



Appendix 5

Context Sensitive Design for the Red Clay Valley Scenic Byway

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Introduction

The underlying intent of the movement towards “context sensitive design” is respect for local surroundings. The term is essentially self-defining: consider the context or physical setting within which you are working and use design approaches and materials that are consistent with local conditions. For example, if typical guardrail along a roadway is steel-reinforced wood, continue to utilize such materials when improvements are made; alternatively, when efforts to slow runoff in a drainage channel necessitate rip-rap, consider the use of native stone rather than stone from other geographic areas. Context sensitive design recognizes local community character and attempts to incorporate elements of such character into future construction projects.

This appendix is intended to provide guidance to those design professionals who do work on or along the road segments of the Red Clay Valley Scenic Byway. The first part of the appendix consists of a palette of design materials or practices that are consistent with the Byway’s community character; such practices are encouraged and should be replicated or expanded as needed. Others are less conducive to the Byway’s community character and should be avoided or replaced. As part of this Corridor Management Plan, a photographic inventory of the Byway’s roadside characteristics, amenities, design features and scenic character was undertaken. Many of these photographs attest to the scenic splendors of the Valley

and provide worthy examples of design practices that should be replicated in the years to come. Others attest to past practices that are less in keeping with the characteristics of the Byway and should be avoided or replaced in future years. In some instances, photographs from outside the Byway are included to represent practices both desirable and undesirable; this was done to give guidance on practices that may not currently exist in the Byway, but may occur in the future. Finally, this section provides a list of resources for additional information.

The second component of this appendix consists of descriptions of demonstration projects that occurred recently or are underway in the Byway. Such descriptions are intended to be instructive in terms of fostering better working relationships among those determined to maintain the character and integrity of the Byway and those undertaking projects in the Byway. As these demonstration projects attest, such relationships need not be confrontational; in fact, working relationships that foster a sense of respect and openness can contribute greatly to a project’s ultimate success.

The third component of this appendix is a description of landscape management tools for the Byway. Included here is a suggested native plant list intended to be used for replacement and enhancement planting efforts in the Byway, a survey of roadside vegetation, and a list of resources for further consultation.

Palette of Design Materials

The following text and photographs are intended to demonstrate both desirable and undesirable design elements. Many of these elements currently exist in the Red Clay Valley and photographs of such features are included here where possible. Other photographs are examples found elsewhere. The practices shown here are not intended to be viewed as good or bad but rather as examples of practices that are generally consistent with or not consistent with the “context” of the Red Clay Scenic Byway. As such, “preferred practices” are those practices that are generally consistent with the character and context of the Valley and should be replicated to promote consistency; conversely, those “practices to avoid” are not consistent with the character of the Valley and should be avoided in the future.

BRIDGE TREATMENTS

Preferred Practices

The bridge treatments shown herein are generally consistent with those currently found in the Byway. In order of preference, stone or stone facing bridge treatments are the number one choice for future bridge construction. Such facing is found throughout the Byway today and is therefore highly desirable. Wooden guardrail and decorative concrete are alternatives to stone, but are not as preferable. Several covered bridges have existed in the Byway through history and this planning effort encourages their maintenance and reconstruction as needed.

1. Stone/stone facing
2. Reinforced Wooden Guardrail
3. Decorative Concrete

1



2



3



Practices to Avoid

Concrete jersey barrier exists only in a few places within the Byway and is considered both unsightly and inconsistent with the local context; furthermore, the appearance of jersey barrier misconstrues what is happening along a roadway: Is construction underway? Will the road be closed or is an alternative traffic pattern anticipated. Is the Road “finished?” Such practices should be avoided in the future.

4. Concrete Jersey Barrier

4



COMMUNITY SUBDIVISION ENTRANCES

Preferred low-impact entrances

Many housing developments and subdivisions conform well to the landscape, neither compromising the scenic, natural and historic integrity of scenic byways or detracting from the houses contained therein. Within the Scenic Byway it is highly desirable to reduce the overall impact of subdivision entrances.



Practices to Avoid - high-impact entrances

The subdivision entrances shown herein are considered high-impact entrances and are not encouraged in the Byway. Typical of such entrances are large stone, brick or stucco walls, lighting, and signs intended to promote and “advertise” the community.

Furthermore, it is the intent of this effort to limit the type and size of signage and minimize the use of “welcome to” signs found in other parts of New Castle County.



CURBING

Preferred Practices

In general, curbing is recommended along Byway road segments only when specifically needed for public safety. Where curbing is specifically warranted, several kinds of curbing materials are available which lessen their visual impact and minimize disturbance; among them are granite curb, dyed concrete curb, and rolled macadam curb.

1. Granite curb
2. Dyed concrete curb
3. Rolled macadam curb



Practices to Avoid

The least sightly of the curbing materials available is undyed concrete curb. Concrete curb tends to stand out and can draw the eye away from other aspects of the road.

4. Concrete curb



FENCING

Preferred Practices

Many styles of fencing exist and it is difficult to present a comprehensive list of the various styles and materials available. It is strongly recommended that fencing be visually transparent as transparent fencing helps maintain the scenic quality of the Byway (such as the scenic vistas and accents found throughout the Byway). The most widely used style of fencing in the Byway today is post and rail.

1. Post and rail

1



Practices to Avoid

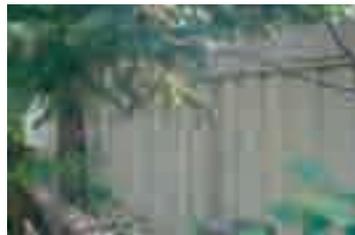
Certain styles of fencing lend themselves more to urban and industrial settings. Such is often the perception garnered by chain link fence or similar “barrier” fences that are intended to strictly limit access. Solid fencing, while not necessarily unsightly, prohibits visual access. Where filtering or opacity is important, it is recommended that vegetative screens be used in conjunction with transparent fencing.

2. Chain link fence
3. Solid landscape fence

2



3



GUARDRAILS

Preferred Practices

In general, the use of guardrail is only recommended along Byway road segments when specifically needed for safety. While guardrail exists in several locations throughout the Byway, there is little consistency to the style and type of guardrail used. This planning effort undertook a comprehensive evaluation of the guardrail of the Byway. It is recommended that a consistent approach be taken when replacing or installing guardrail in the future. The practices listed herein are currently found in the Byway and are recommended for future applications when guardrail is required.

- 1. Reinforced Wooden Guardrail
- 2. Concrete/stone faced Guardrail
- 3. Weathering Steel Beam Guardrail

1



2



3



Practices to Avoid

Although several of the guardrails shown below exist in the Byway today, they are not recommended for use in the future. In general, these practices are not consistent with the overall character of the Byway.

- 4. Concrete Jersey Barrier
- 5. Steel Beam Guardrail
- 6. Epoxy coated Steel Beam Guardrail

4



5



6



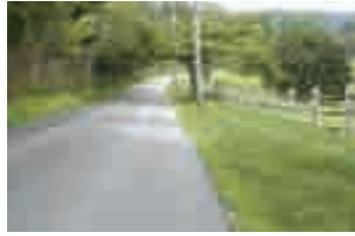
ROAD CHARACTERISTICS (cartway width, lining, etc.)

Preferred Practices

While many of the roads of the Byway are narrow and unlined, others are much wider and striped accordingly. This character contributes both to the overall sense of the Byway and to the “feel” of individual roads. Although traffic volume and safety certainly play a role in roadway width and striping, this planning effort encourages DelDOT to maintain existing cartway widths on all roads in the Byway to the extent feasible. Furthermore, it is hoped that road striping not be overused. Past experience indicates that striping, while intended to promote safety and convey the rules of the road, often contributes to excessive driving speed; conversely, maintaining the rural characteristics of roads often contributes to lower driving speeds.

1. Maintain existing cartway widths
2. No striping
3. Single line striping

1



2



3



SIGNAGE

Preferred Practices

In general, this planning effort encourages the use of signage that respects the character of the Byway, neither detracting from the intrinsic qualities of the Byway nor contributing to scenic blight. In particular, this refers to the desire to encourage signage that utilizes natural components (such as wood and stone) and contributes to the physical surroundings of which it is a part.

1



Practices to Avoid

The use of brightly colored and/or inappropriately lighted signs is distracting. Furthermore, the use of excessive signage, such as the neighborhood “welcome to” signs found elsewhere in New Castle County, is visually distracting and takes away from the character of the Byway. The corridor management plan indicates that a survey of roadway signs will be undertaken and conveyed to DelDOT for future action. In addition, meetings with both DelDOT and New Castle County will be scheduled to discuss sign regulations and placement.

2



STORMWATER MANAGEMENT FACILITIES

Preferred Practices

In general, it is the objective of this Plan to encourage the use of green technology best management practices (BMPs) throughout the watershed. Such practices have obvious advantages, such as recharging groundwater and addressing runoff volumes, as well as some less obvious advantages, such as using vegetated practices and natural materials that blend into the landscape and contribute to community character. The practices shown below are but a few of the many “non-structural” BMPs available for use within the Byway.

- 1. Vegetated Practices
- 2. Natural stone rip rap

1



2



Practices to Avoid

Many of the “structural” facilities shown below are inconsistent with the character of the Byway for several reasons: they utilize materials not found in the valley, they are often unsightly, and they generally only partially address the stormwater management requirements of permitting agencies (infiltration, volume control, peak rate control, etc.). The examples shown below, while for illustrative purposes only, indicate the kinds of practices that should be avoided.

- 3. Stormwater Basin
- 4. Rip Rap composed of stone not consistent with that found in the Valley
- 5. Concrete Swales
- 6. Outlet Structure

3



5



UTILITIES

Adequate public utilities are a necessity of modern life and this effort in no way encourages reductions in services or changes that will lead to service failures. On the contrary, this effort wishes to assure that adequate public facilities be maintained and expanded as needed to serve the residents and businesses of the Valley. That said, it is of paramount importance that the provision of public infrastructure not compromise the resources of the Valley this planning effort strives to preserve. The practices shown below are intended to demonstrate sensitive approaches to the provision of services; conversely, practices to be avoided are documented as well.

For example, cell phones towers can be “camouflaged” to lessen their visual impact. Transformers can be screened to reduce their often unsightly appearance. Sensitive pruning practices can achieve multiple objectives, including: reducing the potential for power outages, buffering power lines from scenic viewsheds, and ensuring the health and longevity of the trees themselves. Also listed here are native plant species appropriate under or near power lines. Finally, lighting practices are available that can illuminate in a manner that does not detract from the Byway.

Preferred Practices

1. Cell phone towers
2. Lighting
3. Pruning practices

Practices to Avoid

4. Cell phone towers
5. Lighting
6. Pruning practices
7. Transformers (undesirable, no screening)



EXAMPLES OF NATIVE PLANT SPECIES APPROPRIATE UNDER OR NEAR POWER LINES

While sensitive pruning practices are extremely important, careful consideration must also be given to planting new vegetation near power lines. In general, it is not recommended that plants be placed directly under power lines; however, in those instances where plants are to be located under or near power lines, the following species native to Delaware are considered compatible. The trees are listed by their common name followed by their scientific name in parenthesis.

Compatible Trees for Planting Under or Near Power Lines:

- Cherry, Choke (*Prunus virginiana*)
- Crabapple, Flowering (*Malus coronaria*)*
- Dogwood, Flowering (*Cornus florida*)
- Dogwood, Gray (*Cornus racemosa*)
- Fringe Tree (*Chionanthus virginicus*)
- Hawthorn, Cockspur (*Crataegus crus-galli*)
- Hawthorn, Dotted (*Crataegus punctata*)
- Redbud, Eastern (*Cercis canadensis*)

Evergreens For Screens:

- Redcedar, Eastern (*Juniperus virginiana*)

* *Malus coronaria* is the only species of flowering crabapple native to the Delaware Piedmont

WALLS/RETAINING WALLS

Preferred Practices

Historically, the walls of the Red Clay Valley were made from field stone typically found in the area (and often removed to permit the planting of field crops). Many such walls remain today and contribute significantly to the character of the Byway. Other natural materials, such as wood and brick have also been used in recent years with much success. The practices shown below are encouraged.

1. Native stone
2. Railroad ties

1



2



Practices to Avoid

Walls made of material unsuited to the Byway are not encouraged, including those walls made from concrete or concrete forms.

3. Formed concrete

3



RESOURCES – PALETTE OF DESIGN MATERIALS

The resources listed below provide additional information on design materials geared towards contextual sensitivity.

- *Better Models for Development in Delaware*, 2003, prepared by The Conservation Fund in partnership with the Livable Delaware Advisory Council and the Office of State Planning Coordination
- *Conservation Design for Subdivisions*, 1996, prepared by Randall G. Arendt
- Context Sensitive Solutions - www.contextsensitivesolutions.org
- *Context Sensitive Solutions for Work on Scenic Byways*, 2005, prepared by Oldham Historic Properties, Inc. for Maryland State Highway Administration
- *Conserving Our Treasured Places: Managing Visual Quality on Scenic Byways*, prepared by Scenic America for the America's Byways Resource Center
- *A Guide for Achieving Flexibility in Highway Design*, 2004, prepared by the American Association of State Highway and Transportation Officials
- *Outdoor Lighting Code Handbook*, 2000, prepared by the International Dark Sky Association
- *Scenic Solutions: Designs and Methods to Save America the Beautiful*, 2003, prepared by Scenic America and the USDA Natural Resources Conservation Service

DEMONSTRATION PROJECTS

The demonstration projects described below involve both prospective road work and road work undertaken in the past within the Red Clay Valley Scenic Byway. Both projects involved careful negotiations with DelDOT and others and are seen as beneficial examples of the value of citizen action and involvement in road construction projects.

Brackenville Road Improvements A Case Study

Background

Well before the designation of Brackenville Road as one of the twenty-eight road segments that compose the Red Clay Valley Scenic Byway, the Delaware Nature Society had a strong interest in preserving the corridor. Since 1976, the Delaware Nature Society's headquarters, Ashland Nature Center, has been located on land owned by the Red Clay Reservation that lies immediately adjacent to the intersection of Brackenville and Barley Mill Roads. The wooded riparian corridor, open meadow, and Indian Rill stream (a tributary of the Red Clay Creek) have been utilized for hands-on natural history and environmental education programming for Delaware Nature Society members, school groups, and public groups, such as girl and boy scouts.

Delaware Nature Society staff, residents along Brackenville Road, and other interested individuals participated in a DelDOT working group from the Spring of 2005 to the Spring of 2007 to help identify suitable solutions to address the ongoing drainage and safety concerns along the roadway. Ultimately the working group was discontinued and DelDOT initiated the construction design process.

Proposed Project

On July 26, 2005, DelDOT representatives met with Delaware Nature Society staff to discuss their preliminary plans for the "Ashland Curve" section of the roadway. On the north side, the "Ashland Curve" is bordered by trees, a steep slope, and the Indian Rill stream and associated floodplain; a steep, wooded slope borders the road on the south side. The road in this area has been

plagued with drainage concerns, improper road profile and slope, and severe erosion/undercutting of the roadbed by the adjacent stream. The preliminary plan included:

- limiting disturbance to the north side of the road, protecting the steep, wooded slope on the south;
- correcting the super-elevation of the roadbed;
- installing curb to tie-in the steep slope on the south side of the road;
- installing catch basins to eliminate water from the road surface;
- discharging stormwater from the road directly to the stream and utilizing rip rap for scour protection at the outfalls;
- installing guardrail on the north side of the road and creating a 1:1 slope behind the guardrail;
- removing the majority of trees on the north slope; and
- relocating and restoring sections of the Indian Rill stream.

During the initial July meeting, Delaware Nature Society staff alerted the DelDOT project representatives that Brackenville Road was part of the Red Clay Valley Scenic Byway designated earlier that year and that a Steering Committee had been formed to draft the Corridor Management Plan for the Byway. Delaware Nature Society staff requested that DelDOT review the project with the Steering Committee and that jointly the groups explore context sensitive solutions.

Marc Cote and Shante Hastings, Squad Managers, and Joe Hofstee, Project Engineer, met with Delaware Nature Society staff and Steering Committee members on September 14, 2005 to review the preliminary plans. The Steering Committee raised many questions/concerns, particularly regarding:

- road width – the Steering Committee preferred no expansion of the cartway widths;
- guardrail – the Steering Committee’s first preference was for no guardrail; reinforced wooden guardrail was the Committee’s second choice and weathering steel guardrail was the third;
- curbing – the Steering Committee’s first preference was for no curb; if needed, 2” curb was preferred over 8” curb and dyed concrete curb was encouraged;

- tree removal/replacement – the Steering Committee encouraged limited tree disturbance and requested a list of all trees (location and species) slated for removal; the Committee insisted all replacement species be native;
- stormwater management – the Steering Committee encouraged DelDOT to explore alternatives to traditional stormwater management structures and utilize indigenous stone rather than rip rap; and
- stream restoration – the Steering Committee was pleased to learn that Rosgen methodology would be utilized for the stream relocation and restoration; the Committee encouraged DelDOT to contact DNREC regarding the recent Pike Creek project; many concerns were expressed about the stream impacts, particularly given the limited detail of the plans at that time.

DelDOT agreed to review the Steering Committee’s concerns/suggestions and report back on any changes. Delaware Nature Society staff maintained regular contact with DelDOT.

On May 9, 2006, DelDOT representatives and consultants from Oasis Design Group participated in a site walk of Brackenville Road with Delaware Nature Society staff and members of the Steering Committee to review the updated version of the construction plans and discuss the context sensitive design issues raised by the Committee. While some progress had been made, many of the Committee’s initial concerns remained.

Delaware Nature Society staff and members of the Steering Committee again met with DelDOT representatives on March 2, 2007. The purpose of the meeting was to review the most recent plan updates and discuss what would be presented at the public workshop the following month. The following decisions were reached regarding the issues originally raised by the Steering Committee:

- road width – the existing cartway width would be maintained;
- guardrail – DelDOT determined that guardrail was essential for safety reasons; the reinforced wooden guardrail could not be utilized because of the slope and it did not have acceptable end treatment options, so weathering steel guardrail would be installed;
- curbing – DelDOT determined that an 8” curb was needed to prevent impacts to the southern

slopes during tie-in; dyed concrete would be used for the curb – the public would be presented with three color choices recommended by the Committee for selection at the public workshop;

- tree removal/replacement – Oasis Design Group conducted an inventory of the existing roadside vegetation and identified those trees that would be preserved and those that would be removed – the removal was considered tree by tree rather than bulk clearing – a draft list of native species for mitigation was proposed;
- stormwater management – limited changes were made to the stormwater management structures, with the possible exception of the use of swales at the outfalls; and
- stream restoration – DelDOT utilized the expertise of DNREC staff regarding the stream restoration project – overall the Committee’s concerns were satisfied.

Delaware Nature Society staff and members of the Steering Committee participated in the public workshop for the Brackenville Road Improvement Project held at the Ashland Nature Center on April 11, 2007. The feedback from the public and members of the Steering Committee was generally positive, particularly in relationship to the context sensitive solutions that were proposed.

DelDOT is now pursuing right-of-way acquisition for the project and anticipates completing final plans for Brackenville Road by October 2007. Construction is scheduled to begin in Spring 2008.

Lessons Learned

The Brackenville Road improvements will be the first major construction project to occur on a Red Clay Valley Scenic Byway road since the designation in April 2005. The project could set a precedent for future road improvement efforts.

The Steering Committee was in the early process of developing the Corridor Management Plan for the Byway when preliminary discussions about the Brackenville Road project began. Ultimately, this project and negotiations with DelDOT regarding context sensitive solutions framed much of the thinking about the goals, objectives, and strategies outlined in the Corridor Management Plan and the accompanying appendices, and fostered the Steering Committee’s

desire to enter into a Memorandum of Understanding with DelDOT.

Final plans are not yet complete and construction is still several months away, so the ultimate outcome of the Brackenville Road project remains to be seen. The Steering Committee was able to negotiate some compromises with DelDOT regarding context sensitive solutions, although not successful in meeting all of the initial goals.

The communication process with DelDOT was generally satisfactory and should be enhanced through the Memorandum of Understanding. Scenic Byway designation should be included and play a prominent role in DelDOT road design efforts (including the use of context sensitive design), public notices and workshops for future projects along designated road segments.

Mt. Cuba Road Improvements *A Case Study*

Background

This DelDOT project involved road improvements along Mt. Cuba Road with a commensurate condemnation action that had been filed as part of the planning process. At the time of community involvement, construction and right of way plans had already been drawn. Although some outreach to the public had been attempted, such negotiations had been limited and non-productive.

The road improvement project involved taking of land around an existing bridge over a stream and through fenced pasture land. There was a vegetative cover on the bank of the stream made up largely of native trees, some of which were to be affected or removed to accommodate construction.

Negotiations

The first need identified was to establish a formal contact with DelDOT and build a working relationship. An initial meeting allowed for a full discussion of the project and allowed those involved to obtain copies of the current construction and right of way plans. This in turn allowed an independent evaluation of the proposed taking and a determination as to whether the taking was excessive for the needs of the project. Although a review of the DelDOT drawings by independent legal experts, engineers and plant experts did not

indicate any objections to the plans themselves, such advisors indicated that the proposed extent of the taking was not necessary. As such, tentative revisions to the planning documents were prepared in-house in advance of a second meeting with DelDOT.

The second meeting with DelDOT was held on-site. At this meeting, the concerned parties first established the dimensions of the project in the field and discussed the tentative revisions. Staff of the Mt. Cuba Center were able to point out those trees and other significant vegetation within the project area that should be preserved. After some discussion, DelDOT agreed to the changes identified. In order to facilitate protection of vegetation, it was also agreed by all parties that the plan changes would necessitate continued contact with the DelDOT field superintendent located in the construction trailer.

Lessons Learned

In this case, the existence of a condemnation action became an advantage. Not only did the action result in property owner notification, but once an agreement had been reached regarding preservation and operational details during construction, it was incorporated as conditions to the Order of Possession entered by the Superior Court.

In addition, Mt. Cuba staff were able to negotiate a substitution program for plants that had to be removed. As to those that remained, a system of marking was established to facilitate monitoring of the site by both parties.

Frequent visits to the site were essential. The contractor and DelDOT supervisors on-site responded well to monitoring and remained cordial throughout the construction process, despite the need for occasional visits to the construction office to ensure enforcement of the agreements made. Throughout the process, it was important to be familiar with and respect DelDOT constraints and project time schedules. Mutual respect was a key to successful field negotiations.

The end results were road improvements everyone supported. For their part, DelDOT responded positively to the ideas generated by the concerned parties, even when they did not agree. One of the most important lessons learned is the need to become involved in the process as early as possible; early involvement allows for a thorough discussion of the greatest number of options.

A Selected List of New Castle County, Delaware Native Plants for Use in Context Sensitive Design Applications

Every region has its own unique assemblage of native plants—often referred to as its “flora”. These plants have inhabited the land for millennia and provide the qualities that humans associate with the forest’s natural character. The Red Clay Valley in northern New Castle County, Delaware is no exception and contains a rich and diverse array of native plants.

The following list contains a subset of the native plants found in northern New Castle County as determined by the Delaware Natural Heritage Program. It is intended to be a guide for assisting natural areas professionals, developers, homeowners’ associations, landscapers, gardeners, and others in the plant selection process to retain the context sensitive character of the Red Clay Valley Scenic Byway through landscape development, restoration or maintenance activities.

A Selected List of New Castle County, Delaware Native Plants for Use in Context Sensitive Design Applications

SCIENTIFIC NAME	COMMON NAME	WETLAND INDICATOR STATUS	HABITAT	SEASON(S) OF INTEREST
<i>Alnus incana</i>	smooth alder	OBI	Tree and river banks, floodplains	Summer foliage
<i>Aralia nudicaulis</i>	red chokeberry	IACW	Swamps and wet woods	Spring flowers, autumn foliage, color and fruit
<i>Aronia melanocarpa</i>	black chokeberry	IAC	Moist woods	Spring flowers, autumn foliage, color and fruit
<i>Aronia prunifolia</i>	purple chokeberry	IACW	Thickets, old fields, edge-	Spring flowers, autumn foliage, color and fruit
<i>Azogone distachya</i>	poa	IACU	Moist woods	Spring flowers, autumn foliage, color and fruit
<i>Ceanothus americanus</i>	New Jersey tea	OBI	Dry, fertile soils	Spring flowers, autumn foliage, color and fruit
<i>C. glaberrimus</i>	blueberry	OBI	Wet meadows	Summer foliage and flowers
<i>C. ovatus</i>	sweet fern	OBI	Dry, sandy soils	Summer foliage
<i>C. rostratus</i>	alternate-leaf dogwood	OBI	Rich woods along streams	Spring flowers, summer foliage and fruit
<i>Cornus alternifolia</i>	dogwood	IACW	Swamps, wet meadows, marshes	Summer flowers, autumn fruit
<i>Cornus florida</i>	flowering dogwood	IACW	Woods	Spring flowers, autumn foliage and fruit
<i>Cornus rugosa</i>	stiff dogwood	IAC	Open low to dry woods and thickets	Spring flowers, summer foliage and fruit
<i>Cornus stricta</i>	red-osier dogwood	IACW	Swamps, stream banks, wet meadows	Spring flowers, autumn fruit, year round bark color
<i>Corylus americana</i>	American hazelnut	IACU	Woods	Spring flowers, autumn fruit
<i>Corylus rostrata</i>	beaked hazelnut	IACU	Rocky woods	Spring flowers, autumn fruit
<i>C. rostrata</i>	cockspur hazelnut	IACU	Thickets, low ground, floodplains	Spring flowers, autumn fruit
<i>Dioscorea</i>	groundnut	OBI	Rich, rocky woods	Summer flowers
<i>Dioscorea</i>	northern nutmeg	OBI	Rich, rocky woods	Spring flowers, winter habit
<i>Dioscorea</i>	northern nutmeg	OBI	Rich, rocky woods	Spring flowers, year-round foliage
<i>Erythronium</i>	trillium	OBI	Dry, shady, wooded slopes	Autumn fruit, year-round bark color
<i>Fragaria virginiana</i>	strawberry bush	IAC	Woods	Autumn fruit
<i>Fragaria virginiana</i>	eastern wildrose	IACU	Moist woods and slopes	Spring flowers, autumn and winter fruit, year-round foliage
<i>Gaultheria procumbens</i>	tealsberry	IACU	Moist to dry, sandy woodlands	

SCIENTIFIC NAME	COMMON NAME	WETLAND INDICATOR STATUS	HABITAT	SEASON(S) OF INTEREST
SHRUBS (cont'd.)				
<i>Fraxinus bicolor</i>	black hickberry	FAC	Dry sandy woods	Spring flowers, autumn foliage
<i>Fraxinus pr-flores</i>	hempberry	FAC	Mead in dry sandy woods	Spring flowers, autumn fruit
<i>Himantoxis fragrans</i>	American witch-hazel	FAC	Woods	Autumn flowers and foliage
<i>Hicoria arborea</i>	wild hickory	FAC	Rich rocky swamps and streambanks	Summer flowers
<i>Hicoria spongaria</i>	hickory bl. Andree's cross	UI	Dry sedge swals	Summer flowers
<i>Ilex cornifolia</i>	winterberry, holly	FACW	Moist woods and swamps	Autumn fruit; winter fruit
<i>Kalmia latifolia</i>	mountain laurel	FAC	Mead in dry woods and slopes	Spring flowers, year-round foliage
<i>Condalia sanguinea</i>	spicebush	FACW	Moist woods and swamps	Spring flowers, autumn foliage; and fruit
<i>Lyonia ligustrina</i>	blueberry	FACW	Swamps and wet thicket	Summer flowers, autumn foliage
<i>Myrica pensylvanica</i>	northern bayberry	FAC	Sandy woods	Summer foliage, autumn and winter fruit
<i>Physalis peruviana</i>	eastern topebark	FACW	Stream banks	Summer flowers, autumn foliage
<i>Quercus bicolor</i>	white oak	UI	Open sterile soils	Autumn foliage
<i>Quercus laevis</i>	dwarf chinquapin oak	UI	Open sterile soils, serpentine soils	Autumn foliage
<i>Rhus glabra</i>	smooth sumac	FAC	Woods	Spring flowers, autumn foliage
<i>Rhus copallina</i>	winged sumac	FAC	Barrens, old fields edges	Summer flowers, autumn foliage and fruit
<i>Rhus glabra</i>	smooth sumac	UI	Barrens, old fields edges	Summer flowers, autumn foliage and fruit
<i>Rhus typhina</i>	winged sumac	UI	Barrens, old fields, edges	Summer flowers, autumn foliage and fruit, year-round bark
<i>Rosa carolina</i>	Carolina rose	UI	Sandy pine lands and swampy ground	Summer flowers
<i>Rosa virginiana</i>	Virginia rose	UI	Sandy soils	Summer flowers
<i>Rubus odoratus</i>	purple flowering raspberry	UI	Rich rocky woods	Summer foliage and flowers
<i>Sally discolor</i>	pusy willow	FACW	Humid moist wooded slopes	Spring flowers
<i>Sally laetiflora</i>	fall, prairie willow	UI	Dry thicket, sterile soils, edges	Spring flowers
<i>Sally laetiflora</i>	dwarf willow	UI	Dry thicket, sterile soils, edges	Spring flowers
<i>Sambucus racemosa</i>	common elderberry	FACW	Open swamps and seeps	Summer flowers, autumn fruit
<i>Spiraea alba</i>	halloweal meadow-sweet	FACW	Seepage meadow	Spring flowers
<i>Spiraea alba</i>	northern meadow-sweet	FAC	Seepage meadows	Spring flowers
<i>Spiraea praeifolia</i>	American halloweal	FAC	Rich woods	Spring flowers

SCIENTIFIC NAME	COMMON NAME	WETLAND INDICATOR STATES	HABITAT	SEASON(S) OF INTEREST
TREES				
<i>Lonicera caerulea</i>	late hawthorn	WAC	Humid woods and clearings	Spring flowers, autumn fruit
<i>Lonicera xylosteum</i>	highbush blueberry	WAC, W	Swamps and wet woods	Spring flowers, summer fruit, autumn foliage
<i>Lonicera canadensis</i>	early hawthorn	W, WI, W	Dry slopes and sandy woods	Spring flowers, autumn fruit
<i>Lonicera canadensis</i>	sourwood	W, WI, W	Sandy woods	Spring flowers, autumn fruit
<i>Lonicera canadensis</i>	maple-leaf viburnum	W, WI, W	Woods	Spring flowers, autumn foliage and fruit
<i>Lonicera canadensis</i>	southern arrowwood	W, WI, W	Metal woods and swamps	Spring, autumn
<i>Lonicera canadensis</i>	possum-haw	W, WI, W	Swamps	Spring, autumn
<i>Lonicera canadensis</i>	ground hickory	W, WI, W	Rich woods, thickets, edges	Spring, autumn
<i>Lonicera canadensis</i>	northern prickly ash	W, WI, W	Rocky wooded slopes	Summer, autumn
<i>Lonicera canadensis</i>	box elder	W, WI, W	Floodplains of rivers and creeks	Summer foliage
<i>Lonicera canadensis</i>	red maple	W, WI, W	Floodplains of rivers and creeks	Autumn foliage
<i>Lonicera canadensis</i>	silver maple	W, WI, W	Floodplains of rivers and creeks	Summer foliage
<i>Lonicera canadensis</i>	sweetgum	W, WI, W	Rich woods	Autumn foliage
<i>Lonicera canadensis</i>	downy dogwood	W, WI, W	Metal woods and slopes	Spring flowers, autumn foliage
<i>Lonicera canadensis</i>	smooth shadbush	W, WI, W	Metal woods, thickets, edges	Spring flowers, autumn foliage
<i>Lonicera canadensis</i>	sweet birch	W, WI, W	Dry and moist woods	Autumn foliage, year-round bark color
<i>Lonicera canadensis</i>	oak	W, WI, W	Floodplains of rivers and creeks	Summer foliage, year-round bark color
<i>Myrica asplenifolia</i>	gray birch	W, WI, W	Edges of woods and thickets	Summer foliage, year-round bark color
<i>Quercus alba</i>	northern	W, WI, W	Woods, banks of creeks and streams	Autumn foliage, year-round bark
<i>Quercus alba</i>	mockernut hickory	W, WI, W	Woods	Autumn foliage
<i>Quercus alba</i>	bitternut hickory	W, WI, W	Woods	Autumn foliage
<i>Quercus alba</i>	prairie hickory	W, WI, W	Woods	Autumn foliage
<i>Quercus alba</i>	small-leaved hickory	W, WI, W	Woods	Autumn foliage
<i>Quercus alba</i>	sharp bark hickory	W, WI, W	Rich woods	Autumn foliage
<i>Quercus alba</i>	American chestnut	W, WI, W	Woods	Autumn foliage, year-round bark
<i>Quercus alba</i>	common hickory	W, WI, W	Sandy woods	Summer foliage and flowers
<i>Quercus alba</i>	northern red oak	W, WI, W	Rich woods	Spring flowers, autumn foliage

SCIENTIFIC NAME	COMMON NAME	WETLAND INDICATOR STATUS	HABITAT	SEASON(S) OF INTEREST
TREES (cont'd)				
<i>Thuja occidentalis</i>	Thuja tree	FAC	Moist woods	Spring flowers, autumn foliage and fruit
<i>Taxodium virginicum</i>	Swampcypress	FAC	Wet and dry woods, thickets, fields	Autumn fruit, year-round bark
<i>Taxus canadensis</i>	American beech	FACU	Woods	Autumn foliage, year-round bark
<i>Taxus americana</i>	White ash	FACU	Woods	Autumn foliage
<i>Taxus nigra</i>	Black ash	FACW	Seepage swamps	Summer foliage
<i>Taxus procumbens</i>	Green ash	FACW	Moist woods and swamps	Summer foliage
<i>Taxus sp.</i>	American holly	FACU	Moist sandy woods and swamps	Autumn and winter fruit, year-round foliage
<i>Tilia cordata</i>	Waterlily	FACU	Moist woods, edges and floodplains	Summer foliage, autumn fruit
<i>Tilia americana</i>	Black walnut	FACU	Moist woods, floodplains, edges	Summer foliage, autumn fruit
<i>Tilia americana</i>	Red cedar	IPU	Old fields, edges, sterile soils	Autumn and winter fruit, year-round foliage
<i>Ulmus americana</i>	Sweet gum	FAC	Swamps and moist woods	Autumn foliage
<i>Ulmus americana</i>	Sulphur	FACU	Rich woods	Spring flowers, autumn foliage
<i>Ulmus americana</i>	Sweet sapling	IPU	Old fields, thickets, tree banks	Spring flowers
<i>Ulmus americana</i>	Red mulberry	FACU	Rich woods, thickets and edges	Summer foliage and fruit
<i>Ulmus americana</i>	Black gum	FACU	Woods	Autumn foliage
<i>Ulmus americana</i>	Eastern hop hornbeam	FACU	Rich woods and slopes	Autumn foliage and fruit, year-round bark
<i>Ulmus americana</i>	Pitch pine	FACU	Dry sandy soils	Spring, summer, autumn, winter
<i>Ulmus americana</i>	Yellow pine	IPU	Sandy woods, edges, old fields	Spring, summer, autumn, winter
<i>Ulmus americana</i>	Large leaf sycamore	FACU	Woods, thickets and low ground	Summer foliage
<i>Ulmus americana</i>	Wild black cherry	FACU	Woods, gallery, old fields	Spring flowers
<i>Ulmus americana</i>	White oak	FACU	Woods	Autumn foliage
<i>Ulmus americana</i>	Scarlet oak	IPU	Woods	Autumn foliage
<i>Ulmus americana</i>	American red oak	FACU	Dry sandy woods	Autumn foliage
<i>Ulmus americana</i>	Black oak	IPU	UP, sandy soils	Autumn foliage
<i>Ulmus americana</i>	Pin oak	FACW	Swamps and wet woods	Autumn foliage
<i>Ulmus americana</i>	Live oak	IPU	Dry, steep, wooded slopes	Autumn foliage
<i>Ulmus americana</i>	Northern red oak	FACU	Rich woods	Autumn foliage
<i>Ulmus americana</i>	Post oak	IPU	Sandy woods	Autumn foliage

SCIENTIFIC NAME	COMMON NAME	WETLAND INDICATOR STATUS	HABITAT	SEASON(S) OF INTEREST
TREES (round leaf)				
<i>Quercus bicolor</i>	black oak	CPC	Woods	Autumn foliage
<i>Salix nigra</i>	black willow	LCUW	Marshes, wet meadows, ditches	Spring thicket
<i>Nyctaginia alba</i>	swamp tree	LCUW	Woods, grassy fields	Autumn foliage
<i>Alnus incana</i>	American hickory	CPC	Rocky woods and stream banks	Summer and autumn foliage
<i>Fraxinus americana</i>	white hickory	LCUW	Unpopulated fields	Year-round foliage
BIRDS				
<i>Abertanus ludovicianus</i>	northern flicker	CPC	Rocky woods	Summer foliage
<i>Colaptes auratus</i>	scarlet tanager	LCUW	Moist woods, open fields, rock walls	Year-round foliage
<i>Geothlypis trichas</i>	indigo bunting	CPC	Rocky wooded slopes	Year-round foliage
<i>Agelaius phoeniceus</i>	great egret	CPC	Rocky woods	Summer foliage
<i>Chondestes motacilla</i>	townsend solitaire	LCUW	Moist woods and fields	Summer foliage
<i>Empidonax griseus</i>	gray kinglet	LCUW	Moist woods and fields	Summer foliage
<i>Chondestes motacilla</i>	townsend solitaire	CPC	Rocky wooded slopes	Summer foliage
<i>Protonotaria citreolinea</i>	citrus kinglet	LCUW	Dry woods and fields	Summer and autumn foliage
<i>Protonotaria citreolinea</i>	citrus kinglet	LCUW	Rocky woods, swamps, fields	Summer and autumn foliage
<i>Protonotaria citreolinea</i>	citrus kinglet	LCUW	Swampy woods	Summer and autumn foliage

SCIENTIFIC NAME	COMMON NAME	WETLAND INDICATOR STATUS	HABITAT	SEASON(S) OF INTEREST
PERENNIALS				
<i>Desmodium illinoense</i>	crested wood fern	I-ACW	Scupper swamps	Summer foliage
<i>Desmodium nudiflorum</i>	larkspur wood fern	I-AC	Moist rich woods	Year-round foliage
<i>Desmodium nudiflorum</i>	resplendent wood fern	I-ACU	Moist woods, swamps and floodplains	Summer foliage
<i>Desmodium nudiflorum</i>	marginal wood fern	I-ACU	Steep slopes and rocky woods	Year-round foliage
<i>Desmodium nudiflorum</i>	Sensative fern	I-ACW	Swamps, floodplains, wet meadows	Summer foliage, winter ferns
<i>Desmodium nudiflorum</i>	cranium fern	I-ACW	Swamps, floodplains, wet woods	Spring to late trends, summer and autumn foliage
<i>Desmodium nudiflorum</i>	interrupted fern	I-ACU	Rich woods and slopes	Spring and summer foliage
<i>Desmodium nudiflorum</i>	royal fern	I-ACU	Swamps and marshes	Spring leaflets, foliage, summer and autumn foliage
<i>Polystichum acrostichoides</i>	Christmas fern	I-ACU	Rich woods and slopes	Year-round foliage
<i>Polystichum acrostichoides</i>	New York fern	I-AC	Moist woods, swamps and floodplains	Summer foliage
<i>Polystichum acrostichoides</i>	marsh fern	I-ACW	Floodplains, wet meadows, marshes	Summer foliage
HERBACEOUS PERENNIALS				
<i>Artemisia biennis</i>	white hellebore	I-PI	Rocky woods and slopes	Spring flowers, summer foliage, autumn fruit
<i>Asplenium platyneuron</i>	illy poison	I-PI	Dry to moist wooded slopes, swamps	Summer foliage and flowers
<i>Asplenium platyneuron</i>	wood anemone	I-ACU	Moist woods, streambanks, floodplains	Spring flowers
<i>Asplenium platyneuron</i>	Virginia asphodel	I-ACU	Woods and edges	Spring flowers
<i>Asplenium platyneuron</i>	gillyweed	I-PI	Rich woods and slopes	Winter foliage, summer flowers
<i>Asplenium platyneuron</i>	wild columbine	I-PI	Rich woods	Spring flowers
<i>Asplenium platyneuron</i>	wild sarsaparilla	I-ACU	Woods	Summer foliage and flowers
<i>Asplenium platyneuron</i>	American storkbill	I-PI	Rich woods	Summer foliage, autumn fruit
<i>Asplenium platyneuron</i>	green dragon	I-ACW	Rich floodplain woods	Spring flowers, autumn fruit
<i>Asplenium platyneuron</i>	swamp black mulla	I-ACW	Woods	Spring flowers, autumn fruit
<i>Asplenium platyneuron</i>	Virginia snake root	I-PI	Rich woods	Summer flowers
<i>Asplenium platyneuron</i>	Canada wild ginger	I-ACU	Rich woods and floodplains	Summer foliage
<i>Asplenium platyneuron</i>	four-leaved milkweed	I-PI	Dry to moist wooded slopes	Summer flowers
<i>Asplenium platyneuron</i>	red milkweed	I-PI	Swamps and wet woods	Summer flowers
<i>Asplenium platyneuron</i>	Common milkweed	I-ACU	Upland fields, ditches, roadsides	Summer flowers

SCIENTIFIC NAME	COMMON NAME	WETLAND INDICATOR STATUS	HABITAT	SEASON(S) OF INTEREST
HERBACEOUS PERENNIALS (cont'd.)				
<i>Atriplex deboreae</i>	blurred milkweed	I-PI	Dry sandy soils	Summer flowers
<i>Atriplex canescens</i>	white milkweed	I-PI	Rich woods	Summer flowers
<i>Atriplex verticillata</i>	whorled milkweed	I-PI	Scrubbing and dry sandy soils	Summer foliage and flowers Autumn foliage
<i>Asclepias tuberosa</i>	green milkweed	I-PI	Dry sandy soils	Summer flowers
<i>Asclepias tuberosa</i>	heart-leaf aster	I-PI	Woods, meadows, roadsides	Autumn flowers
<i>Asclepias tuberosa</i>	various blue aster	I-PI	Dry woods and open places	Autumn flowers
<i>Asclepias tuberosa</i>	eastern blue aster	I-ACW	Ditches and meadows	Autumn flowers
<i>Asclepias tuberosa</i>	globe aster	I-ACW	Roadsides and meadows	Autumn flowers
<i>Asclepias tuberosa</i>	New England aster	I-ACW	Marshes, wet meadows	Autumn flowers
<i>Asclepias tuberosa</i>	late purple aster	I-PI	Dry soils	Autumn flowers
<i>Asclepias tuberosa</i>	smooth leaf aster	I-ACW	Ditches, open woody roadsides	Autumn flowers
<i>Asclepias tuberosa</i>	hairy leaf aster	I-PI	Ditches, open woody roadsides	Autumn flowers
<i>Asclepias tuberosa</i>	hooked-stem aster	I-PI	Moist wooded slopes and meadows	Autumn flowers
<i>Asclepias tuberosa</i>	bristly aster	OBI	Marshes, wet meadows	Autumn flowers
<i>Asclepias tuberosa</i>	Schreber's aster	I-PI	Rich rocky woods	Autumn flowers
<i>Asclepias tuberosa</i>	clasp-leaf aster	I-PI	Dry sandy woods	Autumn flowers
<i>Asclepias tuberosa</i>	amigo bush	I-PI	Dry sandy soils	Summer foliage and flowers
<i>Asclepias tuberosa</i>	marsh marigold	OBI	Scraggy swamps and wet meadows	Spring flowers
<i>Asclepias tuberosa</i>	slender swallowtail	I-ACU	Rich woods	Spring flowers
<i>Asclepias tuberosa</i>	ancient toothwort	I-ACU	Rich woods	Spring flowers
<i>Asclepias tuberosa</i>	blue cutwash	I-PI	Rich rocky woods	Spring flowers, summer foliage Autumn fruit
<i>Chamaecrista fasciata</i>	devil's-bit	I-PI	Rich open woods	Summer flowers
<i>Chamaecrista fasciata</i>	white milkweed	OBI	Swamps and seeps	Summer flowers
<i>Chamaecrista fasciata</i>	spotted sunflower	I-PI	Dry to moist sandy woods	Spring flowers, autumn foliage
<i>Chamaecrista fasciata</i>	Maryland golden aster	I-PI	Dry sandy soils	Summer flowers
<i>Chamaecrista fasciata</i>	black bough	I-PI	Rich woods and slopes	Summer flowers
<i>Chamaecrista fasciata</i>	narrow-leaf spurge	I-ACU	Moist woods and stream banks	Summer flowers
<i>Chamaecrista fasciata</i>	Carolina house plant	I-ACU	Rich woods	Summer flowers
<i>Chamaecrista fasciata</i>	common daisy	I-PI	Open sandy woods	Autumn flowers
<i>Chamaecrista fasciata</i>	large yellow lady's-slipper	I-PI	Rich woods and seeps	Spring flowers
<i>Chamaecrista fasciata</i>	Douglas's breeches	I-PI	Rich woods	Spring flowers

SCIENTIFIC NAME	COMMON NAME	WETLAND INDICATOR STATUS	HABITAT	SEASON(S) OF INTEREST
HERBACEOUS PERENNIALS (cont'd.)				
<i>Desmodium illinoense</i>	coral-leaf aster	I-PI	Dry open woods	Autumn flowers
<i>Dioscorea alata</i>	baton white aster	I-ACW	Edges of swamps and low ground	Autumn flowers
<i>Eupatorium angustifolium</i>	purple ironweed	I-PI	Clearings and disturbed ground	Summer flowers
<i>Eupatorium americanum</i>	yellow iron fly	I-PI	Rich woods and floodplains	Spring flowers and foliage
<i>Eupatorium alatum</i>	Joe-pye thronchwort	I-ALW	Swamps, stream banks, wet meadows	Summer flowers
<i>Eupatorium fistulosum</i>	swallow Joe-pye weed	I-ACW	Swamps, stream banks, wet meadows	Summer foliage and flowers
<i>Eupatorium purpureum</i>	sweet Joe-pye weed	I-PI	Rich woods	Summer foliage and flowers
<i>Eupatorium verticillatum</i>	roundleaf thronchwort	I-AC	Dry sandy soils	Summer flowers
<i>Eupatorium scaberrimum</i>	upland boneset	I-PI	Rich woods	Summer flowers
<i>Euphorbia corollata</i>	flowering spurge	I-PI	Fields, roadsides, ditches	Summer flowers
<i>Euphorbia maculata</i>	lady's-ear	I-AC	Rich wet swamps and swamps	Summer foliage
<i>Phytolacca americana</i>	cherry weed aster	I-PI	Rich woods	Autumn flowers
<i>Rubus odoratus</i>	cruscan goldenrod	I-AC	Moist swales and wet meadows	Summer foliage, autumn flowers
<i>Rudbeckia hirta</i>	Nuttall's grass leaf goldenrod	I-AL	Fields and meadows	Summer foliage, autumn flowers
<i>Conium maculatum</i>	fringe top beetle gentian	I-ALW	Margins, seeps, edges of woods	Autumn flowers
<i>Conium maculatum</i>	stuffed gentian	I-PI	Moist woods, stream banks	Autumn flowers
<i>Conium maculatum</i>	wild geranium	I-AC	Rich woods	Spring flowers
<i>Dianthus barbatus</i>	marble-headed sweetweed	I-AL	Moist roadsides, wet meadows	Autumn flowers
<i>Dianthus barbatus</i>	blue-headed starflower	I-AC	Rich woods, floodplains and ditches	Autumn flowers
<i>Dianthus barbatus</i>	woodland snailflower	I-PI	Dry woods	Autumn flowers
<i>Dianthus barbatus</i>	fall snailflower	I-ACW	Wet meadows, tidal marshes	Autumn flowers
<i>Dianthus barbatus</i>	pale leaf snailflower	I-PI	Rocky woods, ditches	Autumn flowers
<i>Dianthus barbatus</i>	rose	I-PI	Fields and meadows	Summer flowers
<i>Dianthus barbatus</i>	round-lobed hepatica	I-PI	Rich woods	Spring flowers
<i>Dianthus barbatus</i>	American clamshell	I-AC	Moist dry slopes and woods	Spring foliage and flowers
<i>Dianthus barbatus</i>	bluet	I-AC	Marshes, roadsides	Summer and autumn foliage
<i>Dianthus barbatus</i>	purple bluet	I-PI	Rich woods	Spring foliage
<i>Dianthus barbatus</i>	green violet	I-AL	Rich rocky woods	Autumn flowers
<i>Dianthus barbatus</i>	golden-violet	I-PI	Rich woods	Summer flowers
<i>Dianthus barbatus</i>	variegated violet	I-AC	Rich floodplain woods	Spring flowers, summer leaf
<i>Dianthus barbatus</i>	green yellow star grass	I-AC	Upland woods	Summer flowers, autumn foliage
<i>Dianthus barbatus</i>	spring flower	I-AC	Upland woods	Spring flower

SCIENTIFIC NAME	COMMON NAME	WETLAND INDICATOR STATUS	HABITAT	SEASON(S) OF INTEREST
HERBACEOUS PERENNIALS (cont'd.)				
<i>Eleocharis baldwiniana</i>	Blackhead aster	I-PI	Dry sandy soils	Summer foliage, autumn flowers
<i>Erigeron phillyriae</i>	Blue Fagaria	DEI	Fresh water marshes and swamps	Spring flowers
<i>Erigeron affinis var. robustus</i>	Smooth rush	DEI	Wet meadows and swales	Summer foliage
<i>Euthyis canadensis</i>	Four-head gay feather	I-PI	Dry open woods	Autumn flowers
<i>Euthyis spicata</i>	Blazing star	I-PI	Fields and roadsides	Summer flowers
<i>Euthyis spicata var. glabra</i>	Smooth blazing star	I-PI	Dry open woods	Summer flowers
<i>Euthyis spicata var. angustifolia</i>	Small lily	I-PI	Rich woods, fields and swampy edges	Summer flowers
<i>Euthyis spicata var. angustifolia</i>	Wood lily	I-ACU	Dry open woods	Summer flowers
<i>Euthyis spicata var. angustifolia</i>	Turk's cap lily	I-ACW	Moist woods and swamps	Summer flowers
<i>Euthyis spicata var. angustifolia</i>	Knight's flower	I-ACW	Swamps and freshwater marshes	Summer flowers
<i>Euthyis spicata var. angustifolia</i>	Moist lily	I-PI	Roadsides, open woods, wet meadows	Summer flowers
<i>Euthyis spicata var. angustifolia</i>	Great blue lily	I-ACW	Wet meadows, stream banks, swamps	Autumn flowers
<i>Euthyis spicata var. angustifolia</i>	Canada May flower	I-AC	Rich woods and floodplain edges	Spring flowers, summer fruit
<i>Euthyis spicata var. angustifolia</i>	Socumoni's plant	I-ACU	Moist woods	Spring flowers, summer foliage, autumn fruit
<i>Euthyis spicata var. angustifolia</i>	Indian cucumber root	I-PI	Moist woods	Spring flowers, summer fruit
<i>Euthyis spicata var. angustifolia</i>	Broadleaf funnelflower	I-ACU	Rich rocky woods	Summer flowers, autumn fruit
<i>Euthyis spicata var. angustifolia</i>	Original blackbell	I-ACW	Rich woods and floodplains	Spring flowers
<i>Euthyis spicata var. angustifolia</i>	Parade bell	I-ACU	Woods and slopes, swamps	Leaf-stem foliage and fruits
<i>Euthyis spicata var. angustifolia</i>	Two-leaf bishop's cap	I-ACU	Rich woods and seepage slopes	Spring flowers
<i>Euthyis spicata var. angustifolia</i>	Paul's blue bell	I-PI	Moist to dry open woods and ditches	Summer flowers
<i>Euthyis spicata var. angustifolia</i>	Wild bergamot blue bell	I-PI	Dry open soils	Summer flowers
<i>Euthyis spicata var. angustifolia</i>	Narrow leaf sandbars	I-PI	Open woods and fields	Summer flowers
<i>Euthyis spicata var. angustifolia</i>	Strawberry sandbars	I-PI	Open woods and fields	Summer flowers
<i>Euthyis spicata var. angustifolia</i>	Wet wood-scutel	I-PI	Rich woods	Spring flowers
<i>Euthyis spicata var. angustifolia</i>	American gumweed	I-PI	Rich woods and swamps	Autumn fruit
<i>Euthyis spicata var. angustifolia</i>	Swart gumweed	I-PI	Moist woodlands usually along streams	Summer flowers, summer foliage
<i>Euthyis spicata var. angustifolia</i>	Yellow beard-tongue	I-ACU	Moist woods, roadsides	Summer flowers
<i>Euthyis spicata var. angustifolia</i>	Yellow beard-tongue	I-PI	Open woods, meadows, roadsides	Summer flowers
<i>Euthyis spicata var. angustifolia</i>	Spotted phlox	I-ACU	Wet meadows	Summer flowers
<i>Euthyis spicata var. angustifolia</i>	Downy phlox	I-PI	Scrubby soils, open woods	Spring flowers
<i>Euthyis spicata var. angustifolia</i>	Greek valerian	I-ACU	Rich woods and floodplains	Spring flowers

SCIENTIFIC NAME	COMMON NAME	WETLAND INDICATOR STATUS	HABITAT	SEASON(S) OF INTEREST
HERBACEOUS PERENNIALS (cont'd.)				
<i>Protoparce purshiana</i>	east-wind milkweed	I-AC I	Rich rocky woods and slopes	Spring flowers
<i>Pulsatilla nuttalliana</i>	common Solomon's seal	U-PI	Moist or dry woodlands	Spring flowers, summer foliage, autumn fruit
<i>Pulsatilla nuttalliana</i>	great Solomon's seal	I-AC I	Rich woods	Spring flowers, summer foliage, autumn fruit
<i>Pulsatilla nuttalliana</i>	lowly Solomon's seal	U-PI	Rich woods	Spring flowers, summer foliage, autumn fruit
<i>Pulsatilla nuttalliana</i>	cow-woman's foot	U-PI	Rich woods	Spring flowers
<i>Rudbeckia hirtella</i>	purple coneflower	U-PI	Dry to low meadows	Summer flowers
<i>Rudbeckia hirtella</i>	black-eyed Susan	U-PI	Old fields, roadside edges	Summer flowers
<i>Rudbeckia hirtella</i>	gully of stone bridge	I-AC W	Floodplains and stream banks	Autumn flowers
<i>Rudbeckia hirtella</i>	bloodroot	U-PI	Rich woods	Spring flowers
<i>Sarcocolla purpurea</i>	purple pig's-foot	OB I	Wet, white cedar swamps	Summer flowers, autumn foliage
<i>Sarcocolla purpurea</i>	lizard's tail	OB I	Swamps and marshes	Summer flowers
<i>Sarcocolla purpurea</i>	hessop skullcap	I-AC W	Dry grassy fields and clearings	Summer flowers
<i>Sarcocolla purpurea</i>	mad dog skullcap	I-AC W	Old fields and meadows	Summer flowers
<i>Sarcocolla purpurea</i>	wind stonewort	U-PI	Rich woods and floodplains	Spring flowers, year-round foliage
<i>Sarcocolla purpurea</i>	Small's ragwort	U-PI	Serpentine soils	Summer flowers
<i>Sarcocolla purpurea</i>	golden ragwort	I-AC W	Rich woods and floodplains	Spring flowers
<i>Sarcocolla purpurea</i>	wild serum	I-AC	Roadside banks and woods	Summer flowers
<i>Sarcocolla purpurea</i>	gulf aster	U-PI	Dry woods and fields	Autumn flowers
<i>Sarcocolla purpurea</i>	marooned aster	U-PI	Dry open yards, thickets, edges	Autumn flowers
<i>Sarcocolla purpurea</i>	star's catchfly	U-PI	Open sandy woods	Spring flowers
<i>Sarcocolla purpurea</i>	pinked blue-eyed grass	I-AC W	Old fields and meadows	Spring flowers
<i>Sarcocolla purpurea</i>	bluestem goldenrod	I-AC I	Rich woods	Autumn flowers
<i>Sarcocolla purpurea</i>	heavenly goldenrod	I-AC I	Rich woods, slopes and floodplains	Autumn flowers
<i>Sarcocolla purpurea</i>	rosby aster	U-PI	Old fields, road sides, edges	Autumn flowers
<i>Sarcocolla purpurea</i>	round leafed lance flower	U-PI	Succinate soils	Autumn flowers
<i>Sarcocolla purpurea</i>	swallowtail	U-PI	Dry, sandy soils	Summer flowers
<i>Sarcocolla purpurea</i>	early meadow-rue	U-PI	Rich rocky woods	Summer flowers
<i>Sarcocolla purpurea</i>	late meadow-rue	I-AC W	Swamps, floodplains and stream banks	Summer flowers
<i>Sarcocolla purpurea</i>	waxleaf meadow-rue	U-PI	Rich woods	Summer flowers

SCIENTIFIC NAME	COMMON NAME	WET AND INDICATOR STATUS	HABITAT	SEASON(S) OF INTEREST
HERBACEOUS PERENNIALS (continued)				
<i>Diakroon thalictroides</i>	meadow	FAC1	Rich woods	Spring flowers
<i>Sagittaria spaldingii</i>	Arrowhead	FAC1	Rich open woods, floodplains edges	Spring flowers
<i>Lythrum alatum</i>	Lythrum	FACW	Moist rich woods, seeps/edges	Spring flowers
<i>Lythrum virginicum</i>	Lythrum	FAC1	Rich woods	Spring flowers
<i>Proscopium angustifolium</i>	Yellow-leaf tinker's-weed	UPI	Humid rich woods and thickets	Spring flowers, autumn fruit
<i>Proscopium americanum</i>	Red tinker's-weed	UPI	Rich woods and seeps	Spring flowers, autumn fruit
<i>Proscopium purpurascens</i>	Periculate tinker's-weed	UPI	Rich woods	Spring flowers, autumn fruit
<i>Urtica dioica</i>	Stinging nettle	FAC3	Rich woods	Spring flowers
<i>Urtica dioica</i>	Stinging nettle	FAC3	Moist rich woods	Spring flowers
<i>Urtica dioica</i>	Stinging nettle	UPI	Wet rich and dry woods, edges	Autumn flowers
<i>Urtica dioica</i>	Stinging nettle	FACW	Wet meadows, marshes, seeps	Autumn flowers
<i>Urtica dioica</i>	Stinging nettle	FAC1	Dry woodlands, moist meadows, thickets	Autumn flowers
<i>Urtica dioica</i>	Stinging nettle	UPI	Rich rocky woods, edges of seeps	Spring flowers
<i>Urtica dioica</i>	Stinging nettle	UPI	Dry open woods and fields	Spring flowers
<i>Urtica dioica</i>	Stinging nettle	UPI	Rich rocky upper woods and edges	Spring flowers
<i>Urtica dioica</i>	Stinging nettle	UPI	Moist rich woods, floodplains	Spring flowers
GRASSES AND SEDGES				
<i>Andropogon furcatus</i>	Bottlebrush	UPI	Sandy soils, rich fields edges	Autumn and winter foliage
<i>Andropogon furcatus</i>	Bottlebrush	FACW	Wet open swales	Autumn and winter foliage
<i>Andropogon furcatus</i>	Bottlebrush	UPI	Dry fields, roadsides, edges, dry soils	Autumn and winter foliage
<i>Andropogon furcatus</i>	Bottlebrush	UPI	Rich woods	Summer and autumn foliage
<i>Andropogon furcatus</i>	Bottlebrush	UPI	Rich woods	Spring, summer and autumn foliage
<i>Andropogon furcatus</i>	Bottlebrush	FAC1	Rich woods	Spring, summer and autumn foliage
<i>Andropogon furcatus</i>	Bottlebrush	UPI	Dry, acidic soils	Summer and autumn foliage
<i>Andropogon furcatus</i>	Bottlebrush	FAC1	Moist soils, forest woods and edges	Summer and autumn foliage
<i>Andropogon furcatus</i>	Bottlebrush	FAC	Moist woods	Summer and autumn foliage and fruit
<i>Andropogon furcatus</i>	Bottlebrush	UPI	Rich woods and floodplains	Summer and autumn foliage
<i>Andropogon furcatus</i>	Bottlebrush	UPI	Rich woods and floodplains	Summer and autumn foliage

SCIENTIFIC NAME	COMMON NAME	WETLAND INDICATOR STATUS	HABITAT	SEASONS OF INTEREST
GRASSES AND SEDGES (continued)				
<i>Lygodesmia ovifolia</i>	purple lovegrass	UPL	Dry sandy soils	Summer foliage, autumn flowers, winter fruit
<i>Microberberis canadensis</i>	long-awn hairgrass	RACU	Rocky woods	summer, autumn and winter foliage and fruit
<i>Solidago rigida var. serotina</i>	Irish haresnip	UPL	Dry open soils, dunes, sandy soils	Autumn and winter foliage
<i>Sorghastrum nutans</i>	yellow Indian-grass	UPL	Meadows and pastures	Summer of autumn foliage and flowers, winter fruit
<i>Andropogon furcatus</i>	purple-top	RACU	Meadows, road fields, roadsides	Summer foliage, autumn fruit
VINES				
<i>Clematis canadensis</i>	rampet creeper	UACU	Clearings, firm woods, edges	Summer flowers
<i>Clematis verticillata</i>	climbing butterwort	RACU	Cranny gaps in forest woods	Summer flowers, autumn fruit
<i>Clematis integrifolia</i>	purple clematis	UPL	Rocky woods	Summer flowers
<i>Clematis vitalba</i>	woody clematis flower	UPL	Rocky woods and slopes	Summer flowers
<i>Clematis virginiana</i>	Virginia virgin's-bower	UACU	Firm woods, thickets, roadsides	Autumn flowers
<i>Lonicera sempervirens</i>	trumpet honeysuckle	UPL	Cranny gaps in moist and dry woods	Spring flowers, summer fruit
<i>Paeonia officinalis var. moutanensis</i>	Virginia creeper	RACU	Woods	Spring and autumn foliage

Wetland Indicator Codes

Indicator Code	Wetland Type	Description
OB1	Obligate Wetland	Occurs almost always (estimated probability 99% or under natural conditions) in wetlands.
FACW	Facultative Wetland	Usually occurs in wetlands (estimated probability 67% to 99%), but occasionally found in non-wetlands.
FAC	Facultative	Usually likely to occur in wetlands or non-wetlands (estimated probability 34% to 66%).
FAU	Facultative Upland	Usually occurs in non-wetlands (estimated probability 67% to 99%), but occasionally found in wetlands (estimated probability 1% to 33%).
UPL	Obligate Upland	Occurs in wetlands in another region, but occurs almost always (estimated probability 99% or under natural conditions) in non-wetlands in the regions specified. If a species does not occur in wetlands in any region, it is not on the National List.

The **Wetland Indicator Codes** reflect the range of estimated probabilities expressed as a frequency of occurrence of a species occurring in wetlands versus non-wetland across the entire distribution of the species. A frequency, for example, of 67% to 99% (Facultative Wetland) means that 67% to 99% of sample plots containing the species randomly selected across the range of the species would be wetland. A positive (+) or negative (-) sign was used with the Facultative Indicator categories to more specifically define the regional frequency of occurrence in wetlands. The positive sign indicates a frequency toward the higher end of the category (more frequently found in wetlands), and a negative sign indicates a frequency toward the lower end of the category (less frequently found in wetlands).

SURVEY OF ROADSIDE VEGETATION

Note: The following inventory identified and mapped the existing vegetation communities within the Scenic Byway Corridor (defined as a 200 foot buffer from the edge of each road). Although the communities identified include non-native plant species, this inventory should in no way be interpreted to suggest that such species are appropriate components of the Scenic Byway Corridor. In fact, several of the goals and objectives of this plan speak to the desire to encourage the replacement of non-native plant species with appropriate native plant species over time.

RED CLAY CREEK SCENIC BYWAY
Final Report on Vegetation Community Survey: 2007

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The Department of Natural Resources and Environmental Control is committed to affirmative action, equal opportunity and the diversity of its workforce.

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EXECUTIVE SUMMARY

In 2007 the Delaware Natural Heritage Program undertook an inventory of the vegetation communities along the Red Clay Creek Scenic Byway Corridor, which is defined as 200 feet from either side of the road and is located in northern New Castle County, Delaware. This effort represents the first significant effort to map the vegetation communities of any part of the Red Clay Creek Watershed. Red Clay Creek watershed is located in the northern Delaware and covers 13,558 acres in northern New Castle County.

On its winding path south through Delaware, Red Clay Creek flows from 160 feet to near sea level. For most of the way the creek is paralleled by the Wilmington and Western Railroad and also Barley Mill and Creek Roads.

Twenty-eight land types were identified within the Red Clay Scenic Byway Corridor. The Northeastern Old Field is the largest vegetation community in the corridor, and the Golden Bamboo Shrubland is the smallest.

INTRODUCTION

In 2007, work was begun by the Delaware Natural Heritage Program to survey the vegetation communities along the Red Clay Creek Scenic Byway, located in mostly the Red Clay Creek watershed (Figure 1) of northern New Castle County, Delaware but also going slightly into the Brandywine Creek, Christina River and White Clay Creek watersheds. The Byway represents 36.2 miles of road. Red Clay Creek is the second watershed in the state to be mapped to Delaware Community and National Vegetation Classification alliance and association and eventually it is hoped that all watersheds the state will be mapped to this level.

Mapping of vegetation communities began in early 2007 and were completed in the fall of 2007. This report summarizes the results of these surveys. Maps depicting the vegetation communities found along the Byway by road segment are found in Figures 2 through 24. These roads include:

1. Ashland-Clinton School Road
2. Auburn Mill Road
3. Barley Mill Road
4. Brackenville Road
5. Burnt Mill Road
6. Campbell Road
7. Center Mill Road
8. Centerville Road
9. Creek Road
10. Hillside Mill Road
11. Hillside Road
12. New London Road
13. Nine Gates Road
14. Old Kennett Road
15. Old Wilmington Road
16. Owl's Nest Road

17. Pyle's Ford Road
18. Rolling Mill Road
19. Sharpless Road
20. Snuff Mill Road
21. Walnut Green Road
22. Way Road
23. Yorklyn Road



Figure 1. Location of Red Clay Creek Watershed, New Castle County, Delaware

METHODS

Mapping of vegetation communities along the Red Clay Creek Scenic Byway began in the spring of 2007 and were completed in the fall of 2007. Delineations were obtained through existing data, interpretation of 2002 color infrared aerial photography and fieldwork performed during the 2007 field season. Vegetation communities were determined by qualitative analysis and were located using GIS mapping and 2002 aerial photography. These communities were then classified to both the Guide to Delaware Vegetation Communities (GDVC) and the National Vegetation Classification (NVC) System. The NVC classifies vegetation on a national scale for the United States and is linked to the international vegetation classification. The NVC helps provide a uniform name and description of vegetation communities found throughout the country and helps determine relative rarity.

The Scenic Byway Corridor is defined as a 200 foot buffer from the edge of each road. Vegetation communities within this corridor were identified and mapped to type. There is a variance of how far you see in a given season. In the summer you cannot see as far because of leaves but in the winter you can see further since leaves are off. In many cases you cannot see much of the corridor in the summer because of shrub lines (Northeastern Successional Shrubland) along the roads.

RESULTS AND DISCUSSION

Twenty-eight land covers (including vegetation and anthropogenic communities, water, Farm Pond/Artificial Pond, Water Recharge Basin and Lake) were identified (Appendix I). Some of the more unique communities found along the Red Clay Scenic Byway include the Green Ash-Mixed Hardwood Floodplain Forest, the Southern New England Red Maple Seepage Swamp, Golden Bamboo Shrubland and the Red Pine Planted Forest. All of these communities are not common in the Piedmont and some which are planted are not commonly found.

VEGETATION COMMUNITY DESCRIPTIONS

Found below are descriptions of the vegetation communities identified and mapped along the Red Clay Scenic Byway. The community name (e.g. Mesic Piedmont Mixed Hardwood Forest) used in the GDVC, which is the State of Delaware's community classification, is followed by the NVC alliance and association number and name (e.g. A.229-*Fagus grandifolia-Quercus rubra-Quercus alba* Forest Alliance; CEG006921- *Fagus grandifolia-Betula lenta-Quercus (alba, rubra)/Carpinus caroliniana* Forest). The NVC classifies vegetation on a national scale for the United States and is linked to the international vegetation classification. The NVC helps provide a uniform name and description of vegetation communities throughout the country and helps determine their relative rarity. Descriptions and statewide distribution information are given for each community.

The vegetation community descriptions that follow are organized by Natural Communities (Forest and Herbaceous), Anthropogenic Communities and land covers related to development (building, parking lot and road). A forest community contains 60% to 100% tree cover and has a closed canopy. A shrubland community is dominated by shrubs or small trees (Note: both shrubland communities in the byway are described Anthropogenic Communities). Herbaceous communities are dominated by herbaceous, broad-leaf plants and have less than 10% tree or shrub cover. Anthropogenic communities are created by human intervention and planting. There were no woodland communities present in the Byway corridor. Each community description also includes associated plant species that were found during this survey.

Successional fields, shrublands and forests are grouped in the Northeastern Old Field, Northeastern Successional Shrubland and Northeastern Modified Successional Forest categories respectively and are listed under the anthropogenic communities because they typically result from the abandonment of agricultural fields or other man-made disturbances. The Northeastern Successional Shrubland and Northeastern Modified Successional Forest are often dominated by exotic invasive plants and are often considered to be exotic communities and do not function as native communities. Planted Forests are placed in this category as well since they result from human activity.

FORESTED COMMUNITIES

BOX ELDER FOREST

A.278-*Acer negundo* Temporarily Flooded Forest Alliance CEGL005033-*Acer negundo* Forest



Community Description: Box Elder Forests are found on the larger floodplains along Red Clay Creek generally upstream of where the Green Ash-Mixed Hardwood Forests are found. Canopy associates include box elder (*Acer negundo*), silver maple (*Acer saccharinum*) and tuliptree (*Liriodendron tulipifera*). The understory is mostly spicebush (*Lindera benzoin*) and with lesser amounts of green ash (*Fraxinus pennsylvanica*), white walnut (*Juglans cinerea*), bladdernut (*Staphylea trifoliata*) and bitternut hickory (*Carya cordiformis*). Common shrubs include elderberry (*Sambucus canadensis*), multiflora rose (*Rosa multiflora*), winged euonymous (*Euonymus alatus*) and morrow's honeysuckle (*Lonicera morrowii*). Virginia bluebell (*Mertensia virginica*), lesser celandine (*Ranunculus ficaria*), jacob's ladder (*Polemonium reptans*), blue cohosh (*Caulophyllum thalictroides*), jumpseed (*Polygonum virginianum*), broad-leaf goldenrod (*Solidago flexicaulis*) and garlic mustard (*Alliaria petiolata*) compose the dense herbaceous layer. Some examples may have nearly impenetrable stinging nettle (*Urtica dioica*).

Diagnostic Features: This community is distinguished by the dominance of box elder and the absence or small amount of silver maple (*Acer saccharinum*).

Geology and Environmental Features: This community is often found on naturally disturbed floodplains in the Piedmont.

Statewide Distribution: In Delaware this community is generally found on the larger streams in the Piedmont.

CHESTNUT OAK-BEECH FOREST

A.229-*Fagus grandifolia*-*Quercus rubra*-*Quercus alba* Forest Alliance
CEGL006919-*Quercus prinus*-*Quercus velutina*-*Fagus grandifolia*/*Kalmia latifolia* Forest



Community Description: One Chestnut Oak-Beech Forest is located on a steep west-facing slope on the east side of Hoopes Reservoir by Centerville Road. The canopy is co-dominated by both chestnut oak (*Quercus prinus*) and American beech (*Fagus grandifolia*) and associated by white oak (*Quercus alba*), tuliptree (*Liriodendron tulipifera*) and red maple (*Acer rubrum*). The understory is composed of the canopy dominants plus flowering dogwood (*Cornus florida*). Scattered individuals of Mountain laurel (*Kalmia latifolia*) are present in the shrub layer. Common herbs include rattlesnake weed (*Hieracium venosum*), yellow eyed grass (*Hypoxis hirsuta*) and common wood rush (*Luzula multiflora*) and Pennsylvania sedge (*Carex pennsylvanica*).

Diagnostic Features: This community is distinguished by the co-dominance of chestnut oak and American beech on mesic to dry slopes in the Piedmont.

Geology and Environmental Features: This community is often found on steep mesic to dry slopes.

Statewide Distribution: In Delaware this community is generally found in the Piedmont.

GREEN ASH-MIXED HARDWOOD FOREST

A.356-*Fraxinus pennsylvanica*-*Acer rubrum*-*Ulmus americana* Tidal Forest Alliance
CEGL006575-*Fraxinus pennsylvanica*-(*Juglans nigra*, *Platanus occidentalis*) Forest



Community Description: Green Ash-Mixed Hardwood Forests are found on the larger floodplains of Red Clay Creek just upstream from Barley Mill Road and in a bend in the creek by Creek Road. The canopy is co-dominated by red maple (*Acer rubrum*), green ash (*Fraxinus pennsylvanica*) and associated by tuliptree (*Liriodendron tulipifera*). The understory is composed of spicebush (*Lindera benzoin*), black cherry (*Prunus serotina*) and box-elder (*Acer negundo*). Exotic species such as multiflora rose (*Rosa multiflora*), Siebold's viburnum (*Viburnum sieboldii*) and Chinese privet (*Ligustrum sinense*) generally compose the shrub layer. Common herbs include garlic mustard (*Alliaria petiolata*), enchanter's nightshade (*Circaea lutetiana*), jack-in-the-pulpit (*Arisaema triphyllum*), stinging nettle (*Urtica dioica*) and sensitive fern (*Onoclea sensibilis*).

Diagnostic Features: This community is defined by the co-dominance of green ash (*Fraxinus pennsylvanica*) with black walnut (*Juglans nigra*) or sycamore (*Platanus occidentalis*).

Geology and Environmental Features: This community is found on soils derived from Wissahickon Gneiss and often has large outcrops present within.

Statewide Distribution: This community is currently only known from the Red Clay Creek Watershed in Delaware.

LOWER NEW ENGLAND SLOPE CHESTNUT OAK FOREST

A.248-*Quercus prinus*-(*Quercus coccinea*, *Q. velutina*) Forest Alliance
CEGL006282-*Quercus prinus*-*Quercus (rubra, velutina)*/*Vaccinium angustifolium* Forest Alliance



Community Description: The Lower New England Slope Chestnut Oak Forest is found on steeper slopes primarily around the Hoopes Reservoir area. All of the examples in the Red Clay Creek watershed are mature and contain a well-defined understory. This community is the only one in the Red Clay Creek watershed that has a large amount of black birch (*Betula lenta*) contained within it. Common canopy species in this forest include chestnut oak (*Quercus prinus*), northern red oak (*Quercus rubra*), red maple (*Acer rubrum*), black birch and American beech (*Fagus grandifolia*). The understory is composed of witch-hazel (*Hamamelis virginiana*), eastern hop-hornbeam (*Ostrya virginiana*) and American serviceberry (*Amelanchier arborea*). A dense shrub layer of mountain laurel (*Kalmia latifolia*) is often located near the upper slopes. Common herbs include solomon's seal (*Polygonatum biflorum*), white wood aster (*Eurybia divaricata*), false solomon's seal (*Maianthemum racemosum*), jack-in-the-pulpit (*Arisaema triphyllum*) and (*Carex digitalis*).

Diagnostic Features: The co-dominance of chestnut oak and black birch distinguishes this community from others in the Red Clay Creek watershed.

Geology and Environmental Features: This community is often located on xeric upper slopes and ridgetops that have acidic and infertile soils.

Statewide Distribution: This community has been noted from only a few locations in the Brandywine and Red Clay Creek watersheds and is restricted to the Piedmont in Delaware.

MESIC PIEDMONT MIXED HARDWOOD FOREST

A.229-*Fagus grandifolia*-*Quercus rubra*-*Quercus alba* Forest Alliance
CEGL006921-*Fagus grandifolia*-*Betula lenta*-*Quercus (alba, rubra)*/*Carpinus caroliniana*
Forest



Community Description: Mesic Piedmont Mixed Hardwood Forest is the most common forested community in the Red Clay Creek watershed and is likely the most common in the Piedmont of Delaware. Mixed hardwood forests are characterized by a mixture of hardwoods including American beech (*Fagus grandifolia*), tuliptree (*Liriodendron tulipifera*), red maple (*Acer rubrum*), northern red oak (*Quercus rubra*), white oak (*Quercus alba*) and black oak (*Quercus velutina*) in the canopy. Flowering dogwood (*Cornus florida*), black gum (*Nyssa sylvatica*) and smaller members of the canopy are found in the understory. Maple-leaf viburnum (*Viburnum acerifolium*), low-bush blueberry (*Vaccinium pallidum*), deciduous azalea (*Rhododendron periclymenoides*) and spicebush (*Lindera benzoin*) compose the shrub layer. Common herbs include garlic mustard (*Alliaria petiolata*), woodland goldenrod (*Solidago caesia*), common blue violet (*Viola sororia*), white wood aster (*Eurybia divaricata*) and Christmas fern (*Polystichum acrostichoides*).

Diagnostic Features: A high amount of American beech and not much tuliptree as well as mixture of other hardwoods and its location in the Piedmont define this community.

Geology and Environmental Features: This community is often found on mesic soils that are gently sloping and are underlaid by Wissahickon or Brandywine Blue Gneiss.

Statewide Distribution: Mesic Piedmont Mixed Hardwood Forests are restricted to the Piedmont and are likely the most common forested community in the province. It has a Coastal Plain analogue which is called the Mesic Coastal Plain Mixed Hardwood Forest and contains sweetgum (*Liquidambar styraciflua*) as a common associate.

RIVERINE FLOODPLAIN FOREST (Early Successional Type)

A.288-*Platanus occidentalis*-(*Fraxinus pennsylvanica*, *Celtis laevigata*, *Acer saccharinum*)

Temporarily Flooded Forest Alliance

CEGL006036-*Platanus occidentalis*-*Fraxinus pennsylvanica* Forest



Community Description: Riverine Floodplain Forests are found on floodplains of the lower sections of Red Clay Creek primarily around Rolling Mill Road, Barley Mill Road and Creek Road and are intermixed the Green Ash-Mixed Hardwood Forests. The canopy has a large amount of sycamore (*Platanus occidentalis*) and green ash (*Fraxinus pennsylvanica*) and is associated by black walnut (*Juglans nigra*), box-elder (*Acer negundo*) and tuliptree (*Liriodendron tulipifera*). Box-elder (*Acer negundo*), spicebush (*Lindera benzoin*), witch-hazel (*Hamamelis virginiana*) and slippery elm (*Ulmus rubra*) make up the understory. A small shrub and vine layer of multiflora rose (*Rosa multiflora*), poison ivy (*Toxicodendron radicans*) and summer grape (*Vitis aestivalis*) is present underneath. Common herbs include skunk cabbage (*Symplocarpus foetidus*), Japanese stiltgrass (*Microstegium vimineum*), enchanter's nightshade (*Circaea lutetiana*), jumpseed (*Polygonum virginianum*) and mayapple (*Podophyllum peltatum*).

Diagnostic Features: The co-dominance of sycamore (*Platanus occidentalis*) and green ash (*Fraxinus pennsylvanica*) with an understory of box-elder (*Acer negundo*) is diagnostic of this community.

Geology and Environmental Features: This community is often found on sandy islands and floodplains of the larger streams in the Piedmont.

Statewide Distribution: This community is common in the Piedmont and adjacent Coastal Plain of Delaware.

SOUTHERN NEW ENGLAND RED MAPLE SEEPAGE SWAMP
A.316-*Acer rubrum*-*Fraxinus pennsylvanica* Seasonally Flooded Forest Alliance
CEGL006406-*Acer rubrum*-*Fraxinus (pennsylvanica, americana)*/*Lindera benzoin*/*Symplocarpus foetidus* Forest



Community Description: This community is typified by a seepage area or wetland that is dominated by red maple (*Acer rubrum*). Other associates may include green ash (*Fraxinus pennsylvanica*), tuliptree (*Liriodendron tulipifera*) and white oak (*Quercus alba*). The understory is composed of spicebush (*Lindera benzoin*). Typical herbaceous species include skunk cabbage (*Symplocarpus foetidus*), cinnamon fern (*Osmunda cinnamomea*) and orange-spotted jewelweed (*Impatiens capensis*).

Diagnostic Features: The dominance of red maple in a seepage or wetland situation in the Piedmont of Delaware is diagnostic of this community. The seepages may be dominated by skunk cabbage and is another identifying feature.

Geology and Environmental Features: This community is found in shallow to moderately deep mucks over mineral soils.

Statewide Distribution: This community is known only from the Piedmont of Delaware and is located in both the Red Clay Creek and the Brandywine Creek watersheds.

TULIPTREE FOREST

A.236-*Liriodendron tulipifera* Forest Alliance

CEGL006186- *Liriodendron tulipifera*-*Quercus rubra*-*Fraxinus americana*-*Asimina triloba*-*Actaea racemosa*-*Uvularia perfoliata* Forest



Community Description: The Tuliptree Forest is the most herb rich forest community in the Red Clay Creek Watershed. These communities produce a rich display of wildflowers in the spring. The weathering of amphibolite often provides a high amount of nutrients and these communities are sometimes called “rich forests”. Unfortunately the ample nutrients are attractive to invasive species and these places are often the scene of massive tangles of exotic invasive species. Tuliptree Forests that are in a natural state, meaning they are without invasive species, are hard to find in the watershed. The most invaded examples are often classed in the Northeastern Modified Successional Forest.

Tuliptree (*Liriodendron tulipifera*) is the most common canopy species and is often joined by American beech (*Fagus grandifolia*), sycamore (*Platanus occidentalis*), white oak (*Quercus alba*), northern red oak (*Quercus rubra*) and in the Red Clay Creek example black birch (*Betula lenta*). The understory contains bitternut hickory (*Carya cordiformis*), black gum (*Nyssa sylvatica*), witch-hazel (*Hamamelis virginiana*), red maple (*Acer rubrum*) and bladdernut

(*Staphylea trifoliata*). Arrow-wood (*Viburnum dentatum*), greenbrier (*Smilax rotundifolia*), oriental bittersweet (*Celastrus orbiculatus*) and Japanese barberry (*Berberis thunbergii*) make up the shrub/vine layer. There are many herbs in this forest but some of the common ones are broad beech fern (*Phegopteris hexagonoptera*), spinulose wood fern (*Dryopteris carthusiana*), garlic mustard (*Alliaria petiolata*) and blue cohosh (*Thalictrum dioicum*).

Diagnostic Features: This community is typified by the dominance of tuliptree (*Liriodendron tulipifera*) in the canopy.

Geology and Environmental Features: The substrate of this community is high in nutrients and is often underlaid by amphibolite.

Statewide Distribution: This community is known from the Piedmont of Delaware and has a Coastal Plain analogue called the Mesic Rich Forest.

HERBACEOUS COMMUNITIES

EASTERN CATTAIL MARSH

A.1436-*Typha (angustifolia, latifolia)*-(*Schoenoplectus* spp.) Semipermanently Flooded Herbaceous Alliance

CEGL006153-*Typha (angustifolia, latifolia)*-(*Schoenoplectus* spp.) Eastern Herbaceous Vegetation

Community Description: This community is a marsh that is dominated by wide-leaf cattail (*Typha latifolia*) often to the exclusion of all other species. In the Red Clay Creek Scenic Byway area this community is found in small depressions that are wet near roadsides and are associated with either Northeastern Old Fields or Open Lawn.

Diagnostic Features: The dominance of wide-leaf cattail in a wetland is diagnostic of this community.

Geology and Environmental Features: This community is found in places where there is a muck bottom and often has standing water.

Statewide Distribution: This community is found through Delaware in various wet areas.

EASTERN REED MARSH

**A.1431-*Phragmites australis* Semipermanently Flooded Herbaceous Alliance
CEGL004141-*Phragmites australis* Eastern North America Temperate Semi-Natural Herbaceous Vegetation**

Community Description: Eastern Reed Marshes are dominated by eastern reed (*Phragmites australis*) often to the exclusion of all other species. In the Red Clay Creek Scenic Byway area this community, like the Eastern Cattail Marsh, is found in small depressions that are wet and are associated with either Northeastern Old Fields or Open Lawns. One large example can be found near the intersection of Pyles Ford and Creek Roads and a smaller example is present near Yorklyn Road.

Diagnostic Features: The dominance of eastern reed in a non-tidal wetland is diagnostic of this community.

Geology and Environmental Features: This community is found in places where there is a muck bottom and often has standing water.

Statewide Distribution: This community is found through Delaware in various wet areas that are non-tidal.

ANTHROPOGENIC COMMUNITIES and LAND COVERS

AGRICULTURAL FIELD

(No crosswalk to NVC)

Description: This anthropogenic community is characterized by a monoculture of an agricultural crop. In the Red Clay Creek Scenic Byway area the main crop is corn.

Statewide Distribution: This land cover type is the largest in Delaware accounting for about 500,000 acres statewide.

BUILDING

(No crosswalk to NVC)

Description: This land cover denotes those areas comprised of some form of human-made structure including a building (residential or commercial structure) and structures associated with them including driveways and/or tennis courts.

FARM POND/ARTIFICIAL POND

(No crosswalk to NVC)

Description: This land cover includes artificially maintained water bodies that are less than 5 acres in size.

GOLDEN BAMBOO SHRUBLAND

A.2010-*Phyllostachys aurea* Shrubland Alliance

CEGL008560-*Phyllostachys aurea* Shrubland

Description: This community composes a small hedgerow near the eastern end of Barley Mill Road just west of its intersection with Centerville Road. It is characterized by the dominance of golden bamboo (*Phyllostachys aurea*).

Diagnostic Features: The total dominance of golden bamboo (*Phyllostachys aurea*) in a dense thicket is diagnostic of this community.

Geology and Environmental Features: This community is not attributable to any geological or environmental feature.

Statewide Distribution: This community is known from the Brandywine Creek watershed and this small occurrence in the Red Clay Creek watershed. It is likely to be found in small amounts throughout the state.

LAKE

(No crosswalk to NVC)

Description: This land cover includes artificially maintained water bodies that are more than 5 acres in size. In the Red Clay Creek Scenic Byway this includes Hoopes Reservoir.

NORTHEASTERN MODIFIED SUCCESSIONAL FOREST

A.237-*Prunus serotina*-*Acer rubrum*-*Amelanchier canadensis*-*Quercus* spp. Forest Alliance

CEGL006599-*Prunus serotina*-*Liriodendron tulipifera*-*Acer rubrum*-*Fraxinus americana* Forest

Community Description: This community is one of the more common communities throughout the Red Clay Creek watershed. Most often this community is a degraded example of a Tuliptree Forest that has been invaded by exotic invasive plant species. In other cases it is a forest that has regenerated from an abandoned field and has been invaded by exotic plant species as a result of the disturbance.

Even though some these communities have increased the amount of forest area in the watershed since the early 1900's they do not provide as much wildlife value when compared to a natural forest that is without the invasive exotic plant species. In addition there is little, if any, regeneration of the canopy. In most cases the community is in a static situation where the exotic species compete with one another for dominance in the lower layers and prevent any sort of native forest type from forming.

In most cases the canopy of these forests are dominated by tuliptree (*Liriodendron tulipifera*), red maple (*Acer rubrum*), black walnut (*Juglans nigra*) and black locust (*Robinia pseudoacacia*). The understory usually has smaller members of the canopy, sassafras (*Sassafras albidum*), black cherry (*Prunus serotina*) and spicebush (*Lindera benzoin*). The shrub and vine layers can be quite dense and include multiflora rose (*Rosa multiflora*), oriental bittersweet (*Celastrus orbiculatus*), Chinese privet (*Ligustrum sinense*) and Japanese honeysuckle (*Lonicera japonica*). Common herbs include garlic mustard (*Alliaria petiolata*) and Japanese stiltgrass (*Microstegium vimineum*).

Diagnostic Features: A vegetation community that has a tree canopy of mostly native species and is invaded by exotic plant species in the understory and lower layers is diagnostic of this type.

Geology and Environmental Features: These forests are often found in places where there is an ample supply of nutrients such as places that are underlaid by amphibolite.

Statewide Distribution: This community is found throughout the Piedmont and Coastal Plain of Delaware.

NORTHEASTERN OLD FIELD

A.1190-*Dactylis glomerata*-*Rumex acetosella* Herbaceous Alliance
CEGL006107-*Dactylis glomerata*-*Phleum pratense*-*Festuca* spp.-*Solidago* spp. Herbaceous
Vegetation



Community Description: This community originates from fields that were previously in agriculture or are hayed by annual mowing. In the Red Clay Creek watershed most of these communities are maintained perpetually by annual mowing and/or haying. Kentucky fescue (*Festuca arundinacea*) is the typical dominant species of this community. Other associates may be white clover (*Trifolium pratense*), Queen Anne's lace (*Daucus carota*), sweet vernal grass (*Anthoxanthum odoratum*), orchard grass (*Dactylis glomerata*), common velvet grass (*Holcus lanatus*) and redbud panicgrass (*Panicum agrostoides*).

This community is the most common field community in the watershed and can be found in large expanses especially along Ashland-Clinton School Road, Snuff Mill Road, Way Road and Barley Mill Road near Mount Cuba. In some places this community can be hard to differentiate from Open Lawn, but lawns are mowed more frequently than once a year, whereas Northeastern Old Fields are mowed only once a year or not at all.

Diagnostic Features: A grassland dominated by Kentucky fescue or other grasses is diagnostic of this community.

Geology and Environmental Features: This community appears to have a preference for those soils that have a high amount of nutrients as compared to the Little Bluestem Old Field which prefers more nutrient poor places.

Statewide Distribution: This community is known throughout the state of Delaware but more study needs to be done to determine true distribution. The best examples so far are known from the Piedmont.

NORTHEASTERN SUCCESSIONAL SHRUBLAND

A.3558-*Cornus drummondii* Shrubland Alliance

CEGL006451-*Elaeagnus umbellata*-*Cornus racemosa*-*Rosa multiflora*-*Juniperus virginiana* Shrubland

Community Description: Northeastern Successional Shrublands are similar to the Northeastern Modified Successional Forest but lack the tree canopy. They contain a similar assortment of species in both the shrub and herb layers. In the summer this community can often block the view from the road of other communities located behind it.

Diagnostic Features: This shrubland, as expressed in the Red Clay Creek watershed, is composed of invasive plant species both native and exotic and can be quite dense.

Geology and Environmental Features: This community does not appear favor a particular geological type.

Statewide Distribution: This community is known statewide in Delaware and like the Northeastern Modified Successional Forest it has varying species compositions depending on the location.

NORWAY SPRUCE PLANTED FOREST

A.91-*Picea abies* Planted Forest Alliance

CEGL007167-*Picea abies* Planted Forest

Community Description: Norway Spruce Planted Forests are often composed of only Norway spruce (*Picea abies*) but can be joined by other species coniferous species. In Red Clay Creek as in most places in Delaware they are found as residential plantings and very small in size.

Diagnostic Features: The dominance of Norway spruce defines this community in the watershed.

Geology and Environmental Features: This community is planted and is not specific to a geologic type.

Statewide Distribution: This community in Delaware is known from scattered locations in the state but is most common in the Piedmont.

OPEN LAWN

(No crosswalk to NVC)

Description: This community is composed of grasslands that are mowed more frequently than once a year, which separates it from the Northeastern Old Field. This community also contains less 60% coverage of woody species. Most open lawns are around houses or other structures and in the Red Clay Creek watershed and can be quite large.

PARKING LOT

(No crosswalk to NVC)

Description: Parking lots are scattered around the Scenic Byway and are concentrated around old manufacturing mills and places of business.

RED PINE PLANTED FOREST

A.97-*Pinus resinosa* Planted Forest Alliance
CEGL007177-*Pinus resinosa* Planted Forest

Community Description: One Red Pine Planted Forest is located just northwest of the intersection of Owls Nest and Old Kennett Roads. As the name of the community would infer it is composed of a monoculture of red pine (*Pinus resinosa*). The community in Red Clay Creek is in a residential setting and the trees are not planted in rows.

Diagnostic Features: A near monoculture of red pine readily identifies this community.

Geology and Environmental Features: This community is not known to have a geological relationship and is a planted community.

Statewide Distribution: This community located mostly in the northern parts of New Castle County and is often associated with residential development.

RED SPRUCE PLANTED FOREST

A.92-*Picea rubens* Planted Forest Alliance CEGL004758-*Picea rubens* Planted Forest

Community Description: Red Spruce Planted Forests are found occasionally throughout the scenic byway area. Red spruce (*Picea rubens*) is generally the only species present. Often they are planted with other species of spruce such as blue spruce (*Picea pungens*) or Norway spruce (*Picea abies*).

Diagnostic Features: This community is defined by the dominance or near total dominance of red spruce (*Picea rubens*).

Geology and Environmental Features: This community is anthropogenic and does have an affinity for a particular geologic type.

Statewide Distribution: This community found primarily in the Piedmont of Delaware and in scattered locations in the northern Coastal Plain.

ROAD

(No crosswalk to NVC)

Description: The land cover includes the pavement of the roads going through the watershed and the adjacent shoulder.

WATER

(No crosswalk to NVC)

Description: This land cover includes the water surface of Red Clay Creek.

WATER RECHARGE BASIN

(No crosswalk to NVC)

Description: This land cover includes impoundments that are designed to catch nutrients from development.

WHITE PINE PLANTED FOREST
A.98-*Pinus strobus* Planted Forest Alliance
CEGL007178-*Pinus strobus* Planted Forest



Community Description: A few large examples of this community are found near Hoopes Reservoir and many smaller examples occur in wooded lawns and Northeastern Old Fields throughout the watershed. White pine (*Pinus strobus*) is typically the only species in this community due to the acidity of the needles although in the Red Clay Creek watershed this community may be joined by other conifer species such as red spruce (*Picea rubens*), white spruce (*Picea alba*) and Norway spruce (*Picea abies*). Occasionally species of oaks (*Quercus* spp.) may be present.

Diagnostic Features: The dominance of white pine (*Pinus strobus*) defines this community.

Geology and Environmental Features: This community is anthropogenic in Delaware and appears to have no particular affinity for a geological type.

Statewide Distribution: This community is found throughout the state but is most common in the Piedmont.

WOODED LAWN

(No crosswalk to NVC)

Description: This community is similar to the Open Lawn but is more than 60% shaded by trees or shrubs. A lot of these communities contain some of the largest examples of oaks (*Quercus* spp.) and maples (*Acer spp.*) and other tree species found in the watershed. Most examples are place where a house has been built in a Mesic Piedmont Hardwood Forest, a lawn was developed and underneath and the overlying canopy was not removed.

VEGETATION COMMUNITIES BY ROAD SEGMENT

Ashland-Clinton School Road

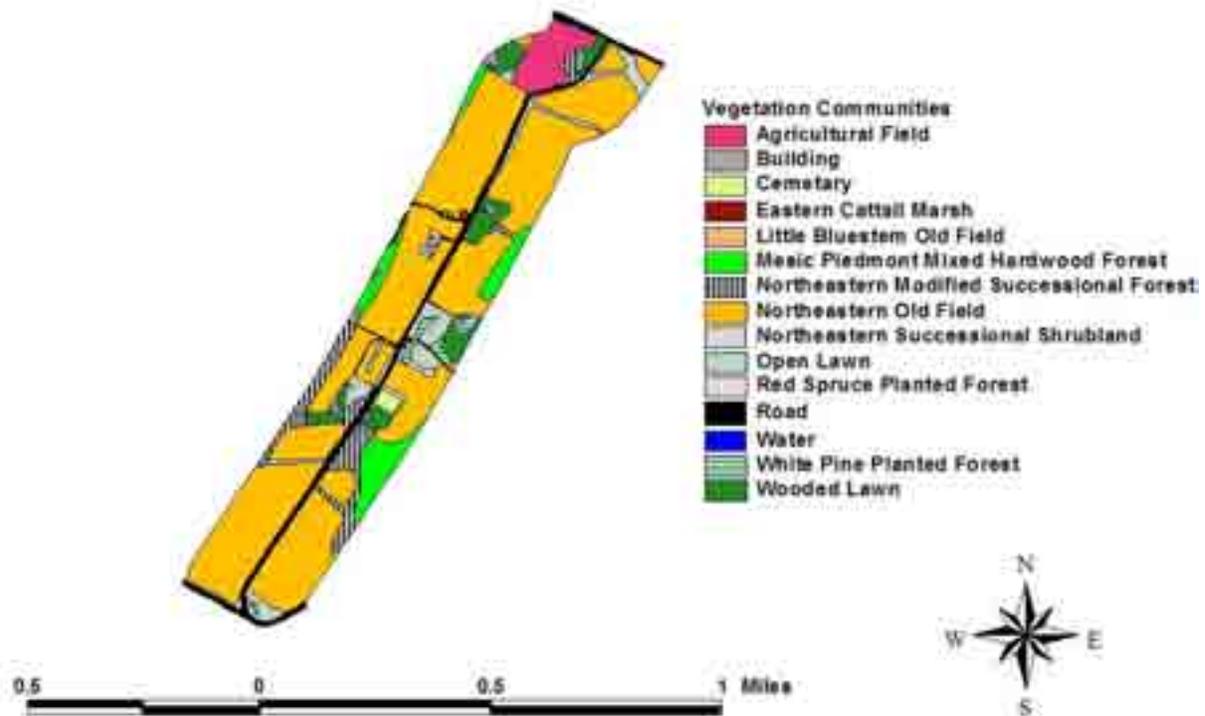


Figure 2. Ashland-Clinton School Road Vegetation Communities

Ashland-Clinton School Road goes from Old Kennett Road south to Creek Road and is about 1.5 miles long. Ten vegetation communities are found on it. This road is lined with large expanses of Northeastern Old Field, the most common community type, with scattered stretches of Northeastern Successional Shrubland which lines the road. Other communities here include:

1. Agricultural Field
2. Eastern Cattail Marsh
3. Mesic Piedmont Mixed Hardwood Forest
4. Northeastern Modified Successional Forest
5. Open Lawn
6. Red Spruce Planted Forest

7. White Pine Planted Forest
8. Wooded Lawn

Auburn Mill Road

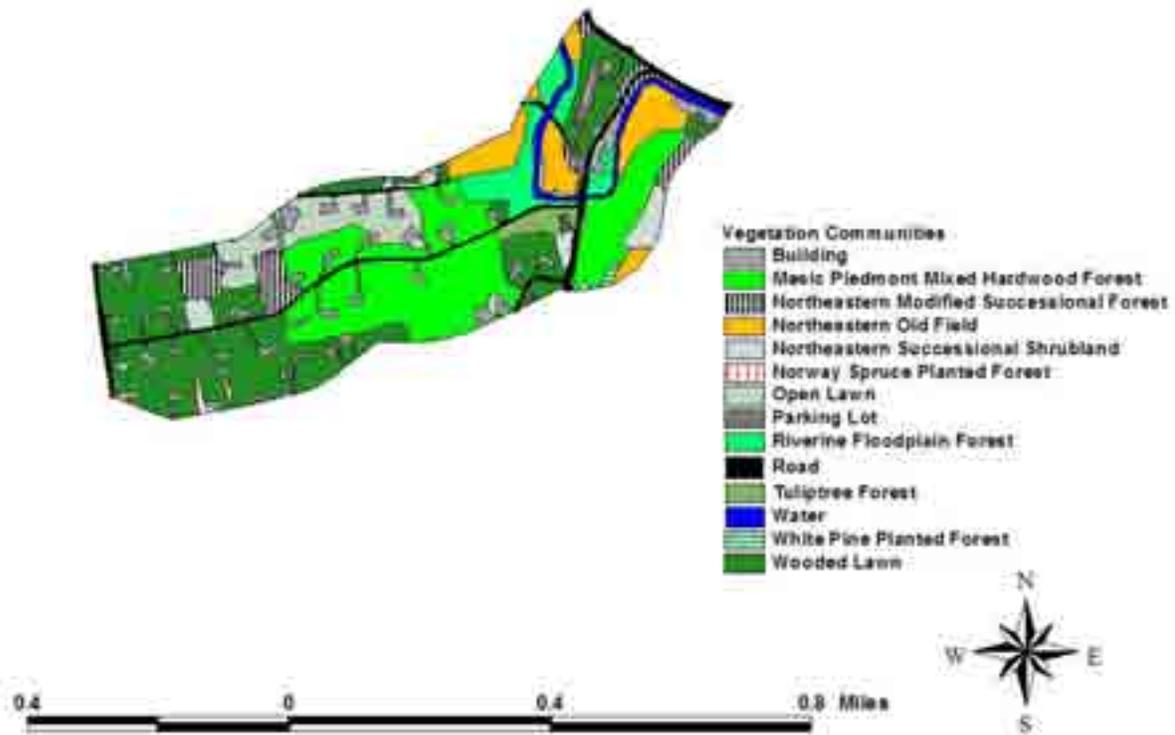


Figure 3. Auburn Mill Road Vegetation Communities

Auburn Mill Road roughly goes east to west from Creek Road to the state line. Auburn Mill Road is about 1.0 mile long and contains twelve vegetation communities. Wooded lawn intersperses with Mesic Piedmont Mixed Hardwood Forest along most of the road. Other communities on Auburn Mill Road include:

1. Box Elder Forest
2. Northeastern Modified Successional Forest
3. Northeastern Old Field
4. Northeastern Successional Shrubland
5. Norway Spruce Planted Forest
6. Open Lawn
7. Riverine Floodplain Forest
8. Tuliptree Forest
9. White Pine Planted Forest
10. Wooded Lawn

Barley Mill Road

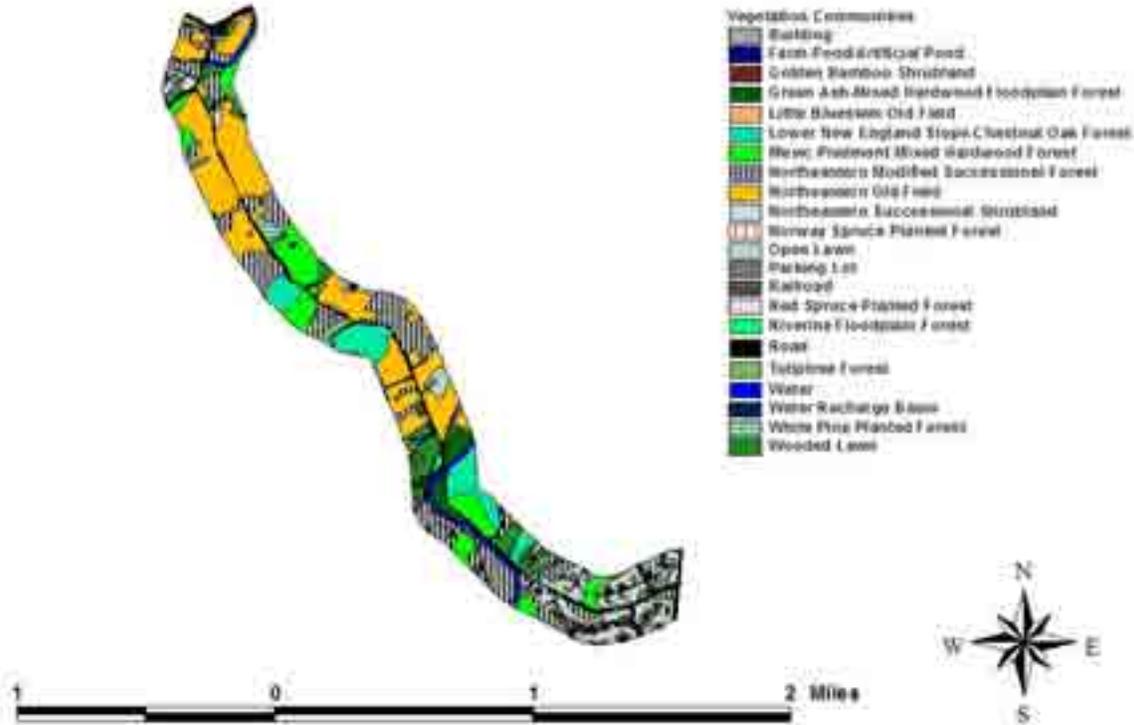


Figure 4. Barley Mill Road Vegetation Communities

Barley Mill Road goes roughly north to south and is the second longest road on the Byway at 3.4 miles in length but contains the second highest amount of vegetation communities with fourteen. Northeastern Old Field is the most common community on the road. Due to disturbance, though, Northeastern Modified Successional Forest is the next most common community. In spite of the disturbance considerable amounts of the more “natural” type communities including Mesic Piedmont Mixed Hardwood Forest and Lower New England Chestnut Oak Forest. At the eastern end of the road is a small stand of Golden Bamboo Shrubland, which is the only occurrence within the Byway. Other communities present on Barley Mill Road include:

1. Green Ash-Mixed Hardwood Forest
2. Northeastern Successional Shrubland
3. Norway Spruce Planted Forest
4. Open Lawn
5. Red Spruce Planted Forest
6. Riverine Floodplain Forest

7. Tuliptree Forest
8. White Pine Planted Forest
9. Wooded Lawn

Brackenville Road

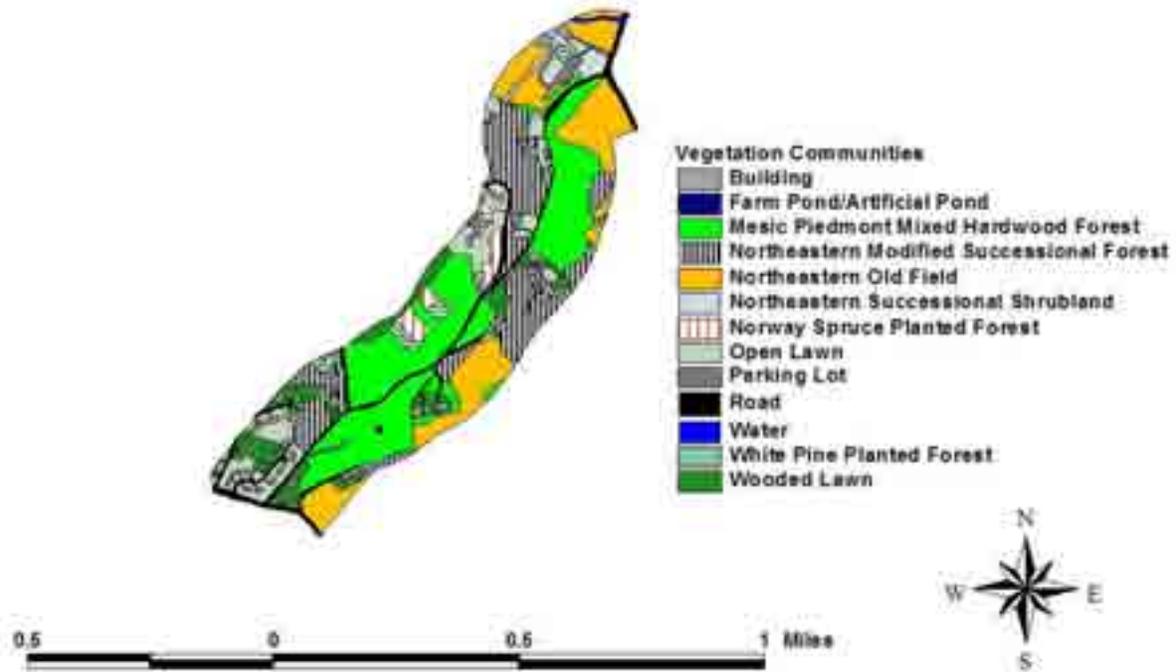


Figure 5. Brackenville Road Vegetation Communities

Brackenville Road runs in a northeast to southwest direction and is 1.2 miles long. Brackenville Road goes through a Mesic Piedmont Mixed Hardwood Forest interspersed with a few areas of Northeastern Modified Successional Forest with Northeastern Old Fields being seen at the edges of the corridor. The western ends of the road have a lot of wooded lawn with the presence of suburban developments. Other communities that can be seen include:

1. Northeastern Successional Shrubland
2. Norway Spruce Planted Forest
3. Open Lawn
4. White Pine Planted Forest

Burnt Mill Road

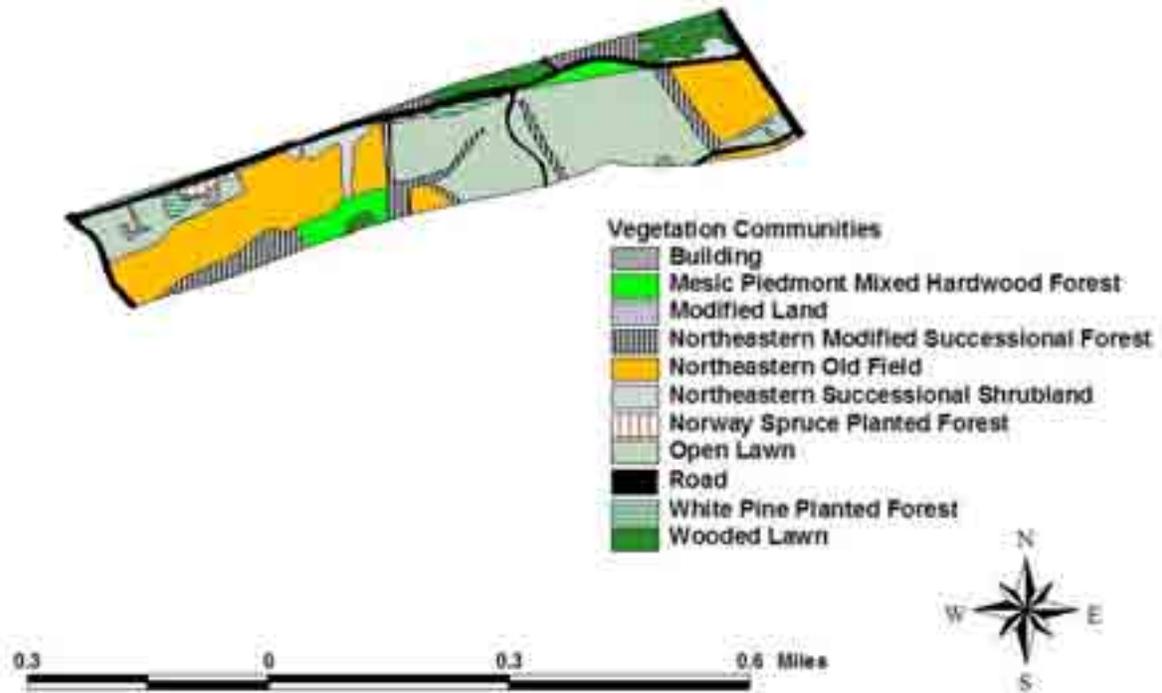


Figure 6. Burnt Mill Road Vegetation Communities

Burnt Mill Road straddles the state line of Delaware and Pennsylvania going between Delaware Route 52 and eventually heading north to the state line. Burnt Mill Road is about 0.9 miles in length before crossing the state line. There are eight vegetation communities, the most prominent of which are Open Lawn and Northeastern Old Field. Other communities include:

1. Mesic Piedmont Mixed Hardwood Forest
2. Northeastern Modified Successional Forest
3. Northeastern Successional Shrubland
4. Norway Spruce Planted Forest
5. White Pine Planted Forest

Campbell Road

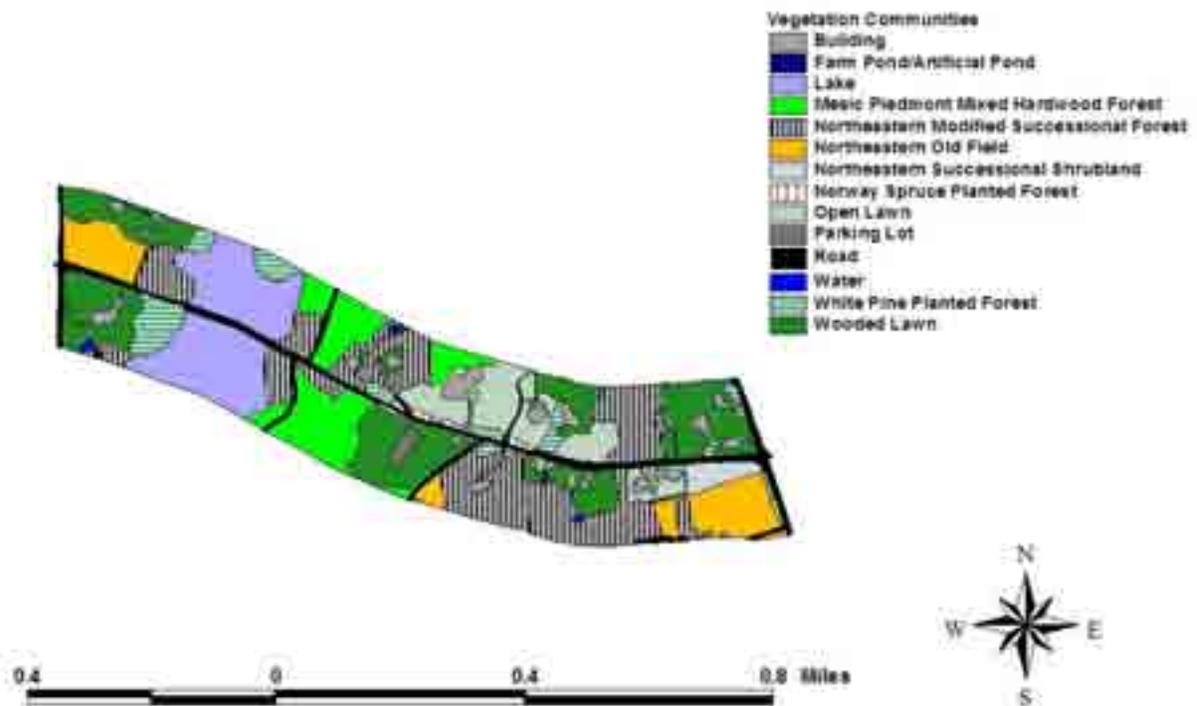


Figure 7. Campbell Road Vegetation Communities

Campbell Road goes west to east and passes between Delaware Route 52 on the east and the intersection of Owls Nest Road and New London Road on the west. Campbell Road is 1.2 miles long. This segment includes a crossing of Hoopes Reservoir which is the largest lake in the Piedmont of Delaware. Wooded lawns associated with houses in the area and Northeastern Modified Successional Forest are the most prominent communities on this route. Other communities include:

1. Mesic Piedmont Mixed Hardwood Forest
2. Northeastern Old Field
3. Northeastern Successional Shrubland
4. Norway Spruce Planted Forest
5. Open Lawn
6. White Pine Planted Forest
7. Wooded Lawn

Center Mill Road

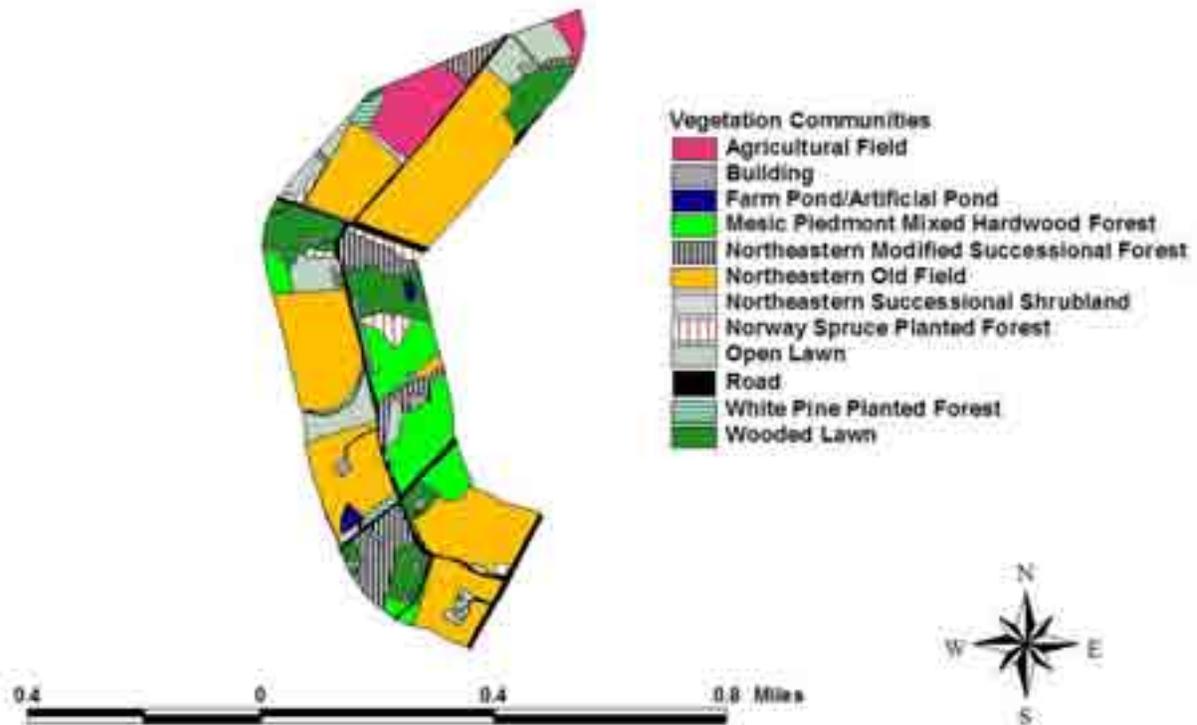


Figure 8. Center Mill Road Vegetation Communities

Center Mill Road runs south from the state line to Snuff Mill Road with a few curves. Center Mill Road is 1.2 miles long and crosses Old Kennett Road in the middle. Northeastern Old Field is the predominant vegetation community out of ten on the road. This road is also one of the few in the watershed with a large Agricultural Field. Other communities on Center Mill Road include:

1. Eastern Cattail Marsh
2. Mesic Piedmont Mixed Hardwood Forest
3. Northeastern Modified Successional Forest
4. Northeastern Successional Shrubland
5. Norway Spruce Planted Forest
6. Open Lawn
7. White Pine Planted Forest
8. Wooded Lawn

Centerville Road

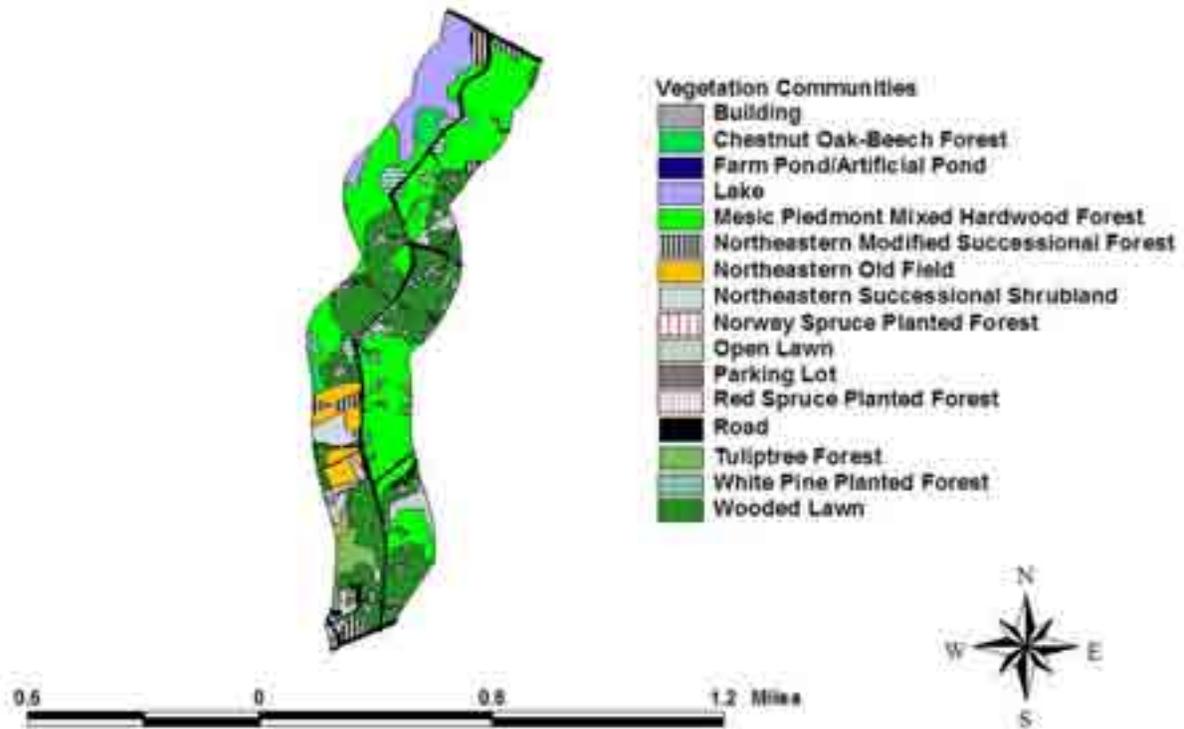


Figure 9. Centerville Road Vegetation Communities

Centerville Road runs from Barley Mill Road north 1.7 miles to Campbell Road to the east of Hoopes Reservoir. Wooded lawn is the most common vegetation community seconded by Mesic Piedmont Mixed Hardwood Forest. A total of ten communities are on this road. This road contains the only example of a Chestnut Oak-Beach Forest on the Byway. Other communities that can be seen include:

1. Northeastern Modified Successional Forest
2. Northeastern Old Field
3. Northeastern Successional Shrubland
4. Norway Spruce Planted Forest
5. Open Lawn
6. Red Spruce Planted Forest
7. Tuliptree Forest
8. White Pine Planted Forest

Creek Road

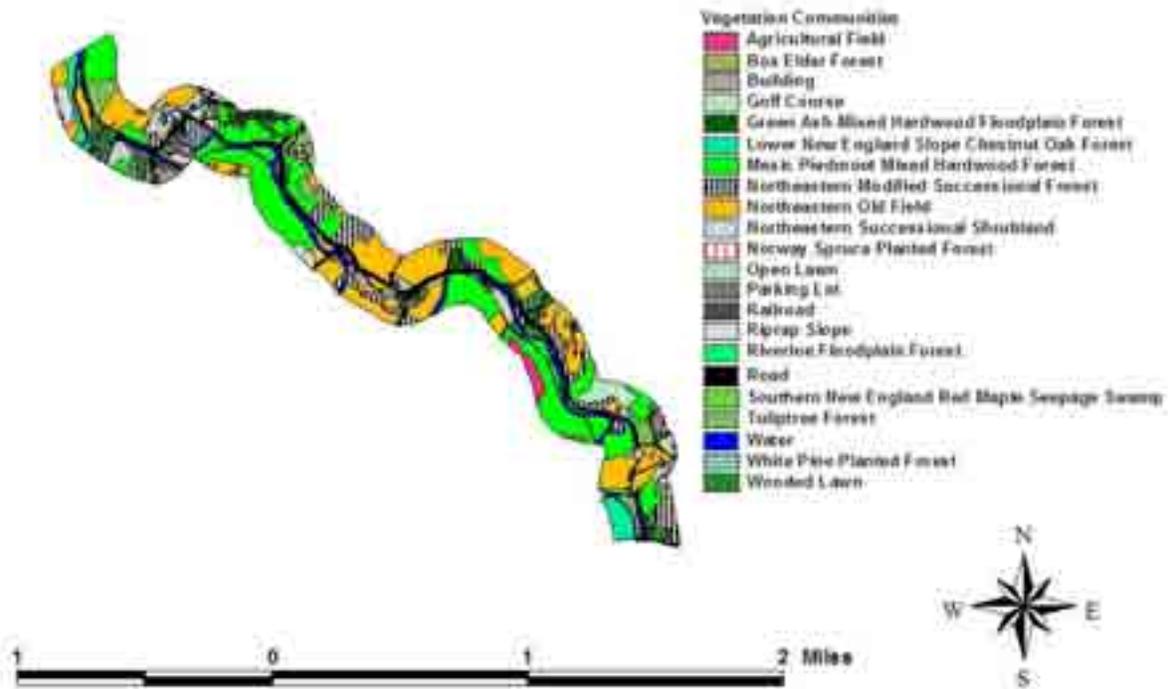


Figure 10. Creek Road Vegetation Communities

Creek Road parallels Red Clay Creek from most of its 3.6 mile length and goes from the state line south to Hillside Mill Road. Creek Road is the longest road in the Byway and contains the most vegetation communities at sixteen. Mesic Piedmont Mixed Hardwood Forest is the prominent vegetation community followed by Northeastern Old Field. Other communities include:

1. Agricultural Field
2. Box Elder Forest
3. Eastern Reed Marsh
4. Green Ash-Mixed Hardwood Forest
5. Lower New England Slope Chestnut Oak Forest
6. Northeastern Modified Successional Forest
7. Northeastern Successional Shrubland
8. Norway Spruce Planted Forest
9. Open Lawn
10. Riverine Floodplain Forest
11. Southern New England Red Maple Seepage Swamp

12. Tuliptree Forest
13. White Pine Planted Forest
14. Wooded Lawn

Hillside Mill Road

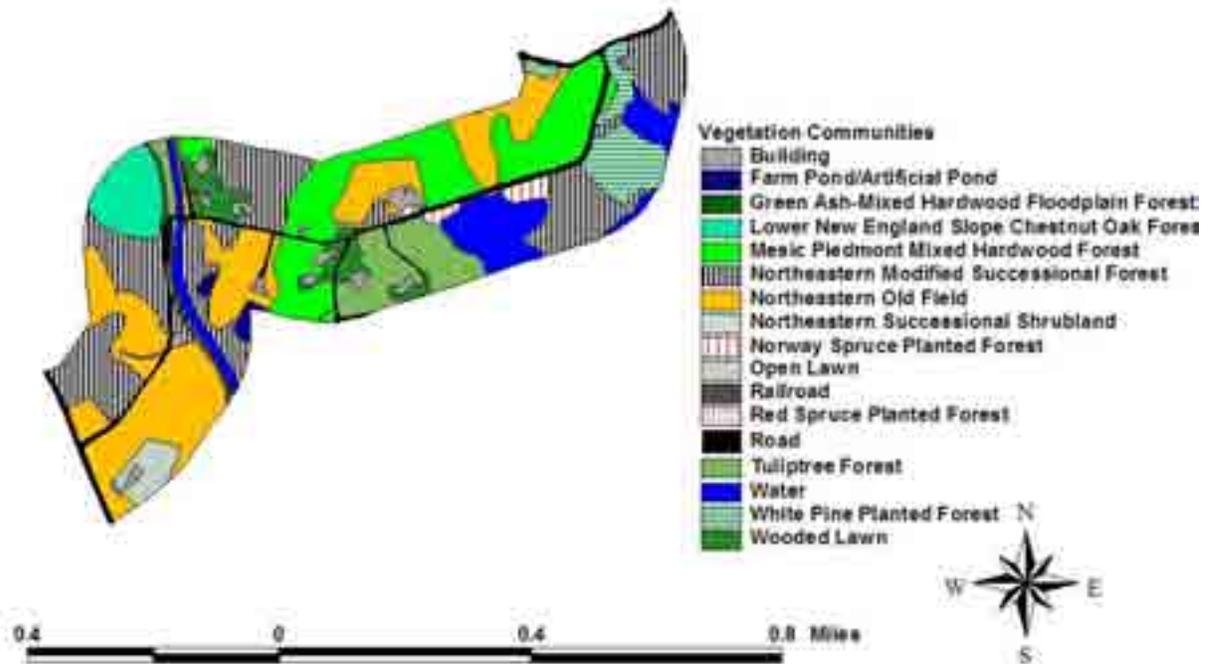


Figure 11. Hillside Mill Vegetation Communities

Hillside Mill Road goes from Pyles Ford Road southwest to Barley Mill Road. Hillside Mill Road is 1.3 miles in length and crosses Red Clay Creek roughly in the middle. Northeastern Modified Successional Forest and Northeastern Old Field are the most prominent vegetation communities. There is also a large amount of Mesic Piedmont Mixed Hardwood Forest among the twelve total communities. Other vegetation communities that can be seen include:

1. Green Ash-Mixed Hardwood Forest
2. Lower New England Slope Chestnut Oak Forest
3. Northeastern Successional Shrubland
4. Norway Spruce Planted Forest
5. Open Lawn
6. Red Spruce Planted Forest
7. Tuliptree Forest
8. White Pine Planted Forest
9. Wooded Lawn

Hillside Road

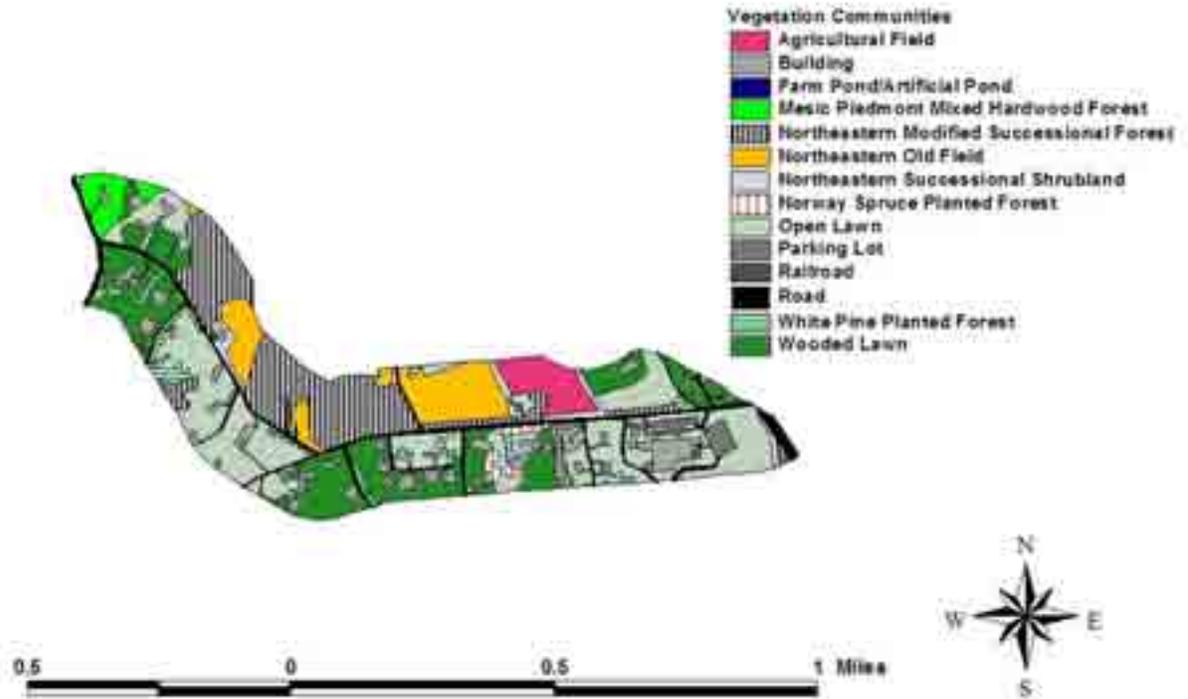


Figure 12. Hillside Road Vegetation Communities

Hillside Road is located in two watersheds, Red Clay Creek and the Christina River, and goes from Greenville Road west to Centerville Road. Hillside Road is 1.5 miles long and contains nine total vegetation communities. Due to development and disturbance Open Lawn and Northeastern Modified Successional Forest are the most common vegetation communities. Falling in a close third is Wooded Lawn. Other vegetation communities include:

1. Agricultural Field
2. Mesic Piedmont Mixed Hardwood Forest
3. Northeastern Old Field
4. Northeastern Successional Shrubland
5. Norway Spruce Planted Forest
6. White Pine Planted Forest

New London Road

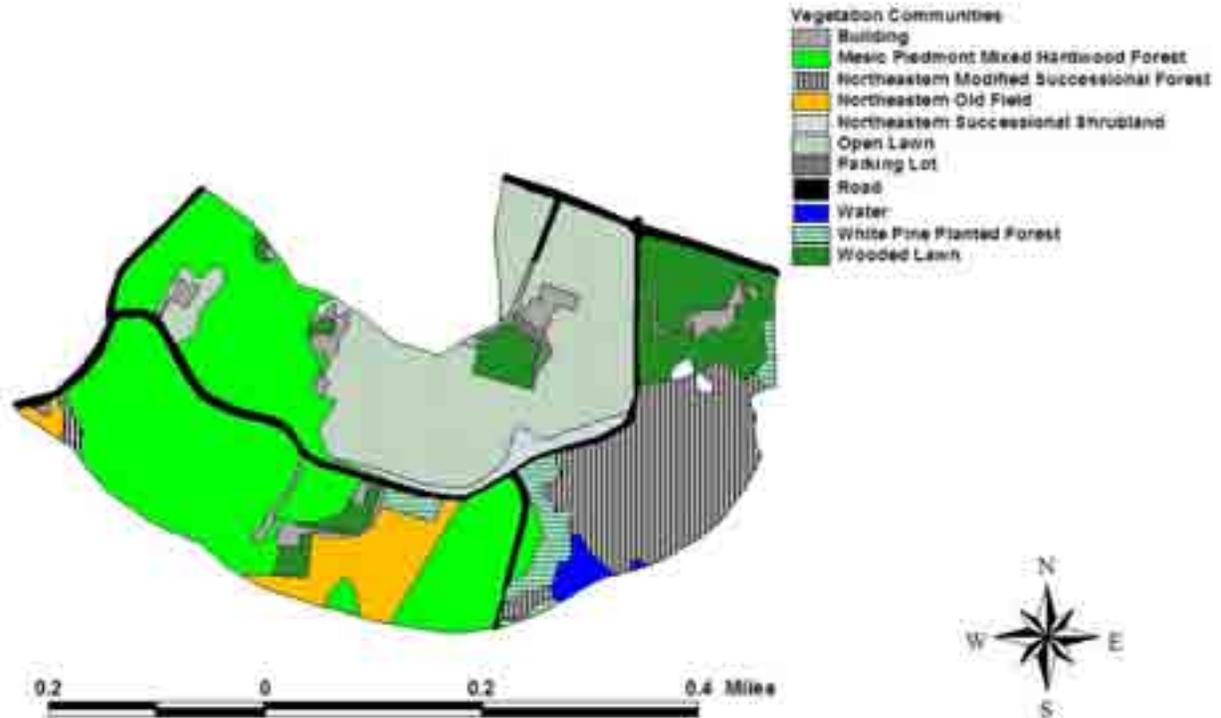


Figure 13. New London Road Vegetation Communities

New London Road goes from Campbell Road roughly south and west to Pyles Ford Road. New London Road is 0.75 miles long and contains seven vegetation communities. Mesic Piedmont Mixed Hardwood Forest is the most prominent vegetation community followed by Open Lawn. Other vegetation communities include:

1. Northeastern Modified Successional Forest
2. Northeastern Old Field
3. Northeastern Successional Shrubland
4. White Pine Planted Forest
5. Wooded Lawn

Nine Gates Road

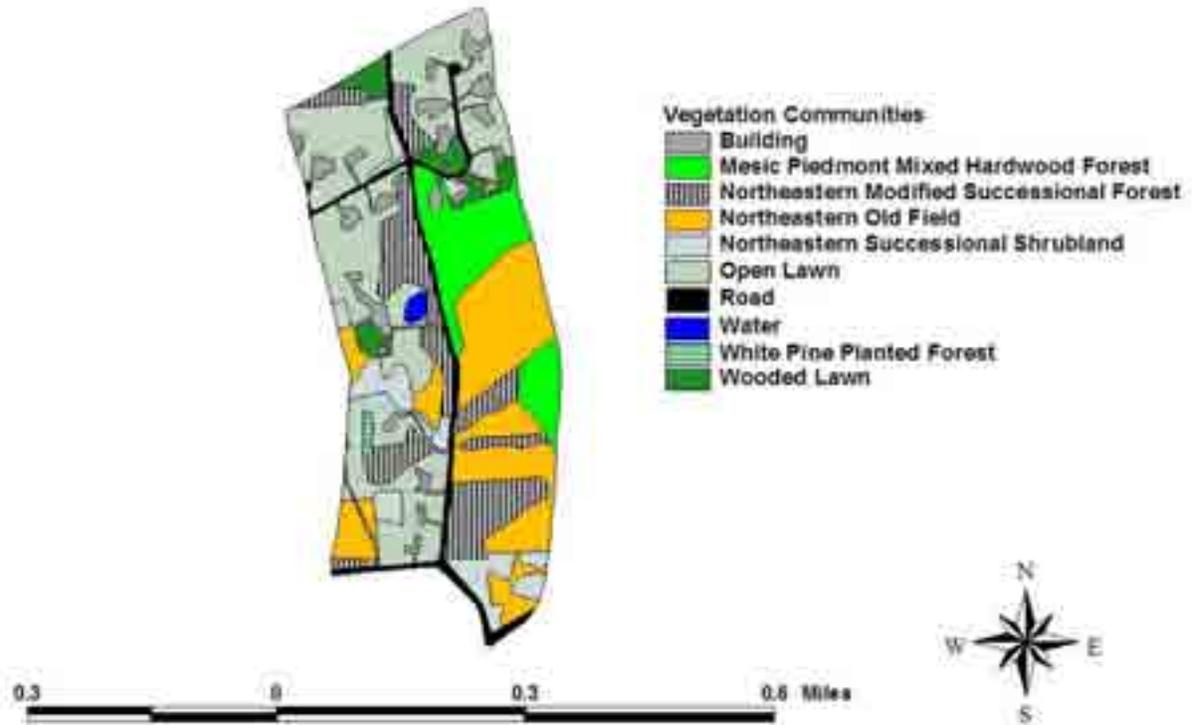


Figure 14. Nine Gates Road Vegetation Communities

Nine Gates Road goes from Snuff Mill Road north for 0.6 miles to the state line. Many residences are present making Open Lawn the most common vegetation community out of a total of seven. Other vegetation communities that can be seen include:

1. Mesic Piedmont Mixed Hardwood Forest (6.4 acres)
2. Northeastern Modified Successional Forest (17.2 acres)
3. Northeastern Old Field (22.3 acres)
4. Northeastern Successional Shrubland (7.1 acres)
5. White Pine Planted Forest (0.4 acres)
6. Wooded Lawn (4 acres)

Old Kennett Road

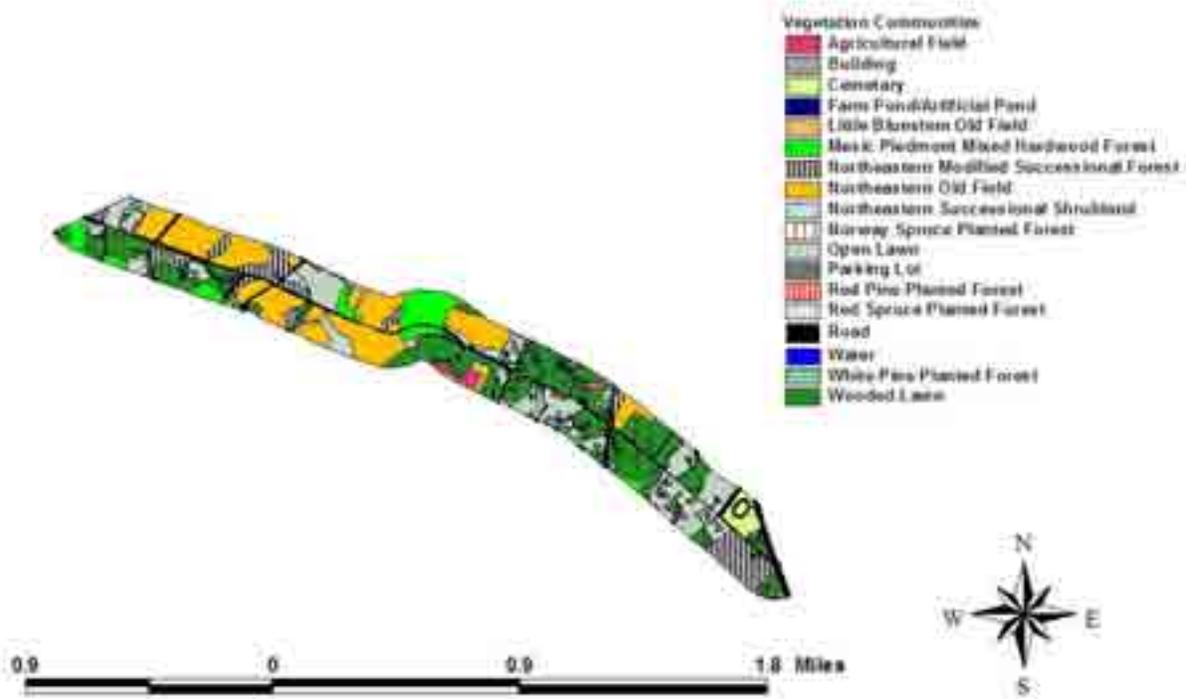


Figure 15. Old Kennett Road Vegetation Communities

Old Kennett Road is one of the longer roads in the Byway and goes from the state line east to Greenville Road. It is 2.9 miles long and contains eleven vegetation communities. Many residences are present along this road making Wooded Lawn the most common vegetation community interspersed with Northeastern Old Fields. Open Lawn is also present in a lot of areas on this road. Other vegetation communities include:

1. Agricultural Field (4 acres)
2. Mesic Piedmont Mixed Hardwood Forest
3. Northeastern Modified Successional Forest
4. Northeastern Successional Shrubland
5. Norway Spruce Planted Forest
6. Red Pine Planted Forest
7. Red Spruce Planted Forest
8. White Pine Planted Forest

Old Wilmington Road

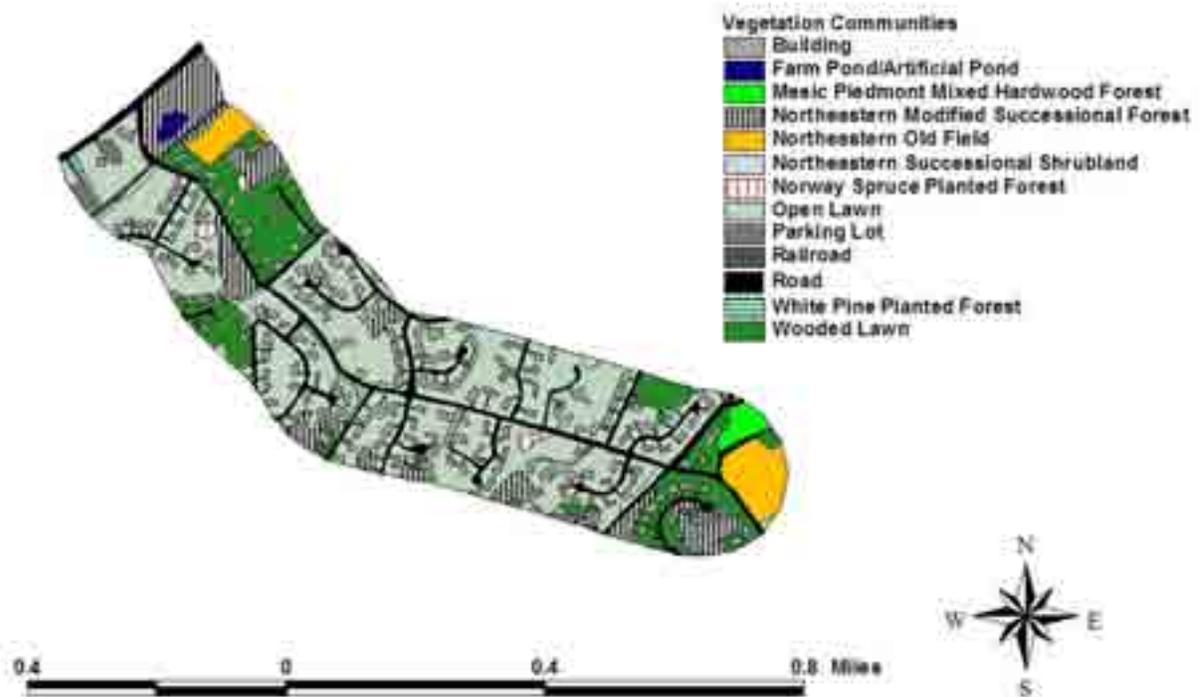


Figure 16. Old Wilmington Road Vegetation Communities

Old Wilmington Road goes from Yorklyn Road southeast to just past Brackenville Road and follows the dividing ridge between Red Clay Creek and White Clay Creek. Old Wilmington Road is 1.25 miles long in the Byway and contains eight vegetation communities. Residential development in the area makes Open Lawn the most prominent vegetation community on this stretch of road. Other communities here include:

1. Mesic Piedmont Mixed Hardwood Forest
2. Northeastern Modified Successional Forest
3. Northeastern Old Field
4. Northeastern Successional Shrubland
5. Norway Spruce Planted Forest
6. White Pine Planted Forest
7. Wooded Lawn

Owl's Nest Road

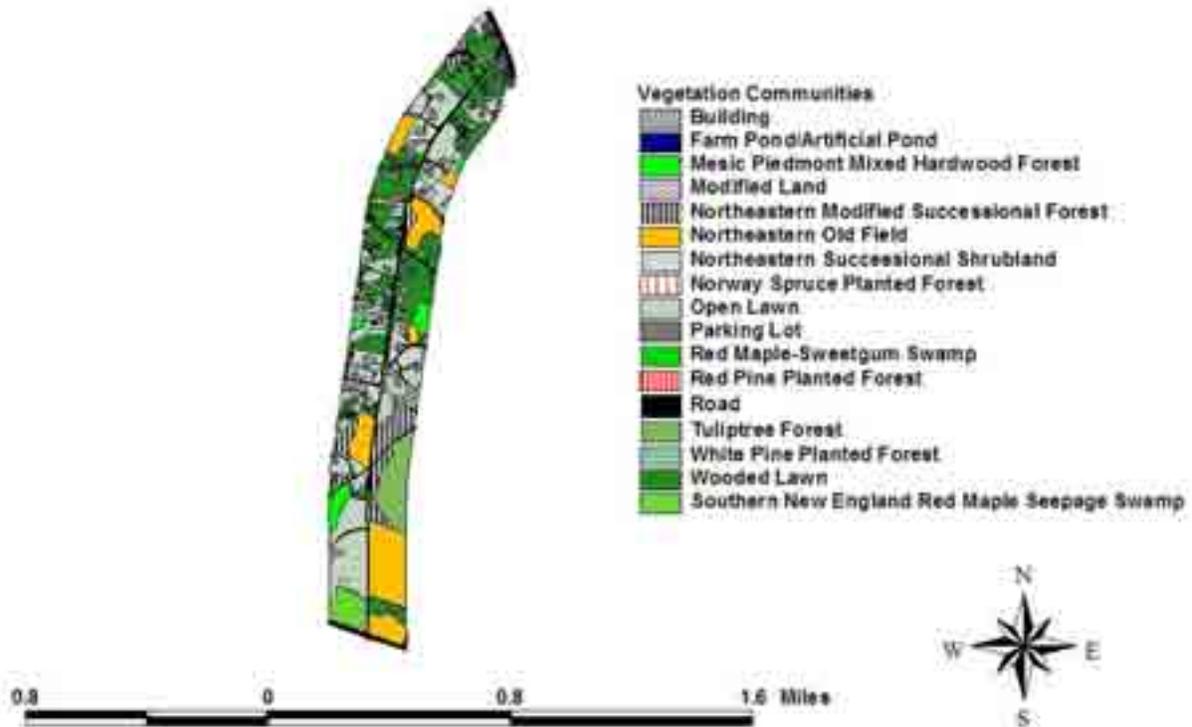


Figure 17. Owl's Nest Road Vegetation Communities

Owl's Nest Road goes south from Greenville Road (Route 52) to the intersection of Campbell Road and Walnut Green Road and is 2.0 miles long. On its way it crosses Old Kennett Road and Pyle's Ford Road. Out of eleven vegetation communities the most common are Wooded Lawn and Open Lawn owing to the fact that there are a lot of large residences on the road. There is also a lot of Northeastern Old Field present along this road. Other communities on Owl's Nest Road include:

1. Mesic Piedmont Mixed Hardwood Forest
2. Northeastern Modified Successional Forest
3. Northeastern Successional Shrubland
4. Norway Spruce Planted Forest
5. Red Pine Planted Forest
6. Southern New England Red Maple Seepage Swamp
7. Tuliptree Forest
8. White Pine Planted Forest

Pyles Ford Road



Figure 18. Pyles Ford Road Vegetation Communities

Pyle's Ford Road goes from Greenville Road (Route 52) southwest to Creek Road and is 2.0 miles long. On its way it crosses Old Kennett Road and Owl's Nest Roads. Ten vegetation communities are present with Mesic Piedmont Mixed Hardwood Forest is the most common community followed closely by the Open Lawn of residences in the area. Other communities along Pyle's Ford Road include:

1. Eastern Reed Marsh
2. Northeastern Modified Successional Forest
3. Northeastern Old Field
4. Northeastern Successional Shrubland
5. Red Spruce Planted Forest
6. Tuliptree Forest
7. White Pine Planted Forest
8. Wooded Lawn

Rolling Mill Road

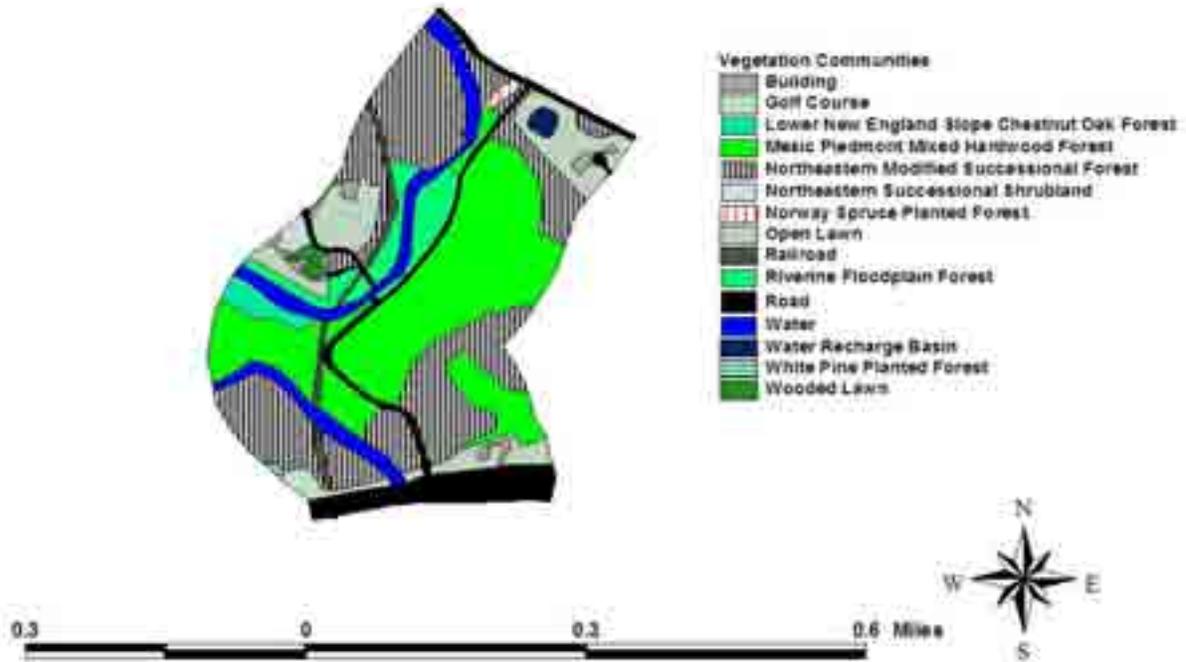


Figure 19. Rolling Mill Road Vegetation Communities

Rolling Mill Road goes from Barley Mill Road south to Route 48. Rolling Mill Road is 0.5 miles long and goes through a mature and perhaps the best example of a Mesic Piedmont Mixed Hardwood Forest on the Byway. The most prominent vegetation community out of eight is Northeastern Modified Successional Forest that is located on the western side of Red Clay Creek and is on the north and south sides of the Mesic Piedmont Mixed Hardwood Forest. Other communities that can be seen here include:

1. Lower New England Slope Chestnut Oak Forest
2. Northeastern Successional Shrubland
3. Norway Spruce Planted Forest
4. Riverine Floodplain Forest
5. White Pine Planted Forest
6. Wooded Lawn

Sharpless Road

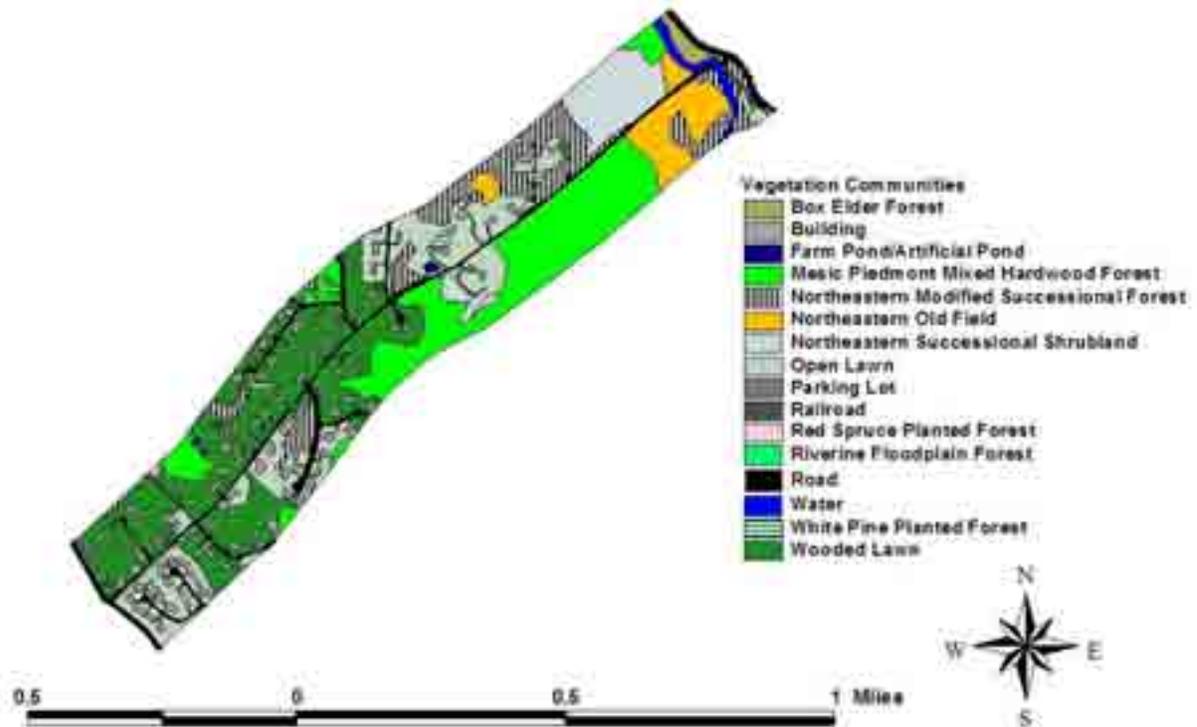


Figure 20. Sharpless Road Vegetation Communities

Sharpless Road goes from Creek Road southwest to Old Wilmington Road and is 1.5 miles long. Wooded Lawn is the most common vegetation community followed by Mesic Piedmont Mixed Hardwood Forest out of ten total communities. Other communities that can be seen on this road include:

1. Box Elder Forest
2. Northeastern Modified Successional Forest
3. Northeastern Old Field
4. Northeastern Successional Shrubland
5. Open Lawn
6. Red Spruce Planted Forest
7. White Pine Planted Forest
8. Wooded Lawn

Snuff Mill Road

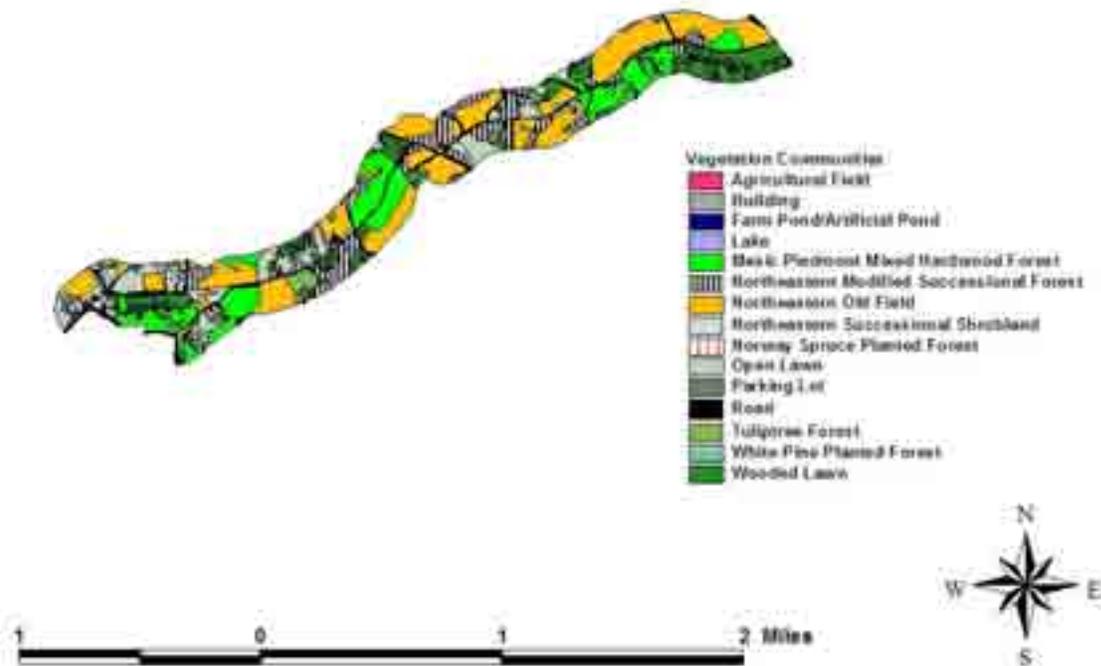


Figure 21. Snuff Mill Road Vegetation Communities

Snuff Mill Road is one of the longer roads on the Byway and goes from Greenville Road (Route 52) southwest to Creek Road. Snuff Mill Road is 2.9 miles long and contains ten vegetation communities. It is similar to Way Road and Ashland-Clinton School Road in that it has Northeastern Old Field as the prominent community type. Mesic Piedmont Mixed Hardwood Forest is next most common community. Other communities that can be seen include:

1. Agricultural Field
2. Northeastern Modified Successional Forest
3. Northeastern Successional Shrubland
4. Norway Spruce Planted Forest
5. Open Lawn
6. Tuliptree Forest
7. White Pine Planted Forest
8. Wooded Lawn

Walnut Green Road

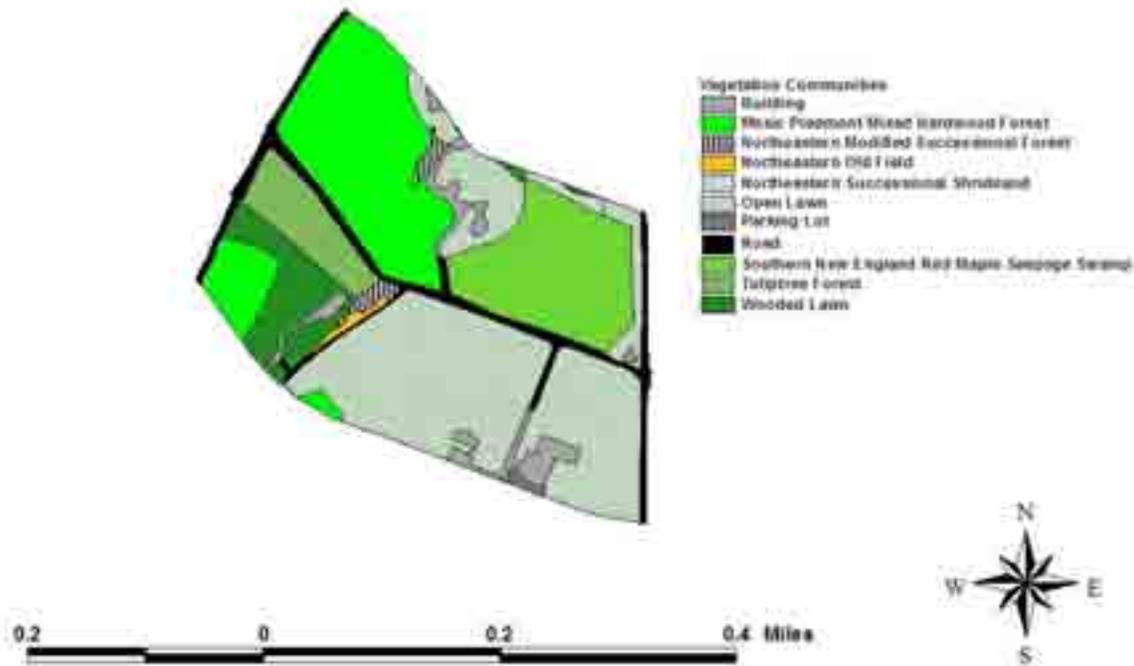


Figure 22. Walnut Green Road Vegetation Communities

Walnut Green Road is a short road that goes from Owls Nest Road west to Pyles Ford Road. Although it is the shortest road in the Byway covering only 0.4, it contains the only example of a Southern New England Red Maple Seepage Swamp. Open Lawn and Mesic Piedmont Mixed Hardwood Forest are the most common communities out of eight. Other communities that can be seen include:

1. Northeastern Modified Successional Forest
2. Northeastern Old Field
3. Northeastern Successional Forest
4. Tuliptree Forest
5. Wooded Lawn

Way Road

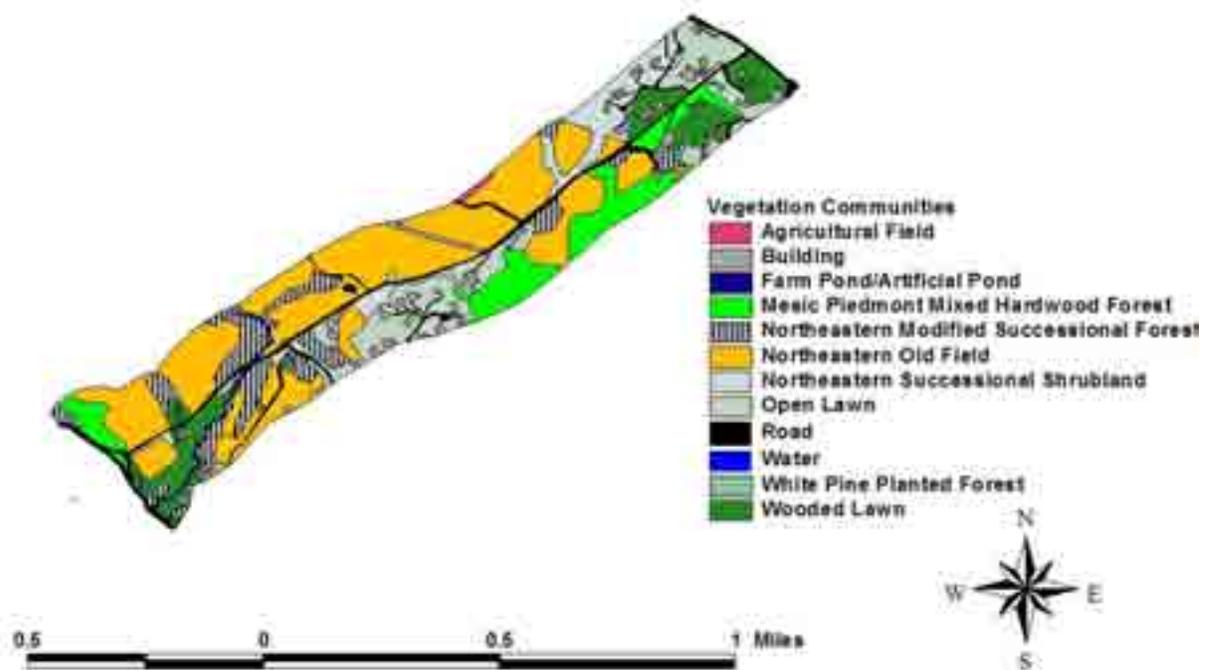


Figure 23. Way Road Vegetation Communities

Way Road goes from Old Kennett Road southwest to Creek Road, is 1.6 miles long and contains eight vegetation communities. It is similar in appearance to Ashland-Clinton School Road and Snuff Mill Road having Northeastern Old Field as the most prominent vegetation community. A small amount of Mesic Piedmont Mixed Hardwood Forest can be seen on this road as well. Other communities present include:

1. Agricultural Field
2. Northeastern Modified Successional Forest
3. Northeastern Successional Shrubland
4. Open Lawn
5. White Pine Planted Forest
6. Wooded Lawn

Yorklyn Road

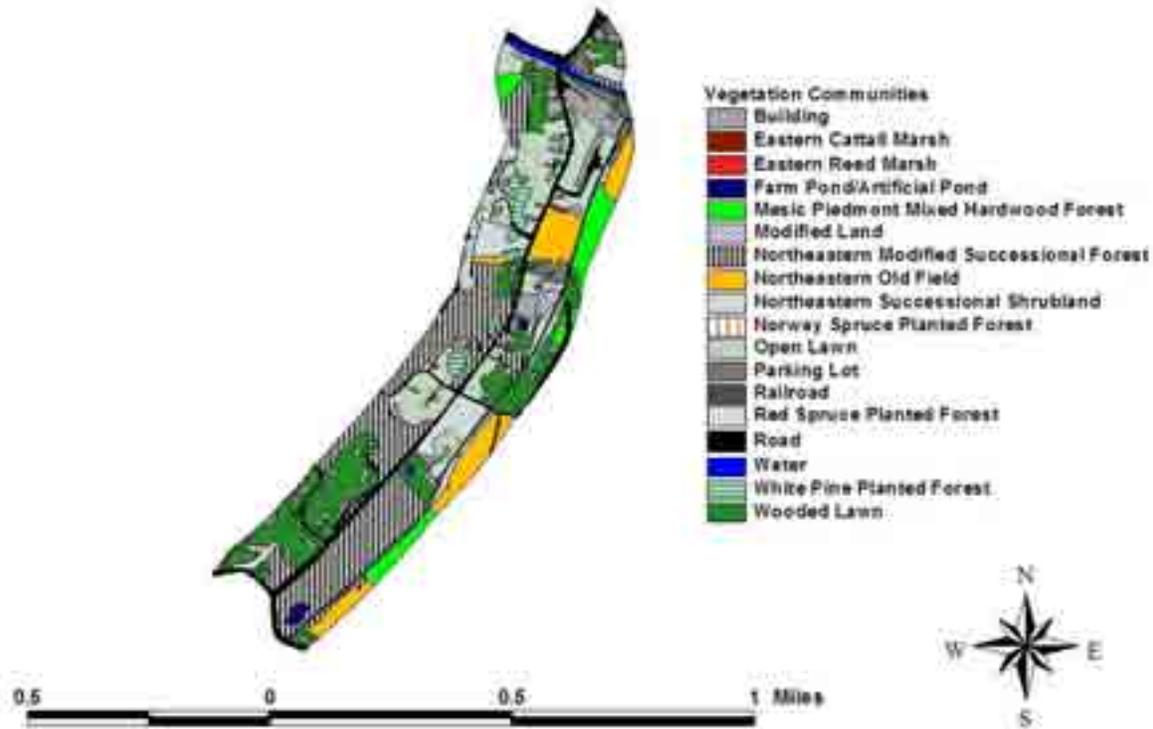


Figure 24. Yorklyn Road Vegetation Communities

Yorklyn Road goes from Creek Road southwest to Old Wilmington Road, is 1.3 miles long and contains eleven vegetation communities. Northeastern Modified Successional Forest the most common vegetation community because of the disturbance around this road. It is followed by Wooded Lawn and Open Lawn. Other communities include:

1. Eastern Cattail Marsh
2. Eastern Reed Marsh
3. Mesic Piedmont Mixed Hardwood Forest
4. Northeastern Old Field
5. Northeastern Successional Shrubland
6. Norway Spruce Planted Forest
7. Red Spruce Planted Forest
8. White Pine Planted Forest

Appendix I: Vegetation communities within the Red Clay Scenic Byway Corridor. The NVC name is presented first followed by the GDVC name in brackets.

Forested communities:

- ◆ C EGL005033-*Acer negundo* Forest [Box Elder Forest]
- ◆ C EGL006036-*Platanus occidentalis-Fraxinus pennsylvanica* Forest [Riverine Floodplain Forest]
- ◆ C EGL006186- *Liriodendron tulipifera-Quercus rubra-Fraxinus americana-Asimina triloba-Actaea racemosa-Uvularia perfoliata* [Tuliptree Forest]
- ◆ C EGL006282-*Quercus prinus-Quercus (rubra, velutina)/Vaccinium angustifolium* Forest [Lower New England Slope Chestnut Oak Forest]
- ◆ C EGL006406-*Acer rubrum-Fraxinus (pennsylvanica, americana)/Lindera benzoin/Symplocarpus foetidus* Forest [Southern New England Red Maple Seepage Swamp]
- ◆ C EGL006575-*Fraxinus pennsylvanica-(Juglans nigra, Platanus occidentalis)* Forest [Green Ash-Mixed Hardwood Floodplain Forest]
- ◆ C EGL006919-*Quercus prinus-Quercus velutina-Fagus grandifolia/Kalmia latifolia* Forest [Chestnut Oak-Beech Forest]
- ◆ C EGL006921-*Fagus grandifolia-Betula lenta-Quercus (alba, rubra)/Carpinus caroliniana* Forest [Mesic Piedmont Mixed Hardwood Forest]

Woodland Communities

- ◆ None

Shrubland communities:

- ◆ C EGL006451-*Elaeagnus umbellata-Cornus racemosa-Rosa multiflora-Juniperus virginiana* Shrubland [Northeastern Successional Shrubland]
- ◆ C EGL008560-*Phyllostachys aurea* Shrubland [Golden Bamboo Shrubland]

Herbaceous communities:

- ◆ C EGL004141-*Phragmites australis* Eastern North America Temperate Semi-Natural Herbaceous Vegetation [Eastern Reed Marsh]
- ◆ C EGL006153-*Typha (angustifolia, latifolia)-(Schoenoplectus spp.)* Eastern Herbaceous Vegetation [Eastern Cattail Marsh]

Anthropogenic communities and land covers

- ◆ Agricultural Field
 - ◆ Building
 - ◆ C EGL004758-*Picea rubens* Planted Forest [Red Spruce Planted Forest]
 - ◆ C EGL006107-*Dactylis glomerata-Phleum pretense-Festuca spp.-Solidago spp.* Herbaceous Vegetation [Northeastern Old Field]
 - ◆ C EGL006451-*Elaeagnus umbellata-Cornus racemosa-Rosa multiflora-Juniperus virginiana* Shrubland [Northeastern Successional Shrubland]
 - ◆ C EGL006599-*Prunus serotina-Liriodendron tulipifera-Acer rubrum-Fraxinus americana* Forest [Northeastern Modified Successional Forest]
 - ◆ C EGL007167-*Picea abies* Planted Forest [Norway Spruce Planted Forest]
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-
- ◆ C EGL007177-*Pinus resinosa* Planted Forest [Red Pine Planted Forest]

 - ◆ C EGL007178-*Pinus strobus* Planted Forest [White Pine Planted Forest]

 - ◆ C EGL008560-*Phyllostachys aurea* Shrubland [Golden Bamboo Shrubland]

 - ◆ Farm Pond/Artificial Pond

 - ◆ Lake

 - ◆ Open Lawn

 - ◆ Parking Lot

 - ◆ Road

 - ◆ Water

 - ◆ Water Recharge Basin

 - ◆ Wooded Lawn

RESOURCES – LANDSCAPE MANAGEMENT TOOLS

The resources listed below provide additional information on landscape management; numerous references apply to Delaware and are particularly applicable to the Red Clay Valley Piedmont area.

- *Community Spaces, Natural Places: A Guide to Restoration, Management, and Maintenance of Community Open Space*, 2005, prepared Delaware Coastal Programs
- *Controlling Backyard Invaders*, prepared by John Harrod, Delaware Nature Society
- Delmarva Power Vegetation Management - <http://www.delmarva.com/home/emergency/veg/res/>
- *Enhancing Delaware Highways: Roadside Vegetation Concept and Planning Manual*, 2005, prepared by Susan Barton, Rick Darke, and Gary Schwetz for the Delaware Department of Transportation
- *The Flora of Delaware: An Annotated Checklist*, 2001, prepared by William A. McAvoy and Karen A. Bennett
- *Landscaping with Native Plants in the Middle-Atlantic Region*, 2004, prepared by Elizabeth N. du Pont for the Brandywine Conservancy
- *Plants for Livable Delaware*, prepared by Susan Barton and Gary Schwetz
- Tree Line USA Program - <http://www.arbor-day.org/programs/treeLineUSA.cfm>
- Trees and Reliable Electric Service – prepared by Conectiv Power Delivery - http://webapps.delmarva.com/dp/our_environment/veg_mgmt/Trees_and_Reliable_Electric_Service.pdf
- *Trees for Delaware*, prepared by Susan Barton, Gary Schwetz, and Charles Newlon

