

SPECIAL REPORT

EAST LINE ROAD FIRE

PLYMOUTH, MASSACHUSETTS

MAY 15, 1971



PREPARED BY

REVIEW COMMITTEE

NORTHEASTERN FOREST FIRE PROTECTION COMMISSION

INTRODUCTION

This investigation was made at the request of Director Bruce S. Gullion, Director, Division of Forests and Parks because of the very unusual nature of the fire and the fact that it resulted in injuries to eight fireman.

REVIEW COMMITTEE

William Bennett, District Fire Warden, Massachusetts

Sidney Thompson, District Fire Warden, Massachusetts

Fred Holt, Deputy Forest Commissioner, Augusta, Maine

Monte Glovinsky, Forest Fire Weather Forecaster, U.S. Weather Bureau, Boston, Mass.

Richard Thompson, District Ranger, Warrensburg, New York

Douglas Baker, Forester, U.S.F.S., Upper Darby, Pennsylvania

A. E. Eckes, Forester, U.S.F.S., Upper Darby, Pennsylvania

Rodney Sando, Fire Research, North Central Forest Experiment Station,
St. Paul, Minnesota

Milton C. Stocking, Executive Secretary, Northeastern Forest Fire Protection
Commission - Chairman

The Committee met at the Myles Standish Forest headquarters on May 26 and 27 and reviewed what took place at the fire. Following this we visited the fire area and were provided an excellent view of the fire by helicopter.

In addition to the review committee the following people were present and provided us with valuable information.

Richard Ford, District Fire Warden

Bruce Gullion, Director, Division of Forests and Parks

Howard Hurley, Chief Fire Warden, Division of Forests and Parks

Stanley Knight, Observer, Bourne Tower

Weldon LaVoie, Deputy Chief, Plymouth Fire Department

Charles Orsi, District Supervisor

Arthur Terry, Patrolman

On June 15 a sub-committee consisting of William Bennett, Sidney Thompson, Alfred Eckes, and Milton Stocking met at the Plymouth Fire House and interviewed the following injured firemen, two of whom were burned so badly it was not possible to talk to them at our previous meeting:

Lawrence W. Sawyer, Captain
Federal Furnace Road
Plymouth, Mass. 02360

Warren R. Diegoli
3 West Street
Plymouth, Mass. 02360
(Firefighter)

David Grennell
Bartlett Road
Manomet, Mass.
(Firefighter)

These men were accompanied by Deputy Chief LaVoie.

The following men were the most seriously burned and are still hospitalized.

Joseph Folger
Lady Slipper Drive
RFD 3
Plymouth, Mass.

John Vincent
Forest Avenue Ext.
Plymouth, Mass.

The East Line Road fire, which burned 35 acres of Myles Standish State Forest land and 130 acres of adjoining private land, was first detected on May 15, 1971 at 1:35 P.M. The fire was in the pine-oak fuel type on sandy hilly terrain and was burning under the influence of a SE seabreeze of about 12 mph. Humidity was recorded at 1:45 P.M. at Myles Standish at 25%, fine fuel moisture was 5.5%.

Initial attack by State Patrol truck and brush breaker appeared to be successful, and three Plymouth town brush breakers intended to tie the fire off and complete control. At about 2:05 unusual fire behavior occurred. A shifting wind and an observed flame sheet 50 feet high engulfed the two Plymouth fire trucks which were beginning to attack the east flank of the fire, just east of the East Line Road.

A possible contributing factor to the unusual fire behavior is the area ignition of a methane gas bog, which probably increased the depth of the flaming front and added to the residual heat of the internal fuels about 5 minutes before wind shift.

The actual fire behavior which resulted in the flame sheet enveloping the trucks was probably the result of a southwest gradient wind overcoming a SE seabreeze. The extremely turbulent winds, with high speed updrafts (possibly to 50 or 60 mph) which passed over the fire at that time resulted in a sharply increased rate of burning and a transfer of residual heat from the NW head of the fire to the NE flank. The combination probably resulted in an extremely hot wave of radiating gasses passing directly over the two brush breakers.

The fire began at 1:35 P.M., the bog probably burned off at about 2:00 P.M., the weather front passed over the fire at about 2:05 P.M. The fire was controlled at 3:45 P.M. and was declared out at 9:00 P.M.

The fire fighting forces on the fire at 2:05 P.M., one patrol truck and one brush breaker from the State and three brush breakers from Plymouth, were attacking the fire in a logical and usually safe procedure. The frontal passage over the fire at that precise instant resulted in the complete disablement of two trucks, the hospitalization of eight men, and loss of control of the fire. Two of the Plymouth men were severely burned, two required ten days hospital care, and four others were treated for varying degrees of burns and released from the hospital the same day. All of the men on the fire were experienced, full time fire fighters, and were using discretion in their attack. To affect control, 16 fire units were used on the fire, with 11 of them arriving after the 2:05 blow-up.

Several unusual occurrences should be pointed out to indicate the extreme nature of the fire behavior.

1. One of the trucks was within 50 feet of the unburned road area, the other was within 100 feet. None of the men had enough warning of the intense flame sheet to allow him to move the 50 feet to safety.
2. Both of the truck engines and the independent pump engines died, possible from lack of oxygen. After the fire went over, the engine of one of the trucks was restarted and the truck was driven to the road, even though the tires and engine wiring was burned.

The unusual behavior of the fire at the point where the men were burned is probably the result of a combination of terrain and a seabreeze overridden by a gradient front.

A report by Monte Glovinsky of the U. S. Weather Bureau, Boston office, clearly substantiates the fact of the seabreeze weakening and being replaced by the gradient front. His report is included

Interview at Plymouth Fire House - June 15, 1971

Captain Sawyer was riding in the right side of the cab of the truck that was trapped on the knoll and makes the following observations:

Smoke column going straight up on arrival at fire.

Intense heat came ahead of the flame burning the paint from the hood of his truck.

Truck motor stopped - had driver try to start it.

Flames came in the left side of the cab seriously burning the driver, John Vincent who remains hospitalized.

Ground fire was a wall of flame 4' - 6' high but the air above as high as he could see was literally filled with burning embers.

When the truck could not be restarted they left the cab through the right door - side toward fire.

Vincent, suffering from burns, fell out and Sawyer was able to help him to the road by travelling in a crouched position.

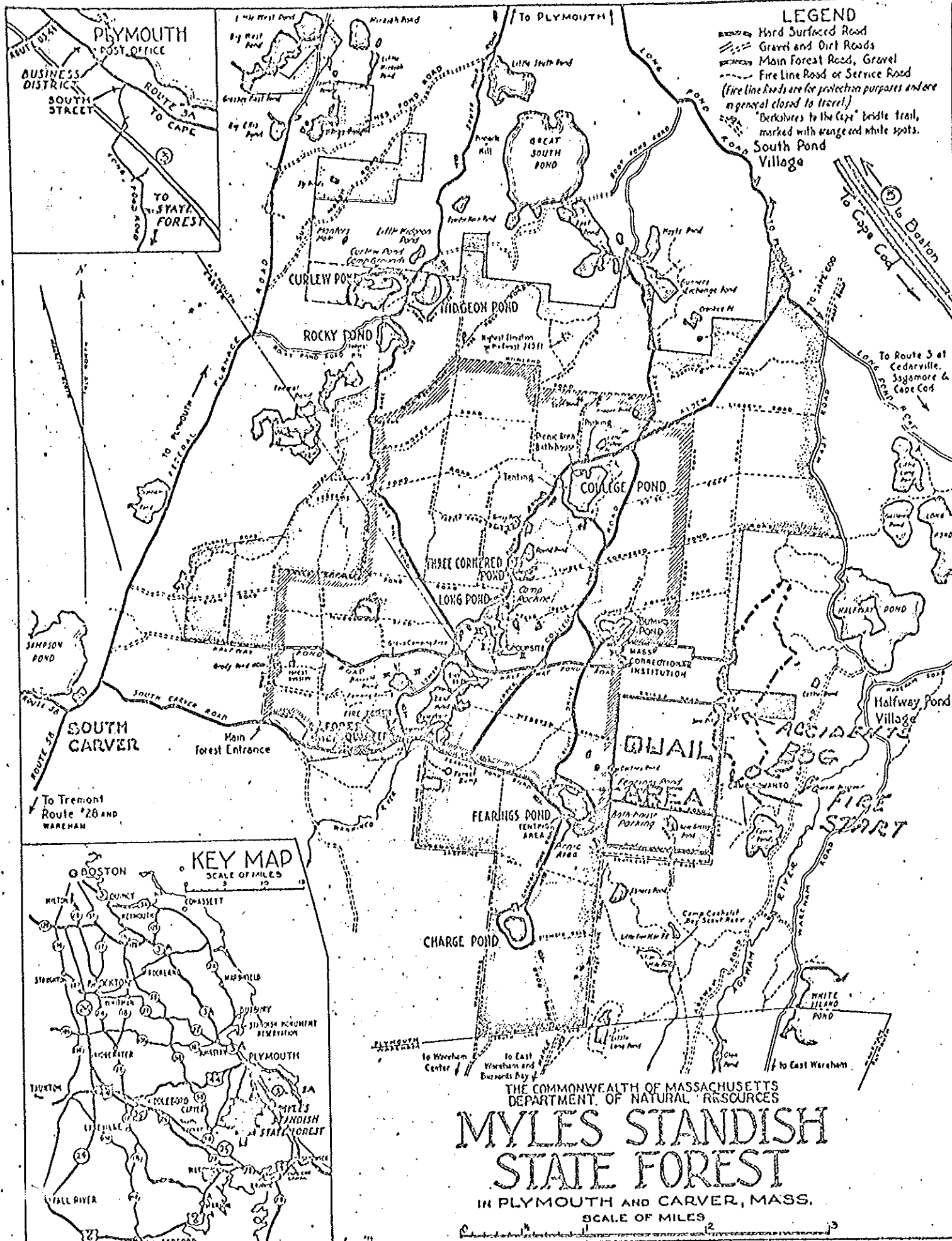
While lying in the road they felt extreme suction pulling in the direction of the fire.

Warren Diegoli - rode on the back of Captain Sawyer's truck, right side of the reel. His partner Folger was on the left side of the reel - he is still hospitalized. Diegoli said he was attempting to open pump valves - no pressure- he saw his hands crack open without pain - no flames present. He was impressed with extreme heat, trees seemed to explode, particles of fire swirled upward. He left the truck and made his way to the road - not certain how Folger got to the road.

David Grennel - on smaller truck in hollow. Truck left East Line Road at about same point that Captain Sawyer's truck went in but had gone over the knoll and proceeded to ravine. When truck got into ravine there was a loss of power in both the truck and pump motor. Grennel reports that they turned the truck toward the road but could not make it. They abandoned the truck and made their way to the road. He was the most seriously burned in his crew - examined at hospital and released the same day. As it turned out his burns were more serious than realized. It took a week or more before burns blistered.

Assumptions

1. Fire was burning in SE seabreeze conditions.
2. Fuel type was pine-oak - 50% dead - type 1D
3. Not exhibiting unusual Fire Behavior.



LEGEND

- Hard Surfaced Road
- Gravel and Dirt Roads
- Main Forest Road, Gravel
- Fire Line Road or Service Road (fire line roads are for protection purposes and are in general closed to travel)
- "Decks to the Cape" bridge trail, marked with orange and white spots.

PLYMOUTH
POST OFFICE

BUSINESS DISTRICT

ROUTE 3A TO CAPE

TO STATE FOREST

TO PLYMOUTH

TO WAREHAM

TO TREMONT ROUTE #28 AND WAREHAM

SOUTH CARVER

TO ROUTE 3 AT CEDARVILLE, SYCAMORE & CAPE COD

KEY MAP
SCALE OF MILES

BOSTON

MILTON

QUINCY

ROSLINDEN

PLYMOUTH

PLYMOUTH STATE FOREST

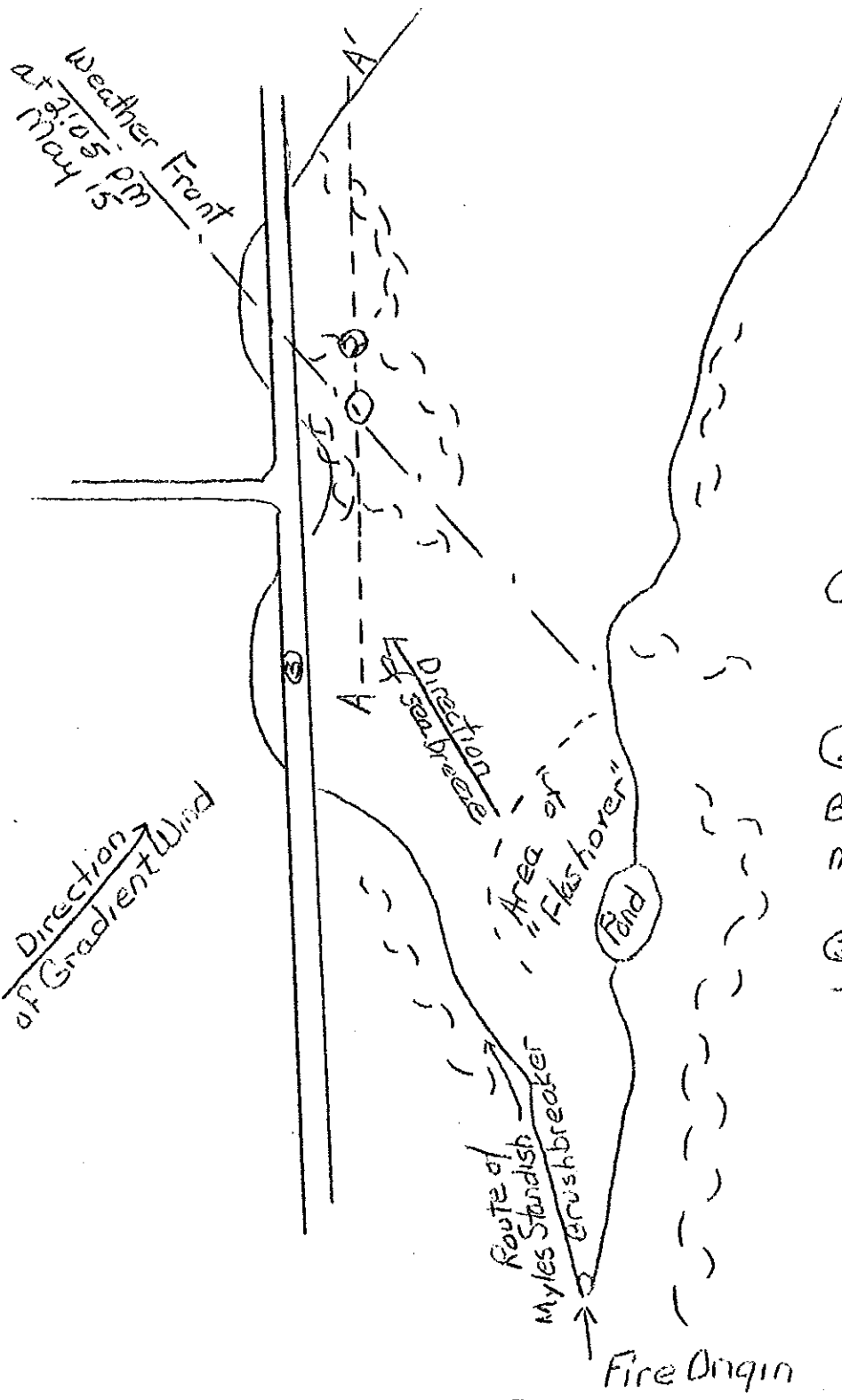
FALL RIVER

NEW BEDFORD

THE COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF NATURAL RESOURCES

MYLES STANDISH STATE FOREST

IN PLYMOUTH AND CARVER, MASS.
SCALE OF MILES

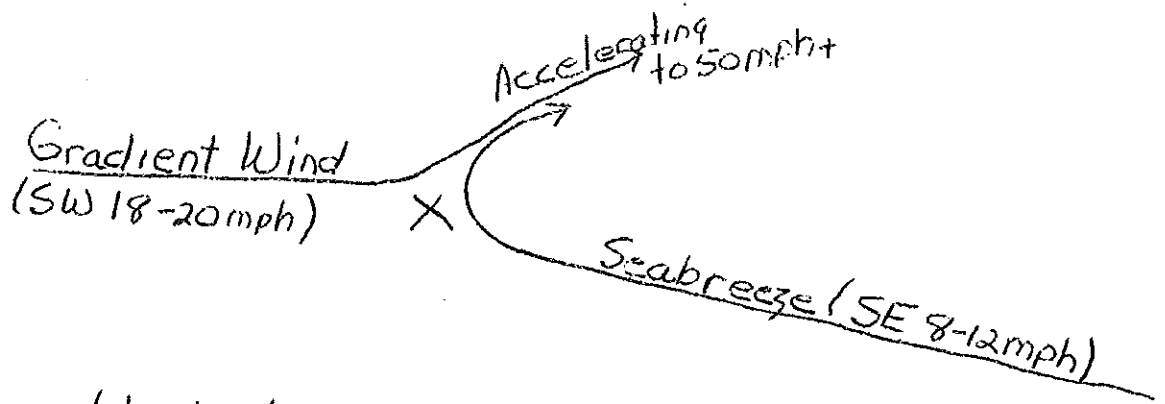


- ① Location of Plymouth Brushbreaker Least damaged.
- ② Location of Plymouth Brushbreaker with 2 most seriously burned men
- ③ Location of Art Terry & patrol truck



topo cross section thru A-A'

Illustration 1



Wind at X estimated at 20 to 50 mph, caused by the turbulent up draft of the weather frontal action.

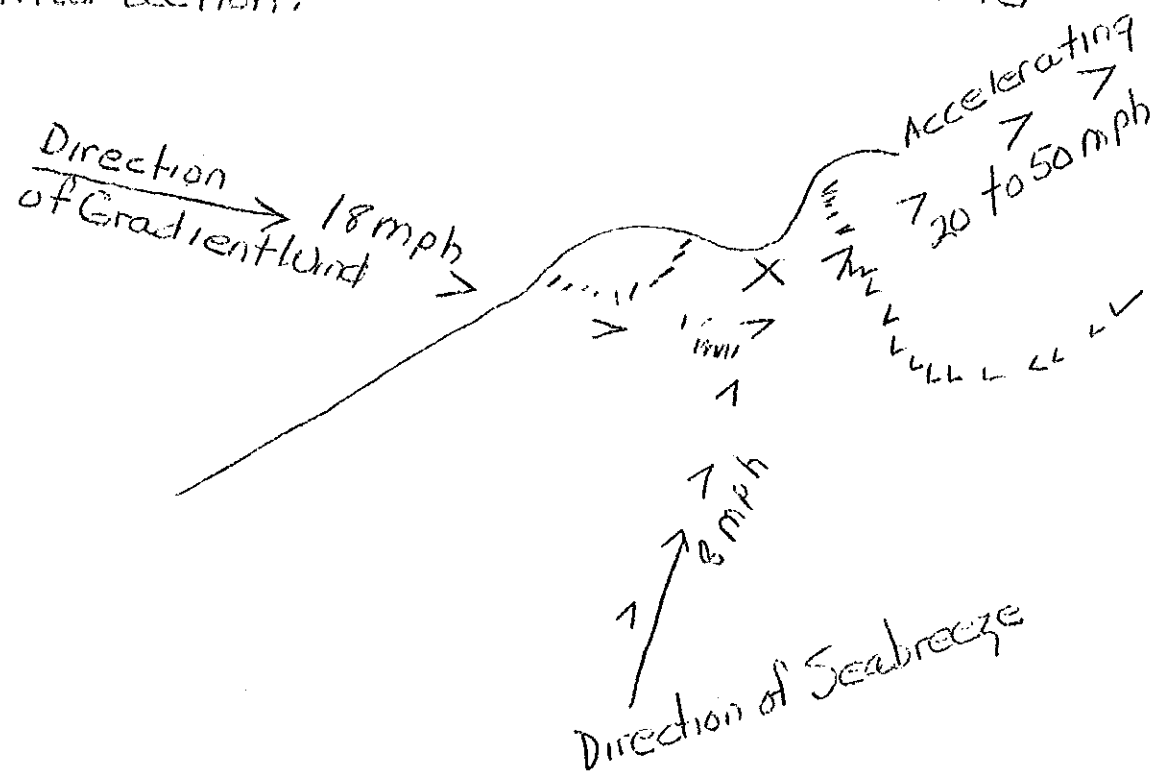


Illustration 2

4. Assignment of equipment and manpower was SOP.
5. Flashover fire observed just prior to acceleration of flame front.
6. Flashover probably was unrelated to accident (except for accelerating effect on initial fire).
7. Fire behavior was the result of extremely unusual and unpredictable coincidence of frontal winds, terrain, sea breeze and fire front.
8. If the weather front had not been in that location at that instant no unusual fire behavior would have occurred.

Recommendations

1. Initiate a research project to study weather problems in the Myles Standish Forest.
- FD 2. Emphasize safety training - Fire Behavior and Tactics.
- FD 3. Investigate anti-stall devices for fire trucks.
- FD 4. Provide protective clothing for crews.
5. Consider development of fire shelter trucks.
6. Consider helicopter attack.
- ? 7. Provide specialized fire fighting force.
8. Initiate a study to determine what effect swamp gasses may have on forest fires.

Report by Monte Glovinsky - Forest Fire Weather Forecaster, U.S.W.B., Boston

A fire started near the Myles Standish State Forest, Plymouth, Massachusetts at about 1:40 P.M. EDT on Saturday, May 15, 1971. A sea breeze front had penetrated much of the eastern New England coastal region earlier in the day and this fire began in the cool air, east of the front, under the influence of a very stable onshore southeasterly wind. Fire control activity appeared to be very effective with no unusual problems. The fire was spreading slowly northwestward. However, at about 2:15 P.M. EDT that portion of the sea breeze front was suddenly dislodged by a strengthened southwesterly flow and this resulted in a fire "blow up" that overran fire control lines on the northeast side of the fire. Eight fire-fighters were burned and required hospital treatment. In addition two fire apparatus were engulfed in flames and damaged. Before control was regained at 3:41 P.M. EDT, 165 acres of forest land were consumed.

Large scale weather maps showed that a high pressure center had moved off the Middle Atlantic coast during the forenoon of May 15, 1971 and a wave was moving eastward into central Quebec. The combination of these two systems caused the pressure gradient over southern New England to tighten considerably during the early afternoon. The result was an increasing west southwesterly flow of warm, dry and unstable air.

Sectional surface weather maps were prepared and analyzed for 1300 DST, 1400 DST and 1500 DST on May 15th, so that we might carefully investigate the meteorological events before and after the wind shift.

Figure 1, 1300 EDT (1700Z)

The sea breeze from the waters east of New England covers the area to the right of a line from just north of Nantucket to Falmouth to just south and west of Providence to just west of Boston, west of Concord and northeastward to Bangor.

Isobars over southern New England are in a west-southwest to east-northeast orientation except that they kink (toward high pressure) at the front and become more southwest to northeast thereafter.

Note: Southwest surface wind at Falmouth and southeast winds at Hyannis, Providence, Boston and Concord.

Pressure difference between Nantucket and Boston is $(1026.8\text{mb} - 1024.2\text{mb}) = 2.6\text{mb}$.

Fire started about 40 minutes after this map time.

Figure 2, 1400 EDT (1800Z)

Sea breeze front has been pushed eastward to a line from Hyannis to some 15 miles east of Providence to just west of Boston and some 20 miles east of Concord with little change northeastward (where isobars were about parallel to the front).

Note: Southwest winds now at Falmouth, Freetown, Concord; also warm sector south winds are at Hyannis and Providence. Southeast winds still at Myles Standish and Boston.

Gradient increasing as pressure difference ACK-BOS is now $(1026.8 - 1023.7) = 3.1\text{mb}$.

Fire at this time spreading slowly northwestward (blow up 15 minutes after map time).

Figure 3, 1500 EDT (1900 Z)

Sea breeze front has been pushed off the southeast Massachusetts coast and now lies along a line from just south and west of Boston, to just west of Portsmouth to Brunswick and Bangor.

Gradient has increased with pressure difference ACK-BOS $(1026.8 - 1022.9) = 3.9\text{mb}$.

Fire out of control (contained some 45 minutes later).

Note: At 2000Z (next hour) the pressure difference ACK-BOS reached 4.6mb, and the Boston observation showed a temperature climb to 68° (from 57 at 19Z) and wind 200° at 18 knots. This was the strongest wind for the day at Boston occurring during the initial surge of the wind shift.

The fire weather forecast issued at 7:00 A.M. DST 5/15/71 for this weather zone called for fine fuel moisture of 5% (based on cured herbaceous stage) and wind southwest 5 miles per hour.

The 2:00 P.M. DST observations from three reporting fire danger stations in the zone were as follows:

<u>Station</u>	<u>Wind</u>	<u>%FFM(cured)</u>	<u>Buildup Index</u>
Bradley Palmer	South 8	5.5	11
Freetown	Southwest 7	8	15
Myles Standish	Southeast 12	5.5	15

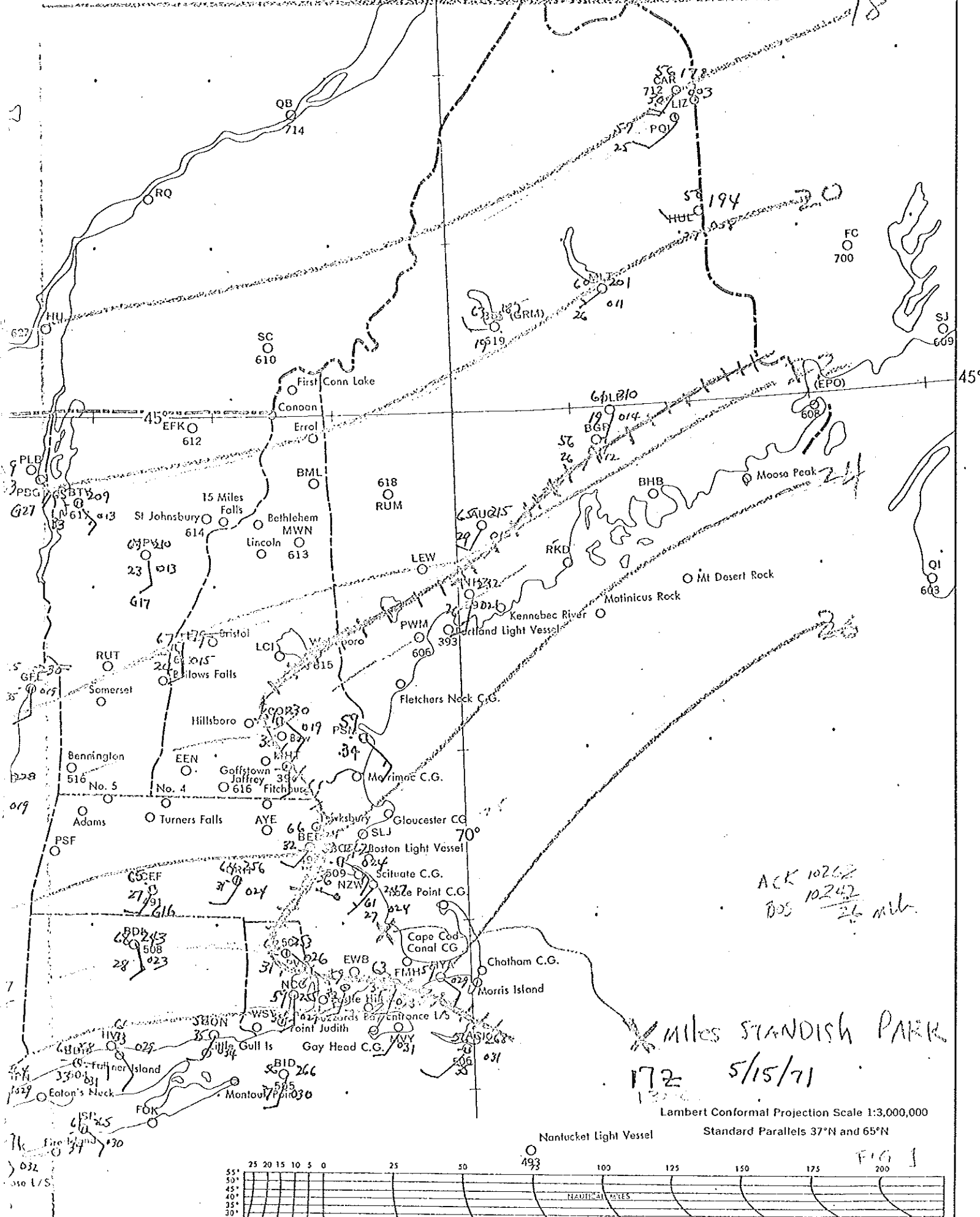
As is often the case, the winds at Myles Standish were somewhat higher than most stations in the zone.

Our established procedure for amended forecasts based on the degree of accuracy and the relatively low Buildup Index did not indicate the necessity for an amended forecast.

A special forecast was not asked for. We rarely (if ever) are requested to provide special forecasts for fires considered under control. Obviously, it was too late once the sea breeze gave up. In retrospect, I'm not sure that the events that did occur would have been correctly forecast anyway.

To "hindcast" - the increasing west southwest flow was indicated by the moving weather systems (which, of course, was the reason southwest winds were forecast). In addition, an objective method (5 A.M. Goldman) for forecasting the localized afternoon surface wind at Boston (not plymouth) did correctly forecast the wind shift (although at a much earlier time). On the other hand, once a sea breeze sets in along the southern New England coast, it normally persists through the entire afternoon. The cold air is usually hard to displace.

The state of the art of weather forecasting is still such that these particular events are very difficult to forecast. Nevertheless, I do feel one result of this fire will be a more careful check (on my part) of its chances of reOccuring.

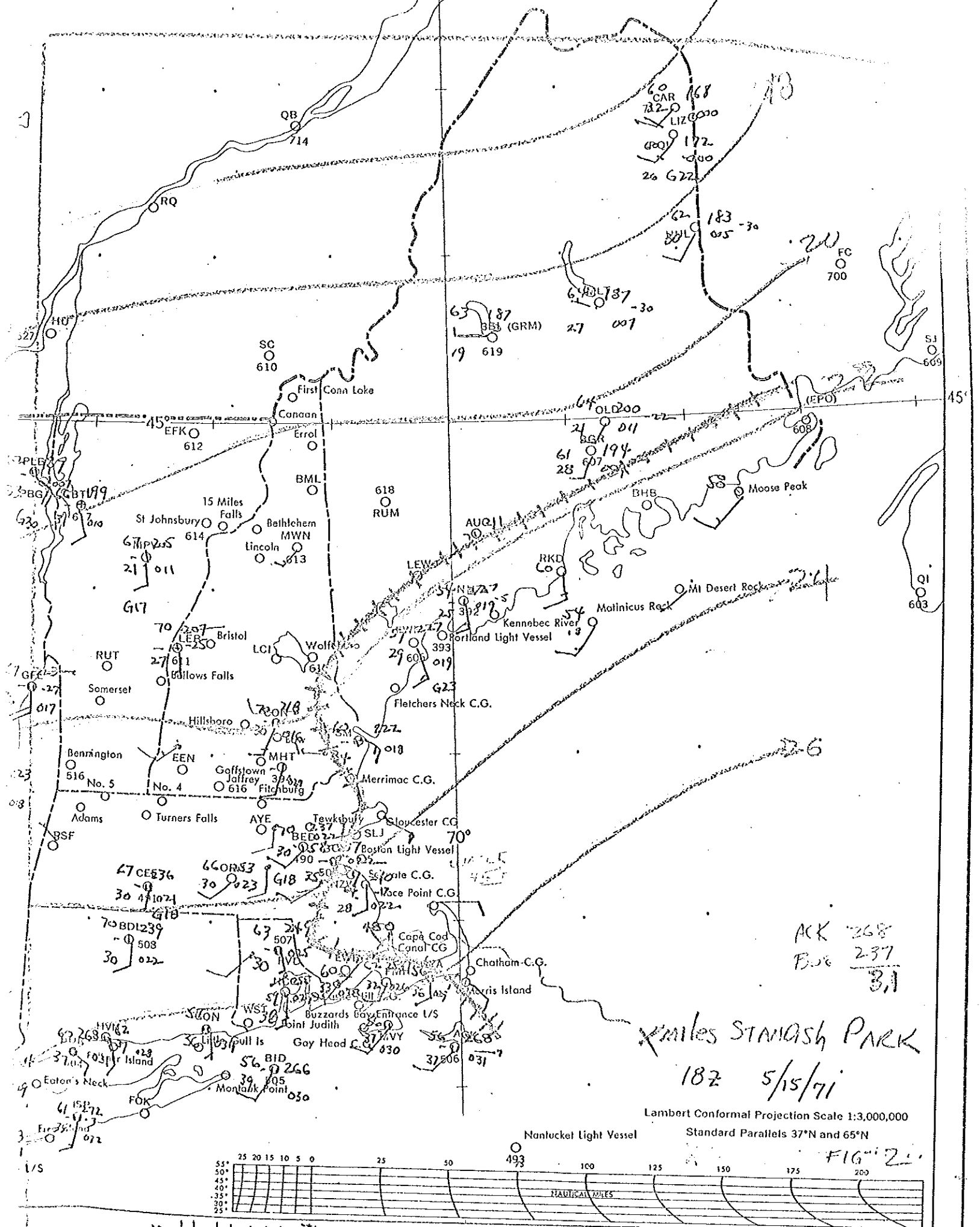


ACK 10262
 BOS 10242
 26 mil.

172 5/15/71
 1300

Lambert Conformal Projection Scale 1:3,000,000
 Standard Parallels 37°N and 65°N

FIG 1

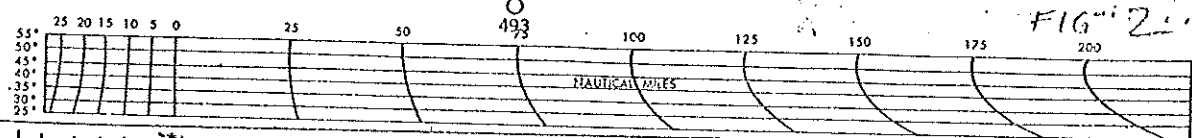


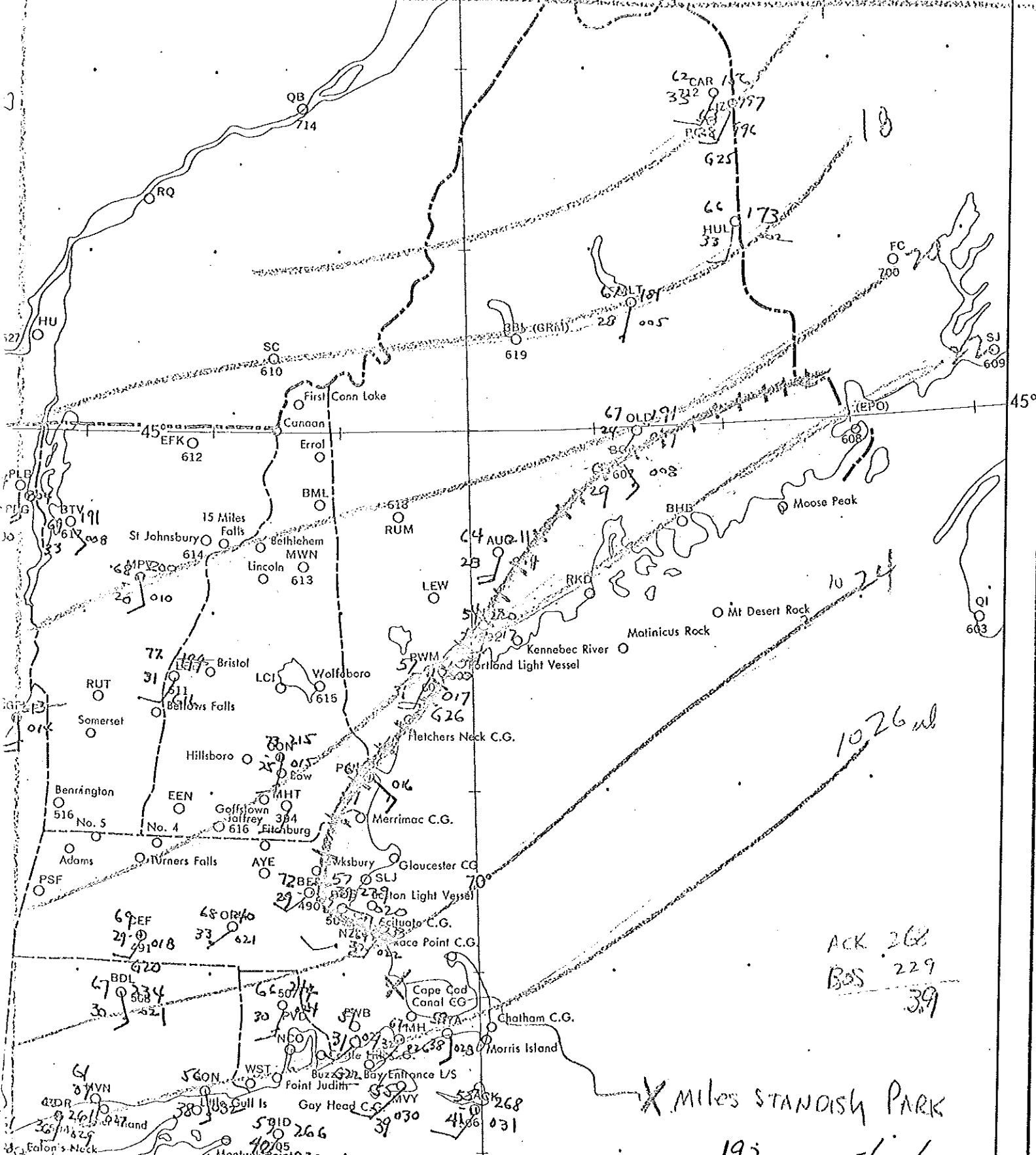
ACK 268
 Box 237
 31

Wales STANDASH PARK
 182 5/15/71

Lambert Conformal Projection Scale 1:3,000,000
 Standard Parallels 37°N and 65°N

FIG 2





1026 ul

ACK 268
 BOS 229
 39

X Miles STANDISH PARK

192 5/15/71

Lambert Conformal Projection Scale 1:3,000,000
 Standard Parallels 37°N and 65°N



FIG 3

