

THE EFFECTIVENESS OF THE RAGWEED ERADICATION CAMPAIGNS IN NEW YORK CITY

A 9-YEAR STUDY (1946-1954)

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SINCE 1936, the Allergy Division of The Jewish Hospital of Brooklyn has been estimating daily the pollen content of the air in the Borough of Brooklyn during pollinating seasons. When, in 1946, the National Pollen Survey Committee of the American Academy of Allergy standardized the techniques for pollen counting,^{1, 2} the surveys were promptly enlarged to include not only all the boroughs of New York City but also the surrounding metropolitan area.³ Coincidentally, in 1946, the New York City Department of Health initiated "Operation Ragweed," a series of annual ragweed eradication campaigns within the city which have been continued without interruption up to the present time.

Variations in rainfall, sunshine, temperature, wind direction and velocity, and other meteorologic factors cause wide fluctuations in the seasonal pollen index of a community from year to year. Hence, a final evaluation of the effectiveness of "Operation Ragweed" was postponed until the influence of meteorologic variations on New York's pollen index could be weighed. After nine years of pollen surveys during which the counts were correlated daily with the weather data, the relative importance of the various meteorologic factors in this community has been established. On the basis of this information, an equitable evaluation of the effectiveness of "Operation Ragweed" may now be attempted.

For the first four years of "Operation Ragweed," a decline in the city's ragweed acreage was reported by the Health Department.⁴ For the last five years, however, no further diminution was noted. On the basis of pollen counts no consistent decline in New York City's pollen index has been observed over the nine-year period. Under the circumstances, it is reasonable to assume that the full benefits of "Operation Ragweed" have been realized and that continuation of the same program will not materially alter the situation. The time, therefore, seems suitable for an evaluation of the benefits of this program.

The analysis presented here covers the longest and most intensive studies on record on what probably has been the most extended and systematic effort by a large city to rid itself of ragweed. Durham⁵ previously reported on Chicago's three-year eradication drive on ragweed which proved to be completely

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ineffective. Durham's observations and the data provided in this analysis of New York's efforts should provide some guidance to those communities throughout the country which contemplate embarking on their own local projects for ragweed eradication.

SCOPE OF POLLEN SURVEYS

A. *In New York City.*—Throughout the ragweed season daily counts were made from greased slides exposed for twenty-four-hour periods in Durham shelters at various stations throughout the five city boroughs. Within the city there were 11 stations studied for periods varying from one to nine seasons for a total of 52 station-seasons. (Table I and Fig. 1). In addition to the above, Brooklyn counts, which had been started in 1936 using the old technique, were

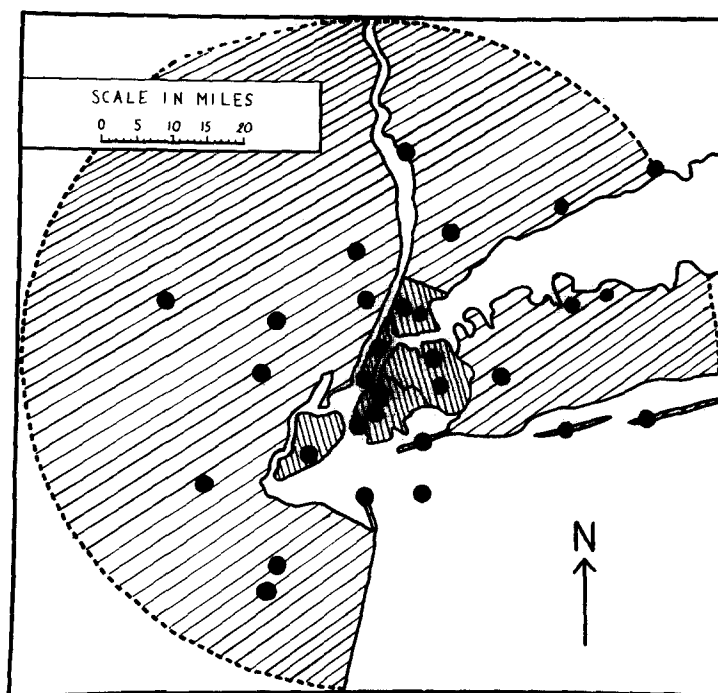


Fig. 1.—Distribution of stations studied in the New York City metropolitan area within a radius of 50 miles of Columbus Circle, 59th St., Manhattan. At the center are the five boroughs of New York City which, starting at the left and rotating clockwise, include Staten Island, Manhattan, the Bronx, Queens, and Brooklyn.

continued annually. They proved useful in comparing Brooklyn's pollen indices before and after 1946, at which point the ragweed eradication program and new counting methods were instituted.

B. *In the Metropolitan Area Around New York City.*—Outside of the city's borders, in the area within approximately a 50-mile radius of Columbus Circle in New York City, 19 stations were surveyed, providing 46 seasonal studies (Table II and Fig. 1). Included were stations in New Jersey, Connecticut, and in Westchester County and Long Island in New York State. There was, in addition, a station on the Atlantic Ocean at Ambrose Lightship.

TABLE I. STATIONS STUDIED IN NEW YORK CITY, 1946 TO 1954 INCLUSIVE

BOROUGH	STATION	1946	1947	1948	1949	1950	1951	1952	1953	1954	TOTAL STATION- SEASONS
Brooklyn	The Jewish Hospital of Brooklyn	x	x	x	x	x	x	x	x	x	9
	Brooklyn College			x							1
	Fort Hamilton				x						1
Manhattan	U.S. Weather Bureau Central Park		x	x	x	x					5
	U.S. Weather Bureau Battery	x		x	x	x			x	x	6
Queens	Rockaway Beach Hospital		x	x	x	x	x	x	x	x	8
	Chamber of Commerce Bldg. Flushing	x	x	x	x	x	x	x	x	x	9
	Jamaica Hospital		x								1
Bronx	Montefiore Hospital	x	x	x	x	x					5
	Fordham Hospital						x				1
Staten Island	Sea View Hospital	x	x	x	x	x	x				6
Total	11 stations										52

This analysis, therefore, covers the findings obtained with the standard technique from 1946 to 1954, inclusive, at 30 stations in and around New York City and includes data on 98 station-seasons. It also makes use of the counts made with the old technique at the Brooklyn station during the ragweed seasons of 1937 to 1954, inclusive.

TABLE II. STATIONS STUDIED AROUND NEW YORK CITY, 1946 TO 1954 INCLUSIVE

STATE	STATION	1946	1947	1948	1949	1950	1951	1952	1953	1954	TOTAL STATION- SEASONS
New Jersey	New Brunswick		x	x	x	x	x	x	x	x	8
	Verona	x	x	x	x						4
	Maplewood		x	x	x						3
	Sandy Hook			x	x						2
	Freehold			x							1
	Marlboro				x						1
	Teaneck		x								1
	Westwood			x							1
	Dover			x							1
Connecticut	Bridgeport			x	x	x	x	x	x	x	7
	Stamford									x	1
New York	Garden City		x	x	x	x					4
	Long Beach							x			1
	Fire Island		x								1
	Huntington								x		1
	Northport									x	1
	White Plains		x	x	x	x					4
	Croton	x	x								2
	Ambrose Lightship— New York Harbor				x	x					2
Total	No. of Stations 19										
	No. of Station-Seasons										46

TECHNICAL CONSIDERATIONS

Durham slide shelters were set up at various stations under similar exposure conditions which approached the standard as closely as possible.¹ Greased slides, prepared at and distributed from the Allergy Laboratory of

The Jewish Hospital of Brooklyn, were exposed in the shelters between 8 and 9 A.M. for twenty-four-hour periods and were returned to the laboratory in sealed containers at regular intervals. At the laboratory, these were stained and counted according to the standard technique by trained staff members and technicians.

Pollen counts were recorded in terms of the number of ragweed pollen granules per square centimeter of exposed slide per twenty-four-hour period. Multiplying this figure by the standard coefficient 3.6 (or by 1.8 for the slides exposed in the old shelter) yielded the approximate pollen content of a cubic yard of air for the twenty-four-hour period.² From the daily ragweed counts of all stations within the city an average reading for New York City was computed. Seasonal totals for a station were obtained by adding all of the daily pollen counts of the entire ragweed season at that station. This figure, however, is inadequate for the clinical appraisal of the community as a pollen hazard to the sensitive patient. For this purpose, a pollen index was computed for each ragweed season at each station according to Durham's formula.⁶ This index is obtained by a summation of three factors computed as follows: (1) the seasonal total divided by 200; (2) the number of days on which the count exceeds 25; and (3) the highest single count of the season divided by 100. All calculations in this formula are based on counts in terms of the number of pollen granules per cubic yard of air. From the indices of the stations studied each season, an average pollen index for the entire city was computed for each year.

METEOROLOGIC STUDIES

Meteorologic data provided by the U.S. weather stations in the vicinity of the sites of survey were analyzed and correlated with the pollen data. The weather station at the Battery at the lower tip of Manhattan Island was the one nearest to the Allergy Laboratory and not only provided invaluable meteorologic information but served as a slide exposure station during six ragweed seasons (Table I). The many meteorologic factors which influence pollen counts will be the subjects of other communications.

WIND AS A FACTOR IN NEW YORK CITY'S RAGWEED PROBLEM

In previously reported surveys of Fire Island, New York,⁷ and Sandy Hook, New Jersey,⁸ the pronounced influence of western winds on New York City's ragweed pollen index was demonstrated. Although these stations were located on sandy beaches, bearing little or no ragweed and almost completely surrounded by the ocean (Fig. 2), they yielded high pollen counts on days when brisk westerly winds prevailed.

Most significant have been the studies made in 1949 and 1950 at Ambrose Lightship,⁹ which is anchored well out in the Atlantic Ocean at the entrance to New York Harbor. The Lightship is at least nine miles from the nearest land and for purposes of comparison might be considered the center of an imaginary ragweed-free region immediately adjacent to New York City and corresponding in area and outline to the city (Fig. 2). The high pollen peak

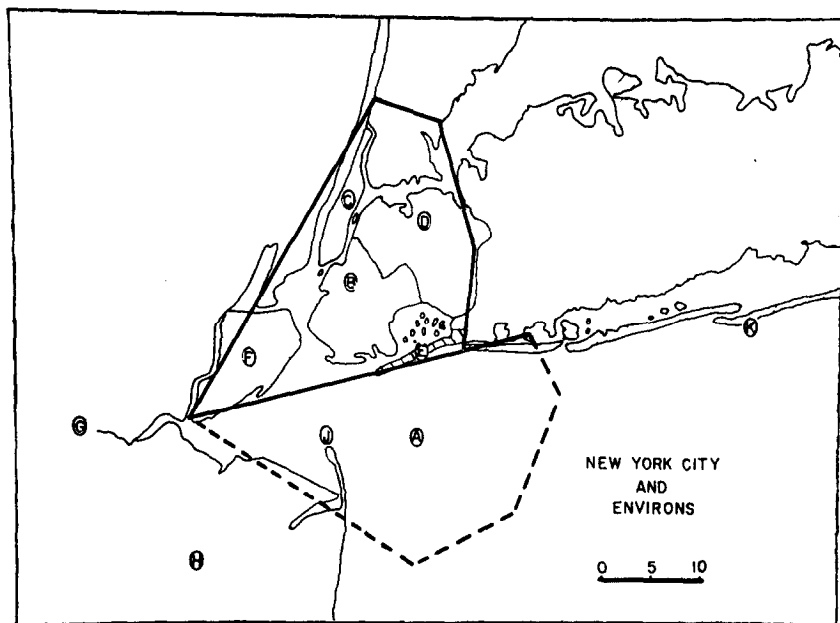


Fig. 2.—The heavily lined pentagon roughly represents the area covered by New York City. Adjacent to it, and on the ocean, a similar figure is drawn in broken outline to represent an imaginary "ragweed-free New York City." Ambrose Lightship (Station A) would be close to the center of this imaginary "city." Other stations on this map include (B) The Jewish Hospital of Brooklyn; (C) Central Park, Manhattan; (D) Flushing, Queens; (E) Staten Island; (F) New Brunswick, New Jersey; (G) Marlboro, New Jersey; (H) Sandy Hook, New Jersey; and (K) Fire Island, New York. (Scale is in miles.)

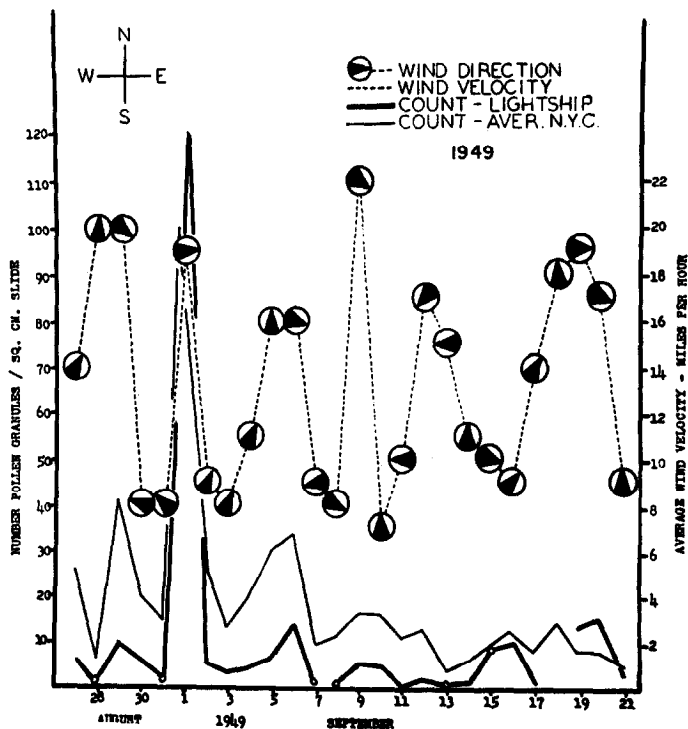


Fig. 3.—Daily pollen counts at New York City and Ambrose Lightship and their relationship to wind direction and velocity during the ragweed season of 1949.

days on the Lightship almost regularly coincided with those of the city and in some instances the counts on the ocean exceeded those of the city (Fig. 3). On these peak days, the wind almost always proved to be westerly and brisk.

On the basis of these Lightship studies, it was conservatively estimated that at least one-half of New York's ragweed pollen originated outside the borders of the city, particularly in areas to the west and southwest, and, to a minor degree, in districts to the northwest and north. Thus, theoretically at least, a perfect intramural ragweed elimination campaign could not be expected to reduce New York's pollen by more than half. The pollen surveys made during the course of the campaigns have supported this hypothesis.

"OPERATION RAGWEED"

From time to time, the Health Department of New York City has issued reports, the most recent one in January, 1955,⁴ on the progress of this project. The cooperation of other city departments has been enlisted in this undertaking, the annual cost of which is estimated at \$85,000. The main feature of the

TABLE III. NEW YORK CITY RAGWEED ELIMINATION CAMPAIGNS 1946-1954

YEAR	ESTIMATED ACREAGE OF RAGWEED*		MAN DAYS OF LABOR	UNUSED ACREAGE†	
	PRECEDING CAMPAIGN	ELIMINATED IN CAMPAIGN		NEW YORK CITY	BROOKLYN
1946	10,000	3,149			
1947	8,000	4,795	3,814		
1948	6,000	3,944	2,904	(Nov.) 48,300	5,900
1949	4,000	3,297	2,953		
1950	5,000	3,157	2,841		
1951	5,500	3,680	3,177		
1952	5,000	3,197	2,853		
1953	5,000	2,350	2,874	(June) 30,800 (-36%)	3,300 (-44%)
1954	4,500	3,004	2,915		

*Report of City Health Department.

†Report of City Planning Commission, November, 1948 to June, 1953.

campaign has been the spraying of ragweed with 2-4D in advance of each pollinating season. Because heavy street-flushing trucks are employed for this purpose, the weed growths which can be reached by these vehicles which traverse the city's roads have received the most intensive spraying.

In its reports, the Health Department has provided estimates on the extent of the ragweed infestation which preceded each campaign, on the acreage that was "eliminated" (sprayed) annually, and on other details of the operation (Table III). According to surveys made by the Police Department in 1946 and 1947, there were approximately 10,000 acres of ragweed in the city before "Operation Ragweed" was started.⁴ All subsequent estimates were provided by the Health Department which has, for the most part, relied on the reports of the spraying teams for its information. According to these reports, the ragweed acreage has been reduced by not more than half during the nine years of campaigns. Most of this improvement was achieved during the first four years, and there has been no radical change in ragweed acreage since then. Although approximately 3,000 acres have been "eliminated" during each cam-

paign since 1950, the city total at the start of the subsequent campaign has remained more or less the same at approximately 5,000 acres. On the basis of these estimates of approximately a 50 per cent reduction in intramural ragweed acreage during this nine-year period, it is theoretically impossible for "Operation Ragweed" to achieve more than a 25 per cent reduction in the offending pollen, since approximately half of New York's airborne pollen is of extramural origin and is therefore not influenced by the city's campaigns.

POLLEN INDICES—NEW YORK CITY 1946-1954

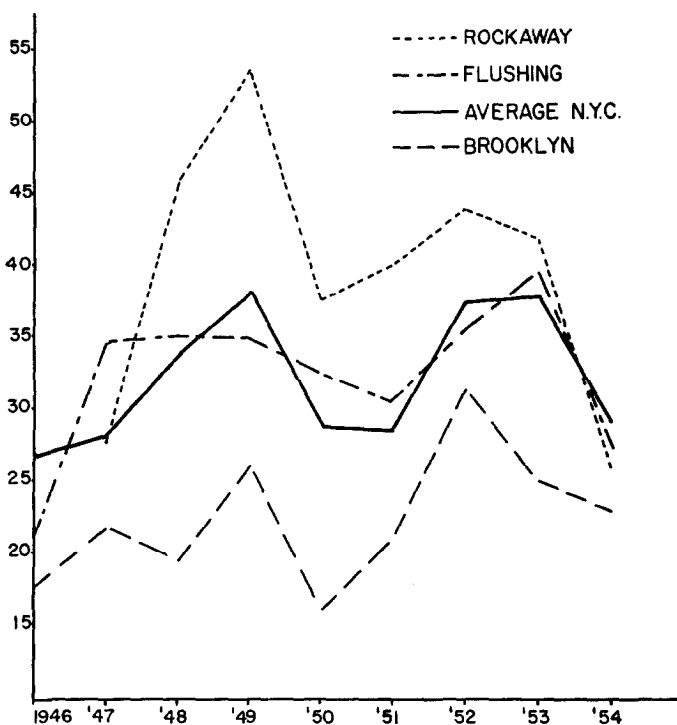


Fig. 4.

THE RESULTS OF THE POLLEN SURVEYS

A. Effect of "Operation Ragweed" on the Pollen Indices of New York City.—The ragweed pollen indices for New York City as a whole and for the stations at Brooklyn, Flushing, and Rockaway (Fig. 2) during the nine years of "Operation Ragweed" are graphically presented in Fig. 4. The index for the entire city has varied from 27 to 38 and has shown no consistent tendency to decline. The indices at Flushing in the Borough of Queens run close to those of the city. At Rockaway in Queens and at Brooklyn, the indices run, respectively, above and below those of the city. At none of these stations was there any indication that the indices were declining or deviating materially from the city indices or from each other. The major fluctuations shown in the

graphs may all be satisfactorily accounted for on the basis of the meteorologic conditions which prevailed during the ragweed pollinating seasons or during the months preceding them. The findings at the other city stations which were studied less extensively were in complete accord with the results obtained in the more complete surveys.

A comparison of New York City's pollen index with those of neighboring cities, where no organized efforts at ragweed elimination were made, likewise fails to provide any evidence that "Operation Ragweed" has a pronounced

**POLLEN INDICES—
AT STATIONS OUTSIDE ERADICATION AREA
1947-1954**

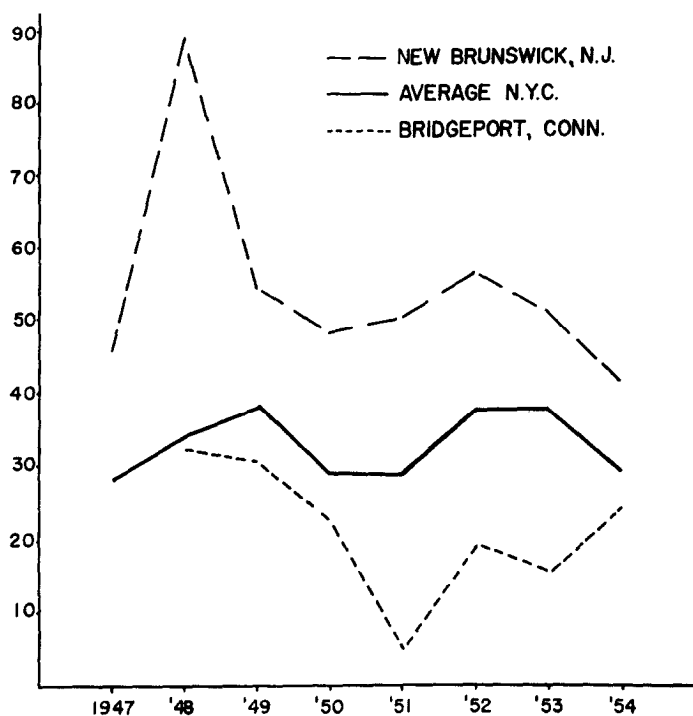


Fig. 5.

effect on the pollen index of New York (Fig. 5). At New Brunswick, New Jersey (Fig. 2), which lies about 30 miles southwest of New York in the vicinity of heavy ragweed growth, the pollen indices since 1947 have consistently been higher than those of New York. With the exception of the 1948 readings, the graphs of the two cities have run almost parallel. Since New Brunswick lies in the direction from which New York receives so much of its pollen, such a pronounced correlation of the two graphs is not remarkable. On the other hand, Bridgeport, Connecticut, which lies about 50 miles northeast of New York (Fig. 1), has a consistently lower pollen index than New York City, since it lacks dense ragweed growth of its own and receives relatively little pollen

from surrounding areas. Here again a comparison of the indices of the two cities fails to provide any indication that New York's readings have been materially reduced or noticeably affected by the eradication program.

B. *The Effect of "Operation Ragweed" on Brooklyn's Pollen Index.*—There are no available statistics by which the pollen indices of New York City as a whole, before and after 1946, can be compared. There are at hand, however, the pollen counts for Brooklyn made annually, since 1936, at the Allergy Laboratory of The Jewish Hospital of Brooklyn. Although these data represent readings at only one station and were obtained with the "old" technique of slide exposure and counting (using the 1.8 factor), they nevertheless

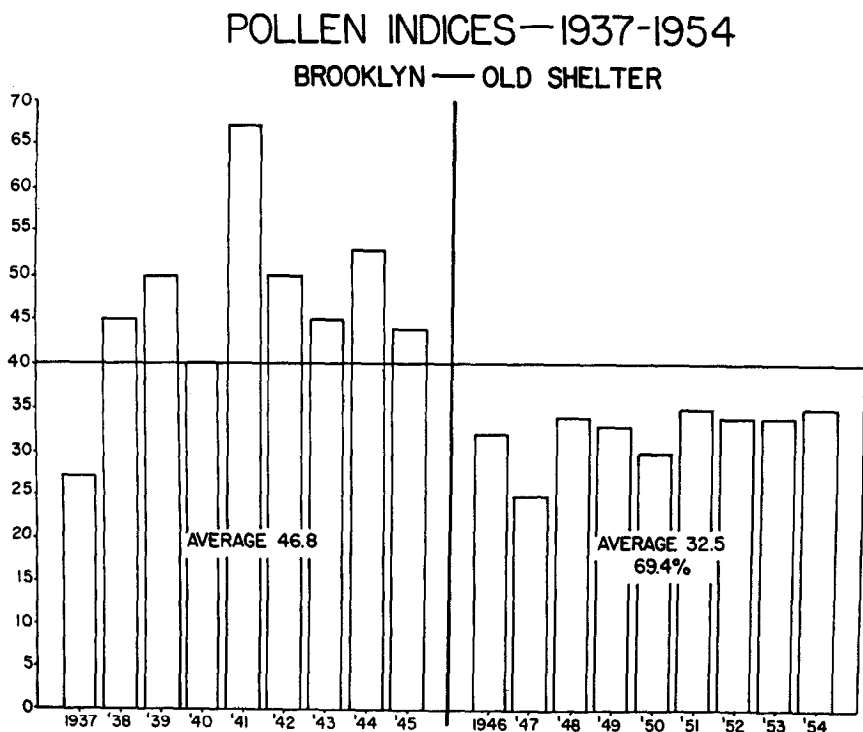


Fig. 6.—Blocks represent annual pollen indices at The Jewish Hospital of Brooklyn Station from 1937 to 1954, inclusive, based on counts made with the old technique. Heavy vertical line marks start of "Operation Ragweed." Light horizontal line represents average pollen index for Brooklyn over the eighteen-year period.

comprise the only series of uninterrupted pollen surveys which were made within New York City throughout the entire period under consideration. For this reason these data have proved to be of considerable value.

From these data, it appears that the average pollen index for this Brooklyn station, during an eighteen-year period running from 1937 to 1954, inclusive, was approximately 40 (Fig. 6). For the nine-year period preceding 1946, the average pollen index was 46.8. For the subsequent nine-year period, it was 32.5. Hence, there appeared to be a decline of 30.6 per cent in the average pollen index of this station while "Operation Ragweed" was in progress.

However, this figure needs careful interpretation since there are factors other than the eradication program which have affected the pollen index of this Brooklyn station during this period. Of these, only the two most important will be discussed at this time.

1. *The decline in vacant land:* Among the local factors affecting the pollen index of this Brooklyn station were changes in the neighborhood where the slides were exposed. Most important among these was the erection of many new buildings on what was formerly vacant weed-infected land. The building boom which affected the entire city was particularly active in the Borough of Brooklyn. In New York City, according to the report of the City Planning Commission,¹⁰ vacant land diminished from 48,300 acres in November, 1948, to 30,800 acres in June, 1953, a decline of 36 per cent in a four and one-half year period (Table III). For the Borough of Brooklyn the decline in vacant land during the same interval was 44 per cent. Since "Operation Ragweed" involves a nine-year period which includes and doubles that covered by the City Planning Commission survey, it is reasonable to assume that the decline in Brooklyn's vacant land acreage from 1946 to 1954, inclusive, was in excess of 60 per cent. The effects of such a change upon the ragweed acreage and pollen indices of the Borough were undoubtedly great.

2. *Wind factors:* A meteorologic factor has also contributed decisively to a reduction in Brooklyn's pollen index during the last nine years. During this period, there has been an inexplicable decline in the average number of days during the ragweed pollinating season, on which the prevailing winds blew from the west or southwest at an average velocity of at least 12 miles per hour. The pronounced influence of these particular winds on New York's pollen index has been stressed.^{9, 11}

For this special study the wind and pollen data for each of the 18 seasons under consideration were reviewed, the analysis being limited to the interval between August 15 and September 22. This is the period of active ragweed pollination in this area when winds may decisively influence the pollen counts. The pollen indices for the Brooklyn station were modified in this special study to cover only the shortened period under consideration.

For the entire eighteen-year period under analysis, there was an average incidence of 4.8 days per season when the prevailing winds blew from the west or southwest at an average velocity of 12 or more miles per hour (Fig. 7). For the nine-year period preceding "Operation Ragweed," this average was 5.7 days per season. For the following nine years, this average fell to 4 days per season, a decline of 30 per cent. An adequate explanation for this change is lacking, but there can be no question as to its significance in affecting the city's pollen index in recent years.

It is impossible to evaluate in percentages the degree to which these declines in vacant land and in seasonal brisk western winds have affected Brooklyn's pollen index during the last nine years. That they have contributed materially to the 30.6 per cent reduction in this Borough's index during this period is certain. They may possibly account for as much as from one- to two-

thirds of this decline. This would leave a diminution of from 10 to 20 per cent in Brooklyn's pollen index which could be attributed to "Operation Ragweed." It is reasonable to assume that these estimates for Brooklyn are fairly representative of the effects of "Operation Ragweed" as they apply to the city as a whole.

DAYS PER SEASON OF PREVAILING WEST OR SOUTHWEST WINDS EXCEEDING 12 MILES PER HOUR

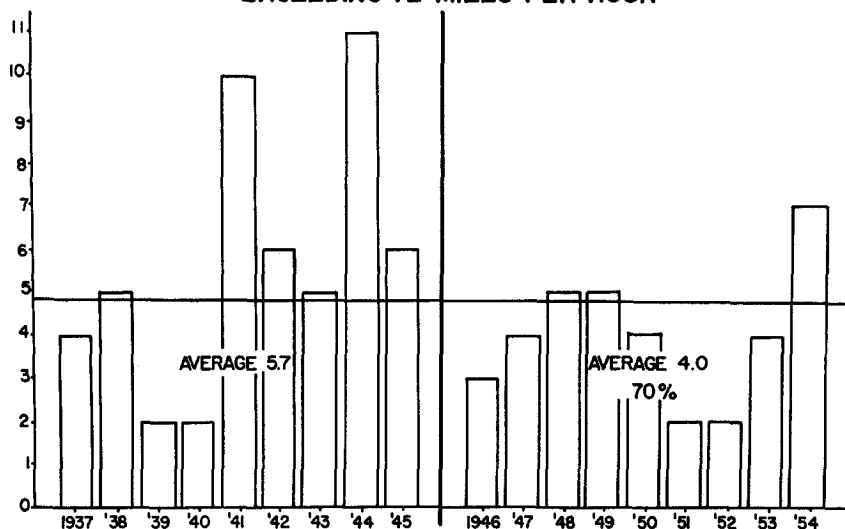


Fig. 7.—Blocks represent number of days each season when predominating winds blew from the west or southwest at velocities of 12 or more miles per hour. Light horizontal line represents the average for the eighteen-year period. Heavy vertical line marks start of "Operation Ragweed." Wind data are based on readings by the United States Weather Bureau at the Battery, at the lower end of Manhattan.

GEOGRAPHIC FACTORS INFLUENCING NEW YORK'S ELIMINATION CAMPAIGN

By all criteria, the effects of "Operation Ragweed" on the city's pollen index are not striking. Yet, limited as they are, they might have been even less apparent had there not been important geographic and meteorologic considerations which were advantageous to the campaigns.

On most sides, New York City is surrounded by large bodies of water (Fig. 2). The Atlantic Ocean and Long Island Sound form its southern and eastern boundaries except where they are interrupted by contact with Long Island. The broad Hudson River and New York Bay make up most of its western border. There are no extensive heavy ragweed concentrations to the east in neighboring Connecticut or Long Island so that eastern winds generally represent no serious problem to ragweed sufferers in New York City. Winds from the south and southeast are sea breezes and are generally free of pollen. Hence, winds blowing into the city on at least one-third of its circumference do not materially increase New York's pollen index. During the last fourteen years, these south, southeast, east, and northeast winds averaging more than 12 miles per hour in velocity constituted about 25 per cent of the brisk winds

charted in New York City during the height of the ragweed seasons. Communities which are well inland may not derive the benefit of such geographic and meteorologic advantages in their elimination campaigns.

THE OUTLOOK FOR RAGWEED ELIMINATION CAMPAIGNS

On the basis of past experience, it seems unlikely that New York City can be rendered completely free of ragweed with the present methods of eradication and by community campaigns. Moreover, it is not to be expected that the problem will be solved by legislation, no matter how authoritative. It has been pointed out repeatedly that ragweed may be totally and permanently eliminated only in those areas where, because of climatic or soil conditions, the weed is not a natural inhabitant and where contamination by wind-borne pollen is prevented by natural barriers such as broad mountain ranges, deserts, forests, or oceans.

In New York City and in most of the nonmountainous parts of New Jersey, Pennsylvania, and New York State, natural conditions favor profuse ragweed growth. The soil in these areas is contaminated with ragweed seeds which may remain viable for as long as thirty or forty years. For many years fresh breaks in the soil surface either for purposes of planting or construction will start new growths of ragweed and reinvasions of the cleaned areas.

The fact that the heavy ragweed concentrations in these states are both rural and urban renders total eradication less attainable, since it is even more difficult to wage effective campaigns in rural and partially developed areas than in cities and towns.

In the past it has been repeatedly demonstrated that anything less than complete success in the battle against ragweed is a doubtful gain. This has again been shown during the last five years of "Operation Ragweed" in New York City where, in incompletely cleared areas, the weeds have returned almost as rapidly as they were "eliminated."

To date, the results of local eradication campaigns in large cities, such as Chicago and New York, have not been encouraging. Whether it is feasible or even possible to solve the ragweed problem on a national or continental scale is a moot question. Without the participation of Canada and Mexico in such an enterprise, the prospect for ultimate success would be dim. The task would be Herculean. The cost would be staggering. The entire problem of ragweed elimination is obviously a formidable one which is not to be solved by a casual approach on a community level.

SUMMARY

1. Approximately half of New York City's ragweed pollen is generated intramurally. The remainder is brought in by brisk western winds from New Jersey, Pennsylvania, and to a lesser degree from upper New York State. Hence, the total eradication of the ragweed within the city can at best reduce its atmospheric contamination with ragweed pollen by one-half.

2. On the basis of the reports of New York City's Health Department, indicating approximately a 50 per cent reduction in the city's ragweed acreage

after nine years of "Operation Ragweed," it may be estimated that the city's ragweed pollen production may have been cut by one-half, thus reducing the pollen contaminating the air of the city by one-fourth.

3. During the nine years of "Operation Ragweed," pollen surveys were made under standard conditions at 30 stations in and around New York City, covering a total of 98 station-seasons. The results of these surveys revealed no definite tendency for the pollen index of New York City as a whole, or of any city station, to decline during this period.

4. Comparisons of New York's pollen indices during this period with those of nearby New Brunswick, New Jersey, and Bridgeport, Connecticut, where there have been no elimination campaigns, afford no indication that the course of New York's index in recent years is deviating from that of its neighbors.

5. Pollen counts at the Brooklyn station made with the old counting technique over a period of eighteen years (1937-1954) reveal a 30.6 per cent decline in the average pollen index at this station during the nine-year period (1946-1954) while "Operation Ragweed" was in progress. During this same interval, however, there was also a pronounced decline in Brooklyn's vacant land, probably in excess of 60 per cent. Coincidentally, there was, in addition, an inexplicable decrease of 30 per cent in the average incidence of stiff western winds during the active pollinating seasons when such winds contribute heavily to New York's ragweed counts. In the light of these important considerations, it may be estimated that only from one- to two-thirds, or from 10 to 20 per cent, of the 30.6 per cent decline in Brooklyn's index may be attributed to the effects of "Operation Ragweed."

6. The results obtained in Brooklyn are probably representative of those achieved for the city as a whole.

7. New York is a coastal city and easterly and southerly winds blowing into the city on approximately one-third of its circumference are comparatively pollen-free. Inland communities would not benefit in this manner.

8. Since ragweed grows naturally and profusely in the New York Metropolitan Area, there is little likelihood that eradication campaigns, *carried out along the lines of those employed at the present time*, will succeed either in eliminating the weed completely and permanently from the city or in decisively reducing its pollen index.

REFERENCES

1. Preliminary Report of The National Pollen Survey Committee of The American Academy of Allergy on Proposed Standardization of Pollen Counting Techniques, M. Walzer, Chairman, O. C. Durham, Technical Director, *J. ALLERGY* 17: 178, 1946.
2. Report of The National Pollen Survey Committee of The American Academy of Allergy on a Conversion Factor for Gravity Slide Counts, M. Walzer, Chairman, O. C. Durham, Technical Director, *J. ALLERGY* 18: 284, 1947.
3. Walzer, E. H., Sherman, J., Chait, R. A., and Walzer, M.: Survey of Ragweed Pollination in the New York Metropolitan District in 1946, *New York J. Med.* 47: 1979, 1947.
4. Hawksby, W. M., and Smahl, A. A.: Report of the New York City Program and Recommendations for a Metropolitan Program. Proc. Ninth Annual Meeting, Northeastern Weed Control Conference, New York City, Jan. 5-7, 1955, p. 491.

5. Durham, O. C.: The Contribution of Aerobiology to Weed Control, Proc. Ninth Annual Meeting, Northeastern Weed Control Conference, New York City, Jan. 5-7, 1955, p. 481.
6. Durham, O. C.: Evaluation of the Ragweed Hay Fever Resort Areas of North America, *J. ALLERGY* 8: 175, 1937.
7. Walzer, E. H., Siegel, B. B., Chait, R. A., and Walzer, M.: Survey of Ragweed Pollination in the New York Metropolitan District in 1947, *New York J. Med.* 48: 2019, 1948.
8. Wiseman, R. D., Siegel, B. B., Glazer, I., Chait, R. A., and Walzer, M.: Surveys of Ragweed Pollination in the New York Metropolitan District in 1948 and 1949, *New York J. Med.* 50: 2552, 1950.
9. Wiseman, R. D., Sack, S. S., Siegel, B. B., Glazer, I., and Walzer, M.: Studies on Factors Influencing Ragweed Pollen Counts in the New York Metropolitan District. I. Pollen Studies on Ambrose Lightship in New York Harbor, *J. ALLERGY* 25: 1, 1954.
10. Report of the City Planning Commission, City of New York, Tenant Relocation Report. Adopted Jan. 20, 1954, Table 40, p. 75.
11. Siegel, B. B., Sack, S. S., and Walzer, M.: Studies on Factors Influencing Ragweed Counts in the New York Metropolitan District. 2. Wind as a Factor in New York's Pollen Problem. (To be published.)