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Climatological Aspects of Air Pollution in West Virginia

ROBERT O. WEEDFALL

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WASHINGTON, D.C.
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INTRODUCTION

This section has been written in order to clarify some of the meteorological aspects of air pollution problems pertinent to West Virginia. The specific pollutants, their sources, and their effects will be discussed in detail in a later section of the monograph.

This section has been written not only for personnel in the field of air pollution control but should be informative to the general public as well. The meteorologist or climatologist may also want to reexamine his existing wind data using the suggested method of analysis and presentation to get an approximation of monthly or seasonal air stagnation and equate this to variations in topography.

PART I. INDICATORS OF LOCAL SCALE STAGNATION

Topographical Setting

Most of West Virginia is in the Appalachian Plateau physiographic province, whose western boundary runs south to north almost through Columbus, Ohio, and then follows the southern shore of Lake Erie. This province also includes the Allegheny Mountain section shown in figure 1. This province is composed of a maze of relatively narrow (1/2 to 10 mi.) valleys with surrounding hills. The major ridges in the Allegheny Mountain section and along the Allegheny Front are oriented south-southwest to north-northeast and many have elevations between 3000 and 4000 ft. The Valley and Ridge physiographic province includes most of the Eastern Panhandle section of West Virginia and is composed of more undulating and gently-sloping valleys.

Because of the State's hilly and forested terrain, air in the valleys stagnates soon after frontal passages and also frequently stagnates in the lulls between storms. The surface winds slow down rapidly, in part because of the frictional effect of this rough terrain.

Surface Winds in the Appalachian Plateau

Surface wind speed data are available from a number of locations throughout West Virginia. The available data most pertinent to an air pollution study have been summarized in table 1 and show the percentage of observations with wind speeds below 4 or 5 m.p.h. Monthly percentages of light wind speeds give an indication of local air pollution potential and degree of air stagnation for the particular location. Hourly summaries show the time of day or night when winds are lightest and stagnation highest.

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[1] Excerpt from Linsky, "Monograph: Air Pollution in West Virginia". West Virginia University, Morgantown, West Va., to be issued in 1967.

An examination of the first six stations in table 1 (all of which are in the Appalachian Plateau--see station location map in figure 2) shows that wind speeds are lightest most frequently at the Huntington location. These data are from the old Huntington "Downtown" or Chesapeake Airport station for the years 1948 through 1954. This airport is located in Ohio near the level of the flood plain of the Ohio River, and is about 3 mi. west of downtown Huntington. To get away from the industrial smog and river fog, airline operations were transferred to the new Tri-State Airport, south of Huntington at Ceredo, W. Va., which was built on top of a hill (partly man-made). The old airport has a relatively low elevation (565 ft) and is sheltered by higher hills surrounding the banks of the Ohio River. This sheltering evidently accounts for the small movement of air. This is really the only station near a valley bottom at a low elevation where wind data are available. A recording wind instrument was recently installed on the Ohio Valley Experiment Station, an experimental farm operated by West Virginia University near Point Pleasant, W. Va.

Elkins Airport is located in the center of a high upland plateau area, Tygarts Valley, which is between the first two major ridges of the Allegheny Mountains, and the distance from ridge-top to ridge-top is about 7 mi. Wind movement would look even lighter if the speed breakdown category had included speeds less than 5 m.p.m. rather than less than 4.

The airport locations at Charleston, Parkersburg, Morgantown, and Wheeling are on relatively high ground compared to their immediate vicinities, which may account for their lesser percentages of light winds. Also the percentages from Charleston, Wheeling, and Morgantown would be higher if speeds less than 5 m.p.h. had been analyzed instead of less than 4. Another possible reason for Wheeling's extremely low percentages may be that its location is nearer to flatter terrain (Lake Erie is about 100 mi. northwest) where the wind movement is less impeded by hilly terrain.

Surface Winds East of the Allegheny Front

Wardensville Reymann Memorial Farm, in the Valley and Ridge physiographic province, lies in a narrow valley about 6 mi. from ridge-top to ridge-top. This West Virginia University experimental farm is about 1 mi. in the lee of a ridge to the northwest. The percentages in table 1 are very close to those for Huntington. The Wardensville data are summarizations of hourly wind speeds taken from a recording wind instrument.

The two other stations east of the Allegheny Front are in a subdivision of the Valley and Ridge physiographic province which is called the Great Appalachian Valley. The University Experiment Farm at Kearneysville is only 5 mi. east of Martinsburg Airport but has a shorter wind record. However, the Kearneysville wind data are measured and analyzed in a way similar to the Wardensville data and are summarizations of hourly wind speeds. The Martinsburg wind data are 1-min. averages taken once an hour, which is the standard practice at airport stations. This may explain why the Martinsburg percentages are somewhat lower than those from Kearneysville. Also, the Federal Aviation Agency personnel at the Martinsburg Airport, when taking the 1-min. average mentally, may be subconsciously recording a higher speed than actually exists, as they are more concerned with any possible manifestation of wind speed. A real difference may still exist, however, as the airport has fewer nearby obstructions to wind movement. The Kearneysville wind instrument is about at the height of the tops of the surrounding orchards. Nevertheless, even the Martinsburg winds are still light and these data demonstrate that little air movement exists in valleys east of the Allegheny Front also.

Diurnal Factors Affecting Air Stagnation

The above discussion has shown that air movement is least in the valleys of West Virginia and is greatest on the hilltops. This is an indication that air stagnation is greater in valley locations. Air stagnation occurs almost daily in some valley locations [5]. The mechanics of this phenomenon are caused by the temperature behavior of the lower air layers in the atmosphere. A temperature inversion is formed almost every night as the surface of the earth cools. Since air is a poor conductor of heat, only the lowest layers are cooled. Air aloft, usually from 500 to 1000 ft. above the surface, cools less than 2°F. under usual wind conditions. This valley inversion may be enhanced by a slow drainage of cold air down the hillside. Pollutants which are trapped or emitted in these cooler air pockets which form shortly after sundown are not dispersed until about midmorning or midday, after the sun heats the surface of the earth and the lower air layers enough to wipe out the inversion, and stirs up the air again to cause wind movement. As the lowest temperatures occur in the valley bottoms because of the cold air drainage, these valley inversions take longer to be "burned off" by the sun than those on hilltops or over more level terrain, and thus give a longer pollutant exposure to people and vegetation in these lower valley locations.

Daily Wind Variation

The temperature inversion is most pronounced in the early morning hours near sunrise, and this is when the least wind movement occurs. Tables 2 and 3 show wind speeds at 4 a.m., 10 a.m., 4 p.m., and 10 p.m. at Elkins Airport and Kearneysville Farm. It is seen that wind movement is least at 4 a.m. and greatest at 4 p.m. at both locations. Table 4 shows a daytime and nighttime breakdown only from the old Huntington airport: 53 percent of the daytime winds are below 5 m.p.h. in contrast to 83 percent of the nighttime winds.

These samples of hourly surface wind data demonstrate that the higher speeds occur during the afternoon hours and the lowest speeds at night and during the early morning hours. If wind speeds during the day are relatively light, horizontal dispersion of pollutants is reduced, and the pollutants disperse or dilute vertically up to the top of the inversion or mixing layer, which, during the day, depends on the amount of heat reaching the ground and heating the lowest layers of the atmosphere.

Seasonal Frequency of Low-Level Stabilization

Hosler [3] examined four years of upper-air radiosonde soundings which covered four different time periods of the day and arrived at seasonal percentages of the length of time that vertical stagnation of the air in a layer at least 500 ft. deep occurred. His comments are pertinent and his figures are similar to the wind speed percentages of the hilltop airport stations: "In general, low-level stabilization occurs 30 to 45 percent of the time in this area, ... [Appalachian Mountain area, which includes all of West Virginia] ... while topographically protected areas have more frequent occurrences of inversions." His percentages, 30 to 45, pertain to total time. His seasonal breakdown for West Virginia is as follows (average values taken from his national map): winter 32 percent; spring 36 percent; summer 52 percent; and fall 52 percent. This is based on average values derived from isolines on his national map which was constructed from radiosonde data from stations outside of West Virginia (the Huntington raob station wasn't yet in existence).

This low-altitude inversion which acts as a lid and prevents vertical dispersion of pollutants undoubtedly averages much higher in "topographically protected areas" or valleys than Hosler's study indicates. These valley areas where most people work and live probably have local air stagnation in proportion to the amount of time light winds prevail, as indicated in table 1.

Seasonal Variation of Height of Inversion Top

Holzworth [2] shows that the estimated average maximum daily mixing depths over West Virginia for the vertical dispersion of pollutants is less than 3500 ft. from October through March, with a maximum of 5500 ft. in June and July. These figures were computed from daily radiosonde plots and daily maximum temperatures. These figures, of course, give no information about the top of the inversion at the beginning of the day, when the mixing layer would have the least depth but they do give some idea of the potential volume of air available for dilution of pollutants.

Local Air Stagnation Periods

These estimated maximum depths computed by Holzworth, combined with Hosler's reports of the duration of inversions in the lowest 500 ft., plus the frequency and duration of light surface winds, show that West Virginia has a climatological potential for frequent, intense, community air pollution in valley locations. This air stagnation may not be on a large enough scale to warrant the issuance of an "Air Pollution Potential Alert" by the Cincinnati Office of the Air Resources Laboratory, Environmental Science Services Administration, but this local stagnation may be just as annoying and potentially detrimental to health. The surface wind data and the inversion studies indicate that daily periods of air stagnation frequently occur in and are typical of West Virginia's valley locations. The similarity of seasonal data between light surface winds at the higher airport locations and Hosler's inversion frequency study suggests a good degree of correlation and provides a readily available method for determining inversion frequency.

The balance of this climatological section examines the synoptic weather patterns and their effects on area-wide air pollution, and also examines the frequency and likelihood of more prolonged periods of air stagnation.

PART II. THE EFFECT OF SYNOPTIC WEATHER PATTERNS ON AIR POLLUTION

Meteorological Factors Affecting Area-Wide Air Pollution

The State's location in the eastern half of the Nation places it in the path of frequent storms. These storms have associated frontal systems which sweep through the State most frequently during the colder half-year. The frequency of frontal passages varies from 2 to 7 per week in winter and averages about 1 per week or less in summer and early fall. Surface winds are usually strongest just before and after frontal passages. These higher wind speeds rapidly disperse pollutants, diluting their concentration, especially on a local scale.

On a larger area-wide scale, air pollution usually appears considerably reduced and visibilities increased the first day or two after a frontal passage. Although documentary data are lacking, it appears reasonable to assume that some type of cleansing action by rain or snow must take place in the frontal zone. This cleansing effect is particularly noticeable if conditions before and after a summer thunderstorm are closely observed, for instance. West Virginia's abundant precipitation, averaging about 43 in. annually (up to 66 in. in the mountains and below 36 in. in some sections east of the mountains), undoubtedly washes out many types of pollutants and thus has an apparent cleansing effect on the atmosphere. Although precipitation is almost equally distributed throughout the year, the summer months usually have the largest totals (from heavy thunderstorm rainfall) and autumn has the least; an upturn begins in December and another in March which continues through the spring. The frequency of precipitation of appreciable amounts (generally considered about .10 in. liquid) follows very closely the monthly distribution of the amounts, and these or greater amounts occur on about 90 days per year (70 in the Eastern Panhandle and more than 120 at higher elevations).

Seasonal Variation of Weather Patterns

A re-examination of table 1 shows that April is the windiest month, and July and October are the months with the least wind. Thus, a climatological pattern of air pollution potential emerges. The percentage of low wind speeds appears to be inversely proportional to the speed of the general atmospheric circulation, or the number of frontal passages. And this follows a definite seasonal pattern. The atmospheric circulation is strongest in winter and early spring, and March and April are the windiest months. A rapid dropoff in surface wind speeds occurs in May as solar heating rapidly increases. The circulation stagnates as summer approaches and the thunderstorm season begins, caused by the invasion of moist tropical air from the Gulf of Mexico but interspersed by occasional outbreaks of cooler, drier air from Canada. As fall approaches, almost complete stagnation frequently prevails as large areas of high pressure dominate the Appalachian region. This dryness persists until middle November usually, at which time frontal activity again increases, and the winter pattern reappears.

Fall Has Greatest Probability for Persistent Stagnation

It follows that a larger amount of atmospheric pollutants may normally be expected during prolonged dry periods which occur most frequently in fall but occasionally during the summer. These dry periods are due to stagnant high pressure areas which bring clear, sunny skies and warm weather. Surface temperature inversions form more readily and are more intense in high pressure areas because nighttime radiation loss, due to lack of cloud cover, is greater. Winds in high pressure areas are light. Extreme drying of forest litter occurs and thus more forest fires--fires which can throw a large amount of pollutants into the atmosphere at a time when the atmosphere is least able to disperse it effectively [7].

It is significant that the Donora, Pa., air pollution incident started October 29, 1948 [1]. Donora's terrain is alarmingly similar to that of many valleys in West Virginia. Also significant is the forest fire pollution incident in Charleston, W. Va., which occurred on November 8 and 9, 1964 [7]. This time of year is marked by the greatest frequency of stagnant high pressure areas. The heating from the sun trends sharply downward at that time, and is the reason for the decrease of average maximum mixing depths from 3300 ft. in October to 2800 ft. in November found by Holzworth.

The work of Korshover [4] indicated a total of 19 occurrences of extensive stagnating anticyclones (high pressure areas) of 4 days' duration or over for the period 1936-1956, over all parts of West Virginia during the fall season (September, October, and November). The summer months had 12, spring 6, and winter only 3.

Air Pollution Dangers Resulting from Persistent Stagnation

When a stagnant high-pressure area settles over the region, the surface inversion is reinforced by the progressively lowering subsidence inversion. When the High persists longer than two or three days, this subsidence inversion's height is usually considerably below Holzworth's maximum indicated values. And such a stagnant high pressure area is potentially the most dangerous air pollution situation. Little vertical dispersion occurs during the maximum heating period of the day, and winds are too light for effective horizontal dispersion. What little air movement occurs in these stagnant conditions is due to gravity flow, and is too imperceptible to be measured on the instruments used by airport weather stations. It can be seen that the concentration of atmospheric pollutants keeps increasing until a new weather pattern sets in to bring a change of air.

CONCLUSION

This paper has attempted to clarify some of the physical factors of West Virginia's climate and topography that apply to air pollution and its control. It should serve as a distinct warning to avoid or control emission of pollutants in meteorologically protected and sheltered valley locations.

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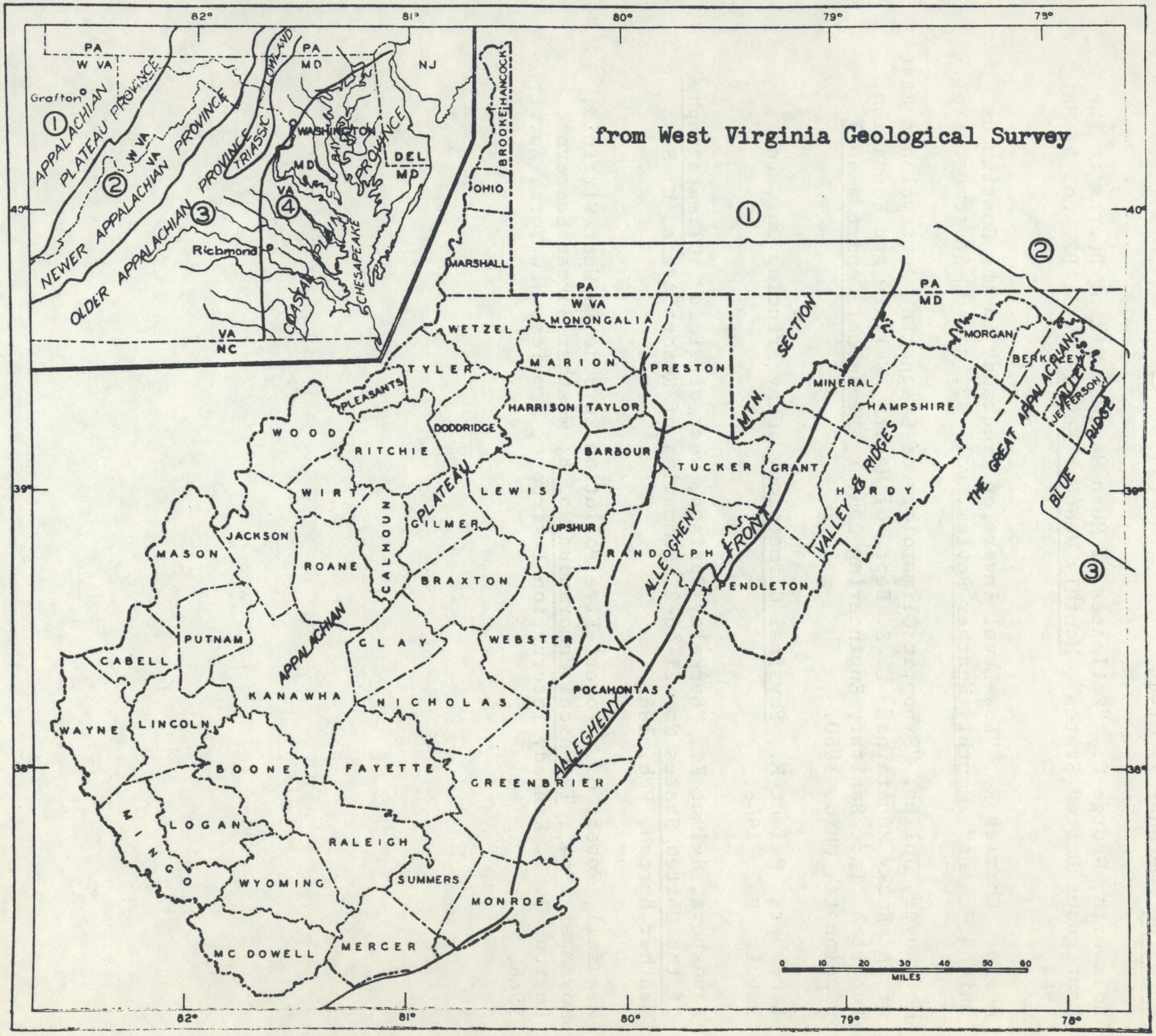

Figure 1 - Map showing physiographic provinces of West Virginia with inset map of southern part of Eastern United States.

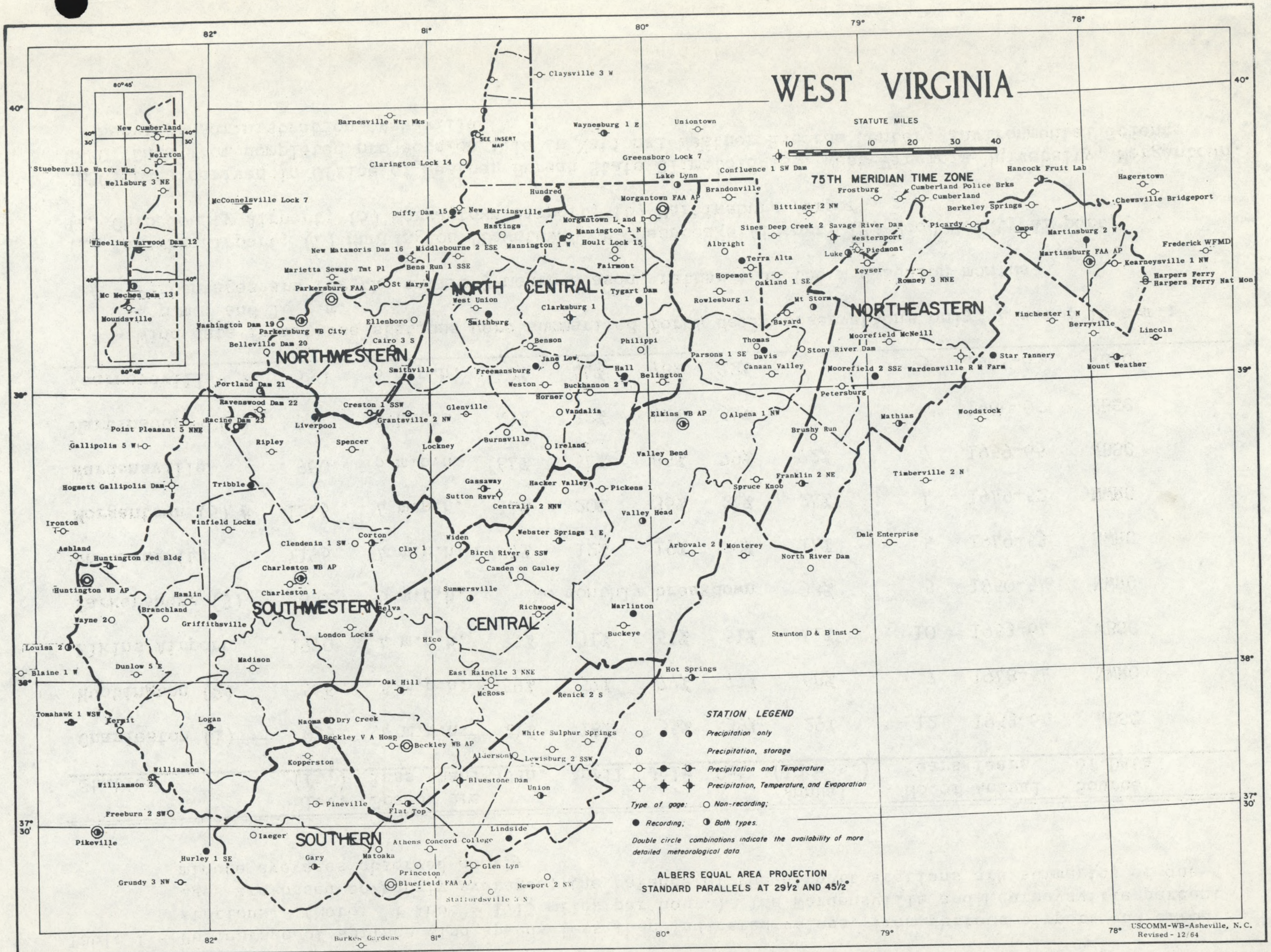

Figure 2 - Station locator map of West Virginia.

Table 1 - Percentage of surface wind speeds less than indicated values, from various airport and climate stations. (Note: 1 knot = 1.15 miles per hour.) The Wardensville and Kearneysville percentages are based on hourly averages; the balance of the airport stations are summaries of one-minute averages observed hourly.

Station	Elev. (ft.)	Speeds are less than:	Jan.	April	July	Oct.	Annual (12 mos.)	No.of Years	Actual Years	Source of Data
Charleston (1)	939	4 m.p.h.	21%	18%	35%	39%	29%	12	1953-64	WBSC
Huntington (2)	565	5 m.p.h.	59%	57%	77%	77%	68%	7	1948-54	NWRC
Elkins Airport	1970	4 m.p.h.	35%	31%	51%	51%	41%	10	1953-64	WBSC
Parkersburg (3)	831	5 m.p.h.	No monthly breakdown				33%	5	1950-54	NWRC
Wheeling (4)	1195	4 m.p.h.	7%	12%	19%	20%	14%	5	1949-53	NWRC
Morgantown (5) #	1245	4 m.p.h.	14%	20%	36%	24%	24%	4	1949-52	NWRC
Wardensville	960	5 m.p.h.	64%	54%	85%	79%	72%	7	1959-65	WBSC
Martinsburg* (6)	537	5 knots	43%	32%	54%	54%		6	1960-65	WBSC
Kearneysville*	550	5 m.p.h.	52%	44%	78%	72%		3	1963-65	WBSC

* - Wind data from these stations were summarized for 4 daily observations only: 4 a.m.; 10 a.m.; 4 p.m.; and 10 p.m.

\# - Percentages are for the entire 3-month season, rather than the mid-season months.

(1) Kanawha Airport; (2) Huntington "Downtown" or Chesapeake Airport; (3) Wood County Airport; (4) Ohio County Airport; (5) Morgantown Airport; (6) Martinsburg Airport.

WBSC: Data derived in Office of Weather Bureau State Climatologist, West Virginia University, Morgantown.
NWRC: Data from completed projects on file in National Weather Records Center, Environmental Science Services Administration, Asheville, N. C.

Table 2 - Hourly breakdown of wind speeds and directions from Elkins Airport for the mid-season months. Seven years of data were used: 1957-1960, 1963-1965. This table illustrates the greater frequencies of light winds or calms during the nighttime and early morning hours.

		CALM	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
Jan. 4 a.m.	% Freq.	31	1	1	1	1	2	0	5	3	5	3	7	9	12	9	9	1
	Ave.Spd.		6.0	4.0	5.0	6.0	7.0		3.9	7.8	7.3	8.7	9.2	12.3	9.2	10.2	9.7	5.0
Jan.10 a.m.	% Freq.	28	2	1	2	0	3	1	1	4	7	4	7	12	8	8	9	3
	Ave.Spd.		4.6	5.0	3.6		6.8	3.5	5.0	6.8	6.7	7.7	7.4	10.7	11.4	12.1	9.6	9.3
Jan. 4 p.m.	% Freq.	13	4	2	2	1	1	0	2	5	4	3	7	14	14	12	10	6
	Ave.Spd.		5.0	4.7	3.8	5.0	4.7		9.0	10.8	6.9	8.7	8.1	9.4	10.5	12.1	10.1	7.8
Jan.10 p.m.	% Freq.	32	1	1	0	1	1	1	4	6	9	3	4	6	8	6	12	5
	Ave.Spd.		5.5	3.0		4.0	4.5	3.3	6.2	8.3	6.2	8.0	8.8	10.7	13.9	9.1	8.2	6.3
Apr. 4 a.m.	% Freq.	50	4	0	0	0	2	0	5	7	8	2	1	4	4	7	3	3
	Ave.Spd.		8.8				3.3		5.0	7.3	8.9	8.0	10.7	11.6	12.9	10.9	10.1	7.2
Apr.10 a.m.	% Freq.	13	6	1	3	0	2	1	2	6	10	3	5	12	10	8	12	6
	Ave.Spd.		4.5	4.0	5.0		6.6	4.0	8.4	11.5	7.7	10.3	8.5	11.6	12.8	12.0	8.5	7.5
Apr. 4 p.m.	% Freq.	3	6	1	2	1	1	1	4	5	7	4	4	8	11	14	17	11
	Ave.Spd.		10.2	9.0	4.8	4.0	8.0	8.0	9.6	11.2	8.5	8.4	8.4	13.9	11.9	12.1	11.2	10.6
Apr.10 p.m.	% Freq.	38	3	0	0	1	2	3	5	9	9	2	4	2	7	7	5	3
	Ave.Spd.		6.1			4.0	3.2	4.8	6.6	9.3	6.6	9.3	5.6	9.2	10.1	11.4	9.8	5.0
Jul. 4 a.m.	% Freq.	67	1	1	1	0	2	1	6	4	3	1	3	5	2	1	1	1
	Ave.Spd.		3.5	4.0	4.0		3.8	5.0	4.5	5.6	5.0	4.7	4.8	6.0	5.4	8.7	4.3	8.0
Jul.10 a.m.	% Freq.	25	9	3	3	1	1	1	3	2	6	4	10	6	8	6	9	4
	Ave.Spd.		5.5	3.7	4.0	4.0	4.0	4.5	5.8	7.3	5.5	6.3	6.8	6.1	8.2	7.3	5.9	8.4
Jul. 4 p.m.	% Freq.	7	7	4	3	1	2	1	3	3	6	2	2	6	13	17	16	9
	Ave.Spd.		6.7	6.8	5.7	7.5	7.8	6.5	7.3	8.0	6.3	7.0	7.2	7.5	7.4	8.8	8.5	8.8
Jul.10 p.m.	% Freq.	52	1	0	1	1	0	5	12	8	9	4	2	3	0	0	1	1
	Ave.Spd.		5.0		4.0	4.0		3.3	4.2	4.9	4.5	5.1	4.5	5.3			3.5	5.0
Oct. 4 a.m.	% Freq.	59	1	0	0	0	3	1	6	5	2	2	2	2	4	4	7	2
	Ave.Spd.		7.5				4.6	3.7	4.2	7.0	6.8	9.7	4.0	8.8	8.1	9.2	7.7	6.0
Oct.10 a.m.	% Freq.	33	7	3	3	3	2	0	2	3	6	5	4	5	5	6	7	6
	Ave.Spd.		5.2	3.0	5.1	5.2	6.3		6.3	5.7	6.1	6.8	7.7	8.2	7.7	9.0	8.3	6.7
Oct. 4 p.m.	% Freq.	2	6	2	1	1	1	1	4	5	6	2	9	4	10	16	18	13
	Ave.Spd.		6.9	7.5	4.0	6.5	10.7	11.0	9.4	8.9	5.2	7.3	7.7	8.5	9.8	10.6	8.4	8.3
Oct.10 p.m.	% Freq.	49	0	0	2	0	2	1	6	6	6	0	2	4	4	8	5	5
	Ave.Spd.				3.5		3.5	3.3	4.9	5.4	5.3		6.3	8.3	9.3	10.0	8.9	9.5

Table 3 - Summary of winds from the Kearneysville climate station on the West Virginia University Experiment Farm. The wind data were summarized for the 3-year period from April 1963 through January 1966. Each wind observation is an average of the preceding hour, rather than the 1-minute average commonly taken at Weather Bureau and FAA Airport stations. This table also illustrates the greater frequencies of light winds or calms during the nighttime and early morning hours.

		CALM	N	NE	E	SE	S	SW	W	NW
Jan. 4 a.m.	% Freq.	31	12	2	1	4	10	5	5	30
	Ave.Spd.		4.7	4.0	3.0	5.0	3.6	4.8	7.8	9.5
10 a.m.	% Freq.	28	8	4	1	3	9	9	7	31
	Ave.Spd.		5.4	4.8	3.0	5.0	3.8	5.4	11.6	9.7
4 p.m.	% Freq.	13	7	13	1	10	13	4	5	34
	Ave.Spd.		6.6	4.0	6.0	4.2	4.2	4.8	13.2	11.7
10 p.m.	% Freq.	35	16	2	1	4	4	6	3	29
	Ave.Spd.		3.5	6.5	4.0	4.0	3.5	5.6	10.7	10.4
Apr. 4 a.m.	% Freq.	27	15	2	2	9	16	4	6	19
	Ave.Spd.		4.9	2.5	6.0	5.3	5.2	3.0	10.6	7.5
10 a.m.	% Freq.	12	14	1	4	17	16	9	6	21
	Ave.Spd.		6.7	4.0	4.5	6.3	5.9	7.6	8.4	10.7
4 p.m.	% Freq.	13	4	7	7	18	12	1	7	31
	Ave.Spd.		7.0	5.0	6.0	7.8	7.3	8.0	6.3	11.6
10 p.m.	% Freq.	23	16	3	3	14	12	4	9	16
	Ave.Spd.		4.9	4.3	4.7	5.3	5.5	4.0	8.8	10.8
Jul. 4 a.m.	% Freq.	79	3	0	2	3	9	3	0	1
	Ave.Spd.		3.7		2.5	2.0	1.8	2.3		2.0
10 a.m.	% Freq.	18	6	13	0	9	12	20	7	15
	Ave.Spd.		4.0	4.0		3.7	2.4	2.8	3.7	5.0
4 p.m.	% Freq.	2	2	16	1	18	10	19	10	22
	Ave.Spd.		6.0	4.6	5.0	5.1	5.4	4.3	7.9	7.0
10 p.m.	% Freq.	56	4	1	3	18	10	3	1	4
	Ave.Spd.		3.0	2.0	3.7	3.8	2.3	1.7	3.0	6.8
Oct. 4 a.m.	% Freq.	67	8	1	1	1	12	2	4	4
	Ave.Spd.		4.1	7.0	1.0	5.0	1.9	4.0	5.5	6.8
10 a.m.	% Freq.	40	8	4	1	2	12	16	2	15
	Ave.Spd.		6.3	4.3	4.0	3.5	4.3	3.3	5.0	7.6
4 p.m.	% Freq.	5	9	12	2	10	19	16	5	22
	Ave.Spd.		6.8	3.6	7.0	4.1	4.3	5.9	7.6	9.3
10 p.m.	% Freq.	58	12	0	0	2	9	3	5	11
	Ave.Spd.		4.3			2.5	2.3	3.7	2.8	7.7

Table 4 - Wind data from the old Huntington "Downtown" (or Chesapeake) Airport, for the years 1948 through 1954. This airport is across the Ohio River in Ohio and is about 3 mi. west of downtown Huntington. The total number of observations were divided into "daytime" and "nighttime" categories and show that the lightest winds occurred more frequently at night.

Monthly Percentage Breakdown of Winds Less Than 5 Miles Per Hour

January	59%	July	77%
February	60%	August	82%
March	52%	September	78%
April	57%	October	77%
May	70%	November	64%
June	71%	December	64%

	Calm	Less than 5 m.p.h.
Daytime Winds (7:30 a.m. through 6:30 p.m.)	21%	53%
Nighttime Winds (7:30 p.m. through 6:30 a.m.)	62%	82%