THE BROAD-WINGED HAWK FLIGHT OF SEPTEMBER 13, 1978

by Paul M. Roberts, Somerville

One of the most spectacular hawk flights ever witnessed in New England, totalling 10,213 hawks, was observed from Mt. Wachusett in Princeton, Massachusetts on September 13, 1978. This includes 10,086 Broad-winged Hawks (Buteo platypterus) which appear to have been part of the single biggest broadwing movement ever recorded in the northeastern United States.

The weather certainly appeared favorable for a good flight when four observers, Nancy Clayton, Leif J. Robinson, Michael Sporer and I arrived on the summit that morning. A clearing high pressure system had arrived late on the afternoon of September 12, pushing out a low pressure system which had given us two days of strong southwest winds and rain. At 8 a.m. EST, the temperature was 46° F., with chilly winds estimated at 20 mph blowing out of the northeast. Humidity was low, and with Greylock standing clearly in the west and Boston shimmering in the sunlight to the east, the visibility was the best I've ever seen on Wachusett.

We were dismayed when we saw only 129 hawks in our first four hours. Several observers grumbled about departing imminently when, at 11:52 a.m. EST, Mike called out that he had 6 broadwings in a thermal northeast of the summit. Our second biggest kettle of the morning! Mike followed the birds, uttering an expletive as he discovered the biggest kettle he had ever seen. Several hundred broadwings were rising in a tight ball above the first small kettle.

Mike began to count the birds while I quickly looked to the top of the large kettle to see if any birds had already peeled off. I found a river of broadwings stretching from horizon to horizon. Some had already passed over us, gliding so high that we had initially failed to perceive them. We can't know how many birds had already passed from our view, but within the next fifteen minutes we tallied 2387 broadwings, almost invisible to the naked eye, passing directly over the summit. Another 1598 were recorded over the next half hour.

We were incredulous. Approximately 4000 hawks in 45 minutes. Our necks and eyeballs ached, but with adrenalin surging through our systems, we were in a state of euphoric shock.

The altitude of the birds we had seen compelled us to continue to scan the skies with our binoculars and scopes. There was little activity until approximately 1:30 p.m. EST when Leif, using his 20x, 80 mm Jaeger scope, discovered a major kettle forming to the north of the mountain. The rest of us ran to our scopes, including Bushnell 20x and Tasco 20-60x models (60mm), but either our optics were inadequate or the objective was too minute, for none of us could locate the kettle in our scopes. After that kettle moved on, Leif discovered a second kettle forming in the same spot. With his scope locked on that location for the next hour, Leif picked up kettle after kettle forming over the same terrain. As these kettles moved southwest, they usually passed within range of our 60 mm scopes, and often our binoculars, but they almost always remained beyond the range of our unaided vision.

Following another brief lull, Mike Sporer called me over to his scope, advising me to look through it and "think hawk." I thought he must have had a Peregrine Falcon, or a Goshawk, but when I put my eye to the glass I saw nothing. I looked again. What now appeared to be a minute drop of condensation on the len was moving slowly -- horizontally. A kettle! For more than an hour, kettle after kettle formed in the same spot northeast of the summit and passed east of the lookout. This stream of hawks, our third distinct alley of flight, did not abate until almost 3:30 p.m. EST.

Suddenly, the kettles disappeared. Individual birds began to materialize in front of us, often coming in from below the summit. For half an hour we enjoyed our best views of birds -- when we could focus our eyes that close.

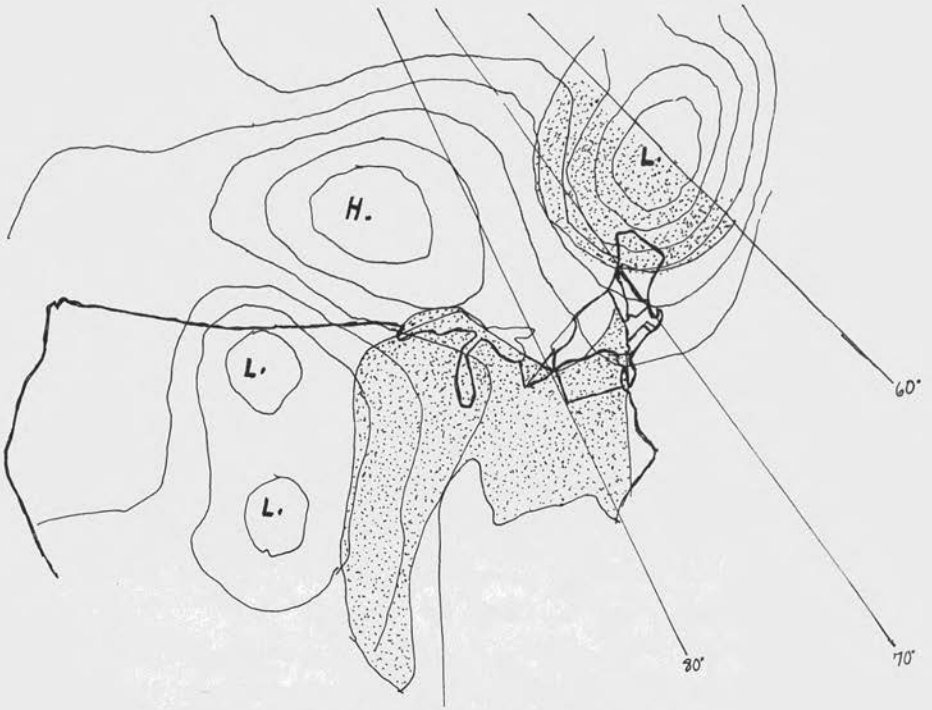
Our minds were boggled. That evening we independently recorded our recollections of the day's events and our emotions. One observer attempted to write poetry for the first time in decades, but none of us could capture in words the floodtide of emotions which had overrun us that incomparable day. As the emotions ebbed, we began to seriously examine what we had observed and recorded, conscious that we had seen something rare and significant.

The incredible totals compelled us to question our counting techniques. Had we grossly overcounted the flight? We think not. Our procedures were as follows: at least one person always scanned the northern skies for hawks. When birds were sighted, two or more observers would count them, singly or estimating by tens, and the lowest tally would be recorded next to the minute when the birds were first spotted. If the birds peeled off within our vision, we would recount for verification, recording the "hardest" total. In several instances recounts revealed that our first estimates had been low. Meanwhile, the fourth observer would glance in the opposite direction to ascertain if there was any activity behind us.

The flight was so structured that it was relatively easy to count. Apart from the first tidal wave of birds, which almost certainly exceeded the 750 we were able to count, only two kettles exceeded 500 birds. The remaining kettles, ranging from 100-500 hawks, streamed by in three distinct alleys over a 3½ hour period.

We were grateful that there had been four observers on the summit. If only one or two people had been there, thousands of birds would probably have been missed. Even with four people scanning the skies, perhaps as many as 2-3,000 birds might have passed unseen if it hadn't been for Leif's scope and his intelligent use of it. Perhaps our greatest mistake was failing to notice and count species other than broadwings in the kettles. We did see 46 Ospreys, many of which were majestically topping off kettles, but we undoubtedly overlooked Sharp-shinned Hawks, American Kestrels and other species.

Believing that our total is credible, we questioned what factors might explain the magnitude of the flight. We first looked to the weather. Leif obtained synoptic weather maps for North America for the 850, 750 and 500 millibar levels, or approximately 5,000'; 10,000'; and 20,000' respectively.



WEATHER SYSTEMS, SEPTEMBER 12, 1978

6 p.m. EST, 850 mb
(shading denotes cloud cover)

PREDOMINANT SURFACE WINDS

SEPTEMBER 13, 1978

On September 10, an intense low pressure system hung over the Atlantic east of Newfoundland while two weak lows hovered over James Bay and the Wyoming-Montana border. A small high pressure system, which I've arbitrarily termed the "Keewatin high," was forming over the Keewatin district of Canada.

On the 11th, the eastern low intensified as it moved eastward slowly. The low over Montana remained there, deepening. Clouds enveloped the entire northern U.S. from the Pacific to Michigan, and all of southern Canada from Vancouver to New Brunswick. The shroud extended down the Atlantic coast from the St. Lawrence to southern New Jersey.

The eastern low continued to move eastward on the 12th; the Montana low remained stationary. The Keewatin high, however, began to bulge almost due south, intersecting the two low pressure systems and clearing the skies over the Canadian side of the Great Lakes and into northern New England (see map). By 7 p.m. EST the entire northern U.S. from Nebraska to the Atlantic was overcast, with the notable exception of a channel of clear skies almost bisecting New England. At the northern tip of this swath of sunlight, in southeastern Quebec, winds at 5,000' were 21-31 mph out of the northeast. In the southwestern corner of the province winds were from the north at 15-25 mph.

The arrival of the polar front in southeastern Canada and northern New England, following the warm winds and rain of the 11th and 12th, brought very cold air in over rather warm earth. In Boston, which is unusually warm during this season because of its coastal location, the highest temperature on the 13th was 20° F. below the high of the previous day. In the corridor of dry sunny skies, conditions were ideal for the development of powerful thermal updrafts. The positions of the two dominant air masses in the northeast, the low off Newfoundland and the polar high shooting almost due south, provided modest-to-strong winds which blew thermal bubbles in the desired southerly direction and provided a tail wind.

New England field reports confirm the impression that these conditions were ideal for Broad-winged Hawk migration. On the 13th, a number of major hawk watching sites in the northeast recorded their biggest broadwing flights of the year; in some instances ever. Mt. Tom had 3,822; Southwick, 2,429; Watertown, Connecticut, 4,186; Hook Mountain, New York, 4,378; and of course Mt. Wachusett, 10,086. The same high pressure system presented Hawk Mountain with its all-time record-breaking flight of 21,488 Broad-winged Hawks on the 14th. Clearly, the Keewatin high had produced one of the most extraordinary hawk flights ever recorded in the northeast. (Although few non-raptorial diurnal migrants were reported on the 13th and 14th, one must question if there was not a major nocturnal migration during that period, enabling large numbers of passerines to "blow through" New England.)

Yet the question remains: why did Mt. Wachusett have the largest hawk flight reported in New England? We can only speculate.

The accompanying flow table illustrates that Little Round Top in Bristol, N.H., Pittsfield and Mt. Everett in western Massachusetts, and Salisbury and West Hartland in western Connecticut, had little perceived migration. Significant hawk activity was observed between the Uncanoonucs and Derry in New Hampshire, and Westhampton and Wachusett in Massachusetts. This concentrated activity began and ended earlier, and was of much shorter duration, in the western portion of this corridor than in the eastern half. Mt. Tom had 91.8% of its broadwings between 10:30 a.m. EST and 1:00 p.m.; Southwick, 94.2%; and Westhampton, 99.5%. Warner Hill, in Derry, had well under half its hawks during those 2½ hours and Wachusett had only 41.8%.

The structure of the flight, studied in conjunction with the local surface winds map, leads to the following extended hypothesis regarding the origin and nature of the flight over Mt. Wachusett.

Either the sudden drop in temperature, the excellent thermal conditions, the favorable winds, or any combination thereof, induced large numbers of Broad-winged Hawks to migrate within a relatively short period of time.

As the hawks moved quickly into northern New England, those in the western portion of the corridor of sunny skies encountered westerly winds which caused some drift eastward. They compensated by cutting west or southwest as they progressed from thermal to thermal, but there was some general drift to the east. Broadwings migrating out of the maritimes, however, had northerly or northeasterly winds which carried them south or southwest, requiring little or no compensatory action.

Assuming that the Atlantic coast functioned as a leading line, the flight paths of substantial numbers of broadwings converged as they approached the coastal counties of southern Maine and New Hampshire. The combination of westerly winds less than 60 miles inland and easterly winds off the ocean probably directed the birds into a relatively narrow front. Given these conditions, one could hypothesize that the western birds, travelling shorter distances, would arrive earlier. They did. One might also expect that the eastern portion of the corridor, presumably drawing birds from a larger area, would contain more birds. It did.

Continuing this line of speculation, as the eastern birds approached the Fitchburg--Leominster region, they encountered a series of hills northeast of and essentially parallel to Mt. Wachusett. Powerful thermals were rising off these hills, which increase in elevation as you procede southwest. When it became obvious that some broadwings were achieving high altitudes very quickly using the lift of these thermals, birds from a fairly wide radius streamed into those columns of rapidly rising air. As the birds rose quickly, the northeast winds blew their thermals southwest, creating a thermal street in the direction the birds were heading. As the hawks peeled off from their kettles with a running start, they used the tail winds to achieve unusually high land speeds. The sight of hundreds, then thousands, of birds rocketing upward attracted additional thousands from an even wider radius.

NEW ENGLAND HAWK FLOW TABLE

SEPTEMBER 13, 1978

TIME (EST)	7:30	8:00	8:30	9:00	9:30	10:00	10:30	11:00	11:30
Frankfurt, ME	(0)		(19)		(0)		(13)		(0)
Bristol, NH	-	5	17	15	4	9	6	7	6
Hopkinton, NH	-	-	-	-	-	-	-	-	-
Derry, NH	-	0	0	0	3	0	0	0	4
Uncanoonuc, NH	-		(17)		(683)		(318)		(98)
Wachusett, MA	1	4	48	5	6	18	0	2	2387
Mt. Tom, MA	1	21	22	145	67	195	767	413	1937
Westhampton, MA	-	-	-	-	-	-	283	0	200
Pittsfield, MA	(0)		(14)		(97)		(7)		(0)
Southwick, MA	23	3	16	31	60	0	22	56	820
W. Hartland, CT	-	0	0	0	1	0	0	2	0
Mt. Everett, MA	-	2	5	1	3	1	4	0	0
Salisbury, CT	-	-	-	-	16	20	4	143	325
Watertown, CT	-	2	6	10	10	4	-	-	-
Brookfield, CT	-	-	-	0	8	7	0	56	27
Hook Mt., NY	5		(70)		(98)		(18)		(9)

	12:00	12:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	TOTAL
Frankfurt, ME		(0)		(3)		(0)	-	-	-	-	28
Bristol, NH	28	3	4	0	0	4	0	4	0	-	112
Hopkinton, NH	-	-	-	-	-	-	-	0	0	-	0
Derry, NH	346	557	1071	29	-	-	-	-	-	-	2010
Uncanoonuc, NH		(17)		(159)		(228)		(105)	-	-	1625
Wachusett, MA	1598	233	530	1470	1130	1226	1287	137	4	-	10086
Mt. Tom, MA	247	144	65	26	0	48	7	41	85	91	3822
Westhampton, MA	-	400	2	1	-	-	-	-	-	-	887
Pittsfield, MA		(5)		(5)	0	0	0	0	0	0	128
Southwick, MA	1350	41	0	7	0	-	-	-	-	-	2429
W. Hartland, CT	0	0	1	3	0	-	-	-	-	-	7
Mt. Everett, MA	0	0	0	0	6	0	-	-	-	-	22
Salisbury, CT	6	121	6	16	-	-	-	-	-	-	657
Watertown, CT	-	1097	1	304	1576	4	717	452	3	-	4186
Brookfield, CT	14	14	16	17	-	-	-	-	-	-	159
Hook Mt., NY		(1)		(124)		(4015)		(38)		(0)	4378

Much of what we observed supports the thermal street hypothesis. The hawks moved in three distinct alleys, each of which was sustained for approximately one hour. Within these alleys, the hawks were always discovered kettling to the northeast of the summit, with the kettles moving to the southwest. When the birds peeled off, they would glide over or past the mountain without rekettling within our vision and with no precipitous increase in their glide angles. Furthermore, they were always flying quite high, generally at or beyond the range of unaided human vision and often at the limits of binoculars-assisted vision. Despite their apparently high altitude, the hawks also appeared to be moving very quickly. We never saw them with wings tucked back in a steep glide nor at any time prior to 3:30 p.m. EST did we observe sustained flapping by any number of broadwings.

The apparent altitude and speed of the hawks caused us to question how high and how fast broadwings can fly. We have never seen them flying higher or faster than they appeared to be on the 13th. We had only two indications of the birds' actual altitude. The hawks which flew directly over the summit, exposing most of their ventral surface area, were at the very limits of unaided human vision. Regrettably, we can find no references in the literature regarding the distances at which humans can first perceive broadwings offering close to maximal surface exposure.

We did observe a kettle of 150+ broadwings rising into a cloud in the second alley. Leif's research revealed that the cloud base was between 8-10,000' ASL. As these birds seemed to be some distance (horizontally) from the summit, visible through Leif's scope only, the hawks were probably a minimum of 7,000' above the terrain, an altitude considerably higher than any reported by the New England Hawk Watch glider study.

The apparent speed of the birds was also thought-provoking. Using extremely rough calculations, Leif estimated that the hawks might have been flying more than 70 mph in their glides, perhaps reaching 100 mph. These figures are so radical, however, that Leif hesitated to even mention them to me.

Independently analyzing the structure of the flight through a nine-state region on the 13th and 14th, I found a pattern suggesting that a wave of broadwings might have been moving through New England at an average ground speed of 70+ mph over a period of several hours. However, there is absolutely no means of proving that the wave recorded contained the same individual birds.

When Leif and I began to discuss flight speeds, the similarity between our estimates tantalized us. We agreed it was necessary to more closely examine the parameters of flight of the broadwing and other hawks.

The flight of September 13, 1978, generated many questions but few answers. How high can Broad-winged Hawks fly? Do observers often fail to perceive hawks because the birds are flying high, out of the range of human vision? Do we miss flights because we aren't using our scopes often enough? How far away can people perceive hawks flying directly overhead? Approaching head-on? Flying parallel to, but some distance from the site?

How fast do broadwings and other hawks fly? What land speeds can the broadwing attain, and how long can it sustain such speeds in migration?

This fall some members of the Eastern Massachusetts Hawk Watch will attempt to begin to answer some questions regarding the parameters of hawk flight. An experimental program using a cinetheodolite, a cross between a surveyor's transit and a 35 mm movie camera, will be conducted on Mt. Wachusett. We hope to gather data on the altitudes, glide angles, ground speeds and headings of Broad-winged Hawks in migration. Weather Services Corporation of Bedford, Massachusetts, is generously providing the watch with the most comprehensive weather data available to aid our analysis of the fall migration.

We may never see another hawk flight like that of September 13, 1978, at Mt. Wachusett, but in years to come, perhaps we'll better examine and understand the flights we do observe.

ACKNOWLEDGEMENTS

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