NYSDEC

Forest Health Aerial Survey 2011 Report

Summary - 2011 Forest Health Aerial Survey

A total of approximately 24.8 million acres of New York State was surveyed by aircraft between June 7th and August 2nd, and approximately 104,000 acres of forest damage was detected.

Inundation was more significant this year than previous years, with associated forest damage totaling approximately 32,000 acres, an increase of approximately 26,000 acres from 2010. The Standardized Precipitation Index (SPI) for March-August 2011 shows high levels of precipitation across New York[1], particularly in the eastern longitudes (Figure 1).

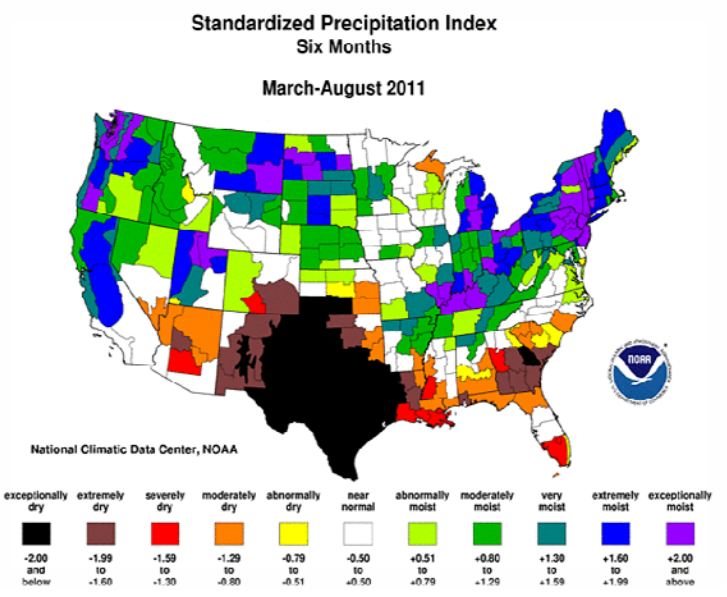

Figure 1. Standard Precipitation Index March-August 2011 National Oceanic and Atmospheric Administration (NOAA)

Inundation was observed in 41 of the 62 New York counties, concentrated within the Adirondack Mountains, Tug Hill Plateau and eastern Erie-Ontario Lowlands. The Hudson Valley did show considerable flooding later in the season but was out of the aerial survey observation window.

Additional abiotic damage was mapped in Regions 5 and 6, with the majority of damage observed as mortality. These areas were not readily accesible for ground verification, and a more detailed damage causal agent (DCA) was not assigned.

Forest tent caterpillar (FTC), *Malacosoma disstria,* as with previous years, caused the majority of biotic damage (21,237 acres statewide). The greater part of this damage was in the Catskill Mountain Region, Finger Lakes Region, Central New York Region, western Allegany Plateau Region and St. Lawrence Lowlands. Host mortality from FTC was concentrated in the Catskill Mountain Region, and St. Lawrence and Madison Counties, likely a result of subsequent FTC outbreaks over several years. Host defoliation from FTC was located in western Allegany Plateau Region, Finger Lakes Region and southwestern Catskill Mountain Region.

Damaged caused by FTC decreased 492,967 acres from 2010.

Gypsy moth caterpillar, *Lymantria dispar,* accounted for approximately 2,400 acres of defoliation, concentrated in Yates and Allegany Counties. Total statewide gypsy moth damage decreased by approximately 62,000 acres between 2008 and 2011.

Spruce/Fir decline was observed in Regions 5 and 6 totaling 11,357 acres.

A total of 14,809 acres of forest damage was classified as unknown cause and located primarily in remote locations within Region 5 between the Great Sacandaga and Indian Lakes.

Other DCAs can be referenced in appendix.

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[1]The SPI compares the actual cumulative precipitation from a 6-month time period to the mean precipitation for that time period. The mean precipitation is calculated using data gathered 1951 to present. A negative SPI indicates a drought is occurring, an SPI of 0 indicates average precipitation, and a positive SPI indicates wetter than normal conditions. The more negative or positive the SPI is, the more severe the condition (National Oceanic and Atmospheric Administration). SPI includes precipitation accumulations from Tropical Storm Irene, not observed with the aerial survey and should be interpreted with consideration.

Introduction

The aerial surveys conducted in New York State are in cooperation with USDA Forest Service and their national forest health aerial survey agenda. The principal objective is the acquisition of general forest health conditions for dissemination to NYSDEC region foresters for management and monitoring, as well as tracking causal agents on a national scale.

The aerial survey identifies possible threats to forest health over large areas, and in a short period of time. The resulting data should be viewed as a general overview of forest health conditions.

Methods

Mission Planning

Factors for flight planning include: insect and host phenology; event-specific phenomenon, such as fire, flooding, frost, and wind damage; latitude and elevation differences; office and airport locations; regional boundary divisions; and airspace restrictions.

A delay of four to eight weeks from initial leaf-out is applied based on known phenological differences. The time delay allows for maximum flush and provides damage causal agents sufficient time to cause foliage damage observable from the aircraft.

In cases where factors are not known until they occur, such as event-specific phenomenon, or unpredicted changes in regional climate and insect populations, the survey schedule is adjusted to capture the greatest amount of damage.

Flight Path

The flight lines are planned in an east to west pattern beginning in Newburgh the second week of June and are planned for completion in Plattsburgh by the second week of August. General bioclimatic effects are considered along with associated growing degree days (GDD), dictating the beginning of flights in southern latitudes and lower elevations first (Figure 2). This allows for variations in GDD and subsequent phenological differences.

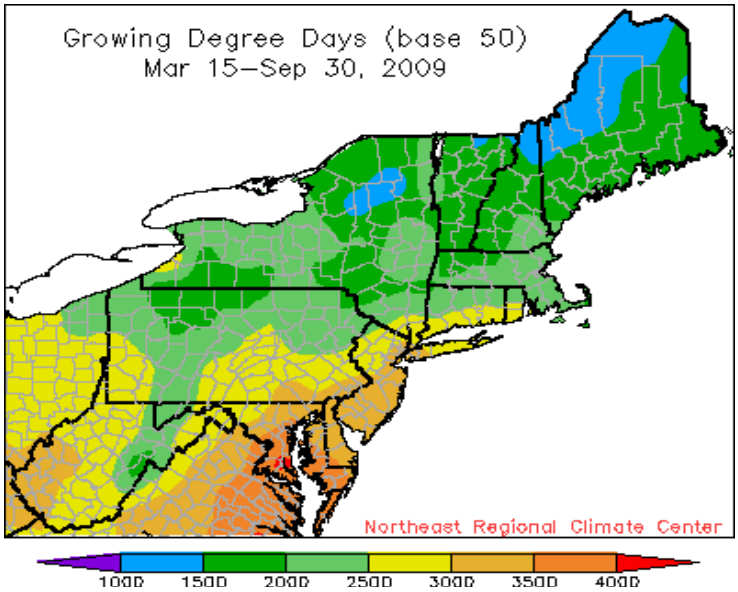

Figure 2. Growing Degree Days Accumulation. Cornell University Atmospheric Sciences and Turf Team 2009.

The flights are normally planned to begin in southern New York, and move north toward Albany. The survey is then flown in the Southern Tier and shifted north and west toward Lake Ontario and Buffalo, respectively. The higher elevations of the Adirondacks and higher latitudes of Franklin and Clinton Counties are surveyed last (Figure 3).

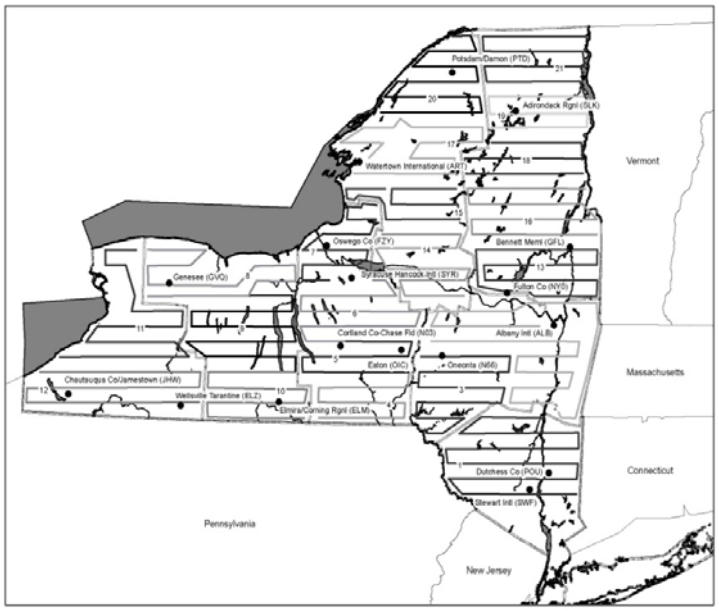

Figure 3. Aerial flight lines.

The surveys are flown at approximately 1,000ft AGL and the visibility is variable, ranging from two to six miles. The flight line is spaced at eight mile intervals (Figure 3) and the flown/not-flown area is based on an average visibility distance of four miles. It can be seen that blocks of the state were not flown, which can be attributed to time, weather or airspace restrictions
(Figure 4).

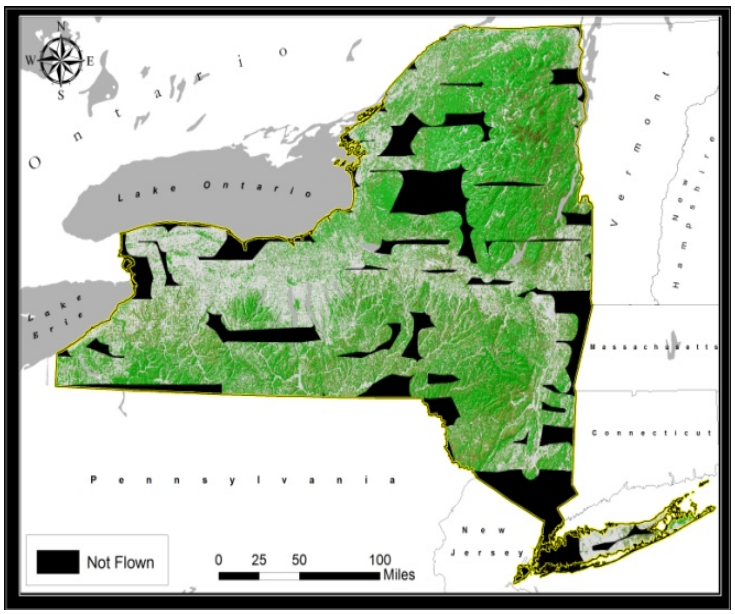

Figure 4. Flown/Not Flown

Aircraft/Equipment
The flights are flown using a Cessna 172, 182, 206 or a Partenavia P-68 Observer. Aircraft choice is determined by, pilot qualifications, aircraft availability and terrain type.

The aerial sketch-mapper uses a GPS (Global Positioning System) receiver integrated laptop, equipped with a touch screen and loaded with DOQQ (digital orthographic quarter quadrangle) base-map layer for reference within a GIS environment.

Post-processing/Editing/Digitization
The data is later reviewed and the polygons are altered in the lab using heads-up digitizing techniques based on 1:24,000 DOQQs. The polygons are then distributed to region foresters and DEC Forest Health ground crews for management, monitoring, ground verification and further causal agent detail categorization.

During the process of data collection many of the polygons created during the flight are adjusted for forest area delineation accuracy.

In many instances the areas of forest damage are widespread, and across a heterogeneous landscape. Due to aerial time constraints and the severity of damage in certain regions, a geographically significant part of the landscape is included (lumped) within the sketched polygons during flight. Because non-forest land cover types cannot be included in damage area calculations, they are removed in the lab (Figure5).

In previous years, the data was modified using a classification based on Landsat TM satellite data. This process removed non-forest areas that were included in the initial polygon creation but did not allow for human interpretation, which degraded the accuracy of these edits. It has proven to be more effective to eliminate non-forest areas by human made edit decisions using heads up digitalizing techniques. The editing process involves layering a base map 1:24,000 DOQQ with the forest damage polygon data and systematically rearranging and removing portions of the polygon to best fit the underlying base map layer. This manual technique is more time consuming but yields a more accurate representation of the actual observed damage.

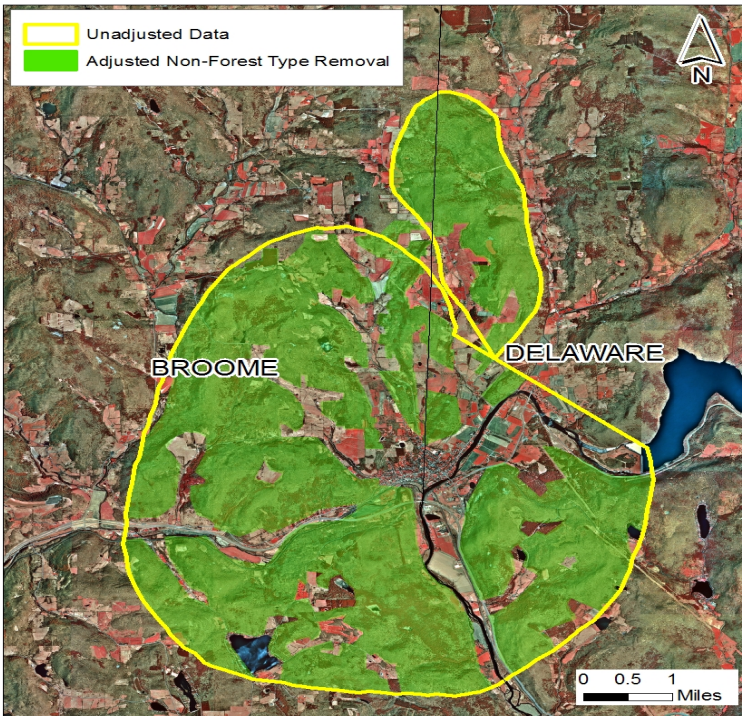

Figure 5. Removed non-forest areas.

Causal Agent Categorization/Ground Verification
The original aerial sketched polygons created from the aircraft were divided into three broad categories, mortality, defoliation and discoloration. These were then given to the ground crews for further categorization. Due to the high volume of data collected and the window period for ground verification, a limited percentage of actual polygons were visited. For those polygons visited further categorization was applied (Appendix, Table 3).

Acknowledgements:
NYSDEC Region Staff
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Appendix

	Region 1	Region 3	Region 4	Region 5	Region 6	Region 7	Region 8	Region 9	Total
Damage Causal Agent (DCA)									
Abiotic Damage				8,360.00	3,212.22				11,572.22
American Beaver					63.17				63.17
Anthracnose						117.55	780.61		898.15
Ash Decline/Yellows		177.85			496.36		139.89		814.10
Bark Beetles		29.23							29.23
Cherry Scallop Shell Moth						1,672.75			1,672.75
Competition					202.86		29.93		232.79
Decline				10,047.76	1,310.08				11,357.83
Defoliators		16.92			87.44		303.81	647.70	1,055.87
Dieback		10.90	26.65	24.96		231.52	639.65		933.67
Dutch Elm Disease				8.34	182.27		98.66		289.26
Emerald Ash Borer							46.89		46.89
Eutypella Canker					105.43				105.43
Fall Webworm							21.80		21.80
Flooding/High Water	110.26	230.69	147.99	11,846.76	11,335.22	4,130.07	3,160.96	91.66	31,053.62
Foliage/Shoot Diseases						9.78			9.78
Forest Tent Caterpillar		5,604.63	3,272.53		720.80	1,207.30	1,179.59	7,955.50	19,940.34
Gallmaker Insects							41.88		41.88
Gypsy Moth							1,191.44	32.05	1,223.49
Hemlock Woolly Adelgid		423.46							423.46
Hickory Tussock Moth							48.90		48.90
Human Activities				7.91	529.92		958.19		1,496.02
Improper Planting				16.61					16.61
Land Use Conversion						13.62			13.62
Logging Damage			2.55				251.14		253.69
Nutrient Imbalances							45.79		45.79
Oak Decline	1,751.44								1,751.44
Road Salt				7.67				21.54	29.21
Root/Butt Diseases				4.14					4.14
<Sirex noctilio>						183.12			183.12
Soil Compaction							26.81		26.81
Stems/Decays Cankers					15.64				15.64
Sycamore Anthracnose		1,497.65	130.79						1,628.44
Unknown		367.09	174.38	11,626.86	137.90	1,000.54	1,452.06	50.26	14,809.09
Verticillium Wilt							3.52		3.52
White Pine Blister Rust							7.19	4.17	11.36
Wind-Tornado Hurricane				36.67	122.76	241.16			400.60
Woodpeckers					521.72				521.72
Total	1,861.70	8,358.43	3,754.89	41,987.68	19,043.79	8,807.39	10,428.71	8,802.88	103,045.47

Table 1. DCA per Region (acres)
Total polygon area was split equally between DCAs when multiple causal agents were present.

	Region 1	Region 3	Region 4	Region 5	Region 6	Region 7	Region 8	Region 9	Total
Damage Type									
Defoliation		6,460.36	456.78		87.44	437.71	3,275.56	8,635.24	19,353.08
Mortality	1,849.42	1,208.91	3,012.79	38,047.11	15,722.42	5,115.91	3,886.90	146.09	68,989.55
Discoloration	12.28	520.79	189.61	3,940.57	3,233.93	3,136.23	2,626.61	21.54	13,681.57
Dieback		168.37				117.55			285.91
Branch Breakage			26.65						26.65
Branch Flagging							639.65		639.65
Old Mortality			69.06						69.06
Total	1,861.70	8,358.43	3,754.89	41,987.68	19,043.79	8,807.39	10,428.71	8,802.88	103,045.47

Table 2. Damage Type per Region (acres)
Total polygon area was split equally between damage types when multiple damage types were present.

Region	Ground Verified	Acres	Not Ground Verified	Acres	Total Polygons	Total Acres
1	0	0.00	15	1,861.70	15	1,861.70
3	18	1,273.70	22	7,084.73	40	8,358.43
4	2	71.04	51	3,683.85	53	3,754.89
5	70	24,517.60	96	17,470.08	166	41,987.68
6	72	17,433.59	32	1,610.20	104	19,043.79
7	20	3,068.04	68	5,739.35	88	8,807.39
8	30	3,548.52	108	6,880.19	138	10,428.71
9	0	0.00	28	8,802.88	28	8,802.88
Total	212	49,912.49	420	53,132.98	632	103,045.47

Table 3. Polygon Ground Sampling (acres)

Appendix

	Region 1	Region 3	Region 4	Region 5	Region 6	Region 7	Region 8	Region 9	Total
Damage Causal Agent (DCA)									
Abiotic Damage				8,360.00	3,603.84				11,963.84
American Beaver					63.17				63.17
Anthracnose						235.09	959.99		1,195.08
Ash Decline/Yellows		222.07			1,063.92		139.89		1,425.87
Bark Beetles		29.23							29.23
Cherry Scallop Shell Moth						1,672.75			1,672.75
Competition					202.86		29.93		232.79
Decline				10,047.76	1,310.08				11,357.83
Defoliators		16.92			87.44		303.81	647.70	1,055.87
Dieback		10.90	26.65	24.96		231.52	639.65		933.67
Dutch Elm Disease				10.00	364.54		197.31		571.85
Emerald Ash Borer							46.89		46.89
Eutypella Canker					316.29				316.29
Fall Webworm							21.80		21.80
Flooding/High Water	110.26	230.69	147.99	11,860.47	12,366.87	4,130.07	3,439.00	91.66	32,377.02
Foliage/Shoot Diseases						9.78			9.78
Forest Tent Caterpillar		5,604.63	3,272.53		720.80	1,324.84	2,359.18	7,955.50	21,237.47
Gallmaker Insects							41.88		41.88
Gypsy Moth							2,371.03	32.05	2,403.08
Hemlock Woolly Adelgid		423.46							423.46
Hickory Tussock Moth							48.90		48.90
Human Activities				15.82	1,059.85		958.19		2,033.86
Improper Planting				16.61					16.61
Land Use Conversion						13.62			13.62
Logging Damage			2.55				251.14		253.69
Nutrient Imbalances							45.79		45.79
Oak Decline	1,751.44								1,751.44
Road Salt				7.67				21.54	29.21
Root/Butt Diseases				8.28					8.28
<Sirex noctilio>						183.12			183.12
Soil Compaction							26.81		26.81
Stems/Decays Cankers					31.28				31.28
Sycamore Anthracnose		1,541.86	130.79						1,672.66
Unknown		367.09	174.38	11,626.86	137.90	1,000.54	1,452.06	50.26	14,809.09
Verticillium Wilt							3.52		3.52
White Pine Blister Rust							7.19	4.17	11.36
Wind-Tornado Hurricane				36.67	350.96	241.16			628.79
Woodpeckers					1,043.44				1,043.44
Total	1,861.70	8,446.85	3,754.89	42,015.10	22,723.22	9,042.48	13,343.96	8,802.88	109,991.08

Table 4. DCA per Region (acres)
Total polygon area was not split between DCAs when multiple causal agents were present.
Each DCA was assigned the total polygon area.

	Region 1	Region 3	Region 4	Region 5	Region 6	Region 7	Region 8	Region 9	Total
Damage Type									
Defoliation		6,469.84	456.78		87.44	555.26	5,814.12	8,635.24	22,018.67
Mortality	1,849.42	1,253.12	3,012.79	38,074.53	19,393.64	5,115.91	4,263.59	146.09	73,109.09
Discoloration	12.28	520.79	189.61	3,940.57	3,242.14	3,136.23	2,626.61	21.54	13,689.77
Dieback		203.10				235.09			438.19
Branch Breakage			26.65						26.65
Branch Flagging							639.65		639.65
Old Mortality			69.06						69.06
Total	1,861.70	8,446.85	3,754.89	42,015.10	22,723.22	9,042.48	13,343.96	8,802.88	109,991.08

Table 5. Damage Type per Region (acres)
Total polygon area was not split between damage types when multiple damage types were present. Each damage type was assigned the total polygon area.