KEY TO VEGETATION TYPES AT HOPEWELL FURNACE NATIONAL HISTORIC SITE

The vegetation key is intended to assist in the identification of alliance-level vegetation within Hopewell Furnace National Historic Site. This key should be used in conjunction with local alliance descriptions within the main body of this report. The anthropogenic types have limited descriptions as they are easily distinguished. Users of the key should have a good knowledge of the local flora within the park. Field guides including Pennsylvania flora may be helpful

Notes on Use of Vegetation Key

The grassland type can be reached through either the anthropogenic or herbaceous sections (I and II). Open grasslands and pasture have both been classified as grassland at the request of NPS staff.

The Skunk Cabbage–Golden Saxifrage Forest Seep type usually occurs under a forest canopy but is considered an herbaceous alliance as the trees are typically rooted in adjacent upland soils, while the seep alliance occurs in small localized zones of seasonal to permanent groundwater discharge.

The upland forest section of the key is the most difficult as much of the park is still considered to be of early to mid-successional age. As such, forest canopy does not always reflect the expected composition given soil type, slope, aspect and topographic position. This is especially true for long-lived early successional species such as tulip poplar. Tulip Poplar Forests can occur as either near monotypic stands or as mixed stands where tulip poplar is co-dominant. It is distinguished from the more disturbed Modified Successional Forest by the absence of very shade-intolerant species such as black walnut and black locust. The Modified Successional Forest also tends to have more vine cover and canopy gaps. Younger Tulip Poplar Forest and older Modified Successional Forest may converge in appearance and composition.

The more mature examples of Tulip Poplar Forest occur adjacent to and occasionally within the Dry Oak–Mixed Hardwood Forest in the northern section of the park. Generally, Tulip Poplar Forest inclusions of less than 0.5 ha were not mapped. Where tulip poplar is abundant within a Dry Oak–Mixed Hardwood Forest, the critical cutoff is 50% tulip poplar cover. Usually, if tulip poplar canopy cover is 50% or more, then oak cover will be much less than 50% and the stand should be classified as tulip poplar. Where tulip poplar cover is less than 50 % and the oak cover 20% or more, the stand is likely Dry Oak–Mixed Hardwood Forest.

The two oak forest types only co-occur in one portion of the park (south-central section) and reflect relative differences in soil moisture and fertility. The best characteristic for separating these two alliances is the relative abundance of ericaceous shrub cover (blueberries, huckleberries, teaberry, mountain laurel, etc). These species are rare or absent from the Dry Oak–Mixed Hardwood Forest and common to abundant in the Dry Oak–Heath Forest. The two types can also be distinguished by relative composition of the canopies as the Dry Oak–Heath Forest tends to be dominated by xeric species such as scarlet oak and chestnut oak. These

species are rare or absent from the Dry Oak–Mixed Hardwood Forest. Conversely, occasional to common associate species in the Dry Oak–Mixed Hardwood Forest, such as white ash and tulip poplar are rare or absent from the Dry Oak–Heath Forest.

VEGETATION KEY

I. ANTHROPOGENIC, DEVELOPED, OR INTENSIVELY MANAGED LAND OR VEGETATION

A. Uplands surrounding or adjacent buildings and infrastructure, typically with regularly mowed lawns and ornamental landscaping.

Developed Land

B. Uplands adjacent to and including roads and maintained road right-of-way.

Transportation Corridor

C. Vegetation located within maintained utility right-of-way. Vegetation maintained as open grassland or shrubland, but not forest.

Right-of-Way

D. Agricultural land, including orchards, pastures and cropland.

1. Planted apple (*Pyrus malus*) orchard **Orchard**
2. Planted row crops (typically corn) **Cropland**
3. Active pasture land **Grassland**

II. HERBACEOUS: TREE COVER LESS THAN 25%, SHRUB COVER LESS THAN 25%

A. Upland, dominated by grasses. Less than 25% cover of shrubs. Fescue (*Festuca rubra*) and orchard-grass (*Dactylis glomerata*) are typical, but other grass species may be prevalent (e.g., *Tridens flava*, *Andropogon virginicus*, and others). Generally mowed seasonally for hay production.

Grassland
Dactylis glomerata–Rumex acetosella Herbaceous Alliance

B. Palustrine, dominated by wetland herbs, especially skunk cabbage (*Symplocarpus foetidus*). Other characteristic species include jewelweed (*Impatiens capensis*), halberd-leaved tear-thumb (*Polygonum arifolium*), jack-in-the-pulpit (*Arisaema triphyllum*), rice cutgrass (*Leersia oryzoides*), and clearweed (*Pilea pumila*). Japanese stiltgrass (*Microstegium vimineum*) may also occur on this vegetation type, often at moderate to high density. At Hopewell Furnace, this type typically occurs as a wet seep in a forested setting, where the trees are on upland soils

Skunk Cabbage–Golden Saxifrage Forest Seep
Symplocarpus foetidus–Caltha palustris Saturated Herbaceous Alliance

III. SHRUBLAND: SHRUB COVER GREATER THAN 25 %, TREE COVER LESS THAN 25%

A. Palustrine shrubland

1. Seasonally or temporarily flooded, dominated by wetland shrub species such as northern arrowwood (*Viburnum recognitum*), winterberry (*Ilex verticillata*), and smooth alder (*Alnus serrulata*).

Highbush Blueberry–Meadowsweet Wetland
Vaccinium corybosum Shrubland Alliance

2. Seasonally flooded, dominated by buttonbush (*Cephanlanthus occidentalis*) and spicebush (*Linderia benzoin*). Vines may have high total cover, including fox grape (*Vitis lambrusca*), summer grape *(V. aestevalis*), oriental bittersweet (*Celastrus orbiculatus*), and Japanese honeysuckle (*Lonicera japonica*).

Buttonbush Wetland
Cephanlanthus occidentalis Seasonally Flooded Shrubland Alliance

IV. WOODLAND: TREE COVER 25% TO 60%

A. Canopy is dominated by conifers, particularly eastern red cedar (*Juniperus virginiana*). The canopy is composed of well-spaced eastern red cedars (*Juniperus virginiana*) (possibly planted) with total cover well below 60%. There is little to no tall shrub layer and low short shrub cover. Typical low shrubs include multiflora rose (*Rosa multiflora*) and autumn olive (*Elaeagnus umbellata*). The herbaceous layer is similar to the Grassland type within the park, but has a somewhat higher cover of forb species.

Eastern Red Cedar Woodland
Juniperus virginiana Forest Alliance

B. Canopy is dominated by deciduous trees, conifers absent. The canopy is sparse (<60%) and dominated by scattered chestnut oak (*Quercus prinus*) and yellow birch (*Betula allegheniesis*). The shrub layer is sparse and may include tree saplings (especially *B. alleghaniensis*) as well as serviceberry (*Amelanchier arborea*), highbush blueberry (*Vaccinium corymbosum*), and black huckleberry (*Gaylussacia baccata*). The herbaceous layer is also depauperate and characterized by rock polypoidy (*Polypodium virginianum*) in crevices between boulders where organic matter has accumulated. Substrate is large boulders on a moderate to steep slope.

Birch Rocky Slope Woodland
Quercus rubra–Quercus prinus Woodland Alliance

V. FOREST: TREE COVER OVER 60%[2]

A. Upland Forest

1. Tulip poplar (*Liriodendron tulipifera*) dominant, comprising over 50% tree cover, in even-age stand (all canopy species), oak (*Quercus*) species with less than 50% cover.

Tulip Poplar Forest
Liriodendron tulipifera Forest Alliance

2. Tulip poplar (*Liriodendron tulipifera*) comprising less than 50% canopy and/or sub-canopy cover.

i.) Oak (*Quercus* spp.) absent or sparse; oak species comprising less than 20% tree cover.

a.) Tulip poplar (*Liriodendron tulipifera*) co-dominant, with 20 to 50% canopy cover with common associates: *Fraxinus americana*, *Fagus grandifolia*, *Populus grandidentata*, *Acer rubrum*, *Ulmus Americana*, or *Quercus* spp.

Tulip Poplar Forest
Liriodendron tulipifera–Acer rubrum–Quercus spp. Forest Alliance

b.) Mixed hardwoods, often with black walnut (*Juglans nigra*), white ash (*Fraxinus americana*), and/or black locust (*Robinia pseudoacacia*). Tulip poplar typically cover less than 20%. Characterized by conspicuous vine cover in tree layer: oriental bittersweet (*Celastrus orbiculatus*), Japanese honeysuckle (*Lonicera japonica*), summer grape (*Vitis aestivalis*), and others. Wineberry (*Rubus phoenicolasius*) and garlic mustard (*Alliaria petiolaris*) are frequent.

Modified Successional Forest
local type

[2] Forests may include small and local wetland seeps beneath the upland canopy. Too small to map as polygons, these are distinguished as seasonally or permanently wet areas with skunk cabbage (*Symplocarpus foetidus*) and ferns (especially *Osmunda* spp.). They are referred to as Skunk Cabbage-Golden Saxifrage Forest Seeps, and tentatively assigned to the *Symplocarpus foetidus-Caltha palustris* Saturated Herbaceous Alliance.

ii.) Oak dominant or co-dominant (oak species comprise over 20% of tree layer).

a.) Canopy includes abundant chesnut oak (*Quercus prinus*) while tulip poplar (*Liriodendron tulipifera*) is absent or very rare. Shrub layers contain moderate to dense cover of ericad species such as black huckleberry (*Gaylussacia baccata*), early low blueberry (*Vaccinium angustifolium*), pink azalea (*Rhododendron periclymenoides*), and lowbush blueberry (*Vaccinium pallidum)*. Restricted to southern half of park.

Dry Oak–Heath Forest
Quercus prinus–(*Quercus coccinea, Quercus velutina*) Forest Alliance

b.) Canopy may include occasional tulip poplar (*Liriodendron tulipifera*) while chesnut oak (*Q. prinus*) and scarlet oak (*Q. coccinea*) are rare or absent. Shrub layers are predominantly non-ericad species such as flowering dogwood (*Cornus florida*), maple-leaved viburnum (*Viburnum acerifolium*), and witch-hazel (*Hamamelis virginiana*). Herbaceous cover variable but often with abundant hay-scented fern (*Dennstaedtia punctilobula*) and Pennsylvania sedge (*Carex pensylvanica*). Restricted to northern half of park except for one occurrence in the southern end.

Dry Oak–Mixed Hardwood Forest
Quercus alba–Quercus rubra (*Carya* spp.) Forest Alliance

B. Palustrine Forest. Red maple (*Acer rubrum*) dominates the canopy in stands which are seasonally flooded or with seasonally high water table.

Red Maple–Mixed Hardwood Palustrine Forest
Acer rubrum–Fraxinus pennsylvanica Seasonally Flooded Forest Alliance