county.

Types of Vegetation

Today more than 50 percent of Dutchess County is covered by forest, brush, or inactive land. As shown in Figure 6.1, roughly one-fourth of the county is developed, 18 percent is actively used for agriculture, and 6 percent is wetland. Vegetation in the county can be more specifically grouped into six land use - vegetation types. As shown on the Vegetation Map, these types are forest, brushland, plantations, wooded wetlands, non-wooded wetlands, and agricultural and developed land.

The distribution of vegetation types shown on the Vegetation Map follows the predominant north-south and northeast-southwest axes of the county's ridges and valleys. Farmland, recently abandoned farmland, wetlands, and development concentrations are most common in the valleys where soil is relatively deep. Forests are

more prevalent on the hillsides where soil is thin. Many of the largest farms and wetlands are located on limestone or sand and gravel deposits in the Harlem Valley and the southern portion of the county (see Bedrock and Surficial Deposits Maps in Chapter 2). Forest tracts are more extensive in the eastern and southernmost sections of the county, where much of the land is steep and rocky and the soil acidic, making it less amenable to farming and residential development. The relationships among geology, topography, soils, and vegetation can be seen by comparing the Vegetation Map to the maps of bedrock, surficial deposits, steep slope, soil types and groundwater occurrences in the preceding chapters.

Vegetation Type as Percent of County Area

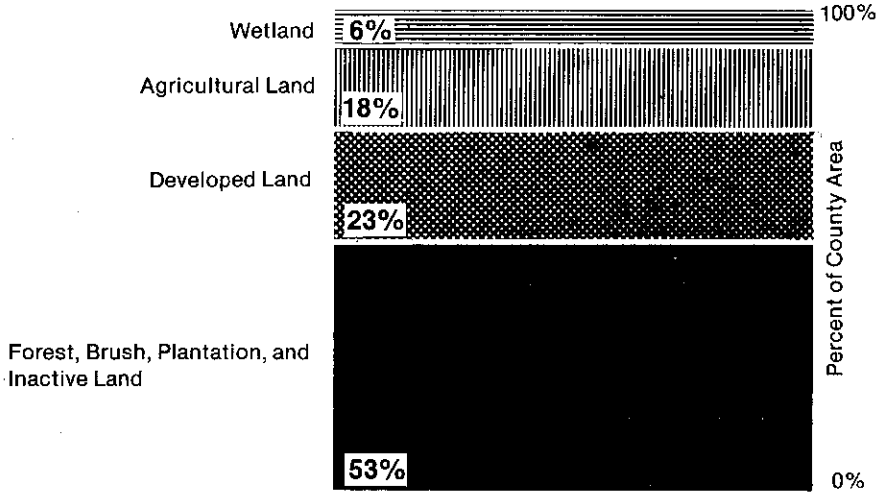


Figure 6.1

A quick look at the Vegetation Map conveys the impression that half of Dutchess County is forested, but the vegetation is considerably more complex. The most common plant communities and their characteristic species are listed in Table 6.1. The species are arranged by "sites" or topographic positions as well as by land use. Figure 6.2 illustrates the topographic positions of the plant communities and suggests how environmental conditions such as moisture and rockiness differ at each position.

Plant communities vary locally depending on geology, human uses, history, and other factors, and comprise a complicated mosaic. Historic patterns of land ownership and land use have divided the county into thousands of "use lots" separated by stone walls and fences. These fence lines sometimes cut across, and at other times delineate, the natural community boundaries.

Table 6.1 Characteristic Plants of Major Site/Use Types

Type	Canopy	Lower Layers
Forests (terrestrial)		
Lower slopes	Sugar maple	Striped maple L
	Hemlock	Flowering dogwood
	Red oak	American hornbeam
	Black oak	Mapleleaf viburnum
	Tuliptree	Spicebush
	Beech	Witch-hazel
	Black birch	Virginia creeper
	Yellow birch L	Grape
	White ash	
	White pine	
	Shagbark hickory	
Mid-slopes	Red oak	Hop hornbeam
	Black oak	Mountain-laurel
	Chestnut oak	Shadbush
	White oak	Witch-hazel
	Sugar maple	Mapleleaf viburnum
	Hemlock L	Bladdernut L
	Black birch	Low blueberry
	White ash	Virginia creeper
	Red maple	Grape
	Black cherry L	Flowering dogwood
	Paper birch L	American chestnut (sprouts)
	Gray birch L	
	Black locust L	
	Pignut hickory	
Upper slopes	Red oak	Staghorn sumac
	Chestnut oak	Scrub oak
	White oak	Chokecherry
	Red cedar	Low blueberry
	White ash	Huckleberry
	Pignut hickory	Downy arrowwood L
	Gray birch L	American chestnut (sprouts)
	Red maple	Gray dogwood
	Sassafras L	Witch-hazel
	Quaking aspen L	Mountain-laurel L
	Pitch pine L	Chokeberry
	Pin cherry L	Sweetfern L
	Shadbush	Bush-honeysuckle
		Little bluestem
		Sedges
Brushland (oldfields)	Gray dogwood	Little bluestem
	Red cedar	Goldenrods
	Gray birch	Asters
	Staghorn sumac	Smooth sumac
	Black locust L	Poison ivy
	White pine L	Dewberry
	Quaking aspen L	Blackberry
	Black cherry	Black raspberry
	Red maple	Multiflora rose
	Arrowwood	Bell's honeysuckle
	American prickly-ash L	Sassafras L
		Sweetfern L
		Chokecherry
		Japanese barberry L
		Common juniper L
		and many other species

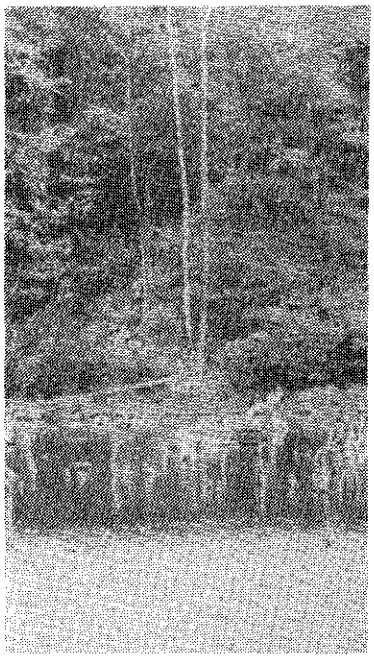


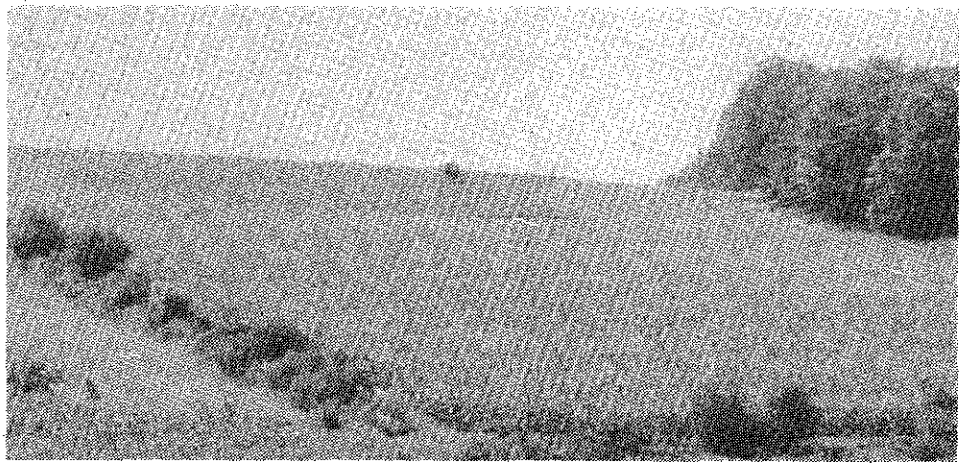
Table 6.1 Cont.

Type	Canopy	Lower Layers
Plantations	Red pine Scotch pine White pine Norway spruce European larch and self-sown trees and shrubs	
Wetlands (non-tidal) Swamps and Stream Slides	Red maple Red ash Black ash L American elm Yellow birch L Willows Silver maple L Sycamore L Tamarack L Swamp white oak Pin oak L	Willows Alders Spicebush Silky dogwood Red-osier dogwood L Buttonbush High blueberry Swamp azalea Nannyberry Arrowwood Purple loosestrife Cinnamon fern Skunk-cabbage and other herbs
Marshes		Purple loosestrife Cattails Bulrushes Tussock sedge Other sedges Rushes Reed canary grass Reed Other grasses and scattered woody plants
Ponds, etc.		Pondweeds Naiads Waterweed Bladderworts Stoneworts Duckweeds White water lily Yellow water lily Water-shield
Wetlands (tidal) Hudson River	Red maple Red ash Black ash (woody plants may be absent)	Narrowleaf cattail Spatterdock Pickerelweed Reed L Broadleaf arrowhead Arrow arum Dotted smartweed River bulrush Wild rice Rice cutgrass Purple loosestrife Silky dogwood Buttonbush Eurasian watermilfoil Wild-celery Water-chestnut and other herbs and shrubs

Table 6.1 Cont.

Type	Canopy	Lower Layers
Waste ground	Staghorn sumac	Poison ivy
	Red cedar	Smooth sumac
	Tree-of-heaven	Bell's honeysuckle
	Black locust	Japanese honeysuckle
	Quaking aspen L	
	Cottonwood	Brambles
		Bittersweet
		False indigo L
		Ragweed
	Many other trees, shrubs, herbs	
Mowed fields and pastures		Orchard grass
		Timothy
		Sweet vernal grass
		Other grasses
		Goldenrods
		Asters
		Clovers
		Other herbs
		Woody plants

*Note: Not all species listed for a type necessarily occur together. L = local.



Forests

Forests, brushland, inactive lands, and plantations cover approximately 53 percent of the county. Forests can be defined as areas where trees over 30 feet tall cover at least half of the acreage. Environmental conditions that influence forest growth vary with elevation to produce lower slope, mid-slope, and upper slope site types (see Figure 6.2). Elevation, however, is not the only factor that determines forest type. For example, a sheltered pocket or north-facing ravine at a high elevation may support trees normally found on lower slopes, while a dry rocky knoll or outcrop with thin soil at a low elevation may support upper slope (crest) vegetation.

Site Types, Relative Elevations, and Environmental Gradients.

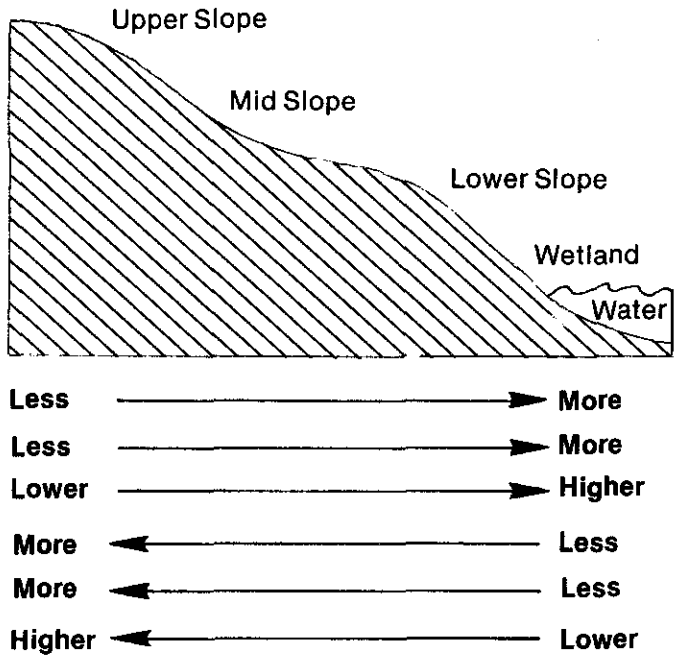


Figure 6.2

Lower Slope Forests

Lower slope forests are frequently composed of mixed hardwoods, sometimes with hemlock or white pine. Sugar maple and red oak are frequently abundant, as are other oaks, tulip, and beech. These forests tend to have the largest trees and the greatest variety of tree species. The canopy height, measured as the height that most of the larger trees have reached, is often 50 to 60 feet. Lower slope forests are found on moist, highly sheltered sites, usually at low elevations.

Mid-Slope Forests

Mid-slope forests are typically dominated by oak, most often red oak. Chestnut oak, sugar maple, black birch, and other species occur, as do hemlock or white pine in some locations. Tree size and species variety tend to decrease as elevation increases from lower slope to upper slope. These forests occur on upland sites that are not unusually dry or moist.

Upper Slope Forests

Red oak or chestnut oak is usually the predominant species in upper slope forests. White oak, pignut hickory, red maple, and many other species may be locally

important. Before chestnut blight struck the county early in the 20th century, American chestnut grew abundantly in many upper slope and mid-slope forests.

The trees of upper slope forests are larger and healthier in low spots and pockets of deeper soil, and stunted on the more exposed or rockier locations. The forest floor can be open or interspersed with shrub-covered or grassy clearings. Areas of nearly-bare soil or rock may occur. Such clearings are less common in mid-slope and lower slope forests.

Upper slope forests occur on ridge crests and exposed rock shoulders, as well as on rocky knolls at low elevations. These knolls include rocky islands in the county's lakes and on the Hudson River.

Upper slope forests sometimes resemble brushland or old fields. Like mid- and lower slopes, most were cleared and cultivated or pastured during the last century. The upper slopes, however, are developing into forest more slowly than the others. The small size and low density of their trees reflect the influence of shallow soil and exposure to winds, rapid temperature changes, and fire. Vegetation on many of these sites will remain stunted and open.

Other Forest Communities

Hemlock stands are examples of forest communities that have particular aesthetic and wildlife habitat interest. Hemlock is more common on glacial till or sandy soils than on clay soils, and is usually found near water

or in cool, moist areas. Young hemlocks are quite sensitive to fire and deer browsing, and grow slowly. Many hemlock stands, as well as hardwood stands, are losing seedlings to heavy deer browsing. These losses are most apparent in large areas where deer hunting is prohibited.

Unusual soils can support patches of distinctive forest vegetation. Black locust is often abundant on disturbed sandy soils; old gravel pits frequently support colonies of quaking aspen. Flowering dogwood is common in clay areas along the Hudson River in northern Dutchess County, where hemlock is scarce. Limestone till soils and outcrops provide habitat for many uncommon species, such as roundleaf dogwood, hackberry, and American prickly-ash.

Brushland

The term "brush" often connotes undesirable vegetation, but brushland communities are valuable for soil protection and wildlife habitat. Brush covers less than 20 percent of the county. It includes vegetation that ranges from weed and shrub-covered fields to areas with scattered 30-foot trees. Brushland plant communities include the shrub patches, small trees, and coarse herbs that represent the period of regeneration between agricultural abandonment and closure of the forest canopy. Most of these "oldfields" are between 3 and 50 years old. Brushland vegetation is usually patchy (horizontally diverse), but not many-layered (vertically complex); it is composed of numerous species that may occur as scattered individuals, small patches, or large stands.

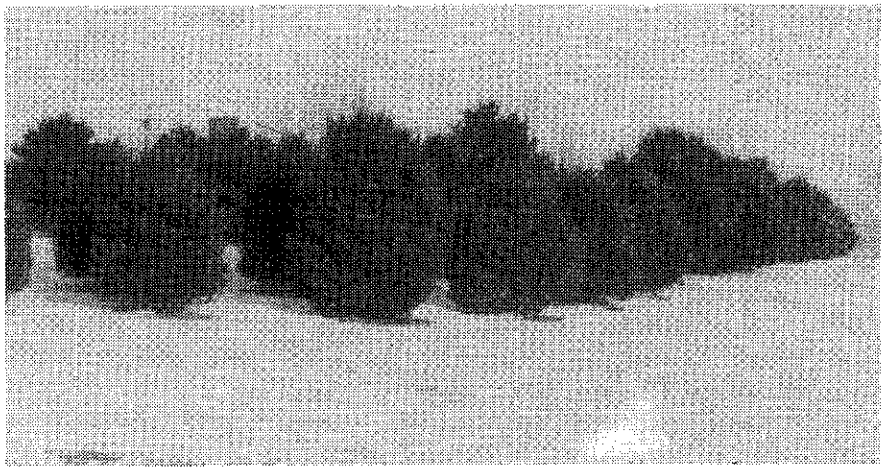
Although some oldfield species start from seeds, many develop from root systems that have persisted from an earlier forested stage. These sprout hardwoods develop from the root or stump sprouts that grow after forests are cut or agriculture is abandoned. Sprout hardwoods are common in Dutchess County and southern New England.

Root-suckering plant species, which spread under or along the soil surface to form colonies, are especially important in oldfields. They include sumacs, aspens, brambles, gray dogwood, and black locust, all of which often persist despite cutting, animal damage, and fire. By browsing and digging, or by eating and scattering seeds, animals such as meadow voles, cottontail rabbits, woodchucks, deer, and birds play an important role in determining which plant species appear and survive in oldfield development.

Red cedar, gray birch, and gray dogwood are among the most typical brushland species in Dutchess County. Red cedar is common in many oldfields. It grows vigorously on limestone soils, lending a distinctive, partly evergreen character to the vegetation. White pine is not as typical an oldfield species in the county as it is in southern New England, but it does appear near where parent trees stood, and it is occasionally abundant. White pine and red cedar are unpalatable to cattle; this enables their seedlings to survive the last stages of grazing before pastures are abandoned.

Old orchards and hedgerows are distinctive types of brushland. Hedgerows are linear plant communities, 5 to 20 feet wide, located along fence lines and stone walls. They often contain large spreading trees scattered among more typical brushland plants. Apple trees are found among naturally occurring woody plants in many areas.

Plantations



Plantations, which are stands of planted trees of any size, cover seven percent of the county. They are numerous but usually small, and typically consist of pure stands or alternating patches of conifers. Certain popular plantation species, such as Norway spruce and European

larch, are not native to this area. They do not commonly reproduce from seed or "volunteer" here. Most plantations are composed of trees of the same age planted in rows. Stands of naturally-occurring white pine sometimes resemble plantations. A variety of volunteer species may be found in unmanaged plantations, including white pine and elm.

Wetlands

Wetlands, both wooded and non-wooded, cover six percent of the county and are significant for the recreation, wildlife habitat, water management, and other benefits they provide. They range from damp or seasonally-flooded areas to lands that are permanently covered with a foot or more of water. Wooded wetlands (swamps) cover approximately three percent of the county; non-wooded wetlands (marshes) account for another three. The county's wetland resources are more fully described in the Hydrology Chapter.

Communities of submerged aquatic plants usually contain patches of one or a few species. They grow in lakes, ponds, and wetland pools where water continuously covers the bottom and enough light penetrates for photosynthesis. Submerged plants are limp-stemmed, and may have parts that float on the water surface. Rooted plants with floating leaves, such as water lilies, or free-floating plants, like duckweed, may also be present. Non-vascular plants, such as mosses or attached algae, often grow in wetlands. Drifting microscopic algae, called plankton, are present in almost all waters.

Wooded Wetlands

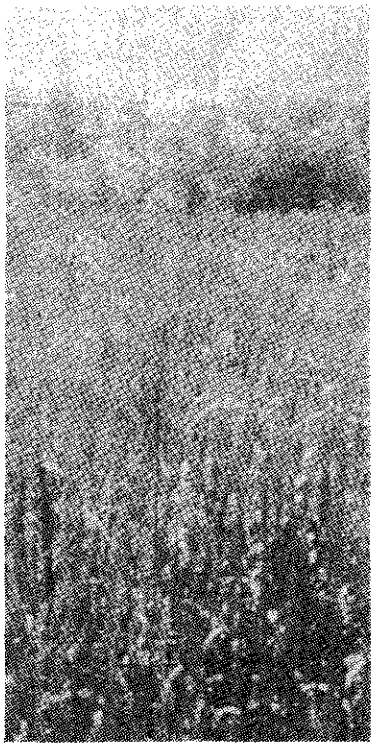
Trees or shrubs dominate wooded wetlands. Red maple is the most common wetland tree species in Dutchess County. Red ash is also important, and American elm was a common wetland tree before Dutch elm disease decimated the elm population. Many swamps in Dutchess County contain ditches that remain from past attempts to drain the wetlands and transform them into drier land.

Most woody plants in wetlands grow on raised root-crowns, called hummocks. Hummocks allow the plants access to sufficient water and air, regardless of the water level, and are best developed where water levels fluctuate.

Non-Wooded Wetlands

Grasslike plants, such as bulrushes, tussock sedge, reed, and cattail, or non-woody broad-leaved plants, such as purple loosestrife, are characteristic of marshes.

Marsh vegetation is heavily influenced by the calcium content of the soil. Limy soils, high in calcium, support the larger stands of cattails as well as other characteristic plant communities.



Wetlands that overlie peat soil, which is rich in organic matter and often acidic, are called bogs. Typical bog plants include sphagnum moss, cranberry, leatherleaf, pitcher plant, sundew, cottongrass, and conifers. Bogs are relatively rare in Dutchess County. Some occur on limy, rather than acidic, soils. Patches of swamp, marsh, and bog are often interspersed.

Tidal wetlands and shallows along the Hudson River are affected twice a day by three- to four-foot tides. Their water is either fresh or seasonally brackish. Submerged and floating aquatic plants, such as wild celery, Eurasian watermilfoil, and water-chestnut, occur in subtidal shallows. Patches of spatterdock and pickerelweed appear in the lower portion of the area between high tide and low tide, known as the lower intertidal zone. Large expanses of grasslike plants, patches of mixed broad-leaved plants, and sometimes shrubs or hardwood swamps occur in the upper intertidal zone.

Agriculture and Developed Land

Agricultural, urban, suburban, and industrial areas cover large portions of Dutchess County. Vegetation types characteristic of these areas include crop and pasture lands, managed grounds, and waste ground.

Agriculture

Farming is a vital industry in Dutchess County. More than 600 farms produce more than $42 million worth of goods each year, on approximately 140,000 acres of land. Milk and dairy products account for $21 million of the total, crops for close to $10 million, and livestock or non-dairy live stock products for the remaining $11 million.

According to the 1982 Census of Agriculture, crops and non-wooded pasture land cover 93,000 acres, equal to 18 percent of the county's land area. Hay and feed corn account for 60 percent of this acreage. Apple orchards take up 2,500 of the 3,000 acres devoted to fruit. These acreage figures are summarized in Table 6.2.

Most of Dutchess County's commercial dairy farms are located in the central and northeastern towns. Apple orchards and vineyards are concentrated in the towns of Red Hook and La Grange, where the terrain and microclimates are suitable for fruit crops.

Few large tracts of farmland remain in the southwestern quarter of the county. The majority of farms that were in this area have been developed for residential, commercial, or industrial purposes. Concern about preserving what remains of the county's best farmland is increasing as development pressures spread.

Table 6.2 Farmland in Dutchess County

Agricultural Use		Total Acreage
Cropland		80,000
corn	20,000	
hay	34,000	
cropland used for pasture	18,000	
orchards	3,000	
vegetables	2,000	
miscellaneous crops (nurseries, sod, oats, wheat, etc.)	3,000	
Woodland (including wooded pasture land)		30,000
Other Pasture Land		13,000
Other Land (farm ponds, and roads, buildings, idle land)		15,000
TOTAL		138,000

Source: U.S. Dept. of Commerce, 1982 Census of Agriculture.

Managed Grounds

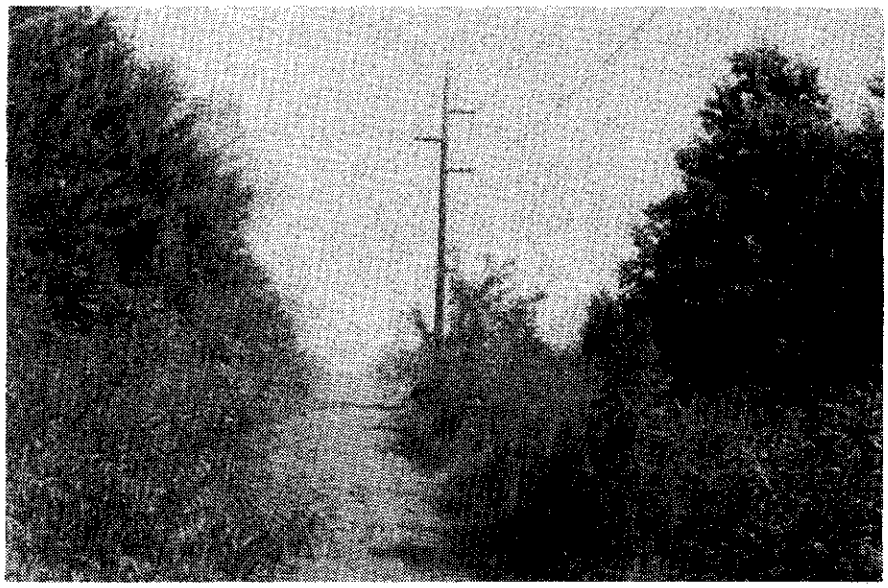
In the developed portions of the county, intensive management with planting, fertilizers, herbicides, irrigation, and pruning creates the plant communities typical of yards, estate grounds, campuses, and many urban streets. These managed grounds are usually composed of ornamental trees and lawns that form artificial savannas. Stresses such as dry soil, salt and air pollution, and selective management reduce the number of species that can thrive. Ornamental trees are often large and spreading. Non-native trees, shrubs, and herbs outnumber natives in managed areas.

Formerly managed grounds that have been abandoned include overgrown yards and estates and old garden sites or house lots. Such areas are usually surrounded by forest or brushland. Planted native and non-native trees, shrubs, and herbs persist (often without reproducing), and gradually become mixed with wild species. Patches of

day lily, periwinkle, European buckthorn, tree-of-heaven, and other ornamentals planted in years past identify these sites after other signs of management have been obscured.

Mowed fields are maintained on many properties for ornamental purposes. In these areas grasses and broad-leaved plants partly conceal the woody plant shoots that survive repeated cuttings.

Corridors for roads, railroads, powerlines and other utilities are called rights-of-way. Ranging from 50 to 300 feet wide, rights-of-way cover a significant number of acres in the county. Right-of-way vegetation is usually shorter than adjacent vegetation because it is mowed, brush-hogged, hand cut, or sprayed with herbicides. The plants are also often exposed to pollutants from vehicles. Depending on soil characteristics and disturbance, right-of-way communities vary from forest to brushland, low-growing herbs, or bare soil. Where topsoil has been removed, rights-of-way resemble waste ground.



Waste Grounds

Numerous sites in Dutchess County have been stripped of topsoil. These waste grounds resemble oldfields, but their vegetation is usually smaller, shorter, and sparser. Bare soil or subsoil is common; woody plants usually are not. Waste grounds include dumps, fills, roadcuts, parking lots, dikes, vacant lots, surface mines, and areas around construction and industrial sites. Climate, chemical and mechanical stress, and deficiencies of moisture and soil nutrients contribute to their simplified vegetation.

Uses of Vegetation

Plants provide food, building materials, fuel, and wildlife habitat; these uses are widely recognized and appreciated. Vegetation also provides many benefits that tend to be overlooked. One of the most valuable functions of wild, landscaped, or agricultural vegetation is ecological or land use buffering. Vegetation slows flood flows, builds up the soil and holds it in place, replenishes oxygen supplies, absorbs noise, gives privacy, and moderates air temperatures and wind exposure near the ground. As they grow, reproduce, die, and decompose, plants regulate the movement and concentrations of dissolved nutrients and minerals in soil and water. Plants help the soil filter and absorb human wastes and certain pollutants, settle dust and sediment from air and water, serve as visual transition zones between land uses, provide shelter and food for wildlife, and make the landscape beautiful and diverse.

The multi-faceted buffering ability of vegetation is especially useful between developed areas or agricultural land and sensitive natural areas, such as lakes and rivers. Ecological buffer zones--areas of undisturbed vegetation--can help minimize the impact of human land use activities on nearby sensitive resources by reducing runoff and catching sediment, providing shelter, food, and trail corridors for wildlife, and reducing noise and visual impacts. In addition to protecting the environment, vegetation buffers enhance the value of developed or agricultural land. They do this by providing windbreaks, natural air conditioning, shade, privacy, erosion control, and aesthetic charm. Vegetation buffers can bring nature into an urban landscape, and tie together the natural elements of that landscape so that visual amenities and wildlife can survive.

Changes in Vegetation

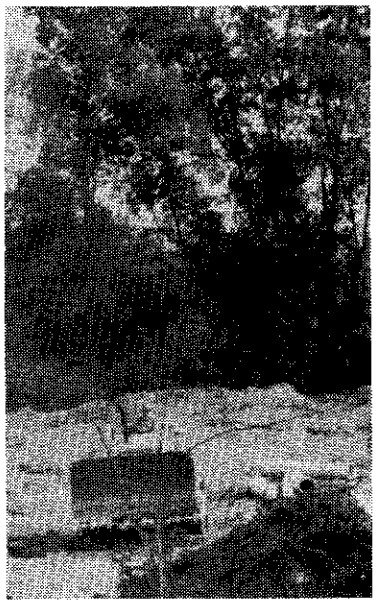
Vegetation is dynamic. Although mature forests and tidal marshes, for example, may remain stable for many years, all vegetation communities eventually change. Such change may occur slowly or suddenly, in response to environmental influences that may be subtle or traumatic. Subtle environmental factors include climatic variations, such as wet or dry years or unusually low or high temperatures; fluctuating animal populations; changes in air quality; gradual increases in wood harvesting; and other conditions that affect the germination, growth, survival, and competition of plant species.

Traumatic environmental stresses, such as fire, floods, clear-cutting, plowing new farm fields, and urban development kill or inhibit certain species. Such stresses cause sudden changes that are followed by a period of recovery. The recovery period, in turn, may produce a totally different vegetation landscape.

Small-scale stresses, such as confined brush fires, increase landscape diversity by creating a mosaic pattern of vegetation in various stages of recovery. Stress applied over a large area, such as large forest fires or air pollution, simplifies the landscape by eliminating sensitive species or entire plant communities.

Human Activities

Farming, clearing land for development, harvesting wood for lumber or fuel, and introducing non-native, highly competitive "weed" species are the major human activities that directly alter vegetation. Different wood harvesting practices, such as cutting particular species or sizes, thinning crowded stands, removing unmarketable trees, clear-cutting, and harvesting whole trees, have significantly different effects on forest composition and regrowth.



Clearing land for residential, commercial, and industrial use permanently takes it out of forest or brushland production, and in most cases replaces the natural vegetation with artificially landscaped grounds and impermeable surfaces. This, in turn, usually increases the amount of fertilizers, herbicides, and pesticides applied to the land, and decreases the amount of rainfall that filters down into groundwater supplies.

Agriculture also maintains vegetation in an unnatural state. Crop farming involves the large-scale cultivation of a relatively few plant species that would probably not survive on their own, and the suppression of diverse, unwanted native species that have a natural

competitive advantage over the chosen crops. Crop fields are artificially simple communities, highly susceptible to diseases and pests. In most cases, fertilizers, pesticides, and herbicides are used to maintain the growing conditions that crops require. Pasture lands are also unnatural to the extent that brush and trees would quickly replace low-lying herbaceous plants if grazing livestock were not present.

Although agriculture remains a significant component of the Dutchess County economy, many farm fields have been abandoned and allowed to revert to native vegetation since the late 19th century. Many of the woodlands present in the county today occupy former pasture land.

Certain introduced plants proliferate in disturbed areas and gradually replace patches of native vegetation. This phenomenon is insignificant in forests, but has had a major impact on herbaceous and some brushland communities. Purple loosestrife has replaced cattail, sedges and other wetland plants at many Dutchess County locations. Water-chestnut and Eurasian watermilfoil are abundant in Hudson River shallows, and are potential invaders of ponds and lakes. Multiflora rose, planted for erosion control and wildlife food, is difficult to eradicate and has become troublesome in oldfields, pastures, and wet meadows. Bell's honeysuckle has spread from ornamental plantings and is very abundant in old fields, wet meadows, and open woods.

These "weeds" tend to replace native plants whose growth forms differ from their own. The weeds increase diversity when present in small numbers and scattered among native species, but when they dominate entire plant communities, the diversity of both the species and the communities is reduced. Exotic species do support some wildlife species, but native plants in extensive wild communities are necessary to maintain natural and diverse populations of native animals. All of the weeds mentioned above spread readily and will probably become much more abundant in the near future. Additional vegetation pests will undoubtedly appear occasionally as new species are introduced for ornamental purposes or other uses.

Pollution of air, water, and soil is one by-product of human activity that significantly affects vegetation. Roadside conifers have been injured at many locations in the county, apparently by road salts and vehicle exhaust. Many ponds and lakes have become eutrophic because of excess nutrients from sewage and agricultural runoff. Several plant species have declined or disappeared from the Hudson River since the 1940s; water pollution is believed to be one of several contributing factors. The effect of acid rain on vegetation in the Hudson Valley is under study.

Natural Events

Natural events that shape vegetation development include fire, disease, defoliation by insects, fluctuations in wildlife populations (especially deer and beaver), and climatic variations. Climate is described in Chapter One; the rest of these natural influences are discussed briefly below.

Large forest fires rarely strike Dutchess County. Most of the vegetation fires that do occur do little damage to the tree canopy, and burn leaf litter, aboveground parts of herbs and shrubs, and small trees. Vegetation usually regenerates quickly after such burns. Oaks and hickories have thick corky bark that makes them fire resistant. Red cedar, white pine, red maple, and hemlock are vulnerable, especially when small.

Disease has almost eliminated chestnut and American elm trees. Beech, white ash, and sugar maple have also been attacked during the last two decades and their numbers could be declining. With the exception of beech bark disease, trees in the interior of forests have been less affected than trees in more exposed locations. The highest disease mortality rates occur where trees are stressed by water or nutrient shortages, salt, or mechanical damage along roadsides, in parks, or on managed grounds.

Insect damage continuously affects vegetation. However, certain pests, such as gypsy moths, go through population cycles that peak at intervals of several years. At their peak in 1980 and 1981, gypsy moth caterpillars defoliated hardwood forests and ornamental trees throughout Dutchess County. Damage was particularly severe where trees lacked sufficient water. Most trees survived the defoliation, even though many were stripped in both 1980 and 1981. Some species suffered more than others. Further studies are needed of the effects of insect outbreaks on forest morbidity and productivity.

Deer, beaver, and other wildlife greatly influence plant growth. Deer are probably more common now in Dutchess County than ever before. Wherever they concentrate, browsing heavily on seedlings and twigs and consuming acorns, their eating habits can restrict the reproduction of all but the most unpalatable trees and shrubs. The species composition of areas affected in this way eventually shifts as young trees most sensitive to deer damage, such as oak and hemlock, die.

Beaver populations in the county appear to be increasing, particularly in the eastern towns. Beaver enhance landscape diversity by constructing ponds and

felling trees, replacing patches of forests with aquatic vegetation and herbs or shrubs. Wetlands usually develop after beaver leave a site. The high values of beaver ponds and wetlands for wildlife habitat, hydrological buffering, and vegetation diversity offset the timber damage they cause. Fur trapping and the removal of "nuisance" animals keep the county's beaver population below its potential level.

Resource Management Implications

Both natural and human activities place vegetation under stress. Damage caused by fire, drought, disease, insects, wildlife, and nuisance plant species is aggra-vated by misguided resource management and land use practices. Farming, timber harvesting, clearing land for development, and modifying wetlands directly alter plant communities. If such activities are undertaken carefully, in appropriate locations, they can maintain environmental diversity while meeting human needs. If they are undertaken carelessly, they can do irreparable environmental harm by eroding soil, eliminating plant species and wildlife habitat, and reducing the capacity of the environment to assimilate wastes and absorb rainfall. Road salts, agricultural and urban runoff, acid rain, and other air, water, and land pollutants can further weaken plant life and disrupt the natural balance that sustains a healthfully diverse and productive ecosystem. Thoughtful management is needed to maintain this balance as development alters more and more of the county's landscape.

Forest Management

More than 90 percent of the land in Dutchess County was cleared and planted or grazed sometime during the 1800s. Intensive wheat cultivation caused serious soil erosion on slopes and hilltops. Forest removal reduced the available wildlife habitat so much that deer and beaver were virtually eliminated. Since that time, brushland and woods have reclaimed much of the land that once was farmed. However, the county's forests remain under pressure. Development, not agriculture, now encroaches on the woodland resource base. Overdevelopment for urban and suburban uses could cause the county to repeat the cycle of erosion, wildlife loss, and related impacts experienced in the 1800s.

To prevent such damage and to maintain the health and abundance of the county's forests landowners, woodland users, and local and county governments should encourage forest uses that are compatible with forest conservation

and enhancement. Wood harvesting should conform to sound forest management practices. The quantities of lumber and fuel wood cut--and of land cleared for development--should be monitored so that appropriate steps can be taken if the total wood supply begins to diminish. Uncommon or especially sensitive forest resources, such as hemlock groves, forests with large trees, beech woods, and woodland buffers around water bodies or wetlands should be protected. Brushland should not be indiscriminately cleared because it supports numerous wildlife species and is tomorrow's forest resource.

Farmland

Agriculture, when balanced with natural vegetation, greatly enchances the appearance, diversity, and productivity of the county's land resources. The more diverse the county's agricultural base is, the healthier it is, both economically and environmentally.

Efforts to strengthen and diversify agricultural activity in Dutchess County should be supported. These efforts should focus on crops, livestock, and farming practices that are compatible with the county's soils and climate. The use of effective alternatives to chemical fertilizers and pesticides and erosion-causing cultivation practices should be encouraged.

Buffer Vegetation

Buffer vegetation is an important part of the developed and natural landscape. It controls runoff rates and volumes, improves air and water quality, moderates site temperatures and sun exposure, provides wind breaks, limits erosion and sedimentation, attenuates noise, screens unattractive landscape elements, and provides plant and wildlife habitat. Well-managed natural buffers can also accommodate a variety of recreational and educational uses while contributing to environmental health and community property values.

Every effort should be made to incorporate buffer vegetation in site development designs and land use plans. Local decision makers and landowners should link buffer zones of vegetation wherever possible, to create greenbelts and natural corridors through their communities. Floodplains and waterways are ideal greenbelt corridor sites. Buffers adjacent to sensitive resources, such as wetlands, streams, and steep slopes, should not be disturbed.

The importance of preserving unusual plant communities is discussed in Chapter 7.