THE FORESTS OF VERMONT: SUGAR MAPLE INDUSTRY, EXPERIMENTAL FARM WORK, CATTLE DISEASES, ETC., ETC

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FORESTS OF VERMONT,

SUGAR MAPLE INDUSTRY,

EXPERIMENTAL FARM WORK,

CATTLE DISEASES, ETC., ETC.

BY

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THE FORESTS OF VERMONT,

Considered in relation to Rain-fall, effect upon Climate and Profit in Tree Culture.

That there is a connection between forest area, and the distribution and amount of rain-fall, no one at the present day will question. In the world at large this opinion is supported by so many well known facts, and so many critical observations, as well as by general history, that it leaves no reasonable doubt. But when we come to our own country, and more particularly to New England there are some found who think that the future will take care of itself and their interests being largely in timber lands, their desire to cut the same for their immediate profit leads them to say, and perhaps often believe, that small areas make no perceptible difference in results. Having made the most minute observations upon the wind and rain-fall I most sincerely believe they are often affected by even small areas of timber land; often by as small a tract as one thousand acres. Of course there must be some general principle underlying the whole and I believe that to be that the atmosphere in and around a forest is cooler than over cultivated fields, and that the cooler air rising from a forest often retains, by condensation into clouds that fall in showers, moisture that otherwise would pass over without precipitation. Among our hills there seems to be what we might call paths for showers and certain hills and certain valleys are sure to get more than their share.

Now in my records I find that those paths have changed considerably during the last forty years, and that such change has seemed to be brought about by the change in timber area. Some hills formerly wooded that received abundant showers, now denuded do not lie in their usual path and hence the streams and springs of that section have failed or dried up, when formerly perennial. The change in the forests in this section have seemed to send the path of showers toward the highest of the White Mountains of New Hamphire, Mount Washington more especially, and hence the summer rain-fall has greatly increased there, while it has almost equally decreased here. References to the accompanying tables will at once convince you that such seems to be a fact. Certainly something has effected the change and as our forest area has been greatly diminished there seems a cause while everything else, as far as we can know, remains the same.

Hon. Benj. A. Willis, of New York, says that the distribution of water supply, if not the amount, is beyond doubt affected by the forests; that their existence is indispensable to public health; that they are needful to preserve the supply of our rivers, and to protect our fields and cities from floods, desolation and destruction.

Hon. Franklin B. Hough says that this growing tendency to floods and droughts can be directly ascribed to the clearing up of woodlands, by which the rains quickly find their way into the streams, often swelling them into destructive floods, instead of sinking into the earth to re-appear as springs. Aside from the direct efforts of shelter and shade afforded by trees, the evaporation of rain-drops that fall upon the leaves, and the chemical action of the leaves themselves, have a marked influence upon the humidity and temperature of the air beneath and around them. The contrast, in a very dry season, between an open and sunburnt pasture, and one interspersed with clumps of trees, must have been noticed by every careful observer, and the actual relative profits of farms entirely without trees, and those liberally shaded, (everything else being equal,) will show, at least in grazing districts, the advantage of the latter in the value of their annual products. The fact that furniture in houses too much shaded will mould is a familiar and suggestive instance of the humid influence of trees, and the aggregate results of woodland shade may well explain the fullness of streams and springs in the forest, which dry up and disappear when it is removed.

Hon. Warren Higley, of New York, President of the Forestry Congress, says: There is abundant evidence in America of the effects of the cutting off the forests. In Central New York streams that thirty or forty years ago kept the ponds well filled for the saw-mill and grist-mill, and furnished a never-failing supply of running water for the farm, are now dry in summer, with the exception of here and there a stagnant pool; the dam is decayed and washed away, the mills gone, and the once picturesque scene is changed to that of desolation. Yet, with the warm rains of spring and the melting snows, the streams overflow their banks, the swift waters carry away fences, bridges, and embankments. Spring opens later. The young cattle were wont to be turned into the wood-sheltered pasture about the first of April; now they are kept shut up until the middle of May. Peach orchards that were sure to be loaded every year with luscious fruit have almost disappeared, and the crop is the exception rather than the rule. The extremes of heat and cold are greater, and droughts in summer and floods in spring-time are more frequent and more destructive. Trace the stream from its source and the cause of these things is apparent. The old tamarack swamp that used to supply the boys and girls with aromatic gum, and in which the creek had its source, has all been cut away. The thickly wooded black-ash swamps, through which the stream ran in its course to the lake, have been cleared, and their marshy areas have given place to cultivated fields and pastures. The cutting away the forests from the headwaters and the banks of this stream accounts for the changes I have noted, and this picture, I doubt not, is a very familiar one in the New England and Middle States. It is not difficult for men who know the effects of cutting the timber from small areas around the headwaters of the smaller streams to understand why summer navigation in the Mississippi, the Missouri, and the Ohio has become difficult and at times impossible where it was easy and constant a few years ago; or why the Hudson and the Connecticut are much lower in sum-

mer and higher in spring than in former years. The partial deforesting of the Adirondack region has materially affected the flow of the Hudson, the Mohawk, the Black, and other rivers, and sufficiently demonstrated the fact that were this great watershed of New York stripped of its forest covering, the Empire State would lose her prestige and New York city her rank as the first commercial city of the new world.

Under a joint resolution of our legislature in 1882, Gov. J. L. Barstow appointed a commission to inquire into the subject of forestry evils in Vermont and to suggest remedies. This commission addressed circulars, asking questions relative thereto, to the representatives, selectmen, listers, postmasters and many prominent men in the State and in its report it says: The answers to questions in regard to the effect of the removal of the forests upon the springs, streams and ponds of the state, with scarcely an exception, tell the same story: that the water supply is year by year failing, and that the smaller springs and streams which had never until recently been known to fail often become totally dry in a dry season. The replies to this question are more full and specific than to any other. A very few say they notice no changes. Only two of the several hundred express the positive opinion that there is no change in their vicinity, and very many over all parts of the state give facts in detail which are certainly of a very alarming character. It is evident from the replies that this phase of the question is the one which has engaged the attention of the people and excited more universal interest than any other. These changes are generally admitted to be the greatest of the many evil results of the devastation of our forests.

There are many specific statements of the diminution of the water supply in particular streams within a certain number of years; of mills without power; of good trout brooks of fifty years ago now nearly dry in summer; with other statements of interest, and the main fact remains that our water supply is, at least, more erratic and fitful and in many places smaller, during the necessary season for the growth of crops, than formerly.

At Lancaster, New Hampshire, on the Connecticut river, an old resident reports "an alarming decrease in the water of the streams and springs during the past sixty years, and especially during the last twenty-five years, within which period the smaller timber also has been removed. Israel's River in my boyhood was a large mill-stream eight or ten rods wide, with sufficient water to carry a very large amount of machinery the year round. Now it is an insignificant stream, with, from May to November, not more than half the water it had fifty years ago, and not more than two-thirds it had twenty-five years since. Other streams have suffered in the same way, and the springs have, if possible, suffered more than the streams. Many, once thought to be never-failing, are now for long periods dry. That the cutting off of the forests accounts very largely for this change I consider as sure as that effect follows cause, and the result is hastened by the reckless methods in use. Instead of cutting timber that is matured, everything is cut to the size of five or six inches in diameter, and what remains is cut into fire-wood, or burned at once,

leaving a dreary waste. In Lancaster the timber and wood are nearly all gone, and the mountains are being stripped to their summits."

The Forestry Commission of New Hamphire, says: "Certain *local* effects are unquestioned, and come under daily observation. Extensive clearings in the vicinity of many of our farm-houses and villages have brought about changes that prove anything but advantageous, adding in many ways to the rigor of our climate, and rendering such localities less desirable for residence than formerly. Trees may not be so much needed by us for shelter and protection as on a Western prairie; but the treeless hilltop or hillside is certainly less favorable for our cattle and our crops, our orchards and our gardens, for health, and even for home comfort, than the same location would be with sheltering belts of timber to break the force of storm in winter, and to check the drying influence of the wind throughout the year. We may call these changes local if we will, and believe their effect on atmospheric conditions will be as difficult to determine in the future as in the past; but let these changes go on for a generation or two longer as they are now going on, becoming general instead of local, and who doubts their effect on both climate and rain-fall, as well as water-supply? Again: It may be said that the forest area of our state is too limited in any case to have much influence on our climate and rain-fall, since both are controlled by conditions covering a much wider area of territory. But when the woodman's axe is as busy as it now is east and west, north and south of us, we cannot fail to see that injurious changes are coming, greater than any as yet experienced, and that our best, perhaps our only, means of protection against them, as they may still further affect climate, rain-fall, and water-supply, is the more prudent management of our forestry interests."

As the watering of the land is by evaporation from the ocean which evaporation is the same each year or else the ocean would soon overflow the low land, it can be asserted, and often is, that the aggregate rain-fall is the same and this may be true and yet our field crops perish by drought. Note what I have said about showers and much the larger part of our rain-fall during summer is from showers. That wooded hill-tops have abundant rain does not help our summer crops in valleys. In July 1884 we received two and one-half inches of rain from showers and Mount Washington twenty-three inches yet observation shows, and our school books teach, that where the country is all wooded the summits of mountains do not receive as much rain-fall as the valleys.

Is there not a lesson in this? The rain-fall is increasing on the summit of the White Mountains but decreasing in the cultivated valleys. Hence you see that while the same number of gallons of water may every year fall in the United States, it may become even too arid to cultivate, as the bleak and desolate mountains may be deluged and severe showers prostrate our crops and destroy our meadows. Yet the same amount of water will fall somewhere. It is the steady rain without wind that is wealth to the husbandman and that a reasonable restoration of forests will doubtless provide. The following deduction as made from tables furnished the New Hamphire Forestry

Commission I submit; with some of the tables and chart of the deductions therefrom, and also complete tables of observations at Lunenburgh. The graphical chart also gives the record of Mr. Hazen Doton, of Woodstock. This chart is worthy of careful study.

The observations made at Lunenburgh, Vt., it will be seen, cover a series of thirty-eight years, and give an average of 40.03 inches of rain yearly, between the extremes of 31.14 inches in 1880 and the unusual amount of 60.91 inches in 1872, when more than twelve inches is recorded in the single month of August. Twenty-four of the above thirty-eight years fall below the average, but the larger portion of these years of deficiency are in the first half of the period, and not in the last half. Again, dividing the series into seven periods of five years (beginning for convenience with 1850), it is the first two periods and the last which fall below the average; the remaining four periods, coming down to 1879 and near the present time, are all above the average, and two of them very much above it. The years 1880 to 1884 inclusive, give an average rain-fall of only 34.78 inches, and mark a time of decided drouth. 1885 is below the average being 37.47 inches, and this year will be below also.

The average rain-fall at Hanover, New Hampshire, for the last fifteen years (all that have a complete record in the table) is only 30.05 inches, which is in striking contrast with the record at Lunenburgh, about 75 miles further north, it being 10 inches greater. Here, too, the average for the last five years indicates a decisive falling off, but not a falling off suggested of necessity by the two five-year periods that precede. The same statements are true as to the record of observations made at Woodstock, about eighteen miles from Hanover, New Hampshire. The average rain-fall of 36.73 inches drops suddenly to 32.51 inches during the last five years.

At Weirs the annual average for twenty-five years has been 49.12 inches; and here again the average is well maintained, until the dry period from 1880 to 1885 is reached.

At Concord, New Hamphire, during the same twenty-five years, the average is 39.17 inches. All but the last of the five-year periods exceed the average, varying from 44.05 inches for the first period to 33.11 inches for the last, and showing a very slight decrease from period to period. The twenty-years record furnished by the late Mr. Tufts, of Dover, New Hampshire, are not entirely complete, but as it stands it also shows a gradual diminution of rain-fall, with the same abrupt falling off of the record during the recent years of widespread drouth.

On the other hand the observations on Mount Washington, New Hampshire, show a decided increase. Observations in Europe and elsewhere show less rain-fall upon mountain tops when the valleys are wooded but so far as I can get reliable information all observations seem to coincide of the increase of rainfall on mountains while the removal of timber causes decrease in valleys.

That you can see just how it stands I publish comparative observations between Lunenburgh and Mount Washington, in a table following the series at Lunenburgh.

TABLE I.

Amount in inches of monthly rain-fall (including melted snow) at Lunenburgh, Vt.

Y'rs.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept	Oct.	Nov.	Dec.	Yearly totals.	Snow in winters.
1848	2.98	4.75	3.60	1.19	2.72	1.84	4.20	3.82	1.10	5.84	3.38	5.95	41.00	71.00
1849	2.25	3.85	6.10	2.22	2.47	2.06	4.08	1.75	2.90	2.25	3.71	3.00	35.80	84.00
1850	2.90	3.95	4.50	2.00	3.50	1.75	3.90	4.00	2.05	4.90	3.50	3.05	40.00	92.00
1851	4.00	1.15	3.50	7.10	.85	3.00	4.18	1.25	2.30	3.90	1.50	.57	33.50	48.00
1852	2.75	3.75	4.10	5.25	5.80	4.20	2.75	2.00	3.25	3.75	.45	.95	39.00	86.00
1853	4.	4.55	2.10	2.80	3.10	2.80	4.20	4.50	3.15	2.88	4.00	3.75	41.75	100.00
1854	[4.80	3.90	3.25	2.10	2.20	2.50	1.10	.75	3.75	4.20	4.05	4.00	36.60	76.00
1855	1.40	2.25	4.25	3.75	4.70	5.80	3.20	2.40	2.25	2.20	2.00	2.25	38.25	63.00
1856	3.25	3.00	5.20	2.10	2.40	3.75	2.75	3.20	3.00	3.15	3.00	4.00	39.80	79.00
1857	3.60	2.90	4.20	3.00	2.80	3.25	2.50	3.00	2.25	4.18	2.50	2.07	37.25	69.00
1858	3.25	3.00	1.80	4.10	2.50	2.25	2.75	3.60	3.25	3.80	5.00	3.00	38.50	75.00
1859	1.07	3.05	4.25	1.25	2.75	4.00	2.25	3.06	4.50	2.50	2.25	4.77	35.30	58.00
1860	2.25	2.16	1.98	1.56	1.56	1.06	3.03	3.06	4.52	2.32	5.27	3.50	36.90	99.00
1861	3.20	3.00	2.95	5.35	6.75	4.60	6.00	1.75	5.00	4.52	2.18	1.70	47.00	147.00
1862	3.80	5.02	3.56	2.40	1.75	1.70	2.75	6.00	4.00	4.00	6.75	4.07	45.80	101.00
1863	5.45	1.40	4.70	2.85	4.50	1.50	6.70	2.90	3.05	3.80	2.25	5.10	46.00	51.00
1864	2.53	1.33	2.92	1.90	6.86	1.32	2.90	3.80	2.75	6.12	3.79	3.85	39.02	87.00
1865	3.35	1.70	5.13	3.35	5.55	2.75	3.92	1.00	4.52	3.35	2.95	1.02	39.69	41.00
1866	1.55	3.35	1.40	2.60	2.00	3.00	5.00	5.25	5.00	1.25	3.25	1.25	38.10	73.00
1867	2.05	4.30	2.60	2.70	9.47	3.75	3.33	3.75	2.60	1.50	2.45	1.75	39.65	68.00
1868	1.57	1.45	2.60	1.30	5.75	4.40	5.00	1.68	5.62	1.80	7.15	2.45	43.37	114.00
1869	4.30	4.12	4.45	2.05	2.85	5.00	2.75	2.50	2.60	8.10	2.21	3.02	43.25	100.00
1870	4.55	4.00	1.47	2.50	3,80	3.50	4.34	6.42	3.00	2.95	6.52	1.30	45.85	55.00
1871	2.15	2.10	3,65	5.72	3.62	2.12	4.35	7.35	2.30	3.90	1.60	3.70	42.96	95.00
1872	2.00	3.05	2.70	2.00	3.20	7.82	7.20	12.58	3.48	2.27	5.05	5.00	60.91	167.00
1873	3.85	3.35	4.50	2.65	2.64	2.00	3.95	2.50	4.75	5.45	2.22	2.65	40.51	117.00
1874	2.70	1.80	2.25	4.05	2.26	7.08	4.96	4.38	1.25	1.15	2.71	3.07	38.45	107.00
1875	3.60	4.08	3.60	2.85	3.73	5.70	2.45	3.45	4.35	5.26	2.92	1.40	42.84	108.00
1876	3.55	3.00	2.00	2.75	4.70	7.05	5.23	1.55	5.94	1.50	1.67	2.82	43.15	70.00
1877	2.15	.55	6.40	2.35	1.05	8.00	4.23	5.95	2.05	4.70	3.65	1.87	36.04	82.25
1878	1.55	.80	2.25	6.15	2.45	4.55	3.35	4.45	1.20	2.00	2.70	2.30	34.55	158.00
1879	3.45	2.75	3.15	2.70	1.48	5.80	5.00	4.67	2.78	2.20	4.18	4.30	43.43	71.75
1880	2.25	2.60	1.47	1.40	3.05	2.30	2.45	3.79	2.40	4.70	2.18	2.55	31.14	191.00
1881	2.90	1.70	2.60	1.60	4.55	2.20	3.09	2.75	2.45	4.85	5.19	4.02	38.20	117.00
1882	2.75	2.75	1.75	1.55	2.20	4.93	2.85	1.05	5.25	1.45	1.27	2.40	32.21	113.00
1883	2.10	3.65	2.60	1.30	4.00	4.34	4.80	1.15	2.90	4.50	2.88	2.60	36.60	116.00
1884	3.30	2.80	4.60	1.25	4.45	1.95	2.50	2.55	2.55	5.00	2.50	2.80	35.75	104.50
1885	3.40	2.55	2.25	.60	1.00	3.85	6.46	5.77	2.00	4.51	2.55	1.70	37.47	60.25
1886	2.55	1.87	.90	.75	2.87	1.70	2.82	4.70						
Av'ge	3.01	2.89	3.34	2.74	3.61	3.54	3.86	3.79	3.38	3.63	3.23	2.94	40.03	