

STOCKTON FOREST PLAN

The Richard Stockton College of New Jersey FOREST PLAN

Prepared for
The Richard Stockton College of New Jersey
10 West Jimmie Leeds Road
Pomona, NJ 08240

1,852.48 Acres (1,522.80 woodland acres)
Galloway Township, Atlantic County, New Jersey

Southern Forest:	Northern Forest:
Block 645, Lots 3, 5 & 6	Block 681.01, Lot 10
Block 875.04, Lots 1.01 - 1.08	Block 663.01, Lot 55.27

MANAGEMENT PERIOD: January 1, 2012 thru December 31, 2021
Plan Date: January 1, 2012, Revised April 26, 2012
LDE File No. F-1759
New Jersey Pinelands Commission Application No. 1981-1833.046

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PLEDGE: As a forest landowner, I believe the right to own land also carries the responsibility for stewardship of the natural resources in my care. I have read the attached ten-year Forest Stewardship Plan and agree to implement it to the best of my ability.

STATEMENT: All forestry activities will be consistent with the guidelines provided in the NJ Forestry Wetlands Best Management Practices Manual developed by NJDEP and dated October 1995.

12/20/11
DATE

Donald E. Moore
LANDOWNER

12/16/11
DATE

Robert R. Williams
PLAN PREPARER

Note 1: Woodland boundaries in the vicinity of proposed forest management activities will be marked with paint as needed.

Note 2: All management activities will be initiated with assistance from a professional forester.

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Note 1: All forest management schedules are dependent upon annual weather conditions, economics and regulatory review processes.

I. GENERAL DESCRIPTION

The Richard Stockton College of New Jersey was established in 1971 and is located in Galloway Township, Atlantic County, New Jersey. The college, and its associated forestlands, are found within the New Jersey Pinelands National Reserve.

The Stockton campus encompasses approximately 1,852.48 acres in the central portion of Galloway Township, located in the northeastern portion of Atlantic County. The Stockton campus is bordered by Pomona Road (County Route 575) to the north; Duerer Street and Jimmie Leeds Road (County Route 561) to the south and the Garden State Parkway to the east. Coordinates for the approximate center of the campus are as follows: 39° 29' 23" N, 74° 31' 54" W (Latitude/Longitude); N 239, 142 ft, E 483,261 ft (State Plane, NAD 83). The location of the Stockton campus is depicted on the United States Geological Survey ("USGS") 7.5' topographic quadrangles for Pleasantville and Green Bank, New Jersey.

The total acreage of land associated with the college is 1,852.48 of which 1,522.80 acres are forested and the specific subject of this ten-year, Forest Plan. These forestlands are critical to the overall atmosphere of the people who work, study, and visit at this academic institution.

The forest resources found here represent a diverse mix of many native Pinelands region forest types. The forest stand's diverse species composition, landscape patterns, age and size classes, and condition that are found here are as much a result of centuries of human disturbances as the specific environmental site conditions that these forests evolved on.

The forest types are a rich mix of hardwood and coniferous species supported by both well-drained upland soils, as well as saturated wetland soils. This plan has been designed to protect and perpetuate the ecological integrity of the forest systems found here, in concert with needed active forest management needs to insure these systems will be here into perpetuity.

1.1 Stewardship Goals & Objectives

1. Provide opportunities for active forest management in concert with scientific research and educational benefits.
2. Demonstrate the College's commitment to the Pinelands environment.
3. Sustain, protect, create and/or enhance not only habitat for threatened and/or endangered species, but all local wildlife populations.
4. Provide active management of 1,522.80 acres of forestland to offset impacts to forests lost to infrastructure development under the no net loss program for state-owned land.
5. Management for forest health issues, such as fire exclusion problems, as well as potential impact of southern pine beetles to mention a few concerns.
6. Provide opportunities for recreational opportunities such as wildlife viewing, hiking, walking, snowshoeing, and cross country skiing.
7. Set baseline forest management activities that research and study can be developed around.
8. Educational goals:
 - Enhance overall environmental education programs.
 - Enrich science curriculum with hands-on, ecological forest management opportunities.
9. Provide buffers from surrounding human disturbance and habitat destruction.
10. Provide opportunity for long-term scientific and forest management activities to:
 - Monitor effects of various forest management activity.
 - Study ecological processes and interactions.
 - Research, restoration, and stewardship projects to be developed by students, and teachers with public input in the context of what is permitted in this plan.

11. Return and maintain fire as a component of this forest ecosystem for both ecological reasons, as well as fire public health and safety issues.
12. Sustain the aesthetic quality of this woodland. The emotional experience that humans have while at this learning institution can be directly linked to the setting of being in a forest. This is a forest with a college in it – not a college with a forest attached to it. The health and visual aspect of this forest is a critical component of a human’s well-being while they are in it, as well as after they leave the campus/forest.

1.2 New Jersey’s No Net Loss Reforestation Act Issue and the Stockton Forest

The purpose of the No Net Loss Reforestation Act is to ensure work undertaken by State entities does not cause irreparable damage or permanent loss of forested land. To meet that goal, this NJDEP-approved Forest Plan has been prepared to insure the protection and enhancement of 1,522.80 acres of natural forestland. This plan intends to insure the protection and perpetuation of native forest types with ecologically-based forest management techniques over time. Additionally, this plan will insure that an increase in tree regeneration occurs in native forest types; and ensure the restoration of four acres of globally-threatened, Atlantic white cedar ecosystems. This overall effort will insure the regeneration and protection of millions of trees across this local landscape, which will far exceed any replanting efforts in currently non-forested areas as would be typically employed to meet the standards in the Act. Accordingly, this plan will fulfill any assumed College obligation of reforestation under the Act for the work in the proposed development areas included in the 2010 Master Plan for The Richard Stockton College of New Jersey.

Implementation of the Forest Plan for 1,522.80 acres of forestland within Galloway Township, Atlantic County, New Jersey within the land holdings of The Richard Stockton College of New Jersey will provide a significant increase in the level of forest sustainability with regards to the requirement of no net loss for state-owned land.

The future disturbances of forestland for university infrastructure will be offset by the dramatic increase in:

1. Tree numbers (increase by hundreds of thousands).
2. Healthy viable sustainable native forest stands including restoration of globally rare forest ecosystems.
3. Dramatic improvement in carbon sequestration.
4. Dramatic reduction in habitat loss, as well as a significant increase in habitat suitability for a wide range of wildlife species.
5. Implementation of this plan will further prevent the loss of hundreds of acres of trees that would occur without management, including thousands of lost trees due to loss the potential from southern pine beetle and gowdy oak gall as just two examples.
6. The enhanced conservation of trees will carry far beyond this land alone. Forest management of this land will also reduce risks of tree loss on many hundred of acres in the surrounding forests and neighborhoods. Reducing the damaging agents that could get a foothold in this forest will have a direct impact of preventing loss of tree cover to surrounding forests and residential areas.

In conclusion, implementation of this Forest Plan will substantially offset impacts that the minor loss of forest cover will have, as the College follows through with the build-out of the college infrastructure.

1.3 Historical Aspects of the Forest

The present character and structure of this forest can be linked directly to centuries of anthropogenic disturbances. Native Americans managed this landscape with fire prior to European settlement in the 1600's. This land has been utilized extensively for the use and production of renewable forest products since colonial times.

The local forest products industries have utilized wood from this land up into the late 1970's when this land was purchased. There are records that portions of this forest were part of a certified tree farm managed for forest products into the 1970's. Additionally, over the last fifty years, some of the forest has received treatments with prescribed fire on a regular basis. The 227 acres of the Northern Forest had an approved Forest Plan throughout the 2000's. Extensive forest stand improvement work was completed with that plan within the upland oak stands.

In August 1978, Carl G. Dury, Assistant Professor of Forestry at Richard Stockton College, drafted a Silvicultural Management Plan to create a forestry study area for a portion of this forest. This plan described a range of forest management techniques, each having separate and distinct objectives and managing the forest for specific purposes. It was intended that future students, under the supervision of Stockton faculty, would implement these activities. It does not appear that the plan was implemented.

Many of the objectives stated back in 1978 remain in this updated plan. Objectives such as consideration of ecological impacts, aesthetic issues, and concerns for minimizing forest fire hazards were all stated in 1978 and remain a part of this modern Forest Plan in 2011.

A statement made in 1978 Silvicultural Plan, “As stated before, the following plans are not absolutes and modifications will be made as necessary. It is hoped that Stockton students, as well as others in the South Jersey Community, will benefit from working in this area and will gain better insight into proper, ecologically-safe forest management techniques remain as part of this current plan.”

Silvicultural prescription issues such as selection harvesting, group selection harvesting, clear cutting, and shelterwood silvicultural techniques were all proposed and discussed in the original plan along with the need to use fire as a forest management tool. These silvicultural techniques remain relevant today and are part of this updated plan.

This modern Forest Plan takes into consideration the past history of how the forest got to be the way it is and uses that information to consider the future trajectory of the forest and future desired conditions of the forest stands as well.

II. PROPERTY OVERVIEW

This forest contains a wide range of many of the different forest types found within the Pinelands region. These forest types are found in a mosaic of irregular pattern across this landscape. The patchy, mosaic of stands will be sustained with the forest management outlined in this plan. The present poor condition of some stands and limited distribution of size classes and age classes raises some overall concerns as to the long term sustainability of many of the forest stands present.

2.1 Basic Concerns

Lack of tree regeneration: An important concern in all of the forest types found on this forest is the fact that little, if any, advanced tree regeneration can be found on this forest as a whole. Tree regeneration typically makes up the future forest. This forest does exhibit some excellent representations of mature forest types found in this region, yet there is little to no regeneration occurring at this time in most areas of the forest.

Along with the lack of regeneration within most stands, there is an unbalance or uneven proportion of age and size classes of stands across this forest. This plan takes into consideration the need to establish some advanced tree regeneration in maturing stands, as well as beginning to regenerate some seedling, sapling and young pole size class groups within older stands. This approach of forest management is proposed to contribute to the sustainability to those forest stands over long periods of time.

The development of a more balanced forest will add significantly to the diversity of the forest structure thus enhancing habitat for a wider range of biota.

Loss of the Oak Component: Forest management activities that occurred more recently (early 2000's) under approved forest plans for the out-parcel to the north that had been managed by the previous owner, has some upland oak stands with examples of excellent advanced oak regeneration. Without intervention and management, most of the maturing stands in the main southern forest are subject to losing the oak component. Outbreaks of gouty oak gall and striped oak worm are causing significant decline in the health and vigor of those stands. It will be important to establish advanced oak regeneration as the overstory declines. The objective is to avoid the loss of the oak stands as they will likely naturally convert to pine over time. These oak stands play an important role in supporting the overall diversity of this forest.

Another concern is the high risk of southern pine beetle infestation within several of the mature pine stand types. In particular, the older-age class, lowland pitch pine are at a very high risk of being lost to this insect. Southern pine beetle is now in the vicinity of this forest and the older stands remain at high risk. These stands are in the condition that has shown the highest degrees of attack by the insect over the last ten years throughout southern New Jersey. These unique stands are at risk of being lost. If the pine component is lost, these stands will almost immediately be dominated by the red maple/black gum component that is in the midstory. Because of the lack of fire, the dense turf that has developed will preclude any pine regeneration if in fact any pine seed source remains. Again, beginning to establish advanced regeneration has become important for these pine stands.

These are a few examples that demonstrate the overall importance of the goals and objectives of this Forest Plan and the potential consequences of continuing with a passive management approach.

2.2 Research Overview

RESEARCH ON THE STOCKTON SUSTAINABLE DEMONSTRATION FOREST by George Zimmermann PhD

This Forest Plan for the forest holdings of The Richard Stockton College of New Jersey is just the start of a commitment by the College to meet the sustainable, carbon budget, forest fire safety, disease control and biodiversity obligations the College has as one of the premiere ecologically oriented colleges in the country. Richard Stockton College has one of the oldest environmental studies programs in the nation, so to retain and advance Stockton's leadership in the environmental sciences, it must take initiatives. This is a rare opportunity for the College and this modest initial research program can augment, verify, and enhance the Forest Plan herein.

But for the Forest Plan to be totally successful, controls with experimental plots should be measured and maintained and used to scientifically document the results of this plan as it unfolds through the decade. Specifically, the College must verify the gains and share those gains and the cutting edge knowledge we have with our community and throughout the State. We envision holding workshops on our campus for all to see how forests can be managed to maximize carbon sequestration yet be fire safe, biologically diverse, and in tune with the environment and local regulations.

The Forest Plan and the research proposed will be used to educate the students at Stockton about the latest and most sophisticated applied forest ecology concepts. This will be done by setting up controls at random areas in similar forest cover types where the forest management plan will have active treatments. From permanent plots in these treatment and control areas we will measure a variety of forest variables such as over and understory

vegetation, fire fuels (crown, ladder, surface), height, forest health, percent covers, basal area, biomass (and eventually carbon). Other professors will be brought into the research so fauna such as birds, insects, and abiotic components as soils and water can be quantified. Few colleges in the East have their own experimental forests and none in New Jersey will compare to what Stockton will have. There is a vacuum in the State for this type of applied holistic forest management and Stockton will be delivering a profound benefit for the State by doing this research.

Taking a few of the forest management scenarios presented by the Forest Plan, we propose control and treatment plots in the following areas:

Pine/Oak and Oak/Pine forest. We have NO substantive reproduction in these forests and given the diseases (gouty oak gall, gypsy moths, Southern pine bark beetle, etc.) which threatened these forests (and have already killed) we need to start a new forest and increase the chances for the remaining forest to ward off future threats. We also can increase biodiversity and bring the carbon sequestration up in the long run. We propose a series of control areas roughly the same size of the six to eight 3-6 acres clearcuts now proposed. In both the control and regeneration treatments, we will measure a variety of forest variables previously mentioned. I have done similar work for the New Jersey Department of Environmental Protection before and I am well versed in what needs to be done.

Pine lowlands. The Southern Pine Beetle (SPB) is just down the road from Stockton College and in 2010 alone has killed over 14,000 forested acres. Our pine lowlands is a very special area with some very large trees but because of passive management and fire suppression it now has a high probability of being killed by SPB thus destroying a rare community, increasing the College's carbon output, and of course embarrassing us for allowing this to happen. We propose a series of control areas along with a series of modest

overstory single tree selections and weeding of the understory. In concert with fire treatment applications that the Forest Plan provides for, we will concentrate on varying the treatments and measure SPB presence/impact, fuel loads, biodiversity, etc.

Atlantic white-cedar. I have done a great deal already on Atlantic white-cedar (AWC) and we will use the few small areas the Forest Plan has proposed to test the effectiveness of techniques that slash smaller hardwoods and retain larger ones for wildlife and general diversity. We will also explore whether we can circumvent the use of fences to protect against deer browse of AWC.

Once we have an agreement in place with the applicable review agencies, we will be in a very good position to get outside grant monies to carry out this long term research and eventually use this forest to teach both students and the surrounding community cutting edge techniques that maintain sustainable, safe, healthy, diverse forests.

III. FORESTRY ISSUES

Southern Forest: Threatened and Endangered Species

Extensive studies and surveys for threatened and endangered species were completed by scientists from Marathon Engineering & Environmental Services, Inc. with regards to species that the New Jersey Pinelands Commission required to be addressed for any development activity, which includes forestry for this land.

References

- Protected Floral Species Report, NJ Pinelands Application No. 1981.1833.046, dated March 13, 2009
- Threatened & Endangered Snake Species Surveys, dated June 2008
- Phase II Presence/Absence Survey Report for Cooper's Hawk, Red-shouldered Hawk, Bald Eagle and Barred Owl, dated March 25, 2009
- Phase II Presence/Absence Survey Report for E. Tiger Salamander, Pine Barrens Treefrog, South Gray Treefrog, Eastern Salamander, dated June 8, 2009
- Phase II Presence/Absence Survey Report for Red-headed Woodpecker, dated January 19, 2009

3.1 Species of Concern

Barred owl (<i>Strix varia</i>)	Pine Barrens treefrog (<i>Hyla andersonii</i>)
Cooper's Hawk (<i>Accipiter cooperii</i>)	Red-shouldered hawk (<i>Buteo lineatus</i>)
Osprey (<i>Pandion haliaetus</i>)	Bald eagle (<i>Haliaeetus leucocephalus</i>)
Pine Barren gentian (<i>Gentiana autumnalis</i>)	Little Ladies'-tresses (<i>Spiranthes tuberosa</i>)

Barred Owl: The southern or campus area of the forest has had extensive barred owl survey work done by Marathon Engineering and Environmental Services Inc. In their raptor survey report dated March 25, 2009, it was concluded, as a result of their extensive survey, that barred owl is not breeding on the campus. Although in an earlier presentation in 2008, Marathon had indicated a barred owl nest was present, further analysis has shown that not to be the case. It also was concluded that with the confirmation of a cooper's hawk nest and that a barred owl nest was unlikely. This area is designated as stand 6A – just east of the gravel road known as Delaware Avenue. It was concluded that the Atlantic white-cedar stand 6A is used for roosting while the entire campus forest likely is providing foraging habitat to the barred owl which likely nests nearby (beyond the Stockton campus). The planned silvicultural activities will sustain suitable roosting and foraging habitat and will enhance those aspects of the habitat.

The raptor nest area is located and protected with a 300 foot, no-activity buffer (see forest map in appendix).

Although barred owl forage within areas of this forest, their use of this land may be limited. The barred owl's primary competitor, the horned owl, also forages and likely nests in this fragmented landscape. It is likely these two species interface in this area. Isolated and fragmented nature of this forest with intensive land development around and within this forest is not well suited to support this interior species raptor. This type of mortality is not uncommon when this interior species begins to disperse into more fragmented landscapes. Barred owl are likely using this woodland by way of a corridor of forests connected to the north. This Forest Stewardship Plan provides for the protection of the suitable, documented foraging habitat throughout this entire forest.

Silvicultural activity is limited to single tree or small group harvesting: 6 four-acre patch regeneration harvest in stand 1C, 6 three-acre patch regeneration harvests in stand 3, a six-acre patch regeneration harvest in stand 8, and 2 three-acre patch regeneration harvests in stand 9, and a 15 acre hardwood/cedar seed tree slashing in stand 15. Barred owl have been surveyed and shown not to be nesting on this woodlot. All mature, larger diameter trees will be protected, as well as any future potential nesting cavity trees. This plan also provides for allowing most of the forest to grow to an older age class forest structure suitable for this species' use.

Pine Barrens treefrog: There are several Pine Barren treefrog breeding ponds found along the southern areas off the main forest, as well as the old barrow pit within the northern section of the northern forest. These breeding ponds will be protected with a 100 foot, no-activity forestry buffer as per the adopted Pinelands treefrog habitat protection best management practices. These areas are 11A, 11B, 11C and 11D.

Cope's Grey treefrog: Surveys have shown this species to be absent from this woodland.

Red-shouldered hawk: Surveys completed by Marathon indicate that this species is not using this woodland for breeding purposes. Marathon found evidence of transient foraging by red-shouldered hawk in the northwestern section of the southern forest.

Cooper's hawk: Marathon's 2008 survey revealed that this species was nesting in the vicinity of Stand 6A just east of the road (Delaware Avenue) that crosses the cedar drainage. This is not shown on this map to protect this nest. Cooper's hawk will forage throughout this woodland. The proposed forest management activities are consistent with sustaining optimum quality foraging habitat for this species. Best management practices: No forest management activity will occur within 600 feet of the nest area except for prescribed fire.

Osprey: This species has been seen foraging on Lake Fred as well as bald eagles. Sustaining a mature healthy forest cover will sustain overall habitat quality for this species which are not presently nesting on or within the vicinity of this forest.

Bald eagle: This species is not presently nesting on or near this forestland. This species will continue to have suitable foraging habitat on the area of Lake Fred.

Pine Barren gentian and Little Ladies'-tresses: The population of these plants will be protected in endangered floral areas (10B and 10A). These areas will be provided a 300 foot, no-activity buffer as well.

Federal Species of Concern in the Stockton Southern Forest

Knieskern's beaked-rush was not identified on the Stockton Campus. The maintained utility easement along the New Jersey Parkway contains suitable habitat for this species and could have this species establish itself in the future. This area will be maintained and mowed by the utility company, not Stockton College.

Northern Forest: Threatened and Endangered Species

This 245.02 acres of forestland has had an approved forest plan for ten years up until 2009 (Pinelands Application No. 81-0614.04). The threatened and/or endangered species that were addressed in the first, ten-year Forest Plan were:

1. Pine Barren treefrog
2. Knieskern's beaked-rush
3. Pale Peak rush
4. Barred owl
5. Northern pine snake

Barred owl: terms of the silviculture planned for the northern forest, the following insures no irreversible, adverse impact to any local population of barred owl.

Stand 13: The selection harvesting planned will not remove any stick nests or suitable cavity trees that are being used by barred owl. The selection work will result in an enhancement of barred owl foraging habitat and allow trees to grow to an older age class more suitable for potential, future nesting habitat.

Stand 14: Again, the selection work planned here is identical to stand 13 and the results are the same. Barred owl are not presently nesting in stand 14 compartment. There are no suitable stick nests or cavity trees present in these two stands.

Stand 15: The 15-acre area designated for cedar restoration has been thoroughly surveyed and this areas, as well as adjacent areas, does not contain any suitable stick nests or cavity trees suitable for barred owl nesting. The planned cedar restoration work will provide suitable, potential foraging habitat.

Note: Implementation of the silvicultural activities for the northern area forest will not have any irreversible, adverse impact on any location population of barred owl or pine snake.

Northern pine snake: All forestry activity in the upland forests are limited to the period of April 15 thru November 15 of each season.

Federal Species of Concern in the Stockton Northern Forest

Knieskern's beaked-rush: Potential habitat has been protected in this plan as was with the first approved Forest Plan. These open, moist and sandy areas, along with the treefrog breeding areas, are protected with a 300 foot no-activity buffer.

Significant forest management activity was approved in the first forest plan in context of addressing concerns for these species. The planned forestry activities were minimally implemented due to the transfer of land ownership to Stockton College. With this updated, Forest Plan, it is planned to follow through with some of the originally planned forest management practices.

As to the threatened and/or endangered species impacts, there is one area within this woodlot that provides suitable habitat for both the Pine Barrens treefrog, as well as the two plant species of concern. This area is found in the northeastern section of this woodlot and is an old barrow pit area created during the construction of the North-South Parkway in the 1950's. This Forest Plan provides a 300 foot, no-activity buffer for specific habitats for these species (see forest stand map – red line).

Implementation of the Forest Plan will not result in any irreversible, adverse impact to any known local population of any threatened and/or endangered species. This plan offers the best opportunity to sustain the existing habitat and allow ecological processes to sustain themselves long into the future.

3.2 Cultural Resources

This Forest Plan does not require or propose the use of any heavy forestry site preparation activities or new forest road construction that would disturb any potential cultural resources.

In time, as this plan adapts to planned experiments and studies designed by students and/or professors, there may be a desire or need to place some plots in the forest where some of those forestry techniques are completed for long-term studies. If this is proposed, a forest plan amendment will be needed and submitted for proper approvals.

The planned forest management activities within this Forest Plan will not result in any adverse impact to any potential cultural resources.

3.3 Aesthetics

The aesthetic quality of this forestland is one of its highest values along with the ecological integrity of this small fragmented woodland. The management of the woodland will be done under the watchful eye of the public, and the human dimensions of the proposed forest management practices are as important as the ecological ones. Ultimately, the success of this forest management plan will depend on public support.

How the forest appears is important in the context of this Forest Plan. People apply their own values and standards when judging whether they like or dislike the appearance of a forest practice. This plan builds on the ecological aspects of this growing forest and considers the visual consequences of the proposed forest management over time.

Visual resource management is a driver in this Forest Plan, but does not allow visual objectives to over ride ecological objectives.

Any proposed forest management action, whether it be prescribed fire or cutting trees, will be done in a fashion that is more likely to successfully maintain forest structure and diversity in tree species composition while encouraging the maintenance of attractive trees, groves, wildflowers, plants, shrubs and wildlife.

Maintaining the aesthetic quality of the Stockton Forest is important for several reasons:

- Increases support of this Forest Plan.
- Enhances the restorative effectiveness of this plan on this landscape.
- Enhances outdoor recreational experiences.
- Improves the quality of life experience when in or near this forest.
- Improves the viability of the local community.
- Increase tourism assets and visitation.

Implementation of this Forest Plan will insure the viability of the native forest types found within this small landscape for generations to come. Most humans who have and will experience this forest will never realize it, but will remember the college visit because of the beautiful setting of the forest it is situated in. The proposed burning, selection harvesting and regeneration harvesting will sustain healthy, viable forest systems that will be aesthetically appealing for generations to come.

In conclusion, aesthetic qualities in a forest stand are difficult to define. Some research suggests that terms like *complexity* (related to uniformity amidst diversity), *mystery* (related to surprise), and *coherence* (again, related to uniformity among diversity) describe aesthetic qualities experienced by forest visitors. Likewise, aesthetic quality includes a lack of hard edges, highly uniform stand structures, and messy structures (for instance, overstocked stands).

Manipulating a stand for general aesthetic objectives will require creating structures varying in size and shape, thinning overstocked clumps, and avoiding straight boundaries between areas of differing structure. A naturalistic stand, with clumps of older trees amidst gaps (or clumps of younger trees) will contribute to diversity of structure, while thinning smaller trees will eliminate messiness and simulate the structural results of a low-intensity fire. A stand thinned to reduce ladder fuels will resemble a naturalistic stand, with even-aged clumps of older trees surrounded with gaps filled with younger trees.

A desirable stand treatment will simulate the structure and structure-forming processes of a natural stand – in an attempt to maintain conditions similar to those in which the forest type evolved. Such conditions will be amenable to biological diversity and risk of catastrophic fire will be much lower than under present circumstances, following fire suppression for nearly a century. This will all be done in the context of blending aesthetics with an ecological forest management approach.

3.4 Recreation

This forestland has been used, and will continue to be used, for a wide range of outdoor recreational activities. Students, employees and visitors to the college frequently use this forest for the following:

1. Walking, jogging or exercising.
2. Wildlife watching and viewing.
3. Cross country skiing.
4. Additionally, the land is used for field trips for a wide range of field studies.
5. Meditation.

Recreation will remain of critical importance in the implementation of this Forest Plan. Many people simply need or enjoy just sitting and relaxing in this forest.

One of the critical aspects of forest management on this forest, with regards to recreation, is the need to have safe trails and paths. Assessments of danger trees, as well as trail maintenance will be ongoing as it has been for many decades.

3.5 Carbon Issues

Forests in the United States are a carbon sink that sequester ten percent of the United State's annual CO₂ emissions. The Stockton forest, although small, plays an important role in carbon sequestration. There is significant potential for enhanced C sequestration by modifying harvesting frequencies and retention levels, as well as implementing ecologically-based systems such as disturbance-based forestry.

The silvicultural approach put forth in this plan provides for long-term carbon sequestration in mature trees while increasing sequestration through the development of some uneven-aged stands. This less intensive management approach has been shown to increase sequestration by managing for higher structural retention and a lower frequency of harvesting.

The storage of carbon in wood products removed from the forest is an additional consideration. These forest products can lock up carbon for centuries.

As important as evaluating the growth of the trees in the forest and their ability to store carbon, one must also realize that forest management has another significant atmospheric carbon benefit. This forest ecosystem is a forest system that had evolved with fire as its primary disturbance regime, yet fire no longer plays the ecological role it once did. By minimizing risks to catastrophic stand replacement fires in this forest, risks to significant carbon release from the initial burning and then the rotting of the dead material can be reduced significantly through forest management. Therefore, implementation of this Forest Plan can, and will, play a significant role in helping to reduce carbon dioxide levels in the atmosphere; thus help in offsetting the carbon footprint of the college infrastructure.

The impacts to forest systems from potential global climate changes are yet to be fully understood. Issues of forest health are directly linked to global climate change and carbon issues. One prime example that may have a direct impact on these forest resources is the recent infestation of southern pine beetles in the vicinity of the Stockton Forest. This insect has the ability to kill thousands of mature pine in a matter of months in a beetle event. The result would be the immediate loss of C sequestration and a dramatic increase in the release of carbon from the rotting trees, and further dramatic release of carbon from the possibility from the potential fires in these dead forests. Managing for a healthy forest can mitigate

the potential southern pine beetle negative impact and resulting fires. This is only one example of the complex issues facing forest managers when considering carbon issues in all forests.

3.6 Economics

Any forest plan that does not include a discussion as to how to pay for the expense of implementing the plan has no place in any meaningful forest management discussion.

The suggested forest management practices outlined in this plan are significant and will need to be supported economically. These costs are not presently sustainable by either taxpayers or the landowner at this time. However, utilizing excess biomass planned for removal from the forest can, at times, cover those forest management costs and at times, result in net dollar gains. However, current forestry and wood production infrastructures are very limited in southern New Jersey.

Having said that, there are increasing opportunities for utilizing wood fiber from southern New Jersey Forests. It is likely initial forest management actions will be done on a barter basis. Whereby needed management is exchanged for the wood fiber extracted. Expecting to pay for the needed silvicultural treatments simply isn't economically feasible at this time. In a sense, the forest will have to pay for its own stewardship.

Utilizing the wood fiber to be removed from this forest will provide significant environmental benefits beyond the local forest being treated. It will . . .

- Create jobs and economic opportunity.
- Improve and sustain forest and ecosystem health.
- Protect public health and safety.
- Grow, produce and market locally-grown, renewable forest products thus enhancing environmental sustainability standards.
- Provide sources of renewable energy sources, i.e. biomass production.
- Sustain or enhance carbon sequestration, thus making contribution to the solutions of global climate change issues.
- Help to save more vulnerable global forests.
- Reduce the carbon footprint by reducing transportation and shipping impacts of CO₂ emissions from the utilization of products from forest far beyond southern New Jersey.

Regardless of the value placed on the non-timber amenities that come from an ecological forest management approach, the economic feasibility of a chose forest management style is a reality check that landowners and forest managers must face. While many are comfortable with the concept of not attempting to maximize timber revenue, the ability of the forest to pay its way is an essential aspect of an ecological approach to forest management.

Although the ecological approach prescribed in this plan has as it primary objective the overall health of the ecosystem, there are substantial economic benefits that will result from this approach to forest management:

- Reduce risks, liabilities and costs associated with unmanaged wildland fires.
- Lower costs of management.
- Non-timber value, i.e. eco-tourism increases.
- Save lives.

3.7 Fire Issues

The forest resources found on this site have evolved with a complex fire regime. Prior to fragmentation of the land since colonial times, fire moved across the landscape in a wide range of diverse frequencies and intensities. These fires were caused by natural events such as lightning strikes and Native Americans who maintained their landscape with fire. It is well documented that Native Americans sustained much of the North American landscape by a managed use of fire.

Today, this forest is largely fire excluded except for a few areas of the upland that have a limited history of prescribed fire. Because of the fragmented landscape, as well as the forest's location in close proximity to intense human infrastructure, fire is suppressed in this area. This lack of fire has and continues to have a profound, long-term impact on these forest resources.

The proposed ecological forest management is not intended to replace the process that fire had played in sustaining these ecosystems, but it is intended to emulate them to the extent practical in the modern setting this small, fragmented forest is now found in.

3.8 Prescribed Fire Issues

Prescribed fire, that is fire set under specific environmental conditions which allows the fire to be confined to a predetermined area and produces the fire line intensity and rate of spread required to achieve planned resource management objectives, has been the critical tool to sustain some Pinelands forest types to date. Prescribed burns will have their place in sustaining some of the forest types found on the Stockton Forest, but their use may be limited at times.

3.8.1 Prescribed Fire Limitations

- Increasingly, fires are raising concerns regarding air quality and global climate change.
- Cannot be used safely where forest stands are dangerously overgrown as a result of fire exclusion for many decades.
- May present significant risks to public health and safety, i.e. Garden State Parkway traffic.
- Limited by specific annual weather conditions that , at times, do not occur.
- Limited due to insurance liability.
- The window for burning each season, and available personnel to burn, is extremely limited.

However, even with its limitations, prescribed burning remains an essential tool to perpetuate these forest systems. A primary objective of the Forest Plan is to return fire to this forest in a safe manner that ensures protection of public health and safety in concert with sustaining the forest ecosystem when practical.

This forest has experienced landscape fragmentation, decades of fire exclusion, intensive residential development, passive management, and global climate changes. This plan outlines a planning process that allows for restoring the Stockton Forest to a “fire safe” forest to the extent practical. This management approach attempts to allow for the reintroduction of fire, and over the long term, will remain a primary management tool when practical.

To move towards a forest with fire-safe conditions, the proposed silviculture prescriptions are intended to manage three types of forest fire fuels: surface fuels, ladder fuels, and crown fuels. Surface fuels include dead and down debris sitting on the forest floor. Ladder

fuels are tall shrubs and small trees that connect the surface fuels to the crowns of larger trees. Crown fuels are those in the overstory.

In order of priority, management prescriptions will focus on surface fuel, ladder fuel, and the crown fuel. Reducing these fuels will limit the potential intensity of fires, provide a higher chance of controlling wildfires, and allow more of the forest to survive when it does burn.

Passive management cannot restore these conditions – active management is necessary. The management can be done by fire alone, by mechanical means, or by both. With all of the inherent risks and liabilities with only fire, both fire and mechanical means are recommended and necessary. Prescribed fire projects will continue to be coordinated with the New Jersey Forest Fire Service as has been the case for many decades.

Regardless of the proposed management approach, this forest will experience fire at one time or another. The fire objective of this plan is try to maximize a forest condition where surface fire behavior is reduced and/or ladder fuels are removed such that torching potential is reduced; and as a third priority, crown density is reduced.

3.8.2 Prescribed Fire: Anticipated Benefits

- Reduce long-term risks of loss of life, property and biodiversity.
- Provide conditions that may create fuel conditions that safely allow growing season burns and/or prescribed stand replacement crown fires.
- Reduce long-term impacts on global climate change by eliminating greenhouse gas emissions from uncontrolled wildland fires.
- Sustain the aesthetic quality of the land and forest.

3.8.3 Prescribed Fire: Mechanical Treatments

Mechanical means of treating the forest is an approach that attempts to manage the structure of the forest by cutting or removal of vegetation. The use of fire, as previously discussed, is an approach to manage the process of the forest and manage how the forest functions. Fire can also manage forest structure as well. This plan has an integrated approach which realizes neither approach will allow management objectives to be met successfully on their own.

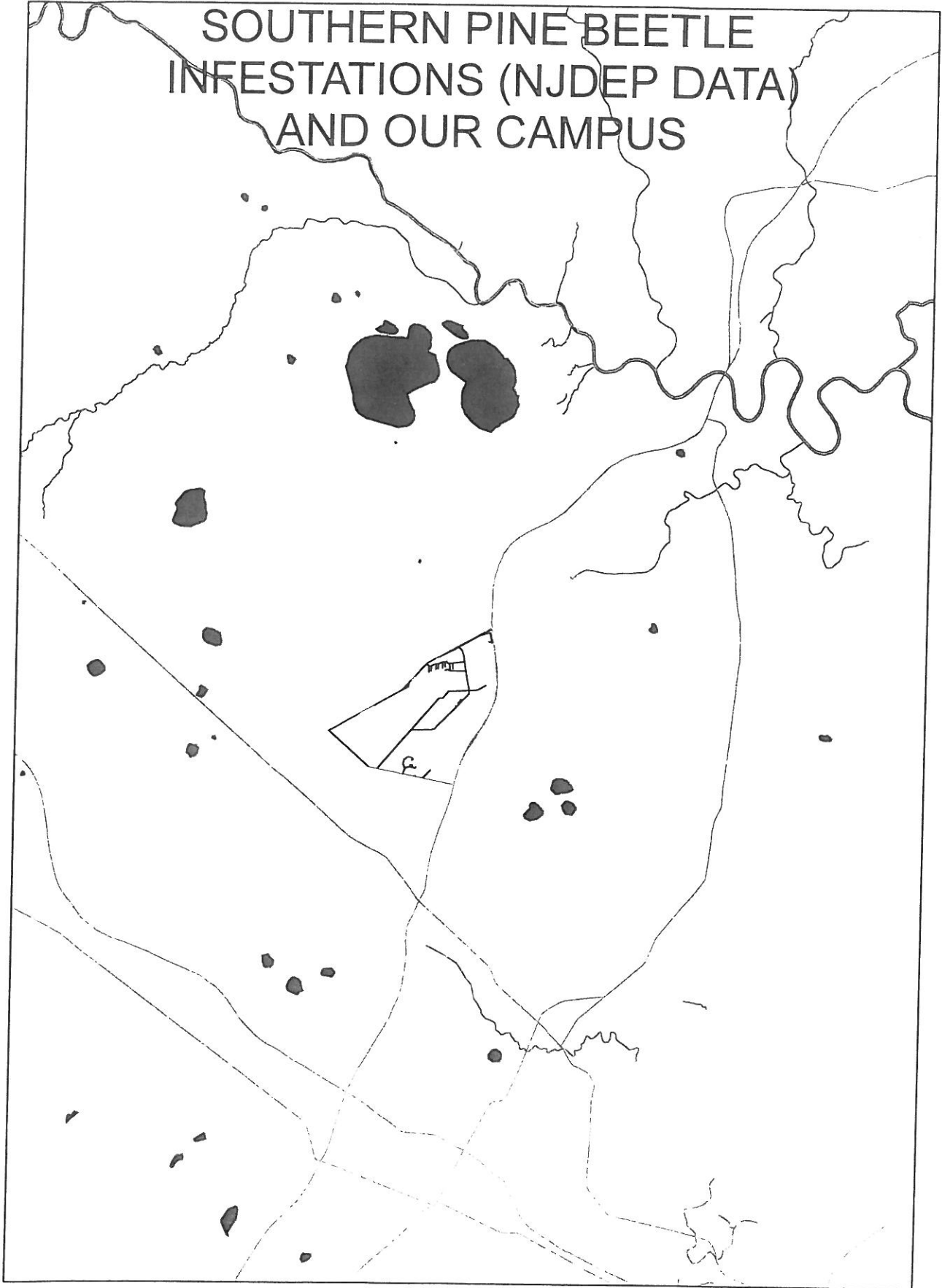
3.9 Nonnative Invasive Species Issues

Within the natural forest types, these plants are not an issue at this time. Sustaining a healthy, regenerating and native forest types is the best defense against these species spreading from the developed or disturbed area of the landscape.

3.10 Southern Pine Beetle Issues

Southern pine beetle (SPB) now pose a significant threat to the pine component of forests in this region. Current infestations of SPB can be found in all directions from the Stockton Forest (see map). This Forest Plan provides for a monitoring program, as well as prevention and suppression strategies to insure impacts from SPB are minimal.

SOUTHERN PINE BEETLE INFESTATIONS (NJDEP DATA) AND OUR CAMPUS



3.11 Wetland Issues

To insure compliance with the forestry provision of both wetland and floodplain regulations and forestry exemptions, the following are part of this plan.

1. No change to topography will occur.
2. No change in groundwater or surface water hydrology will occur.
3. No stream crossing will be installed or needed.
4. The activities are part of a forest plan (FP) approved by the state forester *prior* to their occurrence.
5. The activities are conducted in compliance with and consistent with the approved FP.
6. The FP is designed and activities included are conducted in accordance with the NJDEP, Division of Parks and Forestry, State Forest Service, *New Jersey Forestry and Wetlands Best Management Practices Manual*, dated October 1995.
7. No removal of stumps is proposed or undertaken.
8. The plan identifies and addresses any threatened or endangered species or their habitat found on site by minimizing any adverse impacts.
9. The plan does not allow a change in land use on wetland areas to horticulture, agriculture or other development activities.

Failure to meet the above provisions and conditions when conducting these forest management activities means that the forestry activities are not exempt from the FWPA or the HWPPA and that a permit must be obtained from DEP prior to undertaking any forestry management activities. If a permit is not obtained, the work is a violation of the FWPA and possibly the HWPPA and may result in enforcement action pursuant to N.J.A.C. 7:7A-16.

3.12 Forestry Issues as per the Stewardship Review Letter dated March 2, 2012

Item #8: Access to the various forest stands will be by small, temporary tractor trails randomly through each stand. The access will begin at each landing and meander throughout the forest stand in a manner to minimize the number of times wood is removed from the forest. These access-ways are always allowed to quickly regenerate with native plant cover. This has been the case in this forest since harvesting began in colonial times. No stream crossings are required in this Forest Plan.

Item #9: Log decks have been marked on the forest stand map.

Item #10: The use of an EPA-approved herbicide in stands 8F and 15B to insure successful regeneration of Atlantic white-cedar is the only practical means of control of competitive plant species. Mechanical cutting of hardwood sprouts or woody shrub sprouts is not economically practical nor technically practical in that mechanical cutting only stimulates these woody species sprouting and would result in an increase in competition with the Atlantic white-cedar seedlings.

Item #11: Woody material (slash) such as limbs, leaves, needles and/or tree tops that may be left on site during tree harvesting or silvicultural treatments will be evenly distributed across the ground and left to recycle and decay back into the soil and surface forest litter as has been the case from harvesting this forest many times since colonial times.

Item #12: Trees to be harvested or slashed will be identified and marked by a trained, professional forester that has a clear understanding of the desired goals and objectives of this Forest Plan. Trees will be marked seasonally and prior to cutting activity entering into a given segment of the forest scheduled for an approved treatment. Trees will be marked individually by paint or a blaze.

Item #13: The depth of ground disturbance during tree removal efforts will be of a minimal depth that results in typical tree harvesting operation throughout the Pinelands region that would not require formal cultural resource surveys. There is no heavy site preparation or road building proposed within 300 feet of any wetland.

Item #14: Written comments from the New Jersey State Forester concerning the extent to which the proposed forestry activities are consistent with the guidelines provided in the *New Jersey Forestry and Wetlands Best Management Practices Manual*, developed by the NJDEP, dated October 1995, as amended follows this section.



State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION

CHRIS CHRISTIE
Governor

KIM GUADAGNO
Lt. Governor

BOB MARTIN
Commissioner

NJ Forest Service
5555 Atlantic Avenue
Mays Landing, NJ 08330
Telephone: (609) 625-1124
Fax: (609) 625-6643
Email: njfs.south@comcast.net

April 25, 2012

Richard Stockton College of New Jersey
C/O Robert Williams, Consultant Forester
Land Dimensions Engineering
6 East High Street
Glassboro, NJ 08028

RE: Richard Stockton College Forest Stewardship Plan
Pineland Commission App#-1981-1833.046
Galloway Township, Atlantic County

Dear Mr. Williams:

The NJ Forest Service-Southern Region office has reviewed the above referenced Forest Stewardship Plan dated 1/1/2012. The purpose of this review is to determine if the proposed forestry activities are consistent with the guidelines provided in the *New Jersey Forestry and Wetlands Best Management Practices Manual* dated October 1995. After reviewing the plan, this letter is to inform you that the forestry activities proposed *are* consistent and adheres to the guidelines contained in the *New Jersey Forestry and Wetlands Best Management Practices Manual*. If you have any questions, comments and/or concerns to this letter please do not hesitate to contact this office.

Sincerely,

David M. Finley
Regional Forester



State of New Jersey
THE PINELANDS COMMISSION

PO Box 359
New Lisbon, NJ 08064
(609) 894 7300

CHRIS CHRISTIE
Governor
KIM GUADAGNO
Lt. Governor

Nancy Wittenberg
Executive Director

April 23, 2012

Robert R. Williams
Land Dimensions Engineering
6 East High Street
Glassboro, New Jersey 08028

Please Always Refer To
This Application Number

Re: Application # 1981-1833.065
Southern Forest
Block 663.01, Lot 55.27
Block 681.01, Lot 10
Northern Forest
Block 645, Lots 3, 5 & 6
Block 875.04, Lots 1.01-1.08
The Richard Stockton College of N.J.
Galloway Township

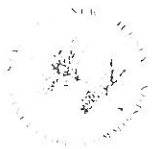
Dear Mr. Williams:

We reviewed your March 21, 2012 letter and attachments concerning threatened and endangered species on or in the vicinity of the above referenced parcel. To address items 7(a) and 7(b) of our of our March 2, 2012 letter, please provide information concerning how the proposed forestry activities in the "Northern Forest" will avoid irreversible adverse impacts on habitats that are critical to the survival of Barred owl and Northern pine snake.

If you have any questions, please contact me.

Sincerely,

Karen Young
Chief Permit Administrator



www.nj.gov/pinlands

General Information: Info@njpines.state.nj.us

Application Specific Information: AppInfo@njpines.state.nj.us



The Pinelands -- Our Country's First National Reserve and a U.S. Biosphere Reserve

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State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION

Division of Parks and Forestry
Mail Code 501-04

ONLM -Natural Heritage Program
P.O. Box 420

Trenton, NJ 08625-0420
Tel. #609-984-1339
Fax. #609-984-1427

BOB MARTIN
Commissioner

CHRIS CHRISTIE
Governor

KIM GUADAGNO
Lt. Governor

March 14, 2012

Maria Monzo
Land Dimensions Engineering
6 East High Street
Glassboro, NJ 08028

Northern Forest

Re: The Richard Stockton College of New Jersey Woodland F-1759 (Block 681.01, Lot 10; Block 663.01, Lot 55.27)

Dear Ms. Monzo:

Thank you for your data request regarding rare species information for the above referenced project site in Galloway Township, Atlantic County.

Searches of the Natural Heritage Database and the Landscape Project (Version 3.1) are based on a representation of the boundaries of your project site in our Geographic Information System (GIS). We make every effort to accurately transfer your project bounds from the topographic map(s) submitted with the Request for Data into our Geographic Information System. We do not typically verify that your project bounds are accurate, or check them against other sources.

We have checked the Landscape Project habitat mapping and the Biotics Database for occurrences of any rare wildlife species or wildlife habitat on the referenced site. The Natural Heritage Database was searched for occurrences of rare plant species or ecological communities that may be on the project site. Please refer to Table 1 (attached) to determine if any rare plant species, ecological communities, or rare wildlife species or wildlife habitat are documented on site. A detailed report is provided for each category coded as 'Yes' in Table 1.

We have also checked the Landscape Project habitat mapping and Biotics Database for occurrences of rare wildlife species or wildlife habitat in the immediate vicinity (within ¼ mile) of the referenced site. Additionally, the Natural Heritage Database was checked for occurrences of rare plant species or ecological communities within ¼ mile of the site. Please refer to Table 2 (attached) to determine if any rare plant species, ecological communities, or rare wildlife species or wildlife habitat are documented within the immediate vicinity of the site. Detailed reports are provided for all categories coded as 'Yes' in Table 2. These reports may include species that have also been documented on the project site.

The Natural Heritage Program reviews its data periodically to identify priority sites for natural diversity in the State. Included as priority sites are some of the State's best habitats for rare and endangered species and ecological communities. Please refer to Tables 1 and 2 (attached) to determine if any priority sites are located on or in the vicinity of the site.

A list of rare plant species and ecological communities that have been documented from Atlantic County can be downloaded from <http://www.state.nj.us/dep/parksandforests/natural/heritage/countylist.html>. If suitable habitat is present at the project site, the species in that list have potential to be present.

Status and rank codes used in the tables and lists are defined in EXPLANATION OF CODES USED IN NATURAL HERITAGE REPORTS, which can be downloaded from http://www.state.nj.us/dep/parksandforests/natural/heritage/nhpcodes_2010.pdf.

If you have questions concerning the wildlife records or wildlife species mentioned in this response, we recommend that you visit the interactive NJ-GeoWeb website at the following URL, <http://www.state.nj.us/dep/gis/geoweb splash.htm> or contact the Division of Fish and Wildlife, Endangered and Nongame Species Program at (609) 292-9400.

PLEASE SEE 'CAUTIONS AND RESTRICTIONS ON NHP DATA', which can be downloaded from <http://www.state.nj.us/dep/parksandforests/natural/heritage/newcaution2008.pdf>.

Thank you for consulting the Natural Heritage Program. The attached invoice details the payment due for processing this data request. Feel free to contact us again regarding any future data requests.

Sincerely,

A handwritten signature in black ink, appearing to read 'Robert J. Cartica', with a horizontal line extending from the end of the signature.

Robert J. Cartica
Administrator

c: NHP File No. 12-3907455-0937

Possibly on Project Site Based on Search of
 Natural Heritage Database: Rare Plant Species and
 Ecological Communities Currently Recorded in the New
 Jersey Natural Heritage Database

Scientific Name	Common Name	Federal Protection	State Protection	Regional Status	Grank	Strank	Identified	Last Observed	Location
<i>Vascular Plants</i>									
Rhynchospora knieskernii	Knieskern's Beaked-rush	LT	E	LP, HL	G2	S2	Y - Yes	1999-10-01	Approximately 0.1 mile west of the Garden State Parkway and 1.6 miles west of Port Republic.
Total number of records:		1							

Immediate Vicinity of the Project Site
Based on Search of Natural Heritage Database
Rare Plant Species and Ecological Communities Currently Recorded in
the New Jersey Natural Heritage Database

Scientific Name	Common Name	Federal Protection	State Protection	Regional Status	Grank	Srank	Identified	Last Observed	Location		
<i>Vascular Plants</i>											
<i>Rhynchospora knieskernii</i>	Knieskern's Beaked-rush	LT	E	LP, HL	G2	S2	Y - Yes	1999-10-01	Approximately 0.1 mile west of the Garden State Parkway and 1.6 miles west of Port Republic		
<i>Rhynchospora pallida</i>	Pale Beaked-rush			HL	G3	S3	Y - Yes	1938-07-27	BOG ON TRIBUTARY TO NACOTE CREEK CA 2 MI NW OF HEWITTVILLE		
Total number of records:		2									



State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION
Division of Parks and Forestry
Mail Code 501-04
ONLM -Natural Heritage Program
P.O. Box 420
Trenton, NJ 08625-0420
Tel. #609-984-1339
Fax. #609-984-1427

CHRIS CHRISTIE
Governor

KIM GUADAGNO
Lt. Governor

BOB MARTIN
Commissioner

March 14, 2012

Maria Monzo
Land Dimensions Engineering
6 East High Street
Glassboro, NJ 08028

Southern Forest

Re: The Richard Stockton College of New Jersey Woodland F-1759 (Block 645, Lots 3, 5 & 6; Block 875.04, Lots 1.01 - 1.08)

Dear Ms. Monzo:

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Robert J. Cartica
Administrator

c: NHP File No. 12-3907455-0938

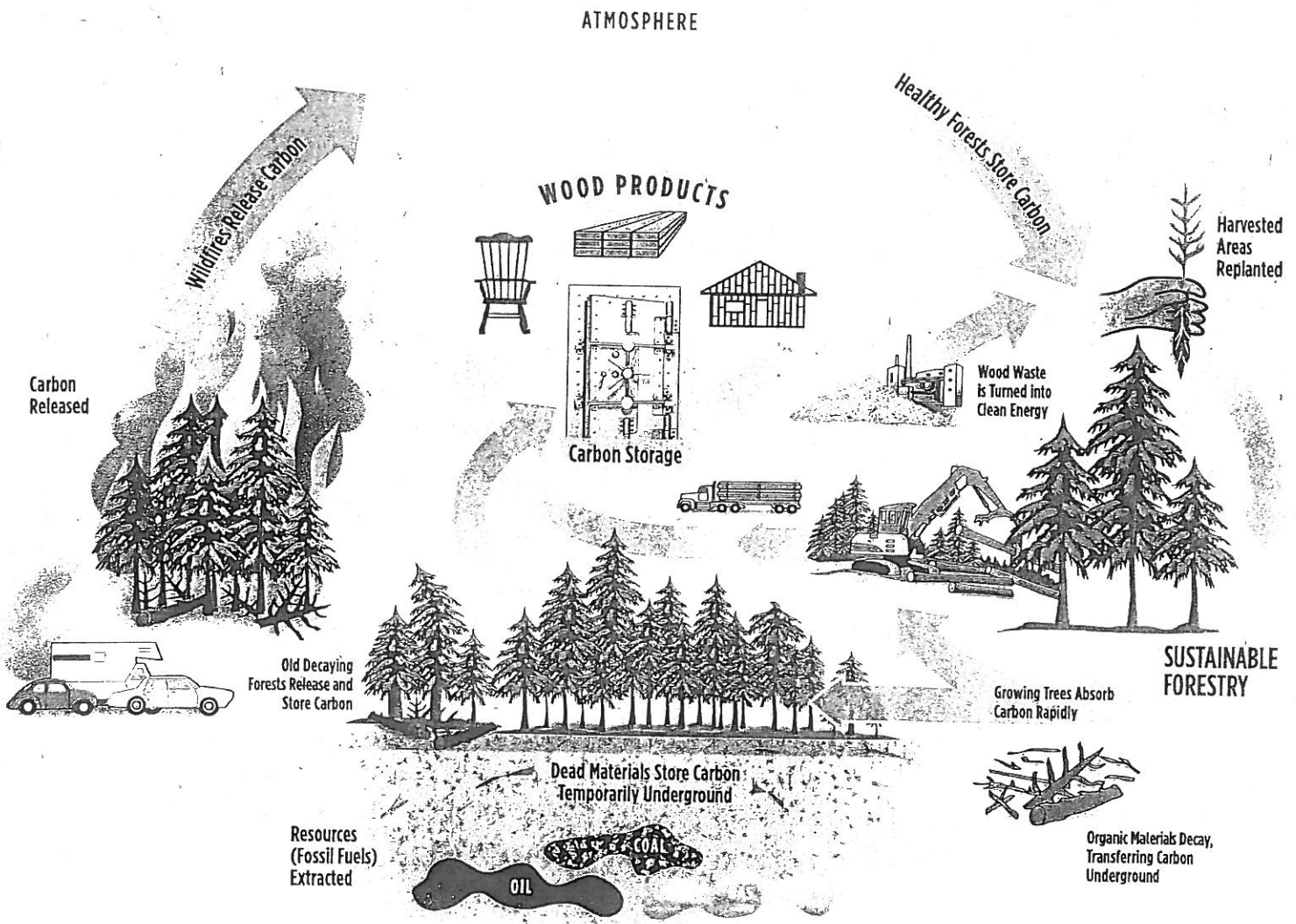
**Rare Wildlife Species or Wildlife Habitat on the Project
Site Based on Search of
Landscape Project 3.1 Species Based Patches**

Class	Common Name	Scientific Name	Feature Type	Rank	Federal Protection	State Protection	Grank	Srank
<i>Aves</i>	Pine Barrens Treefrog	<i>Hyla andersonii</i>	Non-breeding Sighting	3	NA	State Threatened	G4	S2
	Bald Eagle	<i>Haliaeetus leucocephalus</i>	Foraging	4	NA	State Endangered	G5	S1B,S2N
	Barred Owl	<i>Strix varia</i>	Breeding Sighting	3	NA	State Threatened	G5	S2B,S2N
	Barred Owl	<i>Strix varia</i>	Non-breeding Sighting	3	NA	State Threatened	G5	S2B,S2N
	Cattle Egret	<i>Bubulcus ibis</i>	Foraging	3	NA	State Threatened	G5	S2B,S3N
	Common Tern	<i>Sterna hirundo</i>	Foraging	2	NA	Special Concern	G5	S3B,S4N
	Cooper's Hawk	<i>Accipiter cooperii</i>	Breeding Sighting	2	NA	Special Concern	G5	S3B,S4N
	Glossy Ibis	<i>Plegadis falcinellus</i>	Foraging	2	NA	Special Concern	G5	S3B,S4N
	Great Blue Heron	<i>Ardea herodias</i>	Foraging	2	NA	Special Concern	G5	S3B,S4N
	Little Blue Heron	<i>Egretta caerulea</i>	Foraging	2	NA	Special Concern	G5	S3B,S3N
<i>Aves</i>	Red-headed Woodpecker	<i>Melanerpes erythrocephalus</i>	Breeding Sighting	3	NA	State Threatened	G5	S2B,S2N
	Snowy Egret	<i>Egretta thula</i>	Foraging	2	NA	Special Concern	G5	S3B,S4N

Class	Common Name	Scientific Name	Feature Type	Rank	Federal Protection	State Protection	Grank	Srank
	Tricolored Heron	Egretta tricolor	Foraging	2	NA	Special Concern	G5	S3B, S3N
	Worm-eating Warbler	Helminthos vermivorum	Breeding Sighting	2	NA	Special Concern	G5	S3B

The Carbon Cycle

FORESTRY NEVER LOOKED SO COOL



Carbon Released

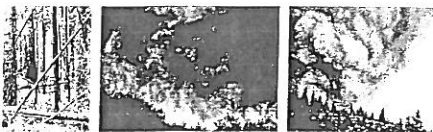
Catastrophic fires release carbon that has been stored in trees into the atmosphere. Manufacturing and automobiles also contribute carbon to the atmosphere by burning fossil fuels. Natural processes like volcanoes and decomposition also release carbon to the atmosphere.

Carbon Absorbed

Young, healthy forests absorb carbon more rapidly than older, dense forests. Older forests release carbon at the same rate that they absorb it, neutralizing their effect on global warming. Sustainably managing forests is an effective way to store carbon. Trees also produce oxygen that we all need.

Carbon Stored

As a tree grows, it stores carbon in its trunk, branches and roots. Sustainably managed forests continuously store and absorb carbon. Trees store carbon for a long time. When trees are harvested, the carbon continues to be stored in wood products. Harvested forests are replanted and the cycle begins again.

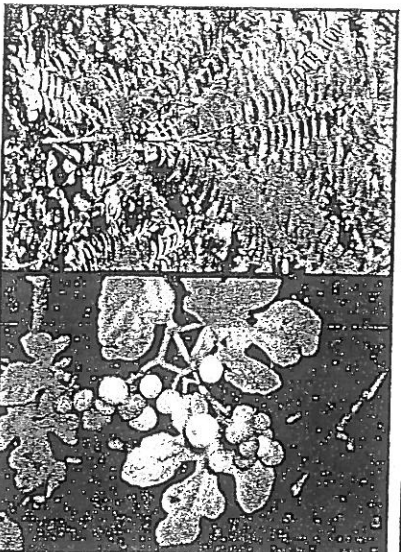


Invasive Plants

Invasive plants are plants that spread on their own after they have been moved from their native habitat to a new location.

- ✦ Most invasive plants are from other continents.
- ✦ Invasive plants lack natural predators because their predators did not make the journey to North America.
- ✦ Invasive problems have increased dramatically in the past two decades.
- ✦ Many invasive plants reach such high densities that they harm the economy, the environment, and people.
- ✦ Recently, the cost of ecological damage and for control of invasive plants in the United States was estimated at \$137 billion per year, and is increasing dramatically.

There Are More Than 21 Invasive Plants That Have Invaded New Jersey Woodlands



Tree-of-Heaven

Porcelain-berry

James H. Muller USDA FS Bugwood.org

Leslie J. Mansholt, U Conn, Bugwood.org

21 Problem Invaders in New Jersey Woodlands

Norway maple	<i>Acer platanoides</i>
Tree-of-Heaven	<i>Ailanthus altissima</i>
Garlic mustard	<i>Alliaria petiolata</i>
Porcelain-berry	<i>Ampelopsis brevipedunculata</i>
Japanese barberry	<i>Berberis thunbergii</i>
Asian bittersweet	<i>Celastrus orbiculatus</i>
Autumn olive	<i>Elaeagnus umbellata</i>
Winged burning bush	<i>Euonymus alata</i>
Japanese honeysuckle	<i>Lonicera japonica</i>
Fragrant honeysuckle	<i>Lonicera fragrantissima</i>
Amur honeysuckle	<i>Lonicera maackii</i>
Morrow's honeysuckle	<i>Lonicera morrowii</i>
Standish's honeysuckle	<i>Lonicera standishii</i>
Tartarian honeysuckle	<i>Lonicera tatarica</i>
European fly honeysuckle	<i>Lonicera xylosteum</i>
Hybrid, pretty honeysuckle	<i>Lonicera X bella</i>
Japanese stiltgrass	<i>Microstegium vimineum</i>
Mile-a-minute weed	<i>Polygonum perfoliatum</i>
Lesser celandine	<i>Ranunculus ficaria</i>
Common buckthorn	<i>Rhamnus cathartica</i>
Multiflora rose	<i>Rosa multiflora</i>
Wineberry	<i>Rubus phoenicolasius</i>
Chinese wisteria	<i>Wisteria sinensis</i>
Japanese wisteria	<i>Wisteria floribunda</i>

How Can Invasive Plants be Controlled?

There are specific methods for controlling invasive plants, depending on the particular species including: manual pulling, mechanical eradication, burning, biological controls and chemical controls. Often a combination of controls or repeated application of controls are needed to effectively control or eradicate a specific invasive plant.

Research is underway to find and test natural predators to control many of the plant species that have invaded New Jersey's woodlands. It can take many years, however, to discover effective predators that will not harm other desirable plants and creatures.

Properly applied herbicides have proven the most effective of all the methods for controlling invasive plants.

Remember!

Use pesticides wisely and always follow all directions and precautions on pesticide labels.

There are many sources of information available for controlling specific invasive plants. The following links provide detailed information on various invasive plant species and recommended procedures for controlling them:

Forest Health Protection-Invasive Plants
http://na.fs.fed.us/fhnp/invasive_plants/weeds

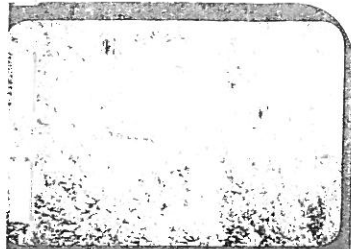
PCA Alien Plant List: Least Wanted: Fact Sheets
www.nps.gov/plants/alien/factmain.htm

Invasive Plants—
 Eastern Forest Environmental Assessment Center
<http://www.forestthreats.org/>

Authors: Charles J. Newton, CF, USFS, Retired and
 Mark C. Votak, Ph.D., CF, Rutgers Cooperative Extension,
 Published by New Jersey Forestry Association.

Southern Pine Beetle

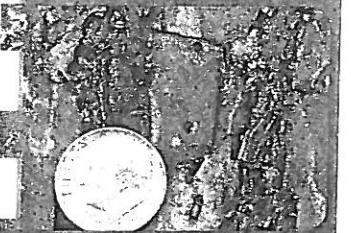
Dendroctonus frontalis



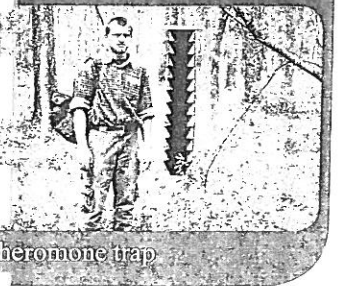
Dense forest affected by southern pine beetle



S-shaped galleries behind the bark



Exit holes



Pheromone trap

The southern pine beetle is a destructive pine pest found from the United States, through Mexico, and into South America. Southern pine beetles attack most species of pines, but in New Jersey the beetle prefers dense, unmanaged stands of pitch pine. These trees, stressed by drought, disease or soil compaction, become vulnerable to southern pine beetle attacks.

Without intervention, southern pine beetle can spread rapidly, affecting thousands of trees. From 1973-77, an outbreak of southern pine beetle in the southern states killed enough trees to build 266,272 two-thousand square-foot homes.

Successive days of extreme temperatures of cold (below 0°) or heat (above 95°) can reduce populations.

When southern pine beetles attack a tree, the tree's needles turn yellow, then red, and within as little as a month, may become brown. Often an outbreak goes undetected until multiple trees are infected and begin to change color.

Beetle monitoring
New Jersey foresters monitor beetle populations in the spring with traps baited with pheromones and pine turpentine. Pheromones are chemicals produced naturally by female beetles to attract males. Turpentine mimics the scent of stressed or wounded trees. Foresters send trap contents to the US Forest Service who identify southern pine beetles and their predator, checkered beetles. The US Forest Service

reports the ratio of southern pine beetle to checkered beetle to New Jersey foresters. With this information, foresters predict the severity of upcoming infestations.

Population Control

In one summer, the population of southern pine beetle can increase tenfold, infesting pine trees up to 50 feet per day.

Often foresters spot dying trees affected by southern pine beetle while conducting an aerial survey. The foresters inspect the site from the ground for telltale signs of southern pine beetle such as pitch tubes, "S" shaped galleries under the bark and exit holes.

To control populations, foresters first cut a 40'-70' buffer strip around the affected area. Then the foresters chip trees or spray them with insecticide.

Outbreak prevention

Often crowded, dense stands of trees become susceptible to southern pine beetle and other insects and diseases. To maintain vigor, foresters perform periodical thinnings, which improve growth and health of the forest.



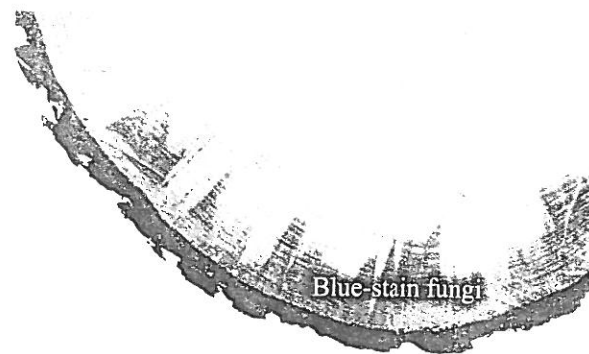
Pitch tubes where beetle entered tree

STOP THE SPREAD

- ◊ Thin pine stands to maintain vigor and minimize mortality
- ◊ Don't transport infested trees
- ◊ Chip infested trees

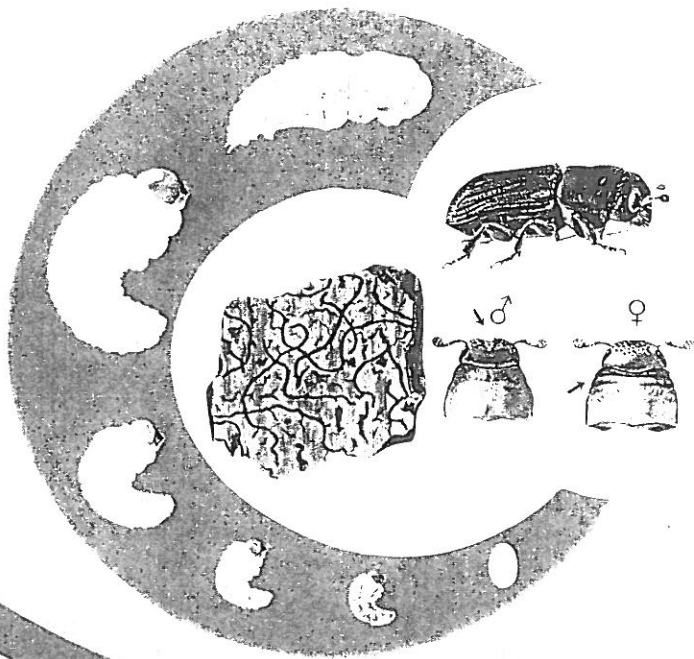
Southern Pine Beetle Life Cycle

The beetles can over-winter in any life stage: egg, larval, pupal, or adult, and produce three to seven generations a year. In New Jersey, the northern-most range of southern pine beetle, beetles usually overwinter in the pupal stage and produce around two generations per year.



A pair of beetles bore galleries into the tree's inner bark for the female to deposit eggs. The eggs hatch into larvae, which feed on the tree's bark. The larvae then become non-feeding pupae, and finally adult beetles. The adults exit the host tree and fly, sometimes several miles, to a new tree.

The "S" shape of the galleries distinguishes this beetle from others. Galleries are created by the larval stage of the insect as it devours the tree's critical inner bark. These galleries girdle the tree while the beetles transmit blue-stain fungi (shown above). The fungi stop water from circulating within the tree. The girdling and fungus may kill the tree within two months after the initial attack.



SPB and NJ Woodland Owners

Landowners enrolled in the NJ Forest Stewardship Program (FSP) or the Farmland Assessment Program (FLA) should contact a Consulting Forester for a southern pine beetle evaluation. If the Consulting Forester determines that southern pine beetle populations may affect the stand, the forester will implement suppression and pre-suppression activities to reduce outbreak severity.

Landowners not enrolled in these programs that have 5 acres or more of woodland should contact the NJ Forest Service or a consulting forester to enroll. The FLA program provides property tax break incentives and the FSP will provide cost-share of up to 75% for the development of the plan. Both of these programs contribute to proper forest management while providing sustainable forest resources.

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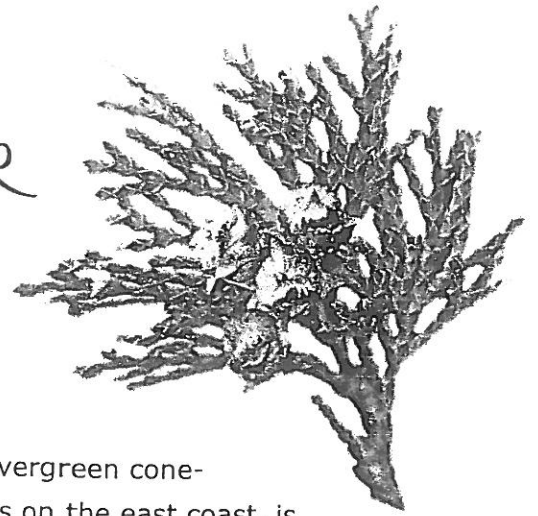
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FOREST RESOURCE EDUCATION CENTER
New Jersey Forest Service
Department of Environmental Protection
WWW.NJFORESTRYCENTER.ORG

Atlantic white-cedar

Chamaecyparis thyoides



Atlantic white-cedar distribution

Atlantic white-cedar (AWC), an evergreen cone-bearing tree found in swamps and bogs on the east coast, is valued not only for its rot resistant wood, but also for the habitat it provides many unique species of plants and animals. Since the settlement of America in the early 18th century, people have recognized the value of Atlantic white-cedar. Cedar totals have fallen dramatically since that time and only 22% of original cedar stands still exist. The New Jersey Forest Service values this unique species and promotes its active management to reverse this declining trend. Through these efforts, New Jersey Forest Service strives to restore AWC forest type to our landscape.

Description

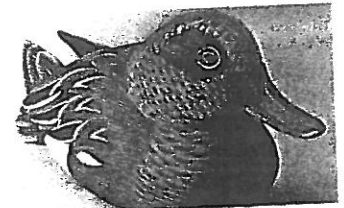
Height	40' - 90'
Spread	10' - 20'
Shape	Pyramidal & Narrow
Growth rate	Moderate
Light requirement	Full Sun
Soil requirement	Damp/Wet

Products

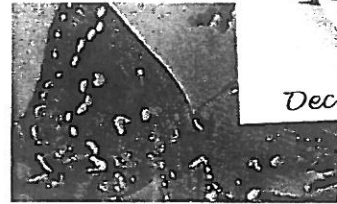
Atlantic white-cedar wood is lightweight, resistant to decay, aromatic, and shrinks and warps very little. In colonial times it was used for shingles, siding, barrels, and boats. The wood and products were also a chief export in this area. Today, AWC wood is commonly used for fencing, decoys, outdoor furniture, and decking. Landscapers occasionally use this tree as an ornamental.

Benefits

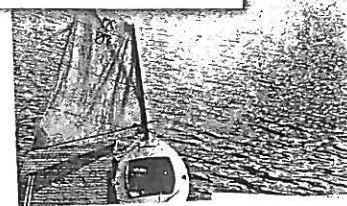
Stands of AWC provide many unique benefits for the environment. AWC swamps filter and absorb pollutants, protect stream banks from soil erosion, control and retain flood waters, and store water in drought. Another notable feature of cedar swamps is that they provide habitat for many species, including the Pine Barrens treefrog, timber rattlesnake, barred owl, black-throated green warbler, and a rare butterfly, Hessel's hairstreak. This butterfly lays its eggs on the foliage of the Atlantic white-cedar. When the larvae emerge, they feed exclusively on Atlantic white-cedar foliage.



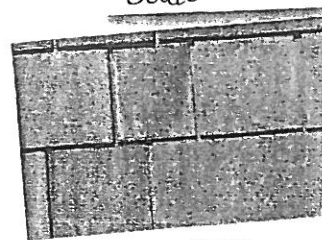
Decoys & Wood carving



Wildlife



Boats



Shingles & siding

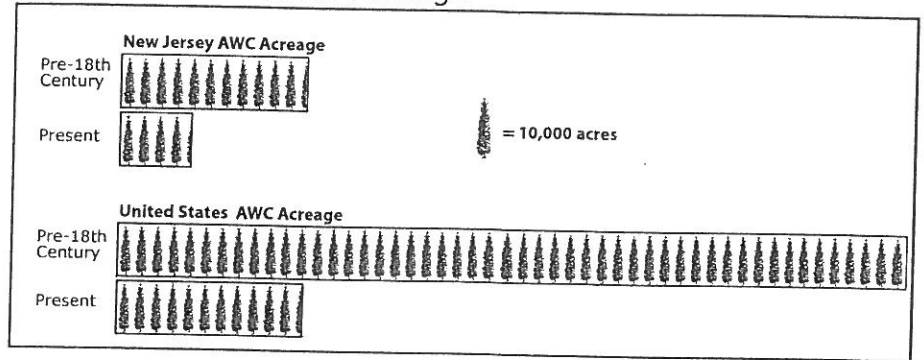


Water Protection

Decline of AWC

Pre-18th century, the east coast had as many as 500,000 acres of AWC stands. Many factors affect Atlantic white-cedar. Although changes in land use such as development or agriculture account for the manmade issues, foresters working with Atlantic white-cedar also encounter natural disturbances such as floods, storm damage, salt water intrusion, wildfire, bark beetles, and natural succession conversion to a climax forest of maple and gum species.

Atlantic white-cedar Acreage



Deer

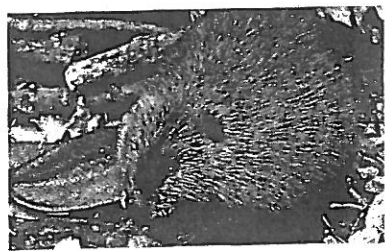
In the early 20th century, deer were scarce because of over hunting. Once tighter restrictions were enforced and the deer restocked, the population increased to the state's carrying capacity by 1935. The current overpopulation of deer has adversely affected cedar growth and sustainability. During the winter, deer browse Atlantic white-cedar, but they do the most damage to young seedlings. Foresters protect Atlantic white-cedar trees from deer by installing fencing around restoration sites, or by placing mesh collars around individual trees to exclude the deer from eating the AWC regeneration.



White-tailed deer

Fire

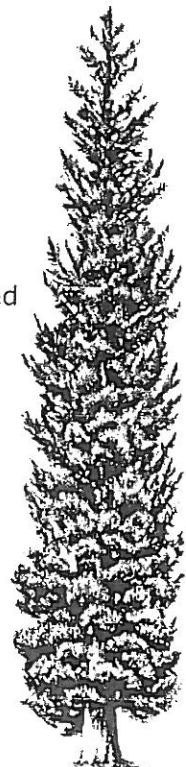
The increased incidence of catastrophic wildfire decreased AWC acreage. Fire affects Atlantic white-cedar in two ways. When exposed to fire, even at a low-intensity, seedlings are killed. Even mature cedars cannot withstand fire and usually die after exposure. While fires negatively affect cedar trees, cedar's seeds can withstand fire. If a fire occurs during the wet season, the seed is preserved in the sphagnum moss. A new cedar stand forms from the seed germination. However, if an intense fire burns and consumes the sphagnum moss layer, the seed will be lost.



Beaver

Beavers and Floods

Beavers have an impact on AWC. Although they have been noted to consume competing vegetation to allow more growing light and room for the AWC seedlings, the beaver's dam affects cedars most. When a beaver dams a stream and the water rises, cedar trees and seedlings die. Once the dam is removed and the affected Atlantic-white cedar trees are harvested, the seed in the sphagnum moss on the ground can regenerate to establish a new young stand of AWC.



For more information on Atlantic white-cedar please contact your regional forester:

North (973) 786-5035
 Central (609) 726-1621
 South (609) 625-1124

References

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Department of Environmental Protection
 Division of Parks and Forestry
 NJ Forest Service

IV. FOREST STAND DESCRIPTION & MANAGEMENT RECOMMENDATIONS

This first, ten-year Forest Plan takes a modest approach to begin to apply active management of these forest resources. Since Stockton College has controlled these forest resources over the past forty years or so, the only management of the forest resources has been some limited prescribed burning. This forest continues to grow and will benefit from a more active stewardship approach as opposed to the past passive management approach. The management of these forest resources will be adaptive over time.

This initial work will focus on sustaining the rich forest diversity that exists. With the suppression of fire, and the exclusion of any disturbance regime, some areas of the forest are overstocked and present concerns for insect and/or fire problems.

Overall, forest stands will benefit from an initial single tree or small group selection harvest to enhance growing space for the maturing trees and stand as a whole.

Tree regeneration is a concern in this initial ten year period, and some of the planned activities will begin to enhance conditions for all tree species to begin to regenerate.

As the woodland has been left to mature, most stands are well on their way to becoming older age class forest types typical for this area of Atlantic County, New Jersey. There are some plans to regenerate a few patches to begin to re-establish a wider age class diversity across this small forest landscape. Additionally, this effort will include restoration of the cedar landscape in a few patches with a long range goal of managing for a net gain in cedar ecosystems and allowing established stands to grow to old growth status when practical.

Stand One Oak/Pine (381.30 Acres)

Compartment	Acres	Compartment	Acres
A	33.70	B	8.70
C	43.60	D	2.30
E	185.70	F	2.60
G	37.90	H	30.90
I	35.90		

The species composition includes an overstory of white oak, scarlet oak, chestnut oak, and black oak. These species can be found in various associations in diverse numbers across the stand. Trees are in the large pole-size class. There are both native mature pitch pine and shortleaf pine scattered as single trees or in a few sections of groups of pine throughout the stand. The stand is mature in the 70 to 80 year age class with a few older and younger groups scattered about. Most trees are of sprout origin and this stand was likely regenerated as a result of a clear cut harvest earlier in the last century. Growth rates continue to decline and most trees are of moderate quality and condition. These increasing defects in the stand with many trees with significant dieback in the crowns. Stand 1C is broken out later as a younger stand.

The pine is of good to moderate quality and condition; and in many cases, is a little older than the oak with some trees close to 100 years in age. This pine may be a residual from an earlier stand and oak has become more dominant as a result of the exclusion of fire. Areas that contain a higher percentage of pine appear to have experienced a more recent disturbance regime. Most trees remain only of fuelwood or pulpwood quality but the pine is showing the potential to produce sawlog quality material.

The understory is primarily a carpet of dense heath shrubs of black huckleberry, early low-bush blueberry with scattered areas of laurel, sheep laurel, bracken fern, and sweet fern. Greenbriar is present in areas that have been long fire excluded. In addition, a few bayberry and scrub oak are widely scattered about.

Tree regeneration is limited at this time. Within the midstory, there are a few scattered sassafras and hickory present. Scattered about are a few groups of suppressed pine regeneration and limited oak saplings. Crown closure averages 95 percent with gaps beginning to increase.

This oak stand will be managed to address several concerns. Recent drought years, infestations of gypsy moth, as well as gouty oak gall have had long term, adverse impacts on the maturing overstory. Much of the crown structure shows some defect. Although a few areas have had prescribed fire, the lack of fire also is having long term adverse impacts on the stand's ability to regenerate oak. Tree condition remains moderate to poor at this time and age. This oak stand provides significant aesthetic diversity and wildlife habitat to the overall forest.

The first ten year management period will start a modest approach to initiating forest stand improvement actions that will enhance the growing space for the best quality trees while beginning to create improved conditions for both oak and pine to begin to regenerate in the understory.

This stand will receive a silvicultural treatment to harvest trees by the single tree and small group selection methods. This will remove no more than 2 to 3 cords of wood per acre, thus retaining a mature overstory of the best quality trees. The diversity of species in the overstory will be retained. Trees to be removed will be individually marked prior to

cutting. Trees to be removed will be suppressed trees, overcrowded trees in the canopy, and defective trees. Dead snags and trees will be retained across the stand. The retained stand will be a maturing oak stand with increasing tree regeneration.

The trees removed will also begin to create a few canopy gaps thus enhancing conditions on the forest floor for natural oak and pine regeneration to begin to occur. The regeneration conditions will also be enhanced by the modest scarification of the shrub layer by the cutting activity. All native shrubs that are scarified will simply be allowed to resprout and/or regenerate.

This work will be done across the stand and completed as wood market present themselves over this ten year management period. No new forest roads will be needed. This stand's selection work will produce no more than 965 cords of wood over this ten year management period. Areas of the stand will be subject to possible prescribe burning once over this management period if weather and conditions permit. All prescribed burning will be done as a slow backing fire.

In addition to the selection treatment, it is planned to complete six separate, irregularly-shaped clearcut patch contoured harvests (1A- one 4-acre patch, 1C - one 4-acre patch, 1E - three 4-acre patch cuts, and 1G - one 4-acre patch). These regeneration harvests are being done to begin to develop some younger age class oak stands, as well as establish oak regeneration areas. All trees will be harvested except dead snags and a few scattered legacy trees. It's anticipated 5 to 10 oak trees will be retained per acre. These harvest patches will be very irregularly shaped to emulate a patch disturbance. These harvests will be completed over this management period. These projects will provide opportunities for development of wider habitat diversity structure. These patch cuts will produce 338 cords of wood over this ten-year management period.