SOILS ON CABWAYLINGO STATE FOREST
(please refer to soils map in section A of this appendix)

DgF—Dekalb-Gilpin complex, 35 to 65 percent slopes, very stony

This complex consists of moderately deep, very steep, well drained soils on side slopes in the central part of the county. Stones cover 1 to 3 percent of the surface. The two soils occur as areas so intermingled on the landscape that it was not practical to map themseparately. Individual areas are about 50 percent Dekalb channery sandy loam, 20 percent Gilpin siltloam, and 30 percent other soils.

Typically, the surface layer of the Dekalb soil is very dark grayish brown channery sandy loam about 1 inch thick. The subsoil extends to a depth of 33 inches. The upper 3 inches of the subsoil is brown channery sandy loam. The next 9 inches is yellowish brown channery sandy loam. The lower 20 inches is yellowish brown very channery sandy loam. Fractured sandstone bedrock is at a depth of 33 inches.

Typically, the surface layer of the Gilpin soil is brown silt loam about 1 inch thick. The subsoil extends to a depth of 22 inches. The upper 5 inches of the subsoil is dark yellowish brown silt loam. The lower 16 inches is yellowish brown channery silty clay loam. Light olive brown, fractured shale and fine grained sandstone bedrock is at a depth of 22 inches.

Small areas of the well drained Pineville and Upshur soils and the moderately well drained Beech, Buchanan, Dormont, and Latham soils are included with these soils in mapping. Also included are small areas of soils that are less than 20 inches deep over bedrock, soils that are more than 40 inches deep over bedrock, soils that have lost most or all of their original surface layer, soils in areas where more than 3 percent of the surface is covered with stones, soils with a slope of less than 35 percent, soils with a slope of more than 65 percent, and bedrock escarpments.

The available water capacity is very low or low in the Dekalb soil and low or moderate in the Gilpin soil. Permeability in the subsoil is rapid in the Dekalb soil and moderate in the Gilpin soil. Runoff is very rapid on both soils. Natural fertility is low in the Dekalb soil and low or moderate in the Gilpin soil. Where unlimed, both soils are extremely acid to strongly acid. The depth to bedrock is 20 to 40 inches in both soils.

Nearly all areas of these soils are used as woodland. A few areas are used as pasture.

These soils are not suited to cultivated crops or hay and are difficult to manage for pasture. Slope and stones restrict the use of farm machinery. Management concerns are overgrazing and a severe hazard of erosion in unprotected areas. The major pasture management needs are rotational grazing and proper stocking rates, which help to maintain a cover of desirable grasses and legumes.

The Dekalb soil has moderate potential productivity for trees, and the Gilpin soil has moderately high potential productivity. The hazard of erosion, equipment limitations, seedling mortality, and plant competition are management concerns.

These soils are poorly suited to most urban uses. The depth to bedrock and slope are severe limitations.

Low soil strength, a moderate or high shrink-swell potential, moderately slow or slow permeability, a seasonal high water table, slippage, and slope limit use of the included soils for most kinds of urban development.

The capability subclass is VIIs. The woodland ordination symbol is 3R in areas of the Dekalb soil and 4R in areas of the Gilpin soil.

DlE—Dekalb-Latham complex, 25 to 35 percent slopes

This complex consists of moderately deep, steep, well drained and moderately well drained soils on narrow ridgetops in the central and southern parts of the county. The Latham soil is subject to slippage. The two soils occur as areas so intermingled on the landscape that it was not practical to map them separately. Individual areas are about 45 percent Dekalb channery sandy loam, 30 percent Latham silt
loam, and 25 percent other soils.

Typically, the surface layer of the Dekalb soil is very dark grayish brown channery sandy loam about 1 inch thick. The subsoil extends to a depth of 33 inches. The upper 3 inches of the subsoil is brown channery sandy loam. The next 9 inches is yellowish brown channery sandy loam. The lower 20 inches is yellowish brown very channery sandy loam. Fractured sandstone bedrock is at a depth of 33 inches.

Typically, the surface layer of the Latham soil is dark brown silt loam about 4 inches thick. The subsoil extends to a depth of 29 inches. The upper 3 inches of the subsoil is yellowish brown channery silt loam. The next 9 inches is yellowish brown channery silty clay loam. The next 7 inches is light yellowish brown channery silty clay mottled with light gray. The lower 6 inches is yellowish brown channery silty clay mottled with light gray. The substratum is yellowish brown channery silty clay mottled with light gray. It extends to gray, weathered shale bedrock at a depth of 34 inches.

Small areas of the well drained Gilpin and Upshur soils and the moderately well drained Dormont soils are included with these soils in mapping. Also included are small areas of soils that are less than 20 inches deep over bedrock, soils that are more than 40 inches deep over bedrock, soils that have lost most or all of their original surface layer, soils in areas where more than 1 percent of the surface is covered with stones, soils with a slope of less than 25 percent, soils with a slope of more than 35 percent, and bedrock escarpments.

The available water capacity is very low or low in the Dekalb soil and moderate or high in the Latham soil. Permeability in the subsoil is rapid in the Dekalb soil and slow in the Latham soil. Runoff is very rapid on both soils. Natural fertility is low in the Dekalb soil and moderate in the Latham soil. The Latham soil has a seasonal high water table about 1.5 to 3.0 feet below the surface. Where unlimed, the Dekalb soil is extremely acid to strongly acid and the Latham soil is extremely acid to strongly acid in the surface layer and extremely acid or very strongly acid in the subsoil and substratum. The depth to bedrock is 20 to 40 inches in both soils.

Most areas of these soils are used as woodland. A few areas are used as pasture.

These soils are not suited to cultivated crops or haybut are suited to pasture. Management concerns are overgrazing and a severe hazard of erosion in unprotected areas. The major pasture management needs are rotational grazing; proper stocking rates, which help to maintain a cover of desirable grasses and legumes; and deferment of spring grazing until the Latham soil is reasonably firm.

These soils have moderate potential productivity for trees. The hazard of erosion, equipment limitations, seedling mortality, and plant competition are management concerns.

These soils are poorly suited to most urban uses. The depth to bedrock and slope severely limit the Dekalb soil, and a high shrink-swell potential, low soil strength, the seasonal high water table, slippage, slope, and slow permeability severely limit the Latham soil.

The depth to bedrock, a high shrink-swell potential, low soil strength, a seasonal high water table, slippage, slope, and slow permeability limit use of the included soils for most kinds of urban development. The capability subclass is VIe. The woodland ordination symbol is 3R.

DPG—Dekalb-Pineville-Guyandotte association, very steep, extremely stony

This association consists of moderately deep and very deep, very steep, well drained soils on side slopes, on foot slopes, and in coves in the southern part of the county. Typically, the Dekalb soil is on ridgetops and convex, upper side slopes; the Pineville soil in on the lower side slopes and on foot slopes; and the Guyandotte soil is in north-facing coves and on the upper and middle, north-facing side slopes. Soils that are similar to the Guyandotte soil are in similar southfacing positions. Stones cover 3 to 15 percent of the surface. Areas of each soil are large enough to be mapped separately. Given the present and predicted uses, however, the three soils were mapped as one unit. Individual areas are about 40 percent Dekalb channery sandy loam, 25 percent Pineville channery loam, 20 percent Guyandotte channery loam, and 15 percent other soils and rock outcrop.

Typically, the surface layer of the Dekalb soil is verydark grayish brown channery sandy loam about 1 inchthick. The subsoil extends to a depth of 33 inches. The upper 3 inches of the subsoil is brown channery sandy loam. The next 9 inches is yellowish brown channery sandy loam. The lower 20 inches is yellowish brown very channery sandy loam. Fractured sandstone bedrock is at a depth of 33 inches.

Typically, the surface layer of the Pineville soil is dark brown channery loam about 5 inches thick. The subsoil is channery loam, which extends to a depth of 53 inches. The upper 9 inches of the subsoil is light yellowish brown. The next 14 inches is reddish yellow. The lower 25 inches is yellowish brown. The substratum is yellowish brown channery loam mottled with light gray. It extends to a depth of at least 65 inches.

Typically, the surface layer of the Guyandotte soil is very dark grayish brown and dark brown channery loam about 13 inches thick. The subsoil extends to a depth of 53 inches. The upper 8 inches of the subsoil is brown channery loam. The next 9 inches is dark yellowish brown very channery loam. The lower 23 inches is yellowish brown very channery loam. The substratum is yellowish brown extremely channery loam, which extends to a depth of at least 65 inches.

Small areas of the well drained Gilpin soils and the moderately well drained Buchanan, Dormont, and Latham soils are included with these soils in mapping. Also included are small areas of soils that are less than 20 inches deep over bedrock, soils that have silty textures, soils that have lost most or all of their original surface layer, soils in areas where less than 3 percent of the surface is covered with stones, soils with a slope of less than 35 percent, soils with a slope of more than 65 percent, and bedrock escarpments.

The available water capacity is very low or low in the Dekalb soil, moderate or high in the Pineville soil, and moderate in the Guyandotte soil. Permeability in the subsoil is rapid in the Dekalb soil, moderate in the Pineville soil, and moderate or moderately rapid in the Guyandotte soil. Runoff is very rapid on all three soils. Natural fertility is low in the Dekalb soil, low or moderate in the Pineville soil, and moderate or high in the Guyandotte soil. Where unlimed, the Dekalb soil is extremely acid to strongly acid, the Pineville soil is extremely acid to neutral in the surface layer and extremely acid to strongly acid in the subsoil and substratum, and the Guyandotte soil is very strongly acid to neutral in the surface layer and very strongly acid to moderately acid in the subsoil and substratum. The depth to bedrock is 20 to 40 inches in the Dekalb soil and more than 60 inches in the Pineville and Guyandotte soils.

Nearly all areas of these soils are used as woodland. A few areas are used as pasture.

These soils are not suited to cultivated crops or hay and are difficult to manage for pasture. Slope and stones restrict the use of farm machinery.

Management concerns are overgrazing and a severe hazard of erosion in unprotected areas. The major pasture management needs are rotational grazing and proper stocking rates, which help to maintain a cover of desirable grasses and legumes.

The Dekalb soil has moderate potential productivity for trees, and the Pineville and Guyandotte soils have moderately high potential productivity. The hazard of erosion, equipment limitations, seedling mortality, and plant competition are management concerns.

These soils are poorly suited to most urban uses. The depth to bedrock and slope severely limit the Dekalb soil, and slope severely limits the Pineville and Guyandotte soils.

The depth to bedrock, a high shrink-swell potential, low soil strength, a seasonal high water table, slippage, slope, and slow permeability limit use of the included soils for most kinds of urban development.

The capability subclass is VIIs. The woodland ordination symbol is 3R in areas of the Dekalb soil and 5R in areas of the Pineville and Guyandotte soils.

DrE—Dormont-Latham complex, 25 to 35 percent slopes

This complex consists of moderately deep and deep, steep, moderately well drained soils on benches and side slopes in the central and southern parts of the county. These soils are subject to slippage. The two soils occur as areas so intermingled on the landscape that it was not practical to map them separately. Individual areas are about 50 percent Dormont silt loam, 25 percent Latham silt loam, and 25 percent other soils.

Typically, the surface layer of the Dormont soil is brown silt loam about 7 inches thick. The subsoil extends to a depth of 40 inches. The upper 4 inches of the subsoil is dark yellowish brown silt loam. The next 12 inches is strong brown silty clay loam. The lower 17 inches is strong brown channery silty clay loam mottled with light gray. The substratum is strong brown very channery silty clay loam mottled with light gray. It extends to weathered siltstone bedrock at a depth of 54 inches.

Typically, the surface layer of the Latham soil is dark brown silt loam about 4 inches thick. The subsoil extends to a depth of 29 inches. The upper 3 inches of the subsoil is yellowish brown channery silt loam. The next 9 inches is yellowish brown channery silty clay loam. The next 7 inches is light yellowish brown channery silty clay mottled with light gray. The lower 6 inches is yellowish brown channery silty clay mottled with light gray. The substratum is yellowish brown channery silty clay mottled with light gray. It extends to gray, weathered shale bedrock at a depth of 34 inches.

Small areas of the well drained Dekalb, Gilpin, Pineville, and Upshur soils and the moderately well drained Beech soils are included with these soils in mapping. Also included are small areas of soils that are less than 20 inches deep over bedrock, soils that have a limy subsoil, soils that have lost most or all of their original surface layer, soils in areas where 1 to 3 percent of the surface is covered with stones, soils with a slope of less than 25 percent, and soils with a slope of more than 35 percent.

The available water capacity is moderate or high in the Dormont and Latham soils. Permeability in the subsoil is slow or moderate in the Dormont soil and slow in the Latham soil. Runoff is very rapid on both soils. Natural fertility is moderate in both soils. Both soils have a seasonal high water table about 1.5 to 3.0 feet below the surface. Where unlimed, the Dormont soil is very strongly acid to moderately acid and the Latham soil is extremely acid to strongly acid in the surface layer and extremely acid or very strongly acid in the subsoil and substratum. The depth to bedrock is 48 to 60 inches in the Dormont soil and 20 to 40 inches in the Latham soil.

Most areas of these soils are used as woodland. A few areas are used as pasture.

These soils are not suited to cultivated crops or hay but are suited to pasture. Management concerns are overgrazing and a severe hazard of erosion in unprotected areas. The major pasture management needs are rotational grazing; proper stocking rates, which help to maintain a cover of desirable grasses and legumes; and deferment of spring grazing until the soils are reasonably firm.

The potential productivity for trees on the Dormont soil is moderately high on north-facing slopes and moderate on south-facing slopes. The Latham soil has moderate potential productivity. The hazard of erosion, equipment limitations, seedling mortality, and plant competition are management concerns.

These soils are poorly suited to most urban uses. Low soil strength, the seasonal high water table, slippage, and slope severely limit the Dormont soil, and a high shrink-swell potential, low soil strength, the seasonal high water table, slippage, and slope severely limit the Latham soil.

The depth to bedrock, low soil strength, a moderate or high shrink-swell potential, moderately slow or slow permeability, a seasonal high water table, slippage, and slope limit use of the included soils for most kinds of urban development.

The capability subclass is VIe. The woodland ordination symbol is 4R in areas of the Dormont soil and 3R in areas of the Latham soil.

Gw—Grigsby loam

This soil is very deep, nearly level, and well drained. It is on flood plains along Twelvepole Creek and smaller streams throughout the central and southern parts of the county. The soil is subject to occasional flooding during winter and early spring. Slope ranges from 0 to 3 percent.

Typically, the surface layer is brown loam about 12 inches thick. The upper 7 inches of the surface layer is brown loam. The lower 5 inches is brown sandy loam. The subsoil is sandy loam, which extends to a depth of 42 inches. The upper 8 inches of the subsoil is brownish yellow. The lower 22 inches is yellowish brown. The substratum is yellowish brown sandy loam, which extends to a depth of at least 65 inches.

Small areas of the well drained Chagrin and Kanawha soils and the moderately well drained Cotaco and Lobdell soils are included with this soil in mapping. Also included are small areas of soils with a slope of more than 3 percent, soils that are subject to frequent flooding, and soils that are subject to rare flooding. Included soils make up about 20 percent of the unit.

The available water capacity of the Grigsby soil is moderate or high. Permeability is moderate or moderately rapid in the subsoil and moderately rapid in the substratum. Runoff is slow. Natural fertility is high. Where unlimed, this soil is moderately acid to neutral in the solum and strongly acid to neutral in the substratum. The depth to bedrock is more than 60 inches.

Most areas of this soil are used as cropland, hayland, or pasture (fig. 6). A few areas are used as woodland.

This soil is well suited to cultivated crops and to hay and pasture. Crops can be grown year after year on this soil, but cover crops are needed to reduce the hazard of erosion. Crop residue management helps to maintain fertility and tilth. There is a risk of crop damage from flooding early in the growing season. The major pasture management needs are rotational grazing and proper stocking rates, which help to maintain a cover of desirable grasses and legumes.

This soil has moderately high potential productivity for trees. Plant competition is a management concern.

The hazard of flooding limits most urban uses. It severely limits this soil as a site for dwellings with basements and for septic tank absorption fields.

The hazard of flooding limits this soil as a site for local roads and streets. Raised fill above the flood level and cross culverts or another system of surface water removal can minimize this limitation.

The hazard of flooding, low soil strength, and a seasonal high water table limit use of the included soils for most kinds of urban development.

The capability subclass is IIw. The woodland ordination symbol is 5A.

LgC—Latham-Gilpin complex, 8 to 15 percent slopes

This complex consists of moderately deep, strongly sloping, moderately well drained and well drained soils on ridgetops and benches in the central and southern parts of the county. The two soils occur as areas so intermingled on the landscape that it was not practical to map them separately. Individual areas are about 55 percent Latham silt loam, 30 percent Gilpin silt loam, and 15 percent other soils.

Typically, the surface layer of the Latham soil is dark brown silt loam about 4 inches thick. The subsoil extends to a depth of 29 inches. The upper 3 inches of the subsoil is yellowish brown channery silt loam. The next 9 inches is yellowish brown channery silty clay loam. The next 7 inches is light yellowish brown channery silty clay mottled with light gray. The lower 6 inches is yellowish brown channery silty clay mottled with light gray. The substratum is yellowish brown channery silty clay mottled with light gray. It extends to gray, weathered shale bedrock at a depth of 34 inches.

Typically, the surface layer of the Gilpin soil is brown silt loam about 1 inch thick. The subsoil extends to a depth of 22 inches. The upper 5 inches of the subsoil is dark yellowish brown silt loam. The lower 16 inches is yellowish brown channery silty clay loam. Light olive brown, fractured shale and fine grained sandstone bedrock is at a depth of 22 inches.

Small areas of the well drained Dekalb and Upshur soils and the moderately well drained Dormont soils are included with these soils in mapping. Also included are small areas of soils that are less than 20 inches deep over bedrock, soils that have a limy subsoil, soils that have lost most or all of their original surface layer because of erosion, soils with a slope of less than 8 percent, and soils with a slope of more than 15 percent.

The available water capacity is moderate or high in the Latham soil and low or moderate in the Gilpin soil. Permeability in the subsoil is slow in the Latham soil and moderate in the Gilpin soil. Runoff is rapid on both soils. Natural fertility is moderate in the Latham soil and low or moderate in the Gilpin soil. The Latham soil has a seasonal high water table about 1.5 to 3.0 feet below the surface. Where unlimed, the Latham soil is extremely acid to strongly acid in the surface layer and extremely acid or very strongly acid in the subsoil and substratum and the Gilpin soil is extremely acid to strongly acid. The depth to bedrock is 20 to 40 inches in both soils.

About half of the areas of these soils are used as hayland, pasture, or cropland. A few areas are used for urban development. The remaining acreage is used as woodland.

These soils have limited suitability for cultivated crops and are better suited to hay or pasture. The hazard of erosion is severe in unprotected areas. If these soils are cultivated, conservation tillage, contour stripcropping, rotations that include hay, cover crops, and crop residue management help to control erosion and maintain fertility and tilth. The major pasture management needs are rotational grazing; proper stocking rates, which help to maintain a cover of desirable grasses and legumes; and deferment of spring grazing until the Latham soil is reasonably firm.

The Latham soil has moderate potential productivity for trees, and the Gilpin soil has moderately high potential productivity. Equipment limitations, seedling mortality, and plant competition are management concerns.

The depth to bedrock, a high shrink-swell potential, low soil strength, the seasonal high water table, slope, and slow permeability limit most urban uses.

These soils are limited as sites for dwellings with basements. The seasonal high water table limits the Latham soil, and slope limits the Gilpin soil. Installing foundation drains, sealing foundation walls, diverting surface water from higher areas away from homesites, and backfilling with porous material can minimize the limitation caused by the seasonal high water table.Land shaping and grading can minimize the limitation caused by slope. Erosion is a hazard in areas cleared for construction. Establishing a plant cover during or soon after construction can reduce the hazard of erosion. Designing dwellings that conform to the natural slope and setting can keep land shaping, and ultimately erosion, to a minimum.

These soils are limited as sites for septic tank absorption fields. The depth to bedrock, the seasonal high water table, and slow permeability limit the Latham soil, and the depth to bedrock limits the Gilpin soil. These limitations can be minimized by installing specially designed absorption fields.

These soils are limited as sites for local roads and streets. The high shrink-swell potential and low soil strength limit the Latham soil, and slope limits the Gilpin soil. Constructing the roads and streets on the contour and on suitable subgrade and installing surface and subsurface drainage systems can minimize these limitations.

The depth to bedrock, a high shrink-swell potential, low soil strength, a seasonal high water table, slope, and slow permeability limit use of the included soils for most kinds of urban development.

The capability subclass is IVe. The woodland ordination symbol is 3C in areas of the Latham soil and 4A in areas of the Gilpin soil.

LgD—Latham-Gilpin complex, 15 to 25 percent slopes

This complex consists of moderately deep, moderately steep, moderately well drained and well drained soils on ridgetops and benches in the central and southern parts of the county. The Latham soil is subject to slippage. The two soils occur as areas so intermingled on the landscape that it was not practical to map them separately. Individual areas are about 50 percent Latham silt loam, 30 percent Gilpin silt loam, and 20 percent other soils.

Typically, the surface layer of the Latham soil is dark brown silt loam about 4 inches thick. The subsoil extends to a depth of 29 inches. The upper 3 inches of the subsoil is yellowish brown channery silt loam. The next 9 inches is yellowish brown channery silty clay loam. The next 7 inches is light yellowish brown channery silty clay mottled with light gray. The lower 6 inches is yellowish brown channery silty clay mottled with light gray. The substratum is yellowish brown channery silty clay mottled with light gray. It extends to gray, weathered shale bedrock at a depth of 34 inches.

Typically, the surface layer of the Gilpin soil is brown silt loam about 1 inch thick. The subsoil extends to a depth of 22 inches. The upper part of the subsoil is dark yellowish brown silt loam, and the lower part is yellowish brown channery silty clay loam mottled with light yellowish brown. Light olive brown, fractured shale and fine grained sandstone bedrock is at a depth of 22 inches.

Small areas of the well drained Dekalb and Upshur soils and the moderately well drained Dormont soils are included with these soils in mapping. Also included are small areas of soils that are less than 20 inches deep over bedrock, soils that have a limy subsoil, soils that have lost most or all of their original surface layer because of erosion, soils with a slope of less than 15 percent, and soils with a slope of more than 25 percent.

The available water capacity is moderate or high in the Latham soil and low or moderate in the Gilpin soil. Permeability in the subsoil is slow in the Latham soil and moderate in the Gilpin soil. Runoff is rapid on both soils. Natural fertility is moderate in the Latham soil and low or moderate in the Gilpin soil. The Latham soil has a seasonal high water table about 1.5 to 3.0 feet below the surface. Where unlimed, the Latham soil is extremely acid to strongly acid in the surface layer and extremely acid or very strongly acid in the subsoil and substratum and the Gilpin soil is extremely acid to strongly acid. The depth to bedrock is 20 to 40 inches in both soils.

About two-thirds of the areas of these soils are used as woodland. A few areas are used as hayland or pasture.

These soils are not suited to cultivated crops or hay but are suited to pasture. The hazard of erosion is severe in unprotected areas. If these soils are cultivated, conservation tillage, contour stripcropping, rotations that include hay, cover crops, grassed waterways, and crop residue management help to control erosion and maintain fertility and tilth. The major pasture management needs are rotational grazing; proper stocking rates, which help to maintain a cover of desirable grasses and legumes; and deferment of spring grazing until the Latham soil is reasonably firm.

The Latham soil has moderate potential productivity for trees, and the Gilpin soil has moderately high potential productivity on north-facing slopes and moderate potential productivity on south-facing slopes. The hazard of erosion, equipment limitations, seedling mortality, and plant competition are management concerns.

The depth to bedrock, a high shrink-swell potential, low soil strength, the seasonal high water table, slippage, and slope limit most urban uses.

These soils are limited as sites for dwellings with basements. The seasonal high water table, slippage, and slope limit the Latham soil, and slope limits the Gilpin soil. Installing foundation drains, sealing foundations, and backfilling with porous material can minimize the limitation caused by the seasonal high water table. Land shaping and grading can minimize the limitation caused by slope. Avoiding unnecessary disturbance of the soil can minimize the hazard of slippage. Erosion is a hazard in areas cleared for construction. Establishing a plant cover during or soon after construction can reduce the hazards of erosion and slippage. Designing dwellings that conform to the natural slope and setting can keep land shaping, and ultimately erosion, to a minimum.

These soils are limited as sites for septic tank absorption fields. The seasonal high water table, slippage, and slope limit the Latham soil, and the depth to bedrock and slope limit the Gilpin soil. These limitations can be minimized by installing specially designed absorption fields.

These soils are limited as sites for local roads and streets. The high shrink-swell potential, low soil strength, and slope limit the Latham soil, and slope limits the Gilpin soil. Constructing the roads and streets on the contour and on suitable subgrade and installing surface and subsurface drainage systems can minimize these limitations.

The depth to bedrock, a high shrink-swell potential, low soil strength, a seasonal high water table, slippage, slope, and slow permeability limit use of the included soils for most kinds of urban development.

The capability subclass is VIe. The woodland ordination symbol is 3R in areas of the Latham soil and 4R in areas of the Gilpin soil.

PbE—Pineville and Buchanan channery loams, 15 to 35 percent slopes,extremely stony

This undifferentiated group consists of very deep, moderately steep and steep, well drained and moderately well drained soils in coves and on foot slopes and the lower side slopes in the south-central and southern parts of the county. Stones cover 3 to 15 percent of the surface. Some areas of the unit are predominately Pineville soil, some are predominately Buchanan soil, and some have both soils. Areas of each soil are large enough to be mapped separately but are mapped as one unit because of similar use and management requirements. Individual areas are about 45 percent Pineville channery loam, 25 percent Buchanan channery loam, and 30 percent other soils.

Typically, the surface layer of the Pineville soil is dark brown channery loam about 5 inches thick. The subsoil is channery loam, which extends to a depth of 53 inches. The upper 9 inches of the subsoil is light yellowish brown. The next 14 inches is reddish yellow. The lower 25 inches is yellowish brown. The substratum is yellowish brown channery loam mottled with light gray. It extends to a depth of at least 65 inches.

Typically, the surface layer of the Buchanan soil is very dark grayish brown channery loam about 2 inches thick. The subsurface layer is brown channery loam about 3 inches thick. The subsoil extends to a depth of 60 inches. The upper 6 inches of the subsoil is yellowish brown channery loam. The next 9 inches is brownish yellow channery loam. The next 8 inches is brownish yellow channery loam mottled with light gray. The lower 32 inches is a fragipan. The upper 8 inches of the fragipan is light yellowish brown very channery loam mottled with light gray and strong brown, and the lower 24 inches is light gray and yellowish brown very channery loam mottled with brown and light brown. The substratum is light yellowish brown very channery loam mottled with light gray and yellowish brown. It extends to a depth of at least 65 inches.

Small areas of the well drained Dekalb and Gilpin soils and the moderately well drained Dormont and Latham soils are included with these soils in mapping. Also included are small areas of soils that are less than 60 inches deep over bedrock, soils that have a limy subsoil, soils that have lost most or all of their original surface layer because of erosion, soils in areas where less than 3 percent of the surface is covered with stones, soils with a slope of less than 15 percent, soils with a slope of more than 35 percent, and bedrock escarpments.

The available water capacity is moderate or high in the Pineville soil and low or moderate in the Buchanan soil. Permeability is moderate in the subsoil of the Pineville soil. It is moderate above the fragipan in the Buchanan soil and slow in the fragipan. Runoff is very rapid on both soils. Natural fertility is low or moderate in both soils. The Buchanan soil has a seasonal high water table about 1.5 to 3.0 feet below the surface. Where unlimed, the Pineville soil is extremely acid to neutral in the surface layer and extremely acid to strongly acid in the subsoil and substratum and the Buchanan soil is extremely acid to strongly acid. The depth to bedrock is more than 60 inches in both soils. The Buchanan soil has a fragipan at a depth of 20 to 36 inches. The fragipan severely restricts root development.

Most areas of these soils are used as woodland. A small acreage is used as pasture or hayland.

These soils are not suited to cultivated crops or hay and are difficult to manage for pasture. Slope and stones restrict the use of farm machinery. Management concerns are overgrazing and a severe hazard of erosion in unprotected areas. The major pasture management needs are rotational grazing and proper stocking rates, which help to maintain a cover of desirable grasses and legumes.

These soils have moderately high potential productivity for trees on north-facing slopes. The Buchanan soil has moderate potential productivity on south-facing slopes. The hazard of erosion, equipment limitations, seedling mortality, and plant competition are management concerns.

These soils are poorly suited to most urban uses. Slope severely limits the Pineville soil, and the seasonal high water table, slope, and slow permeability severely limit the Buchanan soil.

The depth to bedrock, a high shrink-swell potential, low soil strength, a seasonal high water table, and slope limit use of the included soils for most kinds of urban development.

The capability subclass is VIIs. The woodland ordination symbol is 5R in areas of the Pineville soil and 4R in areas of the Buchanan soil.

MPF—Matewan-Pineville-Guyandotte association, very steep, extremely stony

Setting

Landform: Mountains that have cool aspects and are dominated by sandstone bedrock; Matewan—mountaintop summits and upper side slopes; Pineville—backslopes and footslopes of mountain flanks and bases; Guyandotte—backslopes and footslopes of mountain flanks and bases and in the upper reaches of coves

Slope range: 35 to 80 percent

Composition

Matewan soil: 35 percent Pineville soil: 25 percent Guyandotte soil: 20 percent Inclusions: 20 percent

Typical Profile

Matewan

Surface layer:
0 to 0.5 inch—very dark brown, moderately decomposed plant material
0.5 inch to 4 inches—very dark grayish brown very channery sandy loam
Subsurface layer:
4 to 8 inches—yellowish brown very channery sandy loam
Subsoil:
8 to 30 inches—brownish yellow extremely channery loam
Substratum:
30 to 33 inches—brownish yellow extremely flaggy loam
Bedrock:
33 inches—hard sandstone

Pineville

Surface layer:
0 to 1 inch—slightly decomposed plant material
1 to 4 inches—dark brown very channery loam
Subsoil:
4 to 47 inches—yellowish brown channery loam
47 to 59 inches—yellowish brown very channery loam
Substratum:
59 to 65 inches—brownish yellow very channery loam with strong brown mottles and black concretions

Guyandotte

Surface layer:
0 to 1 inch—moderately decomposed plant material
1 to 9 inches—black channery loam
9 to 14 inches—very dark grayish brown channery loam
Subsurface layer:
14 to 19 inches—dark yellowish brown very channery loam
Subsoil:
19 to 46 inches—yellowish brown very channery loam
46 to 65 inches—yellowish brown extremely channery sandy loam

Soil Properties and Qualities

Matewan

Drainage class: Somewhat excessively drained
Permeability: Rapid
Available water capacity: Very low or low
Seasonal high water table: None
Flooding: None
Shrink-swell potential: Low
Slope class: Very steep
Stoniness: Extremely stony

Natural fertility: Very low or low
Reaction: In unlimed areas, extremely acid to moderately acid
Surface runoff: Low
Depth to bedrock: 20 to 40 inches

Pineville
Drainage class: Well drained
Permeability: Moderate or moderately rapid
Available water capacity: Moderate or high
Seasonal high water table: None
Flooding: None
Shrink-swell potential: Low
Slope class: Very steep
Stoniness: Extremely stony
Natural fertility: Low or moderate
Reaction: In unlimed areas, extremely acid to neutral in the A horizon and extremely acid to strongly acid in the B and C horizons
Surface runoff: High or medium
Depth to bedrock: More than 60 inches

Guyandotte
Drainage class: Well drained
Permeability: Moderate or moderately rapid
Available water capacity: Low to high
Seasonal high water table: None
Flooding: None
Shrink-swell potential: Low
Slope class: Very steep
Stoniness: Extremely stony
Natural fertility: Medium or high
Reaction: Very strongly acid to neutral in the A horizon and very strongly acid to moderately acid in the B and C horizons
Surface runoff: Medium or high
Depth to bedrock: More than 60 inches

Inclusions
• Berks soils and scattered areas of rock outcrop on the upper side slopes
• Fiveblock and Kaymine soils in strip-mined areas
• Small areas where stones and boulders cover more of the soil surface

Use and Management Most areas of these soils are wooded. Common trees on ridgetops and southfacing slopes include chestnut oak, scarlet oak, hickory, and white oak. Common trees on north-facing slopes and in coves include red oak, black oak, American beech, yellow poplar, basswood, and sugar maple. In many areas, especially on south-facing slopes, the trees are of poor quality because they have been damaged by fire. These soils are not suited to community development, cultivated crops, hay, or pasture because of the very steep slopes and the stones at the soil surface.

Woodland
Suitability: Moderately suited
Management concerns:
• The long, very steep slopes limit access to the remote ridgetops in this unit and thus compound the problem of fire control and the hazard of erosion.
• Access onto the ridgetops is mostly by mining roads.
• The fire hazard is greater near the numerous residential developments in the narrow valleys.
Management considerations:
• Specialized equipment and management techniques, such as cable yarding, are safer and cause less compaction of the soil.
• Laying out access roads and skid trails along the contour, diverting surface water away from roads, and seeding and mulching roads, skid trails, and log landings help to control erosion.

Wildlife habitat
Suitability: Moderately suited
Management considerations:
• The vegetation in this map unit provides habitat for grouse, turkey, squirrel, whitetail deer, and European wild boar, an

introduced species in the northern part of Logan County.
• Important understory vegetation primarily growing on slopes with cool aspect includes cohosh, snakeroot, ginseng, yellow rot, trillium, mayapple, spring beauty, wild leek, and ferns.

Interpretive Groups
Land capability classification: 7s

Table 8.--Woodland Management and Productivity

(Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available. For map units having slopes of more than 15 percent, site index is given for north aspects. Site index on south aspects will generally be 5 to 10 points lower.)

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Potential productivity: Common trees	Site index	Average annual growth*: Cubic feet/ac	Board feet/ac	Cords/ac
AgC---------- Allegheny	4A	Slight	Slight	Slight	Moderate	Black oak----------	78	60	236	0.78
						Shortleaf pine------	80	130	---	---
						Yellow-poplar-------	93	95	482	1.10
						Sugar maple---------	---	---	---	---
						White ash----------	---	---	---	---
						Northern red oak----	---	---	---	---
						Red maple----------	---	---	---	---
						Pignut hickory------	---	---	---	---
						White oak----------	70	52	180	.67
						Black cherry--------	---	---	---	---
AsA---------- Ashton	5A	Slight	Slight	Slight	Severe	Northern red oak----	85	67	285	.90
						Sweetgum-----------	87	98	---	---
						Hackberry----------	---	---	---	---
						Hickory------------	---	---	---	---
						Yellow-poplar-------	95	98	510	1.0
						Red maple----------	---	---	---	---
						White ash----------	---	---	---	---
						American sycamore---	---	---	---	---
						American elm--------	---	---	---	---
						Cherrybark oak------	---	---	---	---
						White oak----------	---	---	---	---
BeC---------- Beech	4A	Slight	Slight	Slight	Severe	Northern red oak----	80	62	250	.81
						Yellow-poplar-------	95	98	510	1.14
						Shortleaf pine------	80	130	---	---
BeD, BeE-------- Beech	5R	Moderate	Moderate	Slight	Severe	Northern red oak----	85	67	285	.88
						Yellow-poplar-------	102	110	608	1.27
						Shortleaf pine------	85	140	---	---
Ca---------- Chagrin	5A	Slight	Slight	Slight	Severe	Northern red oak----	86	68	292	.89
						Yellow-poplar-------	96	100	524	1.15
						Sugar maple---------	86	53	---	---
						White oak----------	---	---	---	---
						Black cherry--------	---	---	---	---
						White ash----------	---	---	---	---
						Black walnut--------	---	---	---	---
CtA, CtB-------- Cotaco	4A	Slight	Slight	Slight	Moderate	Black oak----------	80	62	250	.81
						Yellow-poplar-------	97	105	538	1.17
						Sweet birch---------	---	---	---	---
DgF:										
Dekalb---------	3R	Moderate	Severe	Moderate	Slight	Northern red oak----	55	38	85	.45
						Yellow-poplar-------	---	---	---	---
						Chestnut oak--------	---	---	---	---
						Red maple----------	---	---	---	---
Gilpin---------	4R	Severe	Severe	Slight	Moderate	Northern red oak----	80	---	---	---
						Yellow-poplar-------	95	---	---	---

See footnote at end of table.

Table 8.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Average annual growth*		
		Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	Cubic feet/ac	Board feet/ac	Cords/ac
DlE:										
Dekalb	3R	Moderate	Moderate	Moderate	Moderate	Northern red oak	55	38	85	0.45
						Yellow-poplar	---	---	---	---
						Red maple	---	---	---	---
						Chestnut oak	---	---	---	---
Latham	3R	Moderate	Severe	Severe	Moderate	Northern red oak	65	48	145	.60
						Black oak	75	57	215	.74
						White oak	75	57	215	.74
						Shortleaf pine	---	---	---	---
DPG:										
Dekalb	3R	Severe	Severe	Moderate	Moderate	Northern red oak	55	38	85	.45
						Yellow-poplar	---	---	---	---
						Chestnut oak	---	---	---	---
						Red maple	---	---	---	---
Pineville	5R	Severe	Severe	Moderate	Severe	Northern red oak	86	68	292	.89
						Yellow-poplar	108	121	692	1.38
						Black oak	85	67	285	.88
						Basswood	---	---	---	---
						Hickory	---	---	---	---
Guyandotte	5R	Severe	Severe	Severe	Severe	Northern red oak	85	67	285	.88
						American basswood	99	---	---	---
						Yellow-poplar	104	114	636	1.31
						Black cherry	86	53	---	---
						Black locust	85	---	---	---
DrD, DrE:										
Dormont	4R	Severe	Severe	Slight	Moderate	Northern red oak	80	62	250	.81
						Yellow-poplar	96	100	524	1.15
						White ash	80	98	---	---
						Sugar maple	80	50	---	---
						Shortleaf pine	80	130	---	---
Latham	3R	Severe	Severe	Severe	Moderate	Northern red oak	65	48	145	.60
						Black oak	75	57	215	.74
						White oak	75	57	215	.74
						Shortleaf pine	---	---	---	---
FvF	4R	Severe	Severe	Severe	Moderate	Northern red oak	80	62	250	.81
Fiveblock						Eastern white pine	94	---	---	---
						Yellow-poplar	105	115	650	1.32
						American sycamore	90	---	---	---
						Black locust	---	---	---	---
GuC:										
Gilpin	4A	Slight	Slight	Slight	Moderate	Northern red oak	76	58	222	.75
						Yellow-poplar	93	95	482	1.10
Upshur	3C	Moderate	Moderate	Slight	Severe	Northern red oak	65	48	145	.60
						Yellow-poplar	80	71	320	.83
						Eastern white pine	80	147	---	---
GuD:										
Gilpin	4R	Moderate	Moderate	Slight	Moderate	Northern red oak	80	62	250	.81
						Yellow-poplar	92	93	468	1.07
						Black oak	75	57	215	.74
						Chestnut oak	69	51	173	.65

See footnote at end of table.

Table 8.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Potential productivity: Common trees	Site index	Average annual growth*: Cubic feet/ac	Board feet/ac	Cords/ac
GuD:										
Upshur	4R	Moderate	Severe	Slight	Severe	Northern red oak	72	54	194	0.70
						Yellow-poplar	90	90	440	1.04
						Black oak	---	---	---	---
GuE:										
Gilpin	4R	Moderate	Moderate	Slight	Moderate	Northern red oak	80	62	250	.81
						Yellow-poplar	92	93	468	1.07
Upshur	4R	Severe	Severe	Slight	Severe	Northern red oak	72	54	194	.70
						Yellow-poplar	90	90	440	1.04
						Black oak	---	---	---	---
						Chestnut oak	---	---	---	---
GuF:										
Gilpin	4R	Severe	Severe	Slight	Moderate	Northern red oak	80	62	250	.81
						Yellow-poplar	92	93	468	1.07
Upshur	4R	Severe	Severe	Slight	Severe	Northern red oak	72	54	194	.70
						Yellow-poplar	90	90	440	1.04
						Black oak	---	---	---	---
						Chestnut oak	---	---	---	---
Gw	5A	Slight	Slight	Slight	Severe	Northern red oak	85	67	285	.88
Grigsby						Yellow-poplar	110	124	720	1.42
						White oak	85	67	285	.88
						Black walnut	---	---	---	---
						American sycamore	---	---	---	---
						Sweetgum	---	---	---	---
						Red maple	---	---	---	---
						Hickory	---	---	---	---
Gy	4W	Slight	Moderate	Moderate	Severe	Northern red oak	80	62	250	.81
Guyan						Yellow-poplar	90	90	440	1.04
						Red maple	80	50	---	---
						American sycamore	---	---	---	---
						Boxelder	---	---	---	---
Hu	5A	Slight	Slight	Slight	Severe	Northern red oak	84	66	278	.87
Huntington						Yellow-poplar	95	98	510	1.14
KaA, KaB	4A	Slight	Slight	Slight	Moderate	Northern red oak	80	62	250	.81
Kanawha						Black oak	80	62	250	.81
						Yellow-poplar	90	90	440	1.04
						White ash	80	98	---	---
						Black walnut	---	---	---	---
						Black locust	---	---	---	---
LgC:										
Latham	3C	Slight	Severe	Moderate	Moderate	Northern red oak	63	46	131	.57
						Black oak	65	48	145	.60
						Shortleaf pine	---	---	---	---
						White oak	72	54	194	.70
Gilpin	4A	Slight	Slight	Slight	Moderate	Northern red oak	80	62	250	.81
						Yellow-poplar	95	98	510	1.14

See footnote at end of table.

Table 8.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Average annual growth*	
		Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	Cubic feet/ac	Board feet/ac	Cords/ac
LgD:										
Latham	3R	Moderate	Severe	Moderate	Moderate	Northern red oak	65	48	145	0.60
						Black oak	75	57	215	.74
						White oak	75	57	215	.74
						Shortleaf pine	---	---	---	---
Gilpin	4R	Moderate	Moderate	Slight	Moderate	Northern red oak	80	62	250	.81
						Yellow-poplar	92	93	468	1.07
						Black oak	75	57	215	.74
						Chestnut oak	69	51	173	.65
Lo	5A	Slight	Slight	Slight	Severe	Northern red oak	87	69	299	.91
Lobdell						Yellow-poplar	96	100	524	1.15
						Sugar maple	---	---	---	---
						White ash	---	---	---	---
						White oak	---	---	---	---
						Black cherry	---	---	---	---
MaB, MaC	4C	Moderate	Slight	Severe	Moderate	Northern red oak	78	60	236	.78
Markland						White oak	75	57	215	.74
Me	5W	Slight	Moderate	Severe	Severe	Pin oak	96	78	362	1.03
Melvin						Eastern cottonwood	101	---	---	---
						Sweetgum	88	101	---	---
						Green ash	---	---	---	---
						Hackberry	---	---	---	---
						Hickory	---	---	---	---
						Red maple	---	---	---	---
						American elm	---	---	---	---
NeD	5R	Moderate	Moderate	Moderate	Severe	Northern red oak	85	67	285	.88
Nelse						Sweetgum	98	132	---	---
						Boxelder	---	---	---	---
						Silver maple	---	---	---	---
						Black willow	---	---	---	---
						River birch	---	---	---	---
						Green ash	---	---	---	---
						American sycamore	---	---	---	---
PbE:										
Pineville	5R	Moderate	Moderate	Moderate	Severe	Northern red oak	86	68	292	.89
						Yellow-poplar	108	121	692	1.38
						Black oak	85	67	285	.88
						Basswood	---	---	---	---
						Hickory	---	---	---	---
						White oak	63	46	131	.57
Buchanan	4R	Moderate	Moderate	Slight	Moderate	Northern red oak	80	62	250	.81
						Yellow-poplar	90	90	440	1.04

* Average annual growth is equal to total volume growth at rotation divided by rotation age. Actual annual growth varies with stand vigor and other factors. Yield data are based on site indices of natural stands at age 50 years. The International 1/4 Log Rule is used for board feet. Cords are standard rough cords. This information should be used for planning only.

Table 9.--Recreational Development

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated.)

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
AgC Allegheny	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
AsA Ashton	Severe: flooding.	Slight	Slight	Slight	Slight.
BeC Beech	Moderate: slope, wetness.	Moderate: slope, wetness.	Severe: slope.	Moderate: wetness.	Moderate: wetness, slope.
BeD Beech	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: wetness, slope.	Severe: slope.
BeE Beech	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
BuC: Beech	Moderate: slope, wetness.	Moderate: slope, wetness.	Severe: slope.	Moderate: wetness.	Moderate: wetness, slope.
Urban land.					
Ca Chagrin	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
CtA Cotaco	Severe: flooding.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
CtB Cotaco	Severe: flooding.	Moderate: wetness.	Moderate: slope, wetness.	Moderate: wetness.	Moderate: wetness.
DgF: Dekalb	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Gilpin	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
DlE: Dekalb	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Latham	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
DPG: Dekalb	Severe: slope, small stones, large stones.	Severe: slope, small stones, large stones.	Severe: large stones, slope, small stones.	Severe: slope.	Severe: small stones, slope.

Table 9.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
DPG:					
Pineville	Severe: slope, large stones.	Severe: slope, large stones.	Severe: large stones, slope.	Severe: slope.	Severe: slope.
Guyandotte	Severe: slope, large stones, small stones.	Severe: slope, large stones, small stones.	Severe: large stones, slope, small stones.	Severe: slope.	Severe: slope, small stones.
DrD:					
Dormont	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Latham	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
DrE:					
Dormont	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Latham	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
FvF: Fiveblock	Variable	Variable	Variable	Variable	Variable.
GuC:					
Gilpin	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope, thin layer.
Upshur	Moderate: slope, percs slowly.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
GuD:					
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Upshur	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
GuE, GuF:					
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Upshur	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Gw: Grigsby	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
Gy: Guyan	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Hu: Huntington	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.

Table 9.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
KaA Kanawha	Severe: flooding.	Slight	Slight	Slight	Slight.
KaB Kanawha	Severe: flooding.	Slight	Moderate: slope.	Slight	Slight.
LgC: Latham	Moderate: slope, wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: wetness, slope.
Gilpin	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope, thin layer.
LgD: Latham	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Lo Lobdell	Severe: flooding.	Moderate: wetness.	Moderate: wetness, flooding.	Slight	Moderate: flooding.
MaB Markland	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
MaC Markland	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Me Melvin	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
NeD Nelse	Severe: flooding, slope.	Severe: slope.	Severe: slope, flooding.	Moderate: slope, flooding.	Severe: flooding, slope.
PbE: Pineville	Severe: slope, large stones, small stones.	Severe: slope, large stones, small stones.	Severe: slope, large stones, small stones.	Severe: slope.	Severe: slope, small stones.
Buchanan	Severe: slope, large stones, small stones.	Severe: slope, large stones, small stones.	Severe: slope, large stones, small stones.	Severe: slope.	Severe: slope, small stones.
Ud Udorthents	Variable	Variable	Variable	Variable	Variable.
UsB: Urban land.					

Table 9.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
UsB:					
Ashton	Slight	Slight	Moderate: slope.	Slight	Slight.
Lindside	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
UtD:					
Urban land.					
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Upshur	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
UvB:					
Urban land.					
Kanawha	Severe: flooding.	Slight	Moderate: slope.	Slight	Slight.
Cotaco	Severe: flooding.	Moderate: wetness.	Moderate: slope, wetness.	Moderate: wetness.	Moderate: wetness.
UwB:					
Urban land.					
Wheeling	Slight	Slight	Moderate: slope.	Slight	Slight.

Table 10.--Wildlife Habitat

(See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated.)

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
AgC---- Allegheny	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
AsA---- Ashton	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
BeC---- Beech	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
BeD---- Beech	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
BeE---- Beech	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
BuC:										
Beech.										
Urban land.										
Ca---- Chagrin	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
CtA---- Cotaco	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
CtB---- Cotaco	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
DgF:										
Dekalb----	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Gilpin----	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
DlE:										
Dekalb----	Very poor.	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Latham----	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
DPG:										
Dekalb----	Very poor.	Very poor.	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Pineville---	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
Guyandotte---	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
DrD:										
Dormont----	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.

Table 10.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba-ceous plants	Hardwood trees	Conif-erous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
DrD:										
Latham	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
DrE:										
Dormont	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Latham	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
FvF Fiveblock	Very poor.	Very poor.	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
GuC:										
Gilpin	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
Upshur	Fair	Good	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
GuD:										
Gilpin	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Upshur	Poor	Fair	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
GuE:										
Gilpin	Very poor.	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Upshur	Very poor.	Fair	Fair	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
GuF:										
Gilpin	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Upshur	Very poor.	Poor	Fair	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
Gw Grigsby	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Gy Guyan	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Hu Huntington	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
KaA Kanawha	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
KaB Kanawha	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
LgC:										
Latham	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.

Table 10.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
LgC:										
Gilpin	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
LgD:										
Latham	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Gilpin	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Lo Lobdell	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
MaB Markland	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
MaC Markland	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Me Melvin	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
NeD Nelse	Poor	Fair	Good	Good	Fair	Very poor.	Very poor.	Fair	Good	Very poor.
PbE:										
Pineville	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
Buchanan	Very poor.	Very poor.	Good	Good	Good	Poor	Very poor.	Poor	Fair	Very poor.
Ud. Udorthents										
UsB:										
Urban land.										
Ashton.										
Lindside.										
UtD:										
Urban land.										
Gilpin.										
Upshur.										
UvB:										
Urban land.										
Kanawha.										
Cotaco.										
UwB:										
Urban land.										
Wheeling.										

Table 8a.--Forest Management (Part 1)--Continued

Map symbol and soil name	Pct. of map unit	Limitations affecting construction of haul roads and log landings		Suitability for log landings		Soil rutting hazard	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
MPF:							
Pineville	25	Severe		Poorly suited		Moderate	
		Slope	1.00	Slope	1.00	Low strength	0.50
		Stoniness	0.50	Rock fragments	0.50		
		Low strength	0.50	Low strength	0.50		
Guyandotte	20	Severe		Poorly suited		Moderate	
		Slope	1.00	Slope	1.00	Low strength	0.50
		Stoniness	0.50	Rock fragments	0.50		
PBF:							
Pineville	40	Severe		Poorly suited		Moderate	
		Slope	1.00	Slope	1.00	Low strength	0.50
		Stoniness	0.50	Rock fragments	0.50		
		Low strength	0.50	Low strength	0.50		
Berks	35	Severe		Poorly suited		Severe	
		Slope	1.00	Slope	1.00	Low strength	1.00
		Stoniness	0.50	Rock fragments	0.50		
		Low strength	0.50	Low strength	0.50		
PnE:							
Pineville	60	Moderate		Poorly suited		Severe	
		Slope	0.50	Slope	1.00	Low strength	1.00
				Low strength	0.50		
Lily	25	Moderate		Poorly suited		Severe	
		Slope	0.50	Slope	1.00	Low strength	1.00
		Restrictive layer	0.50	Low strength	0.50		
SbB:							
Sensabaugh	80	Moderate		Moderately suited		Severe	
		Low strength	0.50	Low strength	0.50	Low strength	1.00
				Slope	0.50		
SeB:							
Sensabaugh	45	Moderate		Moderately suited		Severe	
		Low strength	0.50	Low strength	0.50	Low strength	1.00
Lobdell	35	Severe		Poorly suited		Severe	
		Flooding	1.00	Flooding	1.00	Low strength	1.00
		Low strength	0.50	Low strength	0.50		
		Wetness	0.50				
Ua:							
Udorthents	100	Not rated		Not rated		Not rated	
Ub:							
Udorthents	95	Not rated		Not rated		Not rated	
UcB:							
Udorthents	50	Not rated		Not rated		Not rated	
Urban land	40	Not rated		Not rated		Not rated	
Ud:							
Urban land	45	Not rated		Not rated		Not rated	
Chavies	30	Slight		Well suited		Moderate	
						Low strength	0.50

Table 8b.--Forest Management (Part 2)--Continued

Map symbol and soil name	Pct. of map unit	Hazard of off-road or off-trail erosion		Hazard of erosion on roads and trails		Suitability for roads (natural surface)	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
MPF:							
Guyandotte----------	20	Very severe		Severe		Poorly suited	
		Slope	0.95	Slope	0.95	Slope	1.00
		Erodibility	0.95	Erodibility	0.95	Rock fragments	0.50
PBF:							
Pineville----------	40	Very severe		Severe		Poorly suited	
		Slope	0.95	Slope	0.95	Slope	1.00
		Erodibility	0.95	Erodibility	0.95	Rock fragments	0.50
						Low strength	0.50
Berks----------	35	Very severe		Severe		Poorly suited	
		Slope	0.95	Slope	0.95	Slope	1.00
		Erodibility	0.95	Erodibility	0.95	Rock fragments	0.50
						Low strength	0.50
PnE:							
Pineville----------	60	Moderate		Severe		Poorly suited	
		Slope	0.50	Slope	0.95	Slope	1.00
		Erodibility	0.50	Erodibility	0.95	Low strength	0.50
Lily----------	25	Moderate		Severe		Poorly suited	
		Slope	0.50	Slope	0.95	Slope	1.00
		Erodibility	0.50	Erodibility	0.95	Low strength	0.50
SbB:							
Sensabaugh----------	80	Slight		Moderate		Moderately suited	
				Slope	0.50	Low strength	0.50
				Erodibility	0.50	Slope	0.50
SeB:							
Sensabaugh----------	45	Slight		Moderate		Moderately suited	
				Slope	0.50	Low strength	0.50
				Erodibility	0.50		
Lobdell----------	35	Slight		Moderate		Poorly suited	
				Slope	0.50	Flooding	1.00
				Erodibility	0.50	Low strength	0.50
Ua:							
Udorthents----------	100	Not rated		Not rated		Not rated	
Ub:							
Udorthents----------	95	Not rated		Not rated		Not rated	
UcB:							
Udorthents----------	50	Not rated		Not rated		Not rated	
Urban land----------	40	Not rated		Not rated		Not rated	
Ud:							
Urban land----------	45	Not rated		Not rated		Not rated	
Chavies----------	30	Slight		Slight		Well suited	
Uf:							
Urban land----------	45	Not rated		Not rated		Not rated	
Chavies----------	30	Slight		Slight		Well suited	

Table 8c.--Forest Management (Part 3)--Continued

Map symbol and soil name	Pct. of map unit	Suitability for hand planting		Suitability for mechanical planting		Suitability for use of harvesting equipment	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
MPF:							
Matewan	35	Moderately suited		Unsuited		Poorly suited	
		Slope	0.50	Slope	1.00	Slope	1.00
		Rock fragments	0.50	Rock fragments	0.75	Rock fragments	0.50
Pineville	25	Moderately suited		Unsuited		Poorly suited	
		Slope	0.50	Slope	1.00	Slope	1.00
		Rock fragments	0.50	Rock fragments	0.75	Rock fragments	0.50
						Low strength	0.50
Guyandotte	20	Moderately suited		Unsuited		Poorly suited	
		Slope	0.50	Slope	1.00	Slope	1.00
		Rock fragments	0.50	Rock fragments	0.75	Rock fragments	0.50
PBF:							
Pineville	40	Moderately suited		Unsuited		Poorly suited	
		Slope	0.50	Slope	1.00	Slope	1.00
		Rock fragments	0.50	Rock fragments	0.75	Rock fragments	0.50
						Low strength	0.50
Berks	35	Moderately suited		Unsuited		Poorly suited	
		Slope	0.50	Slope	1.00	Slope	1.00
		Rock fragments	0.50	Rock fragments	0.75	Rock fragments	0.50
						Low strength	0.50
PnE:							
Pineville	60	Well suited		Poorly suited		Moderately suited	
				Slope	0.75	Low strength	0.50
				Rock fragments	0.50	Slope	0.50
Lily	25	Well suited		Poorly suited		Moderately suited	
				Slope	0.75	Low strength	0.50
				Rock fragments	0.50	Slope	0.50
SbB:							
Sensabaugh	80	Well suited		Moderately suited		Moderately suited	
				Slope	0.50	Low strength	0.50
SeB:							
Sensabaugh	45	Well suited		Moderately suited		Moderately suited	
				Slope	0.50	Low strength	0.50
				Rock fragments	0.50		
Lobdell	35	Well suited		Moderately suited		Moderately suited	
				Slope	0.50	Low strength	0.50
						Wetness	0.50
Ua:							
Udorthents	100	Not rated		Not rated		Not rated	
Ub:							
Udorthents	95	Not rated		Not rated		Not rated	
UcB:							
Udorthents	50	Not rated		Not rated		Not rated	
Urban land	40	Not rated		Not rated		Not rated	
Ud:							
Urban land	45	Not rated		Not rated		Not rated	
Chavies	30	Well suited		Well suited		Well suited	

Table 8d.--Forest Management (Part 4)--Continued

Map symbol and soil name	Pct. of map unit	Suitability for mechanical site preparation (surface)		Suitability for mechanical site preparation (deep)	
		Rating class and limiting features	Value	Rating class and limiting features	Value
KrF:					
Kaymine	65	Unsuited		Unsuited	
		Slope	1.00	Slope	1.00
		Rock fragments	0.50	Rock fragments	0.50
Rock outcrop	15	Not rated		Not rated	
LmE:					
Lily	50	Poorly suited		Poorly suited	
		Slope	0.50	Slope	0.50
Matewan	30	Unsuited		Unsuited	
		Slope	1.00	Slope	1.00
		Rock fragments	0.50	Rock fragments	0.50
MHF:					
Matewan	35	Unsuited		Unsuited	
		Slope	1.00	Slope	1.00
		Rock fragments	0.50	Rock fragments	0.50
Highsplint	30	Unsuited		Unsuited	
		Slope	1.00	Slope	1.00
		Rock fragments	0.50	Rock fragments	0.50
Guyandotte	20	Unsuited		Unsuited	
		Slope	1.00	Slope	1.00
		Rock fragments	0.50	Rock fragments	0.50
MnE:					
Matewan	45	Unsuited		Unsuited	
		Slope	1.00	Slope	1.00
		Rock fragments	0.50	Rock fragments	0.50
Latham	30	Poorly suited		Poorly suited	
		Slope	0.50	Slope	0.50
		Rock fragments	0.50	Rock fragments	0.50
MPF:					
Matewan	35	Unsuited		Unsuited	
		Slope	1.00	Slope	1.00
		Rock fragments	0.50	Rock fragments	0.50
Pineville	25	Unsuited		Unsuited	
		Slope	1.00	Slope	1.00
		Rock fragments	0.50	Rock fragments	0.50
Guyandotte	20	Unsuited		Unsuited	
		Slope	1.00	Slope	1.00
		Rock fragments	0.50	Rock fragments	0.50
PBF:					
Pineville	40	Unsuited		Unsuited	
		Slope	1.00	Slope	1.00
		Rock fragments	0.50	Rock fragments	0.50
Berks	35	Unsuited		Unsuited	
		Slope	1.00	Slope	1.00
		Rock fragments	0.50	Rock fragments	0.50

Table 8e.--Forest Management (Part 5)--Continued

Map symbol and soil name	Pct. of map unit	Potential for damage to soil by fire		Potential for seedling mortality	
		Rating class and limiting features	Value	Rating class and limiting features	Value
KfF:					
Kaymine	50	High		Moderate	
		Texture	1.00	Soil reaction	0.50
		Slope	1.00		
		Surface depth	1.00		
		Rock fragments	1.00		
Fiveblock	25	High		Low	
		Texture	1.00		
		Slope	1.00		
		Surface depth	1.00		
		Rock fragments	1.00		
KrF:					
Kaymine	65	High		Moderate	
		Texture	1.00	Soil reaction	0.50
		Slope	1.00		
		Surface depth	1.00		
		Rock fragments	1.00		
Rock outcrop	15	Not rated		Not rated	
LmE:					
Lily	50	Moderate		Low	
		Texture	0.50		
		Slope	0.50		
		Surface depth	0.50		
		Rock fragments	0.50		
Matewan	30	Low		Low	
MHF:					
Matewan	35	Low		Low	
Highsplint	30	Moderate		Low	
		Texture	0.50		
		Slope	0.50		
		Surface depth	0.50		
		Rock fragments	0.50		
Guyandotte	20	Low		Low	
		Texture	0.10		
		Rock fragments	0.10		
MnE:					
Matewan	45	Low		Low	
Latham	30	Moderate		Moderate	
		Texture	0.50	Soil reaction	0.50
		Slope	0.50		
		Surface depth	0.50		
		Rock fragments	0.50		
MPF:					
Matewan	35	Low		Low	
Pineville	25	Low		Low	
Guyandotte	20	Low		Low	
		Texture	0.10		
		Rock fragments	0.10		

Table 9a.--Recreational Development (Part 1)--Continued

Map symbol and soil name	Pct. of map unit	Camp areas		Picnic areas		Playgrounds	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
LmE:							
Matewan	30	Very limited		Very limited		Very limited	
		Slope	1.00	Large stones	1.00	Large stones	1.00
		Large stones	1.00	content		content	
		content		Slope	1.00	Slope	1.00
						Depth to bedrock	0.16
MHF:							
Matewan	35	Very limited		Very limited		Very limited	
		Slope	1.00	Large stones	1.00	Large stones	1.00
		Large stones	1.00	content		content	
		content		Slope	1.00	Slope	1.00
						Depth to bedrock	0.16
Highsplint	30	Very limited		Very limited		Very limited	
		Slope	1.00	Large stones	1.00	Large stones	1.00
		Large stones	1.00	content		content	
		content		Slope	1.00	Slope	1.00
Guyandotte	20	Very limited		Very limited		Very limited	
		Slope	1.00	Large stones	1.00	Large stones	1.00
		Large stones	1.00	content		content	
		content		Slope	1.00	Slope	1.00
MnE:							
Matewan	45	Very limited		Very limited		Very limited	
		Slope	1.00	Large stones	1.00	Large stones	1.00
		Large stones	1.00	content		content	
		content		Slope	1.00	Slope	1.00
						Depth to bedrock	0.16
Latham	30	Not rated		Not rated		Not rated	
MPF:							
Matewan	35	Very limited		Very limited		Very limited	
		Slope	1.00	Large stones	1.00	Large stones	1.00
		Large stones	1.00	content		content	
		content		Slope	1.00	Slope	1.00
						Depth to bedrock	0.16
Pineville	25	Very limited		Very limited		Very limited	
		Slope	1.00	Large stones	1.00	Large stones	1.00
		Large stones	1.00	content		content	
		content		Slope	1.00	Slope	1.00
Guyandotte	20	Very limited		Very limited		Very limited	
		Slope	1.00	Large stones	1.00	Large stones	1.00
		Large stones	1.00	content		content	
		content		Slope	1.00	Slope	1.00
PBF:							
Pineville	40	Very limited		Very limited		Very limited	
		Slope	1.00	Large stones	1.00	Large stones	1.00
		Large stones	1.00	content		content	
		content		Slope	1.00	Slope	1.00
Berks	35	Very limited		Very limited		Very limited	
		Slope	1.00	Large stones	1.00	Large stones	1.00
		Large stones	1.00	content		content	
		content		Slope	1.00	Slope	1.00
						Depth to bedrock	0.65

Table 9b.--Recreational Development (Part 2)--Continued

Map symbol and soil name	Pct. of map unit	Paths and trails		Off-road motorcycle trails		Golf fairways	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
LmE:							
Matewan	30	Very limited		Very limited		Very limited	
		Large stones content	1.00	Large stones content	1.00	Slope	1.00
		Slope	1.00	Slope	1.00	Droughty	0.28
						Depth to bedrock	0.16
MHF:							
Matewan	35	Very limited		Very limited		Very limited	
		Large stones content	1.00	Large stones content	1.00	Slope	1.00
		Slope	1.00	Slope	1.00	Droughty	0.28
						Depth to bedrock	0.16
Highsplint	30	Very limited		Very limited		Very limited	
		Large stones content	1.00	Large stones content	1.00	Slope	1.00
		Slope	1.00	Slope	1.00		
Guyandotte	20	Very limited		Very limited		Very limited	
		Large stones content	1.00	Large stones content	1.00	Slope	1.00
		Slope	1.00	Slope	1.00		
MnE:							
Matewan	45	Very limited		Very limited		Very limited	
		Large stones content	1.00	Large stones content	1.00	Slope	1.00
		Slope	1.00	Slope	1.00	Droughty	0.28
						Depth to bedrock	0.16
Latham	30	Not rated		Not rated		Not rated	
MPF:							
Matewan	35	Very limited		Very limited		Very limited	
		Large stones content	1.00	Large stones content	1.00	Slope	1.00
		Slope	1.00	Slope	1.00	Droughty	0.28
						Depth to bedrock	0.16
Pineville	25	Very limited		Very limited		Very limited	
		Large stones content	1.00	Large stones content	1.00	Slope	1.00
		Slope	1.00	Slope	1.00		
Guyandotte	20	Very limited		Very limited		Very limited	
		Large stones content	1.00	Large stones content	1.00	Slope	1.00
		Slope	1.00	Slope	1.00		
PBF:							
Pineville	40	Very limited		Very limited		Very limited	
		Large stones content	1.00	Large stones content	1.00	Slope	1.00
		Slope	1.00	Slope	1.00		
Berks	35	Very limited		Very limited		Very limited	
		Large stones content	1.00	Large stones content	1.00	Slope	1.00
		Slope	1.00	Slope	1.00	Droughty	0.98
						Depth to bedrock	0.65
PnE:							
Pineville	60	Very limited		Somewhat limited		Very limited	
		Slope	1.00	Large stones content	0.53	Slope	1.00
		Large stones content	0.53				

Wildlife Species List
Cabwaylingo State Forest
Birds (w = winter visitor/resident, m = stop-over migrant)

Great-blue Heron
Green heron
Turkey vulture
Canada goose
Wood duck
American black duck *
Mallard
Sharp-shinned hawk
Cooper's hawk
Red-shouldered hawk
Broad-winged hawk
Red-tailed hawk
Ruffed grouse
Wild turkey
American woodcock
Killdeer
Solitary sandpiper m
Mourning dove
Black-billed cuckoo
Yellow-billed cuckoo
Eastern screech owl
Great-horned owl
Barred owl
Whip-poor-will
Chimney swift
Ruby-throated hummingbird
Belted kingfisher
Red-bellied woodpecker
Yellow-bellied sapsucker w
Downy woodpecker
Hairy woodpecker
Northern flicker
Pileated woodpecker
Eastern wood peewee
Acadian flycatcher
Eastern phoebe
Great crested flycatcher
European starling
White-eyed vireo
Yellow-throated vireo
Blue-headed vireo
Warbling vireo
Red-eyed vireo
Blue jay
American crow
Common raven
Tree swallow
N. rough-winged swallow
Barn swallow
Carolina chickadee
Eastern tufted titmouse
White-breasted nuthatch
Brown creeper
Carolina wren
House wren
Winter wren
Golden-crowned kinglet w
Ruby-crowned kinglet w
Blue-grey gnatcatcher
Eastern bluebird
Wood thrush
American robin
Grey catbird
Brown thrasher
Northern mockingbird
Cedar waxwing
Blue-winged warbler
Northern parula
Yellow warbler
Chestnut-sided warbler
Black-throated blue warbler
Yellow-rumped warbler w
Black-throated green warbler
Yellow-throated warbler
Cerulean warbler
Black-and-white warbler
American redstart
Worm-eating warbler
Swainson's warbler
Ovenbird
Louisiana water thrush
Kentucky warbler
Common yellowthroat
Hooded warbler
Summer tanager
Scarlet tanager
Northern cardinal
Rose-breasted grosbeak
Indigo bunting
Eastern towhee
Chipping sparrow
Field sparrow
Song sparrow
Swamp sparrow
White-throated sparrow w
Dark-eyed junco w
Red-winged blackbird
Common grackle
Brown-headed cowbird
Baltimore oriole
Orchard oriole
Purple finch
House finch
American goldfinch
House sparrow

Mammals
Virginia opossum *(Didelphis virginiana)*
Masked shrew (*Sorex cinereus*)
Smoky shrew (*Sorex fumeus*)
Short-tailed shrew (*Blarina brevicauda*)
Hairy-tailed mole (*Parascalops breweri*)
Little brown bat (*Myotis lucifugus*)
Big brown bat (*Eptesicus fuscus*) – captured summer 1999 mist net survey
Eastern pipistrelle (*Pipistrellus subflavus*) – captured summer 1999& 2008 mist net survey
Northern long-eared bat (*Myotis septentrionalis*) - captured summer 1999 & 2008 mist net survey
Eastern red bat (*Lasiurus borealis*) - captured summer 1999 & 2008 mist net survey
Hoary bat (*Lasiurus cinerius*)
Rafinesque's big-eared bat (*Plecotus rafinesquii)* - observed 2001
Silver-haired bat (*Lasionycteris noctivagans*)
Evening bat (*Nycticeius humeralis*)
Eastern cottontail (*Sylvilagus floridanus*)
Appalachian cottontail (*Sylvilagus obscurus*)-likely
Eastern chipmunk (*Tamias striatus*)
Woodchuck (*Marmota monax*)
Eastern grey squirrel (*Sciurus carolinensis*)
Fox squirrel (*Sciurus niger*)
Red squirrel (*Tamiasciurus hudsonicus*)
Southern flying squirrel (*Glaucomys volans*)
Beaver (*Castor canadensis*)
Norway rat (*Rattus norvegicus)*
House mouse (*Mus musculus linnaeus*)
Deer mouse (*Peromyscus maniculatus*)
White-footed mouse (*Peromyscus leucopus*)
Allegheny woodrat (*Neotoma magister*)
Southern red-backed vole (*Clethrionomys gapperi*)
Meadow vole (*Microtus pennsylvanicus*)
Woodland jumping mouse (*Napaeozapus insignis*)
Meadow jumping mouse (*Zapus hudsonius*)
Red fox (*Vulpes vulpes*)
Grey fox (*Urocyon cinereoargenteus*)
Black bear (*Ursus americanus*)
Raccoon (*Procyon lotor*)
Least weasel (*Mustela nivalis*)
Long-tailed weasel (*Mustela frenata*)
Mink (*Mustela vison*)
Striped skunk (*Mephitis mephitis*)
Bobcat (*Felis rufus*)
White-tailed deer (*Odocoileus virginanus*)
Muskrat (*Ondatra zibethicus)*
Coyote (*Cania latrans*)

Herps
Mudpuppy (*Necturus m. maculosus*)
Eastern hellbender (*Cryptobranchus alleganiensis alleganiensis*)
Jefferson salamander (*Ambystoma jeffersonianum)*
Streamside salamander (*Ambystoma barbouri)*
Spotted salamander (*Ambystoma maculatum*)
Marbled salamander (*Ambystoma opacum*)
Red-spotted newt (*Notophthalmus v. viridescens*)
Northern dusky salamander (*Desmognathus f. fuscus*)
Appalachian seal salamander (*Desmognathus monticola*)
Southern ravine salamander (*Plethodon richmondi*)
Northern Slimy salamander (*Plethodon g. glutinosus*)
Cumberland Plateau salamander (*Plethodon kentucki)*
Four-toed salamander (*Hemidactylus scutatum*)
Kentucky spring salamander (*Gyrinophilus phyriticus duryi*)
Midland mud salamander (*Pseudotriton montanus diastictus)*
Northern red salamander (*Pseudotriton r. ruber*)
Green salamander (*Aneides aeneus*)
Southern two-lined salamander (*Eurycea cerrigera*)
Longtail salamander *(Eurycea l. longicauda*)
Eastern spadefoot toad (*Scaphiopus holbrookii)*
Eastern American toad (*Bufo a. americanus*)
Fowler's toad (*Bufo woodhouseii fowleri*)
Blanchard's cricket frog (*Acris crepitans blanchardi)*
Northern spring peeper (*Pseudoacris c. crucifer*)
Grey treefrog (*Hyla versicolor & H. chrysoscelis*)
Mountain chorus frog (*Psedoacris brachyphona*)
Bullfrog (*Rana catesbeiana*)
Green frog (*Rana clamitans melanota*)
Wood frog (*Rana sylvatica*)
Northern leopard frog (*Rana catesbeiana*)
Pickerel frog (*Rana palustris*)
Common snapping turtle (*Chelydra serpentine*)
Eastern box turtle (*Terrapene c. carolina*)
Midland painted turtle (*Chrysemys picta marginata*)
Stinkpot (*Stenotherus odoratus*)
Eastern spiny softshell (*Trionyx spiniferus spiniferus*)
Northern fence lizard (*Sceloporus undulates hyacinthinus*)
Ground skink (*Scincella lateralis*)
Five-lined skink (*Eumeces fasciatus*)
Broadheaded skink (*Eumeces laticeps*)
Northern water snake (*Nerodia s. sipedon*)
Northern red-bellied snake (*Storeria o. occiptomaculata*)
Eastern garter snake (*Thamnophis s. sauritus*)
Eastern smooth earth snake (*Virginia valeriae valeriae*)
Eastern hognose snake (*Heterodon platirhinos*)
Northern ringneck snake (*Diadophis punctatus edwardsii*)
Eastern worm snake (*Carphophis amoenus amoenus*)
Northern black racer (*Coluber c. constrictor*)
Northern rough green snake (*Opheodrys aestivus aestivus*)
Black rat snake (*Elaphe o. obsoleta*)
Black king snake (*Lampropeltis gentulus nigra*)
Eastern milk snake (*Lampropeltis t. triangulum*)
Northern copperhead (*Agkistrodon contortrix mokasen*)
Timber rattlesnake (*Crotalus horridus)*

Rare Plants recorded as occurring on Cabwaylingo State Forest by the WV DNR Wildlife Diversity Program

SILENE ROTUNDIFOLIA Nutt. Round-leaved Catchfly

FAMILY: Caryophyllaceae

HABIT: Branched, decumbent herbaceous perennial, 2-7 dm.; from a caudex on a taproot; flowering July-September.

SIMILAR SPECIES: Only two other Ohio *Silene* species have bright scarlet flowers like *S. rotundifolia*: *S. virginiana* and *S. regia. S. rotundifolia* is short (to 7 dm.) with weak, branched, and decumbent stems. Flower petals are bilobed and cauline leaves are few (to 8 pr.) and broadly lanceolate to suborbicular. *S. virginiana* is taller (to 8 dm.) with weak stems. Flower petals are bilobed and cauline leaves are more numerous (to 15 pr.) and narrowly oblanceolate. *S. regia* is tall (to 15 dm.), erect, and mostly unbranched. Flower petals are rounded and cauline leaves are many (15-20 pr.), round- based, and sessile.

TOTAL RANGE: WV and s. OH to AL and GA.

STATE RANGE: Wayne County is the only recorded location in WV

STATE STATUS: species of concern

HABITAT: Crevices and talus of exposed siliceous cliffs and banks.

HAZARDS: Overshading as forest canopy closes, casual picking, soil compaction.

RECOVERY POTENTIAL: Unknown, possibly poor due to limited habitat. However, populations are known to recover if area is closed to visitors.

COMMENTS: When in bloom, this species is easily seen, though its occurrence in niches of rock faces makes collecting difficult. The state range probably is accurately known. Because of its scarlet flowers, it has been suggested that *S. rotundifolia* is closely related to *S. virginiana*. The two will form hybrids, but these are sterile. *S. virginiana* does, however, form fertile hybrids with *S. caroliniana*. This indicates that *S. rotundifolia* is further removed from *S. virginiana* than other species that do not have the scarlet flowers.

Small Spreading Pogonia (*Cleistes bifaria*)

By Fred Huber

To many, the small spreading pogonia is one of the most striking orchids. This perennial plant has a wide-spreading underground network of tough, fibrous roots. The flower stem has a single leaf found midway up the stem. The stem can reach fifteen inches tall and it bears a single flower with a small floral bract underneath. The flower resembles a narrow tube with three sepals that are spread behind the lip and petals. The flower can be white, pink, and purple in color. In addition, the small spreading pogonia can give off a light vanilla scent.

The small spreading pogonia is a terrestrial plant that is native to the southeast of the United States. It inhabits savannas, meadows, and openings in oak or pine woodlands with moist soil. In addition, it can be found in mountain habitats with dry, acidic soil. The flower blooms in April to May in coastal plain regions and in June in mountain habitats.

It is adapted to fire and benefits from prescribed fires that reduce overstory trees and shrubs maintain these open conditions.

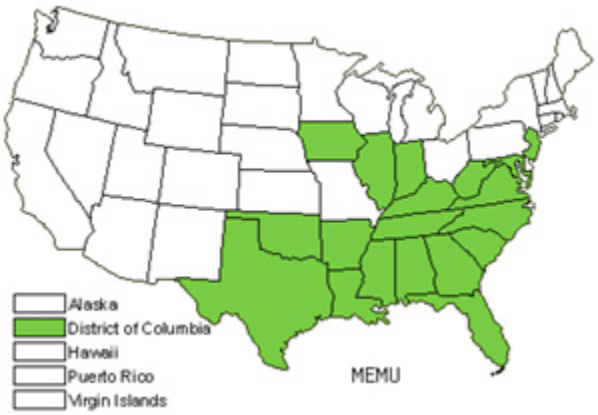
The George Washington and Jefferson National Forests in Virginia have been actively managing small spreading pogonia habitat with great success.

Cleistes bifaria is a beautiful orchid to come across in the wild. Photo by Jim Fowler.

In this image note the landing pad and nectar guides provided for a pollinator to light upon and find the nectar reward. Photo by Jim Fowler.

Twoflower Melicgrass (Melica Mutica)

Melica Mutica, or more commonly know as **Twoflower Melicgrass**, is a graminoid of the genus Melica. It's duration is perennial which means it will grow year after year. Melica Mutica or **Twoflower Melicgrass**'s floral region is North America US Lower 48, specifically in the states of Alabama, Arkansas, Florida, Georgia, Iowa, Illinois, Indiana, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, New Jersey, Oklahoma, South Carolina, Tennessee, Texas and Virginia.



Rare Animals likely to occur on Cabwaylingo State Forest according to the WV DNR Wildlife Diversity Program

Corynorhinus rafinesquii

Rafinesque's Big-eared Bat

Click to enlarge. *(76 kb)*

Order: Chiroptera
Family: Vespertilionidae

Conservation Status: Vulnerable.

Rafinesque's big-eared bat inhabits forests and streamside areas throughout the southeastern United States. These agile flyers may be less frequently seen than some other bats because they leave their roosts only when it is completely dark, forage for insects in the dark, and return to their roosts before sunrise. Curiously, they prefer roosting in locations that have some amount of light. Their range overlaps that of several other forest-dwelling bats, such as the eastern pipistrelle, the big brown bat, and some members of the genus *Myotis*.

Also known as:
Eastern Big-eared Bat, Southeastern Big-eared Bat, Eastern Lump-nosed Bat, Eastern Long-eared Bat

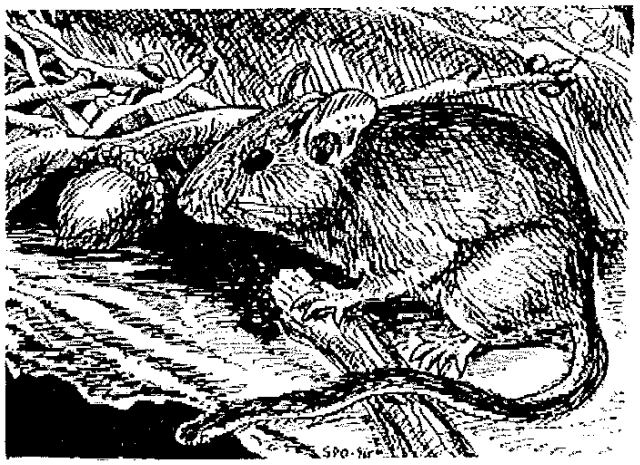
Sexual Dimorphism:
Females may weigh more than males.

Length:
Average: 95 mm
Range: 80-110 mm

Weight:
Range: 7.9-9.5 g males, 7.9-13.6 g females

WEST VIRGINIA NATURE NOTES
RARE SPECIES FACT SHEET

Allegheny Woodrat



Scientific Name: *Neotoma magister*
(NEE-ah-TOH-mah MAA-jih-stir)

Status: The U.S Fish and Wildlife Service considers the Allegheny woodrat a "Species of Concern."

West Virginia Status: The Allegheny woodrat
is more abundant in W.V. than the states to the northeast although it may be declining in the easternmost counties (Berkeley and Jefferson) of the state.

Description: The Allegheny woodrat is a medium-sized rodent with a long, hairy tail. It can be distinguished from the comparably-sized Norway and black rats by its soft, silky fur, large ears and eyes, blunt nose, and hairy, bicolored (dark on top, light underneath) tail. The adult woodrat ranges from 38 to 47 cm. (15 to 19 in.) from the end of its nose to the tip of its tail, and weighs up to 480 grams, (approximately 1 pound). Its fur is brownish gray above and whitish gray beneath. The tidy, meticulous habits of this rodent (also known as packrat) further distinguish the woodrat from its urban cousins.

Range: Historically, the Allegheny woodrat occupied a range extending from southwestern New England along the Appalachian Highlands to northern Alabama and across eastern Tennessee and Kentucky into southern Ohio and Indiana. The woodrat has declined swiftly and severely in the northern part of its range--Pennsylvania, Maryland and New Jersey--and is now considered to be absent from Connecticut and New York.

Habitat: Allegheny woodrats live almost exclusively in rocky areas such as caves, deep crevices, and large boulder fields. Most woodrat dwellings are located in or around hardwood forests that have an abundance of oaks and other mast-bearing trees. The woodrat is also known to occur in northern hardwood (beech, birch, maple) and oak-pine forests. Woodrats are seldom found in agricultural or residential areas.

Diet: Woodrats are herbivores: they rely almost exclusively on plant materials for their food. Among their favorite foods are acorns and other nuts, berries, twigs, leaves and fungi. Occasionally they may feed on snails, insects or other invertebrates. In Autumn woodrats habitually cache (store) large quantities of acorns, twigs, leaves, and other edible vegetation to ensure a constant food supply throughout the winter months.

Life History: Woodrats are active throughout the winter. Around March they mate, and after approximately thirty-five days the female gives birth to between two and four young. During their

early days the young, eyes closed and naked, cling firmly to their mother. Their eyes open within 20 days and they are weaned within four weeks of birth. Females typically have two to three litters per year. Most woodrats do not reach sexual maturity until their second year.

Except for periods of breeding and young rearing, woodrats are solitary animals and often defend their territories against intruders. They construct "houses" that consist of one or two nests, caches of acorns and other food items, and piles of debris found in the area. It is thought that these piles of leaves, twigs, and litter help to alert the woodrats when predators or other woodrats come around. Woodrats have glands on their ventral (stomach) sides that secrete an odor allowing them to mark their territories.

Woodrats are primarily nocturnal, meaning that they are most active at night. They exit their quarters after dark to forage and gather nest materials. Their acute senses of smell and hearing, large eyes, and long whiskers allow these animals to effectively navigate through their dark, underground caverns. It has been suggested that woodrats mark their trails with urine and use the odor to retrace their way to and from their quarters. Predators of the woodrat include owls, foxes, raccoons, opossums, and large snakes.

Threats and Prospects: Scientists have identified several factors that may be contributing to the decline of the Allegheny woodrat. Some cite the gypsy moth, which has been spreading south into the oak forests where woodrats live, as the culprit. Defoliation by gypsy moth larvae can severely weaken oak trees, reducing the acorn crops on which woodrats rely for food in the winter. A second threat to the woodrat is a parasite, the raccoon roundworm (*Baylisascaris procyonis*), that is carried by raccoons. The raccoon roundworm, which does not severely harm raccoons, causes death in woodrats by attacking their central nervous systems. With their tendency to collect debris, including the scats of other animals, woodrats are especially susceptible to contracting this disease from raccoon feces. Habitat degradation and fragmentation may also be playing a role in the woodrat's decline throughout much of its range. Because of their tendency to inhabit remote places, woodrats generally have not been severely impacted by human activities.

Scientists in other states are experimenting with vaccines to reduce the occurrence of raccoon roundworm in their natural hosts. In West Virginia efforts have begun to control gypsy moths with insecticides. However, until more is known about the exact mechanisms that are suppressing woodrat populations, little more than monitoring can be done. Biologists with the West Virginia Division of Natural Resources are monitoring several woodrat populations to obtain long-term data on population trends.

What you can do to help: If you see a rat-like mammal in what appears to be woodrat habitat, do not harm the animal; let it go about its business. Please report any woodrat sightings with a map to Woodrat Sighting, WVDNR, P.O. Box 67, Elkins, WV 26241 or call (304) 637-0245. This will help us better determine this animal's range in West Virginia.

Noel M.Burkhead

Clinostomus funduloides Girard 1856

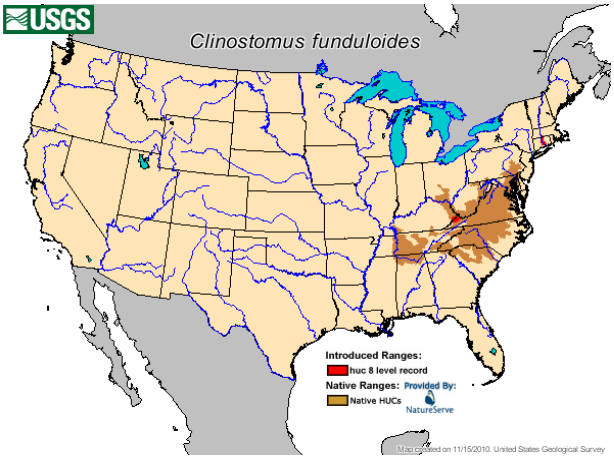
Common name: rosyside dace

Taxonomy: available through ITIS

Identification: Page and Burr (1991); Etnier and Starnes (1993); Jenkins and Burkhead (1994); three subspecies recognized.

Size: 11 cm.

Native Range: Atlantic Slope (mostly above the Fall Line) from lower Delaware River drainage, Pennsylvania, to Savannah River drainage, Georgia; Ohio River basin, West Virginia, Virginia, southern Ohio, Kentucky, Tennessee, North Carolina, Alabama, and Mississippi. Absent in Ohio River basin between central Ohio and Cumberland River (including most of Kentucky) (Page and Burr 1991).



BIRD POINT COUNT DATA
(BIRDS OBSERVED AT CABWAYLINGO STATE FOREST)

SPECIES	2000	2001	2003	2004	2005	2006	2007	2008
Acadian flycatcher	12	9	10	11	13	19	20	
American crow	10	7	9	6	3	13	3	
American goldfinch	3	1	3	0	6	5	3	
American redstart	7	3	2	1	1	4	6	
American robin	10	7	18	10	10	21	16	
Barred Owl	0	0	0	0	0	1	0	
Belted Kingfisher	0	0	1	0	0	2	1	
Black and white warbler	4	6	2	3	5	2	0	
Black-billed cuckoo	1	0	0	0	0	0	0	
Black-throated green warbler	7	9	5	6	8	5	10	
Blue jay	1	0	4	3	2	0	4	
Blue-grey gnatcatcher	5	3	0	0	2	3	3	
Blue-headed vireo	4	1	5	2	9	7	7	
Blue-winged warbler	1	0	0	0	0	0	0	
Brown Headed Cowbird	0	0	1	0	1	0	4	
Canada warbler	0	1	0	0	0	1	0	
Carolina chickadee	5	5	29	8	11	12	4	
Carolina wren	2	5	3	8	9	12	16	
Cedar Waxwing	0	0	0	0	0	0	0	
Cerulean warbler	3	0	1	0	2	0	2	
Chestnut-sided warbler	0	1	2	0	0	0	0	
Chipping sparrow	3	1	1	1	3	4	6	
Comm Raven	0	0	0	0	0	1	0	
Common grackle	1	0	0	3	1	0	0	
Common yellowthroat	1	1	1	0	1	0	0	
Downy woodpecker	3	1	2	5	11	9	1	
Eastern Bluebird	0	0	0	0	1	2	3	
Eastern phoebe	1	3	3	3	6	1	3	
Eastern towhee	1	0	0	1	0	3	2	
Eastern wood peewee	4	4	1	2	4	4	3	
Eastern-tuffed titmouse	13	4	5	5	11	11	9	
Grey catbird	0	0	0	1	3	1	0	
Harry Woodpecker	0	0	0	0	3	1	2	
Hooded warbler	9	8	5	5	9	15	10	
Indigo Bunting	0	0	1	1	2	2	0	
Kentucky warbler	2	2	1	1	1	0	1	

SPECIES	2000	2001	2003	2004	2005	2006	2007	2008
Louisiana waterthrush	2	5	1	0	2	2	1	
Mallard	0	0	0	0	10	0	0	
Mourning dove	1	0	1	1	0	1	2	
Northern cardinal	4	0	3	2	8	7	10	
Northern flicker	1	1	4	1	2	2	1	
Northern parula	12	11	10	12	15	13	9	
Ovenbird	12	14	8	6	12	17	19	
Pileated woodpecker	2	5	2	3	3	4	4	
Red Shouldered Hawk	0	0	0	0	0	1	1	
Red-bellied woodpecker	1	1	1	0	1	1	2	
Red-eye vireo	16	15	15	7	16	24	17	
Rose breasted grosbeak	0	0	0	1	3	0	1	
Ruby Throated humm bird	0	0	0	0	0	0	1	
Scarlet tanager	4	3	6	3	2	2	6	
Song sparrow	4	1	4	3	5	5	6	
Summer tanager	0	1	0	1	0	0	3	
Swanson warbler	0	0	0	1	0	0	0	
Turkey Vulture	0	0	0	1	0	0	0	
White-breasted nuthatch	0	6	1	2	5	6	8	
White-eyed vireo	1	0	0	0	0	0	0	
Wild Turkey	0	0	0	0	0	0	6	
Wood Thrush	9	12	9	8	8	7	5	
Worm-eating warbler	4	0	4	7	4	1	3	
Yellow Billed Cuckoo	0	0	0	0	0	0	1	
Yellow warbler	1	2	1	0	1	0	0	
Yellow-throated vireo	5	4	1	1	1	3	5	
Yellow-throated warbler	7	7	3	4	7	10	8	

	2000	2001	2003	2004	2005	2006	2007	2008
SPECIES	42	36	41	39	45	43	46	N/A
TOTAL NUMBER BIRDS	199	170	189	150	243	267	258	N/A

This information has been taken from: American Wildlife & Plants – A Guide to Wildlife Food Habits: the use of trees, shrubs, weeds and herbs by birds and mammals of the United States.

TREE SPECIES AND WILDLIFE USE

TREE SPECIES	UPLAND GAMEBIRDS	SONGBIRDS	FUR & GAME MAMMALS	SMALL MAMMALS	HOOFED BROWSERS
WHITE ASH					
Seeds	Turkey+	Cardinal+ Finch* Cedar waxwing+	Bear+	mouse+	
Twigs/foliage					Deer*
OAK (MISC.)					
Acorns	Grouse*** Dove* Turkey****	Blue jay**** Nuthatch*** Woodpecker*** Titmouse** Grosbeak+ Thrasher*	Bear**** Squirrels****	Chipmunks** Mouse**	Deer*****
Buds	Grouse*** Dove* Turkey****	Woodpecker+ Carolina wren+			
Bark/wood			Bear**** Squirrels**** Raccoon****		
Twigs/foliage					Deer*****
MAPLE					
Buds	Grouse* Turkey+	Chickadee+ Nuthatch*			
Seeds	Grouse* Turkey+	Chickadee+ Nuthatch*	Bear**** Squirrel*	Chipmunks** Mouse*	
Twigs	Grouse* Turkey+		Rabbit* Bear+		Deer****
Flowers		Chickadee+ Nuthatch*	Squirrel* Rabbit*		
foliage					Deer****
BASSWOOD					
Seeds			Squirrel+	Chipmunk** Mouse-	
Twigs/foliage					Deer*
MAGNOLIAS					
Seeds		Vireo+ Nuthatch+ Titmouse** Woodpeckers+		Mouse+	
Twigs/foliage					Deer+

BLACK GUM					
Fruit	Grouse+ Turkey+	Bluebird+ Finch+ Flicker* Robin** Tananger+ Thrasher* Hermit thrush+ Wood thrush* Titmouse+ Vireo+ Cedar waxwing+ Woodpecker hairy+ Pileated**	Bear** Squirrel*		
Buds	Grouse+ Turkey+				
Twigs/foliage					Deer*
PINE					
Seeds		Chickadee** Gold finch+ Junco+ Nuthatch** Siskin** Thrasher* Towhee* Titmouse+ Woodpecker* Carolina wren+	Beaver** Rabbit+	Chipmunk* Mouse*	Deer+
Bark/foliage			Beaver** Rabbit+		

The star system of rating= use to an undetermined extent

+ = ½ to 2% of diet

*= 2 to 5% of diet

** = 5 to 10% of diet

*** =10 to 25% of diet

**** =25 to 50% of diet

****** = 50% of more of diet

Autumn Olive

Elaeagnus umbellata

Origin: East Asia

USDA, NRCS

Background

Autumn olive was introduced into the United States in 1830 and widely planted as an ornamental, for wildlife habitat, as windbreaks and to restore deforested and degraded lands.

Distribution and Ecological Threat

Autumn olive is found from Maine to Virginia and west to Wisconsin. It is drought tolerant and thrives in a variety of soil and moisture conditions. This trait allows it to invade grasslands, fields, open woodlands and disturbed areas. It threatens native ecosystems by out-competing and displacing native plant species, creating dense shade and interfering with natural plant succession and nutrient cycling. Because autumn olive is capable of fixing nitrogen in its roots, it can grow on bare mineral substrates.

USDA, NRCS

Description and Biology

- Plant: deciduous shrub that can grow to 20 feet in height; stems, buds and leaves have a dense covering of silvery to rusty scales.
- Leaves: egg or lance-shaped, smooth margined and alternate along the stem; underside of leaves covered with silver-white scales.
- Flowers, fruits and seeds: plants begin to flower after three years. Small, light yellow, aromatic flowers appear in June and July; fruits are small, round, pink to reddish and dotted with scales.
- Spreads: by seed, although some vegetative propagation also occurs. Birds and mammals disperse fruits.

Prevention and Control

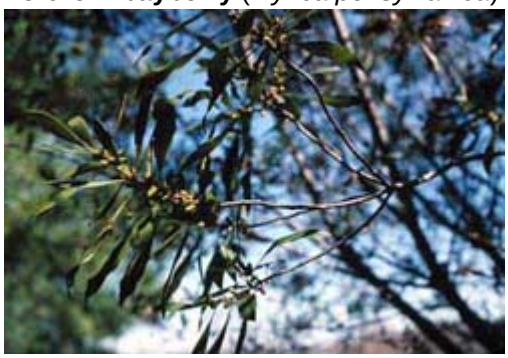
Do not plant autumn olive. Individual young plants can be hand-pulled, ensuring that roots are removed. Cutting, in combination with herbicide application, is effective. Hedges can be cut down using a brush type mower, chain saw, or similar tool, and stumps treated with a systemic herbicide like glyphosate or triclopyr. Application of these herbicides to foliage is also effective but is likely to impact non-target species. Herbivorous animals are not known to feed on it and few insects seem to utilize or bother it. Canker disease is occasionally a problem but not enough to be useful as a control agent.

Native Alternatives

spicebush (*Lindera benzoin*)

Chris Miller, NRCS

northern bayberry (*Myrica pensylvanica*)



Chris Miller, NRCS

arrowwood (*Viburnum dentatum*)

Britt Slattery, USFWS

black haw (*Viburnum prunifolium*)

Chris Miller, NRCS

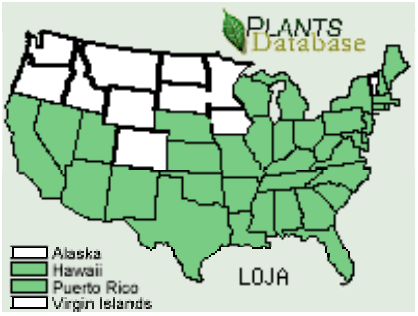
gray dogwood (*Cornus racemosa*)

Britt Slattery, USFWS

winterberry (*Ilex verticillata*)

Chris Miller, NRCS

Japanese Honeysuckle



DESCRIPTION: Japanese honeysuckle, a member of the honeysuckle family (Caprifoliaceae), is a perennial vine that climbs by twisting its stems around vertical structures, including limbs and trunks of shrubs and small trees. **Leaves** are oblong to oval, sometimes lobed, have short stalks, and occur in pairs along the stem. **Flowers** are tubular, with five fused petals, white to pink, turning yellow with age, very fragrant, and occur in pairs along the stem at leaf junctures. **Stems and leaves** are sometimes covered with fine, soft hairs. Small black **fruits** are produced in autumn, each containing 2-3 oval to oblong, dark brown seeds about 1/4 inch across.

ECOLOGICAL THREAT: In North America, Japanese honeysuckle has few natural enemies allowing it to spread widely and out-compete native plant species. Its evergreen to semi-evergreen nature gives it an added advantage over native species in many areas. Shrubs and young trees can be killed by girdling when vines twist tightly around stems and trunks, cutting off the flow of water through the plant. Dense growths of honeysuckle covering vegetation can gradually kill plants by blocking sunlight from reaching their leaves. Vigorous root competition also helps Japanese honeysuckle spread and displace neighboring native vegetation.

HABITAT & DISTRIBUTION IN THE UNITED STATES: A ubiquitous invader, Japanese honeysuckle occurs across the southern U.S. from California to New England and the Great Lakes region. Escaped populations also occur in Hawaii. It thrives in a wide variety of habitats including fields, forests, wetlands, barrens, and all types of disturbed lands.

MANAGEMENT OPTIONS:

Manual and mechanical- For small patches, **hand-pull** seedlings and young plants when the soil is moist, holding low on the stem to remove the whole plant along with its roots. Monitor frequently and remove any new plants. For large patches, repeated **mowing** combined with herbicide application is effective. **Burning** removes above ground vegetation but does not kill the underground rhizomes, which will continue to sprout. In certain situations, **tethered goats** have been used to remove honeysuckle growth, but must be monitored to prevent their escape to the wild where they would become an added ecological threat.

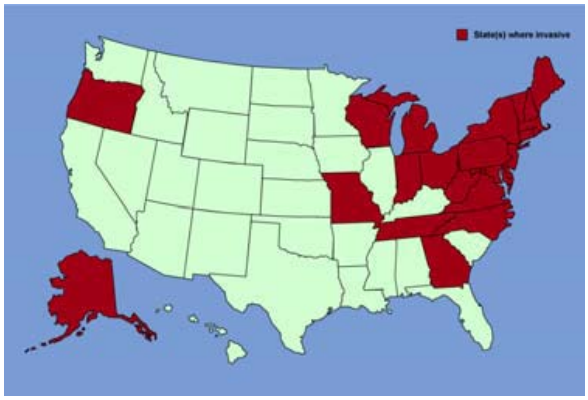
Chemical- For effective control with herbicides, healthy green leaves must be present at application time and temperatures must be sufficient for plant activity. Several systemic herbicides (e.g., glyphosate and triclopyr) move through the plant to the roots when applied to the leaves or stems and have been effective on Japanese honeysuckle. Treatment in the fall, when many non-target plants are going dormant, is best. Repeat applications may be needed. Follow label guidelines.

Biological control- No biological control agents are currently available for Japanese honeysuckle.

Japanese Knotweed

Fallopia japonica

Buckwheat family (Polygonaceae)



NATIVE RANGE

Eastern Asia

DESCRIPTION

Japanese knotweed is an upright, shrublike, herbaceous perennial that can grow to over 10 feet in height. As with all members of this family, the base of the stem above each joint is surrounded by a membranous sheath. Stems of Japanese knotweed are smooth, stout and swollen at joints where the leaf meets the stem. Although leaf size may vary, they are normally about 6 inches long by 3 to 4 inches wide, broadly oval to somewhat triangular and pointed at the tip. The minute greenish-white flowers occur in attractive, branched sprays in summer and are followed soon after by small winged fruits. Seeds are triangular, shiny, and very small, about 1/10 inch long. Japanese knotweed is designated a noxious weed in the State of Washington.

ECOLOGICAL THREAT

Japanese knotweed spreads quickly to form dense thickets that exclude native vegetation and greatly alter natural ecosystems. It poses a significant threat to riparian areas, where it can survive severe floods and is able to rapidly colonize scoured shores and islands. Once established, populations are extremely persistent.

DISTRIBUTION IN THE UNITED STATES

Current distribution of Japanese knotweed includes 36 states in the lower 48 from Maine to Wisconsin south to Louisiana, and scattered midwest and western states. It is not currently known to occur in Hawaii.

HABITAT IN THE UNITED STATES

Japanese knotweed can tolerate a variety of adverse conditions including full shade, high temperatures, high salinity, and drought. It is found near water sources, such as along streams and rivers, in low-lying areas, waste places, utility rights-of-way, and around old homesites. It can quickly become an invasive pest in natural areas after escaping from cultivated gardens.

BACKGROUND

Japanese knotweed was probably introduced to the U.S. in the late 1800's. Also known as crimson beauty, Mexican bamboo, Japanese fleece flower, or Reynoutria, it was first introduced as an ornamental and has also been used for erosion control and for landscape screening. It is now found throughout the eastern U.S., in several western states, and Alaska, which has few exotic invasive plants to date.

BIOLOGY & SPREAD

Japanese knotweed spreads primarily by vegetative means with the help of its long, stout rhizomes. It is often transported to new sites as a contaminant in filldirt seeds, sometimes distributed by water, and carried to a lesser extent by the wind. Escapees from neglected gardens, and discarded cuttings are common routes of dispersal from urban areas.

MANAGEMENT OPTIONS

Grubbing is effective for small initial populations or environmentally sensitive areas where herbicides cannot be used. Using a pulaski or similar digging tool, remove the entire plant including all roots and runners. Juvenile plants can be hand pulled depending on soil conditions and root development. Any portions of the root system not removed will potentially resprout. All plant parts (including mature fruit) should be bagged and disposed of in a trash dumpster to prevent reestablishment.

Chemical

Cut stem application

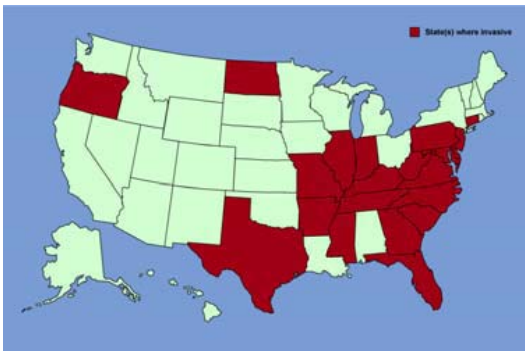
Use this method in areas where plants are established within or around non-target plants or where vines have grown into the canopy. This treatment remains effective at low temperatures as long as the ground is not frozen. Cut the stem about 2 inches above ground level. Immediately apply a 25% solution of glyphosate (e.g., Roundup®, or use Rodeo® if applying in or near wetland areas) or triclopyr (e.g., Garlon®) and water to the cross-section of the stem. A subsequent foliar application of glyphosate may be require to control new seedlings and resprouts.

Foliar application
Use this method to control large populations. It may be necessary to precede foliar applications with stump treatments to reduce the risk of damaging non-target species. Apply a 2% solution of glyphosate or triclopyr and water to thoroughly wet all foliage. Do not apply so heavily that
herbicide will drip off leaves. A 0.5% non-ionic surfactant is recommended in order to penetrate the leaf cuticle, and ambient air temperature should be above 65 ºF.

Japanese Stiltgrass *Microstegium vimineum* (Trin.) Camus

Common Names: Japanese stiltgrass, Nepalese browntop, Asian stilt grass, Vietnamese stilt grass, Nepal microstegium, and Chinese packing grass
Native Origin: Japan, Korea, China, Malaysia and India
Description: Japanese stiltgrass is an annual grass (family Poaceae) with a sprawling habit that may grow to 3 feet in height. Its thin, pale green, lance shaped leaves, about 3 inches in length, alternate along a branched stalk and have a silvery stripe of reflective hairs down the middle of the upper leaf surface. Delicate spikes of flowers emerge from slender tips beginning in late
summer and continuing into the fall. Seeds may persist through the fall. It spreads by rooting at nodes along the stem. A new plant emerges from each node. It also spreads by seed and each plant can produce an estimated 100-1,000 seeds.
Habitat: It occurs on stream banks, river bluffs, floodplains, emergent and forested wetlands, moist woodlands, early succession fields, uplands, thickets, roadside ditches, gas and power line corridors and home lawns and gardens. It is common in disturbed shaded areas like floodplains that are prone to natural scouring, and areas subject to mowing, tilling and other soil disturbing activities. Japanese stilt grass appears to be associated primarily with moist, acidic to neutral soils that are high in nitrogen. It occurs in areas of open soil that are generally not already occupied by other species. Japanese stilt grass is adapted to low light conditions and threatens native under story vegetation in open to shady locations.
Distribution: Japanese stiltgrass has been reported to be invasive in natural areas in fourteen eastern states (Connecticut, Delaware, Georgia, Indiana, Kentucky, Maryland, North Carolina,
New Jersey, New York, Pennsylvania, Tennessee, Virginia, Wisconsin, West Virginia) and Washington, D.C..
Ecological Impacts: Japanese stiltgrass is especially well adapted to low light conditions. It threatens native plants and natural habitats in open to shady, and moist to dry locations.
Stilt grass spreads to form extensive patches, displacing native species that are not able to compete with it. Where white-tail deer are over-abundant, they may facilitate its invasion by
feeding on native plant species and avoiding stilt grass.
Control and Management: Avoid introduction if possible.
Mechanical- Hand pull or mechanical cutting of plants using a mower or "weed whacker" on
vegetative shoots of small infestations.
Chemical- For extensive infestations, where mechanical methods are not feasible, a systemic
herbicide like glyphosate (e.g., Roundup), an herbicidal soap that kills the plants back (e.g., Scythe) and herbicides specific to annual grasses may be a more effective choice. If applying glyphosate to stilt grass in wetland sites, use the formulation labeled for wetland areas (e.g., Rodeo).

Kudzu
Pueraria montana var. *lobata* (Willd.) Maesen & S. Almeida
Pea family (Fabaceae)



NATIVE RANGE
Asia
DESCRIPTION
Kudzu is a climbing, semi-woody, perennial vine in the pea family. Deciduous leaves are alternate and compound, with three broad leaflets up to 4 inches across. Leaflets may be entire or deeply 2-3 lobed with hairy margins. Individual flowers, about ½ inch long, are purple, highly fragrant and borne in long hanging clusters. Flowering occurs in late summer and is soon followed by production of brown, hairy, flattened, seed pods, each of which contains three to ten hard seeds.
ECOLOGICAL THREAT
Kudzu kills or degrades other plants by smothering them under a solid blanket of leaves, by girdling woody stems and tree trunks, and by breaking branches or uprooting entire trees and shrubs through the sheer force of its weight. Once established, Kudzu plants grow rapidly, extending as much as 60 feet per season at a rate of about one foot per day. This vigorous vine may extend 32-100 feet in length, with stems ½-4 inches in diameter. Kudzu roots are fleshy, with massive tap roots 7 inches or more in diameter, 6 feet or more in length, and weighing as much as 400 pounds. As many as thirty vines may grow from a single root crown.
DISTRIBUTION IN THE UNITED STATES
Kudzu is common throughout most of the southeastern U.S. and has been found as far north as Pennsylvania.
HABITAT IN THE UNITED STATES
Kudzu grows well under a wide range of conditions and in most soil types. Preferred habitats are forest edges, abandoned fields, roadsides, and disturbed areas, where sunlight is abundant. Kudzu grows best where winters are mild, summer temperatures are above 80 degrees Farenheit, and annualrainfall is 40 inches or more.
BIOLOGY & SPREAD
The spread of kudzu in the U.S. is currently limited to vegetative expansion by runners and rhizomes and by vines that root at the nodes to form new plants. Kudzu also spreads somewhat through seeds, which are contained in pods, and which mature in the fall. However, only one or two viable seeds are produced per cluster of pods and these hard-coated seeds may not germinate for several years.
BACKGROUND
Kudzu was introduced into the U.S. in 1876 at the Philadelphia Centennial Exposition, where it was promoted as a forage crop and an ornamental plant. From 1935 to the mid-1950s, farmers in the south were encouraged to plant kudzu to reduce soil erosion, and Franklin D. Roosevelt's Civilian Conservation
Corps planted it widely for many years. Kudzu was recognized as a pest weed by the U.S. Department of Agriculture and, in 1953, was removed from its list of permissible cover plants.

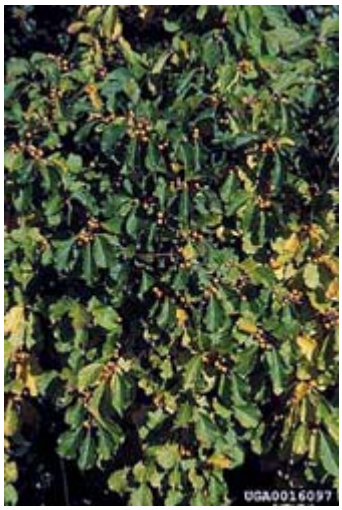
MANAGEMENT OPTIONS
For successful long term control of kudzu, the extensive root system must be destroyed. Any remaining root crowns can lead to reinfestation of an area. Mechanical methods involve cutting vines just above ground level and destroying all cut material. Close mowing every month for two growing seasons or repeated cultivation may be effective. Cut kudzu can be fed to livestock, burned or enclosed in plastic bags and sent to a landfill. If conducted in the spring, cutting must be repeated as regrowth appears to exhaust the plant's stored carbohydrate reserves. Late season cutting should be followed up with immediate application of a systemic herbicide (e.g., glyphosate) to cut stems, to encourage transport of the herbicide into the root system. Repeated applications of several soil-active herbicides have been used effectively on large infestations in forestry situations.
Biological
Efforts are being organized by the U.S. Forest Service to begin a search for biological control agents for kudzu.

Kudzu covering trees

Oriental Bittersweet

Celastrus orbiculatus

James H. Miller



James H. Miller

Origin: Eastern Asia, Korea, China and Japan

Background

Oriental bittersweet was introduced into the United States in the 1860s as
still widely sold for landscaping despite its invasive qualities. It is often as
from which it has escaped into surrounding natural areas.

Distribution and Ecological Threat

Oriental bittersweet occurs from New York to North Carolina, westward t
edges, open woodlands, fields, hedgerows, coastal areas, salt marsh edges
lands. While often found in more open, sunny sites, its shade tolerance all
areas. Oriental bittersweet is an aggressive invader that threatens vegetatic
and open areas. It grows over other vegetation, completely covering and k
preventing photosynthesis, by girdling, and by uprooting trees through exc
Northeast, Oriental bittersweet appears to be displacing the native climbin

scandens, through competition and hybridization.

Description and Biology

James H. Miller

- Plant: a deciduous, woody, twining vine in the staff-tree family (Celastraceae), which sometimes occurs as a trailing shrub. Stems of older plants sometimes grow to four inches in diameter.
- Leaves: glossy, rounded, finely toothed and arranged alternately along the stem.
- Flowers, fruits and seeds: abundant clusters of small greenish flowers emerge from most leaf axils; globular, green to yellow fruits split open at maturity to reveal three red-orange, fleshy arils that surround the seeds; seeds germinate in late spring.
- Spreads: Oriental bittersweet spreads by seed, which is dispersed to new areas by many species of birds. People also spread seed widely when using the plant for wreaths and ornamental arrangements. It also expands vegetatively by stolons and rhizomes, and through root suckering (the ability to send shoots up from the roots).
- Look-alikes: This plant is easily confused with our native climbing bittersweet vine (*Celastrus scandens*), which flowers at the stem tips rather in the leaf axils, it is imperative that correct identification be made before controls are attempted.

Prevention and Control

Manual, mechanical and chemical methods can be employed to control bittersweet. Vines can be pulled out by the roots, cut repeatedly or treated with systemic herbicides. No biological controls are currently known for oriental bittersweet.

Native Alternatives

Note: Although our native bittersweet (*Celastrus scandens*) is an excellent alternative plant to use, many nurseries confuse it with the exotic invasive Oriental bittersweet. Be certain of the species you are buying or choose another plant. Other options include:

passionflower (*Passiflora incarnata*)

R. Harrison Wiegand

trumpet creeper (*Campsis radicans*)

Britt Slattery, USFWS

pipevine (*Aristolochia macrophylla*)

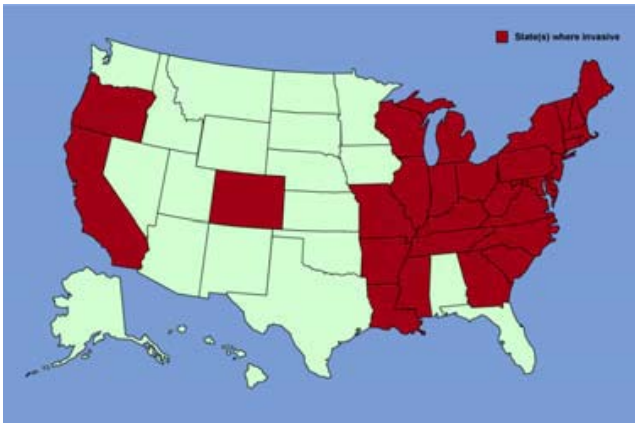
R. Harrison Wiegand

trumpet honeysuckle (*Lonicera sempervirens*)

Britt Slattery, USFWS

Rosa multiflora Thunb.

Rose family (Rosaceae)



NATIVE RANGE

Japan, Korea, and eastern China

DESCRIPTION

Multiflora rose is a thorny, perennial shrub with arching stems (canes), and leaves divided into five to eleven sharply toothed leaflets. The base of each leaf stalk bears a pair of fringed bracts. Beginning in May or June, clusters of showy, fragrant, white to pink flowers appear, each about an inch across.

Small bright red fruits, or rose hips, develop during the summer, becoming leathery, and remain on the plant through the winter.

ECOLOGICAL THREAT

Multiflora rose is extremely prolific and can form impenetrable thickets that exclude native plant species. This exotic rose readily invades open woodlands, forest edges, successional fields, savannas and prairies that have been subjected to land disturbance.

DISTRIBUTION IN THE UNITED STATES

Multiflora rose occurs throughout the U.S., with the exception of the Rocky Mountains, the southeastern Coastal Plain and the deserts of California and Nevada.

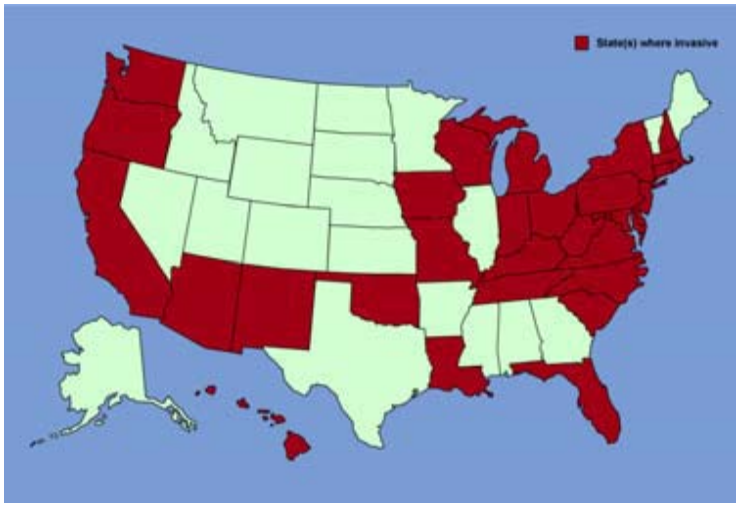
HABITAT IN THE UNITED STATES

Multiflora rose has a wide tolerance for various soil, moisture, and light conditions. It occurs in dense woods, prairies, along stream banks and roadsides and in open fields and pastures.

BACKGROUND
Multiflora rose was introduced to the East Coast from Japan in 1866 as rootstock for ornamental roses. Beginning in the 1930s, the U.S. Soil Conservation Service promoted it for use in erosion control and as "living fences" to confine livestock. State conservation departments soon discovered value in multiflora rose as wildlife cover for pheasant, bobwhite quail, and cottontail rabbit and as food for songbirds and encouraged its use by distributing rooted cuttings to landowners free of charge. More recently, multiflora rose has been planted in highway median strips to serve as crash barriers and to reduce automobile headlight glare. Its tenacious and unstoppable growth habit was eventually recognized as a problem on
pastures and unplowed lands, where it disrupted cattle grazing. For these reasons, multiflora rose is classified as a noxious weed in several states, including Iowa, Ohio, West Virginia, and New Jersey.
BIOLOGY & SPREAD
Multiflora rose reproduces by seed and by forming new plants that root from the tips of arching canes that contact the ground. Fruits are readily sought after by birds which are the primary dispersers of its seed. It has been estimated that an average multiflora rose plant may produce a million seeds per year,
which may remain viable in the soil for up to twenty years. Germination of multiflora rose seeds is enhanced by passing through the digestive tract of birds.

Tree of Heaven

Ailanthus altissima (Mill.) Swingle
Quassia family (Simaroubaceae)



NATIVE RANGE
Central China
DESCRIPTION
Tree-of-heaven, also known ailanthus, Chinese sumac, and stinking shumac, is a deciduous tree in the mostly tropical quassia family. Mature trees can reach 80 feet in height. Ailanthus has smooth stems with pale gray bark and twigs which are light chestnut brown, especially in the dormant season. Its large compound leaves are 1-4 feet in length, alternate, and composed of 10-41 smaller leaflets. Each leaflet has one or more glandular teeth along the lower margin. The leaf margins are otherwise entire or lacking teeth. Ailanthus is a dioecious (“two houses”) plant meaning that male and female flowers occur on separate plants. Flowers occur in large terminal clusters and are small and pale yellow to greenish. Flat, twisted, winged fruits each containing a single central seed are produced on female trees in late summer to early fall and may remain on the trees for long periods of time. The wood of ailanthus is soft, weak, coarse-grained, and creamy white to light brown in color. All parts of the tree, especially the leaves and flowers, have a nutty or burned nut odor.
Look-alikes: It is important not to confuse native shrubs and trees with ailanthus. Native sumacs (*Rhus*) and trees like ash (*Fraxinus*), hickory (*Carya*), black walnut, butternut and pecan (*Juglans*) can be distinguished from tree-of-heaven by having completely serrated (toothed) leaf margins.

ECOLOGICAL THREAT
Tree-of-heaven is a fast-growing tree and a prolific seeder, that can take over sites, replacing native plants and forming dense thickets. Ailanthus also produces chemicals that prevent the establishment of other plant species nearby. Its root system may be extensive and has been known to cause damage to sewers and foundations.
DISTRIBUTION IN THE UNITED STATES
Tree-of-heaven is occurs in many states across the continental U.S. and Hawaii and to date has been reported to be invasive in natural areas in 30 states (see map).
HABITAT IN THE UNITED STATES
Tree-of-heaven is a common tree in disturbed urban areas, where it sprouts up just about anywhere, including alleys, sidewalks, parking lots, and streets. For example, the book "A Tree Grows in Brooklyn," by Betty Smith, is based on the tree-of-heaven. Away from cities, ailanthus is commonly seen in fields, and along roadsides, fencerows, woodland edges and forest openings. It occurs as seedlings that pop up by the hundreds in recently planted fields and as persistent thickets in rocky, untillable areas. Nationally, ailanthus is recognized to be a serious agricultural pest.
BACKGROUND
Tree-of-heaven was first introduced to America by a gardener in Philadelphia, PA, in 1784, and by 1840 was commonly available from nurseries. The species was also brought into California mainly by the Chinese who came to California.

Oak Wilt

Charles O. Rexrode[1] and Daniel Brown[2]

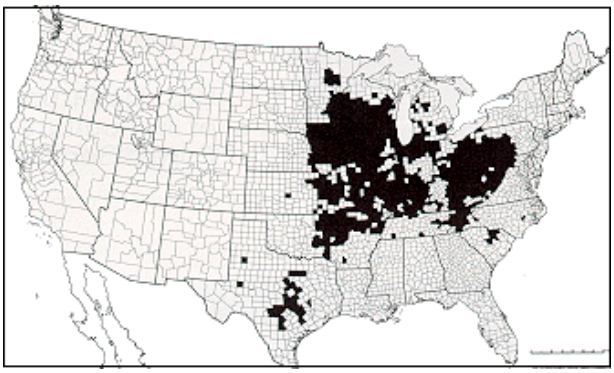
[1]Principal Entomologist, U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station, Delaware, Ohio.

[2]Forest Pathologist, U.S. Department of Agriculture, Forest Service, Southern Region, State and Private Forestry, Forest Pest Management, Atlanta, Ga.

Oak wilt, caused by the fungus *Ceratocystis fagacearum* (Bretz) Hunt, kills oak trees. It has been found in 21 States, with considerable damage occurring in the Midwest. It was first recognized as an important disease in 1944 in Wisconsin (fig. 1) where, in localized areas (less than 100 acres (40.4 ha)), over half the oaks have been killed. Surveys in eight Wisconsin counties showed that about 11 percent of the annual growth increase of oak forests was offset by mortality caused by oak wilt.

In other States, the fungus kills thousands of trees; however, this loss is only a fraction of the total oak timber volume. In West Virginia, for example, where predominately oak forests cover 70 percent of the land area, oak wilt losses average less than one tree per square mile each year. Oak wilt has also been reported in Texas - outside its main range.

Figure 1. - *Distribution of oak wilt, 1980*



Hosts No species of oak is known to be immune to this vascular disease. Infections have been found in 16 native oak species, including most of those of commercial importance. Species of red oak get the disease more frequently and succumb more readily than white oak. Plantation-grown Chinese chestnuts can also be naturally infected by the oak wilt fungus. Moreover, inoculation experiments have demonstrated that over 35 native and exotic oaks are susceptible, as well as American and European chestnuts, species of chinkapin, tanoak, and several varieties of apple.

Symptoms in Red Oak The main period of infection is in the spring, when new vessel wood is being formed. Symptoms in red oak occur as early as May. The leaves turn dull green or bronze, appear water-soaked, wilt, and then turn yellow or brown. Damage occurs from the tip and outer edges toward the midrib and base. Wilting leaves typically curl around the midrib and the line between the bronze and green tissues in individual leaves is very distinct (fig. 2). These symptoms quickly appear throughout the crown, often within a few weeks, and leaves at the ends of branches are shed (fig. 3).

Figure 2. - *Oak wilt symptonms on red oak leaves.*

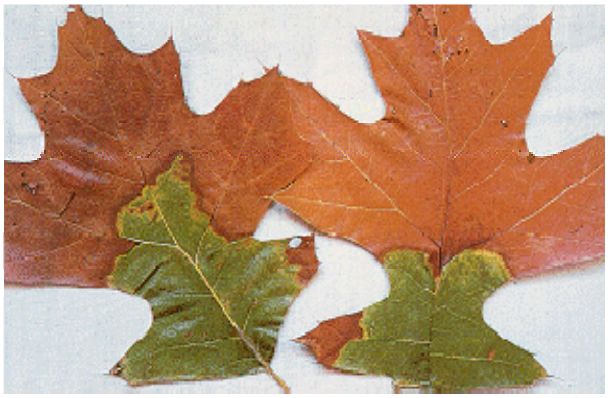


Figure 3. - *Oak wilt symptoms*

Heavy defoliation accompanies leaf wilting and discoloration. Leaves fall in all stages of discoloration. Even entirely green leaves may fall from affected branches. Some affected branches hold green leaves longer than others~sometimes until autumn. Therefore, the crowns of trees with oak wilt are seldom as uniformly brown as those of nondiseased trees that have been poisoned, girdled, or killed by lightning. In dry years, the appearance of trees with oak wilt may be confused with that of trees with drought symptoms.

The disease progresses rapidly, and some trees die within 1 or 2 months after the onset of symptoms. Most trees die within a year. Sprouts frequently grow from the bole and larger branches during the year of defoliation or the following year.

Figure 4. - *Fungus mat*

Fungus mats (fig. 4) are commonly associated with red oaks in some sections of the country, especially Wisconsin, Minnesota, Iowa, and Illinois. These mats, composed primarily of mycelium, form beneath the bark. Sometimes the mats raise and crack the bark giving off a fermenting odor that attracts insects. Discoloration of infected annual rings is seldom a symptom of oak wilt in the red oak group.

Symptoms in White Oak The disease symptoms are much more variable in white oaks, although the foliage symptoms are often the same. In a few, particularly bur oaks, symptoms are essentially the same as in the red oaks, and the tree may die within one growing season. Usually, however, white oaks die slowly. Only one or two branches may show symptoms and die in a year. If the fungus persists, a few branches are killed in a season; and over several years, the tree de clines and may eventually die. Some white oaks seem to recover from the disease, but may harbor the pathogen and serve as symptomless reservoirs.

White oaks, unlike the red, frequently have discolored infected annual rings when diseased. Fungus mats seldom appear on white oaks.

Natural root grafts and insect vectors spread the oak wilt fungus from diseased to healthy trees. Healthy oaks growing next to infected ones become infected through their roots. Root grafts (fig. 5) offer a path to transmit the fungus and are a major factor in the spread, especially in areas with deep, sandy soils and dense, pure stands of red oaks.

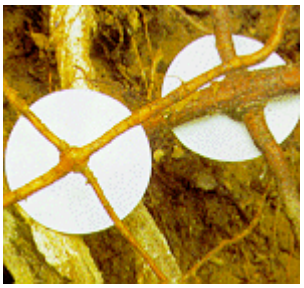


Figure 5. - *Root grafts between oaks.*

The fungus overwinters as mycelium in still-living, infested trees and as fungus pads on dead trees. The fungus can be spread more than a mile by at least two groups of insects: sap and bark-feeding beetles.

When the fungus mats enlarge and crack the bark (fig. 6), the emitted odor attracts insects such as sap-feeding beetles in the family Nitidulidae (fig. 7). When the beetles feed on the mats of the infected tree, fungus spores adhere to their bodies. As the beetles move from diseased trees to wounds on healthy oaks, the disease-causing spores are transmitted to a new host.

Figure 6 - *Broken bark caused by fungus mat on bole of tree*

Figure 7 - *Sap-feeding beetle*

Figure 8 - *Oak bark beetle egg galleries.*

Figure 9 - *Oak bark beetle feeding on an oak twig*

Oak bark beetles, *Pseudopityophihorus* spp., also transmit the fungus. They breed abundantly beneath the bark of oak wilt- infected trees (fig. 8). After egg laying, parents emerge carrying spores and feed on healthy oaks (fig.9).

When the larvae hatch and develop into adults, they also carry infective spores and move to healthy trees. Those bark beetles that overwinter in infected trees can transmit the spores to healthy trees when they move about the following spring.

When transmitted, the pathogen spreads rapidly within xylem vessels.

Besides the bark beetles, a number of other contaminated insects have been collected from diseased trees. Whether or not they spread the pathogen has not been conclusively proven, however.

Control Unfortunately, there is no known way to save an oak tree infected by the oak wilt fungus. The only way to maintain healthy trees is through prevention. Early detection and prompt removal of dead or dying trees and breaking root grafts between diseased and healthy trees are essential.

Mechanical and chemical barriers between diseased and healthy trees can halt the spread of the oak wilt fungus through root grafts. A trencher or vibrating plow can be used to cut or break the tree roots down to a depth of 2 to 4 feet (0.6 to 1.2 m). Soil fumigants can also be used to kill the connecting roots between trees.

Detailed procedures for constructing mechanical and chemical barriers are given in the referenced pamphlet on oak wilt by French and Stienstra. Promptness is important. The sooner the root grafts between diseased and healthy trees are destroyed, the better the chances for saving the trees nearby.

To suppress overland spread of the fungus, control must be aimed at destroying the source of inoculum - the diseased tree - at the proper time. All trees that die in any given year should be checked carefully for fungus mats and oak bark beetle colonization by April 1 of the following year. If the mats or beetles are present, the entire tree should be burned, chipped, or covered with plastic for 60 days. In the Eastern United States, about 50 percent of diseased trees contain beetles and about 25 percent produce mats; however, these figures may vary, depending on geographic location. Fresh pruning wounds may attract beetles contaminated with oak wilt fungus. Because of this, avoid unnecessary pruning and prune in winter whenever possible. Trees should not be pruned during April, May, or June or whenever the beetles are active.

If shade or forest trees are suspected of having oak wilt, contact the county agricultural agent, State agricultural experiment station, or local forester for control recommendations.

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