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NEW YORK STATE SOUTHERN PINE BEETLE RESPONSE

2016 Annual Report

Division of Lands and Forests

Bureau of Invasive Species and Ecosystem Health

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Executive summary

The Department of Environmental Conservation (DEC) continued tracking and managing southern pine beetle (SPB) on Long Island. Early detection traps in Bear Mountain State Park, Roosa Gap State Forest, and Minnewaska State Park in the Hudson River Valley captured SPB, showing that SPB has also moved further north into NY. Aerial surveys mapped thousands of acres of potentially infested trees. In priority aerial survey areas ground surveys verified and delimited SPB infestations on 263 acres of Long Island. No SPB-infested trees were found in the Hudson Valley. More than 4,500 trees were marked for spot suppression in 2016. DEC crews cut 4,010 trees during suppression efforts. DEC created stand hazard maps for forest stands in David Sarnoff Preserve and for New York State as a whole, which will help prioritize areas for SPB monitoring and preventive thinning treatment. DEC research examined regeneration, winter mortality temperatures, and roadside trees to help inform management decisions.

Southern Pine Beetle in New York State

Southern pine beetle was first detected in New York State with a trap in July, 2014 by NYS Agriculture and Markets and was discovered in trees on Long Island during October 2014. Prior to this, SPB had been detected as far north as Pennsylvania and New Jersey (Payne, 1980) and has since spread further north in NY and to Connecticut, Massachusetts, and Rhode Island. Southern pine beetles attract each other to individual trees using pheromones and attack pine trees en masse, which overwhelms the tree's defenses and kills it in 2-4 months. On Long Island, pitch pine is common, especially in the Central Pine Barrens where pitch pine dominates or co-dominates more than 100,000 acres. Aerial and ground surveys show that SPB is widespread and abundant in Long Island, has killed thousands of trees, and continues to spread rapidly. SPB has also been found in the Hudson River Valley, where pitch pine is prevalent on the Shawangunk Ridge and other mountaintops in the area.

Incident Command Structure

To help effectively manage the response to SPB in New York State, an incident command structure is in place (Figure 1, p.5). Incident command was originally established in the DEC Central Office (Albany, NY) to coordinate the response and was then transferred to Region 1. However, incident command was transferred back to Central Office to apply consistent implementation of the response as SPB spreads. SPB has been found in DEC Regions 1, 2, and 3. The incident command management system allows for the management of personnel and resources across multiple jurisdictions and provides for a clear path of communication between all parties involved in the response. This has been critical in Long Island for communication and participation between several partner groups such as DEC Central Office and Region 1, the Central Pine Barrens Joint Planning and Policy Commission, the US Fish and Wildlife Service, the National Park Service, the US Forest Service, Brookhaven National Laboratory, NY Office of Parks Recreation and Historic Preservation, Suffolk County, the Town of Brookhaven, the Town of Islip, and the Town of Southampton.

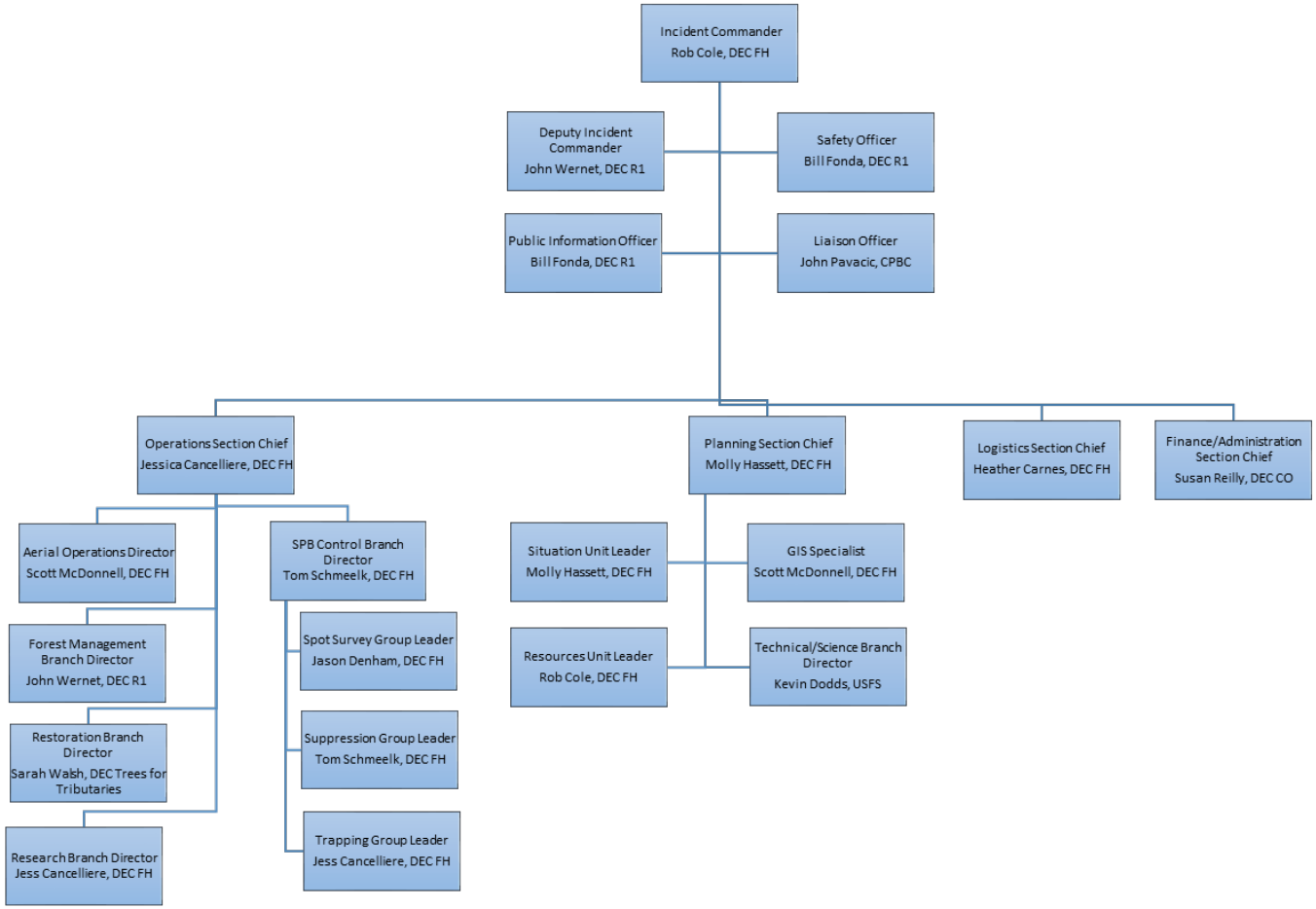

Figure 1. Incident command structure in place December 31, 2016.

Detection and Monitoring

Trapping

DEC used traps as an early detection method in areas north of Long Island (Figure 2, p.7). Twenty-one traps were used for early detection in Albany, Clinton, Oneida, Orange, Saratoga, Sullivan, Ulster, and Westchester Counties from April to August (Table 1) at sites with pitch pine. One SPB was trapped at each of four sites: Bear Mountain State Park, Minnewaska State Park, Roosa Gap State Forest, and Schunnemunk State Park. This alerted DEC that SPB is further north in New York State than just Long Island and prompted aerial and ground monitoring for SPB beyond Long Island.

On Long Island, eight traps were used to monitor beetle populations (Figure 2, p.7) in Nassau and Suffolk Counties from April to August (Table 1). This preliminary population monitoring trap data will help keep track of beetle populations and determine outbreak levels as more data is collected over the next several years.

Table 1. Location and distribution of SPB traps in New York State

DEC Region	Function	County	Number of traps
Region 1	Population monitoring	Suffolk	8
Region 3	Early Detection	Dutchess	1
		Orange	3
		Sullivan	1
		Ulster	5
		Westchester	3
Region 4	Early Detection	Albany	2
		Columbia	1
Region 5	Early Detection	Clinton	2
		Saratoga	1
Region 6	Early Detection	Oneida	2

Figure 2. Location of tested SPB traps in New York State.

Aerial detection surveys

DEC conducted aerial detection surveys in January, May, June, and August over Long Island and Bear Mountain, Minnewaska, and Schunnemunk State Parks to map potential SPB infestation damage. The January survey mapped areas within all of Suffolk County. Since this survey covered more than DEC's priority management area (the Central Pine Barrens Core and Preservation Areas), this survey was used to inform the public rather than inform operations. Aerial surveys in May, June, and August over the Hudson Valley and the Central Pine Barrens were used to inform ground surveys and suppression efforts. Aerial detection surveys mapped 13,490 acres of potential infestations across the Hudson Valley and Suffolk County in January 2016. Aerial surveys in August 2016 mapped 5,192 acres of potential SPB infestations in and around the Central Pine Barrens Core Preservation and Compatible Growth Areas, and 2,237 acres of pitch pine damage in the Hudson Valley.

Ground-truthing surveys

Ground surveys confirmed spots mapped in aerial surveys. Combined aerial and ground surveys (SPB traps and ground-truthing surveys) in New York State show that SPB is widespread on Long Island and is moving north into the Hudson Valley (Figure 3, p.9). DEC conducted ground-truthing surveys from January through December to further map and verify potential SPB infestations detected in aerial surveys. Spots detected in aerial surveys with a higher number of infested trees and spots prioritized for suppression were ground-truthed first. On Long Island, DEC and Central Pine Barrens Joint Planning and Policy Commission staff ground surveyed 263 SPB-infested acres.

During ground surveys, surveyors marked more than 4,500 trees for spot suppression. DEC conducted ground surveys about two weeks prior to spot suppression activities because infestations continue to expand after ground surveys. Conducting suppression within 2 weeks after ground surveys provides a more accurate count of how many and which trees are affected. Suffolk County owns the majority of areas ground surveyed and marked for suppression (Table 2, p.10).

Ground surveys at high hazard, unique areas in Bear Mountain State Park, Minnewaska State Park, Mohonk Preserve, and Schunnemunk State Park were based on data from summer aerial surveys and the National Agriculture Imagery Program. DEC found no infested trees during ground surveys in the Hudson Valley.

Table 2. Landownership of SPB ground surveyed or marked suppression polygons

	Federal	State	County	Municipal	Private
Ground surveyed polygons	<1%	8%	46%	18%	27%
Acres ground surveyed	<1%	25%	15%	27%	32%
Marked polygons for spot suppression	<1%	15%	85%	<1%	<1%
Acres marked for spot suppression	<1%	62%	38%	<1%	<1%

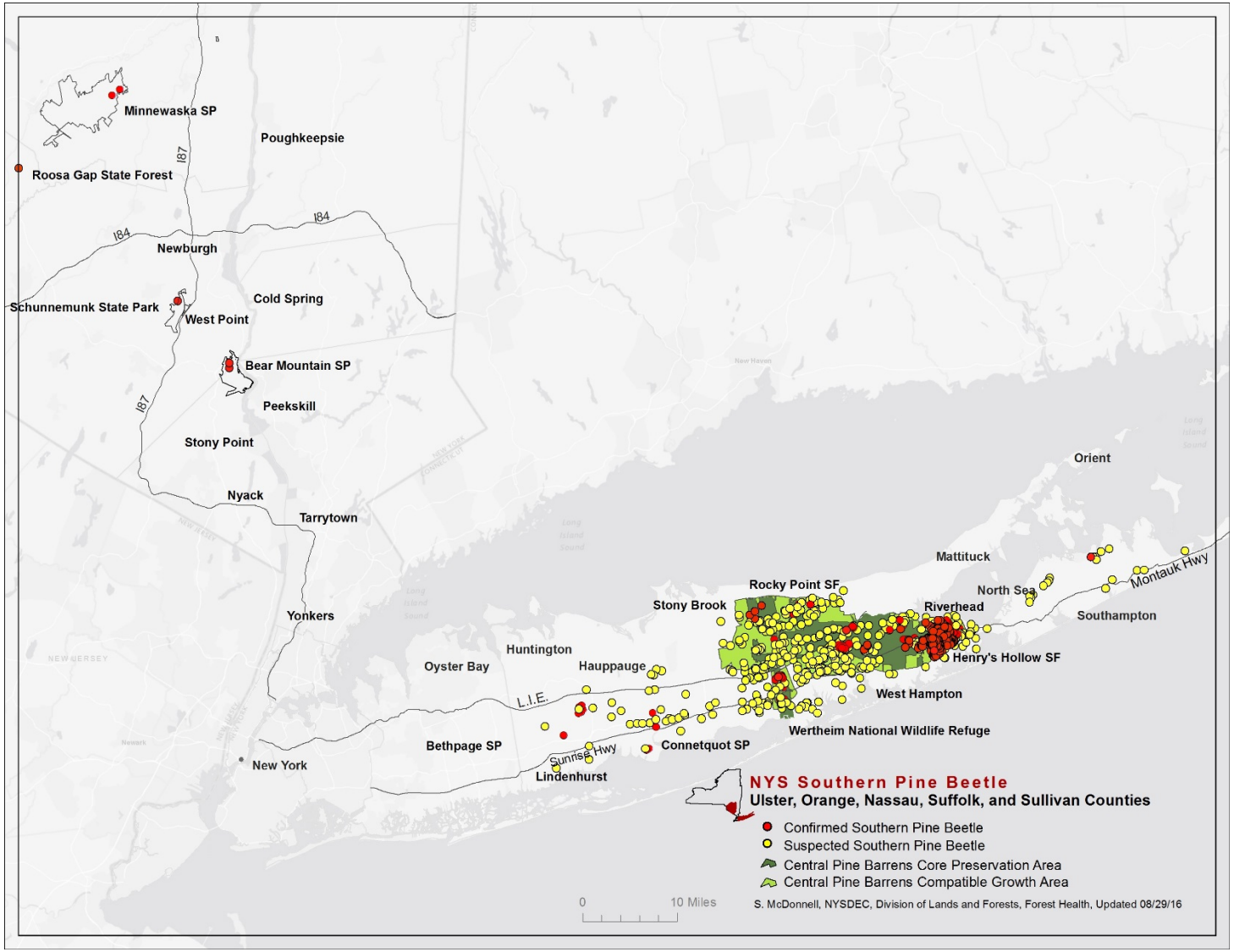

Figure 3. Combined aerial (suspect) and ground surveys (SPB traps and ground-truthing surveys, confirmed) in New York State.

Management strategies

Spot suppression

As there were no infested trees found in the Hudson River Valley, suppression only occurred on Long Island. Live infested and buffer trees were cut before they could produce more SPB. Once the trees were on the ground, crews cut a groove along the bark to facilitate exposure of remaining beetles to winter weather, moisture, and/or predation by other insects or fungi.

DEC crews, consisting of Central Office and Region 1 staff, cut 4,010 trees in 2016 spot suppression efforts (Table 3) (Figure 4, p.11).

Table 3. Number of trees cut by sawyer crews for SPB spot suppression in 2016.

Sawyer crew	Number trees cut at site								
	Henry's Hollow	Sears Bellows CO Park	Hubbard CO Park	Manorville Hills	Otis Pike	David A. Sarnoff	Southaven CO Park	Rocky Point	Other Areas
DEC Forest Health and Region 1	482	480	392	103	41	34	2,351	117	10
Total trees cut	4,010								

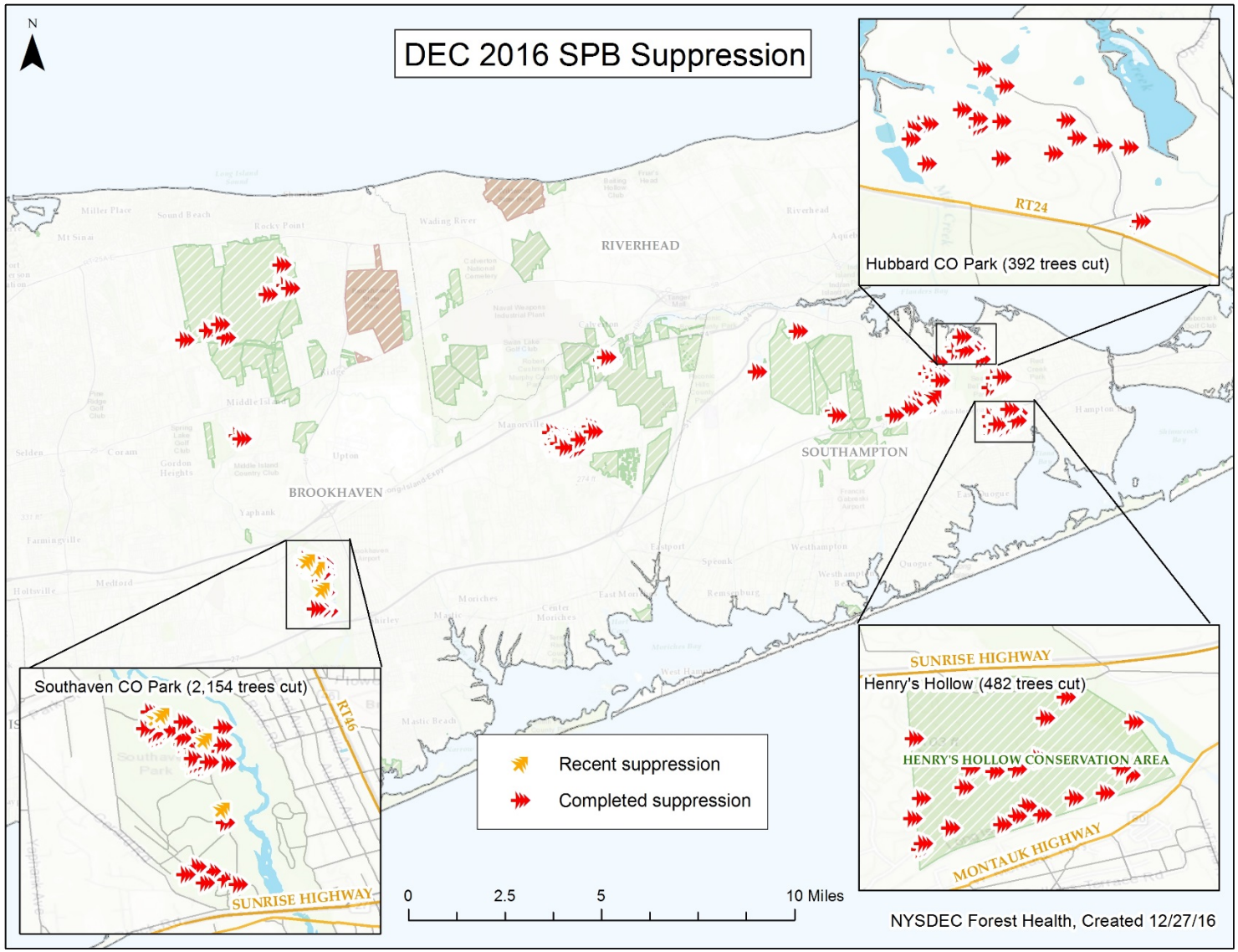

Figure 4. Spot suppression treatment areas. Points represent aerial and ground survey polygons.

Thinning

Thinning is a type of ecosystem restoration that reduces competition between individual trees, and has been proven to make trees more resistant to SPB attack (Belanger 1980, Brown et al. 1987, Fettig et al. 2007, Thistle et al. 2011). Increasing the distance between trees also makes it more difficult for beetles to communicate and attract one another to trees using pheromones, making it more difficult for them to attack trees in great numbers.

Rocky Point Pine Barrens State Forest was the first area to be thinned. DEC hired a contractor at the end of 2016 to begin thinning in high hazard stands. DEC, in partnership with the United States Forest Service, is creating a demonstration forest Rocky Point Pine Barrens State Forest to educate the public about the benefits of forest management techniques including thinning and prescribed burning. The Demonstration Forest, including forest management activities, trails and signage, will be completed in 2017.

DEC staff created hazard model maps for Rocky Point Pine Barrens State Forest, David Sarnoff Preserve (Figure 5, p.12) and for the entire state (Figure 6, p.13) using forest inventory data and remote sensing data to predict which areas are the most susceptible to SPB.

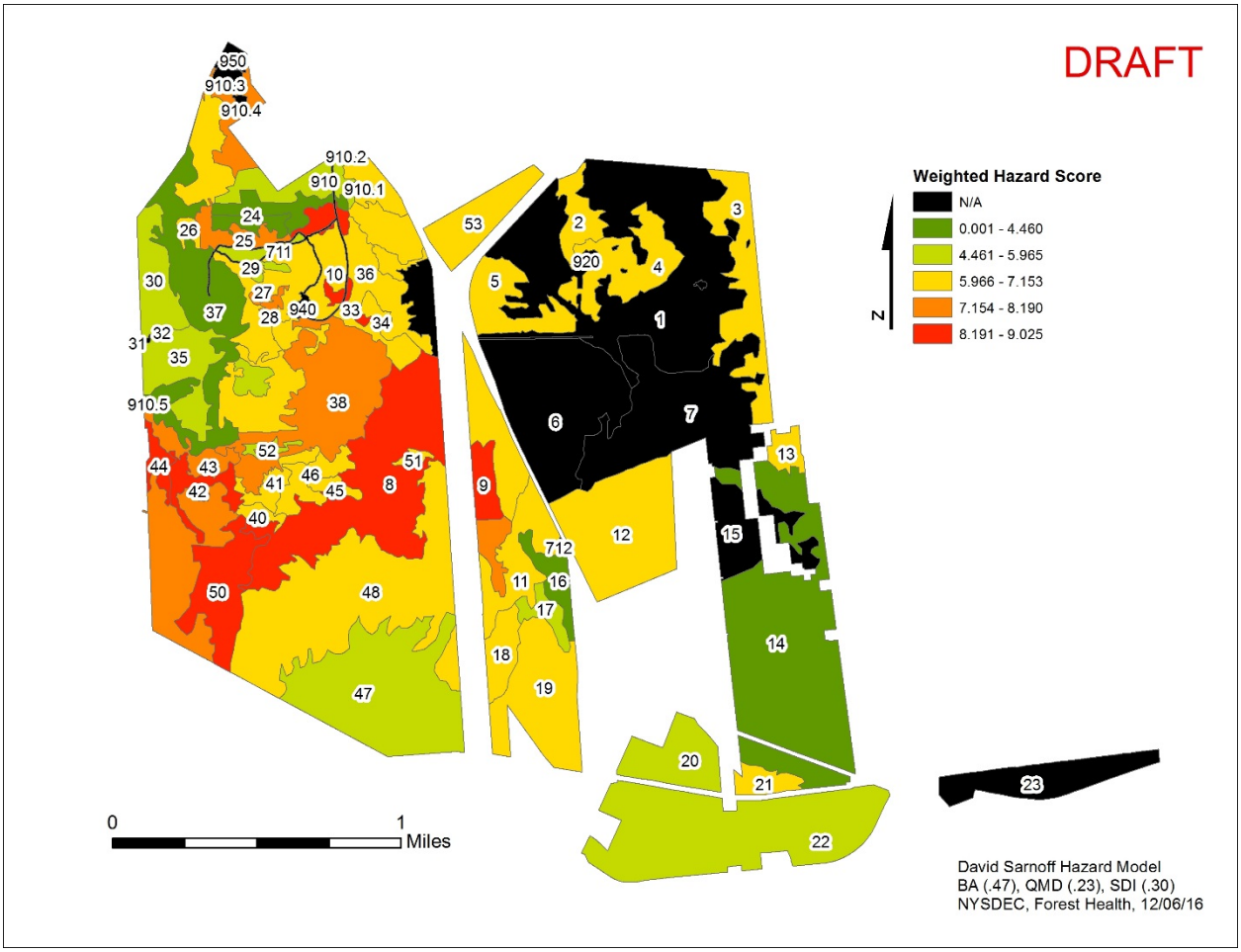

Figure 5. David Sarnoff hazard model map with numbered forest stands.

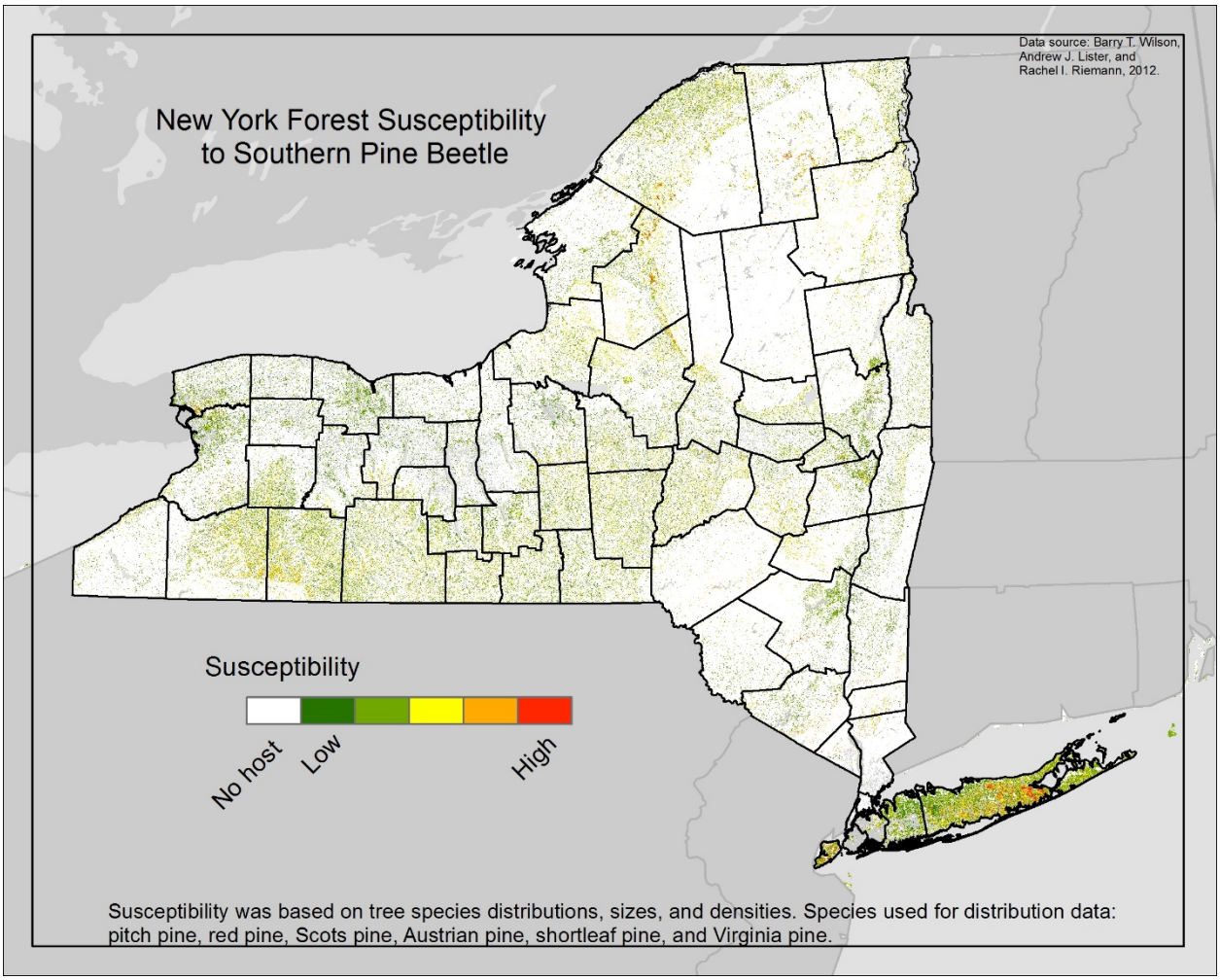

Figure 6. Hazard map for New York State, showing potential susceptibility to Southern Pine Beetle.

Replanting

DEC, in partnership with Parks and Trails New York and NYS Office of Parks and Recreation co-sponsored tree planting as part of I Love My Park Day in Connetquot River State Park Preserve on May 7th, 2016. DEC's Tree for Tributaries program staff trained volunteers to plant the 600 pitch pine that were donated from DEC's Saratoga Tree Nursery. In Connetquot State Park, more than 75% of pitch pine have been attacked and killed by the beetle, leaving large open areas that were once forests. The pitch pine trees from DEC's Tree Nursery were raised from seed collected from Long Island trees. This will help maintain local pitch pine genetics that are well adapted to Long Island conditions.

The Central Pine Barrens Joint Planning and Policy Commission hosted several pitch pine cone collection events in 2016. At these events, volunteers and staff collected 575 gallons of cones. Seeds were sent to several places, including the Long Island Native Plant Initiative and DEC's Saratoga Tree Nursery for storage and planting. DEC's Trees for Tributaries Program, the Central Pine Barrens Joint Planning and Policy Commission, and Wertheim National Wildlife Refuge have begun to discuss possible replanting efforts for the spring of 2017.

Southern Pine Beetle Community Recovery Grants

In 2016, DEC requested applications for Southern Pine Beetle Community Recovery Grants, which could be used to remove SPB-infested trees and to replace trees in areas impacted by SPB. Grants were available to municipalities, municipal corporations, soil and water conservation districts, school districts and community colleges that have a public ownership interest in the property or are acting on behalf of a public property owner. Awards will range from $25,000 to $75,000, and have a match requirement of 25% of the grant amount requested. The grants are funded by the state's Environmental Protection Fund (EPF) and will be managed by DEC. Awards are expected to be announced in January 2017.

DEC Research

1. Regeneration

   DEC measured pitch pine regeneration in areas impacted by southern pine beetle In Hubbard and Southaven County Parks. Pitch pine seedlings were counted in 70 plots in February 2016, and again in July 2016. Other data collected at these sites included: distance to the stand or suppression treatment's edge, canopy openness, basal area, live tree density, percent cover of shrubs, and leaf litter.

   Overall, there was little regeneration in stands treated for suppression and stands that were not treated with suppression. There are a variety of factors that could have impacted the low amount of regeneration, such as deer browse of seeds and seedlings or a high proportion of serotinous cones in the population that need fire to open their seeds. Of the factors that were measured at sites, high shrub cover was negatively associated with regeneration, and intermediate shrub cover had the highest regeneration. This study will be conducted yearly to determine if regeneration changes over time at these sites (Hassett and Cole, 2016a, DEC Technical Report).

2. Winter temperatures and mortality

   DEC collected bark samples from pitch pine trees once a month from November 2015 through March 2016. Four pitch pine bark samples were collected from eight newly-infested and older-infested trees within each of two stands in Southampton NY. Trees were marked with temperature sensors to help determine if temperature correlates with winter mortality. From each sample, larvae were extracted to determine their life stage, location in the bark, and if they were alive, to help determine how SPB larvae overwintered and if they died from cold temperatures over the study period.

   The minimum air temperature recorded on Long Island during the study period was -3.7ºF on February 14. The percent mortality in samples collected in March, two weeks after the cold spell, reached 83.9% at Hampton Bays and 74.8% at East Quogue. This drop in beetle survival corresponds to a model from Tran et al. (2007), showing that our results were consistent with the model's predictions. The February cold spell was not cold enough to significantly reduce the largest SPB spots, but likely led to the collapse of many small to medium sized spots.

   Of the 1,691 specimens collected, 92% were larvae from the outer bark. Of those, 99.8% were still alive at the time of sampling. Comparatively, only 26 larvae were present in the

phloem, and only 7.7% of them were alive at the time of sampling. Our study reflects others that found prepupae to be the most cold-tolerant of all the life stages and studies that found SPB larvae to be more successful overwintering in the outer bark of the tree (Cancelliere, 2016, DEC Technical Report).

3. Roadside trees

   DEC collected densities of roadside trees from 20 plots along Red Creek, Upper Red Creek, and Flanders Roads. The average density of trees was 116 per acre. Knowing that the height of pitch pine trees is about 56 feet (Hassett and Cole, 2015, DEC Technical Report), we estimated that trees within 20 feet of the roadway would likely fall into the roadway if they died. From these, we determined that there would be 106 pitch pine trees within 20 feet of the road, along 1,000 feet of road. In the Central Pine Barrens Core Preservation Area, there are 1,149,118 feet of road. From this, approximately 121,807 trees will be within 20 feet of the roadway (Hassett and Cole, 2016b, DEC Technical Report).

4. Color change

   The objective of this study was to document how fast trees fade and die after being infested by SPB. This information is crucial to correctly interpret aerial surveys, plan survey and suppression efforts, and inform municipalities on how to make better hazard tree management decisions.

   Beginning in June 2016, DEC Forest Health crews marked Stage 1 trees within SPB-infested spots in Suffolk County. These trees were monitored throughout the growing season, and inspected once a week. The percentage of the canopy of each tree that was green, yellow or red was determined, and pine and total basal area and acreage of the spot were measured.

   The average time it took trees to fade from green to brown was 5 to 6 weeks. It appears that trees infested with associate insects of SPB (bark, ambrosia, and checkered beetles) may fade more quickly than trees infested solely by SPB, but more research is needed to determine a significant correlation. Additionally, it appears that the rate of color change in fall-attacked trees through the winter is slower than trees attacked in the summer. This survey is ongoing and tree fade is currently being monitored through the winter.

Public information and outreach

Public information maps have been created from aerial surveys covering the extent of Long Island and will continue to be created each January as resources allow. Several press releases, newspaper articles, social media posts, signs, and one billboard have been made announcing the discovery of SPB and DEC management activities to control SPB.

SPB suppression and monthly bark sampling continued from December 2015	01/06/2016	
	01/06/2016	January SPB aerial flight conducted over the Central Pine Barrens in Long Island and the Hudson River Valley areas SPB was trapped in 2015
January SPB aerial flight conducted over the areas of Long Island not covered in the flight on January 6th	01/12/2016	
	01/28/2016	SPB suppression stopped until spring emergence of beetles
Pitch pine regeneration research plots established	02/01/2016	
	02/10/2016	Ground surveys conducted to verify SPB-infested areas from January aerial flights
SPB population monitoring traps deployed on Long Island	04/25/2016	Tour given of Rocky Point Pine Barrens State Forest thinning stands to officials
	05/06/2016	SPB early detection traps deployed upstate of Long Island and SPB trap training for PRISM volunteers at Bear Mtn.
May aerial flight conducted over the Central Pine Barrens in Long Island and the Hudson River Valley areas SPB was trapped in 2015	05/19/2016	
	05/27/2016	DEC SPB interns and staff began training
Ground surveys and suppression began again on Long Island	05/30/2016	
	06/13/2016	CPBC interns received ground survey training and began ground surveys
Color change research began	06/20/2016	
	06/22/2016	June SPB aerial flight conducted over the Central Pine Barrens in Long Island and the Hudson River Valley areas SPB was trapped in 2015
SPB population monitoring traps taken down on Long Island	06/27/2016	
	07/04/2016	SPB early detection traps taken down upstate of Long Island
Roadside tree research begins	07/11/2016	
	07/25/2015	Training conducted with St. Joseph College professor for ground survey class project
CPBC interns conduct the last summer ground survey	08/19/2016	Begin summer pitch pine regeneration research
	08/22/2016	DEC interns end to return to classes
August aerial flight over the Hudson River Valley areas SPB was trapped in 2015 and 2016	08/23/2016	
	08/30/2016	August aerial flight conducted over the Central Pine Barrens in Long Island
Fall DEC crews began ground surveys	10/03/2016	
	10/03/2016	SPB suppression cutting started by DEC Forest Health sawyer crews
CPBC staff began fall ground surveys in eastern Long Island	11/09/2016	
	11/10/2016	CBPC hosted their last seed collection event for the fall

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