Another Look at Canaan's Shrinking Winter Snowfall

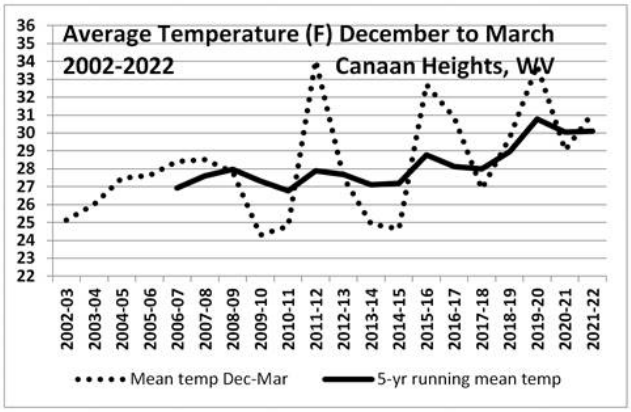
Dave Lesher

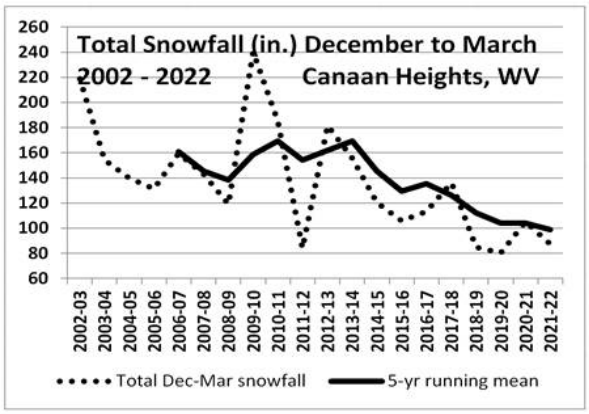
December is here and winter is poised to arrive in Canaan once more. Although it's time to "think snow", some may be wondering if this snowfall season will be a repeat of the pattern of declining snowfall amounts that have dominated most of the past decade. That topic has been discussed in these pages over the past several years, primarily using weather data from Canaan Valley's official weather stations to illustrate the recent rising temperatures and decreasing winter snowfall. What follows here will seek to corroborate what's been found in the Canaan Valley weather data using a set of data from a different source.

First, a short history of Canaan Valley's weather stations. George Thompson and later his son Ben were the first weather observers in the valley to report a full suite of daily weather observations from the 1940s to the 1990s. When that ended, Kenneth Sturm took over as weather observer for the next two decades, not far from the Thompson site. When the Sturm weather station closed, Elaine George became the official Canaan Valley weather observer in 2013 at her home and continues in that capacity today. Taken together, that's more than 75 years of weather data that's been of great use in documenting the valley's climate with a variety of tables, graphs and maps that have variously appeared here in Timberdoodle.

To add to Canaan's long record of weather observations, twenty years ago a new official National Weather Service weather station was established at Canaan Heights, slightly more than three miles north of the Elaine's George's weather station and about 500 feet higher in elevation. (Disclosure: it's this writer's weather station). The Canaan Heights weather station now has an unbroken set of weather data that began in July 2002, sufficiently long to reveal the same temperature and snowfall trends found in the Canaan Valley data.

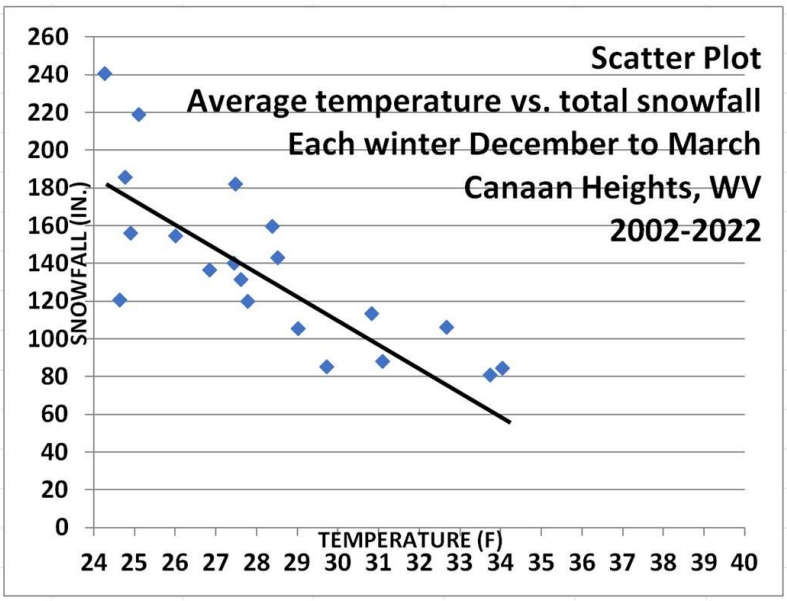
Using the Canaan Heights data, graphs were prepared of average temperature and total snowfall for the four-month period of December through March for each of the past 20 winters. On average, more than 80 percent of each winter's snowfall comes during those four months. Both graphs contain the individual winter values of temperature and snowfall shown with a dotted line plus a solid line showing the running five-year average. The five-year averages produce a smoothing of the up-and-down variations of individual winter values, clearly revealing the long-term trend.





From these graphs, the solid line shows that the average temperature of 27 degrees for the five winters ending 2013-14 rose to 30 degrees for the five winters ending 2021-22. Over that same time frame, the five-year average total snowfall fell from 170 inches to 99 inches. For such a short period of years, that amount of warming and decline in snowfall is extremely notable.

Another way to display these data is through the use of a scatter plot. In a scatter plot, points are marked on the chart for each winter's actual total December-March snowfall and average temperature. Here's what that looks like using the Canaan Heights data. The straight line was "eye-balled" to fit the points.



The scatter plot shows what most people would say is plainly intuitive…snowfall totals are greater when temperatures are lower. Adding some statistical rigor to what the plot obviously shows, the temperature and snowfall data have a correlation coefficient of -0.77 which makes them "strongly negatively correlated." In other words, as temperatures go up, snowfall almost always goes down. Does that mean that one causes the other? While the relationship is more complex than it appears here, the answer is certainly YES in most cases. But that answer must

come with a caution. Suppose we extend the straight line on the scatter plot until it hits the temperature axis at about the value of 39 degrees. According to the plot, when that happens it means there would be zero snowfall. Could there really be a time when zero snowfall falls from December through March in Canaan because the average temperature for that period was 39 degrees or warmer? Although that seems unthinkable, it could get close. Last December, Canaan Heights measured only 2.0 inches of snow that month and Canaan Valley observer Elaine George reported a meager 1.1 inches. For Canaan Valley, that was an all-time record near-snowless December going back to 1944. What if something like that happened for all four months from December to March? Not only would there be little or no natural snow, it would also be too warm much of the time to make snow. What an awful thought!

Will the coming winter rebound in its snowfall amounts to dispel any worry of that or continue to fall in line with the shrinking amounts in recent years? Check back here in the spring to find out.

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