NYSDEC

Forest Health Aerial Survey Report 2012

Summary – 2012 Forest Health Aerial Survey
A total of approximately 19 million acres of New York State was surveyed by aircraft between June 6th and August 16th, and approximately 708,000 acres of forest damage was detected

Drought was the most significant damage causing agent (DCA) for the 2012 survey season, with associated forest damage totaling approximately 500,000 acres. The standard precipitation index (SPI) for February - July 2012 (Figure 1) shows areas of low precipitation across New York State[1]. The majority of drought was categorized as discoloration per aerial survey observations

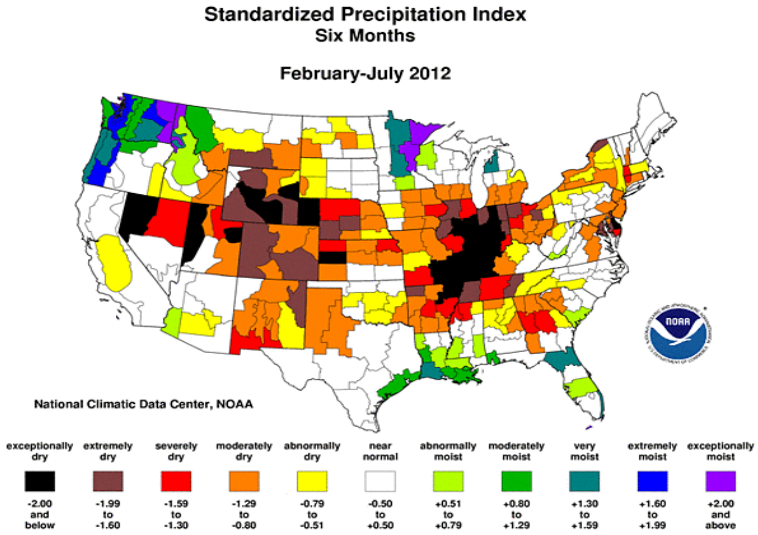


Figure 1. Standard Precipitation Index February – July 2012. National Oceanic and Atmospheric Administration.

Drought was observed in 38 of the 62 counties, concentrated within the perimeter of the Adirondack Park and across Central New York. The majority of drought occurred in the month of July with the exception of the Hudson Valley Region, which showed mild drought in early June, as well as Central New York, showing mild drought in middle August.

Other significant abiotic damage includes, flooding /high-water in low elevation areas, with a majority of the damage occurring in Clinton and Franklin Counties, Tug Hill Plateau Region, and the Mid-Hudson Valley. The total for flooding/ high-water damage was approximately 20,000 acres for the entire state.

Another significant abiotic DCA was frost, which grossly affected New York State in 2010, showing 1.2 million acres of discoloration and defoliation statewide. This previous damage contributed to mortality in 2012, occurring primarily in Allegany Plateau Region, eastern Catskill Mountains and Central New York, totaling approximately 24,000 acres.

Forest tent caterpillar (FTC), *Malacosoma disstria,* as with previous years, caused the majority of biotic damage, approximately 37,000 acres statewide. FTC defoliation was concentrated in eastern Catskill Mountain Region along with small areas located in Central New York and Allegany Plateau Region, totaling approximately 15,000 acres. FTC mortality was also observed, likely caused by reoccurring FTC damage from subsequent years, totaling approximately 16,000 acres. The remaining damage was categorized as discoloration and dieback concentrated in Delaware and Otsego Counties.

FTC damage increased 15,000 acres from the previous year.

Gypsy moth caterpillar, *Lymantria dispar,* accounted for approximately 10,000 acres of defoliation, concentrated in Allegany Plateau Region. Mortality associated with gypsy moth was observed in Suffolk County, totaling approximately 2,250 acres. And in remainder, 2,000 acres of gypsy moth discoloration was observed in Cattaraugus and Chenango Counties.

Egg mass surveys for gypsy moth, conducted in fall of 2012, revealed high numbers of eggs in Cattaraugus County, Allegany State Park. These populations may potentially lead to an increase in damage associated with gypsy moth in 2013.

Decline was significant in 2012, totaling approximately 30,000 acres statewide, with a concentration of 25,000 acres in Region 5 affecting spruce/fir and maple species.

Scotia-Glenville was surveyed for oak wilt, *Ceratocystis fagacearum,* on July 10th and again on August 16th. Suspect trees observed from the aircraft were ground-checked; samples were taken and lab results were negative for oak wilt.

Other DCAs can be referenced in appendix.

---

[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, the more severe the condition (National Oceanic and Atmospheric Administration).

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. A 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

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.

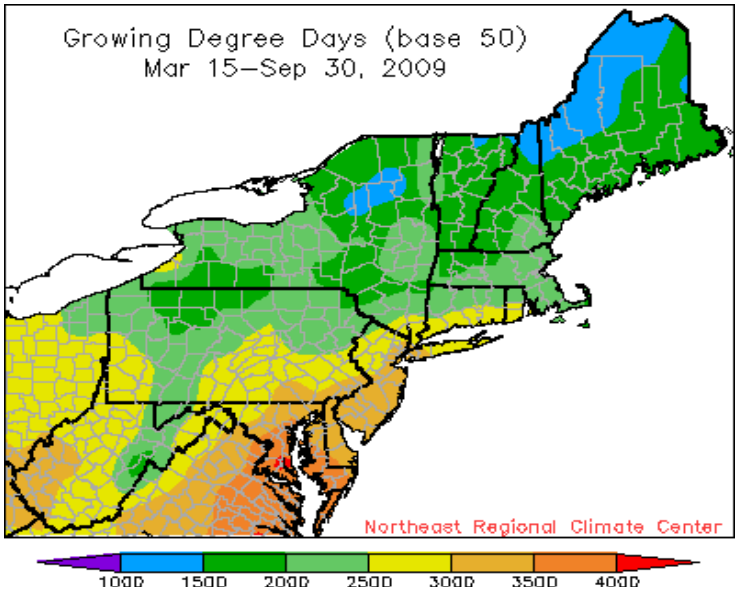


Figure 2. Growing Degree Days Accumulation.
Cornell University Atmospheric Sciences and Turf Team 2009.

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).

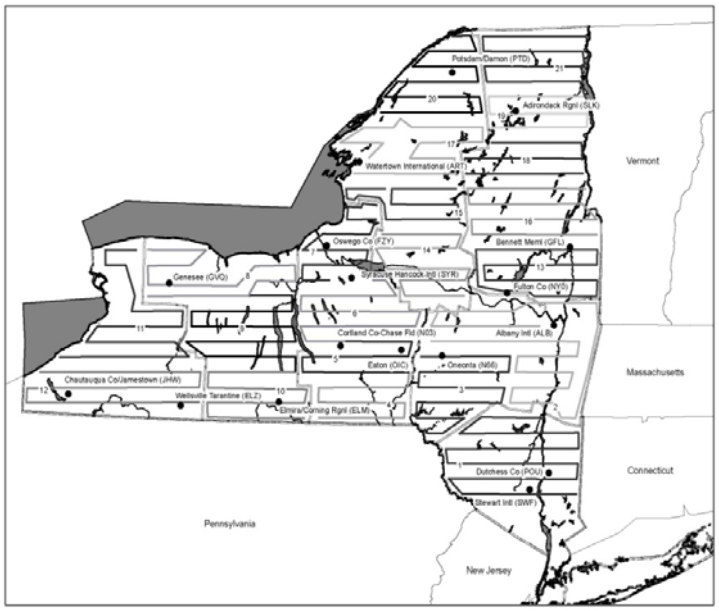


Figure 3. Aerial Flight Lines.

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).

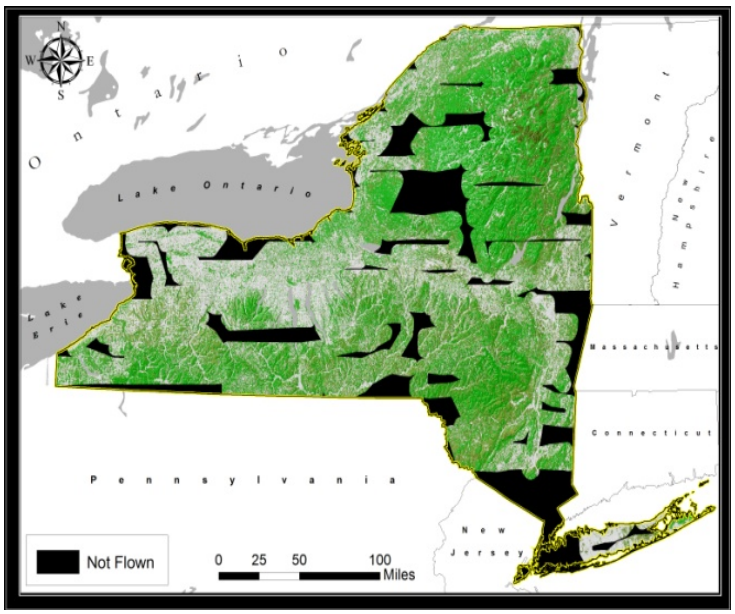


Figure 4. Flown/Not Flown.

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.

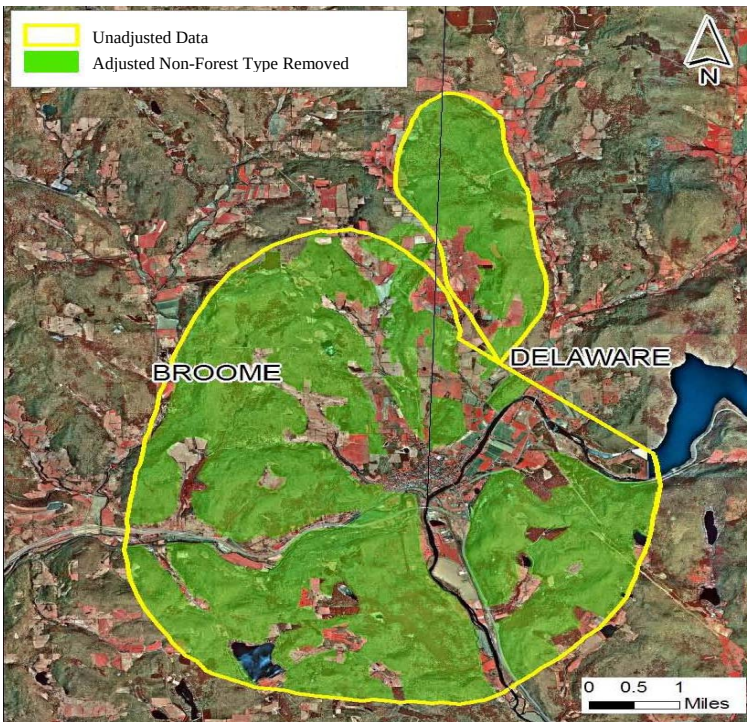


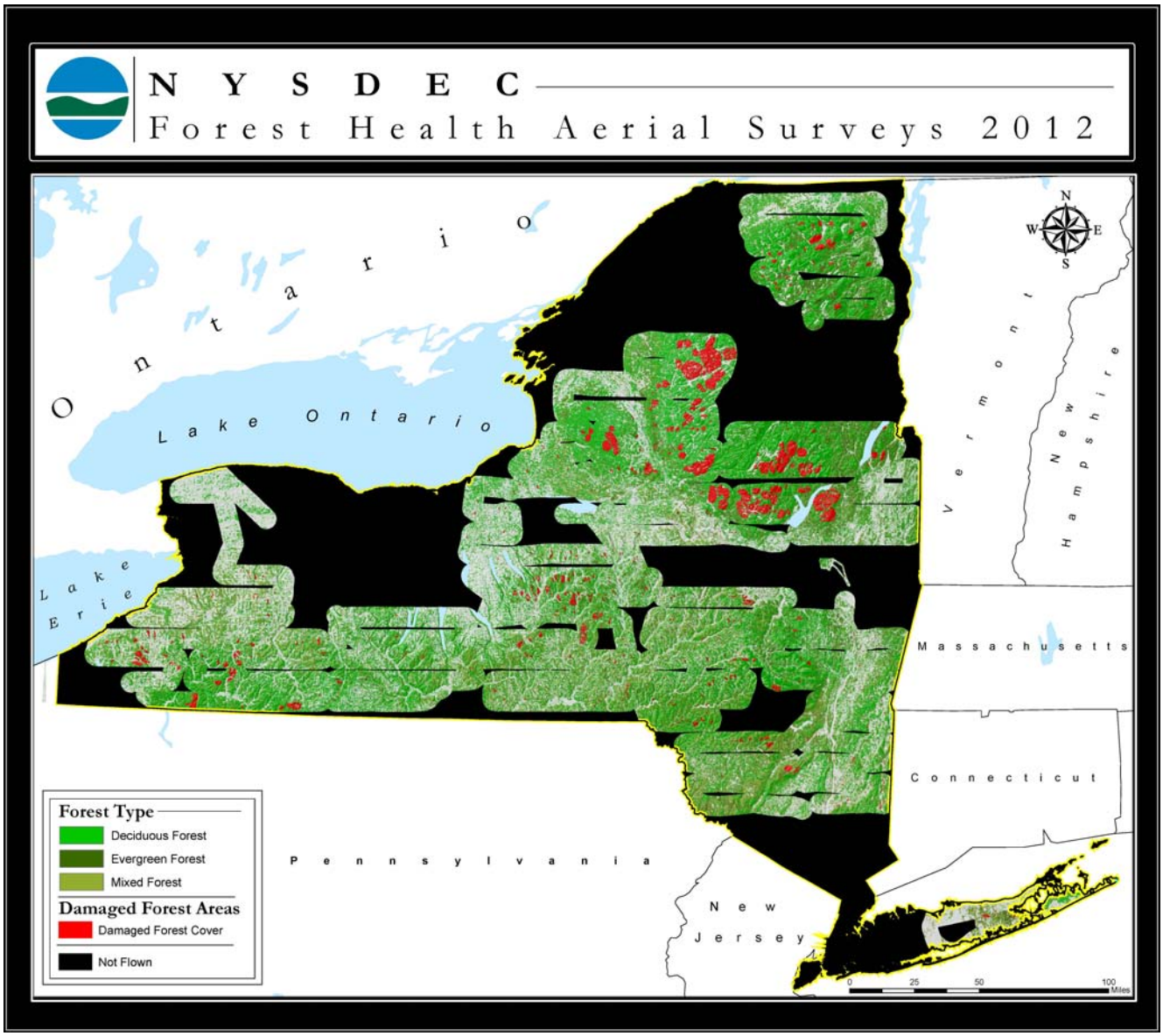
Figure 5. Removed Non-Forest Areas.

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
NYS Police Aviation Unit
Division of Lands and Forests - Forest Health Unit
USDA Forest Service

For more information contact:

Division of Lands and Forests
Forest Health Section
625 Broadway, 5th Floor
Albany, NY 12233-4253
518-402-9425



New York State Aerial Surveys 2012

Appendix

	Region 1	Region 3	Region 4	Region 5	Region 6	Region 7	Region 8	Region 9	Total
Damage Causal Agent									
Abiotic Damage		249	7			731			**987**
American Beaver		448		1,870	9	12			**2,340**
Anthracnose	589							844	**1,432**
Armillaria Root Disease			1,752			347	160		**2,260**
Ash Decline/Yellows		18	4,553	1,753			546	2,045	**8,917**
Bark Beetles	16			365					**381**
Beech Bark Disease		1,001	236	5,397		249			**6,883**
Black Knot of Cherry	136								**136**
Boring Insects			6						**6**
Bronze Birch Borer	7								**7**
Cherry Scallop Shell Moth						6,437			**6,437**
Competition		9	47			13	56	136	**261**
Decline		995	1,240	24,733	82	2,232	26	159	**29,467**
Decline/Complexes/Dieback	183		132	1,124	1,950				**3,390**
Defoliators						576			**576**
Dieback		268							**268**
Diplodia Canker						69			**69**
Drought		86	5,683	230,883	209,706	36,662	1,993	14,461	**499,475**
Dutch Elm Disease		394				401	92	229	**1,117**
Eastern Pine Weevil		5							**5**
Eastern Tent Caterpillar						167			**167**
Elongate Hemlock Scale		33							**33**
Emerald Ash Borer			3						**3**
Engelmann Spruce Weevil			2						**2**
Fall Webworm						45		4,609	**4,654**
Fire	1,690	3,664		2					**5,356**
Flooding/High-Water	58	3,954	1,859	6,394	1,080	6,215	993	160	**20,714**
Forest Tent Caterpillar		5,002	10,302	40	2,026	8,356	196	10,646	**36,568**
Frost		119	829	39	611	701	196	10,394	**12,888**
Gallmaker Insects	226								**226**
Gypsy Moth	2,247					26		12,095	**14,368**
Hemlock Woolly Adelgid		1,510	314						**1,823**
Human Activities			13			637		671	**1,320**
Jack Pine Budworm					3,343				**3,343**
Land Clearing						42			**42**
Lightning		28							**28**
Logging Damage			757	2,627	7,153	3,191		836	**14,564**
Oak Decline	52								**52**
Orange Striped Oakworm	167								**167**
Stems/Decays Cankers						139			**139**
Stem Rust								229	**229**
Sycamore Anthracnose		1,968	551					131	**2,649**
Unknown (No ground check)	453	186	4,863	4,035	1,076	3,551	1,821	5,045	**21,030**
Vine Damage	29	33							**61**
Wind-Tornado Hurricane	122	239	717	28		760		1,103	**2,969**
Woodpeckers						80			**80**
Woolly Alder Aphid		802							**802**
Total	**5,975**	**21,010**	**33,867**	**279,291**	**227,037**	**71,639**	**6,080**	**63,793**	**708,693**

Table1. DCA per Region (acres)
Total polygon area was split 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	384	8,485	12,335	53,286	12,334	18,626	526	23,045	129,021
Mortality	4,869	10,612	7,345	20,847	9,891	16,565	2,187	23,597	95,912
Discoloration	12	199	5,981	201,761	199,066	34,941	2,876	14,801	459,637
Dieback	456	1,714	7,543	2,475		129	444	2,185	14,946
Branch Breakage					5,747		48		5,794
Branch Flagging				365		14			379
Main Stem Broken			501			177		165	843
Old Mortality				558					558
Other Damage	254					1,186			1,440
Topkill			163						163
Total	5,975	21,010	33,867	279,291	227,037	71,639	6,080	63,793	708,693

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	19	5,952	3	23	22	5,975
3	54	16,829	63	4,181	117	21,010
4	59	18,106	91	15,762	150	33,867
5	44	131,302	115	147,990	159	279,291
6	11	36,793	104	190,244	115	227,037
7	112	41,337	96	30,303	208	71,639
8	22	3,689	18	2,391	40	6,080
9	40	34,613	42	29,180	82	63,793
Total	361	288,621	532	420,072	893	708,693

Table 3. Polygon Ground Sampling (acres)