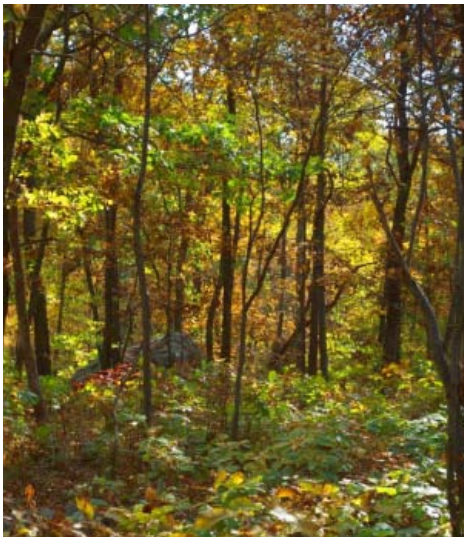
Restoration and Resilience in New Jersey's Forests



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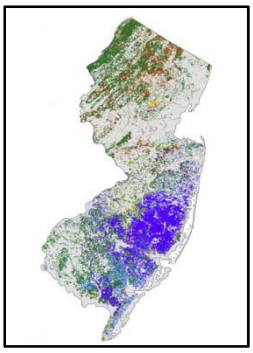

Acknowledgements
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This report was written by Alexander Evans and Amanda Mahaffey with assistance from the workshop planning team. Cover photos: stream by Ken Witkowski, USFWS; meeting by Amanda Mahaffey; New Jersey from US Forest Service; field trip by Alexander Evans; and oak forest by Steven Kallesser.

This report is available online at:
www.forestguild.org/publications/research/2014/New_Jersey.pdf

The Forest Guild practices and promotes ecologically, economically, and socially responsible forestry as a means of sustaining the integrity of forest ecosystems and the human communities dependent upon them.

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Contents

Introduction

New Jersey's forests, and the communities that depend on them, are facing a daunting confluence of threats including a changing climate, invasive species, overabundant deer, and intensified disturbances such as Hurricane Sandy. The workshop that generated this report, *Restoration and Resilience in New Jersey's Forests*, was designed to move beyond some of the political conflict around forest management in the Garden State and focus instead on solutions. A diverse group from state agencies, academia, non-profit organizations, and the private sector came together to plan and host the workshop. This report draws on their ideas as well as on presentations scientists and managers gave during the workshop. In addition, this report summarizes the afternoon working sessions in which attendees engaged in a facilitated process to identify the top threats to New Jersey's forests and responses to those threats. The goal of this report is to document the information shared at the November 2013 workshop and to focus attention on potential pathways to increasing forest resilience in the face of climate change. Presentations from the meeting are available online at: www.forestguild.org/rg_new_jersey.html.

We seek to build on past efforts, many of which serve as excellent additional resources for topics not addressed in detail in this report. Some of these other resources include:

- State of the climate: New Jersey – Rutgers Climate Institute, 2013
- Climate change tree atlas – US Forest Service, 2007
- Forest adaptation resources: climate change tools and approaches for land managers – USDA Forest Service, 2012
- New Jersey statewide forest resource assessment and resource strategies – New Jersey Department of Environmental Protection, Division of Parks and Forestry, 2010
- Guide to controlling non-native invasive plant species on New Jersey's natural lands – New Jersey Audubon, 2002
- A stewardship primer with philanthropic considerations – Victoria Foundation, 2011
- Proceedings of the state of the forest symposium: ecological issues regarding highlands forest degradation and restoration – New Jersey Audubon, 2002

The workshop opened with introductory remarks from Michael Catania, Executive Director of Duke Farms. Michael set the tone for the workshop by urging participants to acknowledge differences in perspective and engage in the search for solutions with an open mind. Michael drew parallels between today's debate about the stewardship of New Jersey's forests and disputes over a century ago between John Muir and Gifford Pinchot. Just as neither of these luminaries changed the mind of the other, differences of opinion on forest management in New Jersey will remain. However, the combination of threats we face today requires us to work together. The risks of ecological degradation are too great to allow our differences in opinion to, in Michael's words, "paralyze our ability and willingness to care for our forests."

New Jersey's Forests – Past, Present, and Future

The Past

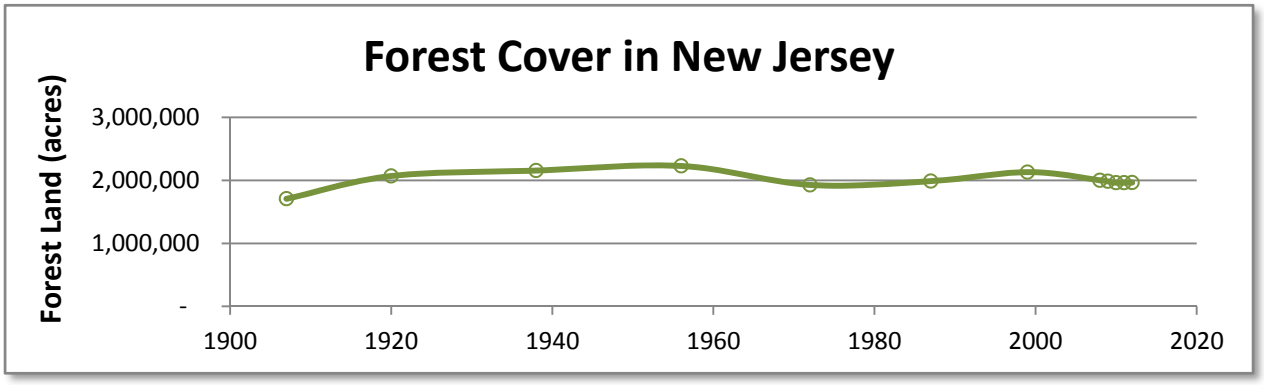
Sound decision making must be based on a scientific foundation. To ground the workshop in science, five presenters summarized essential elements of the past, present, and future of New Jersey's forests. First, Dr. Emily Southgate demonstrated that change has been a constant in New Jersey's forests. Detailed studies of pollen captured in pond sediments show that the composition of New Jersey's forests has varied significantly over the last 12,000 years. For example, a decrease in the prevalence of fire about 9,500 years ago allowed populations of hemlock to expand.[1] Later, around 3,500 years ago, hemlock prevalence declined again (perhaps due to an insect outbreak[2]) and birch species increased their importance in the forest. More recently, the sediments chronicle the changes initiated by Euroamerican land clearing and farming in New Jersey starting around 1700 AD.[3] Charcoal marks the increase in fire and is accompanied by increases in grasses and ragweed pollen in the sediments. During this period, the charcoal industry drove substantial forest harvesting in areas poorly suited to farming.[4] 1850 marked the approximate maximum in deforestation, which caused significant erosion of soil. Since then, New Jersey, like much of the Northeast, has experienced widespread reforestation. Between 1907 and 1963, the forest area in New Jersey increased by over half a million acres.[5] Thanks to this reforestation, residents of the Garden State have become accustomed to a forested landscape.

With the reforestation came changes in public policy; 1963 was the year of the Farmland Assessment Act, an important landmark for forest policy in New Jersey. Ron Sheay, a 30-year veteran of the New Jersey Forest Service, highlighted that the current use valuation referendum affects farmland as well as trees and forest products. Subsequent amendments to the Farmland Assessment have changed aspects of how forestland is taxed, but in general, a lower tax rate for forestlands has been maintained. Regulations completed in 1988 required a forest management plan created by an approved forester and aimed to eliminate excessive and unnecessary cutting. The acreage of woodlands under Farmland Assessment increased from about 118,000 acres in 1969 to over 380,000 acres in 2011 (40 percent of which are appurtenant woodland, i.e., woodlands that are supportive of a larger agricultural parcel). During the same period, New Jersey's forest industrial capacity declined significantly. In 1958, an estimated 17 million board feet of timber was harvested in New Jersey.[6] Nearly 50 years later in 2006, the seven wood processing mills surveyed in New Jersey reported processing just 5.7 million board feet. Employment in the wood products and paper manufacturing industries in New Jersey dropped from nearly 20,000 paid employees in 1997 to a little over 16,000 in 2007.[7, 8]

The Present: The state of New Jersey's Forests

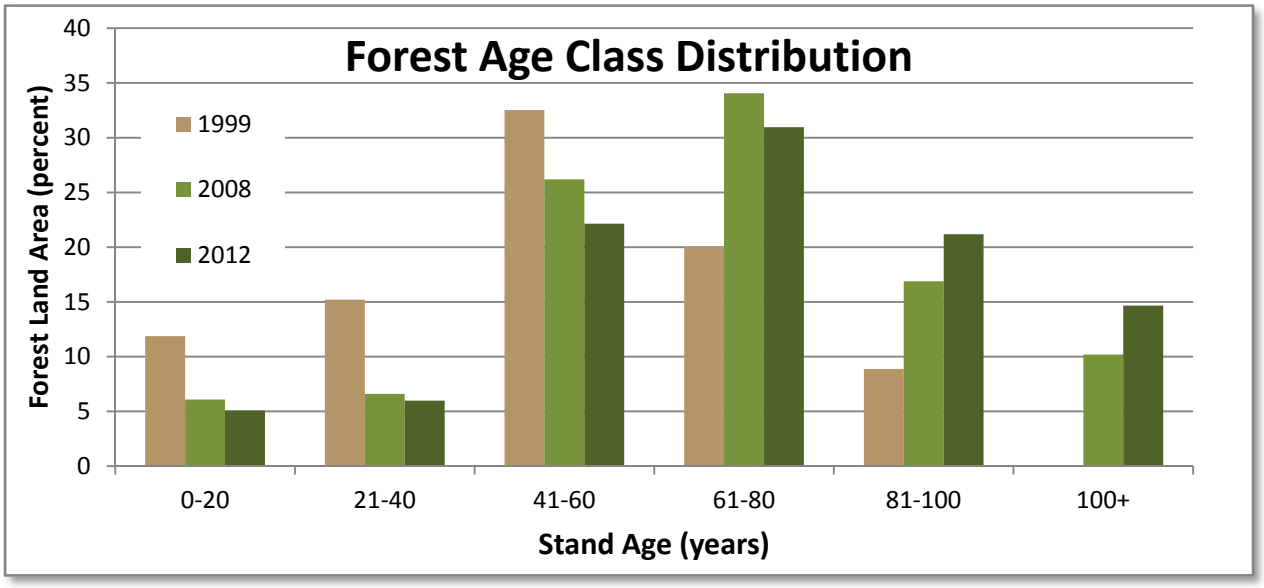
Susan Crocker from US Forest Service provided a view of the state of New Jersey's forests, drawn from the publication, *New Jersey's Forests 2008*, and other work by the US Forest Service Forest Inventory and Analysis (FIA) team.[9] New Jersey's forests are concentrated in the pinelands in the southeast and the highlands in the northwest. The Pinelands National Reserve itself covers 1.1 million acres and accounts for 22% of New Jersey's land area. The amount of forest cover in New Jersey has been close to 2 million acres in recent decades, but since 2009, the total forest area has dropped below this benchmark.[10] Most of the decrease in forest area has occurred in urban areas neighboring New York City and Philadelphia.[11] This pattern in New Jersey mirrors that of the region as a whole. Across the northeast, the twentieth century trend of

increasing forest cover has begun to reverse in recent years.[12] The majority of forestland New Jersey is made up of patches of forest smaller than 1,000 acres, and only 47% of forests have interior forest conditions.[9]



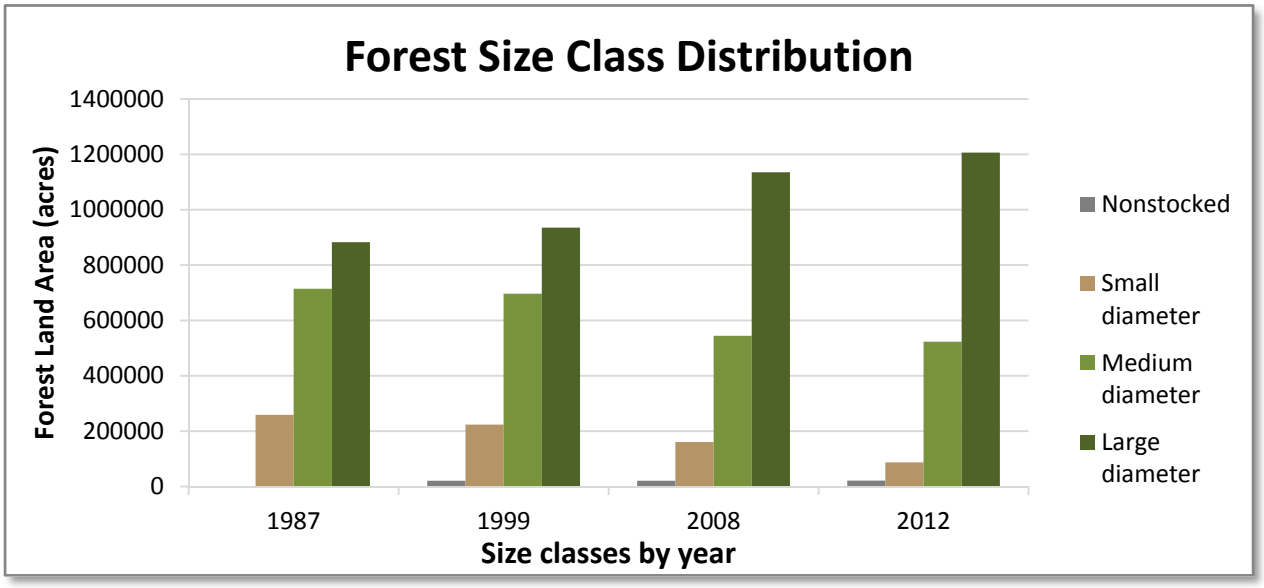
The majority (38%) of New Jersey's forests are owned by families. Other private land owners own about a quarter of the forestland in New Jersey, and the state owns another quarter. Municipalities and the federal government own 8% and 5% respectively. Notably, only 14% of family forest owners have plans to pass the land onto heirs or sell it in the near future. [9] This means there is significant potential for changes in the use of forestland.

The forests of northern New Jersey are dominated by upland hardwood species including oak, maple, birch, and hemlock. The sandy, acidic soils of the pinelands support pitch, Virginia and shortleaf pine, although Atlantic white cedar and pine-oak communities are common as well. On average, forests across the state have grown older in the last two decades; in 1999, the average age was between 41 and 60 years, and now the average is between 61 and 80 years.



Similarly, since 1999, more forest stands have grown into the large-diameter class. Small- and medium-diameter stands have become less common, while large-diameter stands have become

more common. The percentage of forestland considered small-diameter has decreased from 14% in 1987 to 5% in 2012.[9] Based on FIA data from 2007 to 2011, New Jersey is losing young forest habitat at the rate of 6,400 acres per year. The reduction in young, small-diameter forest stands has implications for wildlife habitat and forest resilience.[13] Wildlife species that require early successional habitat, i.e. young forests, have been critically uncommon in the Northeast largely because forests have matured.[14, 15] A diversity of structural stages (young, mature, and old forests) across the landscape can increase resilience against climate change.[16] In forest stands with other similar attributes, young stands have been shown to be less susceptible to damage during severe wind storms because of their low stature and flexibility.[17, 18] It is important to note that patches of young forest are fundamentally different from patches of other land uses such as housing developments or agriculture, as the latter do not provide the full range of habitat values a forest provides.



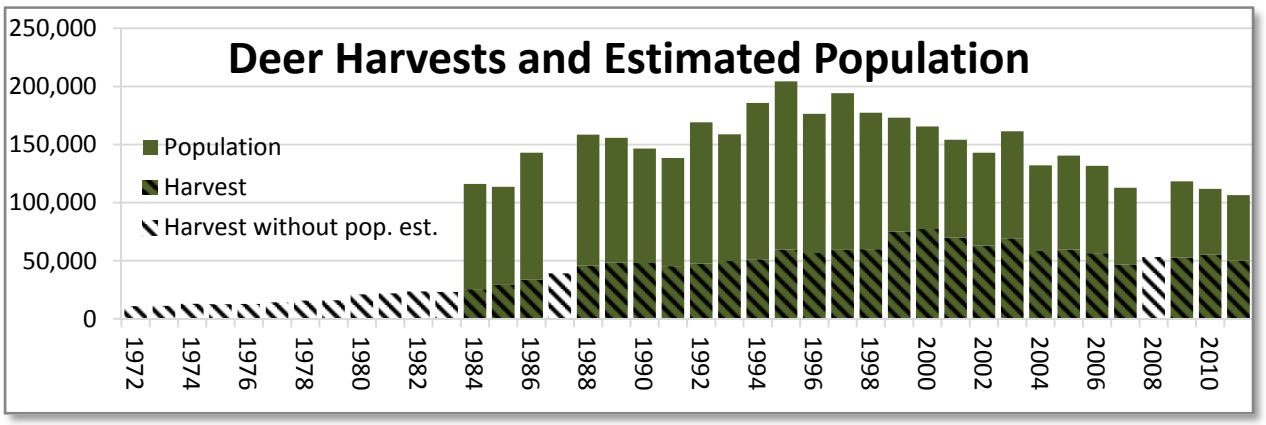
One reason for the increase in old trees and large diameter stands is that removals are significantly less than growth. In 2006, annual growth on New Jersey's timberlands was 55 million cubic feet, harvest was 3.7 million cubic feet, and mortality was 16 million cubic feet.[5] The state average net growth is 2.4% of total growing stock volume while tree death and removal is only 1.4%. Mortality is 0.7%, harvests make up 0.5%, and land use change is 0.2% of total growing stock volume.[9]

Of course, the forests that have regrown in the last hundred years are not the same as the forests that were cleared in the 1700s. For example, chestnut blight functionally removed American chestnut from its ecological role as a dominant tree in eastern forests by the 1950s. Atlantic white cedar has been reduced to less than 30% of the area it covered historically.[19] Southern pine beetle, has expanded its impact in New Jersey and, in 2010, killed over 14,000 acres of pines.[20]

While some native species have receded, new invasives species have moved into New Jersey. The list of invasive plants is long, but common problematic species include tree-of-heaven, garlic mustard, Japanese barberry, Asian bittersweet, spotted knapweed, autumn olive, Japanese

knotweed, phragmites, multiflora rose, and wineberry, among others.[21] Invasive species outcompete and overwhelm native plant species. For example, stiltgrass outcompetes native plants, reduces herbaceous diversity, impedes native woody species regeneration, and creates extensive stiltgrass monocultures.[22, 23] Invasive plants can disrupt plant reproductive mutualism such as pollination or seed dispersal, causing population reductions.[24] An example of a less visible influence of invasive plants is the allelopathic effect of tree of-of heaven, which has a detrimental impact on red oak regeneration.[25] Invasive plants alter, usually negatively, habitat for wildlife. For example, nationwide, about 28% of birds listed as threated are negatively affected by invasive plants .[26]

White-tailed deer are native to New Jersey, but increases in population have begun to create the types of ecological problems often associated with invasive species. At high population densities, deer threaten rare plants and keep trees from regenerating.[27] High densities of deer can eliminate the native shrub layer and, in turn, reduce breeding habitat for many bird species.[28] Long-term deer exclusion studies suggest that the naturally slow rate of change for mature forest trees can mask the full impact of deer herbivory for decades.[29] Unfortunately, high deer densities and invasives species can work in synergy, causing rapid, negative effects on native plants and animals.[30] Controlling deer populations remains difficult in part because many deer can avoid hunting pressure in residential areas or on private land where hunting is not allowed.[31] A recent study indicated that regulated hunting in suburban landscapes may not be able to reduce deer herds below 44 per square mile.[32] Estimates of deer populations and deer harvests in New Jersey indicate that some progress has been made in reducing the population from its maximum of over 200,000 to just above 100,000 in 2011.[33] However, these estimates are extrapolated from the deer harvest, and since there are many areas where hunting does not occur, they are likely an underestimate of the total statewide population. Deer remain a significant ecological problem throughout the state, though solutions are likely to be social or political in nature.[34, 35]



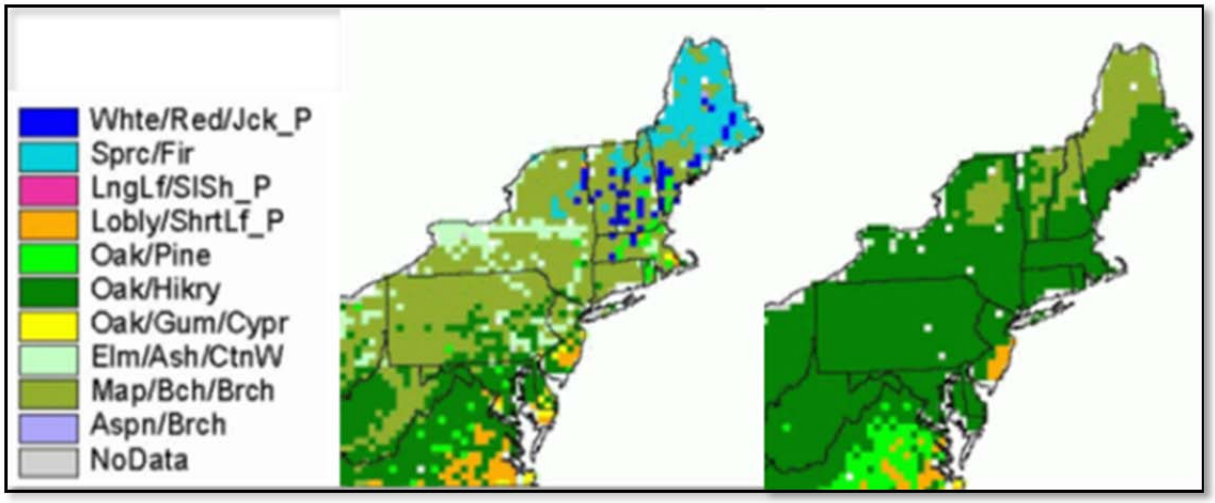
The Future: A changing climate

In addition to the current challenges, changes in temperature and precipitation regimes are beginning to perturb New Jersey's forests. Dr. David Robinson, New Jersey's Climatologist, provided an informative overview of the climate changes likely to occur over the next 100 years. David pointed out that New Jersey is already getting hotter and wetter. 2012 was the hottest year on record in New Jersey, nearly 4°F above the 1901-2000 mean.[36] New Jersey has experienced

six of the ten warmest summers on record since 2005. Scientists estimate summers in the Northeast will be 6 to 14° F warmer and winters will be 8 to 12° F warmer than historic averages by 2100, based on a high emissions scenario.[37]

2011 was the wettest year on record in New Jersey, and annual precipitation has increased about 4.1 inches (or about 9%) over the last 100 years. Heavy rains have become more common, too, and now occur more than twice as often in recent years as they did during the past century.[36] The future is likely to bring steady or increased precipitation, but even with more rain, there may be more frequent droughts because of the timing of precipitation.[37, 38] Models also suggest that more rain will fall during heavy rainfall events.[39] Although current predictive capabilities are insufficient to model the processes that determine hurricane and windstorm frequencies, research does suggest that storms will become more frequent and more intense in the Northeast.[40] In other words, intense storm events such as Hurricane Sandy may occur more frequently in the coming decades.

The effects of the changing climate on forests are likely to be serious.[41] The predicted rapid changes in temperature and alterations in precipitation regimes will increase the stress on trees. As Dr. Jason Grabosky highlighted in his presentation, if the environment changes faster than a plant can respond, the plant becomes stressed. Since trees are long-lived and relatively slow-growing, it is difficult for them to respond to the type of rapid change New Jersey is experiencing. Even if adult trees are able to withstand increased temperatures and greater weather extremes, their seeds may not be able to establish in the changed environment.[42] By 2100, New Jersey is likely to be suitable for different suites of species than currently thrive in the state. For example, sugar maple, white ash, and black cherry are all predicted to decline in importance in New Jersey's forests if greenhouse gas emissions continue unabated.[43] The maps below depict the significant decrease in suitability for the maple/birch/beech forest type in New Jersey by 2100, assuming high emissions.



Current distribution (left) and suitability (right) for forest types in 2100 based on an average of models using a high emissions scenario (right) [43]

The same climate change impacts will disrupt agricultural and urban trees. For example, apple crops may suffer because of an inadequate winter chill period under future climate scenarios.

Similarly, trees planted to match current climates in urban areas may be poorly suited for future increases in temperature. Across the forest continuum from urban to forest interior, the changing climate is likely to benefit forest pests and invasive plants. Warming will facilitate the spread of invasive plants such as kudzu and privet as far north as New England by 2100.[44, 45] In general, invasive plants be better able to respond than native species to recent climate change.[46] Warming will also facilitate the spread of insects such as southern pine beetle, which is expanding its impact in New Jersey's Pinelands.[47]

Other climate changes such as increased CO_2 concentrations and more frequent and powerful storms will benefit invasives. Rising CO_2 concentrations commonly give invaders an extra edge in competition with native species.[48] Higher CO_2 levels help kudzu and honeysuckle tolerate cold temperatures and therefore expand these species' capacity for invading new forests.[49] Extreme climatic events are likely to increase as the climate changes, and these events will facilitate the introduction and spread of exotic invasive species.[50] Hurricanes, ice storms, wind storms, droughts, and fire can all create forest disturbances that invasive species can capitalize on. Many invasive species grow rapidly and can take advantage of the increased sunlight in forest gaps faster than can native species. For instance, tufted knotweed and mile-a-minute weed were able to expand significantly after Hurricane Isabel hit Maryland.[51]

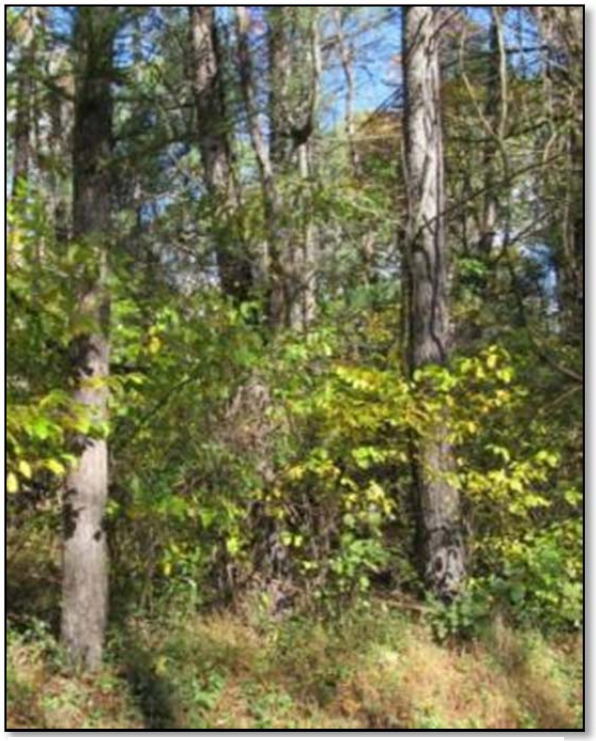
The cumulative effects of a changing climate have the potential to permanently alter the types of ecosystems supported across large areas of New Jersey. For example, where the southern pine beetle is killing pine stands with little or no regeneration, the forest will probably convert from pine to scrub or red maple forests.[28] Similar factors may convert hemlock stands killed by woolly adelgid or oak stands killed by gypsy moth to novel mixtures of invasive species. These type conversions can occur in protected lands, adding to the permanent conversion of forest and agricultural land to developed land and non-forest uses.

Case Studies in Adaptive Forest Management

Although the threats to the forests of New Jersey can be daunting, there are success stories. Therefore, a key focus of the workshop was on-the-ground management. Material from each of these presentations is available online: www.forestguild.org/rg_new_jersey.html.

Merrill Creek Reservoir

Don Donnelly, Jane Bullis, and Jim Mershon hosted a field trip to look at damage from Hurricane Sandy and management responses. Jane and Jim, the administrator and on-site coordinator of Merrill Creek Reservoir, respectively, started the visit by sharing the management objectives and constraints. A consortium of energy companies hold the 2,600 acre Merrill Creek property to protect a water supply used to replenish water during significant drought years. A forest stewardship plan was prepared in 2009 that qualified the property for the Farmland Assessment and aimed to improve forest health for watershed values and wildlife habitat. Don, forester for New Jersey Audubon, became involved with forest management in 2011. Much of the forest is mixed oak, poplar, birch, ash, and maple, but there are approximately 290 acres of conifer plantations. These plantations are 70 to 80 years old and include species not well-suited to the area such as red pine. These stands are marked by poor health, low vigor, little to no regeneration, and significant invasive plant pressure, thereby threatening watershed values near the headwaters of Merrill Creek.



Understory of spice bush and stilt grass. Photo by Don Donnelly

The team had planned to restore two plantations through mowing and/or herbicide application follow by a shelterwood[52] harvest. Two other plantations were targeted for a seed tree harvest[52] with mechanical site preparation and possibly an herbicide application. Although the team began restoration work in September 2012, Hurricane Sandy blew down significant portions of the stands in October 2012. After the hurricane, the team was faced with a choice: Leave stands as they were, or manipulate them in some way in the hopes of better restoring resiliency to the ecosystem. They decided to work with Stryker Forest Products to conduct a salvage harvest on some storm damaged sites and leave other damaged sites as a control. Though the salvage was difficult and did not generate a profit for the landowner or logger, initial results suggest tree regeneration may be better on the salvaged site. For instance, the salvaged area had two-and-a-half times the tree regeneration and twice the regeneration diversity of the unsalvaged site. It is still too early to tell how the two types of sites will develop, but additional surveys will help guide Merrill Creek's management.

The Merrill Creek Reservoir field tour highlighted the uncertainties in forest management in a changing climate. There is no way to predict disturbances like Hurricane Sandy. However, managers must plan for change in the forest and build in plans for regeneration (just as Merrill Creek did before the hurricane). The impacts of the hurricane even 50 miles inland emphasizes that mature forests can easily be converted to scrublands dominated by invasive stilt grass and vines. Active management at Merrill Creek Reservoir before and after Hurricane Sandy illustrates that there is an alternate path that leads towards more resilient forests.

Untreated site after Hurricane Sandy. Photo by Don Donnelly

Gracie & Harrigan Consulting Foresters

Steven Kallesser, Senior Associate Forester for Gracie & Harrigan Consulting Foresters, presented a story of successful oak regeneration for a client who owns approximately 3,000 acres in northern New Jersey. When the project started, almost all of the landowner's forest was between 80 to 90 years old and exhibited canopy closure of 85% or greater. These forests did not provide the wildlife habitat the owners wanted, in part because there was little to no early successional habitat. While few invasive plants grew in the areas targeted for treatment, oak regeneration was weak. The deer populations had been reduced by about half in the last five years through an aggressive Quality Deer Management program. After consultation with the New Jersey Audubon, the New Jersey Division of Fish and Wildlife, and the Natural Resources Conservation Service, Steven developed a plan to restore 10 to 15 acres per year to early successional habitat, with an eye toward providing habitat for the golden-winged warbler, a state-listed endangered species. Before any cutting, the team attacked any invasive plants present on the sites. Then they implemented a modified seed tree harvest[52] that left 10 to 15 perch trees per acre. Initial results were positive with oak regeneration reaching 12,000 feet per acre, far exceeding Steiner and Guild's benchmark of 10,000 feet per acre for successful oak regeneration. [53]

During his presentation Steven also talked about planning for climate change. He emphasized the utility of new publication, *Forest adaptation resources: climate change tools and approaches for land managers*.[16] This workbook focuses on five steps:

- Define area of interest, management goals and objectives, and time frames;
- Assess climate change impacts and vulnerabilities for the area of interest;
- Evaluate management objectives given projected impacts and vulnerabilities;
- Identify and implement adaptation approaches for implementation; and
- Monitor and evaluate effectiveness of implemented actions.

After stepping through this process, Steve Kallesser determined that oak is well suited to northern New Jersey in current climate change scenarios, but regenerating oaks requires deer management and larger openings than medium-scale wind disturbances create.

Steven Kallesser and son in a stand with strong oak regeneration

Land Dimensions Engineering

The third management case study presentation focused on southern New Jersey. Brian Kieffer from Land Dimensions Engineering talked about restoration in pitch pine, shortleaf, and Atlantic white cedar communities. In a pitch pine stand, Land Dimensions worked with a client to mechanically thin stands that had become unnaturally dense because of fire exclusion. Two years later, the stand was patch burned because it had insufficient fuel to carry a broadcast burn. Throughout the pinelands, heath and mixed pine/heath communities develop into closed canopy pine stands with reduced plant diversity and limited wildlife habitat, and that can provide a fire risk for surrounding communities.[54]

A pitch pine stand before 1995, during harvest, and in 2005. Photos by Bob Williams

Brian also discussed an Atlantic white cedar restoration begun in 1995. The site had been cleared and ditched for agriculture in the early 1940s. Over time, hardwoods and overgrown blueberry crops dominated the site. In 1995, the site was cleared, and a drum chopper was used to prepare the site. By 2009, the site supported a healthy density of cedar saplings. This aligns with a recent study that documented that active management, including deer control, is necessary to ensure Atlantic white cedar regeneration. Cedar seedling densities were as much as 100 times higher in the actively managed Great Dismal Swamp National Wildlife Refuge than in a nearby state park under passive management.[55]

Before, during, and after Atlantic white cedar restoration. Photos by Bob Williams

Urban forests

Michael Leff, who serves in a joint position for the Davey Institute and USDA Forest Service, discussed the urban forest that is especially central to New Jersey's landscape. He made the case that urban forestry is a form of ecological restoration. Not only does the urban forest benefit urbanites, but it plays a critical role in the health and function of nearby forests and wildlands. Of course, urban forests face all the challenges of rural forest management such as invasive plants, insects, and diseases as well as harsh urban conditions such as pollution, vandalism, and compacted soils. Because of these intensified stressors, urban forests can serve as a window into the future stressors on natural forests. Michael highlighted some restoration opportunities in this challenging environment including expanding beyond the traditional tree pit, building rain catchments as green infrastructure, connecting with the community, and replacing vacant lots with urban agriculture. The use of native species expands habitat for native arthropods and foraging opportunities of native insectivorous birds. Encouraging homeowners to plant trees and meadows instead of turf lawns can benefit pollinators and reduce fertilizer pollution in streams. Uncovering streams currently hidden by culverts or other obstructions can reduce polluted runoff, cut flash flooding, and greatly improve aesthetics.[56] One tool Michael highlighted that can benefit urban foresters is a computer program called i-Tree.[57] By quantifying ecosystem values, i-Tree can help provide baseline values for urban trees, estimate the benefits of restoration projects, monitor change, and help compare the relative value of potential conservation properties.

Forest Threats and Solutions

Building on the scientific presentations and case studies, participants joined together in the afternoon for an interactive working session to identify threats and solutions. The participants separated into three teams focused on urban forest environment, the pinelands, and northern New Jersey. About half of the participants joined the northern New Jersey group, 30 percent discussed the pinelands, and 20 percent focused on urban issues. In each room, facilitators started by asking the group to write down the biggest threats to the forests in their area. Then the facilitator posted the threats each participant identified on the wall, and led the group in combining similar ideas. For example, a number of participants in the northern New Jersey focus group wrote down "deer," "deer herds too large" or "'lack of understory due to browse;" all these ideas were combined under the single heading, "Deer Overpopulation." Next, each participant was given three red stickers to vote for the biggest threat to the forest by placing one sticker on each of three threats. Then participants were given three yellow stickers to vote for the most pressing threat or the threat that should receive immediate attention. The table below lists the top five immediate threats determined by each focus group.

- Urban focus group
  - Lack of communication or understanding about benefits of urban forests
  - Tree species selection
  - Funding: strained budgets and competing expenses
  - Long-term planning and monitoring in the face of decision-maker turnover
  - Invasive and non-native plantings
- Pinelands focus group
  - Lack of management
  - Southern pine beetle
  - History of fire suppression
  - Regulations in the 1980 Pinelands plan make forestry very difficult
  - Urban sprawl / housing development
- Northern NJ focus group
  - Deer overpopulation
  - Invasives

- Lack of age class diversity
- Lack of public education and outreach
- Lack of public resources for stewardship

The groups next reviewed the clusters of votes with the help of the facilitator and examined large threats that were not selected as an area of immediate action by most participants. For example, although a number of participants in the urban focus group felt that the difficulty of long-term planning and monitoring in the face of decision-maker turnover is a major concern in the urban forest, fewer thought it should be an immediate focus of action. Similarly, in the northern New Jersey focus group, the lack of public education and outreach was highlighted by about 40 percent of the participants as a good problem to tackle immediately even though only about 20 percent thought it was the biggest problem threatening the forest. In most cases, however, there was consistent alignment between the biggest threats and those participants felt should be the focus of immediate action.

In the second half of the interactive exercise, participants went through a similar process to identify the range of solutions. They voted first on the most effective solution and then on the most realistic or achievable solution. Below are the top five realistic solutions for each group.

- Urban focus group
  - Create and share a list of species appropriate for urban planting
  - Public outreach and education
  - Long-term planning in the face of office holder turnover
  - Partnerships to facilitate project delivery
  - Document ecosystem service values of urban trees
- Pinelands focus group
  - Use money earmarked for land purchase for management instead
  - Revise Pinelands comprehensive management plan to reduce regulations
  - Allow more controlled burns (via a burn bill)
  - Build more financial and programmatic support for forest management at the state level
  - Encourage or develop commercial markets (esp. for small-diameter wood)
- Northern NJ focus group
  - Expand hunting opportunities
  - Education through women's groups, scout troops, adult education, etc.
  - More active management
  - Forbid nursery sale of invasives
  - Allow sale of venison

Some participants had difficulty differentiating between effective and realistic solutions, and in most cases, the ranks for solutions were similar. However, a few solutions such as changing regulations to allow the sale of venison were voted effective solutions, but seen as unrealistic or difficult to achieve. Many of the other threats and solutions raised within the focus groups were seen as important for particular locations, projects, or interest groups. The full list of threats and solutions is included the Appendix.

One important result of these working sessions was that climate change was not singled out as a major threat, but tangible impacts of a changing climate were highlighted as the biggest threats. For example, in the urban context, the changing climate was mentioned as one of the reasons the selection of trees for planting needs attention. In the pinelands, 70 percent of participants indicated that southern pine beetle requires immediate attention and that it is likely that southern pine beetle is a threat to the pinelands because the climate in New Jersey is significantly warmer than in the last century. In other words, while all participants acknowledge climate change as a driver of forest threats, it is the on-the-ground impacts that matter for forest stewardship. By the same token, most of the solutions are "no regrets" activities that are appropriate even if international policy efforts are able to reign in climate change.

It is important to note that this list represents a rapid assessment by a self-selected group of workshop participants, most of whom are natural resource professionals or citizens engaged in natural resource conservation. While the five threats and solutions represent some consensus within the group, they do not represent unanimous agreement. Before the forest community (all those who work in, preserve, and restore forests) can move to implement any of these solutions, further discussion and consensus building will be necessary. We hope the results from this working session can help focus attention on collaborative solutions to the otherwise overwhelming challenges facing the ecological stewardship of New Jersey's forests.

Zones of Consensus

Participants emphasized education and outreach to both the general public and to elected officials as a key solution in each focal area. While it is unlikely that all participants can agree on all elements of an outreach program, there appears to be a zone of consensus around 1) the importance of outreach focusing on the high value of forests, 2) the threat of invasives, and 3) the detrimental impact of deer overpopulation. Even if the forest community can agree on nothing else, it would be tremendously powerful to speak with one voice on these three issues. Significant progress could be made to address the threats facing New Jersey's forests if a diverse coalition could set aside differences on other issues to stand behind this relatively simple message about the threats to New Jersey's forests. It may even be possible for such a broad forest coalition to agree on some solutions (even while disagreeing on many other issues). For example, creating and sharing a list of species appropriate for urban planting, banning the sale of invasives in nurseries, and working to control deer are all solutions likely to enjoy wide support. While

building a broad coalition may seem utopian after a history of some bitter divisions, forest communities in other regions of the country have been able to focus on the zone of agreement to achieve common goals while agreeing to disagree on other aspects of forest management. Finally, coalition-building across the spectrum of those who care about forests may be the only way to ensure forests remain a vital part of New Jersey's future.

Building on relatively small areas of agreement, developing trust after a history of conflict, and speaking with one voice is difficult. It is far easiest to fall back on entrenched positions than it is to reach out to those who may disagree. There are some steps that have proven useful to other forest communities across the country. Visiting field sites and talking in specifics about common challenges can highlight agreement. Opportunities to build acquaintances, friendships, and trust between individuals are crucial. This can happen on even the smallest projects and fuel larger successes.

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Appendix: Workshop Results

Urban focus group

Problems

- Lack of communication / understanding about benefits of urban forests
- Tree species selection
- Funding: strained budgets and competing expenses
- Long term planning and monitoring in the face of decision maker turnover
- Invasive and non-native plantings
- Unfavorable view of storm water retention naturalization
- Climate change (heat, drought, flooding, wind events)
- Poor air quality
- Insect and disease outbreaks
- Urban forest are low priorities in economically challenged areas
- Lack of adequate growing space
- Development and fragmentation
- Mechanical damage
- Dealing with contaminated, compacted soils and fill
- Lack of maintenance
- Large deer herds

Solutions

- Create and share a list of species appropriate for urban planting
- Public outreach and education
- Long term planning in the face of office holder turn over
- Partnerships to facilitate project delivery
- Document ecosystem service values of urban trees
- Persistent journalism support (maintain media engagement)
- Encourage funding for urban forestry in economically depressed areas
- Encourage the development of walkable communities with trails
- Support or create active shade tree commissions
- Woodland steward program
- Educate foundations on importance of funding monitoring and stewardship not just restoration
- Find municipal leaders who champion urban forests
- Use urban forest inventory and monitoring to inform decision making
- Tree evaluation and thinning before storm season
- Use local weather events to demonstrate gains/loss of trees
- Create model sites within communities
- Development and land use restrictions

Pinelands focus group

Problems

- Lack of management
- Southern pine beetle
- History of fire suppression
- Regulations in the 1980 Pinelands plan make forestry very difficult
- Urban sprawl / housing development
- Invasive species (gypsy moth and others)
- Irresponsible or illegal recreation
- Invasives plants
- Threat of over use of the Kirkwood-Cohansey aquifer
- Unequal application of controlled burn effort
- Lack of timber market and woods workers
- Recognition of the importance of forestry at the level of the governor's office
- Overstock stands
- Atlantic white cedar restoration
- Density
- Deer
- Lack of prescribed fire capacity
- Wildfire threat in the wildland-urban interface

Solutions

- Use money earmarked for land purchase to be used for management
- Revise Pinelands comprehensive management plan to reduce regulations
- Allow more controlled burns (via a burn bill)
- Build more financial and programmatic support for forest management at the state level
- Encourage or develop commercial markets (esp. for small diameter)
- Management to reduce SPB threat
- Restore Atlantic white cedar stands in old cranberry/blueberry fields
- Build public support for forest management through education
- Follow the laws of the Pinelands comprehensive management plan
- Interagency cooperation for forest management plans

Northern NJ focus group

Problems

- Deer overpopulation
- Invasives
- Lack of age class diversity
- Lack of public education and outreach
- Lack of public resources for stewardship
- Public and professional resistance to active management
- Land development and fragmentation
- Climate change
- Lack of forest product industry
- Lack of species inventory data
- Politics (lack of state support for NJFS and overregulation)
- Lack of fire
- Focus on trees instead of whole forest ecosystem
- Erosion and runoff
- Oil and gas infrastructure
- Air pollution
- Many landowners control many smaller woodlots
- Roads, edge effect, and reduction in interior forest area
- Insect damage
- Irresponsible and illegal recreation

Solutions

- Expand hunting opportunities
- Education through women's groups, scout troops, adult ed etc
- More active management
- Forbid nursery sale of invasives
- Allow sale of venison
- Provide incentives to re-reestablish a forest products industry
- Completion of the forest stewardship act rule
- Integrated management and mandatory stewardship plans (include forest, deer, invasives, and biodiversity management)
- Employ more foresters at various agencies with DEP
- Green acres must be made permanent and robust
- Collation of data from private forest management plans
- Decrease restrictions on burning
- Study management guidelines and come up with BMPs
- Reduce lawns by planting forests
- Planting climate / insect resistant species
- Create a 'poster forest' as an example of a healthy forest
- Zoning
- Stream line regulations that impede forestry
- Control recreation through rules enforcement
- Address invasive species through funding for early detection, identification, biocontrol, management