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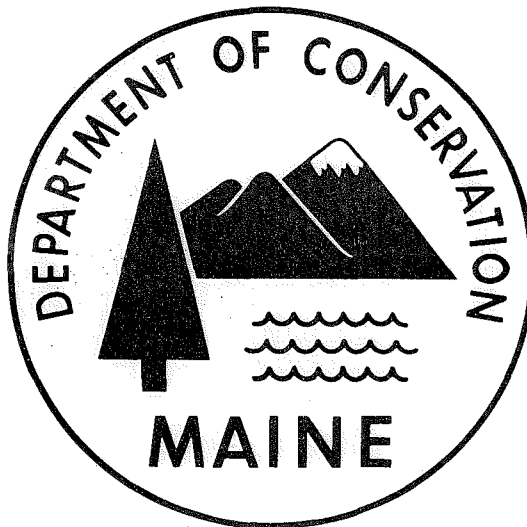
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SPRUCE BUDWORM IN MAINE

The
1981

Cooperative Spruce Budworm Suppression Project



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1981

Maine Forest Service
DEPARTMENT OF CONSERVATION
Augusta, Maine 04333

SEP 9 1985

SPRUCE BUDWORM IN MAINE
THE 1981 COOPERATIVE SPRUCE BUDWORM SUPPRESSION PROJECT

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DEPARTMENT OF CONSERVATION
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TABLE OF CONTENTS

	PAGE
INTRODUCTION.....	1
PROJECT PLANNING.....	3
SPRAY OPERATIONS.....	6
PERSONNEL.....	6
CONTRACTORS.....	6
FACILITIES.....	8
Project Headquarters.....	8
Aircraft Sites.....	8
Laboratory Locations.....	9
INSECTICIDES.....	11
INSECTICIDE PREPARATION.....	12
APPLICATION.....	13
Aircraft Selection.....	13
Aircraft Guidance.....	17
Aerial Monitoring.....	18
Area Sprayed.....	18
Production.....	23
OTHER PROJECT ACTIVITIES.....	28
Radio.....	28
Weather.....	31
Health and Safety Program.....	33
Information and Education.....	34
Mapping.....	35
Board of Pesticides Control Guidelines.....	36
Contract Compliance.....	37
INCIDENT INVESTIGATION.....	38
FINANCIAL SUMMARY.....	39
SMALL WOODLOT MANAGEMENT PROGRAM.....	41
ENVIRONMENTAL MONITORING AND MANAGEMENT RESEARCH.....	42
HUMAN HEALTH MONITORING.....	44
PROJECT SURVEY AND ASSESSMENT UNIT ACTIVITIES.....	45
Results of 1982 spray project and plans for winter 1981-82.....	45
APPENDICES INDEX.....	49

LIST OF FIGURES	PAGE
1	SPRUCE BUDWORM SUPPRESSION AREA MAP..... 5
2	F.A.A. AIR-TO-GROUND FREQUENCY ASSIGNMENTS.....29
3	F.A.A. AIR-TO-AIR FREQUENCY ASSIGNMENTS.....30
4	WEATHER STATION LOCATIONS.....32

LIST OF TABLES

1	PROJECT PERSONNEL POSITIONS..... 7
2	HELIPORT LOCATIONS.....10
3	INSECTICIDE TYPE, DOSAGE AND FORMULATION.....15
4	AIRCRAFT CHARACTERISTICS.....16
5	DAILY SPRAY-NO SPRAY SUMMARY FOR FIXED WING AIRCRAFT.....20
6	DAILY SPRAY-NO SPRAY SUMMARY FOR ROTARY WING AIRCRAFT.....21
7	PERFORMANCE DATA PER AIRPORT.....22
8	C-54 AIRCRAFT PERFORMANCE DATA.....24
9	PV-2 AIRCRAFT PERFORMANCE DATA.....24
10	LSU AIRCRAFT PERFORMANCE DATA.....25
11	ROTARY WING AIRCRAFT PERFORMANCE DATA.....25
12	GALLONS SPRAYED BY FIXED WING AIRCRAFT ACCORDING TO MORNING/EVENING SPRAY PERIODS.....26
13	GALLONS SPRAYED BY ROTARY WING AIRCRAFT ACCORDING TO MORNING/EVENING SPRAY PERIODS.....26
14	GALLONS SPRAYED FROM EACH AIRPORT ACCORDING TO MORNING/EVENING SPRAY PERIODS.....27
15	SUMMARY OF EXPENDITURES BY OPERATIONAL COMPONENT.....39

INTRODUCTION

In late July, 1980, preliminary planning for the 1981 Spruce Budworm Suppression Project was underway. Acres of potentially extreme budworm defoliation (high hazard) were located in the field, plotted on U.S.G.S. topographical maps and developed into spray blocks. At the same time, contracts for insecticides, aircraft, bases of operation, and personnel were being prepared in Augusta. This work continued through March. By early April all contracts were finalized and the hiring of project personnel began.

On May 18, 1981, Project Headquarters was opened in Presque Isle and all personnel, equipment, insecticides and aircraft were assembled at respective airport locations. The first spray period was held on the morning of May 21, 1981 when the helicopter operations began. The final date of treatment was the evening of June 16, 1981 when the Red Pine operation was completed.

PROJECT PLANNING

In the fall of 1980, the State Entomologist identified 4.5 million acres of budworm infested forest land in the high and extreme hazard category. This figure represented the gross acreage that was in danger of severe defoliation and in need of protection from the spruce budworm.

Title 12 MRSA Chapter 803 § 8404 as amended defined the Spruce Fir Protection District (SFPD) and listed those municipalities and townships which make up the district. Within the remaining designated SFPD, acreage was withdrawn which would not receive spray due to buffers, owner's policies etc. With the cooperation of the landowners, the Maine Forest Service (MFS) withdrew areas according to the following criteria:

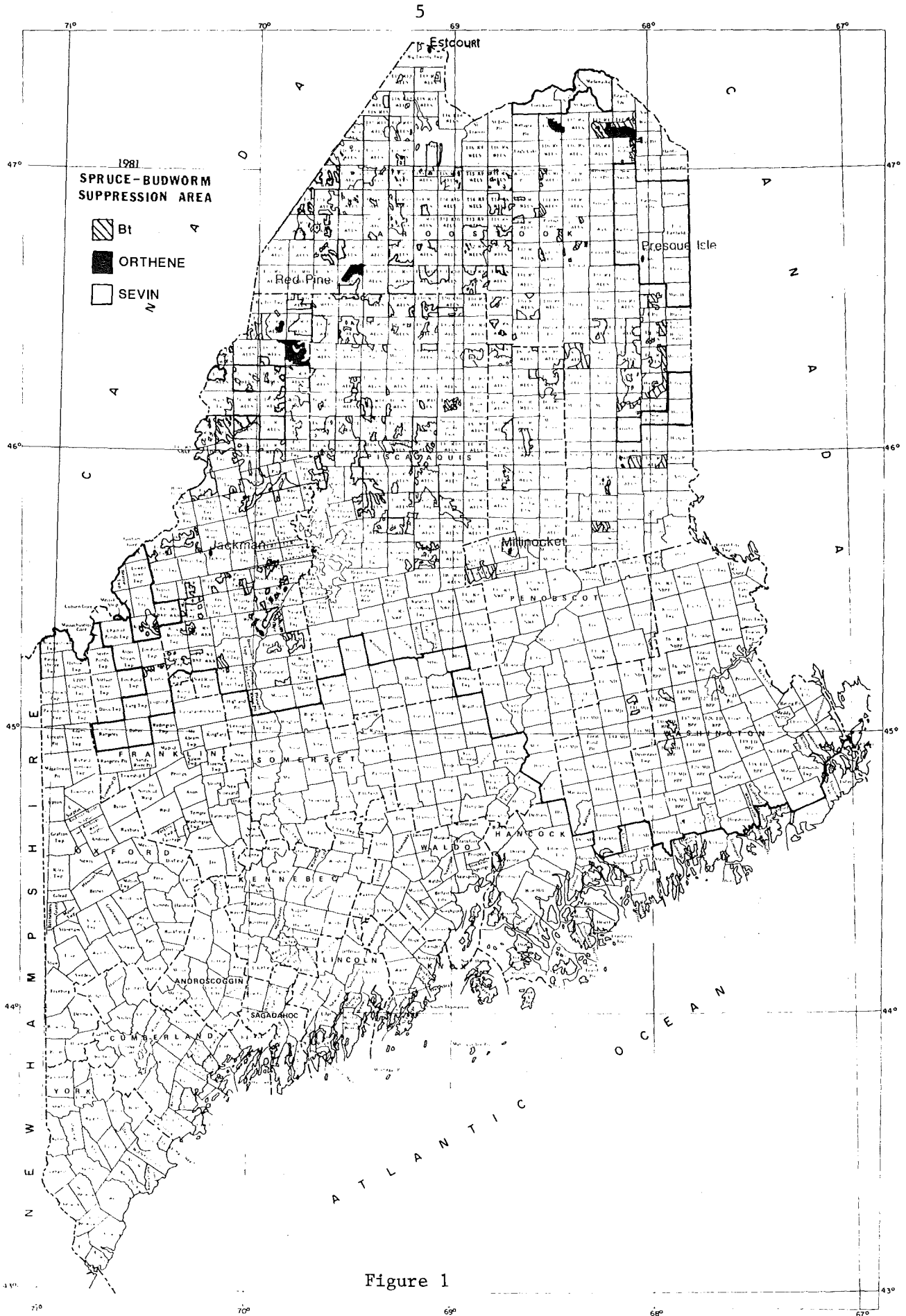
- a. settlement corridors
- b. automatic and silvicultural withdrawals
- c. non-host forest types
- d. areas unpractical to treat
- e. buffers of sensitive areas
- f. lands under management plan
- g. landowner planned harvest areas

Subsequently, spray blocks were designed to most effectively accommodate aerial application. Carbaryl (Sevin-4-Oil) was selected for spray blocks which were remote from permanent human habitation; acephate (Orthene) was chosen for application near sensitive aquatic areas and Bacillus thuringiensis (Bt) was selected for blocks near populated areas within the settlement corridors. These blocks were then transferred to a spray map (see figure 1) which became the central working document for the airport personnel and the central administrative unit located in Project Headquarters.

As part of the planning phase of the 1981 project, the Assistant Director of Spray Operations and the Safety Officer joined representatives of the USDA Forest Service, insecticide manufacturers, landowners, and spray aircraft contractors to participate in spray calibration and characterization studies. The studies were conducted March 1-13 in Selma, Alabama. A variety of insecticides were tested, each insecticide being tested at different concentrations. Both fixed wing aircraft and a Bell 204 helicopter were used for the tests.

The aircraft flew over two lines of spray assessment cards which had been set up to simulate forest targets. Experiments involved cross-wind and in-wind conditions. USDA Forest Service personnel assessed the results shown on the cards.

The studies in Alabama increased MFS understanding of the capabilities of the various aircraft, the conditions under which the different insecticides should be applied, and the appropriate nozzle sizes to use per insecticide formulation. Additional information on applying Bt with fixed wing aircraft may prove valuable in planning for the 1982 spray project.



1981
**SPRUCE-BUDWORM
 SUPPRESSION AREA**

- Bt
- ORTHENE
- SEVIN

SPRAY OPERATIONSPERSONNEL

The Maine Forest Service, through the Department of Personnel and the Bureau of the Budget, established 184 project personnel positions. These positions were filled prior to the project. Special training was provided airport supervisors, assistant airport supervisors, monitors and other key personnel.

In past years, valuable abilities and talents were lost after each project because many positions were temporary and thus terminated a few weeks after completion of the project. In 1981, a year-round staff helped alleviate that problem; they provided thorough research and planning efforts throughout the year and brought experience of past years to the 1981 project.

Table 1 is an indication of the numbers and position titles for the 1981 Spruce Budworm Suppression Program.

CONTRACTORS

Contractors for the project employed approximately 200 personnel. Pilots and co-pilots represented the flight crews; personnel responsible for fueling, servicing and maintenance of aircraft comprised the ground crews. Contractor representatives oversaw operations at each airport and heliport site.

Contractors for the 1981 Spruce Budworm Suppression Project were as follows:

<u>CONTRACTOR</u>	<u>RESPONSIBILITY</u>
Biegart Aviation, Inc. Memorial Airport 22022 South Price Road Chandler, Arizona 85224	Fixed wing spray aircraft Rotary wing spray aircraft
Folsom's Air Service Greenville, Maine 04441	Monitor aircraft, Administrative aircraft Medivac

TABLE 1

<u>CLASS TITLE</u>	<u>NUMBER OF POSITIONS</u>	<u>DURATION (Weeks)</u>
Airport Supervisor	11	10
Assistant Airport Supervisor	10	10
Aircraft Inspector (chief pilot)	1	12
Pilot (administrative)	1	12
Pilots (monitor)	14	10
Safety Officer	3	10
Contract Compliance/Investigating Officer	1	10
Spray Assessment Specialist	1	10
Mapping Technician	11	12
Aerial Monitor	18	10
Public Relations Specialist	2	10
Clerk Typist II	1	10
Clerk Typist II	4	8
Clerk II	3	10
Clerk II	5	8
Forest Insect Ranger	2	15
Forest Insect Ranger	4	10
Laborer I	27	15
Laborer I	10	10
Laborer I	15	8
Laborer II	11	20
Laborer II	5	15
Laborer II	6	10
Laborer II	9	8
Radio Operator	1	10
Radio Operator	5	4
Insecticide Inspector	<u>3</u>	8
TOTAL:	184	

Chempro of Oregon
11535 North Force Street
Portland, Oregon 07217

Mixing and loading of
insecticide

MBI Security Services Inc.
482 Congress Street
Portland, Maine 04111

Security

FACILITIES

Project Headquarters

Andrews Hall on the campus of Northern Maine Vocational Technical Institute in Presque Isle served as Project Headquarters for the 1981 spray project.

Officials having project wide responsibilities: the Forest Insect Manager, Director of Operations, Chief Monitor, Contract Compliance/Incident Investigating Officer, Health and Safety Officer, Information and Education staff and the Mapping Supervisor, were based at Project Headquarters. They provided technical advice and assistance to the field operations and oversaw all aspects of the project. The unit acted as a central communications center for the airport and heliport operations, for government agencies monitoring the project, and for the various contractors involved in the spray operation. Information was provided to the Department of Conservation in Augusta, to the news media, and to the public.

Aircraft Sites

Airports utilized by the Maine Forest Service as bases of operation for the 1981 Spruce Budworm Suppression Project were: Presque Isle, Millinocket, Red Pine (T11R16), Jackman, Estcourt (Big Twenty Twp.) The locations were accessible for flights to and from spray blocks. Meals and lodging facilities were close by. Railroad sidings for the delivery of insecticides existed at Millinocket and Presque Isle. The fifth airport, Estcourt, was made available by J. D. Irving Ltd, Fredericton, New Brunswick.

Paving was completed in the spring of 1981, making it convenient for blocks in the northernmost part of the state to be sprayed with small agricultural-type aircraft.

Helicopters do not require maintained airstrips. Logging roads, clear-cuts and gravel pits were used as heliports. Heliports were generally located 3-4 miles from assigned spray blocks.

Refer to Table 2 for locations of heliports.

Laboratory Locations

The Entomology Division of the Maine Forest Service is responsible for assessing spray results and predicting future budworm infestations. Laboratories were established in Howland, Portage, and Topsfield from May 4 to July 11. Thirty-two staff personnel examined branches for pre-spray and post-spray larval counts.

Entomology field personnel clipped representative branches to determine defoliation. Samples consisted of one 18 inch branch per tree from trees located both within and close to treatment areas. Samples were taken to the laboratories. Laboratory personnel carefully counted the number of larvae and the number of buds so larvae per bud could be determined.

Laboratories also examined samples to assess the types and numbers of parasites, and to determine insect development so that the Project Entomologist could time the release of spray blocks for the most effective spray treatment. The laboratories also processed larval samples taken by individual landowners and for the Greenwoods Project, part of the University of Maine at Orono's School of Forest Resources.

TABLE 2

Helicopter Operation
1981 Spruce Budworm Suppression Project

Bell 204, 205

<u>Heliport</u>	<u>Heliport Location - Township</u>	<u>Heliport</u>	<u>Heliport Location - Township</u>
1	TB R10	12	Ashland
2	Long A Township	13	T14 R6
3	T2 R4	14	T15 R6
4	T4 R3	15	Eagle Lake
5	TA R2	16	New Canada
6	TA R2	17	T17 R3
7	Ludlow	24	Moxie Gore
8	Hammond Plantation	26	Johnson
9	Monticello	27	Eustis
10	E Plantation	28	T3 R4
11	T8 R5	29	Misery Gore
		32	West Forks Plantation

Bell 47

<u>Heliport</u>	<u>Heliport Location - Township</u>
Downeast	T36 MD
Baxter Park	T6 R11
Eustis	Kibby Township

INSECTICIDES

Carbaryl, Acephate, and Bacillus thuringiensis (Bt) were the insecticides used during the 1981 Spruce Budworm Suppression Project. (See Table 3)

Sevin-4-Oil was chosen because of its proven performance as well as its relatively low cost. Sevin-4-Oil is a mixture of four (4) parts Sevin (Carbaryl) and one (1) part #1 fuel oil. Single application treatment consists of an application rate of 30 oz. (24 oz. Sevin and 6 oz. oil) per acre with an active ingredient of .75 lbs. per acre. Split application treatment this year consisted of two separate applications spaced 5-7 days apart at an application rate of 30 oz. (15 oz. Sevin and 15 oz. oil) per acre, each time, for a total of 60 oz. per acre. The active ingredient in each split was .46 lbs. per acre. Split applications were used in eastern Maine and north central Maine spray blocks. The first of the split applications kills the early maturing budworm larvae and thus protects the developing bud. The second application kills the later maturing larvae providing continuous protection to the tree whose survival depends upon new growth.

Orthene was chosen for spray blocks near aquatically sensitive areas. Orthene was applied in single applications at a rate of 64 oz. per acre.

Bacillus thuringiensis (Bt) was selected for use in sensitive areas which needed protection but could not receive chemical treatment. Bt is a rod-shaped bacterium commonly found in the soil which is specifically pathogenic to butterfly and moth larvae. Three commercial formulations were used: Dipel 4L (Abbott Laboratories), Thuricide 16B and Thuricide 24B (Sandoz Corporation).

Different dosage rates (BIU's or Billions of International Units) were tested to determine the most effective dosage.

Dipel 4L was applied at 8 BIU's or 80 oz. per acre, at 8 BIU's split or 80 oz. + 80 oz. per acre, and at 12 BIU's or 120 oz. per acre. Thuricide 16B

was applied at 80 oz. per acre (8 BIU's) and Thuricide 24B was applied at 96 oz. per acre (12 BIU's).

Each of the above Bt formulations included water and .006% Chevron Spray Sticker.

For information on effectiveness refer to the "Results" section of this report (page 45).

INSECTICIDE PREPARATION

(Transferring, Mixing and Loading Procedures)

Chempro of Oregon was contracted to handle all formulations of Carbaryl, Orthene and Bacillus thuringiensis.

The task of preparing three different insecticides all with individual specifications, and delivering them to several remote sites is enormous. Chempro has continued to work with the Maine Forest Service in refining insecticide preparation procedures. Of particular note in 1981 was the development of mobile pumping systems which improved insecticide transfer in remote locations.

Sevin-4-Oil was used in several areas of the Spruce Fir Protection District. Sevin was shipped by rail to Presque Isle and Millinocket, off loaded into mixing tanks and mixed with #1 fuel oil. Each mixing tank was equipped with an agitator to properly mix the fuel oil and Sevin. The Sevin-4-Oil could then be pumped directly from the mixing tank to aircraft or trucks through a closed and metered system.

Trucks were used to transport insecticide from Millinocket to Jackman and heliport locations south and west of Millinocket. From Presque Isle trucks traveled to Red Pine, Estcourt and the remaining heliport. From the trucks, also equipped with agitation, the insecticide was again pumped through a closed and metered mobile pumping system to the aircraft.

Orthene was shipped in dry powder canisters to Presque Isle where it was

mixed with water in 600 gallon tanks and shipped almost immediately to necessary sites. Orthene requires agitation to avoid "settling out" which could cause clogging. This was again prevented by agitators within the tank trucks.

Bacillus thuringiensis, (Bt), was shipped from the supplier to Presque Isle and Millinocket in 55 gallon drums. The drums were then drained into a 600 gallon vat for storage. The material was accurately metered through a closed system as it was loaded into a three compartment tank trailer. The rear compartment remained empty until the truck arrived at field locations. Personnel, hired by the contractor, were at the field locations to mix the Bt with water and .006% of Chevron spray sticker. The mixing and agitation was done in the middle compartment of the tanker. The Bt was transferred immediately through a closed and metered system, into the spray helicopters. Mixing and loading of Bt must be a continuous process as Bt remains active for a limited period of time once it has been mixed.

APPLICATION

Aircraft Selection

The policy of the Maine Forest Service has been to develop site specific spray blocks, which reduce reliability on large aircraft where possible. This policy demands careful consideration of aircraft type. Location and size of airports are determinants in the selection of aircraft.

During this planning phase, the request for bids for spray aircraft brought competition between two companies: Biegart Aviation Inc. and Globe Air Inc., both of Arizona.

The Maine Forest Service took many factors into consideration before awarding the bid. After the bids were received, a committee was established to review the bids. Members of the committee were representatives of the Maine Forest Service, Department of Business Regulation, Department of Finance and Administration and private landowners. After careful consideration, the

committee determined that Biegart, even though their bid was higher, should receive the contract based on: management capability, pilot experience, navigational system, aircraft certification, support services, and types and numbers of aircraft.

Biegart Aviation provided both fixed wing and rotary wing aircraft for the 1981 project. LSU (Light Spray Unit), PV-2 and C-54 (DC-4) constituted the fixed wing division. LSU's are single engine agricultural planes which operate effectively over small spray blocks, over areas with many changes in terrain and over blocks which, due to the existence of sensitive areas, require the boom and nozzle system be turned on and off repeatedly.

Twin engine PV-2's and four engine C-54's are considered large aircraft; their advantages include the ability to spray a substantial number of acres per load, and the ability to ferry considerable distances from their base airports.

The rotary wing division included large twin engine Bell 204 and 205 helicopters and smaller single engine Bell 47's. Helicopters, because of their slower speed and ability to fly at low altitudes, are particularly useful for precision spraying.

The small helicopters operated as one group while the large helicopters split into two working groups, operating at different locations. Pre-project planning involved locating and securing permission to use all heliports necessary to treat helicopter designated acreages. Numerous heliports were required in order to minimize ferry distance to spray blocks. Heliports and approximate locations are listed on Table 2. Because start-up and block release dates cannot be determined in advance, overlapping lodging and meal accommodations were made at a number of facilities. Tank trucks with built-in mixing and pumping apparatus serviced most helicopter groups, the exception being a few mixing units mounted on pick-up trucks accompanying tank trucks. Two chemical insecticides, Sevin-4-Oil and Orthene, as well as the biological

TABLE 3.

INSECTICIDE TYPE, DOSAGE, AND FORMULATION
 SPRUCE BUDWORM SUPPRESSION PROJECT - 1981

INSECTICIDE	DOSAGE ACTIVE INGREDIENT/ACRE	SPRAY VOLUME/ ACRE	FORMULATION/ACRE
<u>Carbaryl</u>			
Sevin-4-Oil	0.75 lbs.	30 oz.	24 oz. Sevin + 6 oz. #1 Fuel Oil (4:1)
Sevin-4-Oil	0.46 lbs. *a	30 oz.	15 oz. Sevin + 15 oz. #1 Fuel Oil (1:1)
<u>Acephate</u>			
Orthene Forest Spray	0.40 lbs.	64 oz.	16 oz. dry Orthene + 128 fl. oz. water
<u>Bacillus thuringiensis</u>			
Thuricide 16B	8 BIU's	80 oz.	64 oz. <u>Bt</u> + 16 fl. oz. Water + .006% Chevron Spray Sticker
Thuricide 24B	12 BIU's	96 oz.	64 oz. <u>Bt</u> + 32 fl. oz. Water + .006% Chevron Spray Sticker
Dipel 4L	8 BIU's	80 oz.	32 oz. Dipel + 48 fl. oz. Water + .006% Chevron Spray Sticker
Dipel 4L	8 BIU's *b	80 oz.	32 oz. Dipel + 48 fl. oz. Water + .006% Chevron Spray Sticker
Dipel 4L	12 BIU's	120 oz.	48 oz. Dipel + 72 fl. oz. Water + .006% Chevron Spray Sticker

*a This number represents one application; this formulation was applied 5-7 days later on the same acreage.

*b This number represents one application; this formulation was applied 1-2 days later on the same acreage.

BIU = Billions of International Units

Table 4.

AIRCRAFT CHARACTERISTICS
 SPRUCE BUDWORM SUPPRESSION PROJECT - 1981

AIRCRAFT	NOZZLE SIZE	DROPLET VMD ()*	SPRAY SPEED (mph)	ALTITUDE (ft)	CAPACITY (U.S. Gal.)	BOOM PRESSURE ±10% psig	SWATH WIDTH (ft)	NUMBER ON PROJECT
Fixed Wing								
C-54	8015	150	180	150	2300	40	1200	5
PV-2	8008	150	175	150	1200	40	600	2
LSU+	8006	150	110	50	300	40	300	15
Rotary Wing								
Bell 204	8004	150	90	50	180-250	40	180	2
Bell 205	8004	150	90	50	350	40	180-300	1
Bell 47	8002	150	50	50	70	40	120	4

*VMD () - Volume median diameter

+ Light Spray Units, or agricultural-type aircraft.

insecticide Bt were applied by the helicopter operation this year. Helicopter groups were able to operate during a greater proportion of potential spray periods than fixed wing groups due to the proximity of heliports to spray blocks.

Aircraft Guidance

As in past years, aircraft guidance in the 1981 spray program was a contractor responsibility.

The electronic guidance system used was the TDL 711 employing the Loran C navigational system. This system proved to be accurate when operated correctly. A company technician, hired by the contractor, was present to correct infrequent malfunctions.

The multi-engine aircraft (C-54's and PV-2's) generally worked in teams of two. The lead aircraft navigated with the TDL 711 and the trailing aircraft formed an echelon right or left and were guided by the lead aircraft.

The smaller fixed-wing aircraft worked in teams of three and employed an additional lead plane in which the TDL 711 was mounted for guidance.

Although this navigational system was used with helicopters for the first time, two problems prevented success. First, the short turn time for helicopters didn't allow the navigator enough time to bring the TDL 711 on line. Secondly, signal acquisition was reduced because the antennae was mounted underneath the aircraft. These two problems will be considered in planning the 1982 project.

The basic map used for visual guidance was the colored USGS topographic quadrangle at a scale of 1:62,500. The quadrangles were assembled into spray plates of convenient size and annotated with data pertaining to spray operations and spray restrictions. The Maine Forest Service produced these base maps and supplied the spray contractor with three copies. Additional copies were produced by the contractors.

Aerial Monitoring

Aerial monitoring is an essential aspect of the spruce budworm spray operations.

The monitor assigned to every spray team, is responsible for deciding if spraying may occur in any given spray period. Weather observations, such as wind direction and speed, temperature differences between tree top level and 1000 feet and general atmospheric conditions (rain, fog clear, haze), all were factors in the decision when to spray.

Most of the monitors for the 1981 project were graduates of forestry studies and had had experience in reading topographic maps and identifying forest types.

In addition, each monitor received five days of classroom training and several days of block observation while in flight.

The classroom training reemphasized topographic map reading, weather observation, radio usage procedures, and proper report preparation.

Judging wind speed, wind direction, and ground distances was incorporated into the flight training. Aerial training continued with the monitors pre-flying all blocks and mapping all streams visible at 1000 feet. These maps of streams were later used by flight crews during the spray project.

Once weather observations and the decision to spray had been made, the monitor would then continue to check weather, aircraft performance and spray behavior to ensure that proper conditions prevailed.

Area Sprayed

The spray periods available for each airport/heliport during the entire project are listed in tables 5 and 6. Also indicated are spray and no-spray times and reasons for no-spray. Of the total number of possible spray periods, the following percentages represent actual periods when weather conditions and biological development of the budworm larvae were favorable: Presque Isle - 63%; Millinocket - 43%; Jackman - 56%; Red Pine - 61%; Estcourt - 79%. In

addition the data on helicopter operations demonstrates the following: Group 1 - 49%; Groups 2 and 4 - 33%; and Group 3 - 51%. Furthermore, 40% of the total number of available spray periods for fixed wing aircraft resulted in no-spray situations, and 55% of rotary wing aircraft spray periods were not favorable.

Table 7 shows the performance data for the 1981 Spruce Budworm Suppression Project. Sevin-4-Oil was used on 1,015,164 acres, Orthene on 31,057 and the various formulations of Bt on 126,471 acres.

Sevin and Orthene were used on areas of high hazard (having extreme budworm populations) with appropriate sensitive area buffers. Bt was applied on high hazard acreage within two miles of publicly maintained roads (settlement corridors) in accordance with Maine Forest Service buffers.

A discrepancy of 55,000 acres exists between calculations of acres sprayed and acres taxed. The total acres treated was 1,172,692; whereas the total acres taxed was 1,117,686.

There are two reasons for this discrepancy:

1. Approximately 22,000 acres of land were taxed separately and do not appear in these tax acreage figures.
2. Normal variations in cartographic procedures account for the remaining discrepancy.

DAILY SPRAY - NO-SPRAY SUMMARY
BY AIRPORT FOR FIXED WING AIRCRAFT

SPRUCE BUDWORM SUPPRESSION PROJECT - 1981

DATE	PRESQUE ISLE	MILLINOCKET	JACKMAN	RED PINE	ESTCOURT
May 25 AM		S			
PM		NB			
26 AM		NB			
PM		NB			
27 AM		S			
PM		NB			
28 AM		NS,V			
PM		NS,W			
29 AM		NS,V			
PM	S	NS,R			
30 AM	NS, R,V	NS,R			
PM	NS,R	S			
31 AM	NS,R	NS,R			
PM	S	S			
June 1 AM	S	S			
PM	S	NS,W			
2 AM	S	S	S		
PM	S	S	S		
3 AM	S	S	S	S	
PM	NS,W	NS,W	NS,W	NS,W	
4 AM	NS, R,V	NS, R,V	NS,V	NS,R	
PM	S	S	S	S	
5 AM	S	S	S	S	
PM	NS,R	NS,T	S	S	
6 AM	S	S	S	S	
PM		NS,W	NS,W	NS,R	
7 AM		NS,R	NS, W,R	NS,R	
PM		NS, W,T	NS,W	NS,W	
8 AM		S	S	S	S
PM		S	S	S	S
9 AM		S	NS,R	NS,R	NS,R
PM		NS,R	NS,R	NS,R	NS,R
10 AM		NS,W	NS,W	NS,W	NS,W
PM		NS, W,T	NS,W	S	S
11 AM		S	S	S	S
PM			NS,W	NS, W,R,V	S
12 AM			S	S	S
PM			S	S	S
13 AM			NS,V	S	S
PM			S	S	S
14 AM			S	S	S
PM				S	S
15 AM				S	
PM				NS,R	
16 AM				NS,R	
PM				S	
<hr/>					
TOTAL SPRAY PERIODS	10	15	14	17	11

Key: S----Spray NB----No spray blocks open T----NS due to turbulence
 NS---No Spray R----NS due to rain V----NS due to visibility
 W----NS due to wind

DAILY SPRAY - NO-SPRAY SUMMARY BY TEAM
FOR ROTARY WING AIRCRAFT

SPRUCE BUDWORM SUPPRESSION PROJECT - 1981

DATE	GROUP 1 BELL	GROUP 2&4 BELL 47	GROUP 3 BELL	
May 21 AM			S	Key: S----Spray NS----No spray NB----No spray blocks open NA----No aircraft available EF----Equipment failure CR----Chance of rain R----Rain T----Turbulence V----Visibility W----Wind M----Movement of equipment DT----Delivery truck breakdown
PM			S	
22 AM	S		S	
PM	S		NS,R	
23 AM	S	S	S	
PM	NS,R	NS,R	NS, NB	
24 AM	NS, R,W	NS,R	NS, NB	
PM	NS,R	S	NS, NB	
25 AM	NS,R	S	S	
PM	NS, R,W	NS, NB	NS, R,W	
26 AM	NS, CR	S	NS, R,W	
PM	S	NS, NB	S	
27 AM	S	NS, NB	NS, R	
PM	NS, CR	NS, NB	NS, R	
28 AM	NS,R	NS, NB	NS, R	
PM	S	NS, NB	NS, W	
29 AM	S	NS, NB	S	
PM	NS, NA	NS, NB	NS, R	
30 AM	NS,W	NS, NB	S	
PM	NS, NA	NS, NB	S	
31 AM	NS, NA	NS, NB	NS,M	
PM	NS, NA	NS,W	NS, EF	
June 1 AM	S	S	S	
PM	S	S	S	
2 AM	S	S	S	
PM	S	NS,M	S	
3 AM	S	NS,M	S	
PM	NS,W	NS,M	NS,W	
4 AM	NS,R	NS,M	NS,R	
PM	S	S	S	
5 AM	S	S	S	
PM	NS, DT	S	S	
6 AM	S	S	NS,M	
PM	NS, W,R	NS,W	NS, EF	
7 AM	NS, W,R	NS,W	NS,R	
PM	NS, W,R	NS,W	NS,W	
8 AM	S	S	S	
PM	S	NS,M	S	
9 AM	NS, W,R	NS,R	S	
PM	NS, W,R	NS,R	NS, W,R	
10 AM	NS, W,R	NS,W	NS,W	
PM	NS, W,R	NS,W	NS,W	
11 AM	S	NS,CR	S	
PM	S	NS,CR	NS,W	
12 AM	S	NS,W	S	
PM	S	NS,W	NS, R,W	
13 AM	S	S	S	
PM		S	S	
14 AM		S	S	
TOTAL SPRAY PERIODS	22	15	25	

Table 7.
 PERFORMANCE DATA PER AIRPORT
 SPRUCE BUDWORM SUPPRESSION PROJECT

AIRPORT	(gal) INSECTICIDE (acres)								TOTALS		% of total acreage
	Chemical			Biological					Gallons	Acres	
	Sevin-4-Oil Single *a	Sevin-4-Oil Split *b	Orthene Forest Spray 64 oz.	Dipel 4L 80 oz.	Dipel 4L 80 oz.*c	Dipel 4L 120 oz.	Thuricide 16B 80 oz.	Thuricide 24B 96 oz.			
Estcourt	<u>19,783</u> 91,375								19,783	91,375	8
Jackman	<u>29,719</u> 111,709								29,719	111,709	10
Millinocket	<u>49,514</u> 250,008	<u>10,884</u> 24,177							60,398	274,185	23
Presque Isle	<u>64,527</u> 282,427								64,527	282,427	24
Red Pine	<u>45,903</u> 224,763		<u>9,860</u> 21,394						55,763	246,154	21
<u>HELIPORT</u>											
Bell 47	<u>2,430</u> 9,501	<u>4,873.8</u> 10,429		<u>3,923.4</u> 6,914					11,227.2	26,844	2
Bell 204-205	<u>1,875</u> 10,778		<u>4,460.6</u> 9,663	<u>36,038</u> 69,684	<u>6,354</u> 5,960	<u>17,191</u> 24,533	<u>3,147.6</u> 5,714	<u>8,934.1</u> 13,666	78,195.3	139,998	12
TOTAL	<u>213,751</u> 980,558	<u>15,757.8</u> 34,606	<u>14,520.6</u> 31,057	<u>39,956.4</u> 76,598	<u>6,354</u> 5,960	<u>17,191</u> 24,533	<u>3,147.6</u> 5,714	<u>8,934.1</u> 13,666	319,612.5	1,172,692	

*a Single application, 30 oz. (operational dose), applied once, .75 lb. active ingredient per acre.
 *b Split application, 30 oz., .46 lb. active ingredient per acre, applied twice, 5-7 days apart.
 *c Double application, 80 oz. applied twice, 1-2 days apart.

Production

Performance data by aircraft type can be seen in tables 8 through 11. Newly added to this list of data is a determination of what percentage of the project each aircraft was used. These data show that small aircraft, LSU's and helicopters, were used for spraying 50% of the total acreage.

For the first time, results of the spray project were examined according to morning and evening spray period productivity. The data may prove useful in planning future spray projects. Each airport and aircraft type is looked at in terms of morning/evening spray productivity. The morning period was more productive in all cases. The results can be found in tables 12 through 14.

24
Table 8

C-54 AIRCRAFT PERFORMANCE DATA
SPRUCE BUDWORM SUPPRESSION PROJECTS 1977-1981

	1977	1978	1979	1980	1981
Acres Treated	281,527	772,276*	1,888,889	546,934	359,002
Number of Aircraft	2	6	11	6	5
Ave. Acres per Aircraft	140,764	128,713	171,717	91,155	71,800
Ave. Acres per Aircraft per Spray Period	10,828	10,726	13,209	5,697	7,978
Gallons Sprayed	65,931	180,849	288,845	105,306	77,466
Number of Spray Periods	13	12	13	16	45
Type of Insecticide	---	---	Sevin-4- Oil	Sevin-4-Oil	Sevin-4-Oil
Percentage of Project					31%

*Includes 134,000 acres treated with split application

Table 9

PV-2 AIRCRAFT PERFORMANCE DATA
SPRUCE BUDWORM SUPPRESSION PROJECTS 1977-1981

	1977	1978	1979	1980	1981
Acres Treated	260,883	401,115	409,577	224,998	116,363
Number of Aircraft	5	4	8	4*	2
Ave. Total Acres per Aircraft	52,176	100,278	51,197	64,285	58,181
Ave. Acres per Aircraft per Spray Period	4,014	10,028	4,266	5,357	5,059
Gallons Sprayed	N/A	N/A	N/A	54,810	24,403
Number of Spray Periods				12	23
Type of Insecticide				Sevin-4-Oil	Sevin-4-Oil
Percentage of Project					11%

*One aircraft became inoperative during one half of the project; further computations were made using 3.5 aircraft.

Table 10

LSU AIRCRAFT PERFORMANCE DATA
 SPRUCE BUDWORM SUPPRESSION PROJECT

	1979	1980	1981
Acres Treated	557,919	429,871	530,485
Number of Aircraft	14	15	15
Average Total Acres per Aircraft	39,851	28,658	35,365
Ave. Acres per Air- craft per Spray Period	1,328	1,024	1,943
Gallons Sprayed	156,984	100,343	128,321
Number of Spray Periods	30	28	23
Type of Insecticide	Sevin-4-Oil Dipel 4L Thuricide 16B Dylox, Orthene	Sevin-4-Oil Dipel 4L	Orthene Sevin-4-Oil
Percentage of Project			44%

NOTE: LSU includes Thrush and Air Tractor

Table 11

ROTARY WING PERFORMANCE DATA
 SPRUCE BUDWORM SUPPRESSION PROJECT

	1980*	1981 Bell 204, 205	1981 Bell 47
Acres Treated	178,997	139,998	26,844
Number of Aircraft	6	3	6
Average Acres per Air- craft	29,833	46,666	4,474
Average Acres per Air- craft per Spray Period	609	993	298
Gallons Sprayed	130,179	77,995	11,227
Number of Spray Periods	49	47	15
Type of Insecticide	Dipel 4L Thuricide 16B	Sevin-4-Oil Orthene <u>Bt</u>	Sevin-4-Oil <u>Bt</u>
Percentage of Project		12%	2%

*Figures for individual helicopter types not available.

Table 12

GALLONS SPRAYED BY FIXED WING AIRCRAFT
ACCORDING TO MORNING/EVENING SPRAY PERIODS

1981 SPRUCE BUDWORM SUPPRESSION PROJECT

AIRCRAFT	INSECTICIDE			TOTALS	PERCENTAGE
	Sevin-4-Oil		Orthene		
	(Single)	(Split)			
Thrush (LSU)	AM 75,805	AM 720	AM 5,860	82,385	64%
	PM 39,933	PM 2,000	PM 4,000	45,933	36%
PV-2	AM 16,794	AM 2,160		18,954	78%
C-54	AM 50,815	AM 2,675		53,490	69%
	PM 21,841	PM 2,135		23,976	31%
				AM 154,829	67%
				TOTALS: PM 75,358	33%
				<u>230,187</u>	

Table 13

GALLONS SPRAYED BY ROTARY WING AIRCRAFT
ACCORDING TO MORNING/EVENING SPRAY PERIODS

1981 SPRUCE BUDWORM SUPPRESSION PROJECT

Aircraft	INSECTICIDE							Totals	Percentage
	Single	Split	Orthene	Dipel 8 BIU/A	Dipel 12 BIU/A	Thuri- cide	Thuri- cide		
Bell 204	AM 1,125	---	AM 2,906	AM 30,811	AM 8,607	AM 677	AM 6,197	50,323	65%
	PM 750	---	PM 1,555	PM 11,631	PM 8,584	PM 2470			
Bell 47	AM 1,612	AM 3,695	---	AM 3,663	--	--	--	8,970	80%
	PM 818	PM 1,178	---	PM 261	--	--	--	2,257	20%
							AM 59,293	66%	
							TOTALS: PM 29,984	34%	
							<u>89,277</u>		

Table 14

GALLONS SPRAYED FROM EACH AIRPORT
 ACCORDING TO MORNING/EVENING SPRAY PERIODS

1981 SPRUCE BUDWORM SUPPRESSION PROGRAM

AIRPORT	INSECTICIDE		Totals	Percentage
	Sevin-4-Oil (Single)	(Split)		
Estcourt	AM 11,023		11,023	56%
	PM 8,760		8,760	44%
Jackman	AM 20,569		20,569	69%
	PM 9,150		9,150	31%
Millinocket	AM 36,361	AM 5,555	41,916	69%
	PM 13,154	PM 5,329	18,483	31%
Presque Isle	AM 41,815		41,815	65%
	PM 22,711		22,711	35%
Red Pine	AM 33,649		49,510	75%
	PM 12,253		16,253	25%
			AM 164,833	69%
			TOTALS: PM 75,357	31%
			240,190	

OTHER PROJECT ACTIVITIES

Radio

In a project as large as the spruce budworm project, communication between the various facilities, both air and ground is vital.

Information on weather conditions, monitors and spray aircraft locations, spray block completions, and helicopter activity was relayed immediately through the radio network.

The Maine Forest Service radio network has grown over the years in both size and complexity, with the goal always being improvement in communications.

For the 1981 project, a repeater was set up on Debouille Mountain; this repeater provided communication between Presque Isle and Estcourt. Enhancing communication established with a repeater that had been set up at Ross Mountain, the Debouille Mountain repeater completed the network linking Project Headquarters to all five airports.

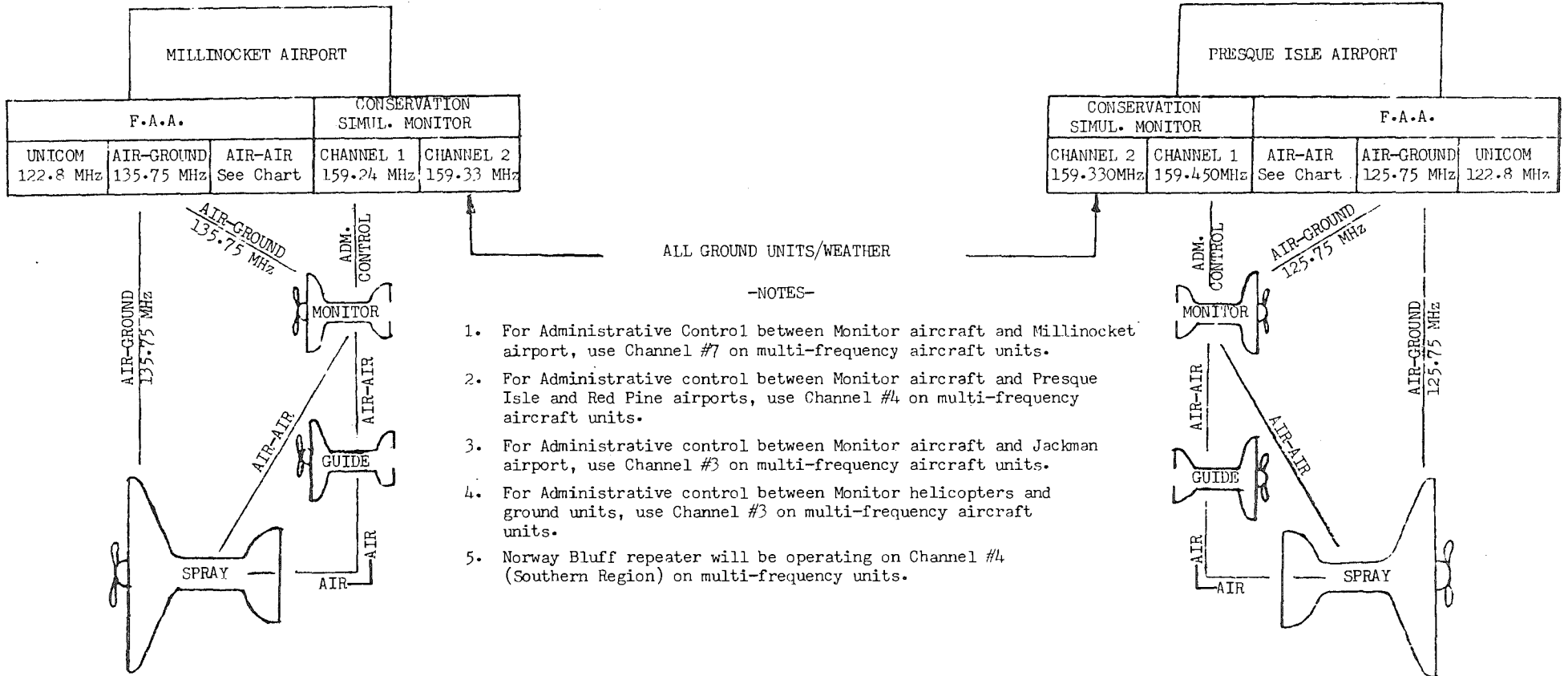
A second improvement was to move the base station from Presque Isle to a hill at Portage and then to operate over telephone lines. Thus contact with Red Pine and also with monitor aircraft was considerably improved over 1980.

Figure 2 depicts the Maine Forest Service radio communication network. Figure 3 lists the frequencies used on the Spruce Budworm Suppression Project for 1981.

Figure 2

1981 Spruce Budworm Project

- RADIO COMMUNICATIONS -



29

-FOR AIR-AIR FREQUENCIES, SEE FIGURE 3-

-FOR AIR-AIR FREQUENCIES, SEE FIGURE 3-

Figure 3

F.A.A. AIR-TO-AIR FREQUENCY ASSIGNMENTS
 SPRUCE BUDWORM SUPPRESSION PROJECT - 1981

AIRCRAFT TYPE	TEAM #	MONITOR #	TEAM DESIGNATOR	GUIDE #	AIR FREQUENCY
C54	1	Monitor 1	Alpha		126.05
C54	2	Monitor 2	Bravo		133.05
C54	3	Monitor 3	Charlie		135.35
PV2	1	Monitor 4	Delta		128.55
Thrush Commander	1	Monitor 5	Golf	Guide 1	127.05
Thrush Commander	2	Monitor 5	Hotel	Guide 1	127.05
Thrush Commander	3	Monitor 6	Kilo	Guide 2	134.05
Thrush Commander	4	Monitor 6	Lima	Guide 2	134.05
Thrush Commander	5	Monitor 7	Papa	Guide 3	135.45
Helicopter	1	Monitor 8	Romeo		133.15
Helicopter	2	Monitor 9	Sierra		127.95
Helicopter	3	Monitor 10	Tango	Guide 4	132.95
Helicopter	4	Monitor 11	Victor	Guide 5	134.35

** EMERGENCY FREQUENCY 121.5 **

AIR-TO-GROUND FREQUENCIES

Presque Isle	125.75
Millinocket	135.75
Jackman	125.75
Red Pine	135.75

Weather

Weather conditions are critical determining factors in the spray project. The presence of fog, rain, low hanging clouds, high winds, increased temperatures, even snow can quickly cancel a spray period. The effectiveness of the insecticides in killing larvae and protecting foliage is heavily dependent on whether precipitation fell prior to or immediately after their applications. Thus it becomes crucial that accurate weather forecasting be available to the Director of Operations, to the monitors and to the airport and heliport supervisors.

In 1981, a contract was set up with New England Weather Service Incorporated, located in Center Harbor, New Hampshire. This service agreed to provide weather forecasts which were made on the basis of very site-specific factors such as terrain and wind patterns.

Weather instruments were set up at five airports. Twice daily, the airport supervisor, assistant airport supervisor or a trained monitor made weather observations which were relayed to project headquarters and then to the New England Weather Service.

The weather service then prepared detailed forecasts for the five airport zones. The forecast consisted of: probability of precipitation, speed and direction of wind, humidity, temperature, and prediction of inversion.

The helicopter operation, besides relying on the above services, also relied on weather information from fire control facilities located near spray blocks.

Weather station and airport weather information locations can be found in figure 4.

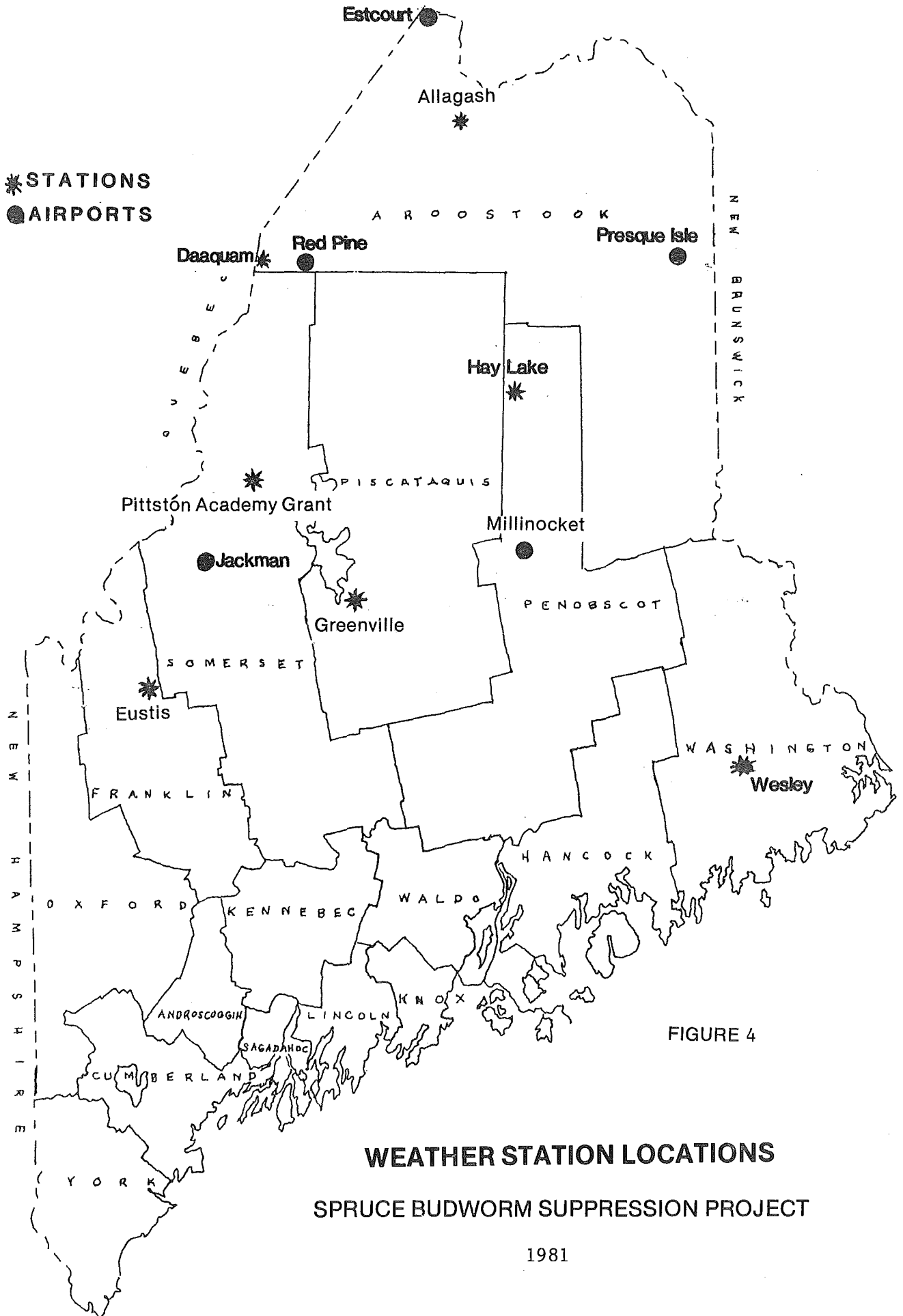


FIGURE 4

WEATHER STATION LOCATIONS
SPRUCE BUDWORM SUPPRESSION PROJECT

1981

Health and Safety Program

The health and safety section of the 1981 Budworm Project was structured and staffed much the same as that of 1980. There was a supervisor of the entire health and safety function, a full time health and safety officer at Presque Isle and Millinocket airports and a staff member at each smaller air operation assigned additional responsibility as its health and safety officer. Instead of having the supervisor assigned permanently to one major airport with the resulting small radius of travel, the supervisor had the opportunity to dedicate considerable time to inspections and technical assistance to all air operations project-wide.

Early in the project, the emphasis was on training. Everyone on the health and safety staff was brought together for a briefing on the health and safety plan as presented in the Project Operations Manual. An equipment checklist was generated based on need and air operation size. In turn, each safety officer was issued his needed equipment from the Presque Isle warehouse for transport to the air operation. Prior to commencing spray operations, a visit was made to each facility to instruct personnel in proper procedures.

As has generally been the case over the years the operation of 1981 was brought through to completion with no occupational illness or accidents requiring medical attention or resulting in lost work. Incidents of spills and mechanical failures were fully investigated by the health and safety officer to determine cause and risk to human health and safety. None of the incidents in 1981 proved a significant threat to health.

Information and Education

Keeping the public informed of all aspects of the spray program is the responsibility of the Department of Conservation Information and Education Section (I&E).

Between January and May 1981, the I&E Section developed informational handouts, advertisements and newsletters explaining several aspects of the project. Mailings were then made to the following individuals and groups within the state:

1. Municipal officials and county commissioners
2. Maine Osteopathic Association Newsletter
3. Maine Medical Association Newsletter
4. All hospitals in Maine
5. Sport and recreation camp owners near spray areas
6. Maine Forest Service Regional and District Rangers
7. Blueberry Growers Association Newsletter
8. Maine Organic Farmers and Gardeners Newsletter
9. Registered Beekeepers near spray areas
10. Maine State "Beeline" newsletter
11. Dairyman's Association Newsletter
12. Sportsman's Alliance Newsletter
13. Maine Sportsman Newspaper
14. Commercial and private flying newsletter
15. Water companies
16. Maine Audubon Society
17. Natural Resources Council
18. Appalachian Mountain Club Newsletter
19. Radio and Television stations
20. Newspapers throughout the state
21. Private citizens

A toll-free public information (800) line was established for use prior to and during the project. This phone was manned by the I&E staff at Project Headquarters from 3:00 a.m. to 10:00 p.m. during the project.

Working with the Department of Conservation I&E Section in Augusta the I&E staff at Project Headquarters provided reports on spray progress throughout the project. These reports were then sent to the media to reach the public. The staff also gave pre-spray notification to anyone who had requested notification. Appendices C, D and E contain a spray information sheet, a budworm fact sheet and a letter to physicians which were provided to the public.

Mapping

Development of the computer mapping system which was started in 1980 was continued in 1981. The system is being developed by the Maine Forest Service and the University of Maine at Orono's School of Forest Resources. Computerized mapping helps eliminate human error in duplication of maps and figuring acreage for tax purposes.

The process started with the landowners submitting proposed spray acreage to the mapping staff of the Maine Forest Service. The mapping staff then checked the spray areas for proper buffers of sensitive areas, such as eagle nests, and designed the spray blocks.

The spray blocks, once approved by the Director of the Maine Forest Service, were then prepared for the computer. Once the material was entered into the computer, a print-out on USGS topographical maps was possible. Duplicate topographical print-outs were complete for each area by April 1. These identical maps were then sent to contractors and landowners. They also served as guides for the monitors to record spray activity. The monitors then presented them to mapping technicians at each airport for permanent recording. The mapping technician not only kept the records but also acted as a liaison between the airport and project headquarters. The mapping supervisor was then able to disseminate progress reports to the Director of Operations and the Public Information and Education Section.

In addition, landownership data was entered into the computer. Once the spray project was completed this ownership data allowed the computer to superimpose the sprayed acreage onto landowner maps and thereby generate taxable acres by landowner and township. This data was sent to the Bureau of Taxation, which then levied the post-project excise tax before September 30.

Further development of the computer mapping system is planned for 1982. Many developments will come as a result of the forest resurvey presently being conducted by the USDA Forest Service.

Board of Pesticides Control

Primary use enforcement responsibility was granted to the Department of Agriculture and its Board of Pesticides Control from the United States Environmental Protection Agency on July 20, 1979. The State in accepting enforcement primacy agreed to be as restrictive as federal law.

The Board of Pesticides Control therefore regulates the sale and application of pesticides registered for distribution in Maine. In performing its duties, the Board is guided by its statutory directive to consider interests of public benefits and risks. Because of public concern, the Commissioner of Agriculture decided to convene a Medical Advisory Committee to investigate the health effects of twelve pesticide products. Carbaryl, the primary insecticide of the Spruce Budworm Suppression Project, was one of the twelve reviewed, because a "University of Maine study indicated carbaryl had the ability to potentiate a virus growth in vitro."

In its report of May 9, 1980, the Medical Advisory Committee did not place additional restrictions on carbaryl but did advise, "allow no uninformed, unconsenting human exposure on the basis of possible viral potentiation."

About the same time as the Medical Advisory Committee report, two proposals were received by the Board of Pesticides Control, which sought additional restrictions and application regulations for carbaryl and initiated a series of public hearings on carbaryl.

The hearings were held on December 3-6, 1980 in Presque Isle, Bangor and Portland. The Board decided that additional regulations would be inappropriate. The Board of Pesticides Control decided instead to adopt a set of guidelines "as a mechanism to ensure safe and efficient application. (See appendix). The Maine Forest Service met or surpassed these guidelines in the 1981 Spruce

Budworm Suppression Project. (See appendix C).

Board of Pesticides Control Monitoring

The Board of Pesticides Control sent three staff members into the field to check guideline compliance in the following ways:

- a. Collected formulation and tank samples of carbaryl to ensure proper mixing rate.
- b. Observed mixing and loading operations, and watched maintenance procedures to be sure leaking nozzles were corrected.
- c. Monitored aircraft frequencies to be sure proper radio procedures were followed.
- d. Reviewed monitor reports for evidence of buffer and sensitive area violations.
- e. Conducted fifty hours of aerial surveillance of spray teams in action. Video camera and still camera utilized, along with visual observations of compliance with buffers and sensitive areas.
- f. Investigated major incidents and collected samples when necessary to check if residue levels exceeded guideline limits.

Contract Compliance

The 1981 spray project continued the precedent established in 1980 of employing full-time contract compliance and incident investigation officers.

Contractual infractions and incidents were investigated fully, The infractions this year were minor and were either remedied immediately, or submitted to the Forest Insect Manager for his attention and action.

INCIDENT INVESTIGATION

There were five major incidents investigated by the Maine Board of Pesticides Control (BPC) during the 1981 spray project. The incidents involved two forced landings of aircraft, one insecticide jettison, one hose line rupture and one report of dead bees.

Forced landings

On June 3, a thrush "Commander" (light spray unit) experienced engine failure on a return trip to Red Pine airstrip and was forced to jettison its remaining insecticide and make a forced landing into the brush near the St. John River. Between 95 and 120 gallons of Sevin-4-Oil were jettisoned over hardwood area, over $\frac{1}{2}$ mile from any flowing water. Any remaining insecticide in the boom lines was minimal (approximately 1 gallon) and was dispersed over an 80 yard path to the final resting point of the plane 100 yards from the St. John River.

No injuries resulted from the crash. After a Maine Board of Pesticides Control investigation the insecticide lost was deemed not hazardous to the waterway. The cause of the crash was determined to be mechanical difficulties causing the engine to burn excessive quantities of fuel.

Another crash occurred on June 13 when a Bell 47 helicopter which had finished spraying experienced engine failure and was forced to land in Kibby Stream, Kibby Township. Again, no injuries occurred. After BPC investigation the Sevin-4-Oil residues were deemed not hazardous to the stream due to the fact that the insecticide tanks were empty and the only carbaryl to enter the stream came from residue in a spray boom.

Insecticide jettison

On June 1 a thrush (LSU) experienced momentary engine failure and made an emergency dump of approximately 200 gallons of Sevin-4-Oil over a hardwood ridge. After investigation by the BPC it was determined the insecticide posed no threat to surface waters.

Hoseline rupture

A PV-2 aircraft was spraying on May 31 when a suction hose ruptured inside the craft. The insecticide (Sevin-4-Oil) leaked out a hydraulic pump area which led the pilots to believe it was overflowing hydraulic fluid. Approximately 30 gallons of insecticide were slowly dispensed on non-target areas. A water sample taken exhibited 0.4 parts per billion of carbaryl, a level considered to cause minimal environmental harm.

Report of dead bees

A beekeeper complained that his bees were killed due to Sevin-4-Oil application in the Jackman area. The BPC investigation and resulting residue analysis of the dead bees proved that carbaryl had not caused the death of the bees.

TABLE 15

SUMMARY OF EXPENDITURES BY OPERATIONAL COMPONENT - 1981

(In thousands of dollars)

Aircraft	2,171
Insecticide	2,741
Fuel Oil	71
Mixing & Loading	408
Security	124
Food & Lodging	272
Temporary Labor	965
Environmental/Health Monitoring	152
*Miscellaneous	<u>296</u>
	7,200

*includes Travel, Communications

TOTAL ACRES TREATED 1,172,692

SMALL WOODLOT MANAGEMENT PROGRAM

The Spruce Budworm Small Woodlot Management Program, since its inception in 1978, has continued to encourage small non-industrial spruce-fir woodlot owners to implement integrated management strategies.

Infrared aerial photographs were taken covering the small non-industrial ownerships in the Spruce Fir Protection District. Most of the photographs were then stand-typed using a standard classification system to determine composition, age and density. Based on this information, landowners with a budworm problem were identified and contacted. In 1981, these efforts continued with several landowners being assisted and on-going alternative management practices implemented.

Integrated management on small private forests is being accomplished through stand treatments including presalvage, salvage, pre-commercial thinnings, controlled natural regeneration, planting of alternate non-host species or combinations of these techniques.

Funding of approximately \$174,000 from the USDA Forest Service is combined with General Fund revenues to support one Entomology Service Forester, two Utilization and Marketing Foresters, four Forest Technicians, one Public Information Officer, one Insect Ranger and one Clerk-Typist.

These personnel provide technical advice and management assistance to woodlot landowners. Moreover, by providing assistance in identifying existing, new and expanded markets for spruce, fir, and non-host species, the program is encouraging cultivation of less budworm-vulnerable mixed stands.

ENVIRONMENTAL MONITORING AND RESEARCH

Since 1970, environmental monitoring/research has been conducted in conjunction with every spruce budworm suppression project. In 1981, the Maine Forest Service funded seven studies through outside contractors, including the University of Maine and private consulting firms. The total amount spent on the Environmental Monitoring and Research Projects in 1981 was \$150,855. Three of these studies were continuations from work begun in 1980.

Dr. K. Elizabeth Gibbs of the University of Maine's Entomology Department continued her work on the persistence of carbaryl residues in pond water and sediments. She also continued her study of re-population recovery rates of pond organisms.

Bruce L. Grantham, a private consultant from Bangor, Maine continued his investigation into headwaters of streams as "refugia". This study was conducted to see if healthy organisms, from the headwater, would repopulate downstream areas if the headwater (refugia) were not contaminated with carbaryl.

Dr. Malcolm L. Hunter, Jr. of the University of Maine's Wildlife Department continued his three part study into the effects of decreased food supply on birds. The first part of the study examined direct application of carbaryl to a pond and resulting effects on black duck food supply. Both behavior and weight gain are being analyzed. The second part of the study was to determine if insecticide application altered the foraging behavior of warblers and chickadees. Finally, several camera-equipped nest boxes were used to record parental feeding behavior and nestling growth of chickadees and tree swallows.

Eco-Analysts, Inc. of Bath, studied the effects of Bacillus thuringiensis (Bt), a biological insecticide, on Trichoptera, commonly known as caddisflies.

Eco-Analysts, Inc. also monitored carbaryl levels in the Machias River and its estuary to determine if crustaceans or molluscs would be exposed to potentially

dangerous amounts of carbaryl.

Dr. Eben Osgood of the University of Maine Entomology Department studied the effects of carbaryl on pollinating insects and wild fruit production. Osgood's data was then combined with a literature review by Dr. Malcolm Hunter, Jr. to relate carbaryl effects to possible decreases in wildlife food supplied.

The Center for Natural Areas, a consulting firm located in South Gardiner, Maine, conducted field research on the effects of acephate on forest bird reproduction.

Harry Trask, an independent consultant, conducted a literature review and summarized what is currently known about the fate of carbaryl in the spruce-fir forest environment.

Budworm Management Research

In addition to environmental monitoring, the Maine Forest Service also funded several studies on other spruce budworm related topics.

A three part study on utilization of budworm killed spruce and fir is being conducted at the University of Maine at Orono. Dr. Richard Hale, of the School of Forest Resources is looking at effective methods for kiln drying balsam fir. Dr. James Shottafer, also of the School of Forest Resources is investigating strength criteria. Dr. Joseph Genco of the Pulp and Paper Engineering Department is studying pulp-making characteristics of budworm-killed spruce and fir.

Dr. Richard Soper of the USDA Science and Education Administration is trying to develop the use of a fungus, Erynia radicans, for spruce budworm control. This represents a potential new biological insecticide.

Dr. John Dimond and Dr. Drion Boucias of the University of Maine Entomology Department have been investigating another biological insecticide, Bacillus thuringiensis (Bt), to determine if its effects on budworm will carry over into the year following initial application.

HUMAN HEALTH MONITORING

The Department of Human Services, Division of Health Engineering monitored carbaryl levels at the Augusta airport to establish ambient air levels for carbaryl. No carbaryl was detected during the monitoring period, May 21, 1981 - June 20, 1981, at a minimum detection level of 0.012 micrograms of carbaryl per cubic meter of air. This data suggests that residents of the major population areas, which are located at considerable distances from spruce budworm spray blocks, do not receive measurable exposure to carbaryl from spruce budworm suppression spraying.

An epidemiologist has been hired by the Department of Human Services to coordinate future human health monitoring activities. A Memorandum of Understanding between the Department of Human Services and the Maine Forest Service has been established. This Memorandum of Understanding identified the responsibilities and activities of the Maine Forest Service and the Department of Human Services for monitoring the effects of the Spruce Budworm Suppression Project on the health of the people of the State of Maine. A copy of this Memorandum of Understanding is available from the Maine Forest Service.

PROJECT SURVEY AND ASSESSMENT UNIT ACTIVITIES

Results of the 1981 Spray Project and Plans for Winter 1981-82

1. The budworm survey and assessment unit conducted a comprehensive field and laboratory effort before, during and following the 1981 project including:
 - a. A winter review and evaluation of proposed 1981 spray blocks employing overwintering larval assessment and aerial evaluation.
 - b. Prespray establishment of survey lines used for insecticide testing, operational assessment, and development sites.
 - c. A prespray population evaluation survey to confirm the need for treatment in each block and to set final dosage recommendations.
 - d. Prespray sampling for operational and experimental evaluation.
 - e. Development sampling of larvae and host foliage to establish block release dates.
 - f. Postspray evaluations of larval survival and defoliation in operational and experimental plots.
 - g. Laboratory evaluation of all development and assessment samples.
 - h. An aerial assessment of defoliation ("browning") within the outside treatment areas.
2. Staffing for the 1981 project was as follows:
 - a. Winter pretreatment evaluations were made by the permanent staff of 11 entomology division and project funded personnel and with 3 project funded employees hired for L-11 assessment.
 - b. Project evaluation utilized the permanent staff plus 33 field workers and 31 laboratory employees hired with project funds.
3. Major results of 1981 operational and experimental evaluations were as follows:

- a. Insect and host development was slightly advanced and bud expansion was ahead of larval development, resulting in large food sources and a small insect which is generally favorable to good spray results.
- b. Prespray larval counts generally matched egg and overwintering larval (L-11) predictions. Highest counts were found in the northern and southeastern portions of Aroostook County and lowest counts occurred in the southwest.
- c. The single application of 0.75 lbs. of Sevin-4-Oil provided generally good population reduction and foliage protection (generally 95% reduction and 40% defoliation).
- d. Two applications of .046 lbs. of Sevin-4-Oil was the most effective treatment.
- e. Orthene was as effective as Sevin in the areas assessed.
- f. Applications of 8 BIU of Bt were inconsistent and generally not effective at a level comparable to chemicals, (90% population reduction, 60% defoliation).
- g. All 12 BIU applications of Dipel and Thuricide were highly effective and comparable to chemical results. Some areas showed very rapid population reduction (60 to 70% in one to three days).
- h. In areas treated for spruce protection, spruce defoliation was generally one half or less the defoliation in check areas, but population reduction on spruce was variable. Many spruce checks had high population reduction.
- i. In areas treated for protection of spruce, fir, and hemlock, all three hosts were protected but results were best on hemlock, fir, and spruce in that order.

- j. Treatment of some blocks in the northwest and northeast was delayed by bad weather but losses due to these delays were not highly significant.
 - k. Several blocks sprayed with Bt, Carbaryl, and Orthene received some rain shortly after treatment. This condition reduced the efficacy of all materials but seemed to have the least effect on Sevin and 12 BIU Bt blocks.
4. Following project activities, the survey and assessment unit conducted the annual egg mass and tree condition survey in order to establish hazard and population predictions for 1982.
 5. Ground tree conditions data was supplemental with an aerial damage survey and the combined data was used to prepare a 1982 hazard map to provide to landowners.
 6. Staffing for the 1982 prediction surveys was somewhat higher than in the past in order to provide survey data to landowners in a more timely manner. Levels were as follows:
 - a. Field collections were made by 6 of the permanent staff plus 22 project funded employees.
 - b. Laboratory procedures were accomplished by 3 of the permanent staff plus 30 project workers.
 - c. Administration, supervision, and aircraft services were provided by the remaining 3 permanent staff members.
 7. Results of population and hazard prediction surveys were as follows:
 - a. Egg counts show an overall reduction in predicted 1982 population with very large reduction to low or moderate levels in a broad band from the southwest to the northeast.
 - b. Egg counts remain high in unsprayed portions of the northwest and in the southeast.
 - c. The total area of high and extreme hazard was set at 4.5 million acres compared to 5.0 million in 1980.

- d. Hazard is sharply reduced in treated areas but is increasing rapidly in unsprayed areas. Reductions were due to lower egg counts and lower current defoliation in treated areas.
 - e. Tree condition is most extreme in the southeast area.
8. Survey and assessment plans for the late fall and winter 1981-82 are as follows:
- a. Unit reports are planned for 1981 Survey and Assessment Activities (Project and Prediction Surveys), experimental testing of Bt variations, experimental testing of Sevin on spruce and hemlock, and surveys of impact from secondary insects.
 - b. Survey of secondary insect and stand decline plots will be conducted in the fall.
 - c. An extensive effort on L-11 sampling is planned in areas designated important by the landowners. Overwintering data will also be used to facilitate insecticide selection decisions. Seven seasonal positions will be requested to conduct this expanded effort.
 - d. Extensive aerial assessment of proposed 1982 spray areas is planned in order to advise landowners and provide information for operational decisions.
 - e. Finally, data analysis will be conducted in the areas of populations prediction and the increased use of the L-11 method in late summer and fall.

APPENDICES INDEXAPPENDIX

- A THE MAINE SPRUCE BUDWORM SUPPRESSION ACT
- B CHRONOLOGY OF THE SPRUCE BUDWORM SUPPRESSION PROJECT
- C 1981 SPRUCE BUDWORM SPRAY INFORMATION SHEET
- D 1981 SPRUCE BUDWORM FACT SHEET
- E DEPARTMENT OF HUMAN SERVICES LETTER TO PHYSICIANS
- F CARBARYL APPLICATION GUIDELINES

SUBCHAPTER IV SPRUCE BUDWORM SUPPRESSION ACT

Section 8401. Short title

The subchapter shall be known and may be cited as the "Maine Spruce Budworm Suppression Act."

Section 8402. Legislative policy

The Legislature declares that it shall be the policy of the State to undertake reasonable measures to control and suppress infestations of spruce budworm insects in the spruce and fir forests of the State during the years 1976-1981, including such measures as the minimization and equitable distribution of the burden of losses attributable to budworm infestation, the maintenance of wood resources sufficient to permit the forest products industries of the State to operate as near to full production capacity as would be possible but for the existence of the budworm infestation; accomplishment of the maximum sustained yield harvest possible; utilization of the most cost-effective methods of budworm protection and control; and as the financing of the state share of suppression and control measures by the General Fund of the State of an extent commensurate with the public benefit accruing from a suppression and control program and by excise taxes on the privilege of owning and operating such forest land for the services of protection rendered to the forest lands to an extent commensurate with the benefits accruing to the owners of the lands from such a program.

Section 8403. Definitions

For the purposes of this subchapter, unless the context otherwise indicates, the following words shall have the following meanings.

1. Contiguous. "Contiguous" means in actual contact. Contiguous parcels of land are those which share a common boundary whether acquired by one or more deeds. Roads, streams and natural features shall not be deemed to interrupt a boundary which would otherwise be common.

2. Forest land. "Forest land" means land in contiguous parcels which are subject to mandatory taxation pursuant to Title 36, chapter 105, subchapter II-A.

3. Hardwood. "Hardwood" means forest land on which maple, beech, birch, oak, elm, basswood, poplar and ash, singly or in combination, comprise 75% or more of the stocking.

4. Mixed wood. "Mixed wood" means forest land on which neither hardwood or softwood comprise 75% of the stand but are a combination of both.

5. New market. "New market" means a wood-processing plant which did not utilize budworm infested or damaged wood on or before January 1, 1976 or the physical expansion of an existing wood processing plant, which expansion did not utilize budworm infested

or damaged wood on or before January 1, 1976. The volume of spruce and fir used by an expanded wood processing plant in any one year shall have subtracted from the volume the average annual volume of spruce and fir utilized by that plant during the calendar years 1973-1975 to determine the volume which represents a new market.

6. Nonfederal share per acre. "Nonfederal share per acre" means the total amount of money raised from General Fund appropriations and excise tax revenues provided for the suppression and control of spruce budworm divided by the number of acres within the designated spray area.

7. Person. "Person" means any individual, partnership, joint venture, corporation or other legal entity, or any group of persons which acts as a tenancy in common or joint tenancy, for ownership purposes, except any government or any agency, bureau or commission thereof.

8. Rebate. "Rebate" means a payment by the State back to a person subject to taxation pursuant to this subchapter.

9. Rule. "Rule" means a duly adopted regulation of the Bureau of Forestry of general applicability. Such rules shall have the force and effect of law.

10. Sawlog. "Sawlog" means a log suitable in size and quality for producing one or more of the following products: Veneer, sawn boards and sawn timber.

11. Softwood. "Softwood" means forest land on which pine, spruce, fir, hemlock, cedar and larch, singly or in combination, comprise 75% or more of the stocking.

12. Spray project. "Spray project" means all operations connected with the application of insecticides or other materials against spruce budworms or bud moths within a single year.

13. Spruce budworm. "Spruce budworm" means the insect of the species known as choristoneura fumiferana, Clem., at any stage of its biological development.

14. Wood Classification. "Wood classification" means the typing of forest land into the categories of hardwood, mixed wood and softwood.

Section 8404. Spruce Fir Forest Protection District

There is established a Spruce Fir Forest Protection District consisting of the following municipalities and townships:

Aroostook County. All municipalities and townships except the following: Caribou, Easton, Fort Fairfield, Fort Kent, Frenchville, Houlton, Limestone, Littleton, Madawaska, Mapleton, Mars Hill, New Limerick, New Sweden, Oakfield, Presque Isle, Washburn and Woodland;

Franklin County. The following municipalities and townships: Alder Stream, Chain of Ponds, Coburn Gore, Coplin Plantation, Dallas, Eustis, Jim Pond, Lang and Rangeley;

Hancock County. All municipalities and townships north and east of a line formed by the northern and eastern boundaries of the following municipalities and townships: Otis, Ellsworth, T.8,S.D., Hancock, Sullivan and T.7,S.D.; except the following: T.9,S.D.; and T.10,S.D.

Penobscot County. All municipalities and townships north of a line formed by the southern and western boundaries of the following municipalities: Bradley, Clifton, Milford, Argyle, Alton and Lagrange;

Piscataquis County. All municipalities and townships, except the following: Abbot, Atkinson, Dover-Foxcroft, Guilford, Kingsbury, Milo, Monson, Parkman, Sangerville, Sebec and Wellington;

Somerset County. All municipalities and townships north and east of a line formed by the southern and western boundaries of the following municipalities and townships: Mayfield, Moscow, Pleasant Ridge Plantation, Carrying Place, T.3,R.4, B.K.P., W.K.R. and Flagstaff, except for the following: T.5,R.6, B.K.P., W.K.R.; and

Washington County. All municipalities and townships, except the following: Addison, Beals, Cutler, Eastprot, Harrington, Jonesport, Lubec, Machias, Machiasport, Milbridge, Roque Bluffs, Steuben and Trescott.

Section 8405. Funding

1. Advance budget planning. The Director of the Bureau of Forestry shall annually, prior to January 1st of each of the years 1977-1981, certify to the Bureau of the Budget his estimate of the cost, if any, of the nonfederal share for the implementation of this Part for the calendar year following that legislative session. The Bureau of the Budget shall include this recommended amount in the Part I budget. The Legislature shall annually, in its Part I budget, determine the amount, if any, which shall be expended for this program and the manner in which the amount shall be funded. The determination shall authorize the budworm suppression program provided for by this subchapter for such calendar year and shall supersede any requirements which may exist for the approval of this program by any other state agency. In the event that the director subsequently determines that the amount necessary to conduct the activities authorized by this subchapter in any calendar year exceeds the amount appropriated in the Part I budget, he shall inform the Bureau of the Budget and it shall certify the additional amount necessary. Any such additional amount shall become a part of the Part II budget, subject to increase, reduction or approval by the Legislature.

2. General Fund. On or before January 1, 1977, and on January 1st for the 4 years thereafter, the Commissioner of Conservation shall report in writing to the Legislature, recommendations of the department as to the percentage of the cost of the annual program for the control and suppression of spruce budworm which the Department of Conservation recommends to be paid out of the General Fund and the percentage from excise or other tax funds during 1977 and 1978 in the first instance and thereafter for the calendar year following the legislative session, the percentages to be based upon the benefits to the State and to private landowners, respectively. Prior to making the recommendations, the commissioner shall hold a public hearing to provide opportunity for public comment on these matters. Money appropriated from the General fund for these purposes shall be paid into the budworm suppression Fund hereinafter established.

3. Excise tax funds. Persons owning parcels of forest land, including persons claiming timber and grass rights in public reserved lands, which are classified as forest land pursuant to Title 36, chapter 105, subchapter II-A, of more than 500 acres within the Spruce Fir Forest Protection District shall be subject to the pre-project and post-project excise taxes established under section 8406 on the privilege of owning and operating such parcels of forest land, except as provided in this subchapter. In cases of divided ownership of the forest land, the persons owning or claiming timber rights in such forest land shall be subject to such taxes. The Legislature hereby finds that it would not be administratively feasible to apply such taxes to smaller parcels of such forest land.

4. Spray project special accounts. Accounts shall be established in the following manner.

A. The Treasurer of State shall establish 2 dedicated revenue accounts as follows.

(1) Into one account shall be deposited any revenues received by the State from the Government of the United States for any spray project.

(2) Into the other account shall be deposited any revenues received by the State from the excise taxes authorized pursuant to this subchapter.

B. The moneys credited to these accounts shall be used by the Bureau of Forestry to pay any expenses, debts, accounts and lawful demands incurred in connection with spray projects authorized under this subchapter and the director shall authorize the State Controller to draw his warrant therefor at any time. Any remaining balance in these accounts shall continue from year to year as a fund available for the purposes set out in this subchapter and for no other purposes.

5. Borrowing from General Fund. To accomplish the purposes of this subchapter, the director may, subject to the approval of the Governor, borrow moneys from the General Fund for up to 120 days, at no interest, in order to enable the bureau to pay expenses, debts, accounts and lawful demands for any spray project authorized under this subchapter; provided, however, that the aggregate amount of that borrowing may not, at any time, exceed the amount of uncollected excise taxes authorized under this subchapter for such spray project.

Section 8406. Taxation

1. Pre-project excise tax. The pre-project excise tax on parcels of softwood forest land shall be \$1.45 per acre for 1980 and 1981. The pre-project excise tax on parcels of mixed-wood forest land shall be 72½¢ per acre for 1980 and 1981. The tax shall be assessed and billed by the State Tax Assessor within 30 days following the effective date of this section for 1980, and on or before April 1, 1981.

2. Post-project excise tax. The post-project excise tax on forest land shall be computed and assessed as follows.

A. The Director of the Bureau of Forestry shall determine the total amount of costs incurred or budgeted to be expended in connection with any spray project conducted during the 1980 and 1981 calendar years.

B. The amount computed in paragraph A for each of the years 1980 and 1981 shall be reduced by the amount of any moneys received for such project from the Government of the United States and from contract payments made for spraying services pursuant to section 8414, subsection 3.

C. 90% of the balance computed under paragraph B shall be raised by a post-project spray tax, the per acre rate of which shall be calculated by dividing the sum to be so raised by the number of acres, subject to excise taxation under this subchapter, which actually received spray treatment in 1980 and 1981.

D. 10% of the balance computed under paragraph B shall be raised by a post-project shared tax, applicable to all taxable acres in the district, the per acre rates of which shall be calculated in accordance with the following:

Each taxable acre in the district which is classified as mixed wood shall be taxed at half the rate applicable to each taxable acre in the district classified as softwood; and each such acre classified as hardwood is not subject to taxation under this paragraph.

E. The director shall certify in writing to the State Tax Assessor, by September 1st, the post-project shared tax rates for softwood and mixed-wood acres and the post-project spray tax rate, together with the number of acres within each ownership which are subject to such taxes.

F. The amount of the post-project excise taxes payable by each landowner shall be reduced by the amount assessed upon that landowner on account of the pre-project excise tax payable for that calendar year.

G. The State Tax Assessor shall compute, assess and bill, by September 30th the amount of post-project excise taxes payable by each landowner in accordance with this section.

Notice of the amount owed by each landowner shall be sent to him or his agent at the address shown on the records of the State Tax Assessor or of the municipality in which the land is located. In the event that the amount so calculated results in a negative balance for any landowner, the State Tax Assessor shall refund to that landowner the amount of the balance in the form of a tax rebate. The rebate shall be made no later than February 28th of the year following the assessment date.

3. Due date. The pre-project excise tax is due June 30th of the year in which it is assessed. The post-project excise tax is due December 31st of the year in which it is assessed. Notice of the taxes shall be presumed complete upon mailing.

4. Interest and penalty. Any tax assessed under this subchapter which is not paid when due shall accrue interest at the rate of $1\frac{1}{2}\%$ for each month, or fraction thereof, that the tax remains unpaid and a penalty equal to 20% of the unpaid tax shall be added to the liability of any person who fails to pay a tax when due.

5. Lien. There shall be a tax lien on all land subject to taxation under this subchapter to secure the payment of all sums due hereunder, and the lien may be enforced in the manner provided by Title 36, sections 1282 and 1283.

6. Collection by Attorney General. Whenever any person fails to pay any tax, interest and penalty due under this subchapter within the time provided, the Attorney General shall enforce payment by civil action against the person from whom it is due for the amount of such tax, interest and penalty, together with costs, in either the Superior or District Court in Kennebec County or in the judicial division in which the person has a residence or established place of business.

Section 8407. Designated spray areas

1. Designation. The director shall, not later than October 15th of each year, designate the areas of the State upon which it is, in his judgment, necessary to apply chemical, biological or other material in order to suppress and control spruce budworm infestations. The designations made by the director shall be on the basis of data compiled for the Bureau of Forestry including, but not limited to, egg mass counts, evidence of defoliation, tree vigor, timber cruises, photography and similar information. The director shall provide forest land owners in the Spruce Fir Protection District with an opportunity to submit their recommendations and any information in support thereof with respect to what areas should be designated.

The director shall annually prepare maps showing the areas designated for spraying by him in the following year by the dates first stated in this section and shall report in writing the number of acres in each township designated for spraying.

2. Notice. Within 10 days of the preparation of the maps and reports required by subsection 1, the director shall cause to be published in the state paper and such other newspapers as he deems appropriate, notice of the designation of the spray areas pursuant to this section. The notice shall state that the designation is complete, shall indicate locations where area maps will be available for inspection and where further information may be obtained, and shall provide information concerning withdrawal procedures pursuant to sections 8408 to 8409.

Section 8407-A. Settlement corridors

1. Designation. All land within 2 miles of publicly-maintained roads in the Spruce Fir Forest Protection District shall be designated by the Director of the Bureau of Forestry as settlement corridors. That designation shall be made to the State Tax Assessor by August 1, 1980.

2. Insecticide spray treatment; exceptions. Land within settlement corridors may not receive insecticide spray treatment except under the following circumstances:

A. The landowner makes a written request for that treatment in accordance with schedules and procedures adopted by the director;

B. The request is accompanied by such information as the director may require and meets criteria as the director may adopt in furtherance of the legislative policies of this subchapter; and

C. The request does not relate to land within a settlement corridor located in a municipality which has taken action to prohibit spray projects within that corridor pursuant to subsection 4.

3. Director's authority. The provision for settlement corridors under this section does not impair or affect the director's authority to define and carry out other policies and procedures, including, without limitation, the use of no-spray buffers, designed to protect the public health and the environment, as he deems necessary or appropriate.

4. Prohibition by municipalities. Any municipality within the Spruce Fir Forest Protection District may prohibit the execution of spray projects authorized under this subchapter within settlement corridors, as designated pursuant to this section, which lie within that municipality. Any such prohibition, or the repeal thereof, may be enacted in accordance with the procedures for enactment of municipal ordinances; provided that any such prohibition shall be enacted before April 15th of any calendar year in which it shall apply and that the municipality shall send a certified copy of its enactment to the director within 5 days following the adoption of the same.

5. Tax levy. No tax levied pursuant to section 8406 may be assessed on lands within settlement corridors for which the execution of spray projects has been prohibited by a municipality as provided in subsection 4.

Section 8408. Automatic withdrawals

1. Conditions. Any person owning or claiming rights in timber or land within the Spruce Fir Forest Protection District and subject to taxation hereunder may, by November 15th of each year, apply in writing to the director for the withdrawal of not less than 500 acres nor more than 1,000 acres. Each person who is an owner or claimant of real estate shall be entitled to only one withdrawal pursuant to this section and all acres withdrawn shall be contiguous.

2. Consent. Applications made pursuant to subsection 1 shall be granted by the director when he is satisfied that the information contained in the application is complete, truthful and accurate. In the event that he is not so satisfied within 30 days after submission of an application, it shall be deemed denied and the director shall state his reason for denial in writing to the applicant. Upon the granting of an application, the director shall notify the State Tax Assessor.

3. Tax exemption. Lands withdrawn pursuant to this section shall not be subject to taxation under this subchapter for the years in which such withdrawal is accepted. The director shall certify on or before December 31st of each year, to the State Tax Assessor and the acreages and owners exempt from taxation under this section.

Section 8409. Silvicultural treatment designation

1. Conditions. Any person owning or claiming rights in timber on land within the Spruce Fir Forest Protection District and subject to taxation hereunder may, by November 15th of each year, apply in writing to the Director of the Bureau of Forestry for designation of contiguous parcels of land of not less than 500 acres as silvicultural treatment areas. Designation as a silvicultural treatment area shall be granted only upon the submission and approval of a plan for the area which provides for the adoption of silvicultural practices designed to minimize susceptibility and vulnerability to future spruce budworm infestations as those practices are defined by the rules.

2. Consent. Applications made pursuant to subsection 1 may be granted, or granted conditionally, by the director when he is satisfied that the information contained in the application is complete, truthful and accurate and that the plan submitted conforms with the rules relating to such designation. In the event that the director is not so satisfied with 60 days after the submission of the application, it shall be deemed denied and the director shall state his reasons for the denial in writing to the applicant.

3. Tax exemption. Lands designated by the director pursuant to this section shall be exempt from taxation under this subchapter so long as they retain such designation. For applications for designation made by April 25, 1976, if acceptance occurs after the tax imposed by this subchapter has been paid, the Treasurer of State shall rebate the tax payments out of the Budworm Suppression Fund. The parcels shall be exempt from taxation pursuant to this subchapter so long as they retain the designation. In the event that the director finds that the owner or claimant is in noncompliance with the terms upon which the application was granted, then an amount equal to the tax, interest and penalty as provided for in section 8406, subsection 6, for each year the parcel was designated as a silvicultural treatment area shall immediately become due and payable and his land shall be subject to a lien as provided for in section 8406, subsection 7.

Section 8410. General conditions for withdrawals

1. Forms. All applications for withdrawals and designations pursuant to sections 8408 to 8409 shall be made on forms prepared under the supervision of the director and shall contain the following information:

- A. The number of acres which are the subject of the application;
- B. The timber types thereon;
- C. Their location on maps of the same size and scale as those accepted by the State Tax Assessor in the administration of the Tree Growth Tax Law;
- D. Statement of ownership rights therein;
- E. Subject to the provisions of paragraph G, written authorization from each owner of, or claimant to, an interest therein, other than owners of easements and mortgages;
- F. Any other information relating to the suitability of the parcel for withdrawal or designation as the director may require, including, but not limited to, the age of the stands within the acreage, the timber volumes to be removed, the budworm hazard classes of the stand therein, management plans therefor and the basis for the application for withdrawal or designation; and
- G. In the case of applications for parcels of land within townships or portions of townships which are held in common and undivided ownership, the owners of a controlling interest in the parcel shall have the power to make applications authorized under this subchapter and the decisions of the director shall be binding on all owners of interests therein.

2. Limitations. The director shall not accept, nor shall he consider, any application for withdrawal or designation pursuant to sections 8408 to 8409 for any acre of land for which withdrawal or designation pursuant to any other of the aforementioned sections already has been granted.

3. Prohibition. No parcel of land for which withdrawal or designation has been granted pursuant to sections 8408 to 8409 shall be sprayed with insecticides by the Bureau of Forestry for the purpose of suppressing spruce budworm populations at any time following the grant, except following a finding by the director that the land has not been operated in accordance with an application or its rules, or as provided in subsection 4 or in section 8413, subsection 4.

4. Petition. A landowner who determines that, notwithstanding the implementation of a plan accepted by the director, there exists a need for the application of insecticides, may petition the director for inclusion in future spray projects. In the event that the director accepts the petition, the applicant shall be assessed for excise taxes due for the year in which the application for exemption was made and each year thereafter. The director shall reject any petition made for the purpose of evading penalties for which the applicant might otherwise be liable for failure to comply with a plan submitted pursuant to section 8409 or the rules pertaining thereto.

5. Written notification. Owners of tracts under silvicultural or automatic withdrawals shall send written notification to the director within 30 days of any transfer of any interest, other than an easement or mortgage, in those tracts.

Section 8411. Duties and authority of the Director of the Bureau of Forestry

1. General. The director shall coordinate the activities of the bureau personnel and render all assistance practicable to the Committee on Spruce Fir Silviculture.

2. Rules. From time to time he shall adopt and amend rules for the implementation of this subchapter consistent with section 8413. These rules shall be adopted in accordance with the procedures set forth in Title 5, chapter 375, subchapter II.

3. Applications. He shall consider applications made pursuant to sections 8408 to 8409 and grant, conditionally or deny such applications.

4. Reduction. In the event that the director determines that the total number of acres remaining within the spruce fir forest type after applications have been made is not sufficient to provide the amount of wood necessary to meet the reasonably foreseeable future need for spruce and fir in the State, then he may reduce the acreage included in each otherwise acceptable application made pursuant to section 8409 in equal portions so that the total number of acres withdrawn does not exceed the number he deems necessary to supply such wood.

5. Declaration of termination of infestation. Upon receipt of satisfactory information to the effect that the severity of the infestation of spruce budworm has declined to the extent that no spray program will be beneficial or cost effective in all the years remaining during which this Part is in effect, he shall report the same to the Commissioner of Conservation and the Governor and shall recommend to the Legislature that it declare a termination of infestation.

6. Markets and utilization. He shall have the authority to conduct and contract for research relating to the marketing and utilization of wood resources which are or may be affected by spruce budworm infestation.

7. Entry and inspection. The director may enter, upon reasonable advance notice to the landowner, at any reasonable time in a reasonable manner, any tract of land for which application pursuant to sections 8408 to 8409 has been made or granted in order to inspect the same free of any charge or cost imposed by the owner or his agents to assure compliance with the rules and order of the director.

8. Inspection. The director or his duly authorized representatives may likewise inspect the books and records of any applicant with respect to any information set forth in an application or verification thereof. He also may require periodic progress reports from applicants in connection with his verification procedures.

9. Reimbursement to state agencies. Out of funds available for any spray project, the director, subject to the approval of the Governor, may reimburse other state agencies for costs incurred by them in connection with that spray project. Such cost may include, but shall not be limited to, those incurred for environmental and health monitoring and regulation. Any department or agency of State Government is authorized to accept funds which may be available for carrying out the purposes of this subchapter.

10. Removal of lands from the spray application. Upon application of a forest landowner received no later than April 1, 1980, for the 1980 spray project and December 31, 1980, for the 1981 spray project, the director shall withdraw lands of that owner from spray application. Those lands shall remain subject to the pre-project excise tax and to the post-project shared tax.

Section 8412. Committee on Spruce Fir Silviculture

1. Committee created. To perform the duties specified in this subchapter, there is established a Committee on Spruce Fir Silviculture.

2. Membership. The committee shall consist of 5 citizens of the State at least 3 of whom shall be registered foresters who are knowledgeable as to commercial forest land management. They shall be appointed for a term of 2 years each by the Commissioner of Conservation with the advice and consent of the Governor. Each member shall be entitled to his actual expenses and \$50 per diem to be drawn from the Budworm Suppression Fund. They shall be subject to removal for cause by the commissioner with the approval of the Governor.

3. Duties. The Committee shall carry out the following duties:

- A. Elect one of its members to serve as chairman for the year in which the election is conducted;
- B. Approve the rules to be issued pursuant to sections 8411 and 8413;
- C. Determine appeals as provided in section 8418, subsection 2; and
- D. Provide advice and consultation to the Director of the Bureau of Forestry with respect to the subject matter of this subchapter.

Section 8413. Rules relating to silviculture

1. Purpose. The director shall adopt and may, from time to time, amend and repeal, subject to the approval of the Committee on Spruce Fir Silviculture, rules to carry out the purposes of this subchapter including, but not limited to, rules relating to the qualifications of parcels of forest land for silvicultural treatment designation.

The purpose and scope of the rules shall be to reduce the vulnerability and susceptibility of the Maine spruce fir forest to spruce budworm depredations, to reduce the economic losses to the State from such depredations as do occur and to assure future supplies of spruce and fir. The rules shall establish standards for forest management including, but not limited to, timber stand improvement and harvesting in accordance with sound silvicultural principles. Economic considerations as well as all other relevant considerations shall be taken into account in determining the rules. The director shall promulgate only those rules directly related to the foregoing purposes. In particular, it is not the intent of this subchapter to regulate operational techniques including, but not limited to, road layout and construction, equipment use and erosion control.

2. Silvicultural designation rules. The director shall adopt rules relating to the eligibility of parcels of land for designation as silvicultural treatment areas to fulfill the objectives of subsection 1 including, as appropriate:

- A. Standards for cutting by selection, shelterwood, clearcutting and such other methods as the director may allow including, but not limited to, the number of cuts, diameter and volumes under reasonable classifications of site conditions;
- B. Minimum standards for seed tree retention including the number and location per acre under reasonable classifications of cutting methods and site conditions; and
- C. Silvicultural practices reasonably related to the alteration of stand composition and the thrift and vigor of the resulting stand.

3. Spraying rules. The director may make rules requiring the mandatory inclusion of parcels within the designated spray area when, in his judgment, the action is necessary because of the intensity of the infestation or because it would be excessively costly or logistically difficult to avoid applying insecticides and for like reasons.

4. Verification. The director also may make rules for verification of compliance with the rules promulgated hereunder.

Section 8414. Forest Insect Manager

1. Position created. There is established within the Bureau of Forestry the position of Forest Insect Manager. Such position shall not be subject to the Personnel Law and shall terminate upon the expiration date hereinafter provided for by this Part. The manager shall be appointed by the Director of the Bureau of Forestry with the approval of the Commissioner of Conservation and may be removed by the director with approval of the commissioner. He shall be directly responsible for the development, coordination and implementation of policies and programs of the State as they relate to the control and suppression of the spruce budworm epidemic. The Forest Insect Manager shall also be known as the coordinator of the spruce budworm program.

2. Contractual authority. The manager shall have the authority to enter into and administer contracts for the acquisition of chemicals, aircraft, personnel services and other goods and services necessary to carry out spruce budworm suppression operations subject to the provisions of Title 5, chapters 145 and 155.

3. Spraying services. The manager shall have the authority to enter into and administer contracts to spray with insecticides or similar materials parcels of spruce-fir forest land outside the designated spray area upon application for the provision of the services by the owner of the parcel, provided that:

A. The application is submitted within 30 days of the notice provided for in section 8407, subsection 2, for inclusion in spray projects in subsequent years;

B. He is satisfied that the area for which the application is made can benefit from the spraying and that spraying is practical; and

C. The applicant enters into a contract with the Bureau of Forestry to pay the actual per acre cost to the bureau to spray the land, less any amount which may be provided by the Government of the United States and less the amount of any excise tax paid or assessed under this subchapter on the parcel for the year in which spraying actually takes place.

Forest land under these contracts shall be included in Maine's spruce budworm suppression program.

4. Executive Director

A. The manager shall serve as Executive Director of the Committee on Spruce Fir Silviculture and carry out such duties as the committee may assign to him.

B. He shall certify to the State Tax Assessor on December 31st of each year the specific acreages, their locations and owners exempted by the director from liability for excise taxes pursuant to sections 8408 and 8409.

C. He shall certify any parcels which the director has found to be in noncompliance with an accepted application or its rules and therefore liable to taxation and penalties and any parcels which are liable to taxation pursuant to section 8410, subsection 4.

5. Cooperation. The manager shall consult with and cooperate with the United States Forest Service, the federal government of Canada, the governments of the Provinces of Quebec and New Brunswick and public and private landowners in Maine in developing joint research and operations projects to control and suppress spruce budworm infestations and on related matters.

6. Report. The manager shall, each year after the completion of a spray program, make a complete financial review of the program, and make a full report to the next session of the Legislature. The report shall include, but not be limited to, source of funding, private, state or federal, and total expenditures broken down in the following categories: Chemicals, aircraft, research and other appropriate categories. Also to be included shall be a statement of any remaining balance by source, private, state and federal.

Section 8416. Other state and municipal agencies.

1. Withdrawal. The chief executive officer of any state agency, authority, commission or that of any county or municipality, may withdraw any land, within the ownership or control of the agency, from the designated spray area upon application to the director in the form provided for by section 8410, subsection 1, within 30 days after notice, pursuant to section 8407, subsection 2.

2. Research on public lands. The commissioner or director of any agency of the State with jurisdiction over public land may make the land available on such terms and conditions as he deems reasonable to any public or private nonprofit entity engaged in spruce budworm control research and related silvicultural research. The Forest Insect Manager shall likewise encourage private landowners within the State to make their lands available for the same purposes.

Section 8417. Research

The Bureau of Forestry, acting through its director, may make grants of funds and enter into contracts for purposes of research related to forest management strategies, insecticide and spray application technologies, integrated pest management techniques, forest product marketing and utilization and other issues pertinent to the purposes of this subchapter. This research shall be funded out of moneys available to the director for that purpose.

Section 8417-A

1. Implementation. The Bureau of Forestry shall undertake to develop and implement budworm management technical assistance programs for small woodlot owners.

2. Analysis of future supply and demand. The Bureau of Forestry shall conduct or cause to be conducted an analysis of future supply and demand for the spruce and fir resources of the State. The purpose of this analysis shall be to determine the types and levels of future spruce budworm protection needs and strategies for such spruce and fir resources.

3. Environmental health monitoring. The Bureau of Forestry shall cause to be conducted by an agency other than the Department of Conservation an environmental health monitoring program each year in which a spray project is conducted. The Bureau of Forestry shall prepare and submit an annual report to the Legislature dealing with all aspects of the environmental health monitoring conducted during the previous calendar year.

Section 8418. Appeals

1. Abatement. Any owner or claimant aggrieved by the action of the State Tax Assessor in determining the tax on owners of forest lands, through error or mistake in calculating the same, may apply for abatement of any such excessive tax within 60 days of the notice of the tax and if, upon reexamination, the tax appears to be excessive through such error or mistake, the State Tax Assessor may thereupon abate the excess.

2. Appeal. Any person aggrieved by any final action of the director under this subchapter may take an appeal therefrom within 30 days of the date of the action to the Committee on Spruce Fir Silviculture and the committee may amend or reaffirm the action in accordance with the subchapter and may order such remedial action as is appropriate, including a refund in whole or in part of any taxes, interests or penalties which have been erroneously or unjustly paid. If the committee fails to give written notice of its decision within 90 days of the filing of the appeal, the appeal as provided unless the appellant shall in writing have consented to further delay. The appeal to the committee shall be filed with the Director of the Bureau of Forestry. The committee may adopt reasonable rules relating to the conduct of procedure under this subsection.

3. Appeal to Superior Court. Any party may appeal from the decision of the Committee on Spruce Fir Silviculture to the Superior Court in accordance with the Maine Rules of Civil Procedure, Rule 80B.

Section 8419. Review

Chapter 803, subchapter IV, which pertains to establishment, description and participation in the Spruce Fir Forest Protection District, shall be reviewed by the Joint Standing Committee on Appropriations and Financial Affairs during the First Regular Session of the 110th Legislature.

Section 8420. Repeal

This subchapter is repealed on October 1, 1981.

Appendix B
B-1

1981 Spruce Budworm Suppression Project

Program Chronology, 1980-81

July	10	Critique of 1980 Spruce Budworm Suppression Project - Augusta
August	6	Scoping Session for 5-year Programmatic Environmental Impact Statement (PEIS) - Orono
	7	Meeting with U.S. Forest Service to review Scoping Session and plan preparation of draft PEIS - Orono
September	11	Review of CANUSA Program with Program Management - Bangor
	23-25	Pesticide seminars - chemical and biological manufacturers present information on pesticides available for budworm suppression - Augusta
	29-30	Integrated pest management tour of Great Northern Paper - Millinocket and Portage areas
October	9	Integrated pest management tour of International Paper - Clayton Lake area
	14	Annual fall landowners' meeting - Augusta
	16-17	Spray Technology Committee Meeting - Quebec City
	17	Wood Supply/Demand Advisory Committee - Augusta
	27-31	CANUSA Working Group Meeting - Buffalo, New York
November	6-7	Eastern Spruce Budworm Council meeting - Bangor
	14	U.S.F.S. Meeting concerning performance standards for 1981 - Portsmouth, New Hampshire
	17-19	Forest Pest Forum - Ottawa
	24	Carbaryl pre-hearing conference - Orono
December	2	Greenwoods Technology Transfer seminar - Bangor
	3-6	Board of Pesticides Control hearings on Sevin-4-Oil and Dylox - Presque Isle, Bangor, Portland
January	7	Environmental Monitoring Committee Meeting -

January	7-8	Eastern Spruce Budworm Research Work Conference - Orono
	9	Public Hearing on Draft Programmatic Environmental Impact Statement on the Proposed Cooperative Five Year Spruce Budworm Management Program - Orono
	21-22	Blaine House Conference on Forestry - Augusta
February	24-25	Northeast Forest Pest Work Conference - Bangor
	26	Spray aircraft contract pre-bid conference - Augusta
March	17	Meeting with Paper Industry Information Office (PIIO) on 1981 gate system
	17-18	Northeast Forest Pest Council Conference - Portland
	25	Spray aircraft contract bid opening - Augusta
	26	Evaluation of spray aircraft contract bid - Augusta
April	4	Final decision on spray aircraft bid - Augusta
	8-9	Eastern Spruce Budworm Council meeting -
	10	Demonstration of smoke generator mounted in aircraft - New York
	13-15	Spray Technology Committee meeting - Halifax, Nova Scotia
	17	Hearing in Superior Court on Globe Aviation lawsuit - Augusta
	29-30	
May	1	Budworm Airport Supervisors and Assistant Airport Supervisors training meeting - Bangor
	4	Budworm monitoring training
	13	Town meeting on 1981 operation - Jackman
	19	Assembly Day, helicopter operation - Millinocket
	21	Helicopter Group 3 started spraying
	21	Assembly Day - Presque Isle
	22	Helicopter Groups 1, 2, and 4 started spraying
	24	Spray blocks opened - Millinocket
	26	Assembly Day - Millinocket

	27	Spray blocks opened - Presque Isle
May	27-28	BPC tour - Millinocket, Presque Isle
	30	Spray blocks opened - Jackman
June	3	Spray blocks opened - Red Pine
	6	Spray blocks opened - Estcourt
	16	Project completed - Red Pine
	23-24	Internal spruce budworm operation critique - Bangor
August	13	External spruce budworm operation critique - Bangor

1981 SPRUCE BUDWORM SPRAY INFORMATION

SPRAY AREA: The Maine Forest Service will spray insecticides carbaryl (Sevin-4-Oil), acephate (Orthene) and Bacillus thuringiensis (Bt) from aircraft on approximately 1.1 million acres shown on the map on the reverse side. The black blocks are acephate spray areas (30,000 acres), crosshatched blocks will be sprayed with Bt (95,800 acres), and the white blocks will be sprayed with carbaryl (952,800 acres).

SPRAY TIMES: The exact time a location is sprayed depends upon the larval development of the budworm. Each location will be sprayed once or, in some instances twice. Spraying is scheduled to take place during the early morning and early evening hours between mid May and June 20th.

ENVIRONMENTAL REVIEW: All of the insecticides to be used in the 1981 spray project have been registered with the U.S. Environmental Protection Agency and by the Maine Commissioner of Agriculture. In addition, the Maine Board of Pesticides Control (BPC) has established guidelines for the application of carbaryl. The Maine Forest Service has met or surpassed the BPC guidelines in planning this year's project.

People who have health-related questions should consult a physician or call the Maine Poison Control Center, toll-free at 1-800-442-6305.

PRECAUTIONS: Campers, fishermen, hikers, woodworkers, farmers, and others who find themselves in an area being sprayed should take the following precautions:

Food & Utensils:

1. If you are preparing an outdoor meal when aircraft approach, wrap or place under cover all exposed food.
2. Try to get all pots, pans, dishes and other utensils under cover before the spray aircraft arrive. If unable to do so, wash in soap and water before use.

Clothing:

If clothing is sprayed, change as soon as possible. Wash sprayed clothing by usual methods.

Personal Hygiene:

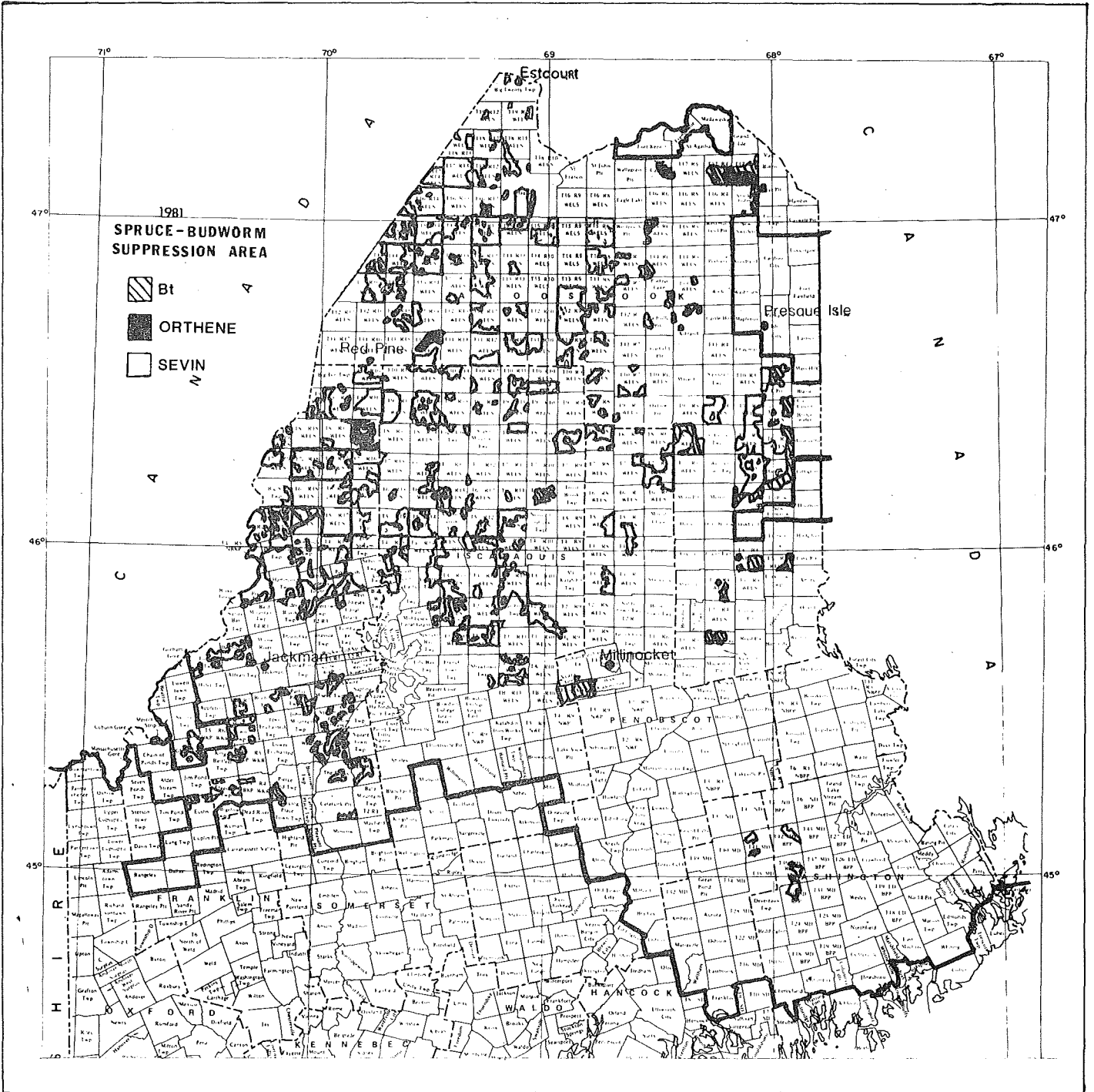
Persons sprayed by aircraft should wash exposed areas with soap and water as soon as possible.

BUFFER ZONES: Spraying will not take place within the buffer zones described below:

	Sevin- 4-Oil	Orthene	Bt
Permanent Habitation	½ mileS* 1 mileL*	½ mileS 1 mileL	¼ mile
Publicly Maintained Roads	2 miles**	2 miles**	500 ft.
Beehives	½ mile S 1 mile L	½ mile S ½ mile L	¼ mile
Organic Farms	½ mile S 1 mile L	½ mile S 1 mile L	½ mile
Eagle nests	½ mile	½ mile	½ mile
Blueberry Lands	½ mile S 1 mile L	½ mile S 1 mile L	none
Critical Fisheries	500 ft.S 1000 ft.L	250 ft.S 500 ft.L	none
Water bodies visible at 1000 ft.	250 ft.S 500 ft.L	150 ft.S 250 ft.L	none
Municipal/Commercial Water Intake	1 mile	1 mile	1 mile

*S = Small aircraft, L = Large aircraft.
**Operational guidelines established by the Maine Forest Service for 1981 precludes spraying of chemical insecticides within the settlement corridor. Title 12 MRSA §8407-A defines the settlement corridor as all land within 2 miles of publicly maintained roads.

FOR FURTHER INFORMATION: Contact Richard Dyer, Information & Education, Maine Forest Service, State House Station #22, Augusta, Maine 04333. You may call toll-free 1-800-452-4669 weekdays (between 9 a.m. and 5 p.m.) until May 15th or, after May 15th, 1-800-432-7848 daily between 3 a.m. and 10 p.m. until the conclusion of the spray project.



1981 SPRUCE BUDWORM

FACT SHEET

How may I obtain information about the spray project?

The Maine Forest Service has established a toll-free Spruce Budworm Suppression Project information telephone number. Call for budworm information at 1-800-452-4669 until May 15th between 9 a.m. and 5 p.m. weekdays. After May 15th and until the spray project is completed, information may be obtained by dialing 1-800-432-7848 from 3 a.m. to 10 p.m. daily.

How many acres are in high or extreme budworm hazard in 1981?

About 4.5 million acres of Maine's spruce-fir forest are in extreme or high hazard condition because of the budworm. The Maine Forest Service plans to treat approximately 952,800 acres of that area with the chemical insecticide carbaryl (Sevin-4-0il). Another chemical insecticide, acephate (Orthene), will be applied to an additional 30,000 acres. A biological insecticide, Bt will be applied to another 95,800 acres. The total acreage to be sprayed in 1981 is approximately 1.1 million acres.

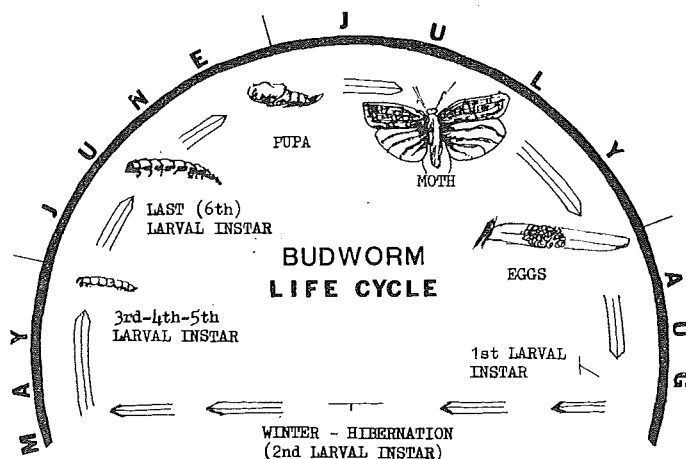
What are the objectives of the spray program?

The spray program is designed to prevent significant tree mortality in Maine's valuable spruce-fir forest, while management practices are being implemented which reduce the need for extensive spray application. Sprayed acreage has a mortality rate of only 0.3 cords per acre as opposed to 3.5 cords per acre for areas not treated with insecticides.

When will spraying begin?

Spraying operations are scheduled to commence around mid May and end by June 20th.

What is the life cycle of the budworm and the best time to spray?



By the time the larva molts to the third instar, the host tree buds are beginning to open and the insect mines into and kills many new buds. The third, fourth, and fifth instars are the best times to spray for tree protection.

Why isn't Bt used on all of the acreage?

Bt has produced erratic results in past spray projects. For this reason, this expensive insecticide is being used only where the chances of success are high. Previous projects have demonstrated that Bt is ineffective where budworm populations are high. Bt will not be used in these areas in 1981. The Maine Forest Service will continue to apply Bt in an effort to improve its effectiveness against budworm.

Where are the project airbases?

Five airports have been established in the following locations: Presque Isle, Millinocket, Red Pine, Jackman and Escourt. Heliport locations will vary and are not known at this time.

How are project guidelines established?

The Maine Forest Service will supervise the Spruce Budworm Project in accordance with guidelines set by the U.S. Environmental Protection Agency and the Maine Board of Pesticide Control. Policies and procedures, in effect and developed by the Maine Forest Service, meet or surpass the established guidelines.

In addition, the following environmental studies will be conducted: (1) Carbaryl residue studies in pond sediments, the mouths of rivers, and amphipods. (2) Studies on the effects of carbaryl and acephate on reproduction and feeding habits of birds. (3) A study on the effects of unsprayed headwaters. (4) Studies on the effects of Bt on caddisfly populations. (5) A study of pollinator mortality and its effect on fruitset reduction in the forest. (6) A literature review on carbaryl in the spruce-fir ecosystem.

What aircraft will be used?

Forest management and site specific spray block design has resulted in smaller spray blocks in 1981. As a result more smaller aircraft can be used and, 70% of the insecticide will be applied by small aircraft this year.

What forest management techniques are being used to reduce the need to spray?

Balsam fir is the major host of the budworm; spruce is less susceptible. For this reason, most forest management activity focuses on the reduction of the fir component of spruce-fir stands. In fact, a recent survey showed that 100% of 1981 landowner harvesting operations are being conducted according to plans designed to reduce the forest susceptibility to budworm attack.

To obtain more information you may call the toll-free number listed earlier or write:

Richard Dyer
Information & Education
Department of Conservation
State House Station # 22
Augusta, Maine 04333



MICHAEL R. PETIT
COMMISSIONER

Appendix E
E-1
STATE OF MAINE
DEPARTMENT OF HUMAN SERVICES
AUGUSTA, MAINE 04333

Dear Physician:

This letter is to inform practicing physicians and hospital medical staffs of the upcoming Spruce Budworm Spray Project and the medical aspects of the insecticides involved.

This year, due to a continued spruce budworm infestation, the Maine Forest Service of the Department of Conservation will once again conduct a spray suppression program on an estimated 1.1 million acres in northern Maine. The project is scheduled to occur between mid-May and June 20th.

The Maine Forest Service plans to use 3 insecticides during the 1981 project, Sevin-4-Oil, Orthene, and Bacillus thuringiensis (Dipel 4L and Thuricide 16B). Sevin will be applied to approximately 950,000 acres, Orthene to 30,000 acres, and Bt on the remaining 96,000 acres.

Sevin (carbaryl), the prime chemical-of-choice for the majority of the acreage for the past 7 years, is a cholinesterase enzyme inhibitor of the carbamate class and is considered only slightly toxic from the standpoint of oral and dermal exposure. The Forest Service will use the material so as to meet or exceed guidelines for its use established by the Maine Board of Pesticide Control. For this reason, Sevin will be sprayed only in those areas where access to the woods can be monitored. Buffers, as described on the attached sheet, will be observed.

Sevin will be applied at a rate of three quarters of a pound active ingredient in 30 ounces of fluid per acre. This low rate of application, coupled with both the buffer zones and the pesticide's low persistence in nature, minimizes the possibility of acute hazard. Studies carried out by the U.S. Environmental Protection Agency during the 1978 and 1979 projects showed exposure to the general population living in or near the treated forest to be extremely small.

Orthene, as an organophosphate, is also a cholinesterase enzyme inhibitor and also considered only slightly toxic from the standpoint of oral and dermal exposure. The pesticide will arrive in Maine in dry form in 50 pound fiber drums and will be stored under security supervision until it is distributed to the contractor for mixing and application at a dose rate of $\frac{1}{2}$ pound Orthene per acre.

Bacillus thuringiensis (Bt), a bacterial insecticide, is considered non-toxic to humans and for this reason requires no special precautions in its mixing, handling, and application.

Disciplined contract crews will mix and load all three pesticides under the supervision of Bureau of Forestry personnel. Contract aircraft companies will apply the insecticides using various size planes and helicopters. Crews will be required to use equipment to protect themselves from exposure during times when such exposure might pose a health hazard.

In the case that you observe any cases of unexplained symptoms or illnesses, please contact Dr. Frank Lawrence, Poison Control Center, Maine Medical Center at 1-800-442-6305.

Some symptoms that you might expect to see from toxic exposure of Sevin and Orthene are: headache, giddiness, nervousness, blurred vision, weakness, nausea, cramps, diarrhea and discomfort in the chest.

Signs include: sweating, miosis, tearing, salivation and other excessive respiratory tract secretions, vomiting, cyanosis, eye reddening, uncontrollable muscle twitchings, convulsions, coma, loss of reflexes and loss of sphincter control. The last four signs are seen only in advanced cases but do not preclude a favorable outcome if energetic treatment is provided.

A 7-10 cc heparinized blood sample can determine cholinesterase levels. The pesticide laboratory of the Maine Public Health Lab performs this analysis. A urine specimen can also be used for specialized testing for pesticides residue.

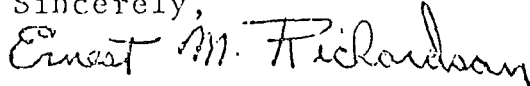
Treatment for carbamate poisoning, including Sevin, differs from recommended treatment of poisoning from organophosphates such as Orthene in that Atropine Sulfate is the only antidote to be used for carbamates. Protopam Chloride (2-Pam) is not recommended for carbamate poisoning as it is ineffective and in some cases contraindicated. It is also not needed since the cholinesterase inhibition characteristics of carbamates are readily reversible upon cessation of exposure. Protopam Chloride is recommended for organophosphate poisoning and should be used only if someone becomes affected by an organophosphate such as Orthene. If one of our health officers is not present with a patient, I would urge that you be extremely positive that the patient was exposed only to an organophosphate before using Protopam Chloride.

Symptoms of mild exposure mimic those of many other maladies. Physicians are encouraged to verify their suspicions of poisoning by taking blood or urine specimens for analysis by the laboratory facilities of the State Public Health Laboratory prior to a positive diagnosis. In the past such diagnostic procedures have proven that cases of suspected poisoning were, in fact, not verifiable using standardized laboratory techniques wholly capable of detecting exposure.

In my dual capacity as public health pesticide chemist and health and safety officer assigned to the project, I will be supervising the handling of pesticides at all airport facilities during the project. I would appreciate it if you would pass the health information on to your staff and post it in the Emergency Room.

The Forest Service provides information about the spray program by in-state toll free telephone, 1-800-452-4669 weekdays, 9:00 am to 5:00 pm until May 15th. After May 15th and up to completion of the project, dial 1-800-432-7848 3:00 am to 10:00 pm daily. Health related questions are referred to the Maine Poison Control Center's toll free number 1-800-442-6305.

Please feel free to contact me if there are any questions.

Sincerely,

Ernest M. Richardson
Pesticide Chemist
Public Health Laboratory
Project Health & Safety Officer

EMR/jl

attachment

FEB 26 1981

CARBARYLApplication Guidelines;
Maine Spruce Budworm Suppression Program1. Definitions

A. Application Site. Application site means the geographic area where a pest problem has been identified, pest control measures are intended, and a pesticide is released to effect control of the identified pest.

B. Buffer Zone. Buffer zone means an area not intended to receive spray application, but within which it is anticipated that some spray drift fallout may occur.

C. Sensitive Area. Sensitive area means a designated nontarget site upon which there should be no pesticide application and which should be separated from an application site by a buffer zone. Such areas include, but are not limited to:

1. Permanent residences, schools, churches;
2. Domestic apiaries;
3. Publicly-maintained roads;
4. Aquatic habitats, such as critical fisheries;
5. Municipal water supply intakes;
6. Rivers, streams, ponds, lakes and ephemeral streams and ponds with flowing or standing water visible from an aircraft flying at an altitude of one thousand (1,000) feet above the terrain at the time of the treatment.

2. Aircraft, Equipment and Operational Standards

A. Aircraft application speed, effective swath width, nozzle type and orientation, boom pressure and spray release height should be in conformity with the standards established in Table I. In the alternative, the aircraft application speed, effective swath width, nozzle type and orientation, boom pressure and spray release height should be calibrated to produce a volume median droplet diameter (VMD) of 150 microns.

1. Aircraft types other than those listed in Table I may be used.
2. If aircraft types other than those listed are used, the operational

standards adhered to should be those prescribed for the aircraft which is most similar in size.

B. Wind speed at time of application, as determined at tree top level, should not exceed ten (10) miles per hour. Application should not be made during a temperature inversion.

C. No aircraft carrying pesticides should leave the ground unless its crew has established proper radio frequency with ground dispatch and, as applicable, assigned scout, guide and monitor aircraft, and otherwise tested the radio communications and found them in working order.

D. If, during flight, any aircraft carrying pesticides has any difficulty establishing or maintaining radio communications with its scout, guide or Maine Forest Service (MFS) monitor, it should immediately cease spraying and return to the ground until communications problems are corrected.

E. There should be a daily inspection of each spray aircraft which should include visual inspection of boom and nozzle apparatus. After every flight, there should be visual inspection of boom and nozzle apparatus to ascertain that nozzles close properly when spray is shut off.

F. In the event any in-flight malfunctions of the shut-off valves or nozzles occur, the spray plane should return to base whenever the monitor provided by the MFS determines that less spray will be deposited in water bodies, areas of human habitation, or other non-target areas by returning to base than by continuing with the spray flight. Whenever informed that a nozzle is leaking, the spray plane should, to the fullest extent possible, avoid turning over water bodies or inhabited areas. When returning to base with spray, the plane should do so avoiding insofar as possible areas of human habitation, water bodies, and other sensitive areas, even if the pump is off. Repairs should be made to any malfunctioning nozzle or shut-off valve before the next flight of that spray plane.

3. Buffer Zones

A. Buffer zones outlined for carbaryl in Table 2 should be strictly adhered to.

B. Carbaryl should be sprayed only in areas where:

1. Public access is monitored by the land owner through existing check points on private roads and on other major access roads, where persons may be informed of the spray program, and other access roads are clearly posted;
2. A buffer zone encompassing all land within 2 miles of a permanent human habitation within the statutory settlement corridor (12 MRSA §8407-A) provides protection for permanent human habitation.

C. All spray blocks involving the application of carbaryl should be pre-flown by at least the monitor and spotter. All spray flights should be conducted only in the presence of an observing spotter and monitor in a plane in adequate radio communication with the spray plane(s).

4. Training

The contractor or MFS should conduct a training program of at least three (3) hours to inform all contractors and MFS personnel of label restrictions, health hazards, dangers and precautions related to carbaryl, and the applicable law and guidelines governing the Maine Spruce Budworm Suppression Program. In addition, spotters and monitors should receive field training and experience designed to simulate actual application conditions and situations.

5. Residue Limits

Carbaryl should be applied in a manner which will reduce the likelihood that in buffered waterways, waterways visible from one thousand (1,000) feet in altitude, and waters outside the application site, samples collected from riffle areas contain in excess of 0.03 parts per million of carbaryl. In addition, carbaryl residues on cultivated food crops outside the application site should not exceed federal food crop tolerance standards at the time of consumption.

TABLE I
 AIRCRAFT, EQUIPMENT AND OPERATIONAL GUIDELINES
 MAINE SPRUCE BUDWORM SUPPRESSION PROGRAM

A. Aircraft Type	Maximum Application Speed	Effective Swath Width (ft) ^{1/}		Nozzle Type ^{2/}	Boom ^{3/} Pressure	Maximum Spray Release Above Canopy
		Oil	Water			
<u>ROTARY WING</u>						
Bell 47	60	100	70	8002	40 psig	50 ft.
Bell 205, 212	100	250	200	8006	40 psig	50 ft.
Bell 206B	80	120	100	8003	40 psig	50 ft.
<u>FIXED WING</u>						
Agcat, Thrush	100	125	100	8004	40 psig	50 ft.
Turbo Thrush	150	200	100	8008	40 psig	75 ft.
TBM	165	250	200	8008	40 psig	100 ft.
PV-2	175	400	300	8008	40 psig	100 ft.
DC-4	180	550	400	8015	40 psig	150 ft.
B-17	155	500	350	8010	40 psig	150 ft.
L-749	210	600	500	8015	40 psig	150 ft.

^{1/} Calculated with zero cross winds, aircraft flying into the wind, for oil-based and water-based sprays. Effective crosswinds swath width calculations in a 10 mph cross wind are approximately 2.2 x greater than the figures listed above.

^{2/} Nozzles will be oriented 90 degrees with respect to the line of flight for oil and water based sprays.

^{3/} An allowance of no more than twenty-five percent (25%) or an increase or decrease of 10 psig in nozzle pressure is acceptable when calculating the operational spray boom pressure.

Aircraft Types	Traditional Widths (ft.)	F-5		Contract ^{2/}	
		Effective ^{1/} Widths (ft.)		Widths (ft.)	
		Oil	H ₂ O	Oil	H ₂ O
Bell 47	100 - 150	100	70	150	110
Bell 205/212	150 - 200	250	200	400	300
Bell 206B	----	120	100	200	150
Ag Cat/Thrush	300 - 400	125	100	300	150
Turbo Thrush	----	200	100	300	200
TBM .	400	250	200	400	300
PV-2	600	400	300	600	400
DC-4	1,200	550	400	1,200	600
B-17	800	500	350	800	
L-749	1,500	600	500	1,500	

1/ Calculated with zero cross winds, aircraft flying into the wind.

2/ Expected swath widths when spraying with a cross wind no less than 2 mph.

TABLE 2
 BUFFER ZONES

Light Aircraft (helicopters and LSU Thrush)

Large Aircraft (TBM, PV-2, DC-4, L-749 & B-17)

Sensitive Area

Carbaryl

Carbaryl

TERRESTRIAL:

Permanent human habitation

1/2 mi.

1 mi.

Publicly-maintained roads

500 ft.

500 ft.

Apiaries

1/2 mi.

1 mi.

AQUATIC:

Critical fisheries

500 ft.

1,000 ft.

Other waters

250 ft.

500 ft.

Municipal water
 supplies and intakes

1 mi.

1 mile

Other waters - This term includes rivers, streams, ponds, lakes and ephemeral streams and ponds with flowing or standing water visible from an aircraft flying at an altitude of one thousand feet above the terrain at the time of treatment.

Publicly-maintained roads - This term applies to any roads which are maintained with public funds.