Northeast Regional Fire Outbreak of October 1947

Charts and Tables

Lloyd C. Irland Sept. 21, 2011

Highlights

1. This document presents a set of charts and tables embodying initial research on this important event.
2. The October 1947 fires were a truly regional event, occurring largely in coastal areas from New York State to Nova Scotia, though the largest and most widely recognized was the 208,000 acres of fires occurring in Maine. In Maine, the number of fires was not impressive – it was their size. (We have as yet been unable to document Massachusetts and Rhode Island)
3. Apart from Maine, fire experience in 1947 was not the worst of the 30's and 40's.
4. The drought conditions in several of these areas were of unprecedented duration and severity, and in some respects have not reccurred since. Yet, weather analysts believe that serious regional droughts will afflict the northeast once every 50 years.
5. In both Maine and New Hampshire, fires that would be considered large and dangerous by recent standards occurred occasionally in and near the '47 fire footprint – in decades preceding 1947 and since.
6. Further work is underway to document the frequency of weather conditions associated with really large fires, fill in data gaps in fire history, and document longterm fire experience in the '47 fire's footprint. We are also preparing a similar note on the more recent 61-65 Northeastern drought.

This note assembles primary data on the famous '47 fires. Because of regional weather patterns, it was truly a regional event and not confined to Maine and New Hampshire. We will build on this later to do a short analysis of what has changed since then.

Quebec experienced a mild 1947 for fires, with area burned well below its average for the 1940s, so we will not consider Quebec further here.

Introduction and Overview

Our principal data source is the listing of individual fires from MFS records as published in Commissioner's report 1947-48. Plus NH Forestry Commissioner '48 Report, and website of National Climate Data Center. *Note that all the area burned was not forest. Wilkin's 1948 summary says 206,000 acres total, of which 179,000 was forest; our tab from the report's table shows 208,000 acres. He reports 213,000 in his 1978 book (p. 258). See maps at end of memo.*

In 1947, Maine's total area burned was 12 times the 1903-2010 average annual area burned. The highest experienced since was about 30,000 in '57.

Maine is Plotted on log scale due to huge differences in fire sizes; many recorded were smaller than one acre.

The 1947 fire year in Maine began quietly with a rainy spring and summer. Then after mid July the weather along the Maine/New Hampshire Coast transitioned to prolonged drought – but people living it day by day did not know that till it had passed. By early October, though, signs of its severity were clear. The '47 Fires were not a bad fire season – they represented a terrible 2 to 3 weeks of fire. Not only that, but those 3 weeks occurred after a "normal" fire season would have been over. Longterm records from the National Climate Data Center indicate just how extreme this October was – it was basically a once in a century event (see charts at end of this paper). Maine's fires were broadly distributed in the coastal areas and nearby. More importantly, 1947 was the state's second worst fire year since 1903, and a 3.7 standard deviation event based on the 1903-1946 record.

Reviewing other years, the footprint of the Maine '47 fires saw occasional fires that would be considered large by recent standards, in the decades before 1947 and also since. This hints at a certain fire-proneness to these areas. Which is consistent with soil and vegetation types. We are pursuing a tighter documentation of this point. Coolidge supplies an accessible reference for largest fires in these years up to the late 60s.

The October fire outbreak illustrates another point – individual states are not usually good analysis units for fire experience. In both northern Maine and northern New Hampshire, fire experience was normal or below normal in Oct of '47 – partly because it was so much cooler up there normally. Also, the coastal climate belt extends from the eastern Maine coast southward to Rhode Island, where weather and soil and vegetation conditions have broad similarities. (Checking to see if coastal areas of Mass & RI and NB also had similar fire experience – Nova Scotia did)

For this reason, southern **New Hampshire** experienced a severe fire outbreak concurrently with Maine's October outbreak. New Hampshire's '47 fires did not come close in area burned to the state's previous records – it was only a modest event relative to the previous 40 yr record, and far less than the bad year of 1940.

In 1947 **New York** experienced a very heavy fire year, tho not as severe as several previous ones. In 1947 32,000 acres burned, not all forest. This contrasts with a statewide average 1970 to date of about 3100 acres/yr. The State forester's report credited effective response with preventing a severe drought from triggering much worse damage. The fall drought was extreme. Fire incidence was high south of the Adirondacks, with 2/3 of the year's area burned coming from just 3 Districts. There were 45 fires above 100 acres, totaling 2/3 of the total area burned. And 9 fires exceeded 600 acres. In 1948 with the return of more normal weather, area burned fell to the lowest level in previous 6 yrs. Consistent with the other states, the month of October saw the most fire activity and area burned.

Vermont experienced an unusual level of fire activity in October 1947, though the year as a whole was not unusually active. Total area burned was less than it had been in 1941, and about the same as 1944 and 1949. The number of fires was similar to adjacent years. Interestingly, though, the state experienced more than half its total number of fires in October, the same month as the regionwide outbreak. This was a surprising break from the normal pattern in which many of the fires were concentrated in April May and June. The fires were also larger than average: 70 % of the statewide area burned for 1947 occurred in October. That area alone was about 1500 acres, equivalent to the total area burned in some entire years during the 1940s. (seeking details)

For **Connecticut**, we have a few gaps in the record for the 1940s. It appears, though, that the 1947 season was milder for CT than the years 1942 and 1943, tho more severe than subsequent years.

We wonder if the **Maritime**s, being the northern shore of the Gulf of Maine, shared similar weather and fire experience in that year, and are checking. So far, we have not been able to find any relevant information.

For **Nova Scotia**, we have no time series history, but Dan MCckinnon of the DNR reports:

"I started looking through previous fire history fire notes that I have collected over the years and found some information that may be useful to you. Wildland fire in N.S. was a serious problem during 1947. Notes state that 45,000 acres burned, including a fire that burned around 10,000 acres in August on Cape Breton Island. A number of large fires also occurred in the province at: Lake Charlotte (Halifax Co.), Antigonish Co. Richmond Co. and Shelburne Co.

The previous year seems to have had a lot of extreme activity as well. On July 25,1946, a fire started in Halifax Co. and burned 6,000 acres, other large fires occurred at: Folly Mtn. (Colchester Co.), Antigonish Co. and Lake Rossignol (Queens Co.).

In 1942, the acreage burned was 28,119 including one fire in the central region that burned what was described as 25 square miles.

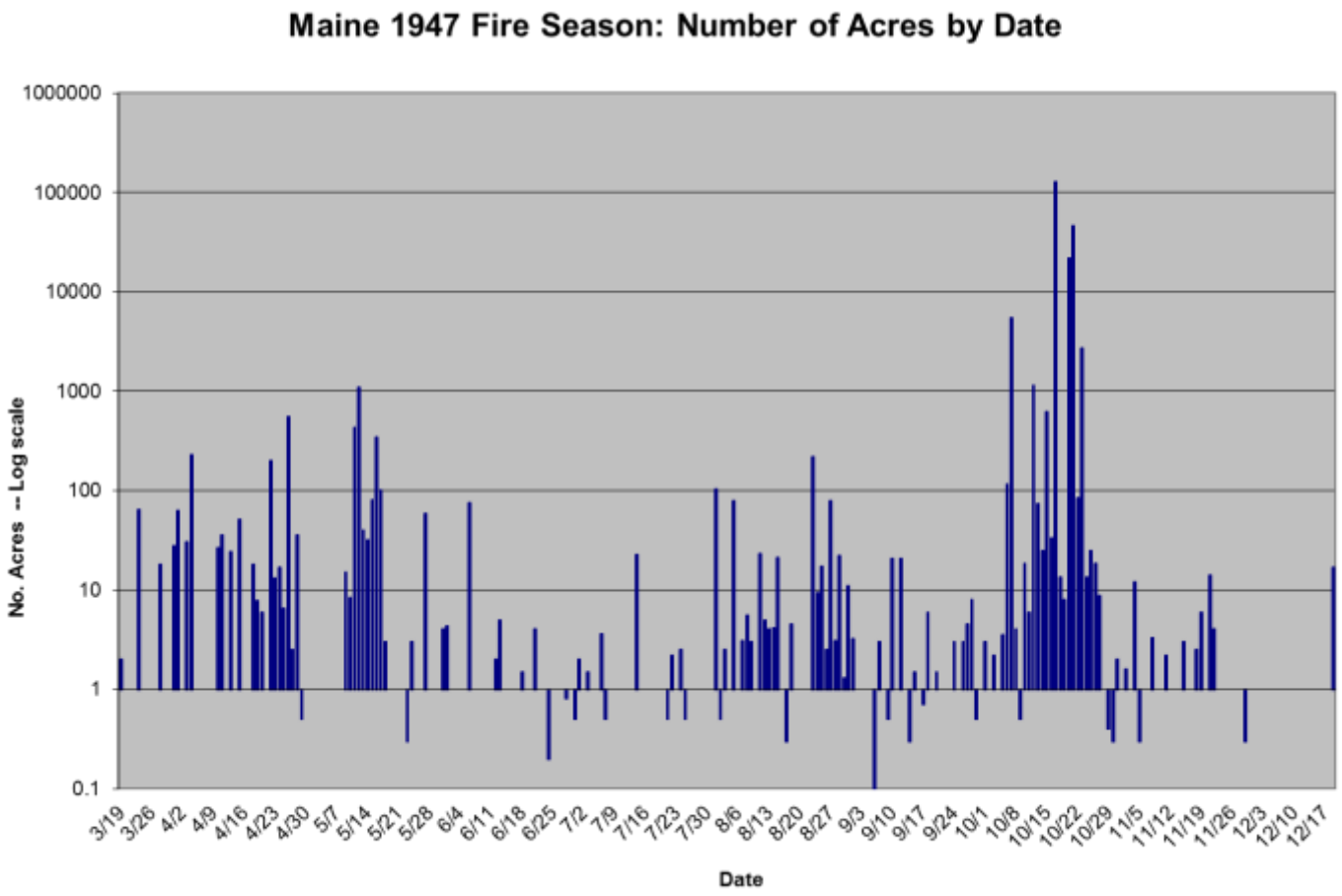
There seems to be a cluster of serious fire years during the 40`s (42, 44, 46, 47) that had extreme fire events." (McKinnon E=-mail to author. 8/4/2011)

Area Burned, 1947 Regional Fire Outbreak -- seeking missing cells.

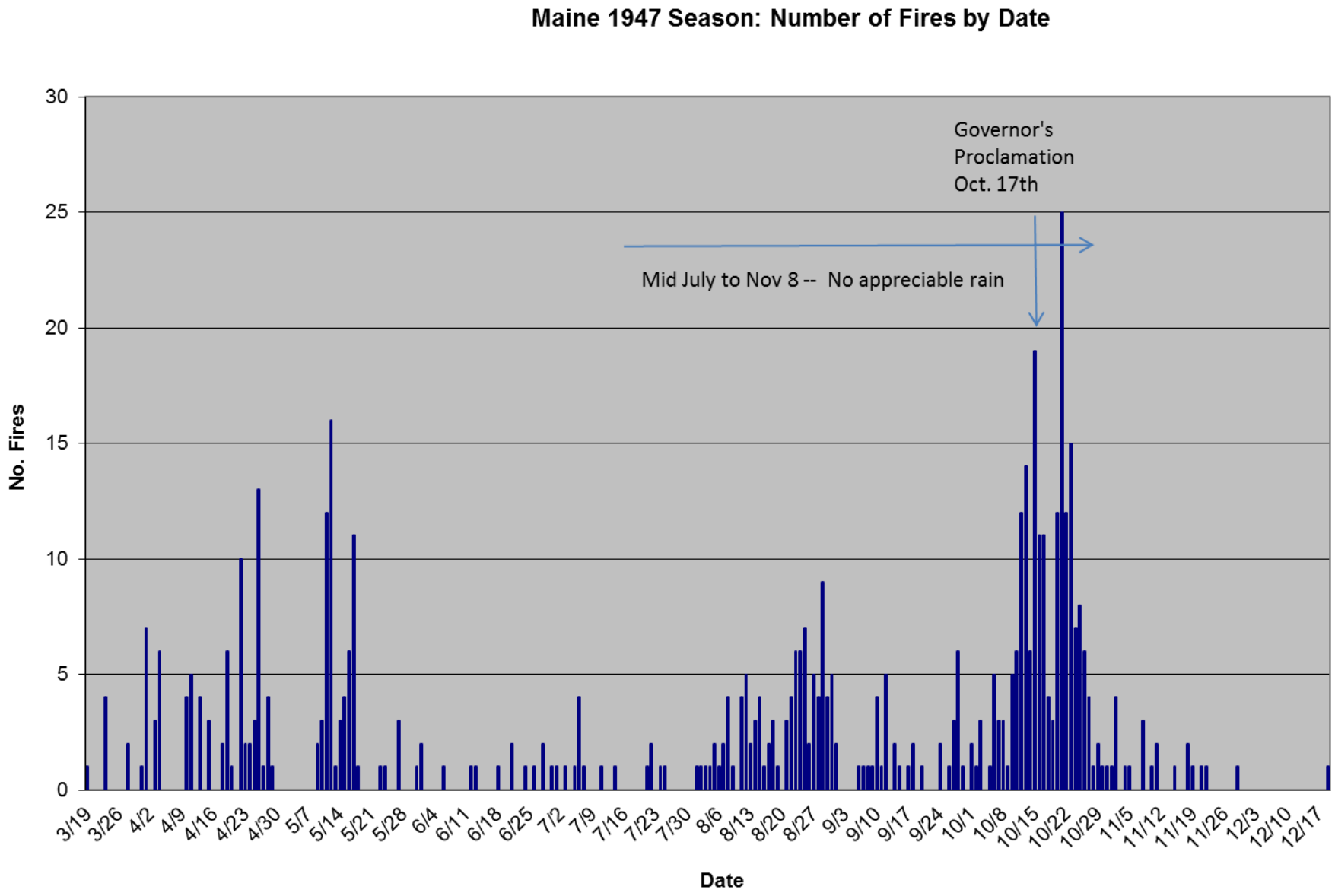
New York	31,683
Connecticut	4,422
Rhode Island	
Massachusetts	seeking – State did issue a Govs Proclamation Oct 16.
Vermont	2,214
New Hampshire	17,535
Maine	208,000
New Brunswick	
Nova Scotia	45,000

Will supply some preliminary observations/implications when further data come in.

Maine's 1947 Fire Outbreak



We assume entire burned area plotted on date fire started… source not clear on this. This would exaggerate the spikiness of the daily area burned record.


Maine 1947 Season: Number of Fires by Date
No. Fires
30
25
20
15
10
5
0
Governor's
Proclamation
Oct. 17th
Mid July to Nov 8 -- No appreciable rain
3/19
3/26
4/2
4/9
4/16
4/23
4/30
5/7
5/14
5/21
5/28
6/4
6/11
6/18
6/25
7/2
7/9
7/16
7/23
7/30
8/6
8/13
8/20
8/27
9/3
9/10
9/17
9/24
10/1
10/8
10/15
10/22
10/29
11/5
11/12
11/19
11/26
12/3
12/10
12/17
Date

Maine's 47 fires were concentrated along the Coast and nearby (S. Oxford County). It is noteworthy that in any other year, the fires in Washington and Sagadagoc, would have been memorable and record-breaking.

No. Fires and Area Burned by County

County	No. Acres	No. Fires	Avg size
Androscoggin	1,814.2	42	43.20
Aroostook	14.0	4	3.50
Cumberland	1,727.7	99	17.45
Franklin	74.0	13	5.69
Hancock	17,845.7	42	424.90
Kennebec	209.0	39	5.36
Knox	130.0	21	6.19
Lincoln	127.7	35	3.65
Oxford	20,636.4	40	515.91
Penobscot	949.3	14	67.81
Piscataquis	13.0	4	3.25
Sagadahoc	8,355.0	28	298.39
Somerset	2,983.7	22	135.62
Waldo	263.3	27	9.75
Washington	20,880.2	43	485.59
York	132,834.9	60	2213.92

Grand Total	208,858.1	533	391.85

Ken Laustsen, MFS, supplies data suggesting that in the late 40's there were some 450,000 acres forest in York County. Its land area is about 646,000 acres, so about 20% of the entire country burned over! In just a few weeks.

The year opened with a fairly normal spring fire season, and a wet early summer. Fires remained small through September. The fires of October were not only bigger, they were two orders of magnitude than the averages for the other months. October was so busy a month that it accounted for 98% of the entire year's burned area.

No. Fires and Area Burned by Month

Month	No. Acres	No. Fires	Avg Size
Mar	112	8	14
Apr	1,318	77	17
May	2,204	65	34
Jun	94	13	7
Jul	37	15	2
Aug	627	94	7
Sep	78	36	2
Oct	204,320	204	1,002
Nov	51	20	3
Dec	17	1	17
Grand Total	**208,858**	**533**	**392**

No. Fires and Area Burned by Cause			
Cause	No. Acres	No. Fires	Avg Size
Campfire	1,039	16	65
Debris	939	76	12
Incendiary	548	20	27
Lightning	14	12	1
Lumbering	85	19	4
Misc.	24,070	72	334
Railroad	1,056	15	70
Smoking	47,888	194	247
Unknown	133,219	109	1,222
Grand Total	208,858	533	392

Looks like with all the unknowns and miscellaneous they did not have a very good handle on causes then… too busy fighting the next fire to investigate the last one, most likely…

Maine 1947: Days by No. Fires		
No. fires	No days	
1 to 5	120	
6 to 10	15	
11 to 15	10	
16 to 20	2	
21 to 25	1	

From Apr to Nov inclusive, there were 101 days with no reported fires.

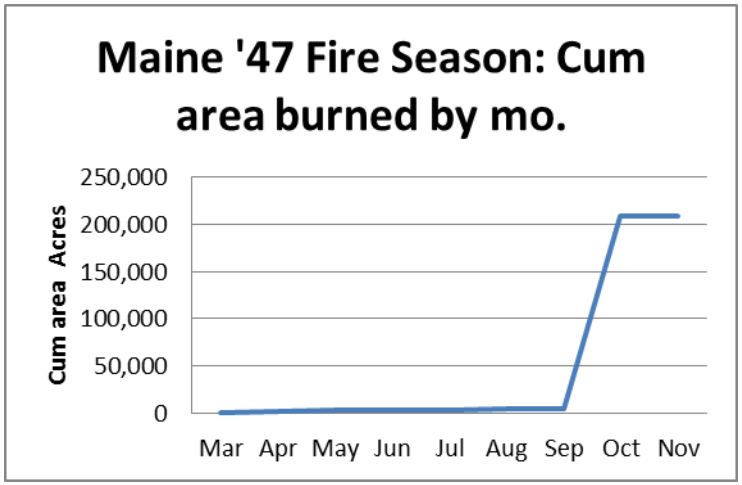
This table needs to be looked at together with the others – the days with lots of fires also had the big ones…

Looking at the detailed calendar, the busiest months were August -- 29 days w. fires and October -- 30 days with fires.

	Days w/Fire	Days w/o a Fire	Actual No. Days
Full year	148	217	365
Jan	0	31	31
Feb	0	28	28
Mar	4	27	31
Apr	18	12	30
May	14	17	31
Jun	10	20	30
Jul	11	20	31
Aug	29	2	31
Sep	18	12	30
Oct	30	1	31
Nov	13	17	30
Dec	1	30	31
	148	217	365

From the record we can calculate number of fires per day, but this hinges on attributing one fire to its date of ignition. This means that these numbers underestimate the total number of fires actually burning at one time. At the height of the May burn, 14 days had fires, and the average was 5 per day. In October, 30 days had new fires, averaging 7 fires each and every day. This followed fairly busy August and September activity. The problem in October was the immense size of the few big fires, their threats to property, and the cumulative exhaustion factor after so many continuous days of action.

In terms of area burned in Maine , 1947, as of September, was set to be a real yawner – possibly the lowest area burned of the decade, with only 4,470 acres burned by the end of the month. (The weather, though, was telling a different story….see references)



Assessments of Fire Impact

Following the fires, USFS staff made several reconnaissance surveys to document the damages due to the fire and help plan remediating measures (Nutting et al 1948; Forest Survey, Div For Econ. 1948). A timber cruise for the SW Maine area gives an indication of the stand types affected[1]. Out of a survey area of 151,00 acres, 86% was forest. About 1/6 of the area was in sawtimber stands and a similar proportion in poletimber. Of that area, 48,000 acres, more than half was in softwoods. In vivid contrast to the dramatic depictions of the fire's intensity, only 8% of this area was burned by crown fires, the balance by surface fires. Details were provided for 3 distinct burned areas and by species group. For white pine, it was estimated that in poletimber stands, 17% of trees in the fire area were living, 8% likely to die, and 75% dead. In the sawtimber stands, 41% were living, 15% likely to die, and the remaining 44% living. Despite the fact that the area burned contained more than 200 MMbf of sawlog material in total, and that the fire was so intense, complete killing of pine in the burned areas did not occur. The report does not characterize to what extent this was due to patchy burning, but that is likely. This report refers to detailed maps provided to the state (we ought to try & find – in archives?) .

Nutting and co authors (1948) examined fire effects and likely rehabilitation options. They developed a listing of some 1000 owners who owned the vast majority of the burned area. A further report by the Dept of Inland Fish and Wildlife examined effects on wildlife habitat. We have been unable to locate a copy.

[1] We are seeking copy of the survey done in E. Maine.

Informal Statistical Analysis: Maine

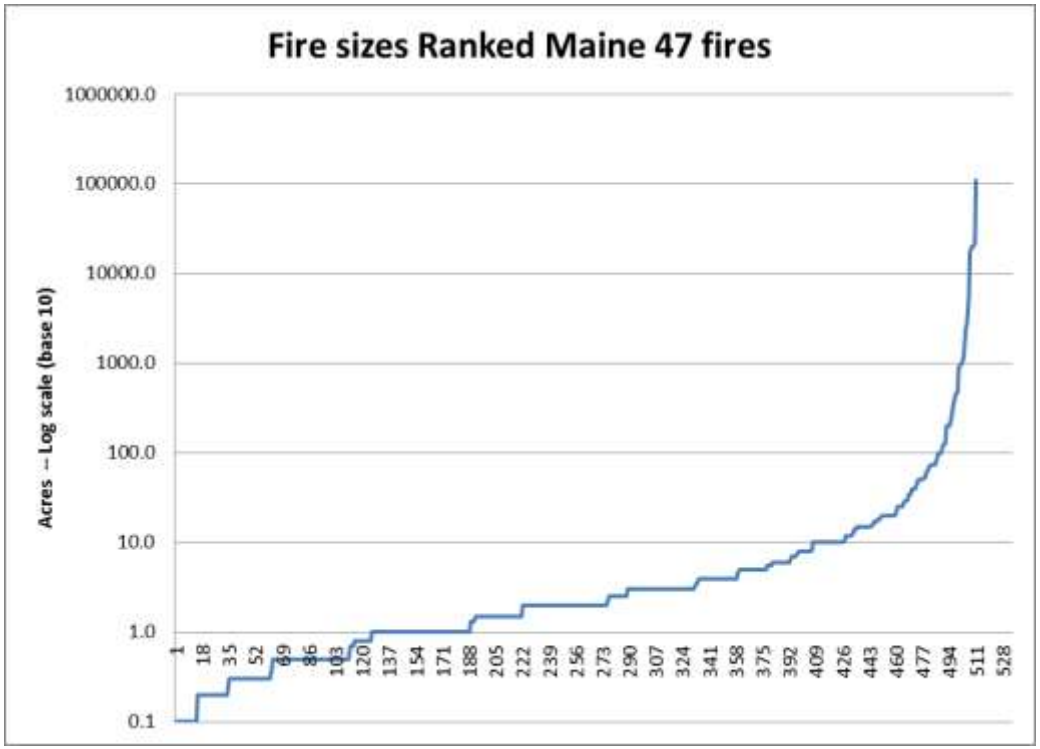
The ’47 fire season in Maine was an extreme example of extreme value situations. In the waning weeks of the fire season, a single fire, the fire complex burning from Fryeburg-Brownfield to Kennebunk, burned more than half of the total for the entire year. In fact, that single fire complex exceeded the annual totals of all but four other entire years. In ’47, the top 5 fires burned 90% of the acreage for the year.

The largest fire complex was, in the jargon of extreme value analysis, a “2.2 standard deviation event” within the year, and a 3.7 standard deviation event compared to 1903-46 experience.

With a fire size distribution like that depicted below, it shows the danger of using summary statistics such as averages or even standard deviations to depict fire history. Even the tenth largest fire of ’47 (which coincidentally was listed at 1,000 acres) would be a very large fire by recent Maine standards. **The steepness of the leg of the curve where the top ten fires are reached is stunning.** There is no equation that closely fits the entirety of the data for the year. This fits an idea that extreme fir conditions are in a class of their own where the relationships of ordinary months do not apply due to extreme fuel dryness and windiness.

Compared to these numbers, more recent decades have been placid:

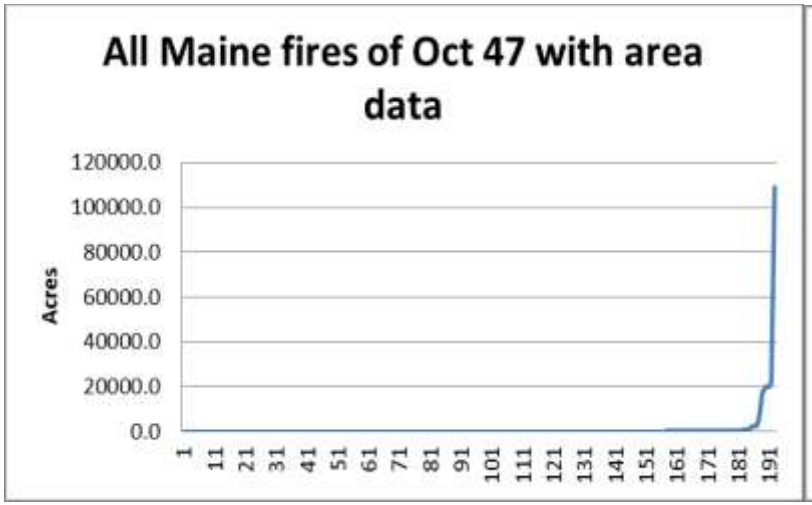
1950-69 average fire year	7,493	acres burned
1970-2010	3,693	“

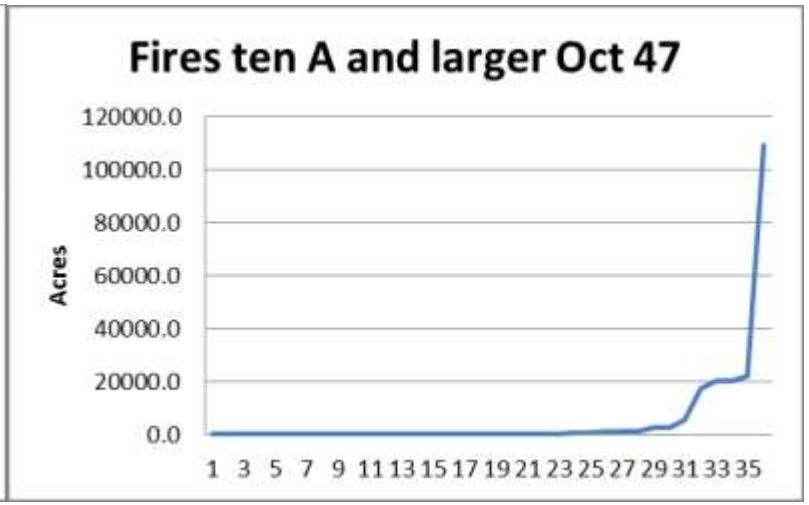


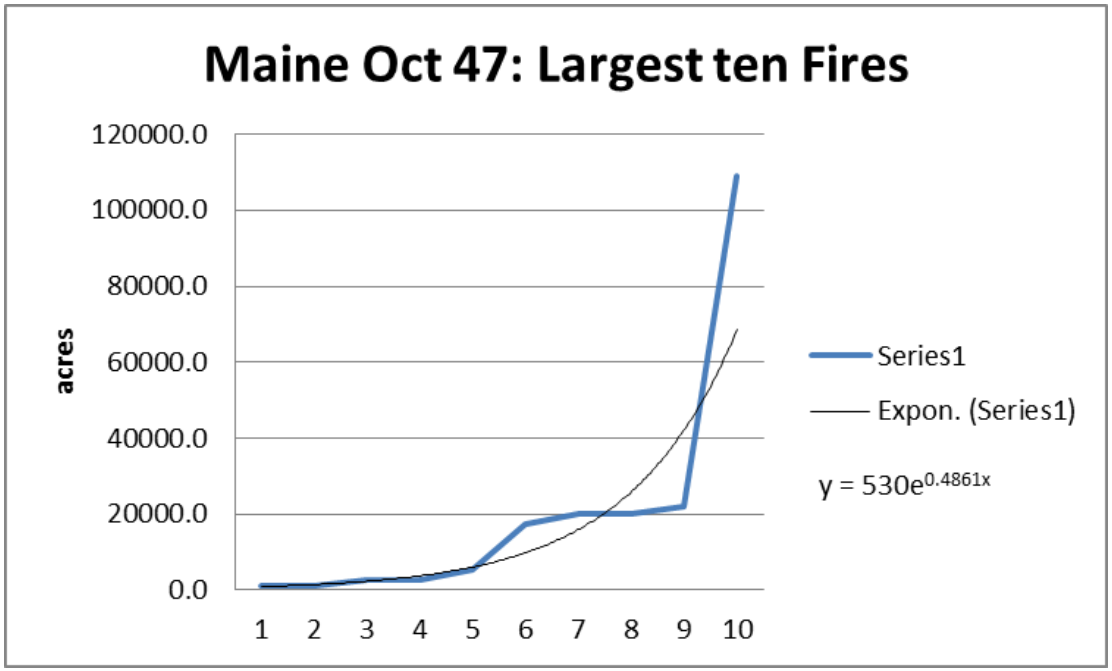
Note: this chart shows 511 fires for which area data were recorded, an additional 22 were listed with no area. Fair to assume they were very small (?)

Focusing in on the October Outbreak –

In October, the fire size distribution was dominated by the very largest ones. Even in this terrible month, with more than 200 fires, most of the fires were smaller than 10 acres. Among the largest ten, the range in sizes was fully 2 orders of magnitude. In fact, the largest one was five times the size of the second largest. This was probably a fire resulting from many smaller ones burning together.






Maine Oct 47: Largest ten Fires
120000.0
100000.0
80000.0
60000.0
40000.0
20000.0
0.0
acres
1 2 3 4 5 6 7 8 9 10
Series1
Expon. (Series1)
y = 530e0.4861x

The 16 largest Fires, Maine Oct 1947			
County	**Town**	**Date**	**Area**
Androscoggin	Poland	10/6/1947	100
Androscoggin	Durham	10/17/1947	130
Cumberland	Brunswick	10/21/1947	307
Somerset	Anson	10/21/1947	410
Washington	Cherryfield-Steuben--Org Towns--No. 10 MFD (Org. town figures listed here)	10/15/1947	480
Penobscot	Carmel	10/21/1947	900
Cumberland	Standish	10/12/1947	1,000
Androscoggin	Livermore Falls (Fayette in Kenn Cty)	10/21/1947	1,200
Somerset	Madison-Norridgewock	10/21/1947	2,496
Sagadahoc	Richmond	10/23/1947	2,650
Sagadahoc	Topsham-Bowdoin	10/7/1947	5,450
Hancock	Bar Harbor	10/17/1947	17,188
Washington	Centerville-Jonesboro-Machias-Roque Bluffs-Whitneyville	10/21/1947	19,970
Oxford	Fryeburg-Brownfield-Hiram-Porter-Denmark, Oxford County; Cornish, York County	10/21/1947	20,120
York	Biddeford-No. Kennebunkport-Kennebunkport	10/20/1947	21,910
York	Shapleigh-Waterboro-Wells-Lyman-Saco-Kennebunk-Hollis-Dayton-Alfred-Newfield-Limerick-Parsonsfield	10/17/1947	109,110

New Hampshire's October 1947 Fire Outbreak

Concurrent with Maine's terrible 3 weeks, New Hampshire was struggling with its own fires. In fact, there was concern that one of them, near Rochester, might spot across the Piscataqua into Maine. The chart, from the 1948 Forestry Commission report, shows that right up to Oct 21, an escalating rate of daily fires was not producing fires of any consequence, whether due to effective control or otherwise. Then most of the burn occurred in just a week.

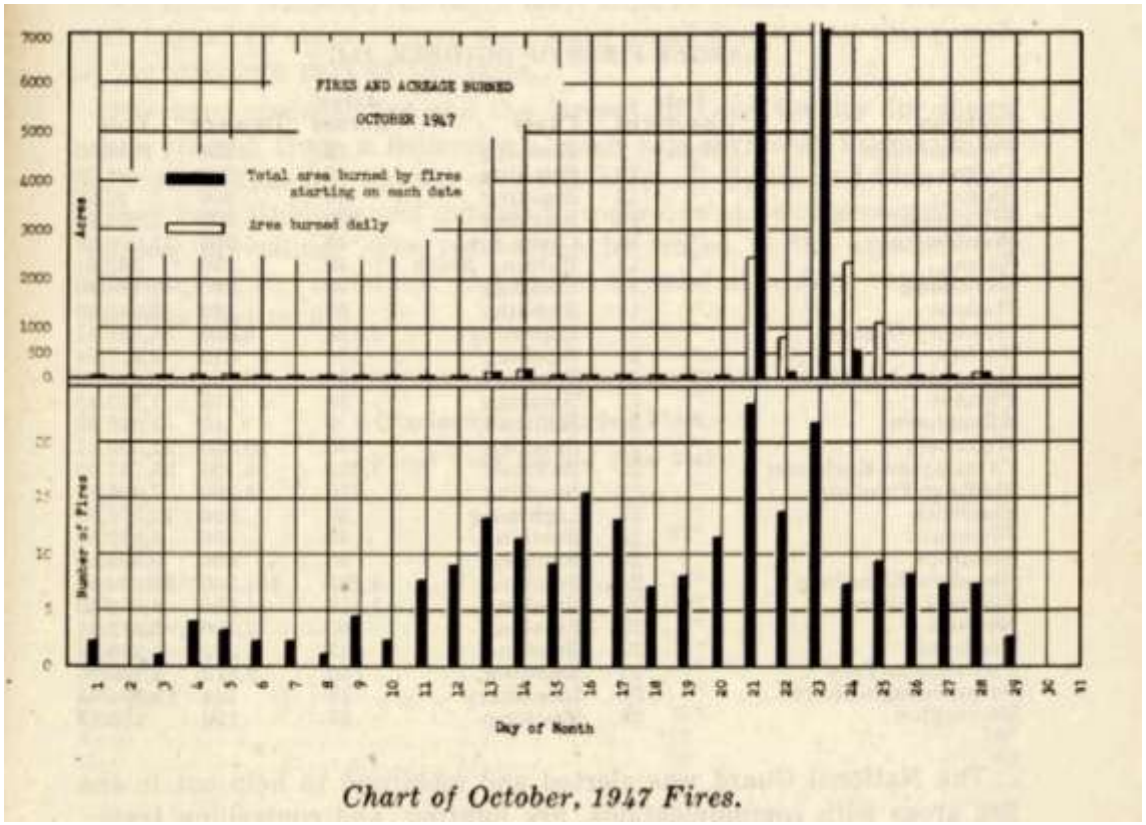


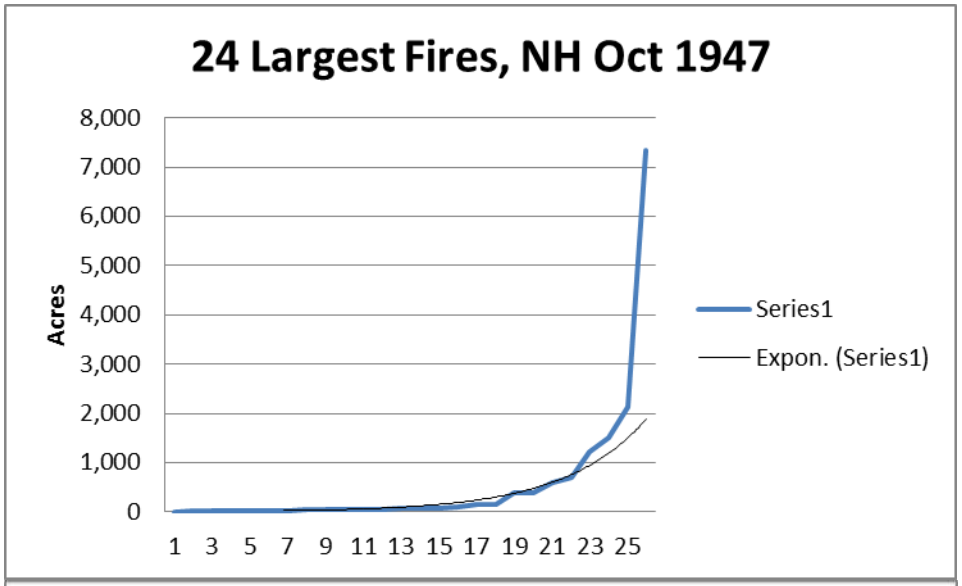
Chart of October, 1947 Fires.

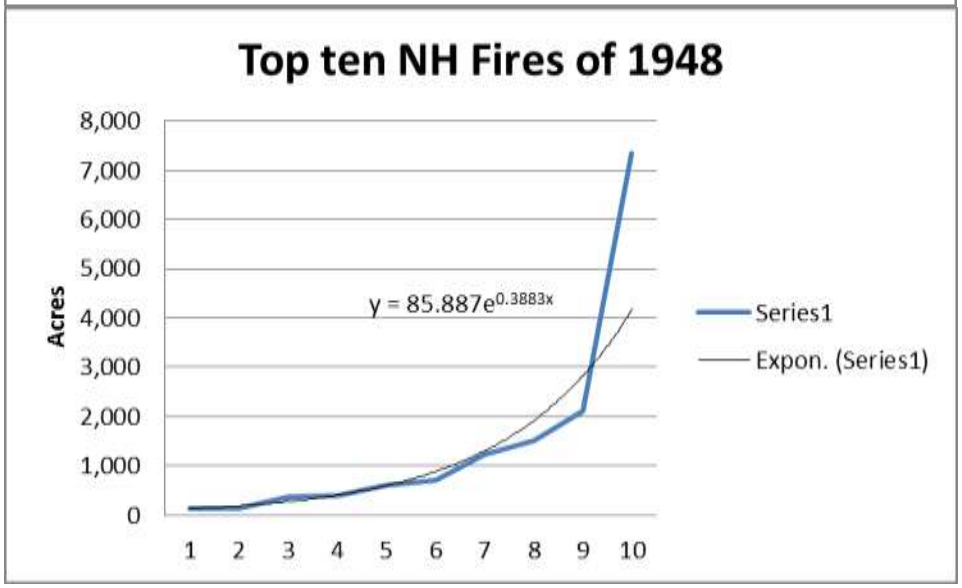
Source: NH Forestry Comm, 1948.

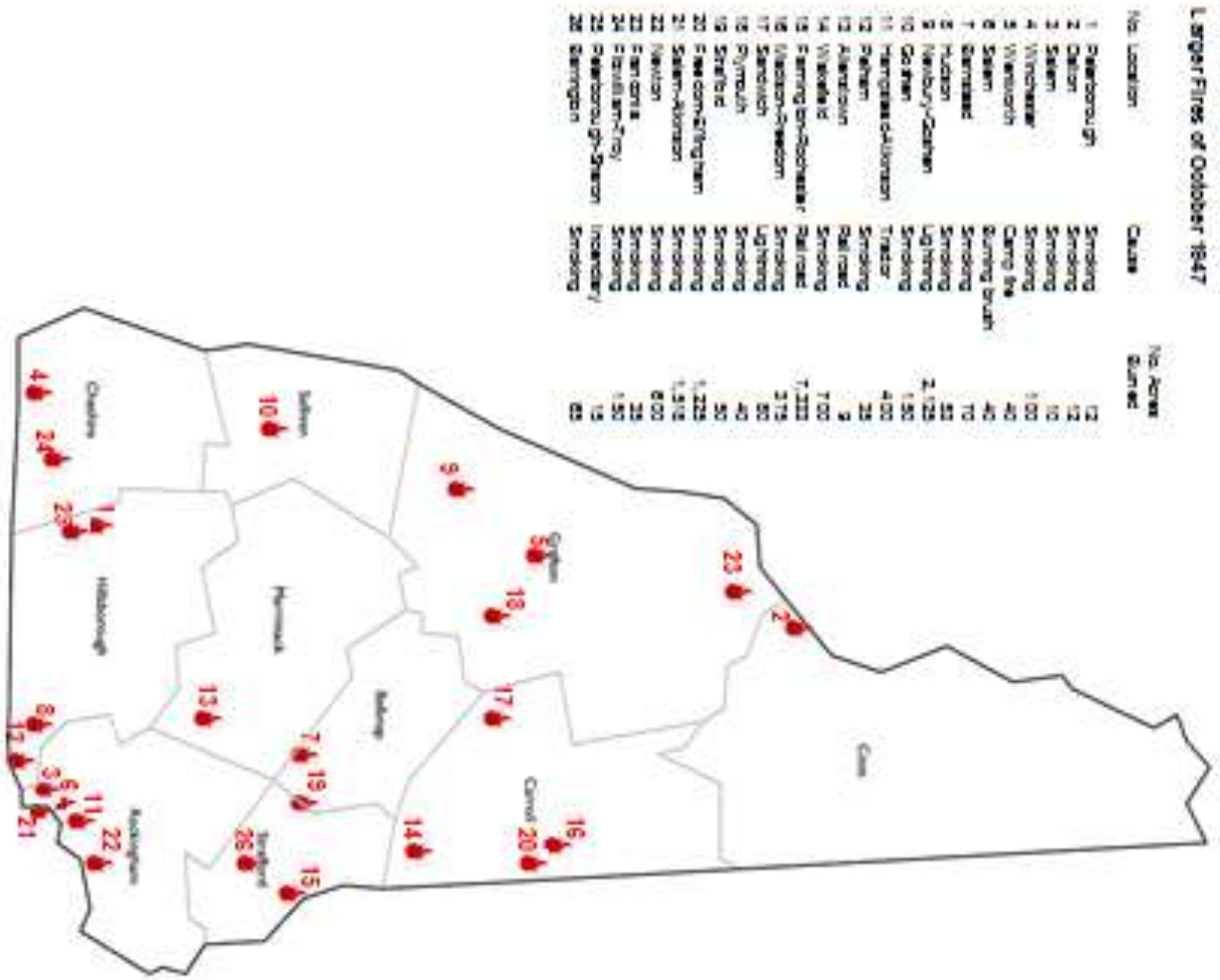
Size Distribution: largest Fires

The largest fires occurred south of the Notches, many in apparent clumps in the southerly areas. The 24 largest fires of October totaled 15,242 acres, a large fraction of the total area burned for the year. The size distribution of the largest fires follows the pattern we see elsewhere: the very largest ones have a size distribution of their own, far divergent from the "averages". Looking at the top 24 fires, it would take a fourth power expression to depict the largest fires. Even when only the top ten are examined, the distribution is not smooth -- the very largest fire is 3 times the size of the second largest. This single fire accounted for half of the area burned by the top 24 fires.

According to an informal, incomplete compilation of 20th century large fires, there has occurred no fire in NH nearly as large since 1947.

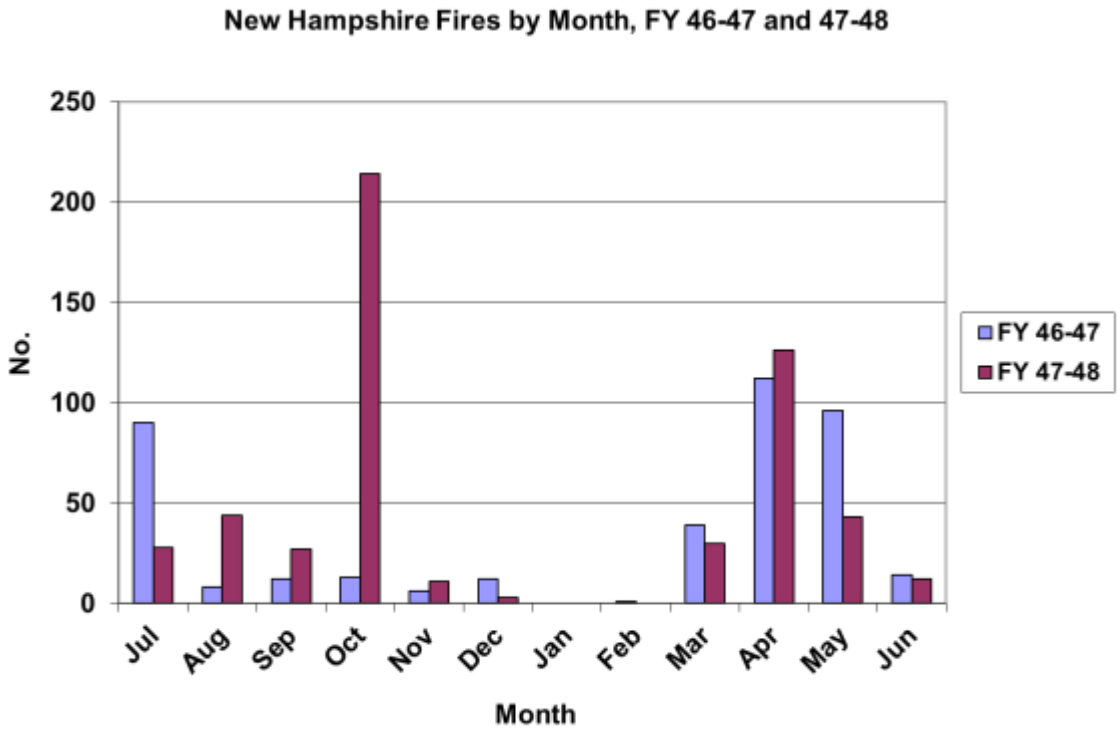

24 Largest Fires, NH Oct 1947
Acres
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
1 3 5 7 9 11 13 15 17 19 21 23 25
Series1
Expon. (Series1)


Top ten NH Fires of 1948
Acres
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
y = 85.887e0.3883x
1 2 3 4 5 6 7 8 9 10
Series1
Expon. (Series1)



Forestry Commission's 1948 report shows that up to midsummer, the 1947 season was somewhat lighter than 1946 had been.

(Note: Due to the fiscal year, the ’47 fires are tallied in the ’47-48 fiscal year)



NH Fires FY 1947-48 By County				
		No. Acres	No. Fires	Avg Size
Belknap	1947	217	23	9.43
	48	155	35	4.43
Carroll	47	76	26	2.92
	48	2,523	64	39.42
Cheshire	47	1,055	45	23.44
	48	419	65	6.45
Coos	47	34	17	2.00
	48	1,052	46	22.87
Grafton	47	48	21	2.29
	48	275	53	5.19
Hillsborough	47	556	100	5.56
	48	255	86	2.97
Merrimack	47	106	55	1.93
	48	2225	67	33.21
Rockingham	47	184	81	2.27
	48	2,698	78	34.59
Strafford	47	94	21	4.48
	48	179	25	7.16
Sullivan	47	12	14	0.86
	48	297	19	15.63

Checking inconsistency in this data w. Large fire list…

Extreme Weather of Late summer and fall 1947.

The weather leading up to October was extreme in several ways and is vividly described by Butler (1987) and Wilkins, (1948). Also the NY State Forester's report for 11974.

Weather conditions can be analyzed in a number of ways, there are several variables and seasonal patterns that can be relevant to fuel conditions and fire weather. But for context for the October Fires, we will focus on two;

3 month accumulated precipitation, Aug to Oct, and

October temperature.

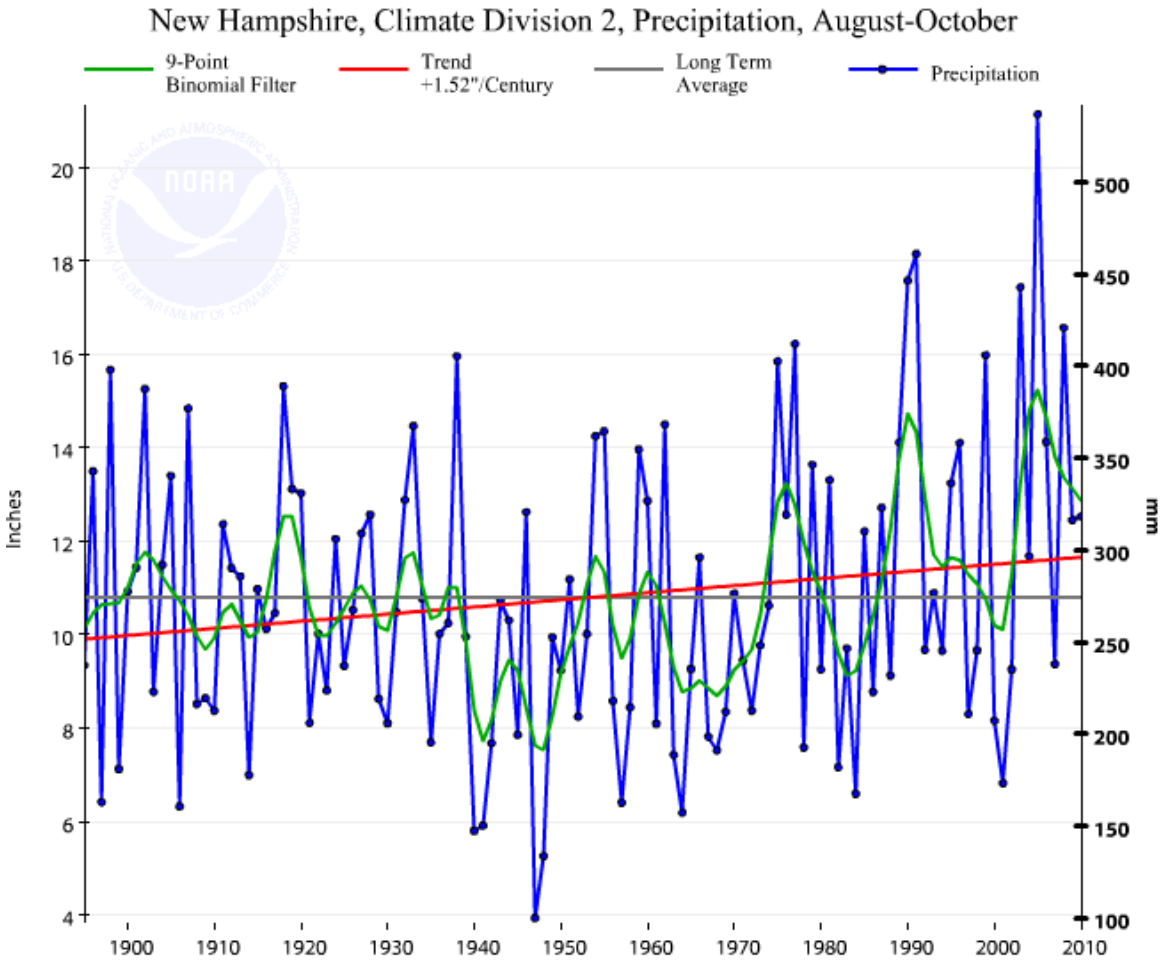
These measures supply a sense of how extreme the conditions were at that time. Widely used drought indicators, a family of Palmer indexes, are readily available but each generates a different spatial and time pattern and using rainfall and temperature seems more concrete and readily understood [2]. For wind, a critical factor, we have not found as convenient a source as the NBCDC website that generates the charts below.

New Hampshire.

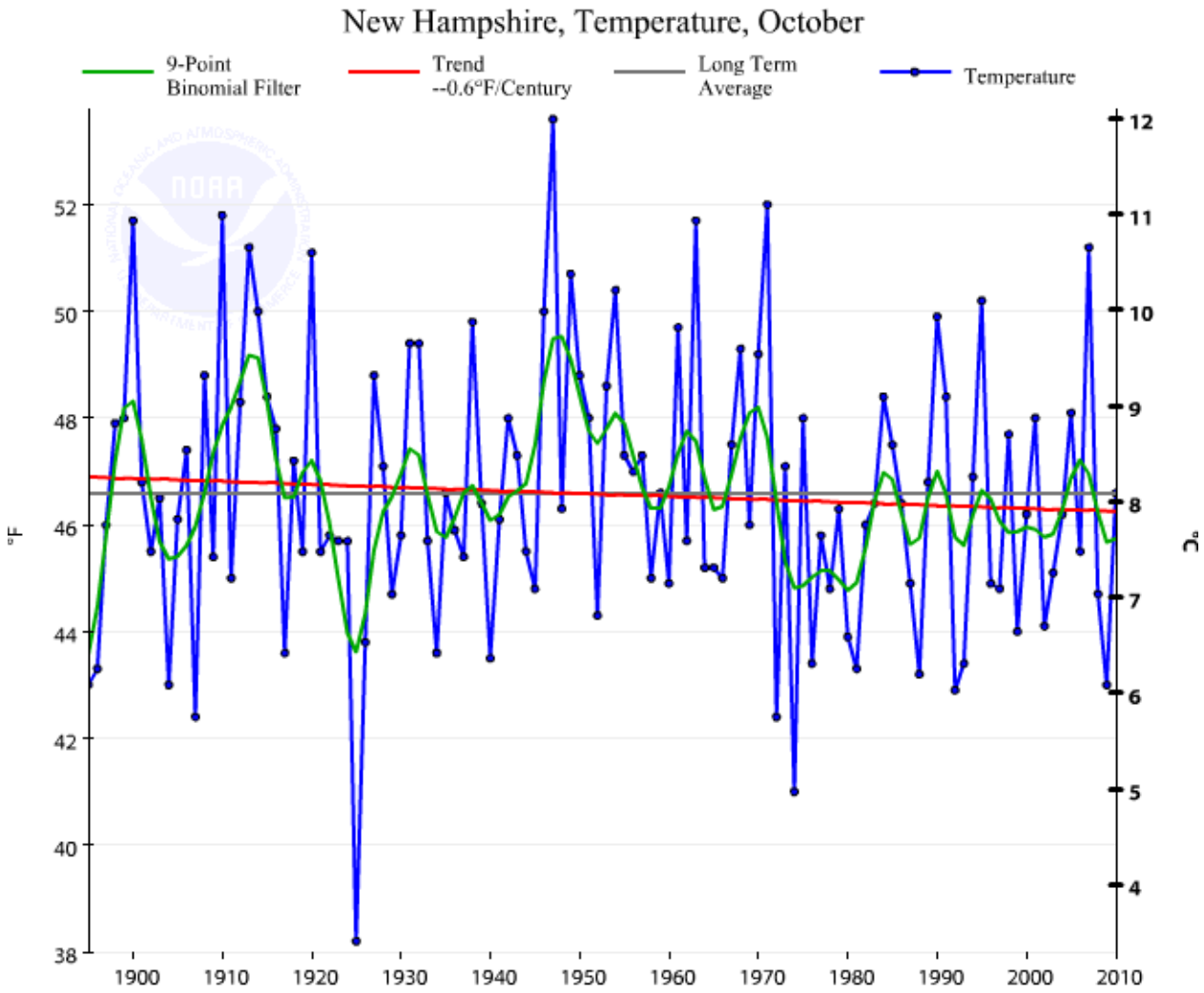
Climate Division 2 is basically New Hampshire south of the Notches.

Three month precipitation up to October 1947 in the was by far the lowest on record since 1895. It may not far wrong to speak of this drought. Late season precip shortfalls occur roughly once a decade in this zone. As the chart also shows, averages for this period have risen notably over the period of record.

[2] NCDC has a great graphic website which enables you to see the USA as a whole, with values of different Palmer Indexes, as they change over time. You can select the index and month, and the site displays a series of maps illustrating the Index levels for any user- selected period of years. http://www.ncdc.noaa.gov/temp-and-precip/drought/historical-palmers.php?index. This could be a powerful educational and I&E tool.

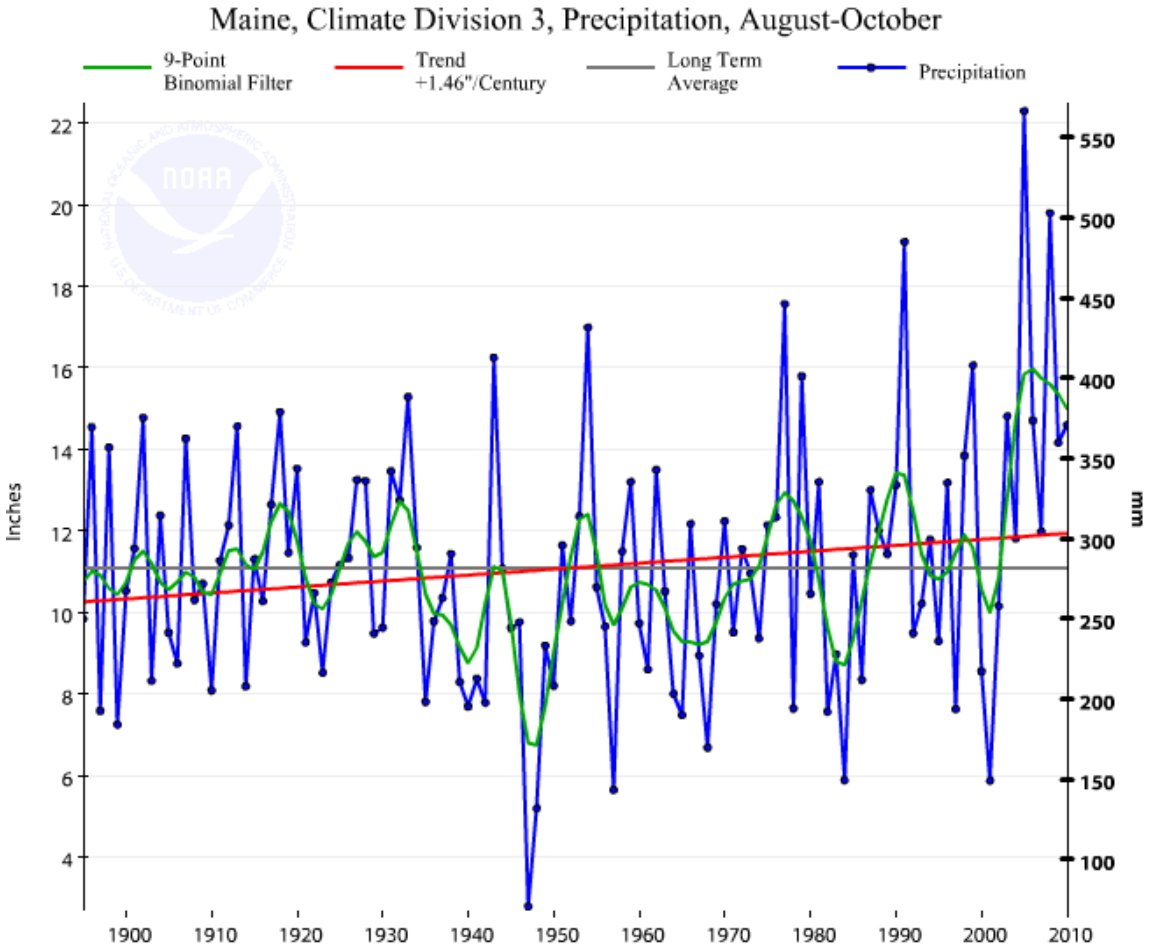


Adding not only to hazard conditions but the burdens on firefighters, October 1947 was by far the hottest October on record since 1895, and since. Temps hit about 5 degrees above the previous average of about 447 degrees.

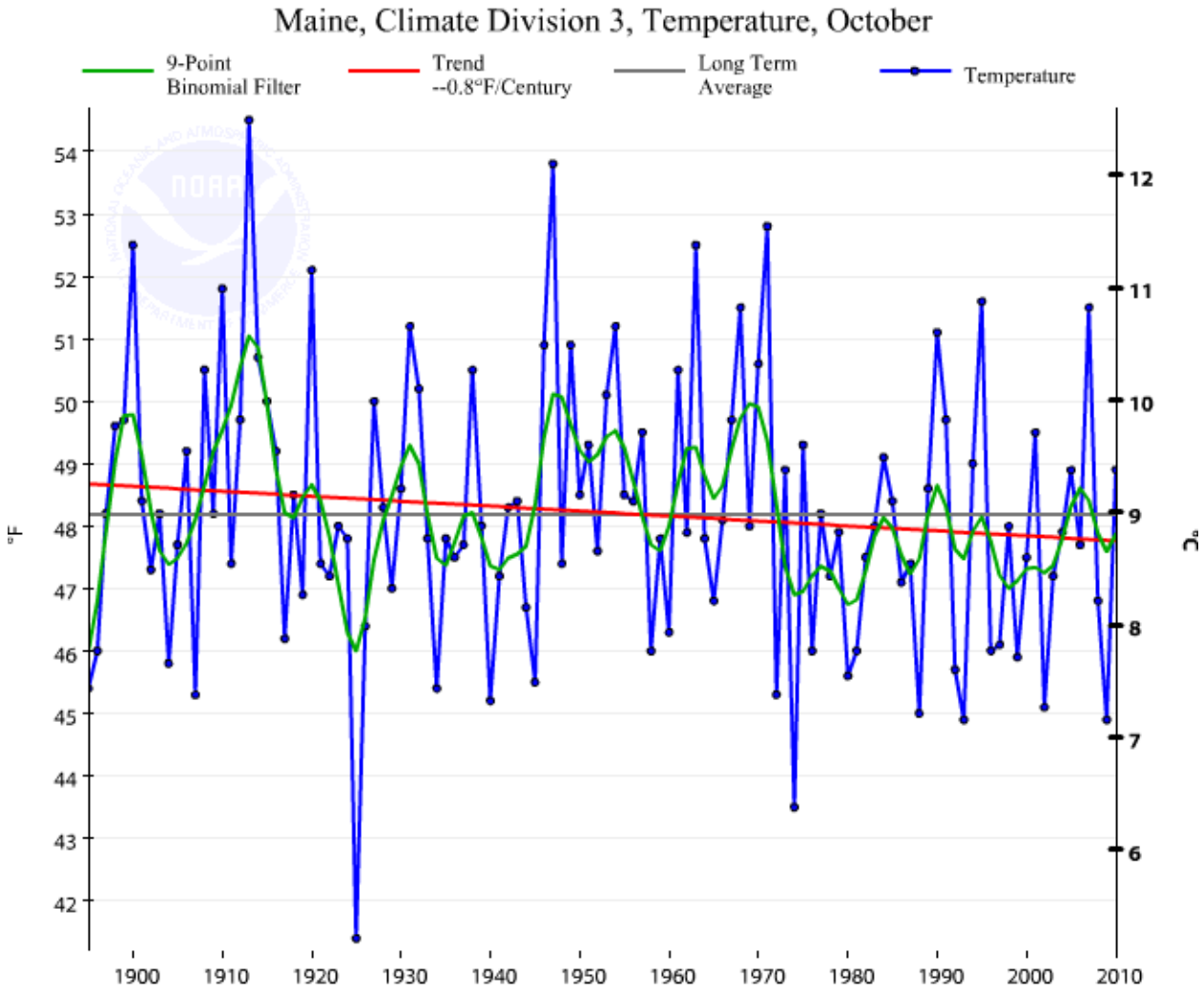

New Hampshire, Temperature, October
9-Point Binomial Filter
Trend --0.6°F/Century
Long Term Average
Temperature
°F
°C
52
50
48
46
44
42
40
38
12
11
10
9
8
7
6
5
4
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000
2010

Maine

Accumulated 3 month precipitation in Maine up to October set an all time low in 1947, far lower than ever reached previously. The widely held expectation in early October that the fall rains would come was well founded. Even the lows of the previous decade brought 8" of rain in August, Sept and October, whereas in 1947 the same three months yielded less than a meager 3".



October 1947 was also historically very hot along the Maine coast. It was the hottest since a warm period 1910-1914. The level of 53.8 was only exceeded by the 1913 record of 54.5. Warm Octobers have not been uncommon, however, even as the general October average has declined.



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Coolidge, P. T. History of the Maine woods. Esp. pp 175 ff.

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Forest Survey, Div of Forest Economics. 1948. Maine fire damage survey, Report on the survey of timber damage by forest fires in Southwestern Maine Oct. 1947, Northeast Forest Experiment Station (NEFES) Jan. 30, 1948. 11 pp. processed. (copy in author files)

Maine Forest Service. 1948. 27th Annual Report of Forest Commissioner. Augusta. Contains daily calendar of the fire season, organized by counties.

A. D. Nutting, James C. Rettie, and Wayne C. Banks. Rehabilitation of fire-damaged forest lands in southwestern Maine. NEFES Station Paper No. 33. Feb 1949. (Al Nutting was later State Forester) (copy in author's files) 25 pp. processed.

Wilkins, A. H. 1948. The 1947 Forest fire disaster. P. 72- 83 in MFS 1948 report.

Wilkins, A. H. 1948. The story of the Maine forest fire disaster. Journal of Forestry August 1948. (similar to version in Commissioner's report)

Wilkins, A. H. 1978. Ten million acres of timber. Woolwich, TBW Books. Important background.

At p. 307 he reproduces the Governor's Proclamation for 1947. Appendix contains state's fire data 1903-1972.

Interestingly, I cannot find reference to the '47 fires in this volume, and he does not cite his own papers on the subject in references.

Wilkins, A. H. n.d. Anniversary of the 50th Maine Forest fire disaster: recollections. On SWOAM website.

Seeking copies –

Maine Dept Inland Fisheries and Wildlife. Status of the York County Burn: analysis of deer kill and woody plant regeneration and growth. Project W-37-R-6. October 1947 to Dec. 1956.

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Maine fire damage survey, Report on the survey of timber damage by forest fires in Southwestern Maine Oct. 1947, Northeast Forest Experiment Station (NEFES) Jan. 30, 1948. 11 pp. processed. (copy in author files)

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Maps from Butler Book……

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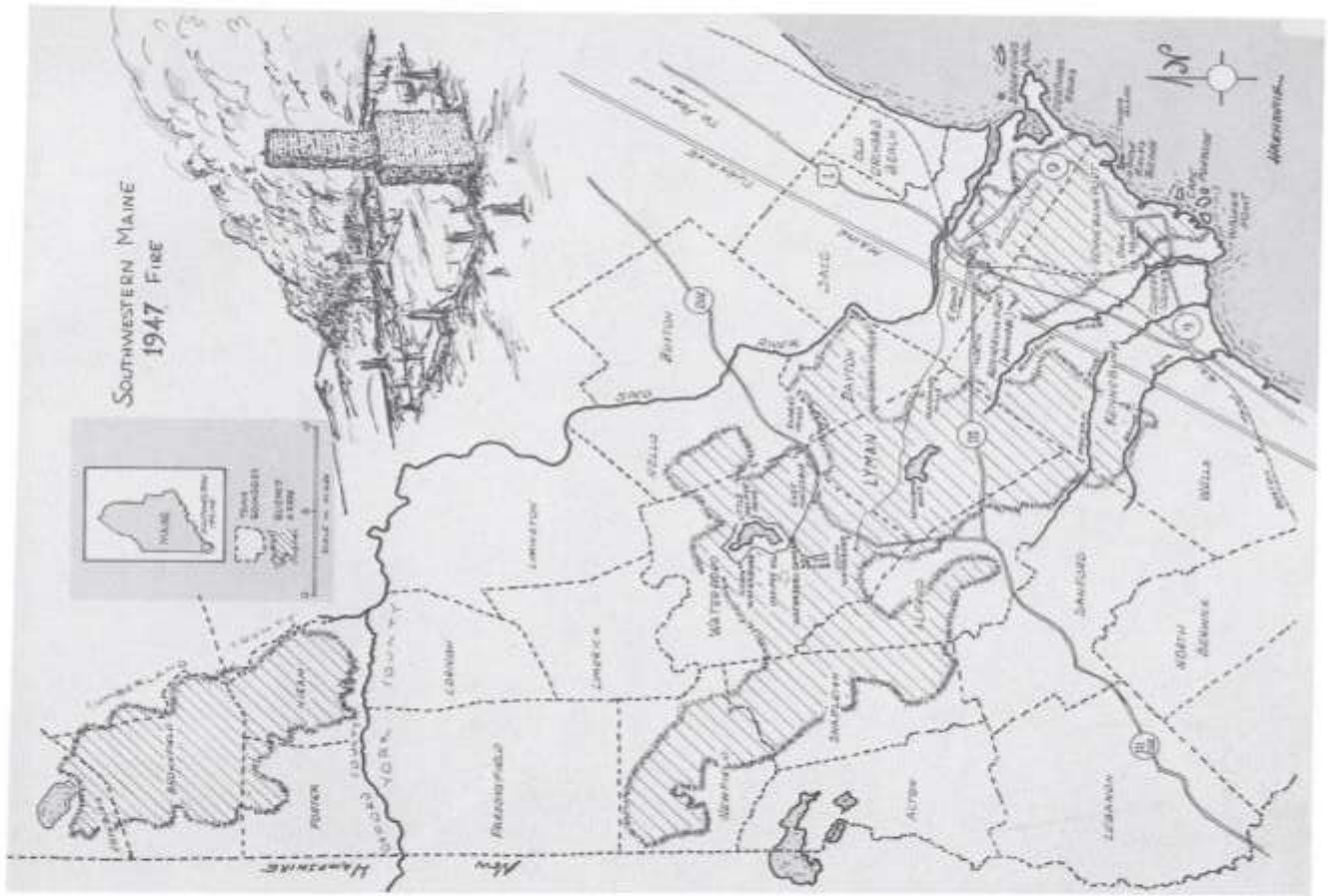
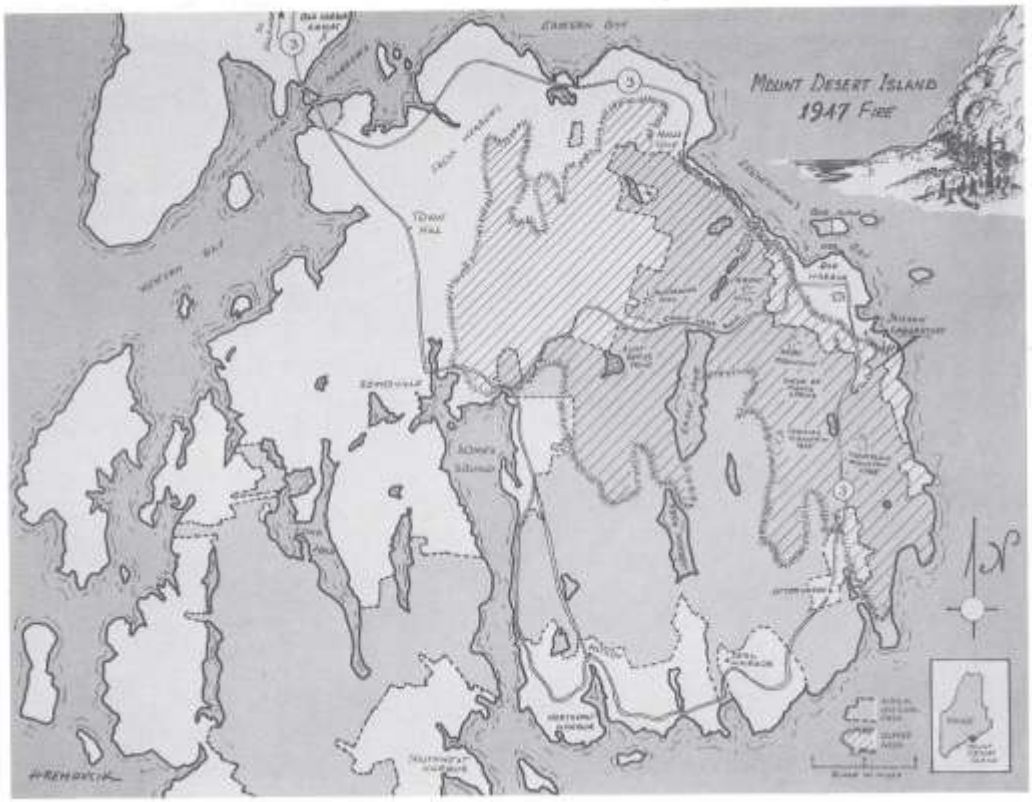

SOUTHWESTERN MAINE
1947 FIRE
LYMAN
SANFORD
SPRINGVALE
ALFRED
LEBANON
NORTH BERWICK
BERWICK
SOUTH BERWICK
ELIOT
KITTERY
YORK
YORK COUNTY
OGUNQUIT
WELLS
KENNEBUNK
KENNEBUNKPORT
BIDDEFORD
SACO
OLD ORCHARD BEACH
SCARBOROUGH
BUXTON
HOLLIS
LIMINGTON
LIMERICK
NEWFIELD
SHAPLEIGH
WATERBORO
HAMPSHIRE
MAINE



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Unfortunately no map on the Washington County fire.