FOREST COMMUNITIES OF ZEKIAH SWAMP
NONTIDAL WETLAND OF SPECIAL STATE CONCERN

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Introduction

The Wildlife and Heritage Division of the Maryland Department of Natural Resources initiated a study of the forest types of Zekiah Swamp order to identify forest types within the Swamp and locate the best examples of each type. Zekiah Swamp is the largest hardwood swamp in Maryland and has been described as one of the most important ecological areas on the East Coast (DNR and Smithsonian Institute Center for Natural Areas, 1975). In order to better protect the natural resources of the Zekiah, the swamp was designated as a nontidal wetland of special state concern in 1989 (COMAR 26.23.06) in accordance with the Nontidal Wetlands Protection Act. Historically, there has been little survey effort within the Swamp concerning rare species and natural communities. This study was initiated in response to a need for better ecological information in order to provide the Maryland Department of the Environment with guidance in permit decisions regarding the Zekiah. The information gathered from 1996 and 1997 field surveys has been incorporated into management recommendations for each forest type within the Swamp. Additionally, several reference wetlands have been identified and described for each forest community type.

Methods

In order to ascertain all of the forest types within the Swamp and its headwaters, it was necessary to choose survey sites across all the variations of the landscape. This study focused on the forested wetlands within the Swamp. Forested sites were chosen based upon analysis of aerial photographs, National Wetland Inventory (NWI) maps, geologic maps, and soil maps in order to gain representatives of major the ecological variables in the Swamp. NWI maps were utilized in order to choose forested sites in a variety of hydrologic regimes, including temporarily flooded, seasonally flooded, and saturated, seasonally flooded. Geological maps were used to choose sites of different hydrologic regime within each geologic formation represented within the swamp. Soil maps were utilized to determine the various soil associations within the swamp and its headwaters. Forested sites were chosen to represent all of the mapped soil associations. At least four replicates were selected for each suite of environmental variables. Because of the small size of the remaining forested areas in the headwaters of the swamp, it was difficult to find areas that would be representative of the natural forest community and relatively free from disturbance. Numerous headwater sites were chosen in Cedarville State Forest for this reason.

Sites were also chosen based on a report entitled "Ecologically Significant Areas in Zekiah Swamp Nontidal Wetland of Special State Concern" (DNR, 1995). We met with the author of this report and chose several sites based on recommendations of high quality forest.

We utilized The Nature Conservancy's methodology for plant community survey to collect data at each site ("Field Form Instructions for the Description of Sites and Terrestrial, Palustrine, and Vegetated Estuarine Communities", 1993). Plots were generally 20m x 20m in forested areas. Due to the small size of seepage wetlands, plots were generally 10m x 10m in this habitat.

Vegetation was visually divided into strata and all the species of each stratum were listed and percent cover estimated. Additional species of the vegetation unit not found in the plot were listed separately as present. Species that were not identifiable in the field were collected for later identification. In addition to floristic information, the following environmental information was taken: soil profile description (including soil texture and color), flooding regime, and soil moisture regimen. Forty plots were sampled in Zekiah Swamp during the summer of 1996.

An initial analysis was conducted on the plot data using the Two-Way Indicator Species Analysis (Twinspan) (Hill, 1979) in the fall of 1996. This program successively divides the species and plots into groups that are similar using species composition.

After reviewing the initial analysis results, we decided to survey several more sites during the summer of 1997. Sites were chosen in areas for which there was a need for further replication of data. We again utilized soil, geologic, and NWI maps to choose sites. Eleven plots were sampled during the summer of 1997.

The additional plot data were entered into a Quattro Pro file with the 1996 data and analyzed using Twinspan. Data were also analyzed using Decorana (Hill, 1979). This program is an ordination technique based on reciprocal averaging.

Results/Community Descriptions

Four forest community types were recognized in the analysis. Descriptions of these forest communities follow.

Liriodendron tulipifera - Acer rubrum - Liquidambar styraciflua/Medeola virginiana Forest

COMMON NAME	Tulip tree - Red maple - Sweet gum/Indian cucumber-root Forest
TNC SYSTEM	Terrestrial
PHYSIOGNOMIC CLASS	Forest
PHYSIOGNOMIC SUBCLASS	Deciduous Forest
PHYSIOGNOMIC GROUP	Cold-deciduous Forest
PHYSIOGNOMIC SUBGROUP	Natural/Semi-Natural
FORMATION	Temporarily Flooded Cold-deciduous Forest
ALLIANCE	*Liquidambar styraciflua* - (*Liriodendron tulipifera, Acer rubrum*) Temporarily Flooded Forest

ENVIRONMENTAL DESCRIPTION

This deciduous forest is characterized by temporary seasonal flooding rather than a saturated hydrologic regime. This forest type generally occurs along lower slopes and banks along streams. Typically this vegetation develops on well-drained to somewhat poorly drained soils that are temporarily flooded during the growing season. An organic layer of 1 to 10 cm overlies soils that are mainly sandy loams and sandy clay loams.

MOST ABUNDANT SPECIES

Strata	Species
Tree canopy	*Liquidambar styraciflua, Liriodendron tulipifera, Acer rubrum, Nyssa sylvatica*
Tall shrub	*Asimina triloba, Lindera benzoin, Ilex opaca*
Vine/liana	*Smilax rotundifolia, Toxicodendron radicans, Parthenocissus quinquefolia*
Herbaceous	*Thelypteris noveboracensis, Mitchella repens, Euonymus americana, Medeola virginiana*

VEGETATION DESCRIPTION

The canopy of this forest type is dominated by *Liriodendron tulipifera* and *Acer rubrum*, with lesser amounts of *Liquidambar styraciflua*. Other species which are occasionally found in the canopy include *Fagus grandifolia*, *Nyssa sylvatica*, *Quercus rubra*, and *Platanus occidentalis*. The understory includes mixtures of *Liriodendron tulipifera*, *Acer rubrum*, *Liquidambar styraciflua*, *Fagus grandifolia*, *Ilex opaca*, and *Nyssa sylvatica*. Less frequent understory trees include *Ulmus rubra, Cornus florida*, and *Carpinus caroliniana*. The species in the shrub layer can be variable across the landscape, but most commonly include *Lindera benzoin*, *Asimina triloba*, and *Ilex opaca*. Less common shrub species include *Clethra alnifolia*, *Magnolia virginiana*, *Vaccinium corymbosum*, and *Viburnum* spp. The herbaceous layer covers 10 - 50 percent of the forest floor and is quite diverse. Characteristic herbaceous species include *Thelypteris noveboracensis*, *Mitchella repens*, *Euonymus americana*, and *Medeola virginiana*.

MARYLAND DISTRIBUTION

Along headwater streams of Zekiah Swamp in Charles County. Probably along other streams on Coastal Plain.

REFERENCE SITES

Cedarville-Zekiah Run, Gallant Green Woods

Acer rubrum - Nyssa sylvatica - Magnolia virginiana Forest

COMMON NAME	Red maple - Black gum - Sweet bay Forest
TNC SYSTEM	Terrestrial
PHYSIOGNOMIC CLASS	Forest
PHYSIOGNOMIC SUBCLASS	Deciduous Forest
PHYSIOGNOMIC GROUP	Cold-deciduous Forest
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural
FORMATION	Saturated Cold-deciduous Forest
ALLIANCE	*Acer rubrum - Nyssa sylvatica* Saturated Forest Alliance

ENVIRONMENTAL DESCRIPTION

This community is a nutrient-poor wetland forest occurring in small patches influenced by water-table fed seepage on slight to moderate slopes along streams or in poorly drained depressions. Vegetated areas are interspersed with flowing channels and standing pools of water. Soils are typically muck over mineral soil except where seepage flow has scoured the surface leaving only gravel or sand exposed. Water pH is acidic.

MOST ABUNDANT SPECIES

Strata	Species
Tree canopy	*Acer rubrum, Nyssa sylvatica, Magnolia virginiana, Ilex opaca*
Tall shrub	*Vaccinium corymbosum, Clethra alnifolia, Rhododendron viscosum, Ilex verticillata*
Herbaceous	*Osmunda cinnamomea, Symplocarpus foetidus, Woodwardia areolata*
Non-vascular	*Sphagnum* spp.

VEGETATION DESCRIPTION

This community is characterized by *Acer rubrum* and *Nyssa sylvatica* in the canopy, which may be quite open in some examples. Canopy associates include *Magnolia virginiana* and Ilex opaca. The shrub layer is characterized by *Vaccinium corymbosum*, as well as *Clethra alnifolia*, *Ilex verticillata*, and *Rhododendron viscosum*. The herbaceous layer occurs on hummocks of higher ground and along the edges of pools of water. Herbaceous species are characterized by *Osmunda cinnamomea* and *Symplocarpus foetidus*, as well as *Woodwardia areolata*. *Sphagnum* and other mosses are common.

Within Zekiah Swamp, this community occurs in small, isolated patches on slopes along headwater streams where there are water-table fed seeps. Though a taller canopy layer surrounds these small wetlands, the tallest trees within this community generally represent a subcanopy layer. This subcanopy is characterized by *Acer rubrum* and *Nyssa sylvatica*, with lesser amounts of *Ilex opaca* and *Magnolia virginiana*. A dense shrub layer includes *Vaccinium corymbosum*, *Clethra alnifolia*, *Ilex verticillata*, and *Rhododendron viscosum*. Two seeps also include *Magnolia acuminata*, a species more common in the western part of Maryland. The herbaceous layer can be dense on hummocks within these seeps and include ferns, *Carex* spp., and *Symplocarpus foetidus*.

OTHER NOTEWORTHY SPECIES

One example of this community type in the headwaters of Zekiah Swamp supports a population of *Parnassia asarifolia*, a State Endangered plant species known from no other site in Maryland. This site also supports a population of *Amianthium muscitoxicum*, a Watch List species.

RANGE

This community occurs on the coastal plain in New Jersey, Pennsylvania, Delaware, Maryland, and northern Virginia.

MARYLAND DISTRIBUTION

Assateague Island National Seashore, small patches along the headwater streams of Zekiah Swamp in Charles County, and several other locales on Maryland's western shore of the Chesapeake Bay.

REFERENCE SITES

County Line Trail Seep, Devil's Nest, Upper Kerrick Seep

COMMENTS

This community occurs only in small isolated patches along the headwater streams of Zekiah Swamp and always below minimum mapping unit in size. These small seepage wetlands occur within *Liquidambar styraciflua - Liriodendron tulipifera - Acer rubrum* Forest or *Fagus grandifolia - Quercus alba* Forest.

Liquidambar styraciflua - Quercus palustris/Carpinus caroliniana/Carex intumescens Forest

COMMON NAME	Sweet gum - Pin oak/Ironwood/ Bladder sedge Forest
TNC SYSTEM	Terrestrial
PHYSIOGNOMIC CLASS	Forest
PHYSIOGNOMIC SUBCLASS	Deciduous Forest
PHYSIOGNOMIC GROUP	Cold-deciduous Forest
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural
FORMATION	Temporarily Flooded Cold-deciduous Forest
ALLIANCE	*Liquidambar styraciflua* - (*Liriodendron, Acer*) Temporarily Flooded Forest Alliance

ENVIRONMENTAL DESCRIPTION

This bottomland, deciduous forest is abundant along the braided channels of Zekiah Swamp. The forest type is characterized by temporary and seasonal flooding rather than a saturated hydrologic regime. Soils are moderately well-drained to very poorly drained. An organic layer of 1 to 10 cm lies over soils which are sandy, silty or clayey loams.

MOST ABUNDANT SPECIES

Strata	Species
Tree canopy	*Liquidambar styraciflua, Quercus palustris, Quercus pagoda*, Quercus phellos, Acer rubrum, Fraxinus pensylvanica*
Subcanopy	*Carpinus caroliniana, Quercus michauxii, Acer rubrum, Ulmus rubra*
Tall shrub	*Ilex opaca, Lindera benzoin, Asimina triloba*
Vine/liana	*Toxicodendron radicans, Smilax rotundifolia, Vitis* spp., *Campsis radicans*
Herbaceous	*Carex intumescens, Cinna arundinacea, Carex debilis, Solidago rugosa, Arisaema triphyllum, Onoclea sensibilis*

VEGETATION DESCRIPTION

The canopy layer of this deciduous forest is quite diverse and a variety of species can be locally dominant including *Liquidambar styraciflua, Acer rubrum, Quercus palustris, Fraxinus pensylvanica, Quercus pagoda*, Quercus michauxii*, and *Quercus phellos*. The understory is well developed and characteristically includes a dense layer of *Carpinus caroliniana*, as well as *Quercus michauxii, Acer rubrum, and Ulmus rubra*. The shrub layer is characterized by *Ilex opaca, Lindera benzoin, and Asimina triloba*. Shrubs which are occasionally found include *Ilex verticillata, Viburnum recognitum*, and *Ilex decidua*. The herbaceous layer can be quite dense and is characterized by *Cinna arundinacea, Carex intumescens, Carex debilis, Onoclea sensibilis, Arisaema triphyllum, and Solidago rugosa*. There are signs of temporary and seasonal flooding on the forest floor, including dried pool areas and intermittent channels. Bark on the lower tree trunks is moss covered.

Within Zekiah Swamp, there appears to be areas of forest which combine characteristics of this community and the *Acer rubrum - Fraxinus pensylvanica* forest located in the wetter areas of the Swamp. Several plots which were sampled contained an understory similar to the one described for this community, but in which *Acer rubrum* and *Fraxinus pensylvanica* were particularly abundant in the canopy and subcanopy layers. With further analysis, it is possible that this transitional forest may be distinguished a separate community.

Another variation in vegetation within this community occurs due to the presence of higher, drier ridges. These ridges appear to be depositional features (of geological time scale events) and consist of sand and gravel. The vegetation supported on these ridges differs from the surrounding community. Canopy species are dominated almost exclusively by *Fagus grandifolia, Liquidambar styraciflua*, and *Quercus palustris*. The subcanopy and shrub layer is dominated by a dense

layer of *Ilex opaca*. The herbaceous layer is generally quite sparse. It is possible that this forest type may be considered a separate community, though it is presented here as a variation within one community.

OTHER NOTEWORTHY SPECIES

Several rare plant species occur in this forest community including two State Threatened species, *Carex louisianica* and *Carex gigantea*, one State Threatened species, *Ilex decidua*, and one Watch List species, *Carex typhina*. Recent information indicates that the status of *Carex louisianica* and *Carex gigantea* may be changed in the near future.

MARYLAND DISTRIBUTION

This forest type occurs along the braided channels of the mainstem of Zekiah Swamp in Charles County.

REFERENCE SITES

Wilmer Creek, La Plata-Bryantown Road Woods

COMMENTS

Other alliances in which this community may fit are:
Quercus (*michauxii, pagoda, shumardii*) - *Liquidambar styraciflua* Temporarily Flooded Forest Alliance
Liquidambar styraciflua - (*Acer rubrum*) Seasonally Flooded Forest Alliance
Quercus palustris - (*Quercus bicolor*) Seasonally Flooded Forest Alliance

*Several trees in Zekiah Swamp were tentatively identified as *Quercus pagoda*. Additional field survey will be done in 1998 in order to verify this identity.

Acer rubrum - Fraxinus pensylvanica/Saururus cernuus Forest

COMMON NAME	Red maple - Green ash/Lizard's-tail Forest
TNC SYSTEM	Terrestrial
PHYSIOGNOMIC CLASS	Forest
PHYSIOGNOMIC SUBCLASS	Deciduous Forest
PHYSIOGNOMIC GROUP	Cold-deciduous Forest
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural
FORMATION	Seasonally Flooded Cold-deciduous Forest
ALLIANCE	*Acer rubrum - Fraxinus pensylvanica* Seasonally Flooded Forest Alliance

ENVIRONMENTAL DESCRIPTION

This deciduous forest is characterized by seasonal flooding. The forest type occurs within the wettest areas of Zekiah Swamp where there is standing water for much of the growing season. In some cases this flooding is influenced by current or prior beaver activity.

Typically this vegetation occurs on poorly to very poorly drained soils that are seasonally to permanently flooded. A thin organic layer of 1 to 5 cm overlies soils which consist of sandy or silty clay loams.

MOST ABUNDANT SPECIES

Strata	Species
Tree canopy	*Acer rubrum, Fraxinus pensylvanica, Quercus lyrata*
Tall shrub	*Leucothoe racemosa, Viburnum recognitum, Ilex verticillata*
Vine/liana	*Smilax rotundifolia, Parthenocissus quinquefolia*
Herbaceous	*Saururus cernuus, Peltandra virginica, Boehmeria cylindrica, Triadenum walteri*

ADDITIONAL CHARACTERISTIC SPECIES

Quercus phellos, Lobelia cardinalis, Carex crinita, Populus heterophylla

VEGETATION DESCRIPTION

This community is characterized by *Acer rubrum* and *Fraxinus pensylvanica* in the canopy and subcanopy layers, which may be quite open in some examples due to seasonal to permanent flooding. Lesser amounts of *Quercus lyrata, Nyssa sylvatica, Quercus phellos*, and *Populus heterophylla* are also frequently found in the canopy. The shrub layer includes *Leucothoe racemosa, Ilex verticillata*, and *Viburnum recognitum*. In more open examples, shrubs can include *Alnus serrulata, Cornus amomum*, and *Rosa palustris*. Herbaceous species are dominated by *Saururus cernuus, Peltandra virginica*, and *Boehmeria cylindrica*. Other herbaceous species include *Triadenum walteri, Lobelia cardinalis*, and *Ludwigia palustris*.

This community occurs in large patches in the wettest areas of Zekiah Swamp that are influenced by seasonal to permanent flooding. In some cases flooding has been influenced by current or prior beaver activity. In the wetter examples of this community type, the canopy is quite open due to tree mortality. In areas with a semi-open canopy, there is a more developed shrub and herbaceous layer.

OTHER NOTEWORTHY SPECIES

Several rare plant species occur in this forest community including three State Endangered species *Carex louisianica, Carex gigantea*, and *Polygonum densiflorum*, two Watch List species, *Carex typhina* and *Bidens discoidea*, and two species considered Status Uncertain, *Polygonum setaceum* and *Panicum aciculare*. Recent information indicates that the status of *Carex louisianica* and *Carex gigantea* may be changed in the near future.

MARYLAND DISTRIBUTION

In wettest areas of Zekiah Swamp in Charles County. Also in freshwater tidal and non-tidal floodplain forest of the Patuxent River in Prince Georges and Anne Arundel Counties.

REFERENCE SITES

Ross Branch, North Clark Run

Discussion

Four forest community types occur in varying abundances throughout Zekiah Swamp. Tulip tree - Red maple - Sweet gum forests generally occur along headwater tributaries. Red maple - Black gum - Sweet bay forests are also found along headwater streams, but these are small patch communities occurring where there is groundwater seepage. These two forest types are not abundant, however, because much of the forest along headwater tributaries has been cleared for agriculture, mining, and development.

Red maple - Green ash forests occur in the wettest areas of Zekiah Swamp where there is standing water and saturated soil for much of the growing season. These forests occur in large patches scattered throughout the Swamp. The flooding in some of the patches of this forest type is influenced by beaver activity.

The main forest type within the Swamp which occurs in the greatest abundance is the Sweet gum - Pin oak/Ironwood forest. This bottomland forest type is temporarily to seasonally flooded. Within this forest community occurs a possible fifth forest type dominated by Beech, Sweet gum and American holly. This forest type occurs on depositional ridges along the mainstem of the Swamp. These are higher, drier patches of ground consisting of sandy or gravelly soil. These depositional features are probably remnants of geologic time scale watershed events. Though the forest on these ridges could be considered a separate forest community type, it is presented here as a variation within one forest community type.

We attempted to correlate NWI map wetland types to the four forest community types in order to create a viable mapping method. Forested headwater tributaries with a wetland type of PFO1A (palustrine, forested, broad-leaved deciduous, temporarily flooded) were likely to support Tulip tree - Red maple forest community. Most examples of Red maple - Green ash Forest were located within the wetland types of PFO1C (palustrine, forested, broad-eaved deciduous, seasonally flooded) or PFO1E (palustrine, forested, broad-leaved deciduous, saturated and seasonally flooded). However, not all PFO1C and PFO1E wetlands in Zekiah Swamp supported Red maple - Green ash forests. The Sweet gum - Pin oak forest could be found in PFO1A, PFO1C, and PFO1E wetland types. Examples of Red maple -Black gum - Sweet bay seepage wetland were too small to use this method of mapping. Due to these results, this method of mapping the forest types was considered unsuccessful.

Sites containing high quality forest and which best describe a community type were chosen as reference sites. Two sites were chosen as reference areas for three of the four community types. Three focus areas were chosen for the Red maple - Black gum - Sweet bay Forest community because of its high conservation value. Within Zekiah Swamp, this forest type is associated with groundwater-fed seepage wetlands. The occurrence of these seepage wetlands is limited across the landscape and these wetlands often support rare and uncommon plant species. Management recommendations are given for each focus area.

Reference Sites

Community Type:
Liriodendron tulipifera - Acer rubrum - Liquidambar styraciflua/Medeola virginiana Forest

Cedarville - Zekiah Run

Site Description: This site contains a maturing, mesic forest along a headwater stream of Zekiah Swamp. This forest probably floods occasionally throughout the growing season. The canopy is dominated by Red maple (*Acer rubrum*) and tulip tree (*Liriodendron tulipifera*), with lesser amounts of Sweet gum (*Liquidambar styraciflua*), Swamp chestnut oak (*Quercus michauxii*), and Beech (*Fagus grandifolia*). The subcanopy includes Beech, Swamp chestnut oak, American holly (*Ilex opaca*), and Sweet gum. A sparse shrub layer includes Beech, Highbush blueberry (*Vaccinium corymbosum*), Sweet pepperbush (*Clethra alnifolia*), and Ironwood (*Carpinus caroliniana*). The sparse herbaceous layer occurs on a forest floor with heavy leaf litter. The dominant herbaceous species are New York fern (*Thelypteris noveboracensis*) and White-edge sedge (*Carex debilis*). Other herbaceous species include Indian cucumber-root (*Medeola virginiana*), Strawberry bush (*Euonymus americana*), Lady fern (*Athyrium felix-femina*) and seedlings of several tree species. A flowing headwater stream traverses this site, as does as a dried, intermittent stream channel.

Gallant Green Woods

Site Description: At this site, a small area of maturing mesic forest occurs along an intermittent stream which joins a headwater tributary of Zekiah Swamp. This forest floods occasionally throughout the growing season. The canopy is dominated by Red maple (*Acer rubrum*) and Tulip tree (*Liriodendron tulipifera*), with lesser amounts of Sweet gum (*Liquidambar styraciflua*) and Sycamore (*Platanus occidentalis*). The subcanopy contains equal amounts of Red maple and Sweet gum and a smaller amount of Tulip tree. The shrub layer is dominated by Spicebush (*Lindera benzoin*). Pawpaw (*Asimina triloba*) and Southern arrowwood (*Viburnum dentatum*) also occur in the shrub layer. The herbaceous layer is relatively dense and diverse, including Sensitive fern (*Onoclea sensibilis*), Lady fern (*Athyrium felix-femina*), Poison ivy (*Toxicodendron radicans*), Virginia creeper (*Parthenocissus quinquefolia*), and Christmas fern (*Polystichum acrostichoides*).

Threats and Management Needs of the Community Type

The main threat to the Tulip tree - Red maple - Sweet gum forest community is logging. These forests are found along the small streams and tributaries constitute the headwaters of Zekiah Swamp. Most of these streams occur in the northern part of Charles County which is experiencing a great deal of development pressure. Much of the forest along these streams has already been cleared due to agriculture, sand and gravel mining, and development.

Further clearing along these streams could be detrimental to the water quality in the Swamp. The process of clearing trees could disturb the soils and cause erosion, thus allowing sediment into the water. Additional housing development would increase the amount of impervious surface in the headwater area, thus creating larger pulses of flood runoff and increased soil erosion along headwater streams. These conditions could create further sedimentation of the water ways leading to the Swamp. Clearing of trees for silviculture or development may also encourage the invasion of non-native plant species into adjacent forest habitat. Due to the small size of many of the headwater forests, the invasion of non-native plant species may be a significant concern.

Clearing of forest within the headwaters of Zekiah Swamp should be monitored and effects of each project assessed. The remaining high quality forest along the headwater streams should be protected from further clearing. Cedarville-Zekiah Run is the oldest forest stand that was surveyed in the headwaters of Zekiah Swamp. This site is located within Cedarville State Forest. Contact should be maintained with Maryland Forest Service staff in order to protect this site from any development or clearing of trees.

Community Type: *Acer rubrum - Nyssa sylvatica - Magnolia virginiana* Forest

County Line Trail Seep

Site Description: This site is characterized by a high quality seepage wetland on a slope associated with a headwater stream of Zekiah Swamp. The canopy within the seepage wetland is shorter than surrounding forest perhaps due to very wet conditions. A sparse canopy layer of Red maple (*Acer rubrum*), Black gum (*Nyssa sylvatica*), Sweet bay (*Magnolia virginiana*), and American holly (*Ilex opaca*) occurs within this seepage wetland, while surrounding forest includes Red maple, Sweet gum (*Liquidambar styraciflua*), White oak (*Quercus alba*), and Tulip tree (*Liriodendron tulipifera*). The seepage wetland supports a thick shrub layer with a mixture of Swamp azalea (*Rhododendron viscosum*), Winterberry (*Ilex verticillata*), Sweet bay, Cucumber tree (*Magnolia acuminata*), and Highbush blueberry (*Vaccinium corymbosum*). The herbaceous layer occurs on higher areas which are interspersed with channels and pools of water. Dominant herbaceous species include Cinnamon fern (*Osmunda cinnamomea*), Skunk cabbage (*Symplocarpus foetidus*), Lizard's-tail (*Saururus cernuus*), and Netted chain fern (*Woodwardia areolata*). Within the herbaceous layer grows a State Endangered plant species, Kidneyleaf grass-of-parnassus (*Parnassia asarifolia*), known from no other site in Maryland. Additionally, there is a population of Fly-poison (*Amianthium muscitoxicum*), a State Rare species, growing at this site. There are thick patches of Sphagnum moss (*Sphagnum* spp.) throughout the wetland.

Devil's Nest

Site Description: A long, narrow seepage wetland occurs here on a gentle slope associated with a headwater tributary of Zekiah Swamp. The forest canopy surrounding the seepage wetland is

dominated by Red maple (*Acer rubrum*) and Sweet gum (*Liquidambar styraciflua*). Within the seepage wetland, the canopy is quite open and subcanopy trees are more dominant. These subcanopy trees include Red maple, Black gum (*Nyssa sylvatica*), Sweet bay (*Magnolia virginiana*), and Red oak (*Quercus rubra*). A dense shrub layer is dominated by Sweet pepperbush (*Clethra alnifolia*), Highbush blueberry (*Vaccinium corymbosum*), and Swamp azalea (*Rhododendron viscosum*). Other species in the shrub layer include Sweet bay, Black gum, and Winterberry (*Ilex verticillata*). Seepage channels and pools of water are interspersed with herbaceous vegetation along the slope. The herbaceous vegetation grows on higher areas within the wetland and is characterized by Skunk cabbage (*Symplocarpus foetidus*), Netted chain fern (*Woodwardia areolata*), and Long sedge (*Carex folliculata*). There are dense patches of Sphagnum moss (*Sphagnum* spp.) throughout the wetland.

Upper Kerrick Seep

Site Description: This site includes a hillside seepage wetland along an upper tributary of Kerrick Swamp. The surrounding forest canopy is absent in the seepage wetland due to wet conditions. The subcanopy is dominated by Red maple (*Acer rubrum*), Black gum (*Nyssa sylvatica*), and American holly (*Ilex opaca*), with lesser amounts of Sweet bay (*Magnolia virginiana*) and Tulip tree (*Liriodendron tulipifera*). A dense shrub layer is dominated by Sweet pepperbush (*Clethra alnifolia*) and Highbush blueberry (*Vaccinium corymbosum*). Additional characteristic shrub species include Swamp azalea (*Rhododendron viscosum*), Fetterbush (*Leucothoe racemosa*), Winterberry (*Ilex verticillata*), and Cucumber tree (*Magnolia acuminata*). Shrubs and herbaceous species are generally restricted to the higher hummocks within the seepage wetland which are interspersed with channels and pools of water. Herbaceous species include Cinnamon fern (*Osmunda cinnamomea*), Skunk cabbage (*Symplocarpus foetidus*), Royal fern (*Osmunda regalis*), and Collins' sedge (*Carex collinsii*). Skunk cabbage (*Symplocarpus foetidus*) grows in wetter mucky areas within the wetland. Numerous shrub saplings also grow in the herbaceous layer including Naked withe-rod (*Viburnum nudum*), Swamp azalea, Highbush blueberry, and Sweet pepperbush.

Threats and Management Need for the Community Type

Any hydrological change, either decreasing or increasing the water level of the groundwater seepage, would alter the vegetation in these seepage wetlands. Of particular concern are the populations of Kidney-leaf grass-of-parnassus (*Parnassia asarifolia*) and Fly-poison (*Amianthium muscitoxicum*) at the County Line Trail Seep. These rare species are intolerant of extended flooding but require saturated soil. Any activities that would alter the hydrology of wetlands at these sites should not be allowed. Activities proposed near these sites should be reviewed for potential effects on the seepage wetland and rare plant species.

The clearing of trees on adjacent uplands and subsequent erosion would produce sedimentation of the wetland and may destroy the vegetation within these seepage habitats. In addition, the cutting of trees on the upland or in the wetlands would increase the amount of sunlight available

to shrubs and herbaceous species. This increase in sunlight would promote the establishment of non-native, weedy species and may exclude native species. The cutting of trees and clearing of vegetation should not occur within these seepage wetlands. Of particular concern is Upper Kerrick Seep. The wetland is located approximately 100 ft. from a golf course at White Plains Regional Park. Any further clearing of trees nearby the seep could be detrimental to the vegetation in the seep.

The size and reproductive success of the rare species at County Line Trail Seep should be monitored regularly to assess the stability of the populations. The seepage habitat at Devil's Nest and Upper Kerrick Seep should be surveyed for rare species throughout the growing season. If other rare species populations are found, steps should be taken to protect those plants.

Devil's Nest and County Line Trail Seep are located in Cedarville State Forest. Recent clearing of forest has taken place nearby Devil's Nest. Further clearing of forest nearby this seepage wetland should be discouraged. Contact should be maintained with Maryland Forest Service staff in order to protect these two small wetlands.

Community Type:
Liquidambar styraciflua - Quercus palustris/Carpinus caroliniana/Carex intumescens Forest

La Plata-Bryantown Road Woods

Site Description: A maturing forest occurs here along the mainstem of Zekiah Swamp. Trees are between 80 and 90 ft tall with diameters of 1 ½ ft. The canopy is dominated by Sweet gum (*Liquidambar styraciflua*), Pin oak (*Quercus palustris*), and Green ash (*Fraxinus pensylvanica*). Further from the mainstem, Willow oak (*Quercus phellos*) and Cherrybark oak (*Quercus pagoda*)✓ are also abundant in the canopy. The understory is characterized by Ironwood (*Carpinus caroliniana*), Green ash, Slippery elm (*Ulmus rubra*), Red maple (*Acer rubrum*), and Swamp chestnut oak (*Quercus michauxii*). Ironwood is also characteristic of the shrub layer, in addition to American holly (*Ilex opaca*), Pawpaw (*Asimina triloba*), and Spicebush (*Lindera benzoin*). The herbaceous layer is quite dense in the wettest areas close to the mainstem and less dense in the areas further from the mainstem. In the wettest areas of this forest the herbaceous layer is dominated by Wood reed-grass (*Cinna arundinacea*), False nettle (*Boehmeria cylindrica*), and Clearweed (*Pilea pumila*). In areas of the forest which are less wet, the herbaceous layer includes such species as Bladder sedge (*Carex intumescens*), White-edge sedge (*Carex debilis*), Virginia creeper (*Parthenocissus quinquefolia*), Rough-stemmed goldenrod (*Solidago rugosa*), and Jack-in-the-pulpit (*Arisaema triphyllum*). Higher mounds of ground support Partridge berry (*Mitchella repens*) and Strawberry bush (*Euonymus americana*). Vines are moderately abundant in some areas of the forest and include Grape (*Vitis* spp.), Poison ivy (*Toxicodendron radicans*), and Trumpet creeper (*Campsis radicans*).

✓ This species was tentatively identified as Quercus pagoda. Additional field survey will be

done in 1998 to verify this identity.

Wilmer Creek

Site Description: Some of the oldest forest that was surveyed in Zekiah Swamp occurs at this site. The forest is seasonally flooded and occurs just north of tidal influence to the west of the mainstem of the Swamp. The forest canopy is dominated by Pin oak (*Quercus palustris*), Swamp chestnut oak (*Quercus michauxii*), and Cherrybark oak (*Quercus pagoda*)✓, with a lesser amount of Sweet gum (*Liquidambar styraciflua*). The subcanopy is dominated by Sweet gum, with lesser amounts of American holly (*Ilex opaca*) and Ironwood (*Carpinus caroliniana*). Shrubs are dominated by Pawpaw (*Asimina triloba*), but also include American holly and the State Threatened Deciduous holly (*Ilex decidua*). Lower areas and intermittent channels support a dense herbaceous layer containing Bladder sedge (*Carex intumescens*), White-edge sedge (*Carex debilis*), and the Watch List species, Cat-tail sedge (*Carex typhina*). Jack-in-the-pulpit (*Arisaema triphyllum*) grows in higher areas. There are a moderate amount of vines present in this forest including Common greenbrier (*Smilax rotundifolia*) and Poison ivy (*Toxicodendron radicans*). Some parts of the site support invasive species such as Japanese honeysuckle (*Lonicera japonica*) and Groundberry (*Rubus hispidus*).

✓ This species was tentatively identified as Quercus pagoda. Additional field survey will be done in 1998 to verify this identity.

Threats and Management Needs for the Community Type

This community type occurs along the braided channels of Zekiah Swamp is the most abundant forest type in the Swamp. Several rare plant species grow within this forest type including two State Threatened species, Louisiana sedge (*Carex louisianica*)* and Giant sedge (*Carex gigantea*)*, a State Threatened species, Deciduous holly (*Ilex decidua*), and a Watch List species, Cat-tail sedge (*Carex typhina*). The main threat to this forest type and its rare species is logging. Clearing of the forest canopy near the rare species populations may create sunny, drier conditions which could eliminate these species. Additionally, logging in or near this community type could create conditions which promote the growth of non-native, weedy species to the exclusion of native species.

The process of logging in these forests is also likely to alter the hydrology of the area due to rutting and compaction of the soil. Disturbance of the soil could allow for sediment runoff into the channels of the Swamp. Logging proposals should be reviewed for their compliance with Best Management Practices. Selective logging should be encouraged as this type of logging is most likely to retain the ecological character of the Swamp. Best examples of this forest community type and forest areas which support rare species should not be logged and should be allowed to mature.

Surrounding land use is also likely to affect this forest type within Zekiah Swamp. Further

clearing for agricultural fields and housing developments should be closely monitored. Runoff of herbicides and pesticides from agricultural fields can pollute the waters of the swamp. Development of nearby lands creates additional impervious surface in the watershed which allows for larger pulses of flood waters and more erosion and runoff of soil sediments into the swamp. Additionally, the disturbance of clearing of trees for development in surrounding areas can promote the invasion of non-native plant species into adjacent forests. Wherever possible, forest buffers surrounding the swamp should be encouraged and maintained in order to protect the forested swamp from activities on adjacent lands.

*Recent information indicates that the status of these species may be changed in the near future.

Community Type: *Acer rubrum - Fraxinus pensylvanica/Saururus cernuus* Forest

North Clark Run

Site Description: This site contains a seasonally to permanently flooded forest along a beaver influenced channel of Zekiah Swamp. The forest canopy is dominated by Red maple (*Acer rubrum*) and Green ash (*Fraxinus pensylvanica*), with lesser amounts of Over-cup oak (*Quercus lyrata*), Willow oak (*Quercus phellos*), and Black gum (*Nyssa sylvatica*). The canopy is somewhat open due to nearly permanently flooded conditions. The shrub layer is diverse and includes Fetterbush (*Leucothoe racemosa*), Highbush blueberry (*Vaccinium corymbosum*), Silky dogwood (*Cornus amomum*), Smooth alder (*Alnus serrulata*), and Winterberry (*Ilex verticillata*).
The most abundant herbaceous species include Lizard's-tail (*Saururus cernuus*), Mermaid-weed (*Proserpinaca palustris*), Arrow arum (*Peltandra virginica*), Water-purslane (*Ludwigia palustris*), St. John's-wort (*Triadenum walteri*), and Fringed sedge (*Carex crinita*). Several rare species grow in this forest community including two State Endangered species, Louisiana sedge *(Carex louisianica)** and Dense-flowered knotweed (*Polygonum densiflorum*) and two Watch List species, Cattail sedge (*Carex typhina*) and Swamp beggar-ticks (*Bidens discoidea*). There are also two species that are considered Status Uncertain, including Bristly smartweed (*Polygonum setaceum*) and Bristling panicgrass (*Panicum aciculare*). These species may be rare in Maryland but there is not currently enough information to be certain.

*Recent information indicates that the status of these species may be changed in the near future.

Ross Branch

Site Description: A seasonally flooded, maturing swamp forest near the mainstem of Zekiah Swamp characterizes this site. The canopy is dominated by Green ash (*Fraxinus pensylvanica*), with lesser amounts of Red maple (*Acer rubrum*), Over-cup oak (*Quercus lyrata*), and Sweet gum (*Liquidambar styraciflua*). The subcanopy is dominated by Red maple, River birch (*Betula nigra*), and Green ash. The forest floor is inundated for much of the growing season. Hummocks of higher ground support a sparse shrub layer dominated by Fetterbush (*Leucothoe racemosa*) and Highbush blueberry (*Vaccinium corymbosum*). The dominant herbaceous

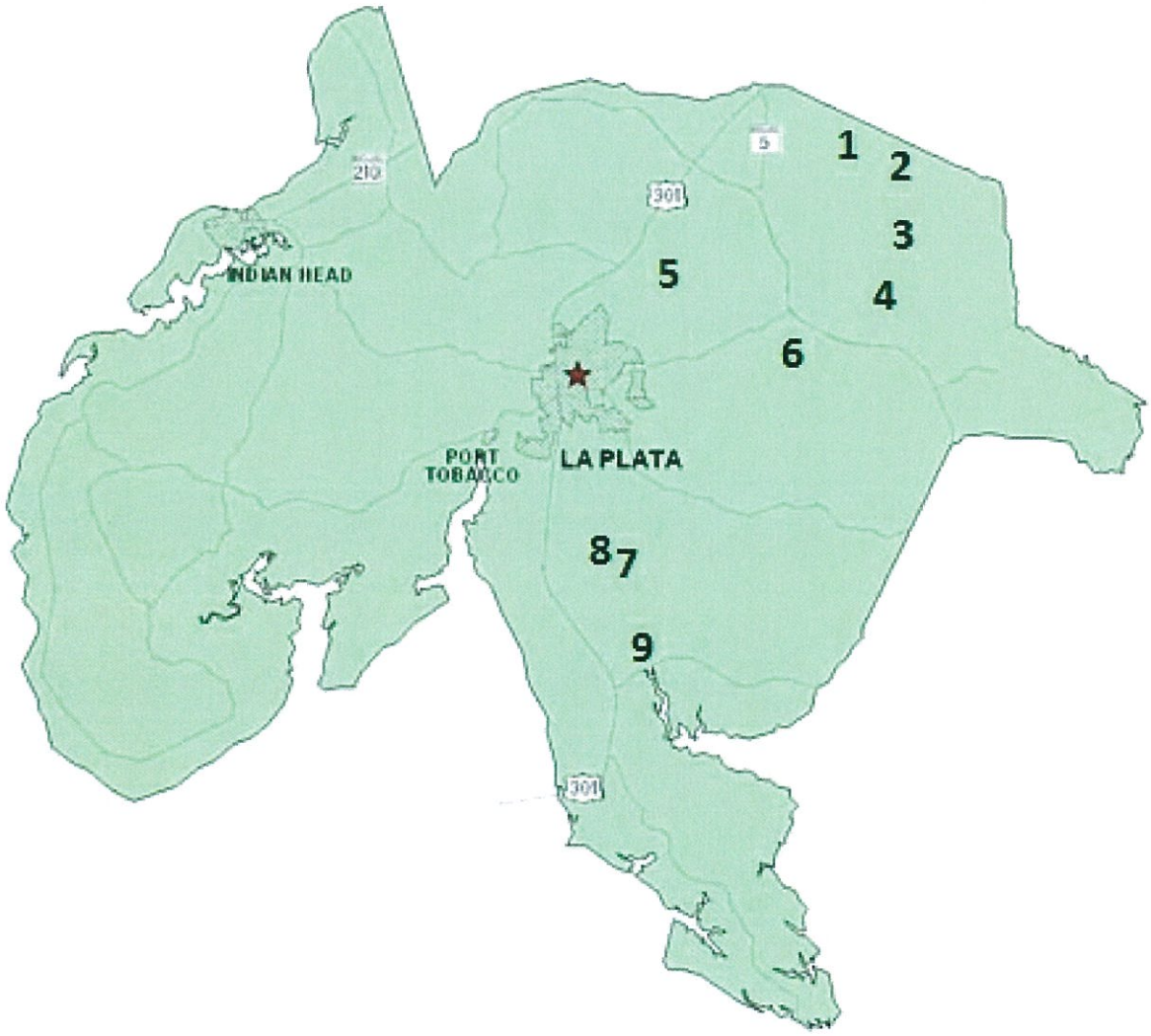
species grow in the wettest areas of the forest floor, including Lizard's-tail (*Saururus cernuus*), Wood reed-grass (*Cinna arundinacea*), Fringed sedge (*Carex crinita*), and Arrow arum (*Peltandra virginica*). Species such as Touch-me-not (*Impatiens capensis*), smartweed (*Polygonum* spp.), and St. John's- wort (*Triadenum walteri*) grow on the higher hummocks. Several rare plant species grow at this site including two State Endangered species, Louisiana sedge (*Carex louisianica*)* and
Giant sedge (*Carex gigantea*)*, and a Watch List species, Cattail sedge (*Carex typhina*). There is evidence of prior beaver activity.

*Recent information indicates that the status of these species may be changed in the near future.

Threats and Management Needs for Community Type

This forest community represents the wettest forest type found in Zekiah Swamp. This forest type is only moderately abundant within Zekiah Swamp occurring in large patches where flooding is seasonal to permanent. These forests support numerous rare plant species which are listed above. Though the very wet conditions in these forest stands may preclude logging, it is possible that trees may be cleared during years which are particularly dry. Clearing in these areas would destroy these forest communities and their rare species by opening the forest canopy and disturbing and compacting the soil. These conditions would also promote an influx of non-native species. The best examples of this forest type, such as Ross Branch and North Clark Run should be preserved and allowed to mature.

COUNTY MAP



1. County Line Trail Seep
2. Cedarville Zekiah Run
3. Devil's Nest
4. Gallant Green Woods
5. Upper Kerrick Seep
6. La Plata-Bryantown Road Woods
7. North Clark Run
8. Ross Branch
9. Wilmer Creek

Bibliography

Gauch, H.G., Jr. 1982. Multivariate Analysis in Community Ecology. Cambridge University Press, Cambridge, England. 298 pp.

Hill, M.O. 1979. "Decorana - A Fortran Program for Detrended Correspondence Analysis and Reciprocal Averaging". Cornell University, Ithaca, NY.

----------. 1979. "Twinspan - A Fortran Program for Arranging Multivariate Data in an Ordered Two-Way Table by Classification of the Individuals and Attributes". Cornell University, Ithaca, NY.

Maryland Department of Natural Resources and Smithsonian Institute Center for Natural Areas. May 1975. Compendium of Natural Features Information. Maryland Department of State Planning, Baltimore, MD. 148 pp.

Maryland Natural Heritage Program. 1996. "Ecologically Significant Areas in Zekiah Swamp Nontidal Wetland of Special State Concern: Site Newly Identified or Updated in 1995". Department of Natural Resources, Annapolis, MD. 46 pp.

Maryland Wildlife and Heritage Division. 1998. "Maryland Vegetation Classification (Draft)". Maryland Department of Natural Resources, Annapolis, MD. 940 pp.

Sneddon, L., M. Anderson, and K. Metzler. 1994. "A Classification and Description of Terrestrial Community Alliances in The Nature Conservancy's Eastern Region". Eastern Regional Office of The Nature Conservancy. 88 pp.

The Nature Conservancy Eastern Heritage Task Force. 1993. "Field Form Instructions for the Description of Sites and Terrestrial, Palustrine, and Vegetated Estuarine Communities." The Nature Conservancy, Boston, MA. 57 pp.

Weakley, A. S. 1997. "Nomenclature Guidelines for the Naming of Associations (Draft)". Southeast Regional Office of The Nature Conservancy, Chapel Hill, NC. 4 pp.

----------, K.D. Patterson, S. Landaal, and M. Pyne. 1998. "Terrestrial Vegetation of the Southeastern United States (Draft)". The Nature Conservancy Southeast Regional Office, Chapel Hill, NC. 689 pp.