

LAKE EFFECT SNOW EAST AND SOUTHEAST OF LAKE ONTARIO

AS OBSERVED BY RADAR

By

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Atmospheric Sciences Research Center

Early in the fall of 1963, a mobile 3.2 cm radar was located atop 1700 ft. Jackson Hill, three miles south-southwest of the Village of Boonville, New York. Equipment is operated by the Tug Hill Field Station of the State University of New York, Atmospheric Sciences Research Center. The site on Jackson Hill, which is some 42 miles directly east of Lake Ontario, was selected because it was a high point of land, and was far enough back from the lake to survey these lake originated storms, and show the modification they undergo over the land masses east of the lakes. It was originally hoped to observe their area of coverage, the section where they decayed, and if possible, something on their point of origination. The 3.2 cm radar, which has a power peak of 50 kw, was found to have certain limitations, however, the main limitation being, that the power was not sufficient to receive echoes from snow in most cases at a distance greater than 30 miles from the radar site, and often when a heavy storm at the immediate site, the attenuation was such, that little or no echoes were received at a distance greater than 20 miles. Actually, almost all institutions operating radar have found that snow and especially dry snow gives a very poor echo, when compared with rain or hail. At Boonville snow "precip" of an intense nature has been observed once or twice as far as 35 miles out from the radar site, but rain precipitation has been observed up to 60 or so miles from the radar site.

The 30 inch parabolic antenna is located atop a trailer, which places it only 9 or 10 ft. above the ground. Because of wooded areas near the radar site, it is found to be necessary to operate the antenna with an upward tilt of plus three degrees, and even this tilt range does not permit clearance of the wooded area to the east, which area has successfully blotted out about all precipitation echoes eastward. Actually the ideal situation, is to be able to operate the antenna with a zero degree tilt for this prevents overrunning the precipitation pattern, while with three or five degrees tilt as the signal gets out, often the radar overshoots the top of the precipitation area, and no echoes are received. To remedy this last mentioned situation, it is hoped to eventually place the complete radar atop a 50 or 75 ft. tower, which would easily clear all wooded areas, enabling the antenna tilt to be kept at zero degrees, which as mentioned before, is the best operating range. In addition, the tower could be instrumented as a micro meteorological tower with wind and temperature instruments etc. A further recommendation will be made, that a radome cover the antenna to prevent water from getting into the wave guide, and/or snow and water getting into the selsyn motor, which drives the antenna. Further, it is hoped that perhaps that a more powerful set can eventually be installed to do research on these storms, something on the order of the Raytheon WSR-57, which seems to pick up snow echoes as far as 60 or 70 miles out.

The storm of February 8th, like several preceding it, showed areas of precipitation close to the radar site, than an area westward with apparently no "precip", and further west an area of intense "precip" echoes. I believe that the area of no "precip" shown was mainly an area of light "precip" and thus little or no echoes. It should be noted here, that the snow of the storm of February 8th was very dry, and actual measurements at the radar site showed one inch of snow to yield only .03 inch of water (normal for non lake effect snows is one inch equals .10 water). The temperature in the storm period at

Boonville, from 5:00 P.M. to 11:00 P.M., ranged from 18 degrees at 5:00 P.M. to 13 degrees at 11:00 P.M. Winds were from the west-southwest at the start of the storm at 10 miles per hour, with occasional gusts to 15, and with the termination of the snow at or near 10:30 P.M. had shifted to west-northwest. Total snowfall unmelted at the radar site in the period 5:15 P.M. to 10:15 P.M. was eight inches, or somewhat under two inches per hour. Actual visibilities during the main part of the storm ranged from 1/16th to 1/4th. It appears that eastward of the radar site in the Black River Valley area, because of down slope conditions, only five inches of snow fell.

This particular storm occurred as usual after the passage of a low and the attendant cold front with an incursion of polar air into the Great Lakes region. On the morning of the 8th, snow was falling generally in northern Lewis and southern Jefferson Counties, and by 5:00 P.M. in the evening, when the storm ended at Lowville, some 25 miles north of the radar site, nine inches of snow had fallen in the Village of Lowville, and 12 inches or more on the surrounding hills, with a water content of .55 inch.

The radar was first put into operation to see if this storm could be viewed early the afternoon of the 8th, and not too much was visible at that time, except a band out about 25 miles to the distant northwest. There were, however, a few isolated snow showers within the target area. About 3:00 P.M., it was decided to go out and find the storm, which was known to be operating some 25 miles north, accordingly, a car was obtained and driven to the Village of Turin, some 15 miles north of the radar site, where the southern and leading edge of the storm area was entered at 4:00 P.M. The storm was then penetrated three or four miles, and visibilities were estimated to be down to 1/16th to 1/8 mile. In order to find out how the storm was moving, the car was turned around, headed south, and ran out of the storm into brilliant sunshine at 4:30 P.M. at a point four or five miles south of Turin, indicating, that due to a slight shift of the wind aloft, the storm cell was moving south at a rate somewhere between eight and ten miles per hour. The storm was outraced to the radar site, and the set was "firmed up" and operational at 5:00 P.M. Shortly after 5:00 P.M., Lowville called to say, the day long storm had terminated. At 5:10 P.M., the southern edge of the storm hit the radar site. This thus effectively showed, that the transverse axis of the storm was once again on the order of 20 miles through, and was of the intense single band type that is so common east of Lake Ontario. At this time Griffith Air Base at Rome was called and alerted to the fact, that the storm had started to move south, and could probably be expected in the Rome area later in the evening, provided it did not stall before reaching the Air Base. (Note: to show how local these storms are, no Weather Bureau hourly reporting station had shown this storm at any time, except that Watertown had given an indication on their hourly sequence reports early in the day by noting under remarks, that snow showers were observed southwest through southeast). However, due credit must be given here to: Mr. B.L. Wiggin and the staff of the Weather Bureau Office at Buffalo, who had called for heavy snows to hit Jefferson County on the 8th, and indeed south Jefferson and much of Lewis County were actually hit by a 12 inch fall of snow. In addition, Ray Falconer, of the ASRC staff in Albany, phoned early on the morning of the 8th to put the radar station on an alert basis, while westward in the Oswego area, the school systems, operating under the guidance of ASRC Research Associate, Bob Sykes, were alerted by Mr. Sykes, himself, well in advance, when he anticipated the polar air outbreak.

A series of radar slides, taken at intervals of around 15 minutes from 5:15 P.M. to 10:30 P.M., were shown (see radar echo maps). These radar echoes showed that the south line of the storm finally stalled in the general Westernville area between 6:15 and 9:15 P.M. Shortly after 9:15 P.M., further movements south occurred, and at 9:18 P.M., the Griffiss Air Force Base was hit by moderate to heavy snow, when visibilities dropped to 1/4th to 1/2 mile. During the storm few precipitation echoes were observed east, but a strange gooseneck like area of intense precipitation echoes were observed extending from the Point Rock area to near Osceola. The thought here might be, that this area of rising land

was causing orographic lifting of the air mass, intensifying the precipitation. (Note: snow surveys always show a maximum water-snow ratio in the general area four or five miles eastward of Osceola). After 6:00 P.M., the north line of the storm seemed to stabilize in the general areas seven or eight miles north of the Boonville radar site. Once again, it was decided to check this out, and lurching through snow drifted roads, it was indeed found to be true, that eight miles north of the radar site, the stars were shining brightly in an almost cloudless sky.

Reports from the Rome-Utica area, where the storm started 9:15 P.M., indicate that the storm let up in that area shortly after midnight, after depositing two inches of snow with water content .05 to .07.

Earlier in the day, Bob Sykes, ASRC Research Associate, of Oswego, New York, followed this same single band storm cell in the area immediately adjacent to Lake Ontario. In the morning he reported, the center of the storm on the Lake Ontario shore line was located near the Oswego-Jefferson County line, and that when he reached Stony Point on the east shore of Lake Ontario, he observed the storm to the south, and penetrated it once again on his way back to Oswego. On his afternoon trip into the storm area near 5:00 P.M., the storm was general from Pulaski southward to beyond the intersection of Route 104 and Route 11. Between 6:45 and 7:00 P.M., Sykes was in the Mexico-New Haven area, where the storm was intense with visibilities from 1/4th to 1/16th of a mile. He ran out of the storm westward of New Haven towards Oswego, but reported, that the storm started in Oswego near 8:50 P.M. leaving three inches of snow before it ended that evening. (Note: Oswego is somewhat north of a direct east-west line with the Griffiss Air Force Base). The storm at Oswego started approximately 25 minutes ahead of its starting in Rome. Also, the storm that Sykes observed on the county line in the morning, was the southwestern overland end of the cell that was observed in the Lowville area at the same time.

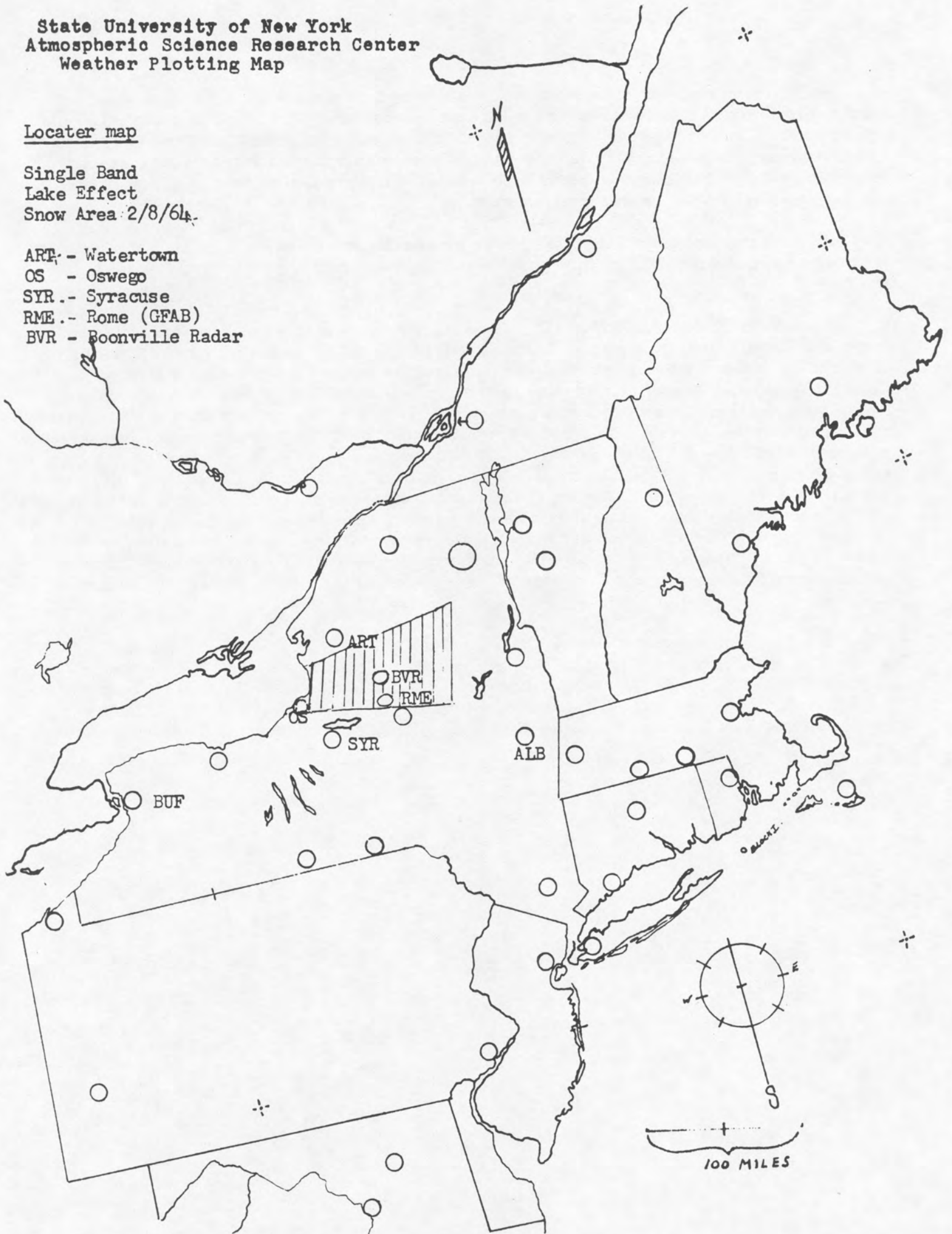
Finally, in the liaison between the Griffiss Air Force Base Weather Station and the ASRC Station at Boonville, the following pilot reports were received by the Griffiss Base: 4:18 P.M. on top, Syracuse-Watertown tops 12,000, 4:57 P.M. pireps, just north of Boonville tops 10,000, line of cu southwest through northeast. (Note: This pirep was made just before the storm hit the radar site). At 7:44 P.M., another pirep was made with tops reported 10,500 msl, eight miles northwest of the Boonville radar site.

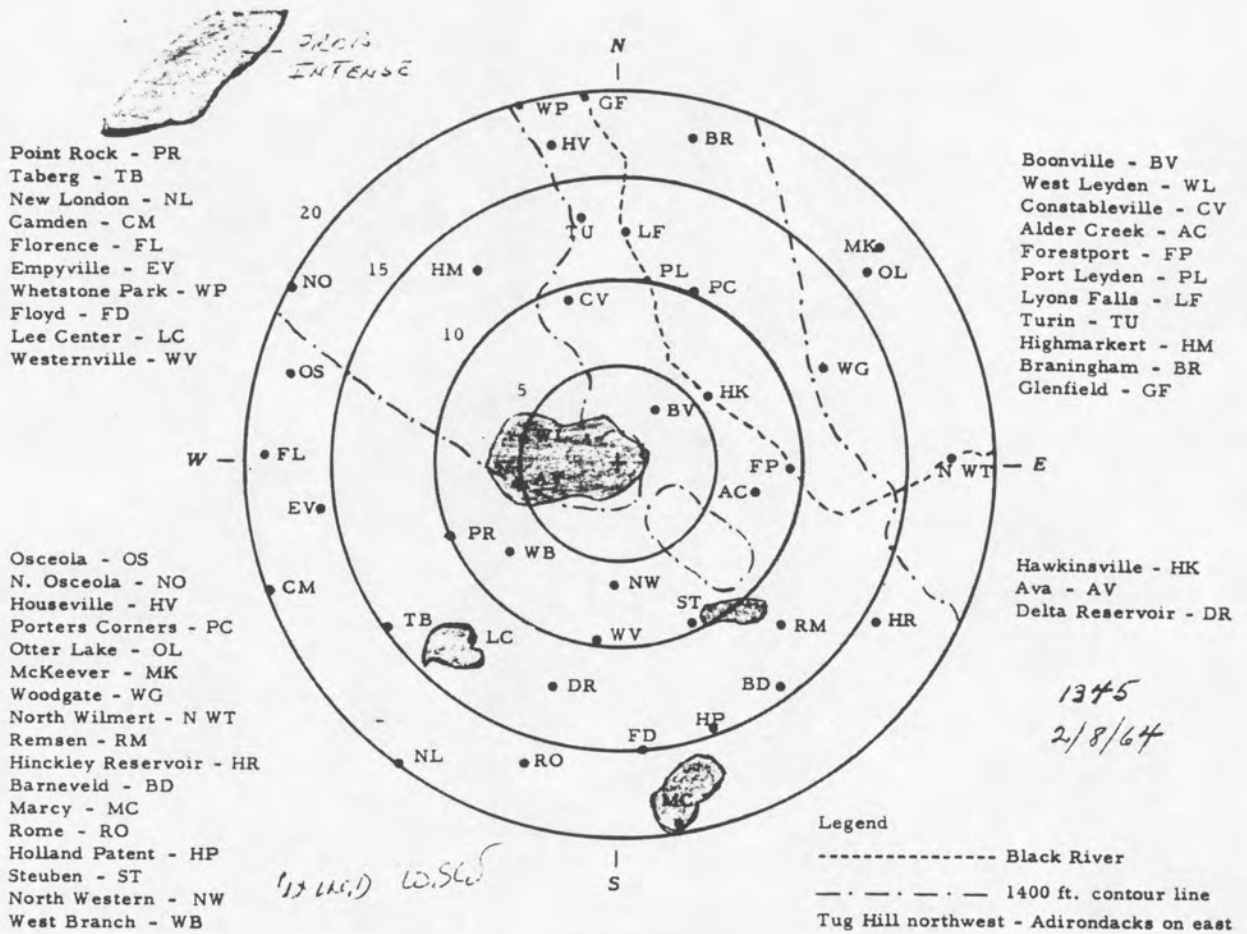
State University of New York
Atmospheric Science Research Center
Weather Plotting Map

Locater map

Single Band
Lake Effect
Snow Area 2/8/64.

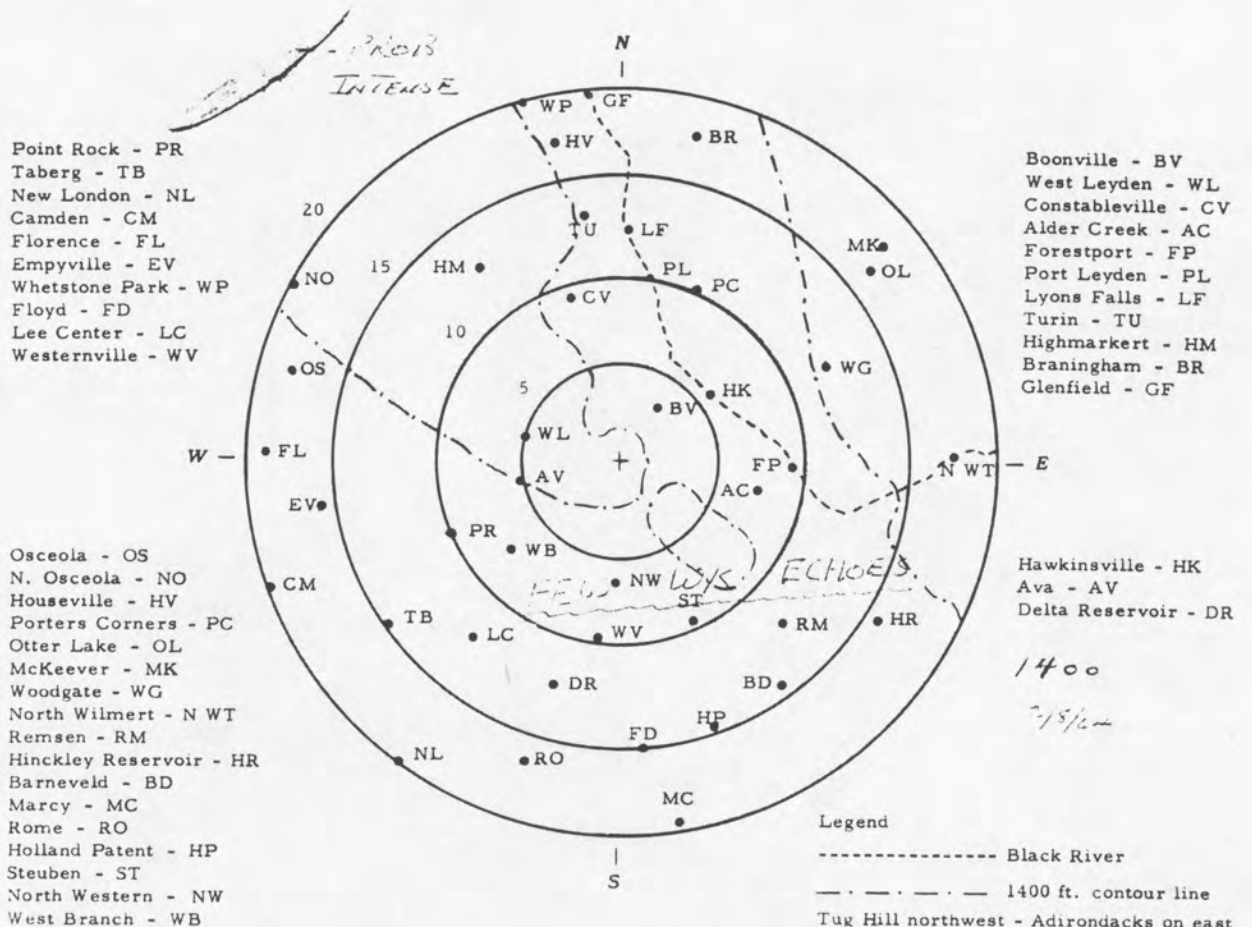
- ART - Watertown
- OS - Oswego
- SYR - Syracuse
- RME - Rome (GFAB)
- BVR - Boonville Radar



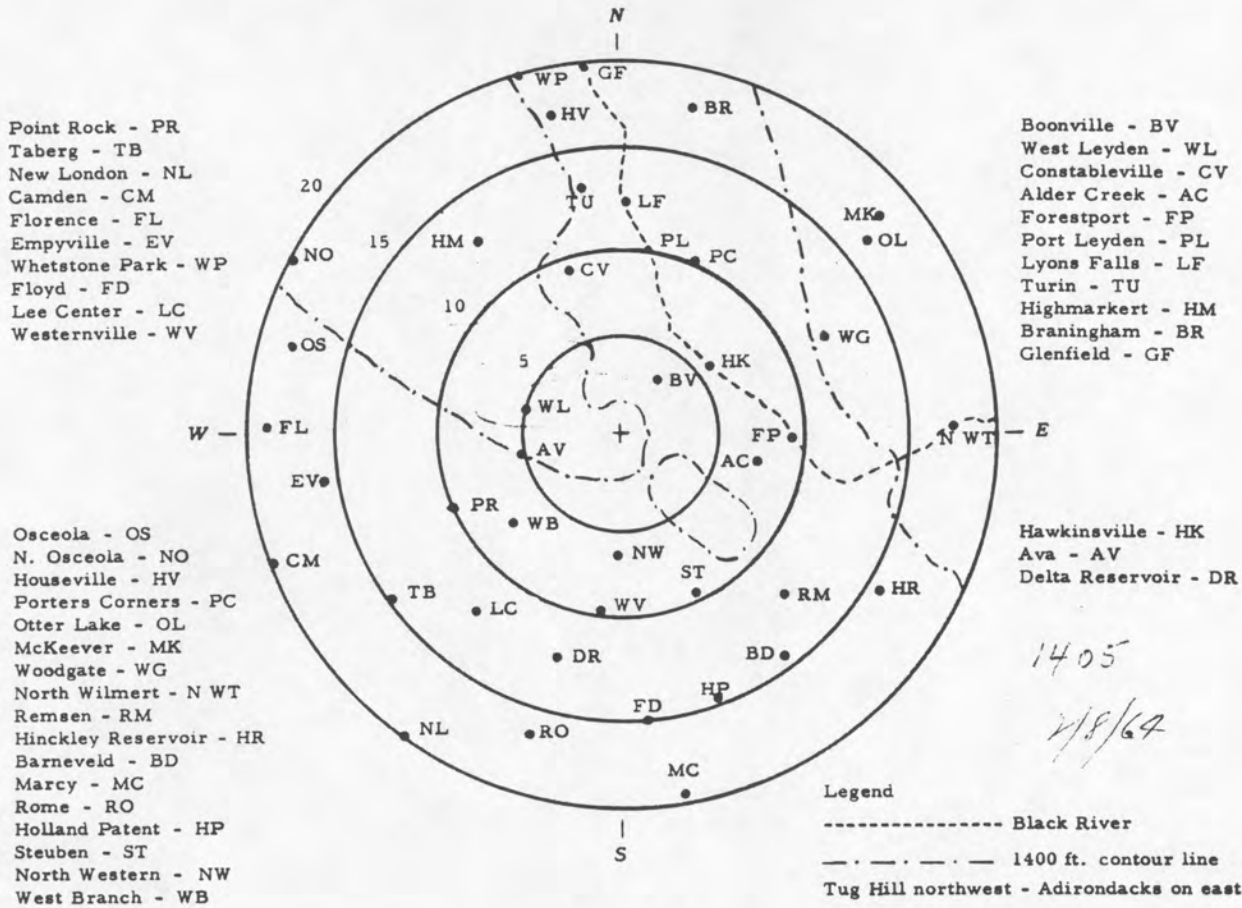


ASRC RADAR PLOTTING CHART

20 Mile Range

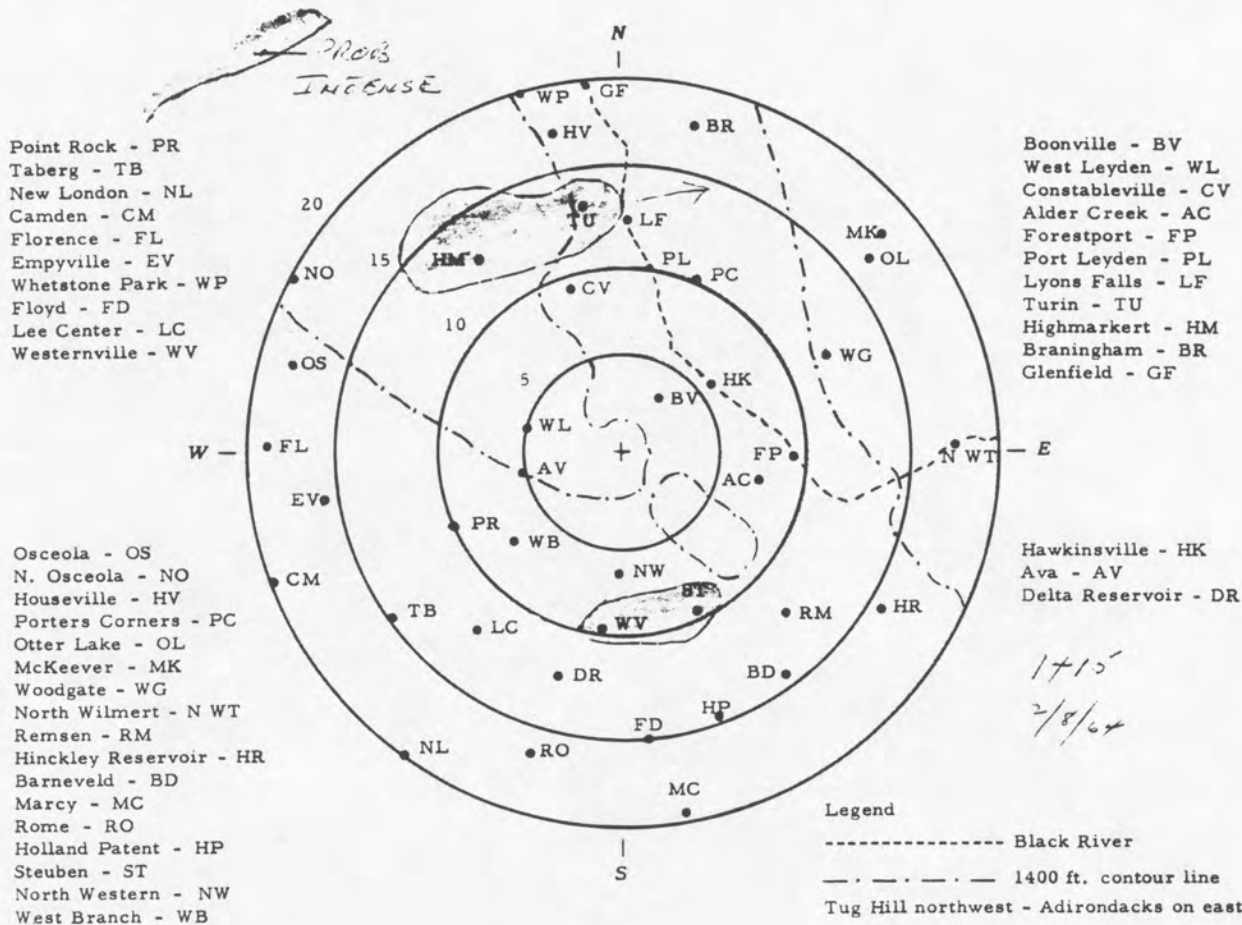


20 Mile Range



ASRC RADAR PLOTTING CHART

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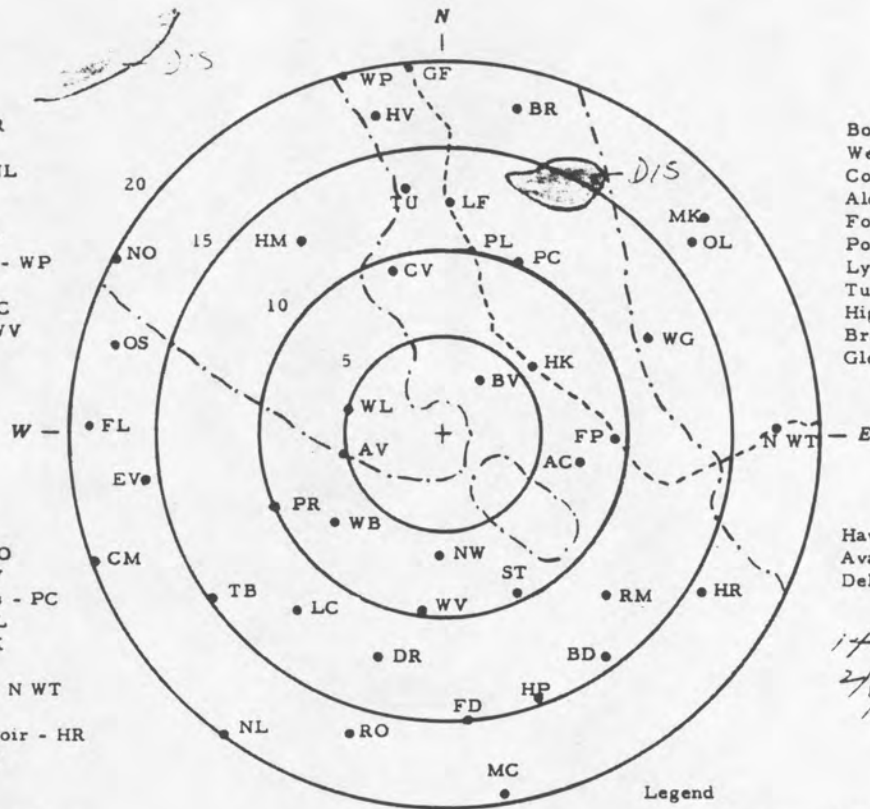
20 Mile Range

Point Rock - PR
 Taberg - TB
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 Floyd - FD
 Lee Center - LC
 Westernville - WV

Boonville - BV
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Hawkinsville - HK
 Ava - AV
 Delta Reservoir - DR



END OF SERIES

S WIND LOSSES

1430
 2/8/64

Legend
 ----- Black River
 - . - . - . 1400 ft. contour line
 Tug Hill northwest - Adirondacks on east

ASRC RADAR PLOTTING CHART

20 Mile Range

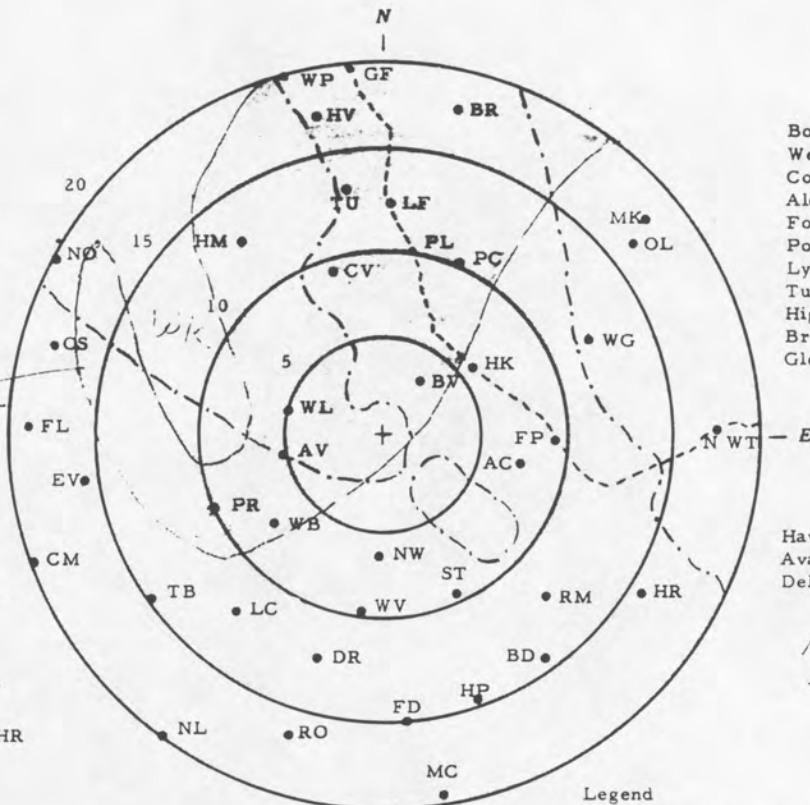
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PROB INTENSE



START NEW SERIES

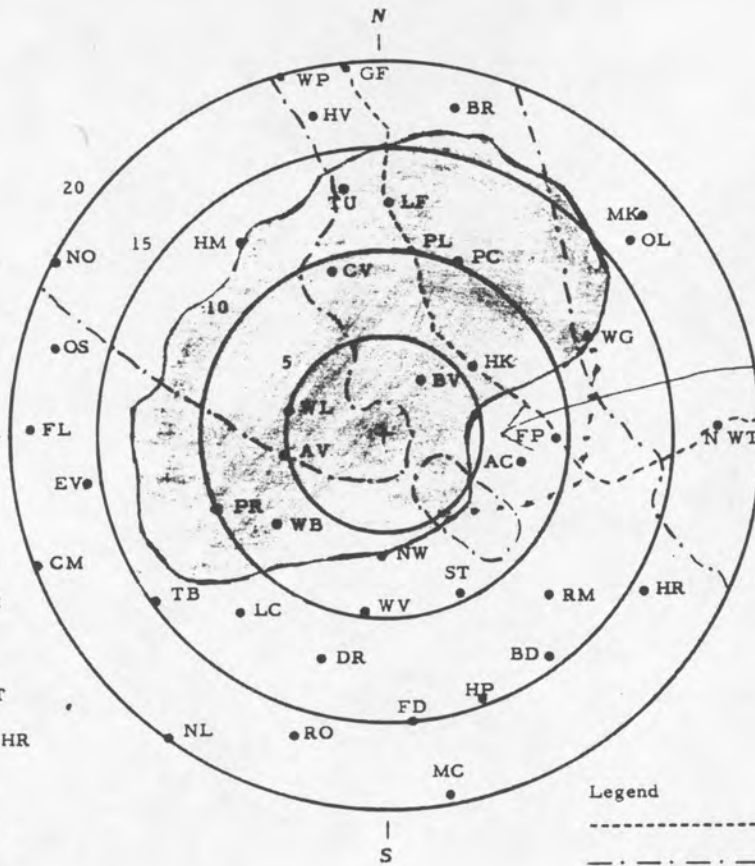
S WIND LOSSES

1715
 2/8/64

Legend
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 - . - . - . 1400 ft. contour line
 Tug Hill northwest - Adirondacks on east

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TREE SHIELDING

Hawkinsville - HK
 Ava - AV
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1730
 2/8/64

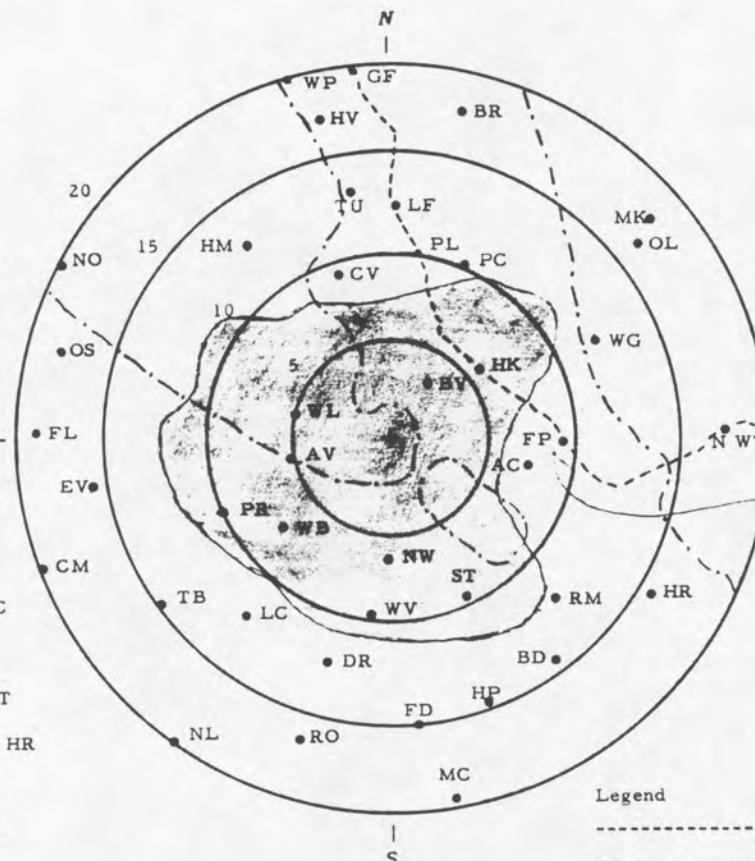
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TREE SHIELDING

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1800
 2/8/64

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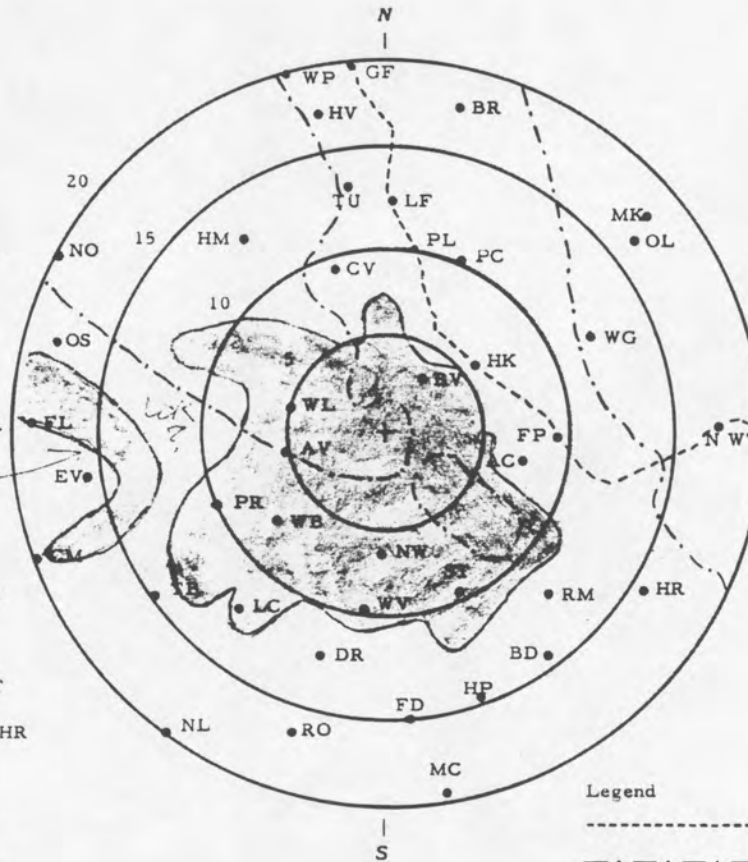
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 Tug Hill northwest - Adirondacks on east

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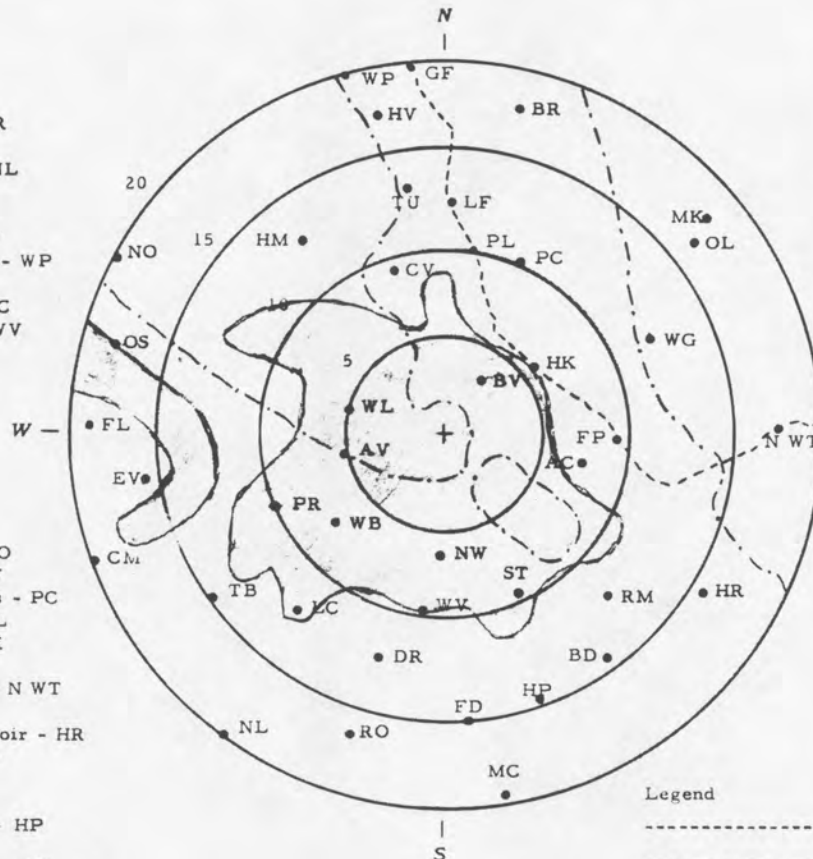
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1820
 2/8/64

Legend
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ASRC RADAR PLOTTING CHART

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1830
 2/8/64

Legend
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 Tug Hill northwest - Adirondacks on east

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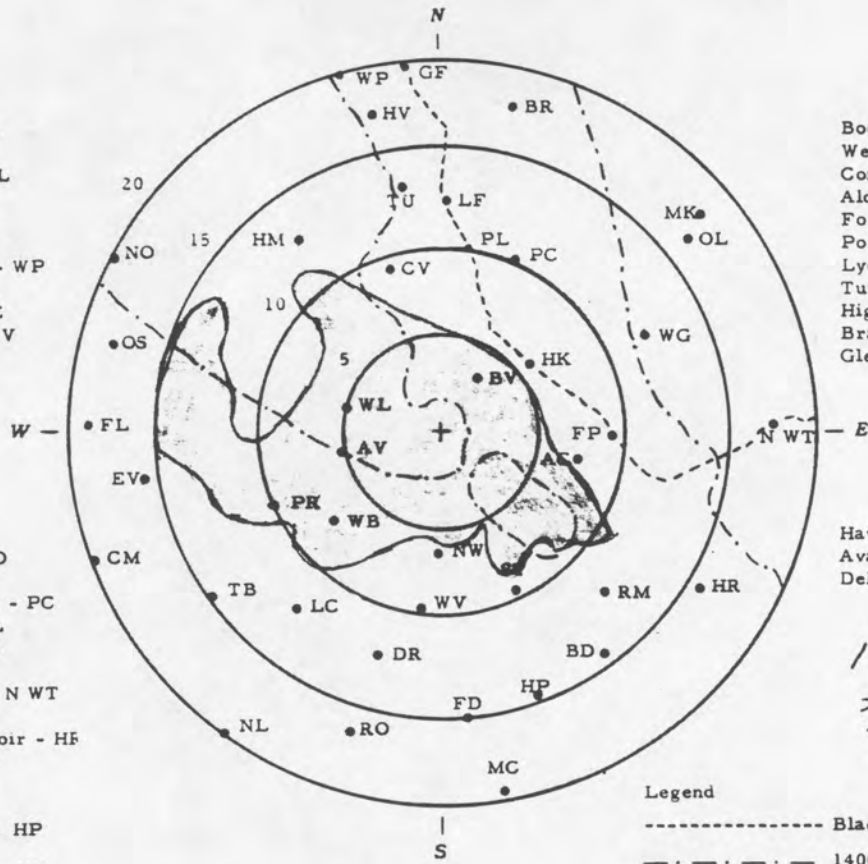
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1875
 2/8/64

Legend
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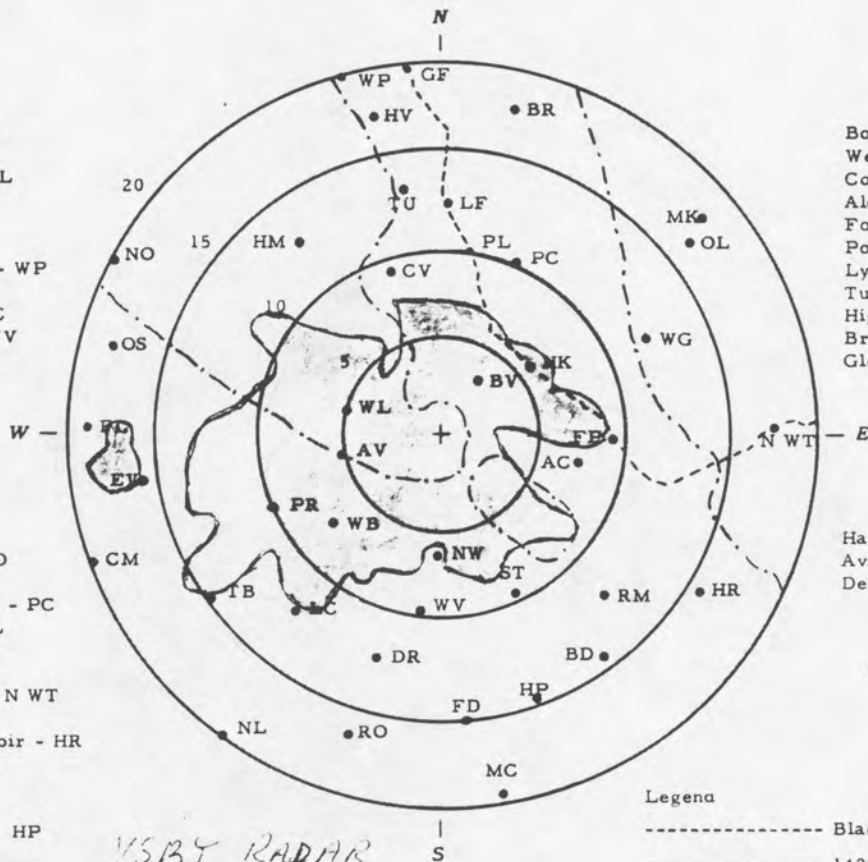
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1900
 2/8/64

Legend
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YSBY RADAR
 SITE URBAL
 1/16 - 1/4 SWS

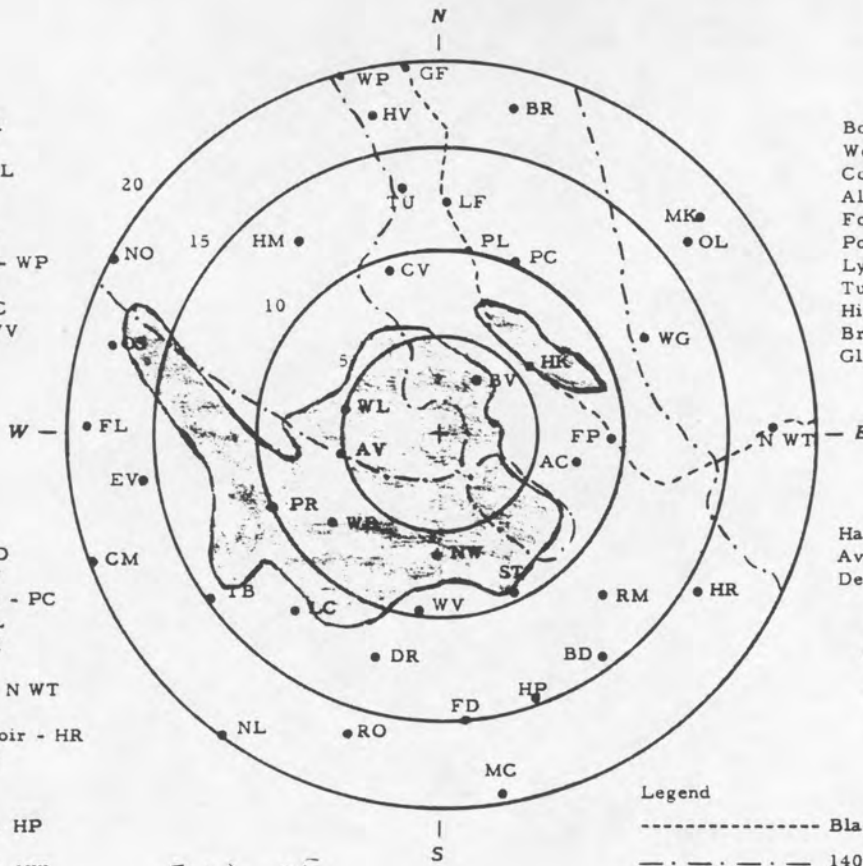
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END OF SERIES

*1915
 2/8/64*

Legend
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ASRC RADAR PLOTTING CHART

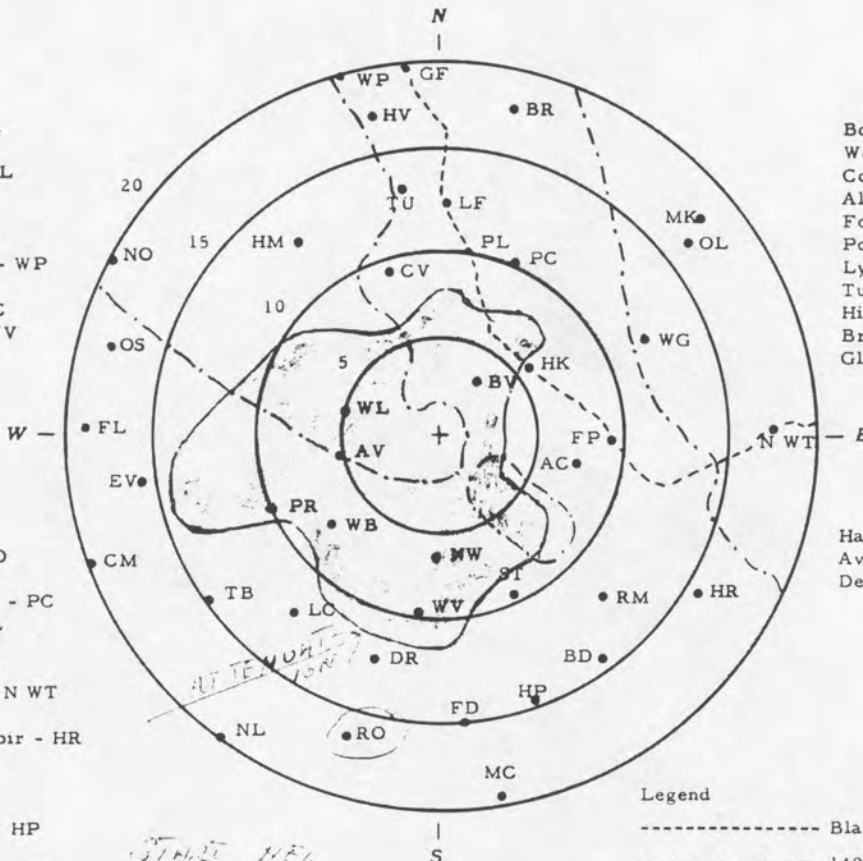
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*ATTENTION
 10/15/64
 STABLE MEAS
 SERIES*

*2115
 2/8/64*

Legend
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 Tug Hill northwest - Adirondacks on east

ASRC RADAR PLOTTING CHART

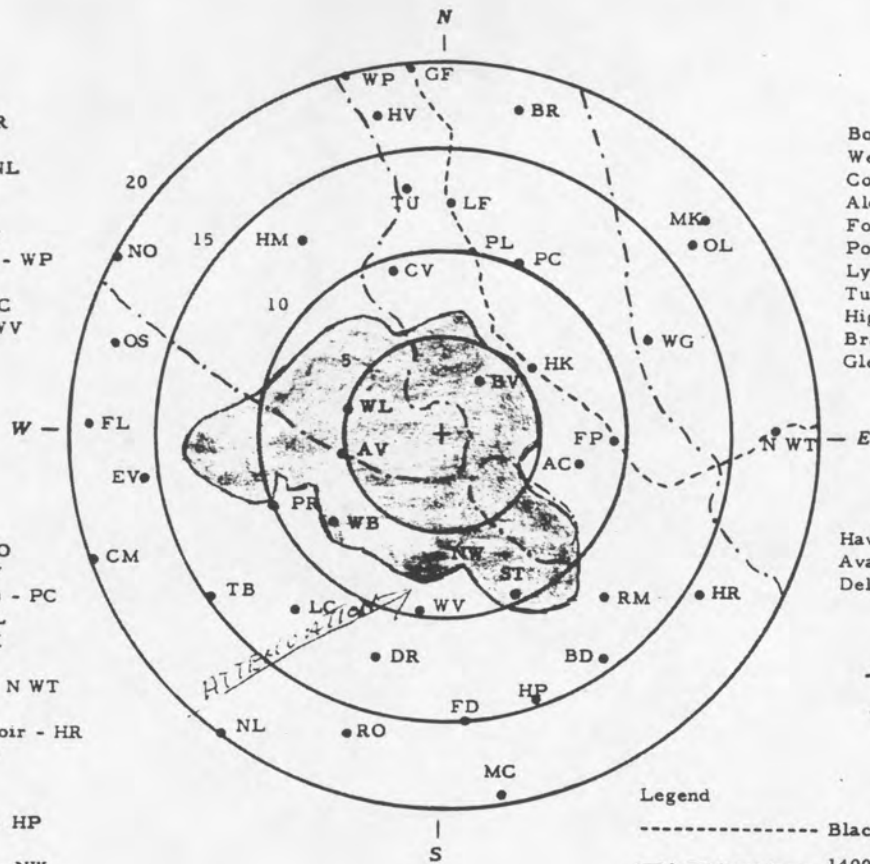
20 Mile Range

Point Rock - PR
 Taberg - TB
 New London - NL
 Camden - CM
 Florence - FL
 Emphyville - EV
 Whetstone Park - WP
 Floyd - FD
 Lee Center - LC
 Westernville - WV

Boonville - BV
 West Leyden - WL
 Constableville - CV
 Alder Creek - AC
 Forestport - FP
 Port Leyden - PL
 Lyons Falls - LF
 Turin - TU
 Highmarkert - HM
 Branningham - BR
 Glenfield - GF

Osceola - OS
 N. Osceola - NO
 Houseville - HV
 Porters Corners - PC
 Otter Lake - OL
 McKeever - MK
 Woodgate - WG
 North Wilmert - N WT
 Remsen - RM
 Hinckley Reservoir - HR
 Barneveld - BD
 Marcy - MC
 Rome - RO
 Holland Patent - HP
 Steuben - ST
 North Western - NW
 West Branch - WB

Hawkinsville - HK
 Ava - AV
 Delta Reservoir - DR



2130
 2/8/64

Legend

----- Black River
 - . - . - . 1400 ft. contour line
 Tug Hill northwest - Adirondacks on east

ASDC RADAR PLOTTING CHART

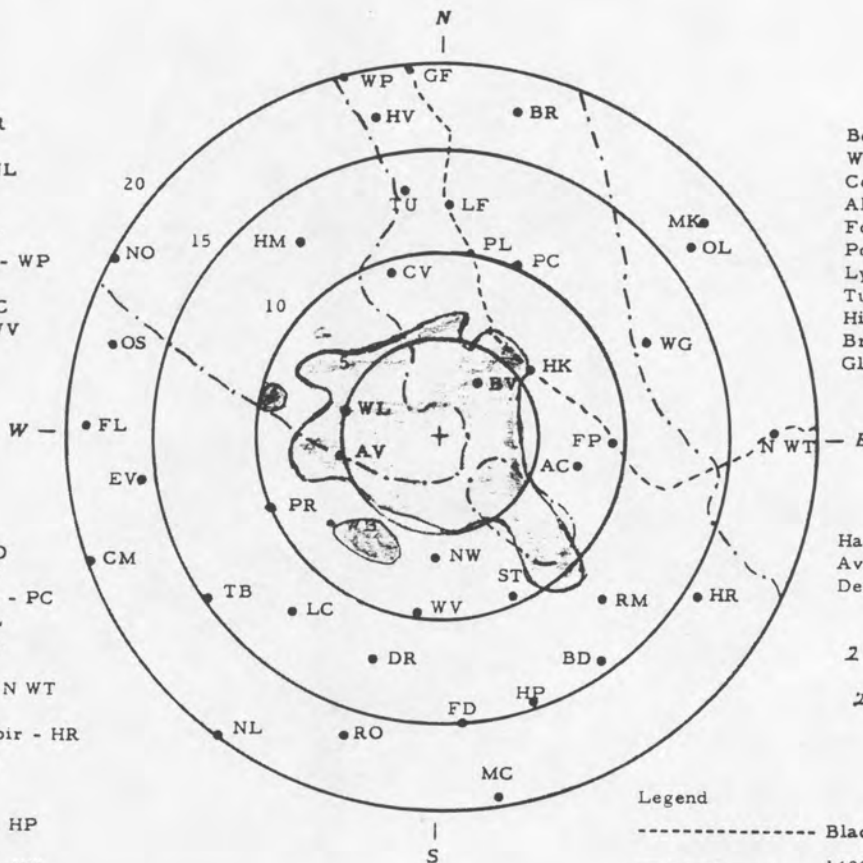
20 Mile Range

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 Marcy - MC
 Rome - RO
 Holland Patent - HP
 Steuben - ST
 North Western - NW
 West Branch - WB

Hawkinsville - HK
 Ava - AV
 Delta Reservoir - DR



2175
 2/8/64

Legend

----- Black River
 - . - . - . 1400 ft. contour line
 Tug Hill northwest - Adirondacks on east

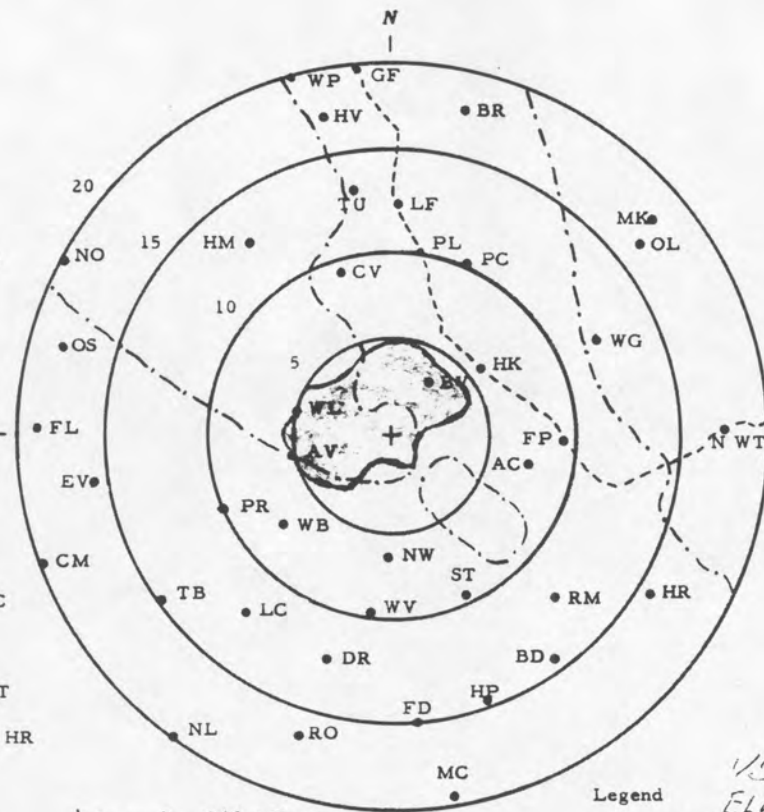
20 Mile Range

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 Emphyville - EV
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 Rome - RO
 Holland Patent - HP
 Steuben - ST
 North Western - NW
 West Branch - WB

Hawkinsville - HK
 Ava - AV
 Delta Reservoir - DR



Legend
 ----- Black River
 - . - . - . 1400 ft. contour line
 Tug Hill northwest - Adirondacks on east

2215
 2/8/64
 VISBT 2
 ELEV ANGLE 3°

ASRC RADAR PLOTTING CHART

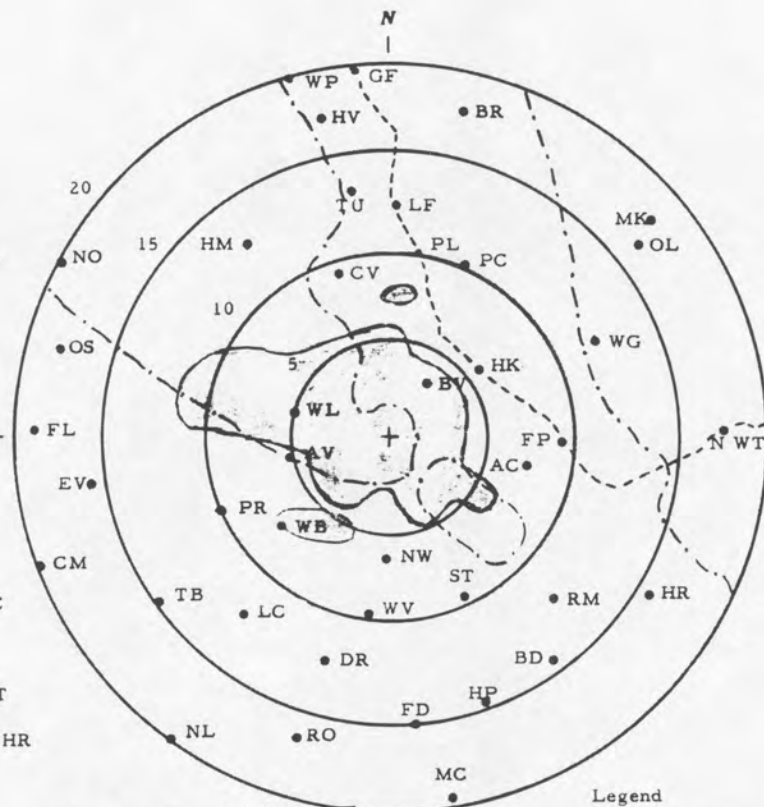
20 Mile Range

Point Rock - PR
 Taberg - TB
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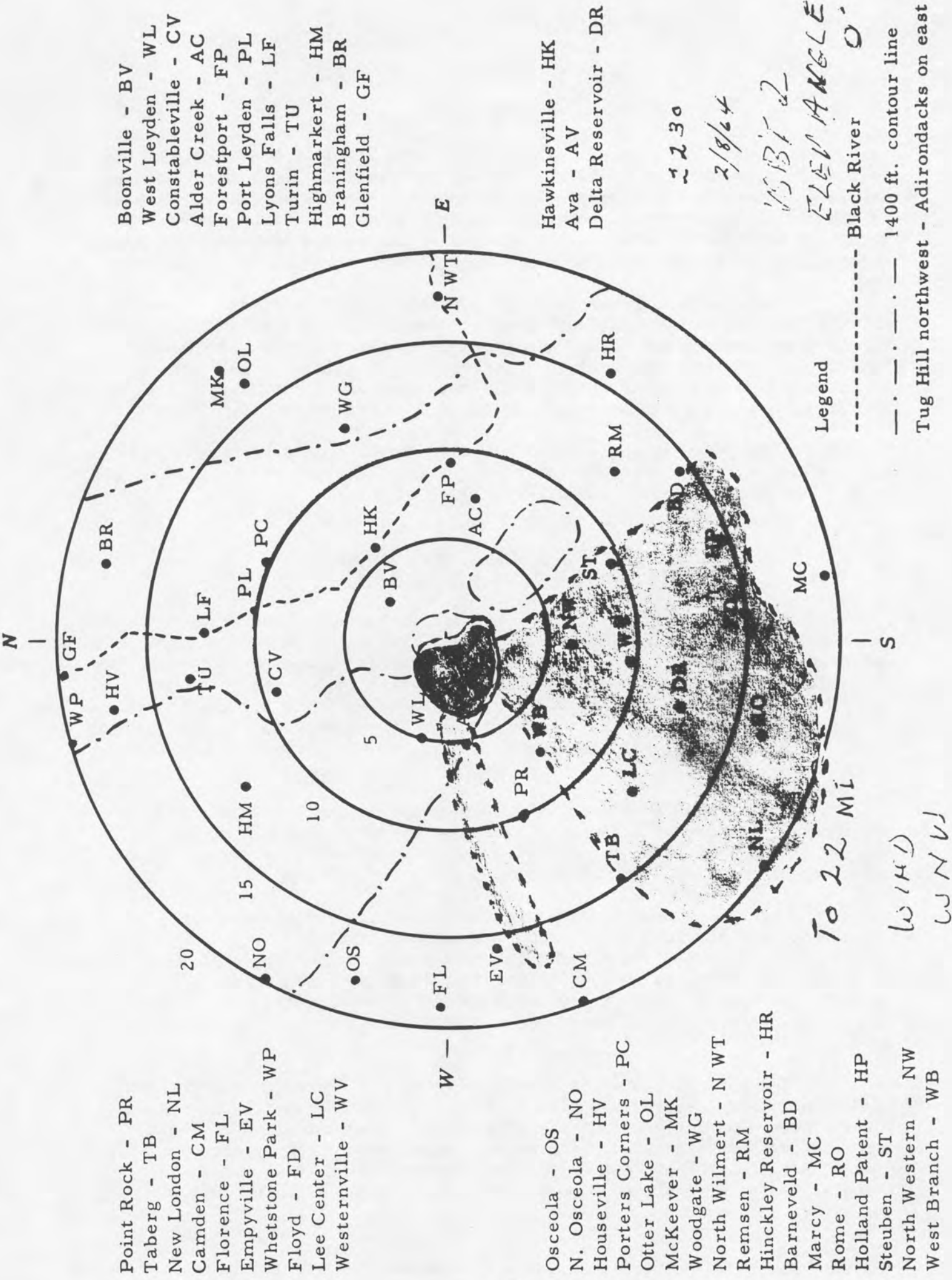


Legend
 ----- Black River
 - . - . - . 1400 ft. contour line
 Tug Hill northwest - Adirondacks on east

2200
 2/8/64

ASRC RADAR PLOTTING CHART

20 Mile Range



Boonville - BV
 West Leyden - WL
 Constableville - CV
 Alder Creek - AC
 Forestport - FP
 Port Leyden - PL
 Lyons Falls - LF
 Turin - TU
 Highmarkt - HM
 Braningham - BR
 Glenfield - GF

Hawkinsville - HK
 Ava - AV
 Delta Reservoir - DR

2230
 2/8/64

WBT 2
 ELEV ANGLE
 Black River 0'

Legend
 ----- Black River
 - . - . - 1400 ft. contour line
 Tug Hill northwest - Adirondacks on east

Point Rock - PR
 Taberg - TB
 New London - NL
 Camden - CM
 Florence - FL
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 Remsen - RM
 Hinckley Reservoir - HR
 Barnevelde - BD
 Marcy - MC
 Rome - RO
 Holland Patent - HP
 Steuben - ST
 North Western - NW
 West Branch - WB

To 22 MI
 W (HD)
 W N W