

# Vermont Fall Foliage and Tree Phenology in 2005 - An Unusual Year

**Vermont Monitoring Cooperative**

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The first state-wide frost occurred on OCTOBER 21, 2005 compared to a normal first of as follows:

**AVERAGE FROST DATES FOR VERMONT LOCATIONS**

LOCATION	FIRST DATE OF 32 (F) DEGREES IN FALL
BURLINGTON (near Lake Champlain)	OCTOBER 5
ESSEX JUNCTION	SEPTEMBER 30
MONTPELIER	SEPTEMBER 25
MORRISVILLE	SEPTEMBER 20
NEWPORT	SEPTEMBER 25
RUTLAND	SEPTEMBER 27
ST. ALBANS (near Lake Champlain)	OCTOBER 6
ST. JOHNSBURY	SEPTEMBER 22



Typical foliage color in northern Vermont.  
Photo: Sandy Wilmut



## Warm September-October 2005

### Burlington, VT - Days < 32 F

September 2005 - 0 days vs. average 1 day

October 2005 - 4 days vs. average 9 days

### Mt. Mansfield, VT - Days < 32 F

September 2005 - 1 day vs. average 5 days

October 2005 - 13 days vs. average 18 days

Oct. 17th first day in October with frost at Mt. Mansfield.



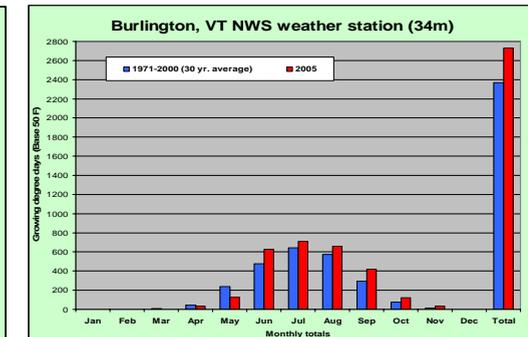
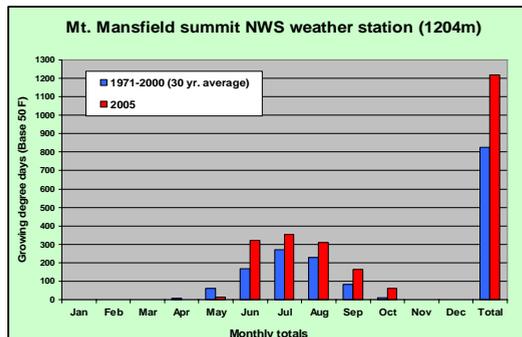
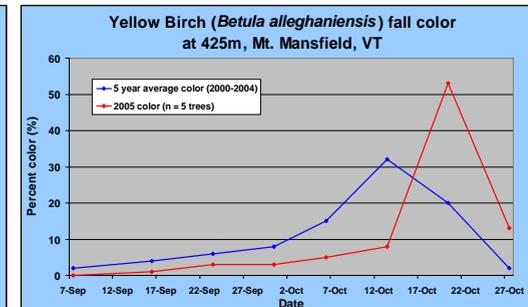
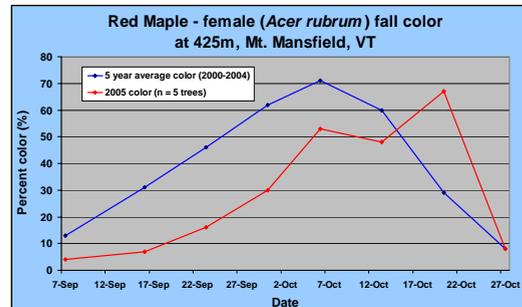
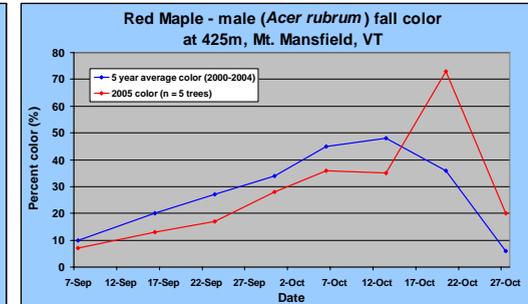
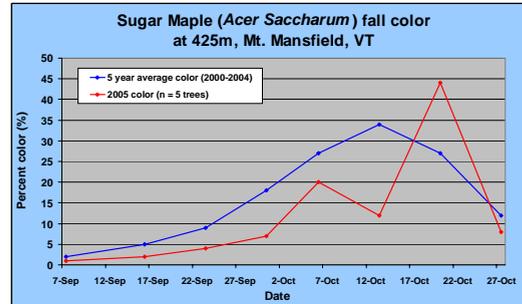
Snowfall arrived on 21 October, with no prior sub-freezing temperatures. Many trees still retain most of their leaving causing extensive crown damage in northern areas.  
Photos: Sean T. Lawson



Fall colors in 2005 were generally lacking and slow to develop with a late peak. Photos: Sandy Wilmut



## Results



## Abstract

The 2005 growing season was warmer than average across the state of Vermont. The fall foliage season arrived noticeably later than usual with muted colors and entirely green hillsides until mid to late October. Growing degree days (GDD Base 50) were 15.1% higher than average at Burlington, VT (34m) and 47.4% higher than average near the summit of Mt. Mansfield, VT (1204m) for 2005. The first state-wide frost of fall 2005 was on October 21, one of the latest dates on record. First frost was recorded 15-28 days later than average (1971-2000) at eight National Weather Service stations across the state. Measurable snowfall (3-7 cm) arrived with the first frost on October 21 and a second significant snowfall (8-46cm) on October 25 caused extensive damage to trees that still retained their leaves (especially beech, birch, apple, and ornamentals) creating lengthy power outages across northern Vermont. Greatest damage was observed in the 300-600m elevation range.

The Vermont Monitoring Cooperative established tree phenology plots in 1991 on the west slope of Mt. Mansfield, Vermont to measure forest conditions, establish the timing of developmental events and trends, and detect long-term changes. The study sites are located in a northern hardwood forest at 425m, 670m, and 792m elevations. Annual measurements include percent color, percent green, percent leaf drop, transparency, and dieback. A July survey establishes the baseline, followed by weekly surveys in September and October. Data from the 425m site in 2005 indicate that "peak color" (% color) in sugar maple (*Acer saccharum*), red maple (*Acer rubrum*), and yellow birch (*Betula alleghaniensis*) was 8-13 days later than the 5 year average (2000-2004). Percent color in most trees was also much lower than average during the foliage season until a brief peak. The lack of sub-freezing temperatures in September and most of October led to low production of anthocyanin (red pigments), a key mechanism for the brilliant colors in maples. Fall 2005 in Vermont will be remembered as unusually warm, with lackluster color and notably late senescence.

## Methods

Study sites are located at Mt. Mansfield in Underhill, Vermont at three elevations. At each site five trees and five saplings of each species are measured. Tree species evaluated are as follows: at 425m - sugar maple, red maple (male and female), yellow birch, and white ash; at 670m - sugar maple and yellow birch; at 792m paper birch and yellow birch. The following measurements are recorded for each tree/sapling: % Color, % Green, % Leaf Drop, Transparency (%), and Dieback (%). Initial ratings are taken in July/August, with weekly measurements from September to late October (full leaf drop).

The Vermont Monitoring Cooperative (VMC) is a partnership of the Vermont Agency of Natural Resources, The University of Vermont, and The Green Mountain National Forest, founded to research and monitor forest health in the state of Vermont. The VMC mission is to facilitate the collection of environmental data and provide the information needed to understand, protect, and manage forest ecosystems within a changing global environment.



THE UNIVERSITY OF VERMONT

