DUTCH ELM DISEASE IN NEW BRUNSWICK, 1957 - 1967

by

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INTRODUCTION

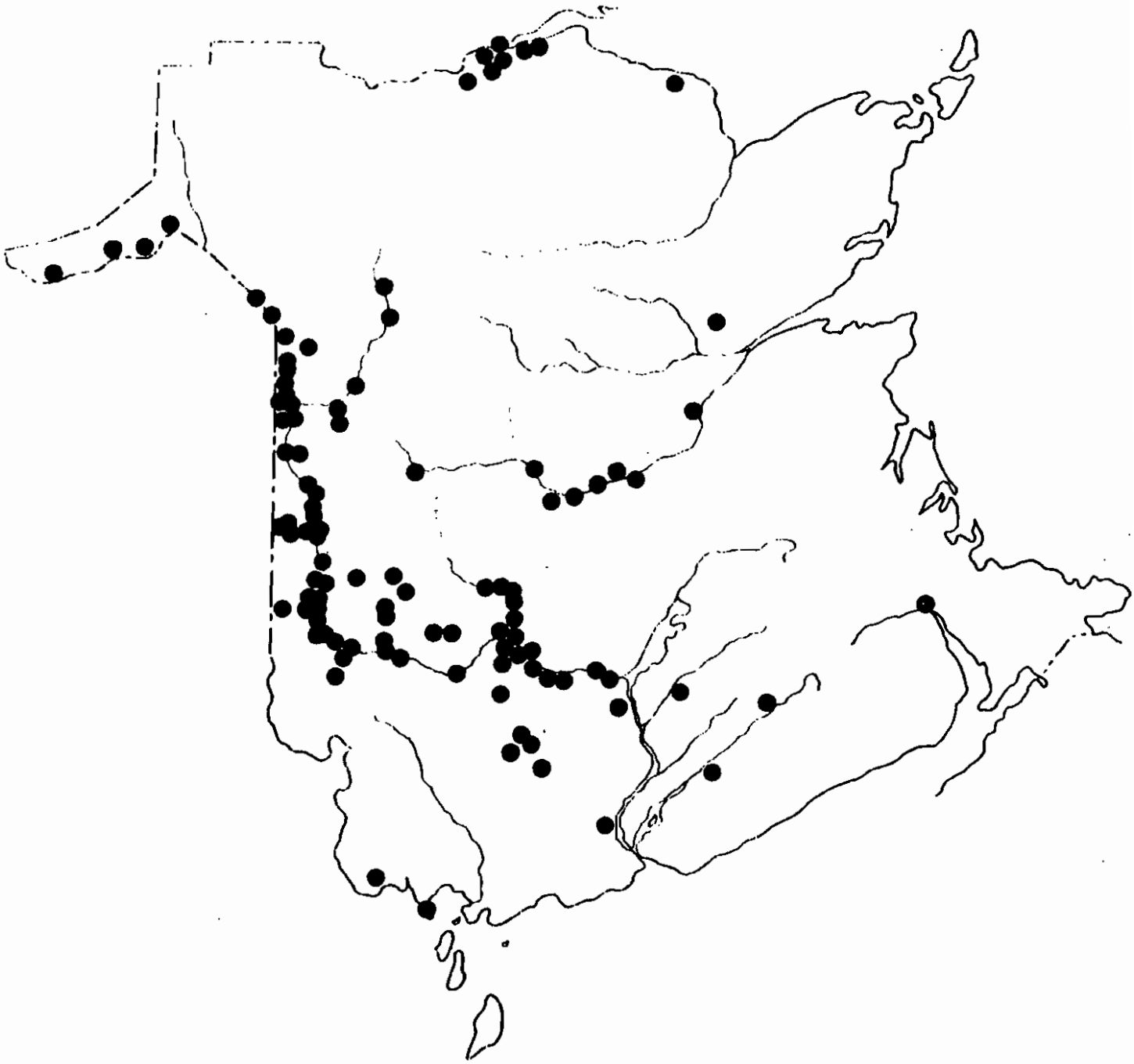
Dutch elm disease, caused by the fungus *Ceratocystis ulmi* (Buism.) C. Moreau, was first found in New Brunswick at Woodstock in 1957 (Anonymous, 1957). The disease has since spread and now occurs in all counties of the Province except Gloucester, Kent, Albert, and Saint John. It has not yet been found in trees in Nova Scotia or Prince Edward Island.

This report brings together information on the nature and extent of work done and results obtained in New Brunswick since the disease was first found. Also described are the symptoms of the disease, the life history and habits of the principal vector, the native elm bark beetle, *Hylurgopinus rufipes* (Eichh.), and details of control by sanitation and by spraying. The roles played to date by the Department of Forestry and Rural Development, the Canada Department of Agriculture, and the New Brunswick Department of Natural Resources are outlined as is the extent of liaison with municipalities. This report, an 11-year record of work on the disease, should provide a useful reference for future surveys and for research.

DISTRIBUTION AND SPREAD

The spread of Dutch elm disease has been reviewed by Pomerleau (1964). The disease, first observed in the Netherlands and northern France in 1919, was discovered in Ohio in 1930 and in northern New Jersey in 1932. Apparently the causal fungus was introduced to North America in elm logs. In Canada infected trees were first found at St. Ours, Quebec in 1944. By 1963 the disease was known to occur over about 46,000 square miles in Quebec and over about 64,000 square miles in Ontario (Pomerleau, 1964).

In 1957 when the disease in New Brunswick was first found at Woodstock, the nearest known infections were about 55 miles west in the State of Maine. Between 1957 and 1962 the disease was confined mostly to trees in the Saint John River Valley, from St. Hilaire, Madawaska County to a point about 30 miles southeast of Fredericton. In 1962 the disease was found at Tidehead, Restigouche County, about 85 miles from the nearest known infected trees in New Brunswick. The following year 3 diseased trees were found in the City of Campbellton, and in 1964, 81 suspect trees and 34 dead trees were observed on the islands in the Restigouche River between Atholville and Matapedia. Ouellette (1963) recorded the disease at locations in Bonaventure County, Quebec and it is probable that the source of infection in the Tidehead-Campbellton area was from Quebec rather than from infected trees in New Brunswick. Infected trees were also found in 1963 at Blissfield, Northumberland County, and Milltown, Charlotte County (Magasi, 1964). In 1964 the disease was found for the first time at Hoyt and Oromocto, Sunbury County; Haysville, York County, and Boiestown, Renous, and Sevogle, Northumberland County (Magasi, 1965). In 1965 infected trees were located at St. Andrews, and at Nashwaaksis and Taxis River, York County, and McNamee, Northumberland County (Forbes et al, 1966). In 1966 the disease was found at Sussex and at Moncton (Forbes, Underwood, and Van Sickle, 1967), representing a spread of 30 and 70 miles, respectively, from the nearest known areas of infection. New locations for the disease in 1967 included Jacquet River and Robinsonville, Restigouche County; Doaktown, Northumberland County; Welsford and Big Cove, Queens County, and Hampton, Kings County (Forbes, Underwood, and Van Sickle, 1968). The known distribution of the disease to the end of 1967 is shown on the accompanying map. Additional locations where the disease was found for the first time are listed in annual reports of the Forest Insect and Disease Survey.



KNOWN DISTRIBUTION OF DUTCH ELM DISEASE

IN

NEW BRUNSWICK

● 1957 to 1967

Scale: 1 inch = 34 miles (approx.)

SURVEY AND COLLECTING METHODS

Scouting for Dutch elm disease has been conducted in New Brunswick since 1951 by the Forest Insect and Disease Survey and for some years previous to this by the Plant Protection Division, Canada Department of Agriculture. Surveys were intensified in 1957, especially in areas adjacent to Maine. Except for towns, cities, and municipalities undertaking control, little attempt was made until 1967 to determine incidence of the disease in an area, (Forbes, Underwood, and Van Sickle (1968), or to find all diseased trees. Rather, scouting has been confined mostly to areas where the disease is not known to occur. Scouting is carried out mainly from July 1 to August 15, by field staff of the Forest Insect and Disease Survey assisted by staff of the Plant Protection Division, Canada Department of Agriculture. Observations are made mostly from the ground but sometimes aerial reconnaisance helps locate suspect trees for checks later from the ground.

Collections consisting of six branch sections 6 to 8 inches long and ½ to 1½ inches thick are taken from trees with wilted or dying leaves on the branches and/or with dark brown streaks under the bark or in the outer rings of wood. The sections are placed in suitable cartons, sealed with masking tape, and sent for culturing and diagnoses to: Forest Insect and Disease Survey, Forest Research Laboratory, P. O. Box 4000, Fredericton, N.B.

SYMPTOMS OF DISEASE

The fungus that causes Dutch elm disease develops in the sap-conducting vessels, producing spores and a poison that are carried in the sap stream to other parts of the tree and cause discoloration and death. The first external symptom is a sudden wilting of the leaves on one or more branches (Fig. 1). These leaves become yellow and later brown and shrivelled. Leaf

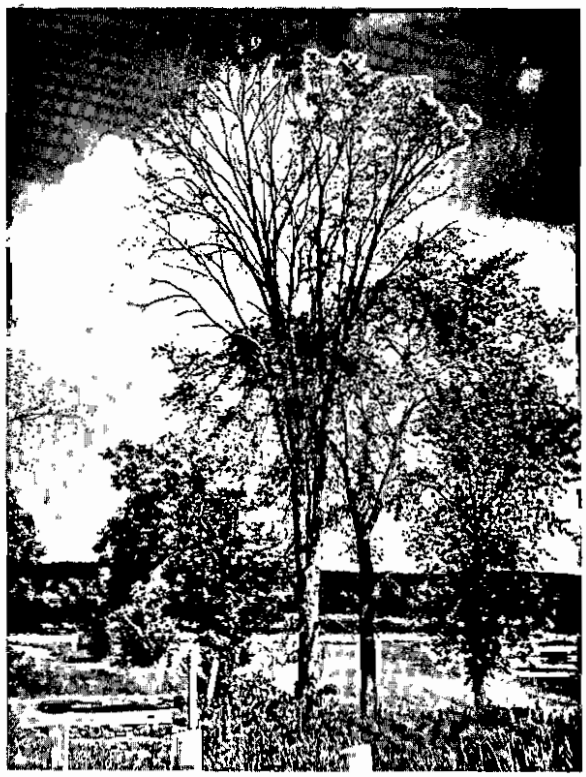


Fig. 1. Elm tree showing symptoms of Dutch elm disease.

Fig. 2. Adult gallery and larval mines of the native elm bark beetle on surface of wood.

Fig. 3. Peeled branches showing brown streaking of sapwood.

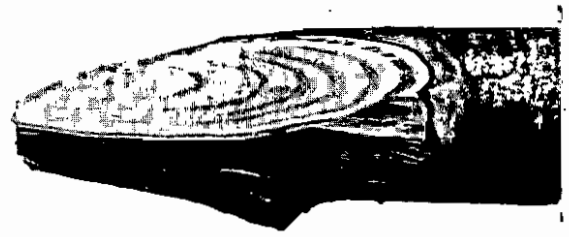


Fig. 4. Section of branch showing partial brown ring.

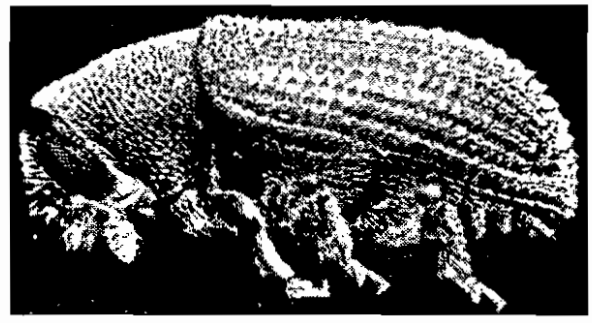


Fig. 5. Adult of the native elm bark beetle.

wilting is usually evident from late June to early August. Following the development of foliar symptoms, affected branches die and ultimately the tree dies. Long brown streaks develop in the outer sapwood under the bark of infected branches and stems (Fig. 3). In cross-section the discoloration usually looks like a partial to complete dark ring (Fig. 4).

The symptoms of Dutch elm disease are similar to those of Cephalosporium wilt and Verticillium wilt, two other diseases of elm. Positive identification in the field is therefore not possible making it necessary to collect samples of branches with these symptoms for culture in the laboratory.

The time required to kill a tree varies considerably. Small trees may die in a single season. Large trees occasionally die in a single season but may survive for three or more years. Occasionally an infected tree survives but usually the disease is fatal.

DISSEMINATION

Insects

The native elm bark beetle, *Hylurgopinus rufipes* (Eichh.) is believed to be the primary carrier of the fungus in New Brunswick. Spores stick to adult beetles emerging from infected trees and are introduced into healthy trees when the beetles feed on branches or enter the bark in the spring. The European elm bark beetle, *Scolytus multistriatus* (Marsh.) is also an important carrier of the disease fungus in other areas but is not known to occur in New Brunswick. Two weevils, *Magdalis armicollis* (Say) and *M. barbita* (Say), are capable of transmitting the disease, but neither species is considered an important vector (Finnegan and Sippell, 1964).

Native Elm Bark Beetle

In Canada the native elm bark beetle is known from western Manitoba to central Nova Scotia. There are, however, extensive areas along the eastern, northern, and western limits of the range of white elm, where the insect has never been recorded. It was found in Nova Scotia for the first time in 1964 at Upper Stewiacke, Colchester County. It has not been recorded in Prince Edward Island. The insect has been found at the following locations in New Brunswick:

Restigouche County

Kedgwick River

Campbellton

Doyles Island

McBeath Island

Long Islands

Victoria County

Jct. Little Tobique River and Little Cedar Brook

Near Blue Mountain Bend

Madawaska County

Mouth St. Francis River

Carleton County

Hartland

Grafton

Woodstock

Lower Woodstock

Northampton

York County

South Tay Bridge

Stanley

Durham

Marysville

Fredericton

Northumberland County

Boiestown

Sevogle

Sunbury County

Lincoln (Baker Brook)

Sheffield

Charlotte County

DeWolfe

The adult beetle (Fig. 5), dark brown to black, is slightly less than 1/8 inch long. The minute egg is globular, shiny, and pearly white. The larva is a legless, white grub with a brown head, and is about 1/8 inch long when full grown. The pupa is white and is about the same size as the adult.

The life history and habits of the native elm bark beetle in southwestern Ontario have been described by Finnegan (1957). The seasonal history of the insect in New Brunswick, although not studied intensively, seems very similar to that in Ontario.

There is one complete generation and a partial second a year. Most specimens overwinter as adults. Hibernation tunnels may be in living healthy or diseased trees or in dead trees including those diseased. In early May the beetles come out of hibernation and may resume feeding in these bark tunnels. Many then go to small branches of healthy trees where the bark is thin and feed further, and it is chiefly at this time - if they have emerged from diseased material - that they may introduce the fungus spores into the water-conducting vessels of the trees. After feeding, the beetles fly to weakened, dying, diseased, or newly cut material, and construct brood galleries, breed, and oviposit during May, June and July. New adults emerge in late summer and autumn and feed in bark of healthy trees until late fall; they pass the winter in special hibernation tunnels. A few adults construct brood galleries and give rise to larvae. Most of these are killed by low temperatures but survivors emerge as adults the following June.

The female cuts galleries in the inner bark and across the grain of the wood (Fig. 2). One female lays about 60 eggs in tiny grooves along both sides of the main gallery. The eggs, laid between mid-May and mid-July, hatch after about one week. The larvae mine the cambium and surface of the wood until about the end of August. When full grown they make cells at the end of the mines and pupate.

Other Means of Dissemination

The causal fungus may also be transferred from one tree to another by root grafts. This is possible, however, only when the roots and consequently the vessels of diseased trees are in contact with roots of healthy trees thereby allowing passage of the fungus.

Adult beetles may be dispersed by winds. Spores of the fungus are sticky and their spread by air currents is probably negligible. No information has been obtained on the role motor vehicles play in spreading the disease by carrying fungus-contaminated beetles. Similarly, little is known about the hazards of spread associated with the transport of infected unbarked logs or lumber with beetles. Both agencies may be important in the spread of the disease.

CONTROL

There is no cure for the disease and it is virtually impossible to eradicate it from an area. Its incidence and spread can be reduced, however, by (1) eliminating beetle-breeding material such as diseased and dying trees, recently dead trees, freshly cut trees or logs, broken or recently dead branches, and unbarked stumps, and (2) spraying the living elm trees with a residual insecticide such as DDT. Spraying alone will not satisfactorily control the spread of the disease and best results are obtained when both sanitation and spraying are practised.

Sanitation

Recommendations for sanitation follow:

(1) burn or bury all elms known to have Dutch elm disease;

(2) prune living elms to eliminate possible beetle-breeding material, burn all wood removed, and paint the wounds with a tree-wound dressing;

(3) burn, bury, debark, or spray all cut or broken elm wood near elm trees, especially during the spring and summer;

(4) debark all elm stumps and bolts saved for fuelwood, or spray them with 1% benzene hexachloride or 1% DDT;

(5) remove before May 1 (before bark beetles emerge) all cut elm wood that has not been debarked or sprayed.

Spraying

Spraying may be done any time in the spring while the trees are dormant (before the buds begin to swell) or after the leaves drop in the fall, but it should not be done when the temperature is below 40°F. For maximum effectiveness all bark surfaces of the trunk, branches, and twigs must be thoroughly sprayed particularly the upper part of the crown. Best results are obtained if all elm trees in an area are sprayed but this is not always possible. Wherever possible all healthy elms should be sprayed within a radius of 700 feet of diseased trees.

Sprays can be applied either with a hydraulic sprayer or a mist blower. A 2% DDT water emulsion is recommended for hydraulic sprayers and 12.5% for mist blowers. Some Commercial DDT emulsions contain solvents that may cause damage to the buds and twigs. Xylene solvents are safe and assure a maximum deposit of DDT on the bark surfaces. Emulsion sprays dry quickly and are not affected by rains one or two hours after application. Care should be exercised in handling DDT - Xylene concentrates because they are highly flammable and have poisonous fumes that may cause headaches, nausea, and irritation of the eyes, nose and mouth. DDT, like other poisonous insecticides, may affect humans in ways not fully known, and all reasonable precautions should be taken in its use.

LIAISON AND POLICY

The Department of Forestry and Rural Development, through its regional Forest Insect and Disease Survey staff, is responsible for: (1) determining the incidence and spread of the Dutch elm disease; (2) providing

laboratory culturing and diagnostic services of samples from suspect trees; (3) informing municipalities and individuals of the presence of diseased trees and (4) providing information and advice on sanitation and control measures. The removal of diseased trees has been and still is the responsibility of the owner, whether individuals or municipalities. Close co-operation in scouting for the disease has been developed and maintained with the Plant Protection Division, Canada Department of Agriculture, and in 1966 and 1967 assistance in scouting for suspect trees was solicited from the New Brunswick Department of Natural Resources and the Nova Scotia Department of Lands and Forests. In 1961 members of the Fredericton Kiwanis Club assisted with scouting for diseased trees in Fredericton. Since 1965 the New Brunswick Department of Natural Resources has played a valuable role in removing hazard trees adjacent to cities and towns carrying out intensive sanitation and control practices.

The following section details the incidence and development since 1958 of the disease in various towns and cities and outlines the sanitation programs carried out by these communities. Included also are summaries of the working agreements for scouting and for sanitation programs carried out for some years between staffs of the Forest Insect and Disease Survey and other agencies.

Municipalities

Fredericton - Despite the occurrence of Dutch elm disease at Kingsclear, York County (14 miles from Fredericton) in 1958, at Lincoln, Sunbury County (just outside the City limits) in 1959, and other places nearby in 1960, it was not until 1961 that it was found in the City of Fredericton. The numbers of infected trees found in the City by years are listed below:

Year	No. diseased trees
1961	2
1962	2
1963	1
1964	14
1965	11
1966	18
1967	16
	64

A total of 64 trees since 1961 is remarkably low considering there are some 7,500 elms in the City. If this low incidence can be maintained it will be unique and will bear testimony to the value of the sanitation program carried out annually since 1952.

Since 1952 approximately 500 decadent trees have been removed and destroyed. In addition all trees in the City have been pruned at least twice and some three or four times. Trees infected by Dutch elm disease were promptly removed and destroyed (small branches burned and the trunks buried under at least one foot of soil). Healthy elms within a radius of 1,000 feet of infected trees were sprayed during dormancy with a 12.5% DDT water emulsion. The spray was applied with a concentrate applicator purchased by the City in 1957 when the elms in most eastern sections were sprayed with DDT for control of fall cankerworm. All work was done by six men under the direction of the City engineer.

Woodstock - The discovery of the first infected elm tree in Woodstock was reported to the Town authorities by letter in November, 1957. The Town council was advised to have the tree removed and to dispose of the wood, or treat it with an insecticide before May 1, 1958. Removal of the tree the following

April probably had little or no effect on control of the disease as in 1958 it was found widely in Woodstock and surrounding areas and spread rapidly during the years that followed.

On request of a citizens' committee, Dr. A. G. Davidson, then senior departmental pathologist and head of the regional Forest Disease Survey, attended a meeting of the Town council in October 1958 to talk on Dutch elm disease and its control. Town authorities were contacted repeatedly between 1958 and 1962 but little interest was shown and no serious attempts were made to reduce losses from the disease. In late 1963 the authorities, realizing the seriousness of the situation, again sought advice and assistance from the Department of Forestry and Rural Development. Again the problem was discussed and it was decided to count diseased trees within the Town limits as a basis for further recommendations. Intensive scouting for the disease has been conducted annually in Woodstock since 1964 by the staff of the Forest Insect and Disease Survey.

Of 2,350 elm trees tallied within the Town in 1964 about 350 were found to be infected and were marked for removal. This coverage did not include the Meduxnekeag Creek area where there were 400 dead and dying elms, most of which were diseased, nor a small area along the Saint John River east of Main Street below the Woodstock-Grafton bridge where about 25 additional diseased trees were found. In 1966 all these trees were removed by the New Brunswick Electric Power Commission in connection with the Mactaquac power development project.

A total by years of trees cut and destroyed in Woodstock follows:

Year	No. trees removed
1958	1
1959	37
1960	2
1961	18
1962	88
1963	12
1964	337
1965	177
1966	200
1967	196 (to be removed early in 1968)

Grand Falls - Infected trees were found at Ortonville, some 10 miles south of Grand Falls in 1960, but not until 1963 was the disease found in Grand Falls on two trees. These were removed and no diseased trees have been found since.

Edmundston - In 1962 one infected elm tree was found on property owned by Fraser Companies Limited. It was removed the same year. No additional infected trees have been observed since.

Campbellton - In 1962 one infected elm tree was discovered at Tidehead, some 5 miles north of Campbellton. In 1963 three diseased trees were found in the City. An aerial survey in 1964 revealed many suspect elms (later confirmed for disease) on the islands in the Restigouche River estuary. In 1965 two more diseased trees were found in the City and two more were discovered in 1967. All diseased trees were removed the same year they were found.

Moncton - In 1966 one infected elm tree was discovered along Jonathan Creek in the Centennial Park. Several dead elms seen across the Creek were not sampled. All these were removed. In 1967 one diseased tree was found in the main part of the City but up to early 1968 this tree had not been removed.

Sussex - Two diseased trees have been found, one in 1966 and one in 1967. Both trees were removed.

St. Andrews - One diseased tree found in 1965 was promptly removed by Town staff. During the past 15 years much tree sanitation work has been carried out, especially the removal of dead branches. However, of some 30 decadent trees marked in 1965 for removal, only a few have been removed.

Milltown - One infected tree was found in Milltown in 1963. This was cut and destroyed soon after its discovery.

Following a severe infestation of elm leaf beetle, *Galerucella xanthomelaena* (Schr.) in 1949 (Smith, 1949) many twigs and branches died. These were removed in 1961 from trees on Town property but not from those privately owned.

Oromocto - Two infected trees were found in 1964 and six others in 1967 in the central part of the Town. Others, perhaps 100, were observed in private woodlands along the Oromocto River east of the highway bridge. All diseased trees except those on private property along the River were removed.

Of about 200 elm trees in the Town, some are almost 90 feet high. During construction of the new town from 1956 to 1959 some of these trees were damaged by machinery, by the lowering of the water table, or by increasing the depth of soil over the roots and around the trunks. A few died and others experienced top dieback. Town authorities have maintained a good tree sanitation and care program since 1958.

Marysville - Diseased trees in Marysville totalled: 4 in 1961; 14 in 1962 and 1963; 29 in 1964; 98 in 1965 and 1966; and 97 in 1967. All these trees have been removed.

Provincial and Federal Departments

New Brunswick Department of Natural Resources

The Province of New Brunswick, through its Tree Commission and the Department of Natural Resources has cut and destroyed a number of isolated diseased trees during the early years of the Dutch elm disease outbreak. At present the Province's activities are largely confined to the removal of diseased and decadent trees just outside the limits of communities undertaking control. Usually such trees are those recommended for removal by officers of the Department of Forestry and Rural Development. This co-operative program by these provincial and federal agencies is of value in lowering hazard from Dutch elm disease at and near the communities concerned and in offering encouragement to these communities in carrying out local sanitation and control practices.

The numbers and locations of trees removed by the New Brunswick Department of Natural Resources since 1958 and costs (where available) are listed below:

Year	Location	No. of trees	Costs
1958	Kingsclear	3	-
	Temperance Vale	3	-
1959	Upper Lincoln	1	-
	Woodstock	25	$850.00
1960	Penniac	1	-
1962	Barkers Point	1	-
1963	Blissfield	2	-
1965	Lincoln	2	$830.00
	Lower St. Marys	11	
	Nashwaaksis	4	
	Barkers Point	1	

Year	Location	No. trees	Costs
1966	Woodstock Road	1	
	Lincoln Crossing	3	$415.00
	Nashwaaksis	25	
	Barkers Point	1	
1967	Lincoln	11	
	Nashwaaksis	1	$2,005.00
	Marysville (outskirts)	98	
	Barkers Point	3	
	Woodstock (outskirts)	75	$2,077.00

Plant Protection Division

The Plant Protection Division, Canada Department of Agriculture enforces regulations restricting the importation into Canada of elm trees and unbarked elm wood from countries where the disease occurs. It also attempts to restrict movement of elm trees and logs with bark from infected areas to non-infected areas within Canada. The following incident attests to the diligence of its officers:

In February, 1963 samples of elm wood and bark were sent to the Forest Research Laboratory, Fredericton by John Cockerill, Plant Inspector, Halifax, N. S. Lumber with bark, consigned to H.M.C. Dockyard, Halifax by a lumber company in Levis, Quebec, contained the European elm bark beetle, *Scolytus multistriatus* (Marsh.) (identified by the Entomology Research Institute, Ottawa). Cultures showed that wood samples contained the causal fungus of Dutch elm disease. Subsequent inquiry showed that the elm logs, shipped by another lumber company in Parkersburgh, West Virginia, U.S.A. originated at Arranum, Ohio, where both the disease and the European elm bark beetle are common.

Fortunately the shipment reached Halifax in winter. All bark was promptly removed under supervision of Plant Protection personnel and although

careful scouting has been conducted in the Halifax area each year since no evidence has been obtained that the disease or the beetle became established.

Plant Protection officers have for several years assisted staff of the Department of Forestry and Rural Development in scouting for the disease in New Brunswick on Deer and Campobello islands, south-western and coastal Charlotte County, Saint John County west of the Saint John River, and south of Highway 112 to Moncton and Shediac; in western Nova Scotia especially the Annapolis Valley, and at Halifax and Yarmouth; and through most of Prince Edward Island.

PROSPECTS OF SPREAD

Observations in the Upper Saint John River Valley in 1967 showed that the intensity of infection by county, expressed as a percentage of suspect trees to total living trees was: Victoria, 30; Carleton, 45; York, 9; and Sunbury, 13 (Forbes, Underwood, and Van Sickle, 1968). These figures do not include trees already dead from attack, hence the overall impact of the disease is considerably greater than these figures indicate. In some places tree mortality has reached an estimated 75% or more. Unless good programs of sanitation and spraying are planned and diligently followed or unless more satisfactory controls or cures are developed, it is only a matter of time until white elm will cease to be a common shade and ornamental tree in this Region. If the present rate of spread continues, the probability is strong that it will reach Nova Scotia and Prince Edward Island within the next few years, and eventually spread throughout these provinces.

RECOMMENDATIONS

Despite the lack of completely effective control measures for Dutch elm disease, tree losses can be kept low (average of 0.1% per year since 1961

at Fredericton) by diligent programs of detection, sanitation, and spraying. Implementation of the following recommendations will strengthen these programs.

1. Intensify efforts of Forest Insect and Disease Survey staff to determine distribution and relative incidence of the native elm bark beetle and to watch for evidence of the European elm bark beetle. Such information presently incomplete, is basic to the implementation of effective sanitation and spraying recommendations.

2. Strengthen further the co-operation and liaison between the Department of Forestry and Rural Development and the Plant Protection Division, Canada Department of Agriculture, especially in Nova Scotia and Prince Edward Island. More intensive surveys for evidence of the disease between July 1 and August 15 should be made along the "South Shore" and in the Annapolis Valley and at and near such shipping points as Halifax, Dartmouth, Yarmouth, Digby, Charlottetown, and Summerside, and in areas such as Bridgetown where decadent trees are common.

3. Encourage the appointment of a liaison or contact man (town clerk, town manager, works engineer, park superintendent, etc.) in each major town or city through whom reports of disease incidence or recommendations for sanitation and spraying can be directed. Such appointees, with similar liaison individuals appointed by the provinces, would be key persons to whom all pertinent literature, reports, and recommendations could be sent and with whom meetings, either on an individual basis or collectively, could be held.

4. Conduct intensive detection surveys in the following cities and towns where the disease is not yet known and inform the responsible officials (or the proposed liaison men) of the threat of the disease and what can be done through basic sanitation measures.

<u>New Brunswick</u>

Newcastle	Bathurst	Saint John
Chatham	St. Stephen	Sackville
Dalhousie	St. George	

Prince Edward Island

Charlottetown		Summerside

Nova Scotia

Amherst	Digby	Dartmouth
Truro	Yarmouth	New Glasgow
Windsor	Lunenburg	Antigonish
Wolfville	Bridgewater	Pictou
Kentville	Halifax	Sydney

5. Inform through demonstrations and literature all provincial co-operators (who already submit regular collections and reports of pests in forested areas) of the distribution, symptoms, and impact of Dutch elm disease and encourage them to submit samples from suspect trees between July 1 and August 15. Such a program of familiarization would provide about 100 trained observers, well distributed throughout the Region, to supplement the scouting now carried out by staff members of the Forest Insect and Disease Survey and the Plant Protection Division, Canada Department of Agriculture.
6. Encourage the New Brunswick Department of Natural Resources to continue its valuable program of removing diseased trees immediately adjacent to the boundaries of cities and towns conducting control programs.
7. As the disease is not known to occur in Nova Scotia, and as the spread of the disease has been generally from the northwest to the southeast, and as the only access by land to Nova Scotia is via the Tantramar Marshes, and as the number of elms on the Nova Scotia side of the marshes from Tidnish to Minudie (excluding Amherst) totals only 74, the Nova Scotia Department of Lands and Forests should be encouraged to undertake as a preventative measure, the removal of bark beetle breeding material (dead branches) from these trees.

8. Continue to mark in the summer or autumn for removal before the following May, diseased trees found in the following municipalities that have control programs:

Woodstock	Oromocto
Grand Falls	Milltown
Edmundston	St. Andrews
Campbellton	Sussex
Fredericton	Moncton
Marysville	

9. Contact all hardwood mill operators or lumber dealers to explain the dangers inherent in and to discourage the practice of shipping unbarked elm logs or semi-processed lumber with bark from areas where the disease is known, to areas where it is not known to occur (domestic regulations under Destructive Insect and Pest Act). This would apply chiefly to material shipped from New Brunswick to Nova Scotia or Prince Edward Island.

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