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Forecasting Fall Foliage in Vermont: The Role of Meteorological Factors in Autumn Phenology

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Motivations

MWOBS Partnership With RVG Radio Vermont

- Provide weather forecasts during fall foliage season for the RVG radio region.
- Develop and be able to communicate autumn climatology for the state of Vermont, specifically during “peak” foliage periods.

Establish Relevant Meteorological Factors Affecting Fall Foliage

- Find trends between different weather patterns and fall foliage (autumn leaf senescence) performance.

Provide Foundation for Future Work

- Primarily a literature-based study, focused on compiling previous work on fall phenology.
- Build reference material for operational use by MWOBS staff and further research by future interns.

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Foliage Season Climatology (1991-2020)

Burlington, VT (Champlain Valley Region)

	Avg. Max Temp	Avg. Min Temp	Avg. Precip (in)	Precip Days
Sept.	72.6	52.9	3.67	11
Oct.	58.9	41.8	3.83	13

Island Pond, VT (NE Kingdom)

	Avg. Max Temp	Avg. Min Temp	Avg. Precip	Precip Days
Sept.	67.7	46.2	4.06	15
Oct.	54.2	35.9	4.52	17

Woodstock, VT (Central / East Region)

	Avg. Max Temp	Avg. Min Temp	Avg. Precip	Precip Days
Sept.	73.0	47.3	3.59	10
Oct.	59.2	35.5	4.57	13

(NOAA NCEI, 2025)

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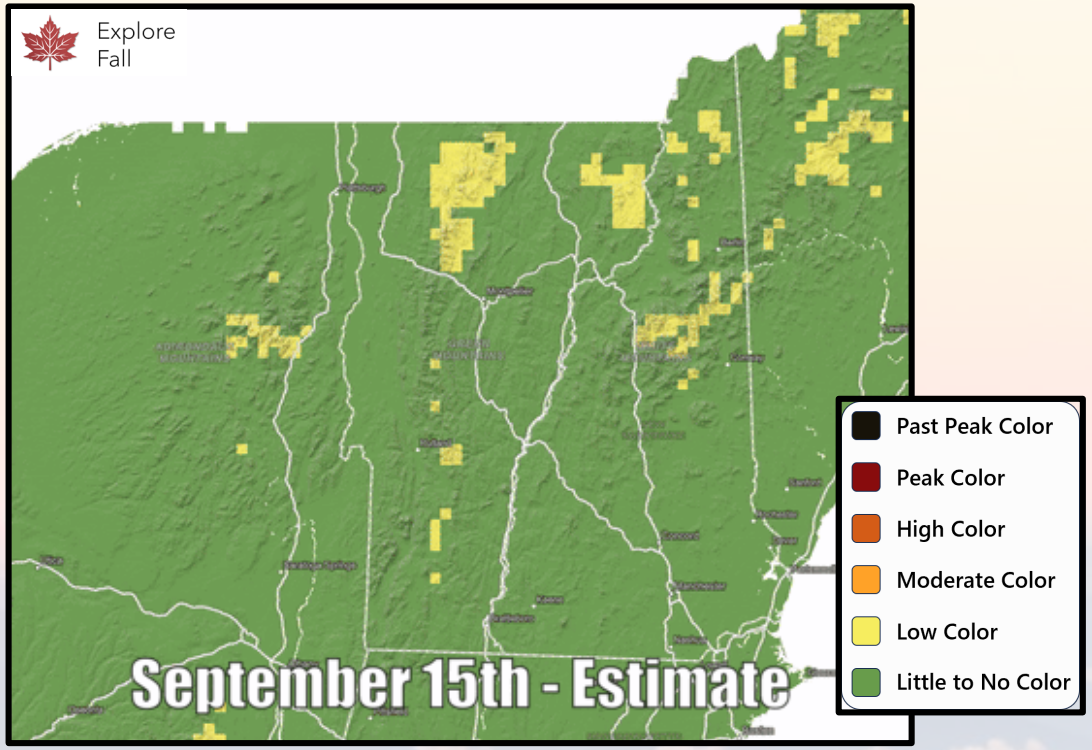
Autumn Phenology in Vermont



REGION	AVG. START TIME	AVG. "PEAK" TIME	AVG. END TIME
NE KINGDOM / GREEN MTNS	MID - SEPT	EARLY OCT	MID/LATE OCT
CENTRAL / EAST VERMONT	LATE SEPT	EARLY / MID OCT	LATE OCT
CHAMPLAIN VALLEY	LATE SEPT / EARLY OCT	LATE OCT	EARLY NOV

Meteorological Trends on Fall Phenology

Timing

- **Soil Moisture**
  - **Drier** soil (less precipitation) - **earlier** foliage season
  - **Wetter** soil (more precipitation) - **later** foliage season
- **Temperature**
  - **Hotter** summer + fall temperatures - **later** foliage season
  - **Cooler** summer + fall temperatures - **earlier** foliage season

Intensity

- **Cooler** late summer + early fall minimum temperatures - more **vibrant** colors
- **Warmer** fall minimum temperatures - more **dull** colors
- **Brighter** days (less cloud cover) - more **vibrant** colors

Species Variability

5 most common deciduous tree species in Vermont:

	Maples	American Beech	Paper Birch	Yellow Birch	White Ash
Delays with Heavy Autumn Rainfall?	YES	YES	NO	YES	NO
Drought Resistant?	NO	YES	NO	NO	NO
October Min. Temp Sensitivity?	YES	YES	NO	YES	NO
Overall Phenology	EARLIER	LATER	EARLIER	EARLIER	EARLIER

(Xie et al. 2017)

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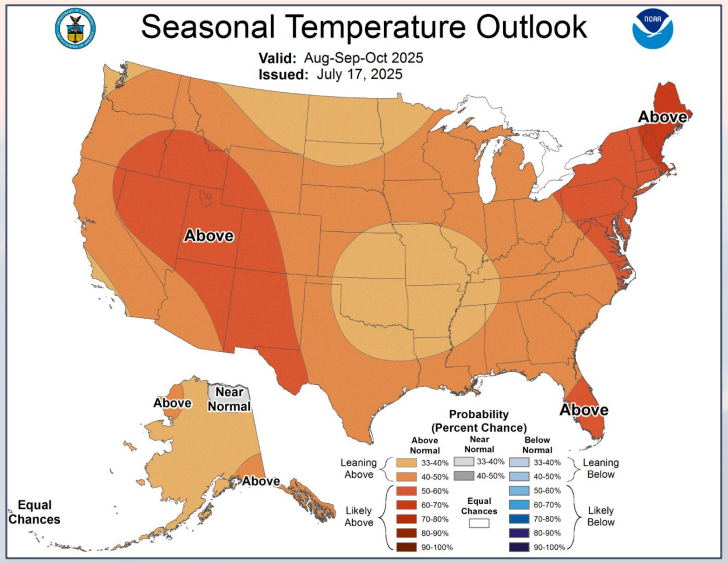
Conclusions

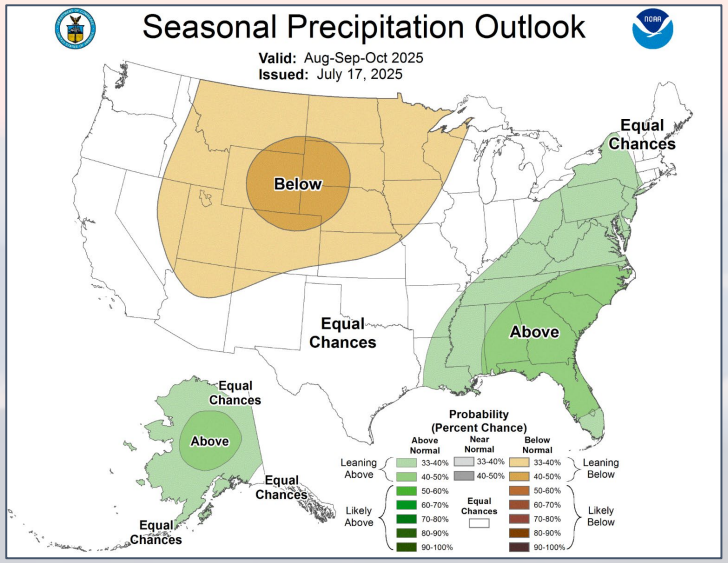
Meteorological Factors Play a Secondary Role in Autumn Senescence

- A changing photoperiod (shortening daytime length) is the primary driver for deciduous tree leaves changing color
  - The reason why foliage season is around the same time period every year
- However, temperature and precipitation patterns namely can influence timing and intensity of fall foliage differently year to year

This Season's Foliage Forecast?

- Too early to make any definite conclusions
- Long-range forecasts point to above average temperatures for New England, indicating a potential delay in the onset and peak times for this season
  - This can change!





(Climate Prediction Center, 2025)

★ Local weather patterns over the next month heading into fall will reveal more about this year's fall foliage season

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Thank You!