

**H B**

**574**

# HOUSE COMMITTEE REPORT

(9)

Date Referred: February 28, 1990

FURTHER REFERRALS:

FINANCE

Date of Committee Action: 3/12/90

The RESOURCES Committee considered:

HB 574

HOUSE BILL NO. 574

APPROP: KENAI PENINSULA FIRE HAZARD

"An Act making special appropriations to the Department of Natural Resources to build certain fire breaks and to take other action to control the fire hazard on the Kenai Peninsula created by the bark beetle infestation; and providing for an effective date."

**RECOMMENDATIONS:**

- be replaced with \_\_\_\_\_  the same title
- have attached amendment(s)  a new title
- do pass
- do not pass
- no recommendation
- individual recommendations
- additional referral to the \_\_\_\_\_ Committee

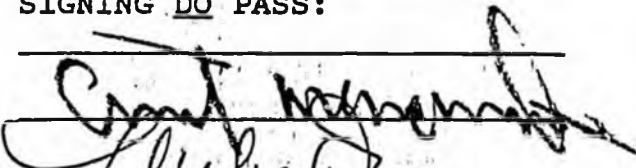
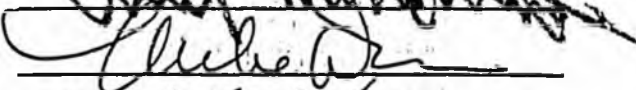
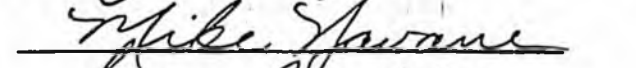
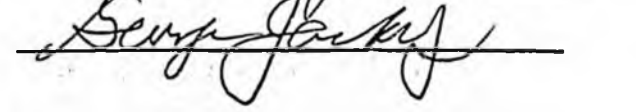
ADOPTS: \_\_\_\_\_ letter of intent

ATTACHES NEW FISCAL NOTE(S): \_\_\_\_\_ APPROVES PREVIOUS: \_\_\_\_\_ (Date/Dept)

(Dept)

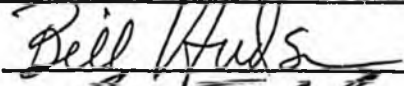
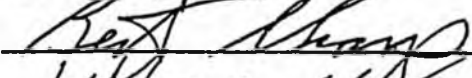
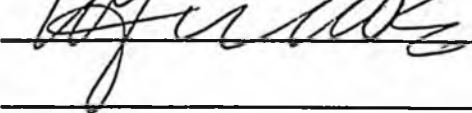
- fiscal impact DNR-FOREST MANAGEMENT  fiscal note(s) \_\_\_\_\_
- zero fiscal note \_\_\_\_\_  zero fiscal note(s) \_\_\_\_\_
- zero with analysis \_\_\_\_\_  zero fn/analysis \_\_\_\_\_

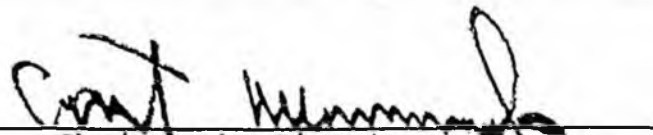
**SIGNING DO PASS:**

\_\_\_\_\_  
  
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**SIGNING:**

(Check approp. column)

	Do Not Pass	No Rec	Amend
		<input checked="" type="checkbox"/>	
		<input checked="" type="checkbox"/>	
		<input checked="" type="checkbox"/>	

  
 \_\_\_\_\_  
 Chairman's Signature

STATE OF ALASKA  
1990 LEGISLATIVE SESSION

BILL VERSION : HB 574  
PUBLISH DATE : \_\_\_\_\_

FISCAL NOTE

REQUEST:

Revision Date: 14-Mar-90 Agency Affected: Natural Resources  
 Title: Special Appropriation to build fire breaks and  
central fire hazzard on the Kenai Peninsula. BRU: Forest Management  
 Sponsor: Resource Committe Components: Forest Management  
 Requestor: House Resources

EXPENDITURES/REVENUES: (Thousands of Dollars)

OPERATING	FY 91	FY 92	FY 93	FY 94	FY 95	FY 96
PERSONAL SERVICES	202.9					
TRAVEL	8.0					
CONTRACTUAL	748.0					
SUPPLIES	29.1					
EQUIPMENT	12.0					
LAND&STRUCTURES						
GRANTS,CLAIMS						
MISCELLANEOUS						
TOTAL OPERATING	1,000.0	0.0	0.0	0.0	0.0	0.0

CAPITAL						
---------	--	--	--	--	--	--

REVENUE	55.0					
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FUNDING: (Thousands of Dollars)

GENERAL FUND	1,000.0					
FEDERAL FUNDS						
OTHER						
TOTAL	1,000.0	0.0	0.0	0.0	0.0	0.0

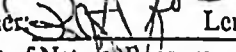
POSITIONS:

FULL-TIME						
PART-TIME						
TEMPORARY	4.0					

ANALYSIS: (Attach a separate page if necessary)

See Attached

Prepared by: George K. Hollett Phone: 762-2503  
 Division: Forest Management Date: 14-Mar-90

Approved by Commissioner:  Lennie Gorsuch Date: 14-Mar-90  
 Agency: Department of Natural Resources

Distribution (by preparer) :  
 Legislative Finance  
 Legislative Sponsor  
 Requestor  
 Office of Management and Budget  
 Impacted Agency(ies)

COOPER LANDING SPRUCE BEETLE PROJECT  
ALASKA DIVISION OF FORESTRY  
MARCH 7, 1990

Outline of Project Proposal

Over the years, the Kenai Peninsula has been impacted time and time again by spruce beetle (*Dendroctonus rufipennis*, kby). Approximately 538,000 acres has been infested from the late 60's through '75. Presently, the area of primary concern is the area from Kenai Lake to Skilak Lake along the Kenai River corridor and northward towards Hope. Within this area, an estimated 130,000 acres of spruce trees have been killed or infested. Due to the extensive amounts of beetle killed trees surrounding the community of Cooper Landing, this area has been given first priority for attention.

The State of Alaska owns approximately 6,400 acres in the Cooper Landing area. The lands have been selected by the Kenai Peninsula Borough under the Municipal Entitlement Act. Transfer of these lands to the Borough are still pending. Approximately 2,000 acres have been infested. The Division of Forestry has identified the following priorities:

1. Protect life and property from wildland fire;
2. Reduce the fuel loading adjacent to private lands;
3. Salvage usable forest products from the beetle killed forest and create employment opportunities;
4. Put the forest back into productivity as quickly as possible.

To achieve these objectives, the Division has embarked on the following course of action. Presently, the Division has seven active or completed salvage sales in the Cooper Landing Area. Additional salvage areas are currently being prepared. These actions are being completed under existing budget dollars.

The Division has requested an additional \$700,000 to be appropriated by the Legislature to help meet the above objectives. With these additional dollars, the Division proposes to develop two fuelbreaks of approximately 500 feet in width and 4,000 feet in length (92 acres). A containment line to mineral soil will be developed within these fuelbreaks. One is proposed east of Cooper Creek and will utilize the old Cooper Creek dam road as the containment line and the other is proposed west of Shackelford Creek and will require construction of a containment line. Within the fuelbreaks, all dead and infested spruce will be removed. The hardwoods and hemlocks will be left untouched. The harvested trees will be tree length yarded to landings where they will be limbed and topped, cut to log length and decked. The slash will be disposed of by burning. The fuelbreaks will be regenerated to primarily hardwoods. Estimated cost of the fuelbreaks is \$117.1.

The Division is also proposing to reduce fuel loading in areas immediately adjacent to private land by the creation of fuel reduction areas. The fuel reduction areas total 656 acres. These areas will be treated similarly to the

## Cooper Landing Spruce Beetle Project

fuelbreaks but will not include containment lines. Some of this area is currently under salvage contracts, but additional treatment and regeneration of areas is necessary to reduce the potential of fire spread. These areas are located within 1/2 mile of private lands and do not have any vegetative buffers between the treatment area and private lands. Estimated cost of the fuel reduction areas is \$477.4.

The areas outside of the fuelbreaks and fuel reduction areas are called vegetative management areas. Stands and pockets of beetle killed trees will be salvaged as part of the Division's normal budget process.

The Division also wants to remove the hazard trees on State land along the Sterling Highway. The field work is completed, but dollars are needed to contract the removal. The estimated cost of the project is \$25.0.

To administer these various contracts, the Division is proposing to hire a temporary position at the Forest Tech IV level for the life of the contracts. The Division also proposes to upgrade our radio system into Cooper Landing to allow better coordination on initial attack fires. At the present time, our initial attack vehicles do not have communications with our dispatch office by radio. Costs for this position plus administrative support dollars for the project are estimated to be \$80.5

The purpose of this project is to rapidly develop two fuelbreaks in the vicinity of Cooper Landing and to reduce fuel loading on areas adjacent to private lands in an effort to diminish the potential for loss of life or property from wildfire. This project is also designed to return the forest back into productivity by reforesting the treated areas with primarily hardwoods to reduce the potential of fire spread. Due to the seasonal time constraints of portions of this project proposal, the funds should be allocated as a capital improvement project (CIP). That portion of this project that may extend into the fall of 1991 is the regeneration and possibly slash burning. Some of the costs allocated are for one and seed collection which will be undertaken in the fall of 1990. Approximately 110,000 seedlings will need to be ordered and would be old enough to outplant in the fall of 1991. To get a jump on the grass competition, we will want to scarify just prior to seeding and planting. This means scarification will be conducted in the late summer and early fall of 1991. Some of the ash and debris piles will need to be burned in the late fall of 91.

### Project Cost Summary:

Fuelbreak(s)	\$ 117.1
Fuel Reduction Areas	477.4
Hazard Trees	25.0
State Administration	\$ 80.5
	<u>\$ 700.0</u>

Cooper Creek Fuelbreak

Project size: 500 feet by 4,000 feet (46 acres)

Current conditions: 85% of the spruce is dead. Stand structure is roughly 2/3 spruce and 1/3 hemlock.

Special concerns: This bench has a very thin soil depth overlaid by alluvial deposits of silty sand.

Project Proposal:

1. Open up old Cooper Creek dam road and put to bed after completion of use.  
Cost \$6.0.
2. Remove all dead spruce 7" DBH and larger. Tree length yard, limb and top at landings and deck merchantable material. Burn slash and unmerchantable material at landings. Work to be completed by vendor service contract.  
Cost: \$41.8 (\$160/MBF @ 5 MBF/ac - total 46 acres) (plus \$5.0 slash burning)
3. Mechanically pile ground fuel accumulations during winter months with dozer and brush blade. Vendor service contract on approximately 35 acres.  
Cost: \$1.9 (\$50/acre + mobilization costs)
4. State crew to burn mechanically piled slash.  
Cost: \$0.2
5. Regeneration of fuelbreak with birch by direct seeding. Some interplanting with spruce. Seed collection, handtool site prep and direct seeding to be accomplished by vendor service contract.  
Cost: \$7.3 (\$150/acre and cone/seed collection and seedling cost)

Project Totals:

Open Road	\$ 6.0
Removal	41.8
Piling	1.9
Burning	.2
Regeneration	7.3
Total	\$ 57.2

000 feet (46 acres)  
ately spruce forest with approximately 90% of the  
ead.

visible from the Sterling Highway while  
a Bridge.  
stable soils capable of mass movement.

18 and larger. Two vendor services  
oped. One will address the lower sidehill  
ch may require unconventional harvest  
tract will be the more stable uplands, and  
y conventional means. Logs will be decked  
cations. Slash to be burned at landings.  
6 MBF/ac - Total 46 acres) (plus \$5.0 for  
plus containment line construction)  
by dozer with a brush blade of 50% of the  
leted by vendor service contract.  
obilization, etc.)  
reak will be completed by one vendor  
: provisions differing the sidehill area  
project. The sidehill will involve hand  
plant spruce seedlings and to direct seed  
stabilize slopes. The upper area will be  
and hand planted with spruce.  
seed collection and seedling cost)

\$ 49.7  
2.4  
7.8  
\$ 59.9

## Bean Creek Fuel Reduction Area

Project Size: 200 acres

Current Condition: 95% dead spruce in a homogenous stand.

### Special Concerns:

1. The Bean Creek recreation trail transect area.
2. Removal of spruce product on Bean Creek road will negatively impact residents. This road is not satisfactorily built for heavy truck traffic.

### Project Proposal

1. Develop a new access forest road along the DOT&PF "preferred alternative" for realignment of the Sterling Highway.  
Cost: \$40.0
2. Log all dead spruce 7" DBH and larger by vendor service contract. Deck product along access route. Slash dead under 7" DBH size.  
Cost: \$128.0 (\$160/MBF) (4 MBF/ac)
3. Mechanically scarify 50% of the fuel reduction area with dozer and brush blade by vendor service contract. This will effectively break ground fuel continuity while at the same time establishing regeneration planting sites.  
Cost: \$14.0 (\$70/ac)
4. Regular State crew to develop prescribed burn plan to fire berm piles resulting from the scarification phase. Vendor service contract burning of the piles.  
Cost: \$6.0
5. Relocate 1 1/2 miles of the Bean Creek recreation trail and develop trail head parking area. This will put the trail completely on State land compared to its current trespass through private property and the trail head parking on subdivision roads.  
Costs: \$28.0
6. Regeneration of the fuel reduction area is planned to be in hardwoods-paperbirch. Vendor service contract to collect seed and distribute on site by a direct seeding method. Seed drying and cleaning to be completed by State nursery.  
Cost: \$12.0

### Project Totals:

Access Development	\$ 40.0
Dozer Work	14.0
Trail Relocation	28.0
Burning	6.0
Site Regeneration	12.0
Total	\$ 227.0

West Shackleford Fuel Reduction Area

Project size: 139 Acres (Snug Harbor)  
+ 204 Acres (Cooper Creek)  
+ 42 Acres (Shackleford Creek II)  
+ 14 Acres (Bridgeview)  
+ 17 Acres (Firebreak)  
+ 50 Acres (Old Buffers)  
Total 466 Acres

Current Conditions: 90% of the spruce stand is dead.

Special Concerns:

1. Existing timber salvage contracts on 385 acres. Snug Harbor sale totaling 139 acres will need special attention to work out a program with existing contractor.

Project Proposal:

1. Remove all dead spruce 7" DBH and larger on 81 acres by vendor service contract. Slash dead under 7" DBH in size. Deck logs at designated access points. Burn slash at landings as part of ongoing process.  
Cost: \$64.8 (\$160/M&F @ 5MBF/ac)
2. A total of 385 acres will be harvested under salvage contracts. Approximately 343 acres will need to have all dead trees under 10" DBH removed or slashed. To be completed by vendor service contract.  
Cost: \$60.0 (\$175/ac)
3. Mechanically scarify 50% of 281 acres with a dozer and brush blade by vendor service contract.  
Cost: \$19.7 (\$70/ac)
4. Burn slash piles and berm piles from scarification by vendor service contract.  
Cost: \$5.0
5. Regeneration of the fuel reduction area is planned to be primarily in hardwoods (birch and alder - alder on unstable soils). Some interplanting of spruce seedlings is planned. Scarified sites will be direct seeded with hardwood seed. Vendor service contract to collect seed and distribute on site. Seed drying and cleaning will be completed by the State Nursery.  
Costs: \$100.9 (collect and seed \$12.0-145 acres) (Interplant of spruce-200 acres @ \$220/ac-\$44.0) (Hand seed and hand seed bed prep-186 acres @ \$125/ac=\$23.1) (Cost of seedlings 436/ac @ \$.25/ea-\$21.8)

Project Totals:

Removal	\$	64.8
Slash		60.0
Scarify		19.7
Burning		5.0
Regeneration		100.9
Total	\$	250.4

HAZARD TREES REMOVAL-COOPER LANDING

The Division of Forestry has marked approximately 600 hazard trees located along the Sterling Highway in the Cooper Landing area. The trees marked have the potential to fall onto the road surface of the highway. The trees are located between milepost 46.0 -46.8 and milepost 49.5 - 50.2. Removal of the trees will be necessary to reduce the hazard to the passing motorist and disposal of the slash from the tree removal will be necessary to reduce the fire potential. Intermittent closure of the Sterling Highway will be necessary for public safety reasons. The estimated cost to remove these trees from state land is \$25.0.

State Administrative Costs

Forest Technician IV (new)	\$ 37.2
This position will assist in propagation, supervise, and administer contracts, evaluate field results, and complete project reports.	
Travel	2.0
Contractual	25.0
(Vehicle lease, advertisements, printing, professional contract preparation assistant, photoprocessing, phone charges, postage, vehicle maintenance, seedling shipping cost, etc.)	
Commodities	\$ <u>16.3</u>
(Gas, film, paper, communications, office supplies, paint, ribbon, tags, minor tools and equipment.)	
Total	\$ 80.5

Position Title Forest Technician IV		No. of Positions 1	Range/Step 13/A	Barg. Unit GG
Time Status T	Staff Months 12	Location Sotodolls		Electoral District
Type of Expenditure		Annual		
1		2	3	
Salary* 2205 x 12		26,460	////////////////////	
Benefits* 891 x 12		10,692	////////////////////	
Premium Pay (Included in Above)			////////////////////	
Other			////////////////////	
Total Personal Services			37.2	
Travel			2.0	
Contractual			25.0	
Commodities			20.0	
Equipment				
Other				
Total Cost			84.2	
Funding Source for Total Cost				
Federal Receipts	1002			
G.F. Hatch	1003			
General Fund	1004		84.2	
Program Receipts/GF	1005			
I-A Receipts	1007			
CIP Receipts	1061			
Other				
* Personal Services Salary and Benefits Costs are from PACS.				

**Justification**  
This position will administer the various contracts that will be developed to handle the hazard reduction of the Cooper Landing Spruce Beetle Project.

Contracts will be developed and issued to do the following:

1. Remove hazard trees on state land along Sterling Highway.
2. Construct the Cooper Creek fuelbreak.
3. Construct the Shackleford Creek fuelbreak.
4. Fuel reduction in the Bran Creek area.
5. Fuel reduction in the west Shackleford area.

This position will be the contract administrator and the responsible person to see the fuel hazard reduction is accomplished.

REQUEST FOR  
NEW POSITION

AGENCY Natural Resources  
BRU Forest Management  
COMPONENT Forest Management

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Revised Date

FY 91

EVALUATION OF SPRUCE BEETLE ALTERNATIVES ON THE KENAI PENINSULA  
ALASKA DIVISION OF FORESTRY  
March 9, 1990

Outline of Project Proposal

The Division of Forestry has submitted an appropriation request to the legislature to fund an evaluation of alternatives to deal with spruce beetle (*Dendroctonus rufipennis*, kby.) infestations on the Kenai Peninsula. The three areas of highest priority for evaluation of beetle infestations on State lands on the Peninsula are Moose Pass, Kalgin Island, and Bear Cove. These areas will be prioritized for evaluation and field review will be undertaken to assess forest conditions and beetle population levels. The evaluation process will include interagency activities, landowner interface and public involvement. A summary document will be prepared listing areas of concern by priority, alternatives for action, a preferred alternative, a funding estimate to implement the preferred alternative and a decision document.

Minimum staffing to manage and complete the actions outlined in this project proposal are outlined below. The new positions are temporary and will only last until June 30, 1991, which is the projected completion date of this project.

Natural Resource Manager I (new)

52.5  
~~55.0~~

This position will be the project leader. The employee will lead field crews in the collection of field data; will coordinate agency, landowner and public involvement; will develop and evaluate alternatives; will prepare cost estimates of alternatives; and will prepare decision documents for line officer approval.

Clerk-Typist III (new)

29.4  
~~30.0~~

This position will provide clerical support to the project including formulating newsletters, maintaining mailing lists, typing documents and correspondence, recording minutes of meetings, serving as receptionist for the group, etc.

Information Officer I (new)

39.3  
~~45.0~~

Design public participation program and implement that program. Ensure compliance with public meeting regulations. Identify opportunities for better keeping the general public informed of the merging issues as well as steps being undertaken to effect control. Set results of annual aerial surveys out to everyone. Design other publications and brochures as needed.

Forest Tech III (extension - 8mm)

\$25.6

Forest Tech II (extension - 8mm)

\$20.9

Extend present seasonal technicians to gather data and preliminary map preparation; verification of ownerships, classifications and infestation levels. These positions would also gather stand data to allow determination of treatment alternatives.



Position Title Natural Resource Manager I		No. of Positions 1	Range/Step 18/A	Barg. Unit GO
Time Status T	Staff Months 12	Location Anchorage		Election District 7
Type of Expenditure		Justification		
1	2	3		
Salary* 3114 x 12	37,356	//////////		
Benefits* 1099 x 12	13,188	//////////		
Vacation Pay (Included in Above)	//////////	//////////		
Other	//////////	//////////		
Total Personal Services	//////////	50.5		
Travel		3.0		
Contractual		53.5		
Commodities		3.0		
Equipment		5.0		
Other				
Total Cost		115.0		
Funding Source for Total Cost				
Federal Receipts	1002			
G.F. Match	1003			
General Fund	1004	115.0		
Program Receipts/GF	1095			
I-A Receipts	1007			
CIP Receipts	1061			
Other				
* Personal Services Salary and Benefits Costs are from PACS.				

This position will be the project manager in development and evaluation of alternatives to deal with spruce beetle infestations on the Kenai Peninsula. Duties of the position will include:

1. Leading of field crews in collection of field data.
2. Coordinate agency, landowner and public involvement.
3. Develop and evaluate alternatives.
4. Prepare cost estimates of alternatives.

This position will provide overall project management and direction. Getting the job done on time and within budget are direct responsibilities of this position.

REQUEST FOR  
NEW POSITION

AGENCY Natural Resources  
 BUI Forest Management  
 COMPONENT Forest Management

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 Revised Date

FY 91

Position Title Clerk Typist III		No. of Positions 1	Range/Step 8/A	Barg. Unit GG
File Status T	Staff Months 12	Location Anchorage		Election District 7
Type of Expenditure		Justification		
1	2	3		
Salary* 1678 x 12	20,136	////////////////////		
Benefits* 771 x 12	9,252	////////////////////		
Premium Pay (included in above)	////////////////////	////////////////////		
Other	////////////////////	////////////////////		
Total Personal Services	////////////////////	29.4		
Travel				
Contractual				
Commodities		6.8		
Equipment				
Other				
Total Cost		36.2		
Funding Source for Total Cost				
Federal Receipts	1002			
G.F. Hatch	1003			
General Fund	1004	36.2		
Program Receipts/GF	1005			
I-A Receipts	1007			
CIP Receipts	1061			
Other				
* Personal Services Salary and Benefits Costs are from PACS.				

This position will provide clerical support for the Kenai Peninsula Spruce Hard Bistle project. Duties will include receptionist, recording minutes at public meetings, typing documents and correspondence, developing newsletters, maintaining mailing list and mailing of newsletters and notices to the public.

REQUEST FOR  
NEW POSITION

AGENCY Natural Resources  
 DRU Forest Management  
 COMPONENT Forest Management

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 Revised late

FY 91

Position Title Information Officer I		No. of Positions 1	Range/Step 14/A	Barg. Unit GO																																																												
Time Status T	Staff Months 12	Location Anchorage		Election District 5																																																												
Type of Expenditure		Justification																																																														
		This position will design the public participation program dealing with spruce beetle alteration on the Kenai Peninsula. The public is a major player in which alternative is accepted and must be involved in its development.																																																														
<table border="1"> <thead> <tr> <th>Type of Expenditure</th> <th>1</th> <th>2</th> <th>Account</th> <th>3</th> </tr> </thead> <tbody> <tr> <td>Salary* 2353 x 12</td> <td></td> <td>28,836</td> <td>////////////////////</td> <td></td> </tr> <tr> <td>Benefits* 026 x 12</td> <td></td> <td>11,100</td> <td>////////////////////</td> <td></td> </tr> <tr> <td>Freight Pay (Included in Above)</td> <td></td> <td>////////////////////</td> <td>////////////////////</td> <td></td> </tr> <tr> <td>Other</td> <td></td> <td>////////////////////</td> <td>////////////////////</td> <td></td> </tr> <tr> <td>Total Personal Services</td> <td></td> <td>////////////////////</td> <td></td> <td>39.3</td> </tr> <tr> <td>Travel</td> <td></td> <td></td> <td></td> <td>3.0</td> </tr> <tr> <td>Contractual</td> <td></td> <td></td> <td></td> <td>50.0</td> </tr> <tr> <td>Commodities</td> <td></td> <td></td> <td></td> <td>3.0</td> </tr> <tr> <td>Equipment</td> <td></td> <td></td> <td></td> <td>7.0</td> </tr> <tr> <td>Other</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Total Cost</td> <td></td> <td></td> <td></td> <td>102.3</td> </tr> </tbody> </table>		Type of Expenditure	1	2	Account	3	Salary* 2353 x 12		28,836	////////////////////		Benefits* 026 x 12		11,100	////////////////////		Freight Pay (Included in Above)		////////////////////	////////////////////		Other		////////////////////	////////////////////		Total Personal Services		////////////////////		39.3	Travel				3.0	Contractual				50.0	Commodities				3.0	Equipment				7.0	Other					Total Cost				102.3	<p>Duties of this position will include the following:</p> <ol style="list-style-type: none"> <li>1. Implement the public participation program.</li> <li>2. Ensure compliance with public meeting regulations.</li> <li>3. Ensure the public is informed of issues and what steps are underway for beetle control.</li> <li>4. Conduct any necessary surveys and get the results out to the public.</li> <li>5. Develop and have printed brochures and any other publications.</li> </ol>		
Type of Expenditure	1	2	Account	3																																																												
Salary* 2353 x 12		28,836	////////////////////																																																													
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* Personal Services Salary and Benefits Costs are from PACS.																																																																

REQUEST FOR  
NEW POSITION

AGENCY Natural Resources  
 BRU Forest Management  
 COMPONENT Forest Management

Page 1 of 1  
 Revised Date

FY 91

ALASKA DIVISION OF FORESTRY  
 COOPER LANDING AREA-PROGRAM RECEIPTS  
 MARCH 13, 1990

The following is an estimate of the program receipts or salvage operations in the spruce beetle killed stands in the Cooper Landing Vicinity.

1. Proposed Operations Under Service Contract Within the Proposed fuelbreaks and Fuel Reduction Areas

<u>Activity</u>	<u>Acres</u>	<u>Est. Volume</u>	<u>Est. Value</u>	<u>Total Value</u>
Fuelbreaks	92	920 Cords	\$25/Cord	\$23,000.00
Buan Creek	200	300 Cords	\$25/Cord	7,500.00
Bridgeview	10	93 Cords	\$25/Cord	2,325.00
Fuelbreak	22	240 Cords	\$25/Cord	6,000.00
Old Buffers	50	500 Cords	\$25/Cord	12,500.00
			Total	\$51,325.00

2. Operations Proposed or Existing Under Timber Sale Contract Within Fuel Reduction Areas

<u>Activity</u>	<u>Acres</u>	<u>Est. Volume</u>	<u>Est. Value</u>	<u>Total Value</u>
		70 MBF	\$22.75/MBF	
*Snug Harbor	130	563 Cords	\$ 1.00/Cord	\$ 2,155.50
*Shackleford Creek	42	42 Cords	\$ 1.00/Cord	450.00
Cooper Creek	204	2,618 Cords	\$ 1.00/Cord	2,618.00
Total (Less \$1,522.50 for Scarification on Portions of Snug Harbor)				\$ 3,701.00
			Grand Total of #1 and #2	\$55,026.00

\*Active Sales previously sold.

STATEMENT OF  
DUANE HARP  
DISTRICT RANGER, SEWARD DISTRICT  
CHUGACH NATIONAL FOREST, USDA FOREST SERVICE

Before the  
Joint House and Senate Resources Committee  
Alaska Legislature

Concerning  
*Beetle Infestation on the Kenai Peninsula.*

March 12, 1990

**MR. CHAIRMAN AND MEMBERS OF THE COMMITTEE:**

As Dr. Holsten has pointed out, the Kenai Peninsula has been infested with an epidemic of spruce bark beetle over the past 10 years. In particular, the Cooper Landing area has been severely affected.

In 1986, the Forest Service initiated plans to deal with the beetle epidemic. Based on an environmental assessment completed in July 1987, a decision was made to 1) reduce the spread of the infestation by thinning green stands of spruce trees susceptible to beetle attack, 2) to salvage harvest timber where feasible and 3) to reduce the threat of fire to the Cooper Landing area by harvesting dead and dying trees and by constructing fuelbreaks around trailheads and campgrounds. That decision was appealed, and consequently, harvest was limited to dead trees in areas posing only the highest fire threat to Cooper Landing.

The threat of wildfire to the Cooper Landing area is very real. The Kenai Peninsula has a history of large wildfires including a burn of over 350,000 acres in 1947, the 10,000 acre Kenai Lake Burn of 1959, and in 1969, the 86,000 acre Swanson River Burn and the 2,600 acre Russian River Burn. Each of these fires was man caused. Each summer we experience fire starts in the Cooper Landing area. To date, weather and wind conditions have allowed us to suppress the fires before they became large.

Since the 1987 decision, the beetle infestation has increased in intensity. Currently, in the Cooper Landing area, some 27,000 acres of spruce on National Forest System lands are affected. Estimates of tree mortality range from 65 to 95 percent of all spruce 5 inches in diameter and larger. Of the total affected acreage, only 950 acres are currently scheduled for harvest; and to date, less than 100 acres have actually been logged. The Forest Service continues to reduce hazardous fuels in and around heavily used areas such as campgrounds and trailheads.

Over the past three years, the U.S. Forest Service, the State Division of Forestry, and the residents of Cooper Landing have become increasingly concerned about the potential for a catastrophic wildfire in the Cooper Landing area. Trees which have been dead for five years or more are now starting to fall, creating large concentrations of dry fuels on the forest floor. These concentrations increase both the severity of a fire and the difficulty of suppressing one. If no additional fuel reduction work is done, we can expect such hazardous fuel conditions to exist for 20 to 40 years.

In response to these concerns, in June 1989, the Forest Service, State Division of Forestry, U.S. Fish and Wildlife Service, and the Kenai Peninsula Borough strengthened plans for responding to a wildfire in the Cooper Landing area.

Last August, the Chugach National Forest began planning to deal with the present situation. In October, I initiated an environmental assessment process to examine alternatives to meet two primary objectives on National Forest System lands: 1) to reduce the risk of a catastrophic wildfire in the Cooper Landing area to an acceptable level; and 2) to restore forest health by re-establishing a vigorous and diverse forest. A working group consisting of Cooper Landing area residents, representatives of the local timber industry, the

environmental community, the Kenai Borough Economic Development District, the Department of Fish and Game, and the Division of Parks, was formed to participate in the planning process. The State Division of Forestry, the U.S. Fish and Wildlife Service, and the Kenai Peninsula Borough are also key in integrating and coordinating our efforts with their own plans.

The working group recommended a concentrated effort in three areas: 1) reduce fire hazards around residences and on private property, 2) construct fuelbreaks in strategic locations, and 3) reduce large concentrations of dead fuel. Public forums to discuss these actions are scheduled this week in Soldotna, Anchorage, and Cooper Landing.

The deadline for a decision based on the environmental assessment is June 29, 1990. However, it has become apparent that the situation is too urgent to wait and that some action is needed before the 1990 fire season. As a result, the Forest Service plans to construct two major fuelbreaks and several smaller fuelbreaks in critical areas. In addition, we will increase our fire suppression forces and fire prevention efforts. The Forest Service and State Division of Forestry will also conduct a workshop for Cooper Landing residents on how to make homes fire resistant.

I must stress that the fuelbreaks are only a small part of the solution to the problem. The 200 to 500 foot wide breaks will provide lines of defense for fighting wildfires. To adequately lower the risk of wildfire hazardous fuels must be reduced over a large area. The forest health and vigor must also be restored so that bark beetle infestations will not reach epidemic proportions in the future. The environmental assessment scheduled for completion in late June will assist me in making that decision for the National Forest System lands in the Cooper Landing area.

It is also crucial that actions be implemented on State of Alaska lands. The Division of Forestry has been working closely with us in developing coordinated strategic plans to deal with the spruce bark beetle epidemic and associated wildfire problem. I urge the Committee to give full support to the Department of Natural Resources efforts to work with the Forest Service on this important issue.

EVALUATION OF SPRUCE BEETLE ALTERNATIVES ON THE KENAI PENINSULA  
ALASKA DIVISION OF FORESTRY  
March 9, 1990

Outline of Project Proposal

The Division of Forestry has submitted an appropriation request to the legislature to fund an evaluation of alternatives to deal with spruce beetle (*Dendroctonus rufipennis*, kby.) infestations on the Kenai Peninsula. The three areas of highest priority for evaluation of beetle infestations on State lands on the Peninsula are Moose Pass, Kalgin Island, and Bear Cove. These areas will be prioritized for evaluation and field review will be undertaken to assess forest conditions and beetle population levels. The evaluation process will include interagency activities, landowner interface and public involvement. A summary document will be prepared listing areas of concern by priority, alternatives for action, a preferred alternative, a funding estimate to implement the preferred alternative and a decision document.

Minimum staffing to manage and complete the actions outlined in this project proposal are outlined below. The new positions are temporary and will only last until June 30, 1991, which is the projected completion date of this project.

Natural Resource Manager I (new)	\$51.0
This position will be the project leader. The employee will lead field crews in the collection of field data; will coordinate agency, landowner and public involvement; will develop and evaluate alternatives; will prepare cost estimates of alternatives; and will prepare decision documents for line officer approval.	
Clerk-Typist II (new)	\$30.0
This position will provide clerical support to the project including formulating newsletters, maintaining mailing lists, typing documents and correspondence, recording minutes of meetings, serving as receptionist for the group, etc.	
Information Officer I (new)	\$45.0
Design public participation program and implement that program. Ensure compliance with public meeting regulations. Identify opportunities for better keeping the general public informed of the merging issues as well as steps being undertaken to effect control. Get results of annual aerial surveys out to everyone. Design other publications and brochures as needed.	
Forest Tech III (extension - 8mm)	\$25.6
Forest Tech II (extension - 8mm)	\$20.9
Extend present seasonal technicians to gather data and do preliminary map preparation; verification of ownerships, classifications and infestation levels. These positions would also gather stand data to allow determination of treatment alternatives.	

Required start-up cost increment for this initiative:

Personal Services (new positions)	\$126.0
(extensions of seasonals)	\$ 46.5
Travel	6.0
Contractual (phones, utilities, copies, brochures, professional services)	103.5
(Advertisements, printing, helicopter/aircraft flights Vehicle lease and operating costs)	
Commodities	6.0
Equipment (computer, printer, peripherals)	7.0
(Desks, chairs, bookcases, etc.)	5.0
<b>TOTAL START-UP INVESTMENT</b>	<b>\$300.0</b>

For additional information, contact Jim Peterson, the Kenai-Kodiak Area Forester and Project Manager at:

Alaska Division of Forestry  
Kenai-Kodiak Area  
HC 1, Box 107  
Soldotna, AK 99669  
(907) 262-4124

COOPER LANDING SPRUCE BEETLE PROJECT  
ALASKA DIVISION OF FORESTRY  
MARCH 7, 1990

Outline of Project Proposal

Over the years, the Kenai Peninsula has been impacted time and time again by spruce beetle (*Dendroctonus rufipennis*, kby). Approximately 538,000 acres has been infested from the late 60's through '75. Presently, the area of primary concern is the area from Kenai Lake to Skilak Lake along the Kenai River corridor and northward towards Hope. Within this area, an estimated 130,000 acres of spruce trees have been killed or infested. Due to the extensive amounts of beetle killed trees surrounding the community of Cooper Landing, this area has been given first priority for attention.

The State of Alaska owns approximately 6,400 acres in the Cooper Landing area. The lands have been selected by the Kenai Peninsula Borough under the Municipal Entitlement Act. Transfer of these lands to the Borough are still pending. Approximately 2,000 acres have been infested. The Division of Forestry has identified the following priorities:

1. Protect life and property from wildland fire;
2. Reduce the fuel loading adjacent to private lands;
3. Salvage usable forest products from the beetle killed forest and create employment opportunities;
4. Put the forest back into productivity as quickly as possible.

To achieve these objectives, the Division has embarked on the following course of action. Presently, the Division has seven active or completed salvage sales in the Cooper Landing Area. Additional salvage areas are currently being prepared. These actions are being completed under existing budget dollars.

The Division has requested an additional \$700,000 to be appropriated by the Legislature to help meet the above objectives. With these additional dollars, the Division proposes to develop two fuelbreaks of approximately 500 feet in width and 4,000 feet in length (92 acres). A containment line to mineral soil will be developed within these fuelbreaks. One is proposed east of Cooper Creek and will utilize the old Cooper Creek dam road as the containment line and the other is proposed west of Shackelford Creek and will require construction of a containment line. Within the fuelbreaks, all dead and infested spruce will be removed. The hardwoods and hemlocks will be left untouched. The harvested trees will be tree length yarded to landings where they will be limbed and topped, cut to log length and decked. The slash will be disposed of by burning. The fuelbreaks will be regenerated to primarily hardwoods. Estimated cost of the fuelbreaks is \$117.1.

The Division is also proposing to reduce fuel loading in areas immediately adjacent to private land by the creation of fuel reduction areas. The fuel reduction areas total 666 acres. These areas will be treated similarly to the

## Cooper Landing Spruce Beetle Project

fuelbreaks but will not include containment lines. Some of this area is currently under salvage contracts, but additional treatment and regeneration of areas is necessary to reduce the potential of fire spread. These areas are located within 1/2 mile of private lands and do not have any vegetative buffers between the treatment area and private lands. Estimated cost of the fuel reduction areas is \$477.4.

In order for both the fuel breaks and the fuel reduction areas to be effective over the next several years, some form of grass control will be necessary.

The areas outside of the fuelbreaks and fuel reduction areas are called vegetative management areas. Stands and pockets of beetle killed trees will be salvaged as part of the Division's normal sale program. Regeneration of these sites will be part of the Division's normal budget process.

The Division also wants to remove the hazard trees on State land along the Sterling Highway. The field work is completed, but dollars are needed to contract the removal. The estimated cost of the project is \$25.0.

To administer these various contracts, the Division is proposing to hire a temporary position at the Forest Tech IV level for the life of the contracts. The Division also proposes to upgrade our radio system into Cooper Landing to allow better coordination on initial attack fires. At the present time, our initial attack vehicles do not have communications with our dispatch office by radio. Costs for this position plus administrative support dollars for the project are estimated to be \$88.0.

Due to the seasonal time constraints of portions of this project proposal, the funds should be allocated as a capital improvement project (CIP). The scarification and tree planting cannot be completed until fall of 1991.

### Project Cost Summary:

Fuelbreak(s)	\$ 117.1
Fuel Reduction Areas	477.4
Hazard Trees	25.0
State Administration	88.0
	<u>\$ 707.5</u>

For additional information, contact Jim Peterson, the Kenai-Kodiak Area Forester and Project Manager at:

Alaska Division of Forestry  
Kenai-Kodiak Area  
HC 1, Box 107  
Soldotna, AK 99669  
(907) 262-4124

### Cooper Creek Fuelbreak

Project size: 500 feet by 4,000 feet (46 acres)

Current conditions: 85% of the spruce is dead. Stand structure is roughly  
2/3 spruce and 1/3 hemlock.

Special concerns: This bench has a very thin soil depth overlaid by alluvial deposits of silty sand.

#### Project Proposal:

1. Open up old Cooper Creek dam road and put to bed after completion of use.  
Cost \$6.0.
2. Remove all dead spruce 7" DBH and larger. Tree length yard, limb and top at landings and deck merchantable material. Burn slash and unmerchantable material at landings. Work to be completed by vendor service contract.  
Cost: \$41.8 (\$160/MBF @ 5 MBF/ac - total 46 acres) (plus \$5.0 slash burning)
3. Mechanically pile ground fuel accumulations during winter months with dozer and brush blade. Vendor service contract on approximately 35 acres.  
Cost: \$1.9 (\$50/acre + mobilization costs)
4. State crew to burn mechanically piled slash.  
Cost: \$0.2
5. Regeneration of fuelbreak with birch by direct seeding. Some interplanting with spruce. Seed collection, handtool site prep and direct seeding to be accomplished by vendor service contract.  
Cost: \$7.3 (\$150/acre and cone/seed collection and seedling cost)

#### Project Totals:

Open Road	\$ 6.0
Removal	41.8
Piling	1.9
Burning	.2
Regeneration	7.3
Total	\$ <u>57.2</u>

Shackleford Creek Firebreak

Project size: 500 feet by 4,000 feet (46 acres)

Current Conditions: Predominately spruce forest with approximately 90% of the spruce dead.

Special Concerns:

1. Project will be highly visible from the Sterling Highway while crossing the Kenai River Bridge.
2. Lower sidehill is on unstable soils capable of mass movement.

Project Proposal:

1. Remove dead spruce 7" DBH and larger. Two vendor service contracts will be developed. One will address the lower sidehill with unstable slopes which may require unconventional harvest systems. The second contract will be the more stable uplands and they will be harvested by conventional means. Logs will be decked at various accessible locations. Slash to be burned at landings.  
Cost: \$49.7 (\$160/MBF @ 6 MBF/ac - Total 46 acres) (plus \$5.0 for slash disposal) (plus containment line construction)
2. Mechanical scarification by dozer with a brush blade of 50% of the upland area. To be completed by vendor service contract.  
Cost: \$2.4 (\$70/ac and mobilization, etc.)
3. Regeneration of the fuelbreak will be completed by one vendor contract with distinctive provisions differing the sidehill area from the balance of the project. The sidehill will involve hand preparation of sites to plant spruce seedlings and to direct seed with birch and alder to stabilize slopes. The upper area will be direct seeded with birch and hand planted with spruce.  
Cost: \$7.8 (\$150/ac and seed collection and seedling cost)

Project Totals:

Removal	\$ 49.7
Scarification	2.4
Regeneration	7.8
Total	\$ 59.9

## Bean Creek Fuel Reduction Area

Project Size: 200 acres

Current Condition: 95% dead spruce in a homogenous stand.

### Special Concerns:

1. The Bean Creek recreation trail transects area.
2. Removal of spruce product on Bean Creek road will negatively impact residents. This road is not satisfactorily built for heavy truck traffic.

### Project Proposal

1. Develop a new access forest road along the DOT&PF "preferred alternative" for realignment of the Sterling Highway.  
Cost: \$40.0
2. Log all dead spruce 7" DBH and larger by vendor service contract. Deck product along access route. Drop all dead spruce under 7" DBH size.  
Cost: \$128.0 (\$160/MBF) (4 MBF/ac)
3. Mechanically scarify 50% of the fuel reduction area with dozer and brush blade by vendor service contract. This will effectively break ground fuel continuity while at the same time establishing regeneration planting sites.  
Cost: \$14.0 (\$70/ac)
4. Regular State crew to develop prescribed burn plan to fire berm piles resulting from the scarification phase. Vendor service contract burning of the piles.  
Cost: \$5.0
5. Relocate 1 1/2 miles of the Bean Creek recreation trail and develop trailhead parking area. This will put the trail completely on State land compared to its current trespass through private property and the trail head parking on subdivision roads.  
Costs: \$28.0
6. Regeneration of the fuel reduction area is planned to be in hardwoods-paperbirch. Vendor service contract to collect seed and distribute on site by a direct seeding method. Seed drying and cleaning to be completed by State nursery.  
Cost: \$12.0

### Project Totals:

Access Development	\$ 40.0
Dozer Work	14.0
Trail Relocation	28.0
Burning	5.0
Site Regeneration	12.0
Total	\$ 227.0

West Shackleford Fuel Reduction Area

Project size: 139 Acres (Snug Harbor)  
+ 204 Acres (Cooper Creek)  
+ 42 Acres (Shackleford Creek II)  
+ 14 Acres (Bridgeview)  
+ 17 Acres (Firebreak)  
+ 50 Acres (Old Buffers)  
Total 466 Acres

Current Conditions: 90% of the spruce stand is dead.

Special Concerns:

1. Existing timber salvage contracts on 385 acres. Snug Harbor sale totaling 139 acres will need special attention to work out a program with existing contractor.

Project Proposal:

1. Remove all dead spruce 7" DBH and larger on 81 acres by vendor service contract. Drop all dead spruce under 7" DBH in size. Deck logs at designated access points. Burn slash & landings as part of ongoing process.  
Cost: \$64.8 (\$160/MRF @ 5MBF/ac)
2. A total of 385 acres will be harvested under salvage contracts. Approximately 343 acres will need to have all dead trees under 10" DBH removed or slashed. To be completed by vendor service contract.  
Cost: \$60.0 (\$175/ac)
3. Mechanically scarify 50% of 281 acres with a dozer and brush blade by vendor service contract.  
Cost: \$19.7 (\$70/ac)
4. Burn slash piles and berm piles from scarification by vendor service contract.  
Cost: \$5.0
5. Regeneration of the fuel reduction area is planned to be primarily in hardwoods (birch and alder - alder on unstable soils). some interplanting of spruce seedlings is planned. Scarified sites will be direct seeded with hardwood seed. Vendor service contract to collect seed and distribute on site. Seed drying and cleaning will be completed by the State Nursery.  
Costs: \$100.9 (collect and seed \$12.0-145 acres) (Interplant of spruce-200 acres @ \$220/ac-\$44.0) (Hand seed and hand seed bed prep-185 acres @ \$125/ac=\$23.1) (Cost of seedlings 436/ac @ \$.25/ea-\$21.8)

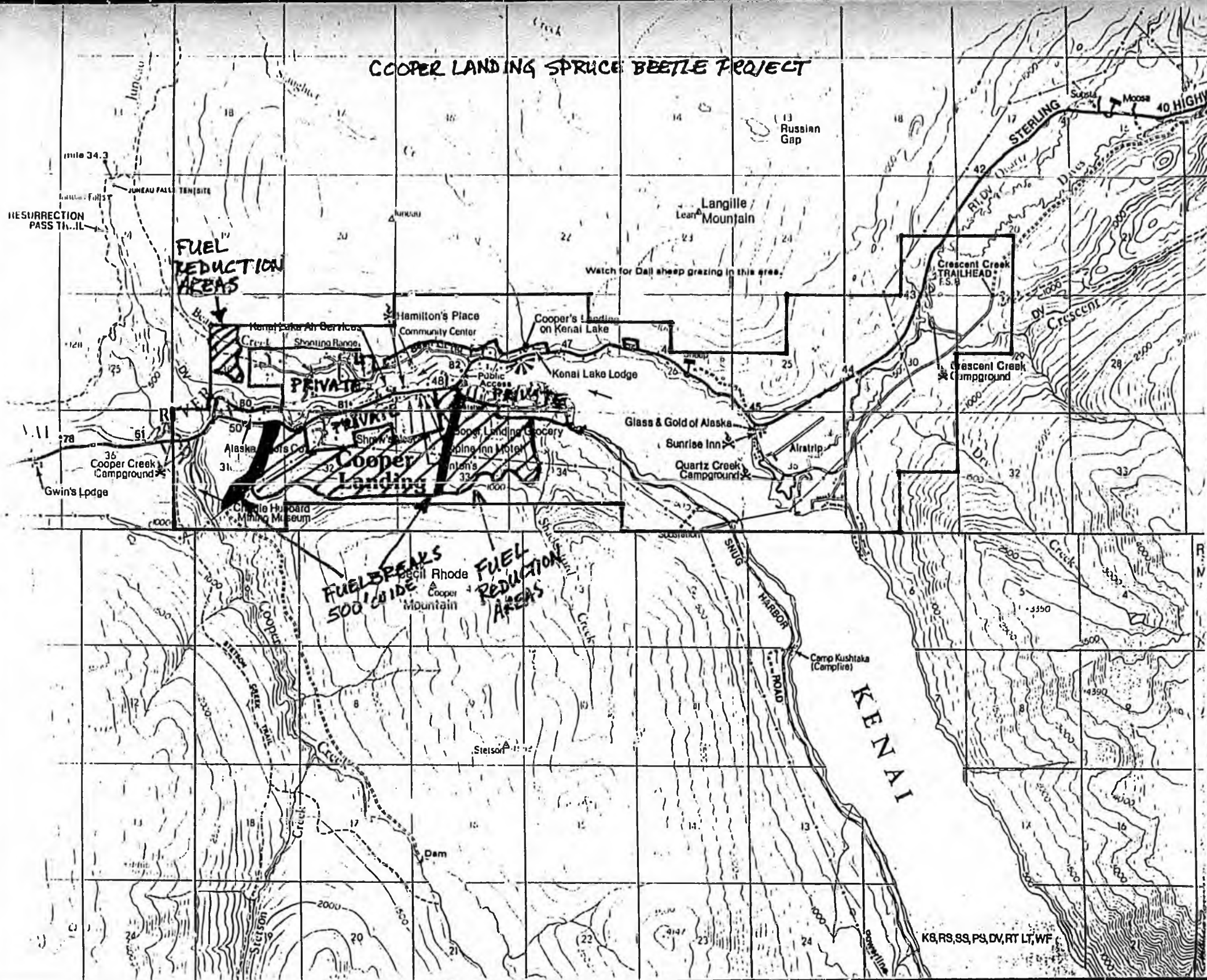
Project Totals:

Removal	\$	64.8
Slash		60.0
Scarify		19.7
Burning		5.0
Regeneration		100.9
Total	\$	<u>250.4</u>

State Administration Costs

Forest Technician IV (New)	\$ 41.0
This position will assist in propagation, supervise, and administer contracts, evaluate field results, and complete project reports.	
Travel	2.0
Contractual	25.0
(Vehicle lease, advertisements, printing, professional contract preparation assistance, photoprocessing, phone charges, postage, vehicle maintenance, seedling shipping cost, etc.)	
Commodities	8.0
(Gas, film, paper, office supplies, paint, ribbon, tags, minor tools and equipment.)	
Equipment	<u>12.0</u>
(Communications, repeater equipment, etc.)	
Total	\$ 88.0

# COOPER LANDING SPRUCE BEETLE PROJECT



K9,RS,SS,PS,DV,RT,LT,WF



United States  
Department of  
Agriculture

Forest Service

Alaska  
Region



# Forest Pest Management Report

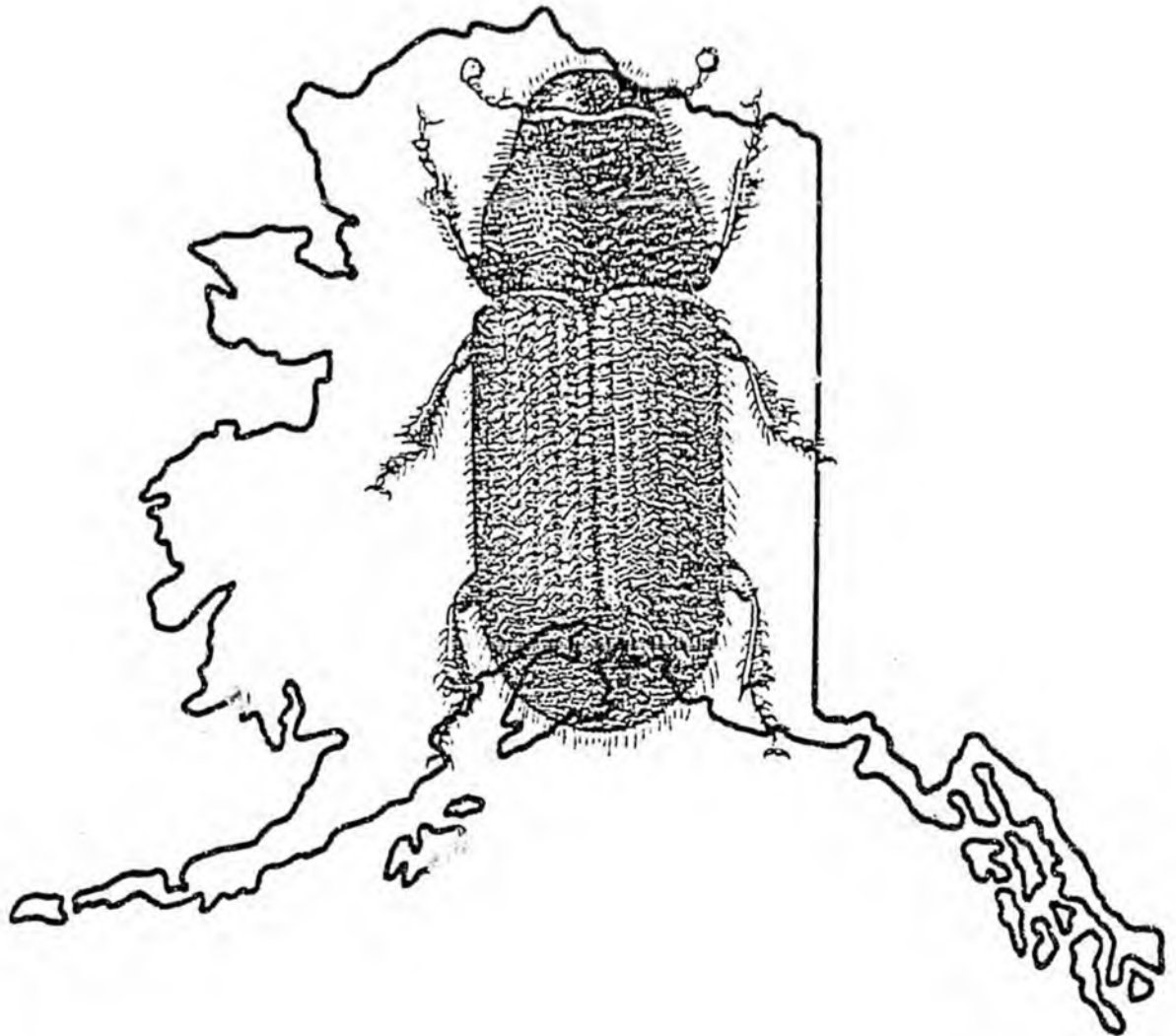
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Technical Report: R10-90-18

Spruce Beetle Activity in Alaska: 1920-1989

February 1990

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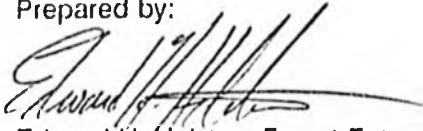


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TECHNICAL REPORT R10-90-18  
SPRUCE BEETLE ACTIVITY  
IN ALASKA  
1920-1989

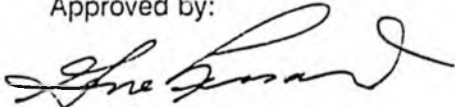
FEBRUARY 1990

Prepared by:

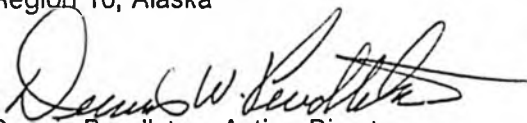


Edward H. Holsten, Forest Entomologist  
Forest Pest Management  
Region 10, Alaska

Approved by:



Gene Lessard, Group Leader  
Forest Pest Management  
Region 10, Alaska



Dennis Pendleton, Acting Director  
State & Private Forestry  
Region 10, Alaska

Forest Pest Management  
State & Private Forestry  
201 E. 9th Ave., Suite 201  
Anchorage, Alaska 99501

## SPRUCE BEETLE ACTIVITY IN ALASKA, 1920-1989

The most destructive forest insect in Alaska is the spruce bark beetle, *Dendroctonus rufipennis* (Kirby). This insect has killed mature spruce on hundreds of thousands of acres of Alaska's forested lands (Werner et al. 1977). All species of Alaska spruce are susceptible to beetle attack, but black spruce (*Picea mariana*) is rarely attacked.

The occurrence of spruce bark beetle outbreaks and their related impacts have been a common feature of Alaska's forested landscape for decades in south-central Alaska. Statements such as: "It is estimated that in this area at least 60 percent of the spruce is already dead or dying. In a few years green spruce will be hard to obtain, and travel will be more difficult by windfalls resulting from the rotting of the roots of the dead trees. The danger of forest fires will also be increased;" were common in Alaska decades ago (Capps and Tuck 1935).

An on-going infestation of the spruce bark beetle in the Cooper Landing area of the Kenai Peninsula has resulted in public outcry concerning the impact(s) on forest resources resulting from the death of millions of spruce trees. Newspaper articles covering the pro's and con's of spruce beetle outbreaks, impacts, proposed suppression, etc. abound. Statements such as "\_\_\_ an epidemic of spruce bark beetles has swept the Kenai Peninsula, outrunning government efforts to stop its spread around the headwaters of the Kenai River. Officials say the dying forests now pose a fire hazard in the populated canyon \_\_\_\_." (Anch. Daily News, Oct. 25, 1989) have been common in the press recently. We can expect an increase in public awareness of spruce beetle infestations as many of Alaska's spruce forests become more susceptible through the effects of aging, fire suppression, and the lack of management.

Most spruce beetle infestations have, and will continue to occur in the Lutz (*P. X lutzii*) and white spruce (*P. glauca*) stands of south-central Alaska where weather conditions appear to be more favorable for increases in populations of spruce beetles. Outbreaks have been uncommon in the Sitka spruce (*P. sitchensis*) forests of maritime Alaska (Werner et al. 1977). However, results of a recent study (Holsten and Werner 1990) have demonstrated that host suitability may be as important as host susceptibility and weather conditions in the development of spruce beetle outbreaks in Alaska. In terms of progeny production, white spruce as a host produces more beetles than Lutz spruce which is more productive than Sitka spruce. Cold winter temperatures and thrifty fast growing stands have probably helped maintain spruce beetles at endemic levels in interior Alaska. When these factors are ameliorated however, spruce beetle populations can increase rapidly to outbreak levels: a condition which became apparent along the Yukon River in the last five years. Further massive outbreaks can be expected in interior Alaska, especially in forests bordering the major drainages such as the Yukon and the Kuskowkim. In the absence of fire and management, these forests are becoming more susceptible to spruce beetle outbreaks.

Forest pest outbreaks in the United States appear to have increased both in frequency and severity during the last twenty years and Alaska is no exception as spruce beetle outbreaks have increased in severity and occurrence. These pest outbreaks are apparently a symptom of an overall decline in the health of the Nation's forests (USDA For. Serv. 1989). This is not an irreversible trend. Action can and must be implemented on our more important forested lands. Achieving a desired level of productivity, whether productivity is timber, recreation, wildlife or some mix of these resources, generally requires that forest vegetation be alive and healthy. Silvicultural changes are the most important and long lasting, cost effective actions to reduce forest pest impact on the condition of the forest (USDA For. Serv. 1989). On those lands where economics and other societal values allow treatment, emphasis must be placed on achieving long-term improvements. We must avoid practices that promote short-term outputs but are detrimental to the forest health. Such practices can have a negative impact on long-term productivity. There is an urgent need for research studies which

delineate the effects (impacts) of bark beetle infestations on such non-timber forest resources as recreation, wildlife and fisheries, and stream flow.

An interesting finding from this review of Alaska spruce beetle infestations is that many areas have been repeatedly infested over the years: Eklutna-1950's&1980's; Tilikakila River 1950's&1980's, Resurrection Creek-1957&1977, Skwentna River-1930's&1989, Willow Creek-1930's&1980's; Tustumena Lake 1950's&1980's; and most of the northern portion of the Kenai National Wildlife Refuge, to name a few. The general result of the early infestations was a reduction in the size of the residual stems because the majority (up to 90%) of all stems greater than 6" in dbh were killed by spruce beetles. Type conversion did not occur in many areas because there were plenty of small spruce remaining (Beckwith and Curtis 1972). It appears that these stands of small spruce became over-stocked and less thrifty with age and again became susceptible to spruce beetle outbreaks. Many of the repeatedly infested areas are undergoing a type conversion as little or no natural spruce regeneration is present. In order to bring these sites back into spruce, some site preparation such as brought about by fire or logging must be undertaken followed by planting. Type conversion has also occurred in mixed hardwood/spruce stands that have been infested. For example, the severe spruce beetle infestation near Tyonek in the 1970's resulted in 65% mortality of all spruce over 5" dbh. Birch became the dominant species in the residual stand (Baker and Kemperman 1974).

The following summaries present a brief, but complete overview of all documented spruce bark beetle infestations in Alaska presented by year and general location. Outbreaks are grouped into three geographic areas: (1) Interior Alaska -- those forested areas north of the Alaska Range; (2) South-central Alaska which encompasses the Kenai Peninsula and other forested areas south of the Alaska Range excluding the Sitka spruce forests which are placed in the (3) Maritime Region which includes the forests of southeast Alaska, Prince William Sound, and portions of Cook Inlet. Factors contributing to the genesis of a spruce bark beetle outbreak, location of the outbreak, acreage infested, and impact(s) of the outbreak are discussed if available from the literature. A brief discussion of spruce beetle biology, tree hosts, population dynamics, and impacts, etc. is presented in Appendix A. A summary of all outbreaks by geographic location is presented in Table 1 at the end of this report. The bibliography concluding this report lists, by year, the majority of Alaska reports, publications, etc. pertaining to the spruce bark beetle.

## SUMMARIES BY YEAR AND LOCATION

### 1920-1930

**SOUTH-CENTRAL:** The first recorded Alaska spruce beetle outbreak occurred in white spruce stands along the Copper River drainage between Chitina and McCarthy. The outbreak started in the early 1920's and by the mid-1920's covered more than 200,000 acres (Moffit 1922). The cause of the outbreak is not known but may have been related to drought and logging activities associated with the Kennecott Copper development (Fig. 1a).

### 1931-1940

**SOUTH-CENTRAL:** USGS geological survey parties described wide-spread white spruce mortality northwest of Anchorage (Capps 1935, Capps and Tuck 1935). Large spruce beetle outbreaks occurred in the late 1920's to the early 1930's along the Skwentna and Susitna Rivers and in the Willow Creek/Kashwitna area during the early 1930's (Fig. 1b).

**MARITIME:** A large spruce bark beetle outbreak infested more than 100,000 acres of Afognak Island's Sitka spruce forests in the 1930's (Williams 1933). The outbreak was over by the mid-1940's (Furniss 1948). Areas most heavily impacted included Blue Fox Bay, along Kupreanof Strait, and Whale Island. A 1933 timber inventory estimated that 23% of the spruce had been killed with mortality amounting to 149,679,000 board feet (bf) over 107,776 acres (Williams 1933). The cause of the outbreak is not known (Fig. 2a).

### 1941-1950

**SOUTH-CENTRAL:** Scattered mortality of white spruce was noted in 1950 in trees bordering the Kenai Burn of 1947 (Furniss 1950). Spruce beetles had attacked and bred in fire scorched trees then moved into nearby green trees (Fig. 1b).

Spruce beetle activity was apparent in 1947 along the lower slopes on the southeast side of Knik Arm between Anchorage and the Knik River crossing (Furniss 1950). Beetle populations apparently increased in fresh blowdown near Eagle River and Chugiak as well as in logging slash near Eagle River.

**MARITIME:** From 1940-1948, a spruce bark beetle outbreak occurred in the Edna Bay area of Kosciusko Island located in southeast Alaska. Considerable mortality also occurred on Bluff and Barrier Islands (Furniss 1946, Furniss and Jones 1946). The outbreak was possibly caused by a combination of factors including blowdown, overmature low-vigor spruce growing on shallow, dry soils. Approximately 50,000,000 bf of high value Sitka spruce was killed over 6,400 acres (Fig. 2b).

**INTERIOR:** Increasing mortality of white spruce caused by the spruce beetle was first reported in 1943 from the Haines cut-off area (Hughes 1948) during construction of the Haines Cut-off Highway. Spruce mortality averaged 50% in stands from mile 89 northward to the south end of Dezadeash Lake

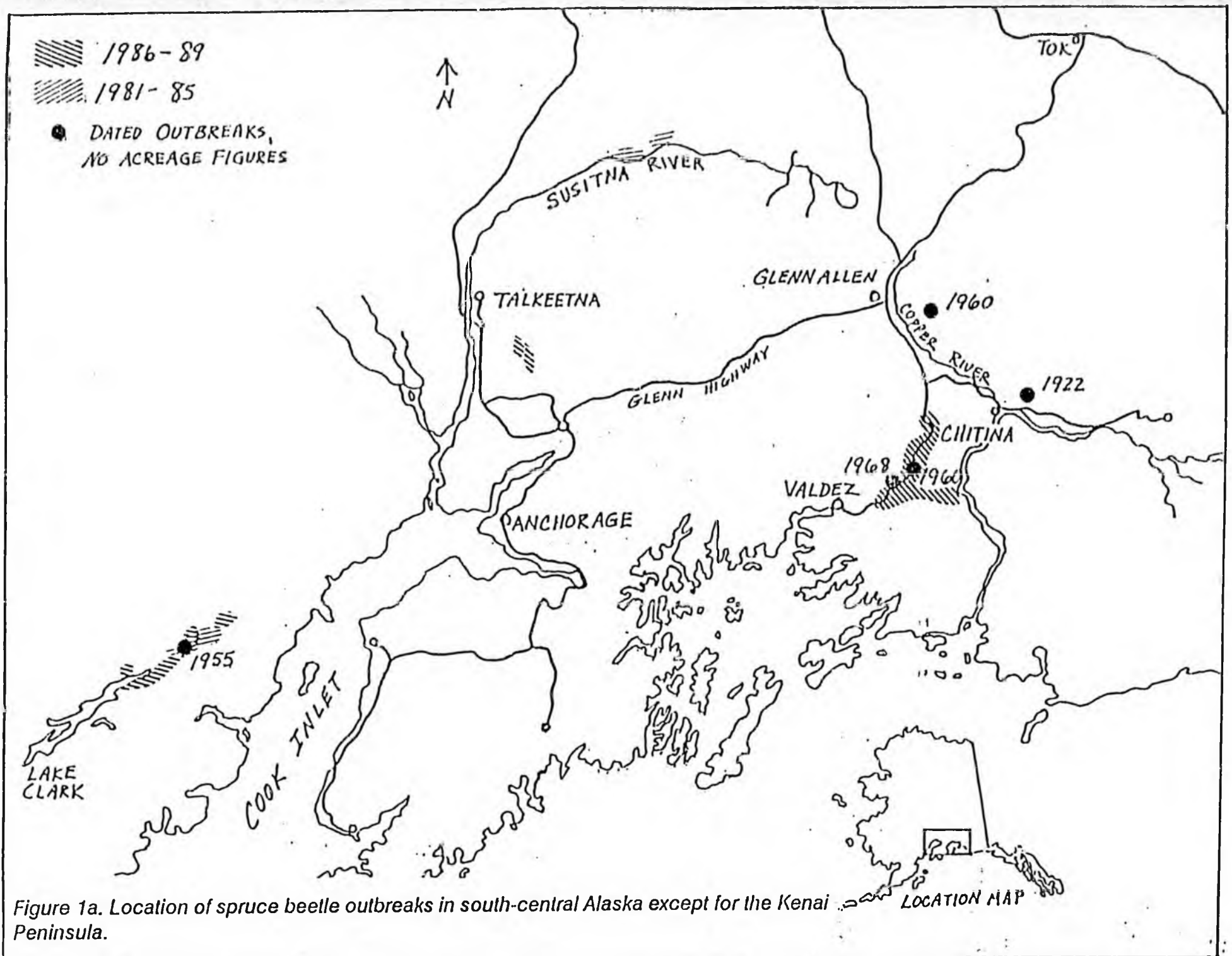


Figure 1a. Location of spruce beetle outbreaks in south-central Alaska except for the Kenai Peninsula.

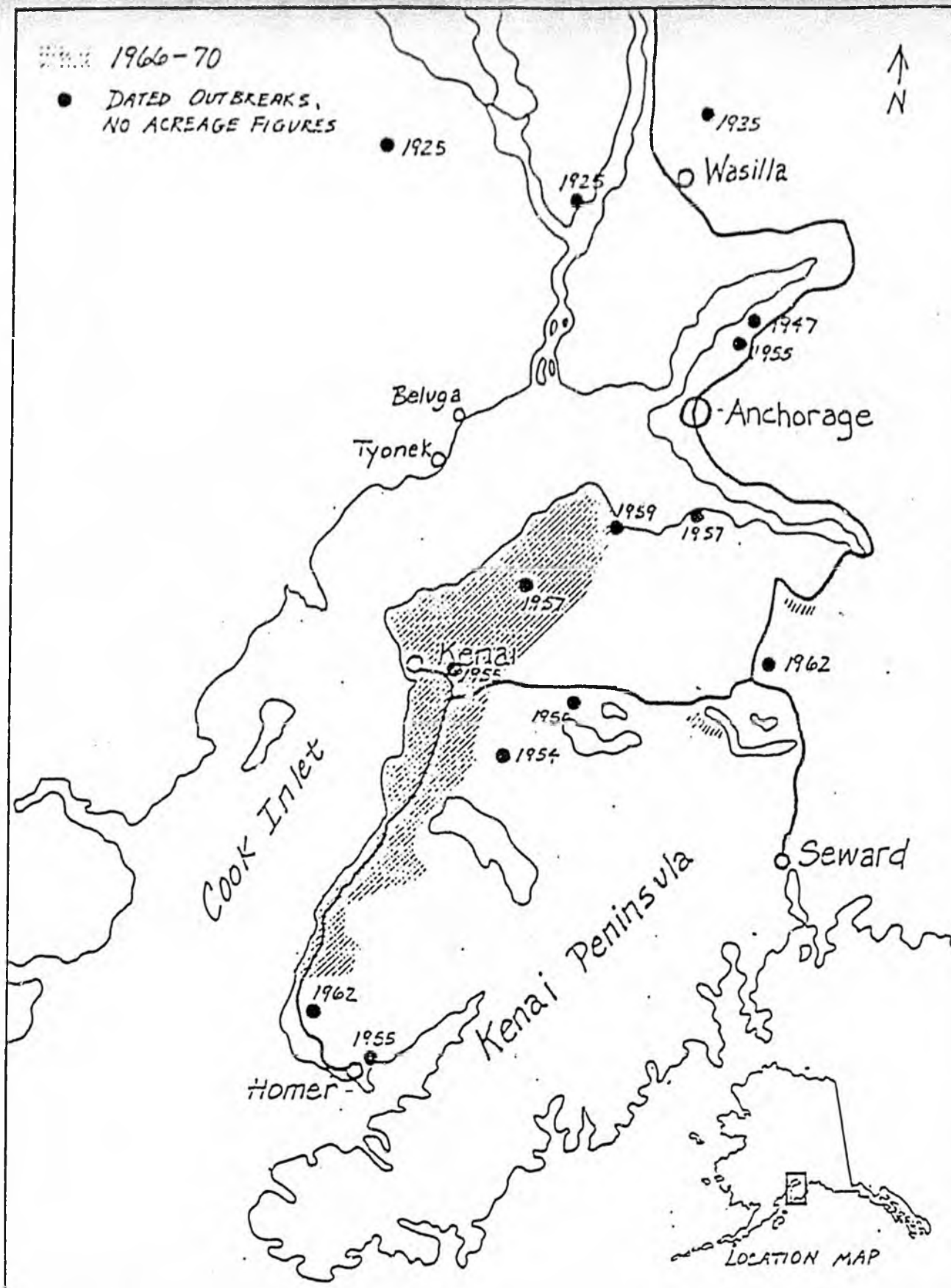


Figure 1b. Location of spruce beetle outbreaks in south-central Alaska up to 1970; specifically on the Kenai Peninsula.

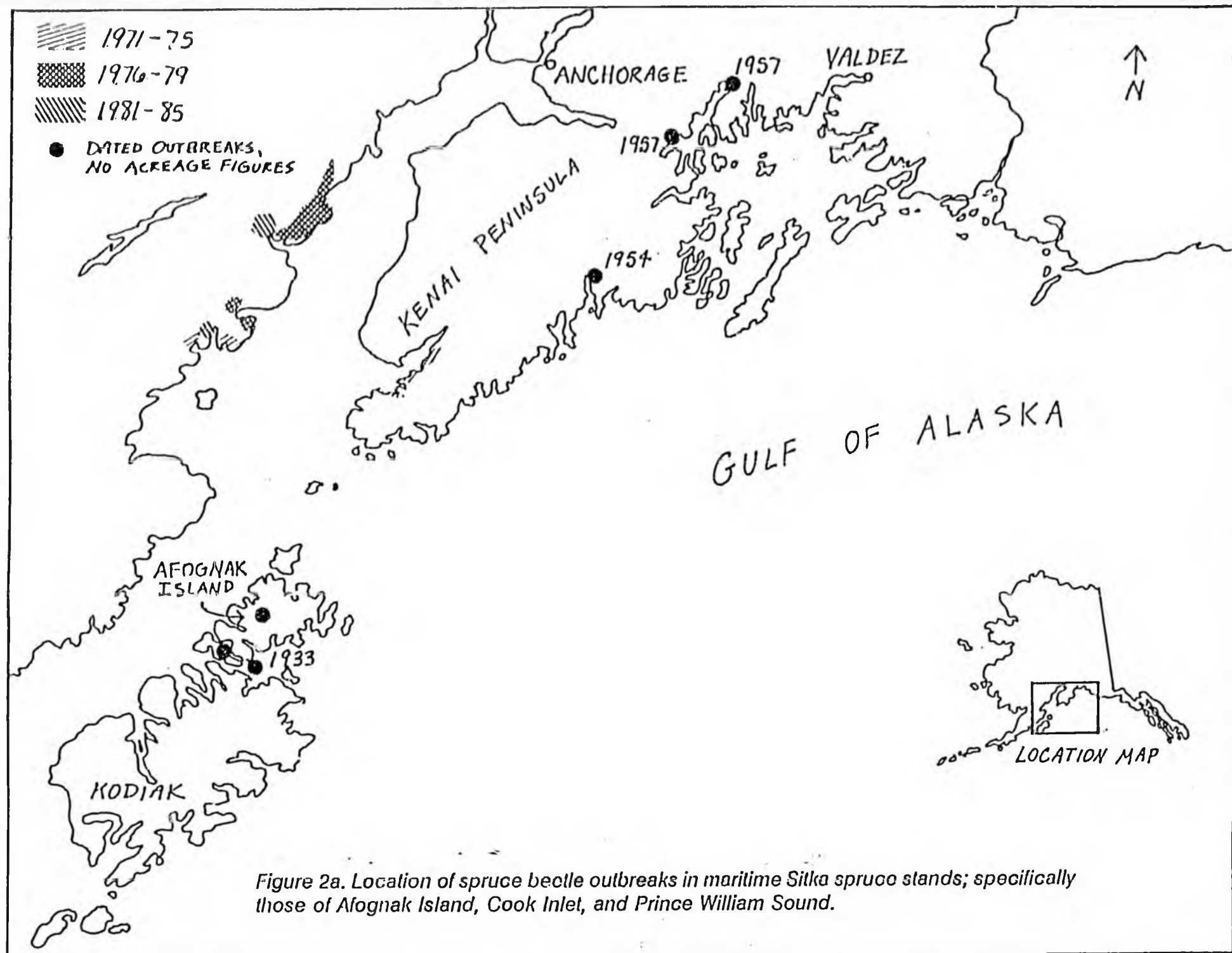


Figure 2a. Location of spruce beetle outbreaks in maritime Sitka spruce stands; specifically those of Afognak Island, Cook Inlet, and Prince William Sound.



Figure 2b. Location of spruce beetle outbreaks in southeast Alaska's maritime Sitka spruce stands.

(Canada) at mile 127 then northeasterly towards Champagne, Y.T., Canada. The infestation barely made it into Alaska and caused little mortality.

## 1951-1955

**SOUTH-CENTRAL:** Spruce bark beetle activity was reported (McCambridge 1954) from the vicinity of Skilak and Tustumena Lakes; no acreage figures were given. A 1954 ground check indicated that wood pecker and parasite activity were quite high and spruce beetle populations were declining. Powerline and road construction were undertaken near Soldotna and Homer and large quantities of slash were left on the ground. Spruce beetle populations apparently increased in this material and began attacking and killing standing live spruce at a light, but steady rate (McCambridge 1955) (Fig. 1b).

Infested spruce were once again apparent northeast of Anchorage in 1955. The scattered outbreak (single trees or small groups) encompassed several thousand acres in the vicinity of Eklutna (McCambridge 1955) (Fig. 1b).

An on-going spruce beetle outbreak was detected in white spruce stands near Lake Clark (McCambridge 1955). Extensive areas of previous beetle activity as well as current tree mortality were observed along the Tikakila River, NE of Lake Clark. The infestation was scattered over 100,000 acres in 1955 and declining (Fig. 1a).

**MARITIME:** A small number of standing infested Sitka spruce were observed in 1954 near the Bear Lake logging operation near Seward (McCambridge 1955). This spruce beetle activity declined in the following years (Fig. 2a).

1955 aerial detection surveys noted pockets of recent spruce beetle activity on the south side of Port Bazan on Dall Island (McCambridge 1955). This outbreak lasted from 1952-1957 and impacted 200 acres of Sitka spruce resulting in a volume loss of 1.5 million bf (500 trees killed each averaging 3,000 bf) (Downing 1956 a,b). Salvage logging was promptly undertaken (Fig. 2b).

## 1956-1960

**SOUTH-CENTRAL:** Spruce bark beetle activity increased on portions of the Kenai Peninsula in the late 1950's. Several small outbreaks were detected in 1957 on the Chugach National Forest (CNF) near the east fork of Sixmile Creek and mid-way up the Resurrection Creek (Downing 1957). Elsewhere on the Kenai, bark beetle activity was noted along the shore on the east side of Chickaloon Bay and mid-way up the Swanson River on the Kenai National Moose Range (KNMR). Losses within the KNMR were in close proximity to a large burned-over area (Fig. 1b).

Bark beetle activity on the CNF increased in 1958 with infestations noted along Resurrection Creek, Palmer Creek, Granite Creek, Quartz Creek. Losses were expected to be high in 1959 (USDA For. Serv. 1958). As expected, spruce beetles caused heavy losses of white and Lutz spruce on portions of the Kenai Peninsula (Downing 1959). Specifically, infestations covered approximately 16,000 acres of the CNF in the following areas: Quartz Creek-Summit Lake, Granite Creek, Resurrection and Palmer Creek. Control of the outbreaks through salvage logging and chemical measures was considered. A larger, scattered infestation covering tens of thousands of acres was located on the northern portion of the KNMR extending from Chickaloon River on the east to Moose Pt. on the west and north to Pt. Possession (Downing 1959). Infestations did not increase in size in 1960 on the Kenai but intensified

(Downing 1960). Two new spruce beetle outbreaks however, were detected near Copper Center; one along the Little Tonsina River and the other on the east side of the Copper River. Several thousand trees were killed and the outbreak was expected to continue (Downing 1960) (Fig. 1b).

North of Anchorage, losses due to bark beetles declined in 1957 along the Matanuska River and the southeast side of Knik Arm.

**MARITIME:** A spruce beetle infestation in Sitka spruce stands bordering Blackstone Bay near Whittier was detected in 1957. This two thousand acre outbreak had been on-going since 1952 (Downing 1957). Another smaller (500 acre) outbreak was detected along Pt Pakenham in the College Fjord area of Prince William Sound. Both outbreaks declined in 1958 (USDA For. Serv. 1958) (Fig. 2a).

## 1961-1965

**SOUTH-CENTRAL:** Bark beetle activity was static in 1961 (Crosby 1961) but increased in 1962 on the Kenai Peninsula (Crosby 1952). Two new hot spots were detected: one near Anchor Point and the other about 40 miles north of Seward. It was estimated that there would be a 2- to 3-fold increase in numbers of newly attacked trees in 1963. Also, recent (1962) beetle infested spruce were detected in the Copper River area near Chitina. The increases in spruce beetle populations expected in 1963 failed to materialize and by 1965, spruce beetle populations were at low, endemic levels throughout the State (Crosby 1963, 1964, 1965). No active beetle infestations were noted from either aerial survey or highway reconnaissances (Fig. 1a,b).

**MARITIME:** Spruce beetle activity was reported in 1963 from central Prince of Wales Island and from a point near Petersburg (Crosby 1963). Only a few trees were attacked in each area. Several areas of recent Sitka spruce blowdown in southeast Alaska failed to produce the expected build-up of spruce beetle populations (Fig. 2b).

## 1966-1970

**SOUTH-CENTRAL:** The late 1960's was a period of rapid expansion of spruce bark beetle outbreaks on the Kenai Peninsula. Patches of tree mortality occurred in a variety of areas of the CNF in 1966: west shore of Kenai Lake, junction of the Russian and Kenai Rivers, and near Jerome Lake. The use of trap trees as a control measure for the suppression of spruce beetle populations was contemplated for a section of Snug Harbor Road where infestations were increasing due to large amounts of breeding material (scorched spruce) from the 1959 Kenai Lake Burn (Crosby 1966, Galea 1968). Elsewhere on the Kenai spruce beetle populations increased. Considerable tree mortality was observed in 1966 on 100 acres near the mouth of Chickaloon River and further south on the Kenai Peninsula near Anchor Point. The Chickaloon River infestation within the Moose Range extended its borders noticeably during 1967 and by 1969 bark beetle populations covered 40,000 acres from Pt. Possession to Homer. A continuation of drought conditions had provided the catalyst for numerous minor outbreaks created by a succession of land clearing, petroleum exploration and various right-of-way activities to erupt into the present major epidemic (Crosby and Curtis 1969). By 1970 two hundred thousand acres were infested on the KNMR with an additional 60,000 infested acres on State and private lands accounting for more than a billion bf of spruce mortality. The spruce beetle infestation extended almost unbroken from Pt. Possession to Clam Gulch with two smaller outbreaks occurring in the Deep Creek drainage near Ninilchik. This major outbreak expanded from a minor outbreak of less than 100 acres in 1966

into a major epidemic covering more than four townships (USDA For. Serv. 1970, Curtis 1970) (Fig. 1b).

Bark beetle activity likewise increased in the late 1960's on portions of the CNF; a high incidence of bark beetle activity was observed in 1967 in the Granite Creek area. Scattered spruce mortality had been noted in this area since 1957. Approximately 1,300 acres of infested spruce occurred between East Fork River and the Granite Creek Guard Station (Crosby 1967). An eight acre stand of spruce was infested around a proposed Forest Service Campground near Juneau Falls. A 400 acre hot spot within the 1,300 acre Granite Creek/East Fork infestation was treated with a combination of trap trees and chemicals (Crosby and Curtis 1968). By 1969, spruce beetle populations were subsiding on the CNF. Another 300 acres of the Granite Creek infestation were treated (Crosby and Curtis 1969). Spruce beetle population build-up was detected in 1970 in the 1969 blowdown which occurred in the Six Mile area, Resurrection Creek drainages and in the Summit Lake area. Likewise, spruce beetle populations were increasing around the edges of the 1969 Russian River Burn (USDA For. Serv. 1970, Curtis 1970) (Fig. 1b).

Spruce mortality was observed in 1968 on 200 acres along Caribou Creek near mile 108 of the Glenn Highway. Likewise, increased tree killing was observed on scattered over-mature spruce along the east side of the Tonsina River in the vicinity of Stuart Creek (Crosby and Curtis 1968); beetle populations declined in both areas by 1970 (Fig. 1a).

The 1969 drought conditions as well as land clearing practices resulted in increased spruce beetle population build-up causing heavy tree killing of white spruce in suburban Anchorage areas. Similar conditions occurred in the white spruce stands between Palmer and Eureka (Crosby and Curtis 1969).

**MARITIME:** The only documented spruce beetle activity occurred in 1968 along a five mile stretch of the Salmon River at the head of Portland Canal in southeast Alaska. Two hundred acres of river bottom Sitka spruce were killed by spruce beetles. The infested timber was probably pre-disposed to beetle attack by prior flooding and subsequent damage to tree roots. Salvage logging was employed (Crosby and Curtis 1968) (Fig. 2b).

## 1971-1975

**SOUTH-CENTRAL:** The early 1970's saw an overall decline of spruce beetle activity on the Kenai Peninsula and a dramatic increase in infestations on the west side of Cook Inlet. Increased activity however, was noted on the eastern edge of the Moose Refuge where 400 acres along Mystery Creek were infested. The anticipated build-up of spruce beetle populations in portions of the CNF did not materialize. The 700 acre treatment area in the Granite Creek area was effective as no new infestations were detected in 1971 (Curtis and Swanson 1972) (Fig. 1c).

Spruce beetle populations in 1972 started to decrease on the northern half of the Kenai Peninsula following six years of outbreaks. These outbreaks followed several years of drought. Rainfall within the infested area was below the long-term average for six of the ten years from 1961-1970. The general result of this infestation was a reduction in size of the residual stand. Type conversion had not occurred as there were plenty of small size spruce (Beckwith and Curtis 1972). The most serious outbreak in progress on the Kenai Peninsula was occurring south and west of Tustumena Lake from Clam Gulch to the Anchor River. Tree killing was reported scattered over 60,000 acres (Baker and Curtis 1972) (Fig. 1c).

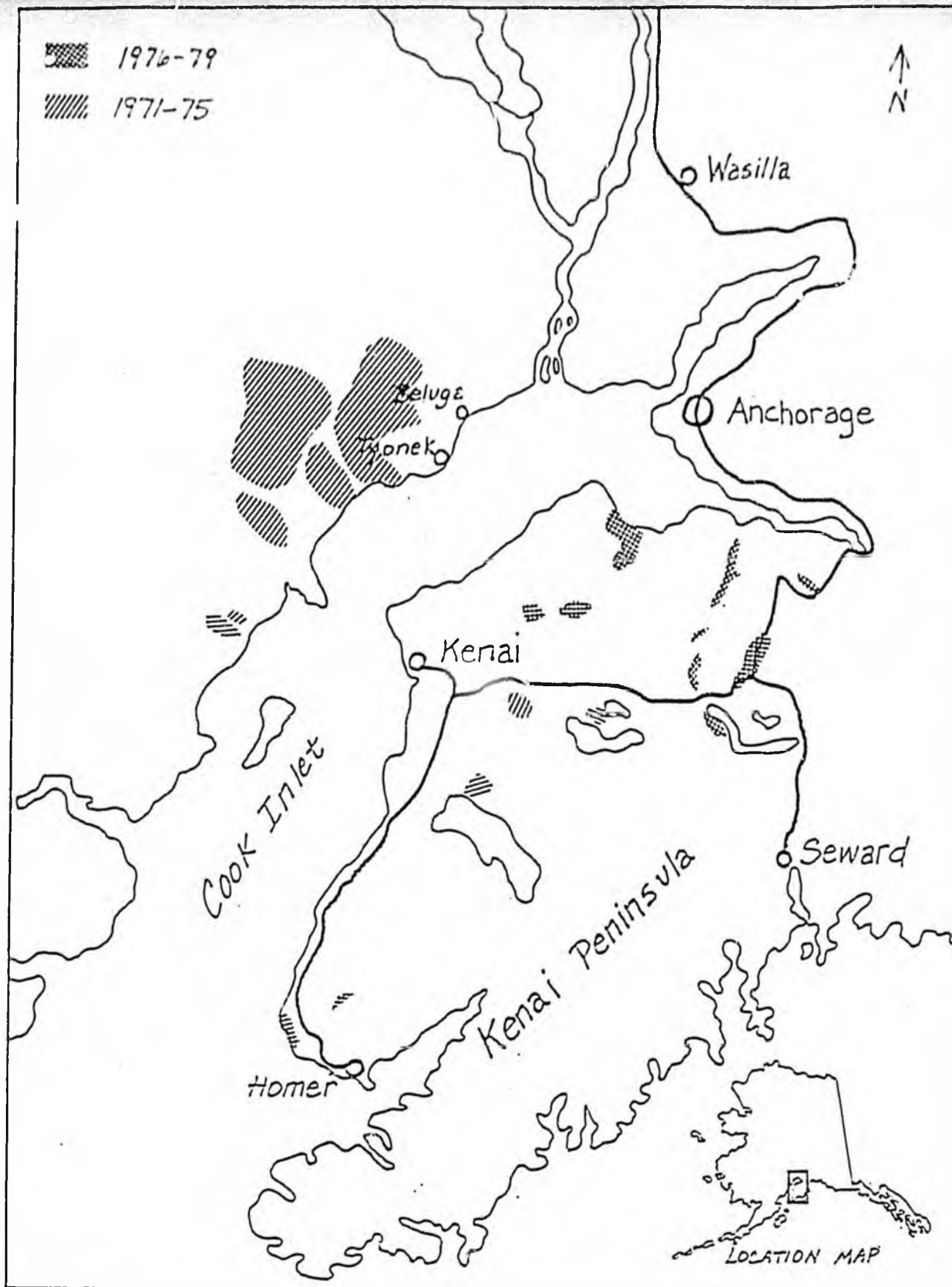


Figure 1c. Location of spruce beetle outbreaks from 1971-1979 in south-central Alaska; specifically on the Kenai Peninsula and the west side of Cook Inlet.

Spruce beetle populations were generally at low levels on the CNF with localized patches of spruce mortality occurring near Canyon and Granite Creek drainages (Baker and Curtis 1972). Spruce beetles continued to breed in patches of blowdown along Resurrection Creek (Fig. 1c).

A "new" large outbreak was detected in 1972 on the west-side of Cook Inlet where more than 70,000 acres of spruce mortality occurred near Trading Bay and Tyonek. This outbreak appeared to be in progress for 3-4 years. The cause of the outbreak was not definitely known but was believed to be associated with seismic line clearing debris from 1965-68 and the severe drought of 1968-69.

The Tyonek infestation impacted 103,000 acres in 1973. The Alaska State Division of Lands initiated a salvage sale near Tyonek that covered 223,000 acres with a total of 425 mm bf of mixed species (spruce 285 mm bf). Bark beetle populations continued to decline on the Kenai Peninsula where only 53,000 acres of active infestations were noted (Baker and Laurent 1974).

Spruce beetle caused tree mortality was concentrated in 1974 near Beluga Lake on the west-side of Cook Inlet and impacted an additional 140,000 acres. Tree killing was expected to intensify along the Beluga River in 1975. The Kenai Peninsula outbreaks declined further in 1974-no significant infestations were observed (Baker et al. 1975). The following table summarizes recent Cook Inlet spruce beetle outbreaks (in acres) (Baker et al. 1975):

	KENAI PENIN.	W. COOK INLET	TOTAL
Late 60's thru 1973	253,700	120,600	374,300
1974	300	143,400	143,700
<b>TOTAL</b>	<b>254,000</b>	<b>264,000</b>	<b>518,000</b>

Assuming an average gross volume of 4,500 bf per acre, spruce beetles caused more than two billion board feet of spruce mortality.

The spruce beetle remained in outbreak status on the west-side of Cook Inlet in 1975 with infestations totalling 167,000 acres. Population levels were expected to decline in 1976 (Hosteller et al. 1976). Of the estimated 425 mm bf of timber in the Tyonek Sale; 88 mm of spruce was cut and decked by Dec. 1975. An estimated additional 25 mm bf of spruce and 20 mm of hardwoods had been cut. Spruce beetle populations on the Kenai Peninsula remained at low levels in 1975 with a few small scattered populations (Fig. 1c).

**MARITIME:** Five to six thousand acres of infested Sitka spruce were detected in 1972 on BLM lands along the southwest shore of Cook Inlet near Mt. Iliamna (Baker and Curtis 1972). Infested areas were adjacent to several patches of blowdown which occurred in 1967-68. This infestation subsided by 1974. In southeast Alaska, forty Sitka spruce were killed by spruce beetles in Saw Mill Creek Campground near Sitka. These trees were previously defoliated by the spruce aphid possibly predisposing them to spruce beetle attacks (Baker and Curtis 1972) (Fig. 2a).

## 1976-1980

**SOUTH-CENTRAL:** Spruce beetle activity decreased in 1976 on the west side of Cook Inlet; of the 167,000 acres of active infestations reported in 1975, only scattered spots remained in 1976. Most of the activity was confined to an area east of Lone Ridge, nw of Tyonek. Spruce beetle activity remained

at low levels on most of the Kenai Peninsula. Increased spruce mortality however, was detected in 1976 on almost 8,000 acres along the Resurrection Creek drainage of the CNF. This increased mortality is a result of beetle populations breeding in the extensive windthrow of 1974 and 1975 (Rush et al. 1977). The Resurrection Creek outbreak increased in 1977 by 5,000 acres and encompassed 12,830 acres (USDA For. Serv. 1978). Spruce beetle caused tree mortality on the CNF increased by 18% over 1977 levels. Much of this increase occurred in the Summit Lake area where more than 3,000 acres of spruce were infested. Close to 1,000 acres of spruce forests were impacted near Upper Russian Lake (USDA For. Serv. 1979) (Fig. 1c).

Elsewhere on the Kenai Peninsula spruce beetle populations increased: 47,000 acres were infested throughout the Moose Range in 1978. The heaviest impacted area was near Barabara Lake (7,620 acres).

Spruce beetle activity on the west side of Cook Inlet increased in 1978; 64,000 acres of very light (less than 0.25 trees/acre) spruce mortality was detected near Lower Beluga Lake. As of October 1978, a total of 58.9 mm bf of spruce had been harvested on the Westside Salvage Sale (USDA For. Serv. 1979).

Spruce beetle populations exploded and by 1979/80 infestations covered approximately 380,000 acres throughout the State. This was an increase of 250,000 acres over 1978 levels (USDA For. Serv. 1980, 1981). Mortality was apparent on the CNF where 33,098 acres were infested. The Summit Lake infestation increased by 50% and covered 13,924 acres; the Resurrection Creek infestation had increased to 15,240 acres. Elsewhere on the Kenai, spruce beetle populations increased: Barabara Lake area-12,162 acres; west of Tustumena Lake-19,698 acres. Infestations on west side of Cook Inlet covered approximately 374,452 acres north of Beluga Lake (Fig. 1c).

**MARITIME:** For the first time in many years, Sitka spruce mortality was detected in 1980 on 1,000 acres in southeast Alaska; areas most heavily impacted were along the Taku River near Juneau. The infestation appeared to be about three years old; probably originating near Klackman Mountain (USDA For. Serv. 1981). Scattered groups of spruce beetle infested spruce were detected along the south-west shore of Kachemak Bay across from Homer on the Kenai Peninsula (Fig. 2a,b).

**INTERIOR:** The only spruce beetle impacted areas occurred in the white spruce stands along the Kuskokwim River. Light spruce beetle activity was detected on 2,600 acres 15 miles south of Devil's Elbow in 1978 (USDA For. Serv. 1979). The Devil's Elbow outbreak declined in 1979. Infestations (4,000 acres) then increased five miles northeast of Little Russian Mission (USDA For. Serv. 1980). Spruce beetle activity decreased by 50% in 1980; only 2,481 acres of scattered infested spruce were aerially detected along the Kuskokwim River (Fig. 3).

## 1981-1985

The early 1980's experienced increased spruce beetle activity in southeast and south-central Alaska. Little activity was detected in the interior.

**SOUTH-CENTRAL:** Spruce beetle populations infested 490,220 acres in 1982 vs. 240,000 acres in 1981. The increase was most apparent in the Beluga Lake area on the west side of Cook Inlet. New infestations were detected in 1982 on 49,291 acres of white spruce along both sides of the Susitna River from Devil's Canyon to Gold Creek (USDA For. Serv. 1983).

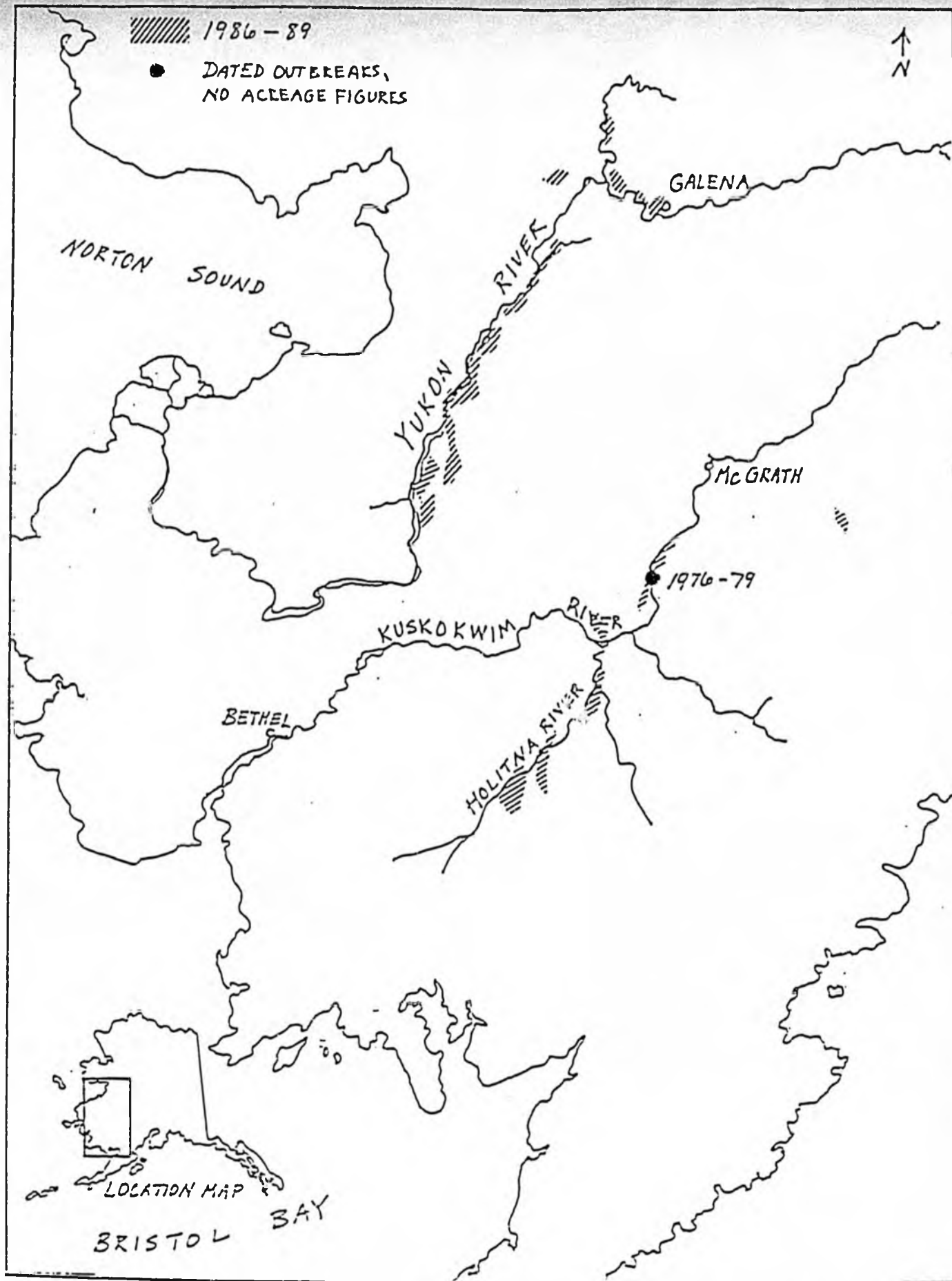


Figure 3. Location of spruce beetle outbreaks in interior Alaska's white spruce stands.

Infestations on the CNF decreased from 41,051 acres in 1981 to 37,929 acres in 1982. After three years of increase, the Summit Lake infestation declined, and by 1982, extended over 9,924 acres. The Resurrection Creek infestation had not expanded and still affected 15,240 acres. Beetle activity increased in 1981 near Cooper Lake, Mystery Hills, Round Mountain, and other areas near Cooper Landing. Elsewhere on the Kenai, infestations increased; 41,369 vs. 27,303 acres in 1981. The largest increase was detected northeast of Mystery Hills on the Kenai National Wildlife Refuge (KNWR) where 29,688 acres were infested in 1982; a 40% increase over 1981 levels. On the southern end of the Kenai, bark beetle populations were 50% less in 1982 than the 1981 level of 2,560 acres (USDA For. Serv. 1983). Scattered spruce beetle activity was still observed on the southeast side of Kachemak Bay. Heavy spruce beetle activity was noted in 1982 on Kalgin Island; on-going for at least two years (Fig. 1d).

Spruce beetle populations decreased slightly in 1983 but increased by 22% in 1984 and covered 432,603 acres state-wide (USDA For. Serv. 1983, 1984). Bark beetle activity was static on the CNF with the exception of the Resurrection Creek outbreak which expanded in 1983 and encompassed 20,320 acres. 44,745 acres of the KNWR were impacted in 1983; the majority occurring in the Mystery Hills area. Infestations also increased further south on the Kenai Peninsula where 8,344 acres of scattered infestations were aerielly detected. Of interest in 1983, 1,524 acres of spruce beetle activity was detected north of Valdez along the Richardson Highway near the confluence of the Tiekel and Tsina Rivers (USDA For. Serv. 1983) (Fig. 1a,d).

By 1984 bark beetle activity increased on the CNF where 56,342 acres were impacted. Intense spruce beetle activity continued on 12,484 acres in the Cooper Landing/Russian River areas-most notably west of Juneau Creek. Other areas on the Chugach appeared to be static or declining. The Mystery Hills outbreak increased dramatically; 53,713 acres of Wildlife Refuge lands were infested north of the Sterling Highway and following Mystery Hills up to and including the Big and Little Indian drainages. Infestations on the southern end of the Kenai Peninsula more than doubled and covered 22,177 acres; the majority (15,690 acres) occurred along the Fox River drainage. The spruce beetle activity detected along the Richardson Highway in 1983 increased to 5,293 acres in 1984. Scattered spruce beetle activity also increased in the Anchorage bowl and Chugiak/Eagle River areas: Ship Creek-3,523 acres; Eklutna Lake-3,597 acres. Beetle activity was aerielly detected on 31,509 acres along the Tikakila River near Lake Clark; the same area infested almost 30 years ago. This scattered beetle activity declined by 1985 (Fig. 1a,d).

Spruce bark beetle infestations decreased statewide in 1985 by 40% over 1984 levels; infestations covered covered 255,270 acres. Decreases were most apparent on the CNF and the west side of Cook Inlet. Increased activity however, was still apparent in the Cooper Landing/Russian River areas (USDA For. Serv. 1985). Infestations decreased by 28% on the KNWR but were still evident on 43,326 acres in the Mystery Hills/Skilak Lake areas.

Infestations decreased (63%) on the west side of Cook Inlet where spruce beetle activity was detected on 64,234 acres north of Beluga Lake (USDA For. Serv. 1985). The Richardson Highway outbreak increased; more than 5,000 acres were infested.

**MARITIME:** The largest increase in spruce beetle activity in Sitka spruce occurred in southeast Alaska in Glacier Bay National Park. This infestation was first detected in 1982 and was apparent on 5,000 acres. It was thought to have been active for four years. The outbreak expanded in 1983 and impacted 6,350 acres (USDA For. Serv. 1983) and by 1985, the outbreak had expanded to the east and north and covered 12,200 acres in the Park (USDA For. Serv. 1985). Other outbreaks in southeast such as the Taku River infestation of 2,000 acres and the Whiting River 900 acre infestation died out (Fig. 2b).

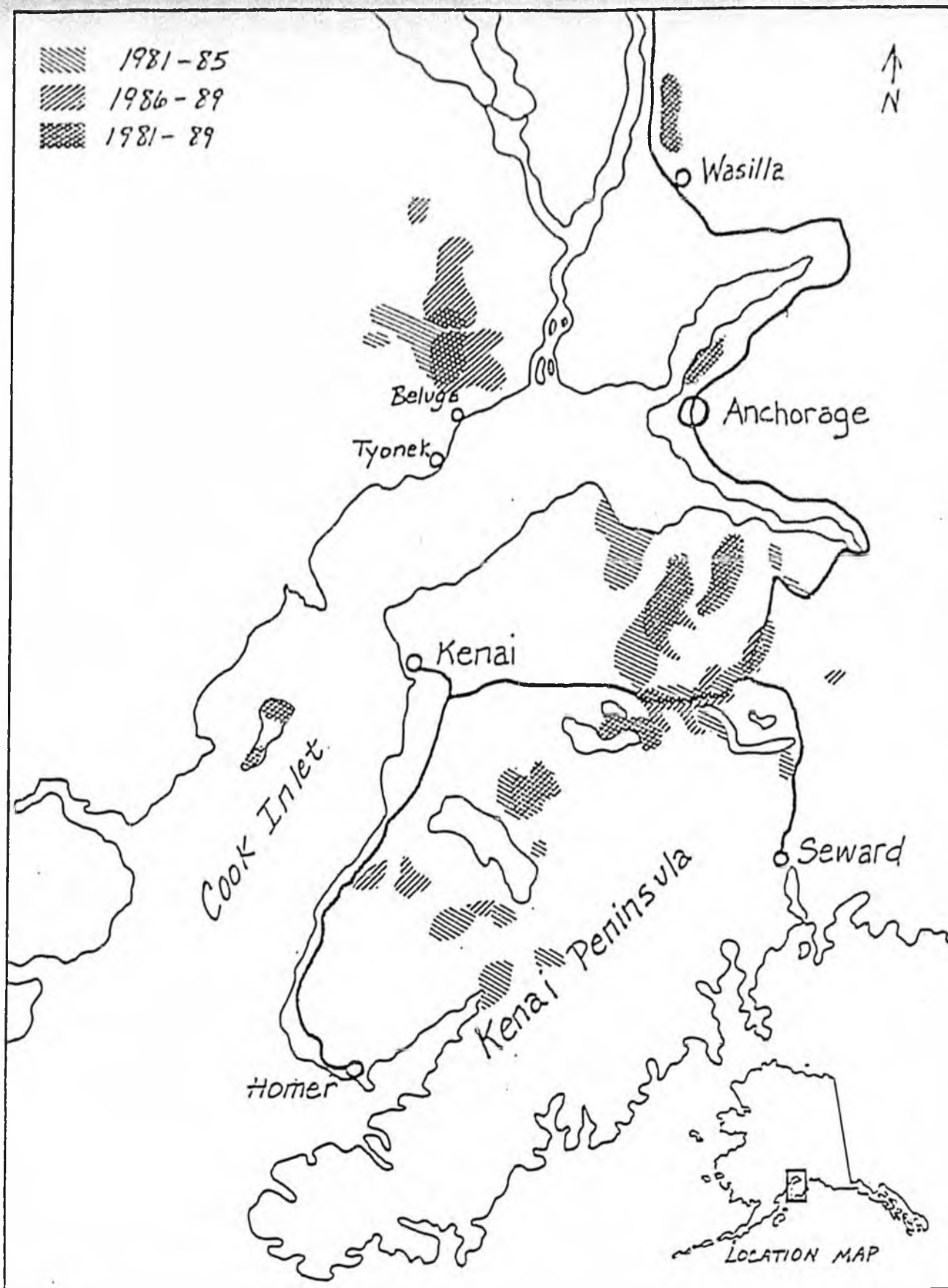


Figure 1d. Location of spruce beetle outbreaks from 1981-1989 in south-central Alaska; specifically on the Kenai Peninsula and the west side of Cook Inlet.

Of interest though, was the detection of 200 acres of Sitka spruce mortality within Kachemak Bay State Park across from Homer on the Kenai Peninsula. This beetle activity was located near Mallard Bay and was associated with nearby spruce windthrow (USDA For. Serv. 1985) (Fig. 2a).

## 1986-1989

Spruce beetle activity in the late 1980's was most apparent for the first time in interior Alaska's white spruce stands. Populations decreased in south-central and southeast Alaska.

**SOUTH-CENTRAL:** Spruce mortality continued on 40,423 acres of the CNF in 1986 (USDA For. Serv. 1986). A slight increase in activity was noted in the Cooper Landing/Russian River area. The majority of the KNWR infestations were still occurring north of Mystery Hills. Approximately 10,000 acres of light scattered beetle activity was detected in the Ninilchik River and Crooked Creek areas.

Spruce beetle infestations continued in 1986 on the west side of Cook Inlet where 100,000 acres were impacted nw of Little Mt. Susitna and west of Beluga Mountain. Spruce beetle activity in the Anchorage and Eagle River/Chugiak areas was apparent although decreasing; Fort Richardson lands had 5-10,000 acres of infested spruce. The Tielke River outbreak along the Richardson Highway covered close to 20,000 acres. Spruce beetle infestations decreased in 1987; decreases most apparent on west side of Cook Inlet and on the CNF (USDA For. Serv. 1987). Activity was still apparent in the Summit Lake, Cooper Landing, and Russian River Campground areas. Spruce beetle activity increased in 1987 by 9,000 acres on KNWR where 63,099 acres were infested; mostly in the Mystery Hills/Skilak Lake area. Infestations declined further south on the Kenai along the Fox River drainage. Spruce beetle activity further declined in the Anchorage/Eagle River areas. The Tielke River outbreak however, intensified by 3,500 acres and encompassed 23,586 acres (Fig. 1a).

Spruce beetle populations remained static in 1988 although heavy localized infestations were apparent along the road corridor in the Cooper Landing area and near Upper Trail Lake (USDA For. Serv. 1986). Scattered spruce beetle activity has been apparent for 2-3 years on 41,000 acres southwest of Tustumena Lake. Spruce beetle populations declined further in the Anchorage/Eagle River areas. However, further north of Anchorage spruce beetle activity increased: 14,000 acres were detected south of the Matanuska River near Kings Mountain; 19,000 acres were detected for the third year between Willow and Little Willow Creek. The Tielke River outbreak decreased in size (Fig. 1a,d).

Most spruce beetle infestations in south-central Alaska's spruce forests declined in 1989 (USDA For. Serv. 1989). Only 7,000 and 10,000 acres of active infestations were detected on KNWR and the CNF, respectively. Likewise, spruce beetle activity decreased on the west side of Cook Inlet with the exception of recent activity (2,600 acres) detected along the Skwentna River north of Beluga.

**MARITIME:** Sitka spruce mortality increased in 1986 in the Kachemak Bay area of the Kenai Peninsula. Scattered infestations covered 3,600 acres: 1,168 acres in Mallard Bay; 1,300 acres near Bear Cove. Most of this mortality was associated with numerous pockets of blowdown. Likewise there were 500 acres of scattered spruce mortality north of Seldovia associated with logging debris left during road construction. By 1988, spruce beetle infestations increased to 10,000 acres in the Kachemak Bay area. The spruce beetle outbreak in Glacier Bay National Park in southeast Alaska increased from 12,000 to 18,000 acres (USDA For. Serv. 1986) (Fig. 2a,b).

Nearly 2,000 acres of scattered spruce have been infested during the past three years in the Yakutat Forelands. These infestations are believed to have originated in blowdown and salvage sale units. The

level of mortality in this infestation however is quite low (3-5% of the stand infested) (USDA For. Serv. 1988) (Fig. 2b).

Bark beetle populations continued to spread in the Kachemak Bay area in 1989 but declined in Glacier Bay National Park and the Yakutat Forelands (USDA For. Serv. 1989).

**INTERIOR:** One of the largest spruce beetle infestations to occur in interior Alaska was detected in 1986 along the Yukon River. Spruce mortality was spread along 50 miles of river and impacted 63,000 acres. This outbreak had been on-going for at least two years and more than likely originated in windthrown spruce as well as flood damaged spruce (USDA For. Serv. 1986). This outbreak impacted an additional 15,000 acres in 1987 and spread up the south fork of the Nulato River (USDA For. Serv. 1987). By 1989 this outbreak encompassed 140,000 acres with increased activity detected along the Nulato River and near the mouth of the Koyukuk River (Fig. 3).

Scattered spruce beetle infestations detected in 1988 along the Kuskokwim River continued on 10,000 acres between Sleetmute, Devil's Elbow and McGrath. Recent spruce beetle infestations were detected in 1989 southeast of McGrath along the Windy Fork and south fork of the Kuskokwim Rivers: 2,257 and 3,738 acres, respectively. The 14,000 acres of scattered spruce beetle infestations detected in 1988 approximately 30 miles southwest of the Taylor Mountains declined to low levels in 1989 (USDA For. Serv. 1989) (Fig. 3).

TABLE 1. AREAS OF SPRUCE BEETLE OUTBREAKS (IN ACRES) IN ALASKA BY GEOGRAPHIC LOCATION.

	SOUTH-CENTRAL	MARITIME	INTERIOR
1920-1940	200,000 (Copper River)	--	--
1930-1940	*1/ (Swentna R.) (Willow Crk.)	100,000 (Afognak Is.)	--
1940-1950	* (Kenai Lk.) (Knik Arm)	6,400 (Kosciusko Is.)	* (Haines Cut-off)
1950-1955	2,000 (Eklutna) 100,000 (Tlikakila R.)	200 (Dall Is.)	--
1956-1960	16,000 (CNF) 20,000 (KNMR)	2,000 (Blackstone Bay) 500 (College Fjord)	--
1961-1965	* (Anchor Pt.) (Chitina)	* (Pr. of Wales Is.)	--
1966-1970	100 (Chickaloon R.) 39,900 (Pt. Possession) 220,000 (KNMR) 1,300 (CNF) 200 (Caribou Crk.)	200 (Salmon R.)	--
1971-1975	400 (KNMR) 60,000 (Clam Gulch) 223,000 (Tyonek) 140,000 (Beluga R.)	6,000 (Trading Bay)	--

1976-1980	16,240 (CNF-Res.Crk.) 13,000 (CNF-Summit L.) 1,000 (CNF-Up.Russ.) 47,000 (KNMR) 364,000 (Beluga Lk.)	2,000 (Taku R.) 900 (Whiting R.)	2,600 (Kusko.R.) 4,000 (Kusko.-Russ.Miss.)
1981-1985	49,291 (Susitna R.) 55,000 (KNWR) 2,560 (Anchor Pt.) 5,000 (CNF-Res.Crk.) 15,344 (Fox R.) 5,524 (Rich.Hiway) 12,484 (CNF-Cooper Ldg.) 3,523 (Ship Crk.) 3,597 (Eklutna Lk.) 31,509 (Tlikakila R.)	12,200 (Glacier Bay) 200 (Kachemak Bay)	--
1986-1989	10,000 (Ninilchik R.) 7,000 (Fort.Rich.) 18,586 (Rich.Hiway) 50,000 (KNWR) 14,000 (Kings Mtn.) 19,000 (Willow Crk.) 2,600 (Skwentna R.)	9,800 (Kachemak Bay) 5,800 (Glacier Bay) 2,000 (Yakutat)	140,000 (Yukon R.) 10,000 (Kusko.R.) 6,000 (s.f.Kusko.R.) 14,000 (Taylor Mtn.)
TOTAL	1,769,158	148,200	176,600

1/ \*-infestations reported but no acreage estimates given.

## APPENDIX A

### SPRUCE BEETLE

*Dendroctonus rufipennis* (Kirby)

- HOSTS:** White, Sitka, Lutz, and black spruce.
- DISTRIBUTION:** Wherever spruce is found; a serious forest pest in south-central Alaska throughout Cook Inlet and Kenai Peninsula.
- DAMAGE:** Larvae feed beneath bark, usually killing affected trees.
- DESCRIPTION:** Adult spruce beetles are maroon to black, cylindrical in shape, approximately 5 mm long and 3 mm wide. Larvae are stout, white, legless grubs, 6 mm long when full-grown. The pupae are soft-bodied, white, and have some adult features.
- BIOLOGY:** The life cycle of the spruce beetle may vary from one to three years, with a two-year cycle being the most common. Temperature plays an important part in determining the length of time required for beetle development.

Adult beetles become active in the spring (late May--early June) when air temperatures reach a threshold of 16°C (61°F). At this time, beetles emerge from trees in which they overwintered and fly in search of a new host material. These dispersal flights may be short-range even though beetles are capable of flying for several miles without stopping.

Spruce beetles prefer to attack the sides and bottom surfaces of windthrown or other downed materials which have been on the ground less than one year. In the absence of such host material, large-diameter live trees may be attacked instead, and if beetle populations are high, these trees may be killed.

Beetle attacks, whether on windthrown or on standing timber, are mediated by pheromones which insure that individual trees will be attacked "en masse", and fully colonized by subsequent broods. Trees that are mass-attacked form attractive centers which result in groups of trees being killed by spillover attacks.

Female beetles initiate attacks and begin constructing an egg gallery in the cambium parallel to the grain of the tree. They are joined by males and after mating, lay eggs in small niches along the sides of the egg gallery. Most eggs will hatch by August.

As they feed in the cambium, larvae construct their own galleries perpendicular to the egg gallery. Normally, spruce beetles pass the first winter in the larval stage, resume feeding the next spring, and pupate by summer. About two weeks later, pupae transform into adults which pass the second winter, either in the old pupation site, or more commonly, in the bases of infested trees. The following spring, two years after initial attack, the new adults emerge and attack new host material. In some years when temperatures are abnormally high, or on certain warmer microsites, spruce beetles may complete their development within one season and new adults will emerge one year after attack.

Most major outbreaks of spruce beetle have originated from stand disturbances -- blowdown, logging, or right-of-way clearance. Stand susceptibility to beetle attack is influenced by stocking, with slow growth and moisture stress playing an important part in predisposing trees to attack.

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