LOS
1978

CPT. 18-BIRCH REGENERATION STUDY

Bartlett Experimental Forest, Bartlett, NH
USDA-Forest Service

Objective

To determine effect of seeding and lime plus fertilizer treatments on establishment and early height growth of paper and yellow birch in a scarified clearcutting.

Background

7.1 acres of a 90-year old northern hardwood stand were clearcut in 5/68. There were 118 ft.^{2}/a basal area--24% Yellow birch, 10% Paper birch, and the remainder in beech, red maple, sugar maple, and hemlock. Site index for paper birch was 65. Entire area was scarified and slash was piled in 4 large piles in 9/68. Lime was applied in fall 68. Residual trees over 2 in. dbh were frilled and poisoned in summer 69 which is considered the first growing season.

Treatments -- (3 blocks with 4 plots of .44 acres per plot)

Control - scarification only
Direct Seeding - 2 lb. YB plus 1 lb. PB seed per acre, spring 69.
Light Fert. - D.S. plus 1 ton dolomitic limestone & .5 ton 15-10-10 NPK per acre
Heavy Fert. - D.S. plus limestone & 1.5 ton 15-10-10 per acre.

Results

SEEDLINGS PER ACRE, THOUSANDS

TREATMENT	PB			YB			OTHER COMM'L			PIN CHERRY		
	2yr	4yr	10yr	2yr	4yr	10yr	2yr	4yr	10yr	2yr	4yr	10yr
Control	29	20	3	12	14	1	5	7	2	32	18	5
Seed Only	41	25	--	18	12	--	6	6	--	42	22	--
Light Fert.	7	6	1	3	3	<1	4	3	1	34	20	6
Heavy Fert.	4	2	<1	2	1	<1	3	3	<1	20	10	4

% BIRCH STOCKING

TREATMENT	PB			YB			OTHER COMM'L	ALL
	2yr	4yr	10yr	2yr	4yr	10yr	10yr	10yr
Control	90	88	83	75	73	10	33	100
Seed Only	95	87	--	85	70	--	--	---
Light Fert.	62	50	37	37	32	0	17	53
Heavy Fert.	37	27	10	25	13	0	7	17

AVERAGE HEIGHT DOMINANT & CO-DOMINANT SEEDLINGS, FEET

TREATMENT	PB			YB			PC		
	2yr	4yr	10yr	2yr	4yr	10yr	2yr	4yr	10yr
Control	4	6	21	3	5	20	6	9	22
Seed Only	4	6	--	4	6	--	6	10	--
Light Fert.	5	9	22	1/	5	1/	8	13	24
Heavy Fert.	6	12	28	1/	1/	1/	10	17	28

1/ No dominant or co-dominant seedlings on plots

AVERAGE BASAL AREA 1978, FT^2/A

TREATMENT	PB	YB	OTHER COMM'L	PC	TOTAL
Control	20	3	8	41	72
Light Fert.	10	2	3	55	70
Heavy Fert.	6	<5	2	69	78

Cpt. 18--Birch Regeneration Study

Bartlett Experimental Forest, Bartlett, N. H.
USDA--Forest Service

Background

7.1 acres clearcut 5/68. Original stand even-aged about 90 years old with 9 commercial species, averaging 205 trees and 118 sq. ft. per acre 5.0 inches d.b.h. and larger. Yellow birch BA 24%; paper birch BA 10%. Five log products harvested (13%), plus birch boltwood (17%), and pulpwood (70%). Total harvest averaged 15 M bd. ft. per acre, having a mill-delivered value of $758 per acre. Stumpage averaged $9 per M bd. ft.

Study Objective

To determine the effect of clearcutting and post-logging cultural treatments on establishment and early height growth of yellow and paper birches.

Design and Area

Randomized Block: 5.28 acres in 3 blocks with 4 plots (treatments) in each. Plots are 1.1 x 4.0 chains or 0.44 acres each.

Treatments

(All plots A, B, C, and D scarified by tractor, and T.S.I. down to 2 inches d.b.h.)

A -- Control (scarified only)
B -- Direct seeding: 2 lb. Y.B. & 1 lb. P.B. per acre.
C -- D.S. plus 1.0 ton dolomitic limestone & 0.5 ton 15-10-10 NPK per acre.
D -- D.S. plus limestone and 1.5 tons N.P.K. fertilizer per acre.

4-Year Results (1969-1972)

TREES AND SHRUBS PER ACRE IN THOUSANDS

Treatment	YB	PB	Other Comm'l	Sub-Total	PC	Shrubs[1/]	Total
A	14	20	7	41	18	47	106
B	12	25	6	43	22	49	114
C	3	6	3	12	20	47	79
D	1	2	3	6	10	45	61

1/ Mostly Rubus spp. and some hobblebush.

% BIRCH STOCKING (based on at least one seedling per 1/4-milacre (3.3' x 3.3')

Treatment	YB	PB	Both Birches
A	73	88	93
B	70	87	88
C	32	50	58
D	13	27	35

HEIGHTS[2/] (feet)

Treatment	Yellow Birch		Paper Birch		Pin Cherry	
	Average D + C[3/]	Average All[3/]	Average D + C[3/]	Average All[3/]	Average All[3/]	Tallest
A	5.1	3.5	6.2	5.2	8.8	13.4
B	5.8	3.2	6.1	5.3	9.8	15.2
C	5.3	2.9	8.8	6.3	13.4	20.8
D	-	1.8	12.5	6.8	16.7	22.3

2/ Based on heights of tallest seedling per 1/4-milacre.
3/ D = Dominant; C = Codominant; All = D + C + Intermediate & Suppressed.

STUDY TITLE: REHABILITATING A SECOND-GROWTH NORTHERN HARDWOOD STAND BY CLEAR-CUTTING AND INTENSIVE CULTURAL WORK
STUDY # 4110-FS-NE-1104-32

12-18-1968

BIRCH REGENERATION STUDY

COMPARTMENT: 18 and 20 BARTLETT EXPERIMENTAL FOREST. 7.1 Acres.

PERIOD OF OPERATION: May 7, 1968 thru May 31, 1968.

PURPOSE OF OPERATION: To provide a small clearcut area to install a study of birch regeneration after scarification and treatment of soil with lime and fertilizer. Part of the study will also be seeded with yellow and paper birch.

CONTRACTOR: Heath Brothers, Fryburg, Maine.

DESCRIPTION OF WORK DONE:

1. SURVEY AND TIMBER CRUISE: An area of 7.1 acres along Stanley Road within Compartments 18 and 20 was surveyed in the summer of 1967. Filip, Williams, and two summer students staked out the boundary and then made a 100 % cruise to determine merchantable volume. The sale contract of 97MBF was handled by The White Mountain National Forest.

Survey time= 44 man hrs. Tally time for timber cruise= 32 man hrs. White paint was used to spot the boundary for the logger.

2. LOGGING: Logging started on May 7, 1968 and was completed by May 31, 1968. The road and its fringes provideeenough open area for landings, no other area was used. The logger used a rubber-tired skidder, an older model mechanical boon with tongs for loading, and two trucks which were in good condition. The area is relatively flat to gently rolling, so no water bars were needed. The weather was good, a few days of rain caused some delay.

3. SCARIFICATION: Scarification was done by William Duprey and Son Inc. of North Conway, N.H. A #955 Caterpillar with a toothed bucket was used by an experienced operator. The job started on 9-13-68 and was completed at noonon the sixteenth, a combined time of 20 hours. The rate was $16.00 per hour x 20=$320.00 or $60.60 per acre. Hauling costs are included at the hourly rate. The area scarified was 5.28 acres. Approximately 95% of the ground surface was scarified. The time was 3.79 hours per acre. No serious problems were encountered. There were numerous rocks and stumps on the site. Slash was pushed off the site into the isolation zones wherever practical. Several large slash piles had to be made within the study area to keep the cost of scarification within reasonable limits of the K-V funds. The equipment used worked very well, the size of the toothed bucket and the maneurverability made it better than the rock rake used in Cpt. 28. The bucket was smaller than the blade of the rock rake. The only bad feature was the tractor sat too close to the ground. This worked well on this site but where terrain is very rough as in Cpt. 28 this would be a disavantage.

BIRCH REGENERATION STUDY
Cpt-18 and 20 (cont'd).

DESCRIPTION OF WORK DONE

4. SURVEY OF STUDY AREA: A survey to determine the limits of the study area and to establish the treatments was done by Filip, Williams and a student from 9-16-68 thru 9-17-68. Nine man hours x 3 men = 27 man hours. A map included in this report shows the design, scale, and other pertinent facts. Wire pins with attached aluminum tags were later put in place of the stakes by Williams.

5. LIMING: On 9-17-68, Williams and a summer student loaded 66 bags of dolomitic limestone (80 pd. bags) and hauled them to Compartments 18 and 20. There are three blocks containing 12 treatments; 6 are to be limed, fertilized and seeded. Each lime-treated plot was divided into four equal units, each unit received two and three-quarter bags of lime which would be 1 ton per acre. (2.75 bags x 80 = 880 lbs. divided by 0.44 acres per plot = 2000 lbs. or 1 ton per acre). It took two days or 16 man hours to haul and spread the lime. Two men x 16 = 32 man hours. The lime was broadcast by hand using a 10 quart pail and a sugar scoop. The weather was good and no problems were encountered. (2.64 tons at $16.55 a ton = $43.69 or $16.55 per acre.

6. FERTILIZATION: (NPK 15-10-10) 80 pd. bags. On 5-16-69, Filip, Williams, and Donald West (WMNF) loaded 66 bags of fertilizer and transported it to compartments 18 and 20 by truck (WMNF). Each of the three blocks had two treatments that would receive fertilizer. Treatment C = 0.5 tons per acre. 0.44 acres x 0.5 = 0.22 tons x 2000 = 440 pds. divided by 80 lbs. per bag = 5½ bags per treatment. 16½ bags for treatment C - all blocks. Each treatment was sub-divided by 4 units as previously staked on a per chain basis. 5½ divided by 4 = approx. 1.4 bags per unit. Block I and II were completed May 16-69. This includes treatment D in those blocks.
Treatment D = 1.5 tons per acre (0.44 acres x 1.5 = 0.66 tons x 2000 = 1320 pds. divided by 80 = 16½ bags per treatment. Sub-divided by units = Approx. 4.1 bags per unit. 49½ bags for treatment D - All blocks. Block III was started and completed on May 21,1969 by Filip and Williams. It rained from 5-19 thru 20. A total of 66 bags were spread (66 x 80 = 5280 divided by 2000 = 2.64 tons of fertilizer. 2.64 tons at $75.40 per ton = $199.05 or $75.65 per acre.

7. DIRECT SEEDING: Direct seeding was done by Filip and Williams. A cyclone seeder was used with the seed mixed with sawdust. The sawdust would give the seed enough body to spread it effectively. Three treatments in each block would receive seed. This made a total of nine treatments to seed. Seed collected in 1968 was weighed out at a ratio

DESCRIPTION OF WORK DONE

of 1 pd. YB to $\frac{1}{2}$ pd. PB. Each plot therefore would receive 0.44 pds. YB to 0.22 pds. of PB. Germination tests showed that the seed was had a low germination count. The quantity was then doubled by using seed from the year 1966 which had a high germination count. This made 2 pds. YB to 1 pd. PB. Each plot was divided into 4 sections as previously done in the types of work. These units took a mixture of $\frac{1}{2}$ jar (2 cup jar) mixed seed to 3 jars of sawdust. The seeder was set at a $4\frac{1}{2}$ opening for spreading. Block I was completed on 5-22-69. ($5\frac{1}{2}$ hours). Block II was seeded on 5-23-69 (4 hours). Block III was done by just one man , Filip did this on 5-28-69 (6 hours).

8. CULTURAL APPLICATION OF HERBICIDE: On 7-1-69 thru 7-2-69, Williams and two summer students poisoned the remaining living trees that were on the study site. Trees from 1" up were poisoned by using a cran-injector and 2-4-5-T mixed with kerosene at a ratio of 1:1. The time was kept plus the species, size, and number of trees on each treatment. Trees in the isolation zones were also killed. It took $2\frac{1}{2}$ hours for the study area of 5.28 acres, $\frac{1}{2}$ hour for the isolation zone. 3 hours x 3 men = 9 man hours for the complete job.

FACT SHEET

Intensive Culture and Fertilization in Seedling Stands of Birch

Bartlett Experimental Forest, Bartlett, N. H.
and
Massabesic Experimental Forest, Alfred, ME.

Objective

To determine if control of stocking level and fertilizer treatments will stimulate height and diameter growth of birch seedlings.

Background

The Bartlett location of this study is in the Birch Regeneration Study Area in Compartment 18. It is on the "B treatment" which was clearcut, scarified, and direct seeded with 1 kg/ha yellow and .5 kg/ha paper birch seed in the spring of 1968. The soils are well to moderately well drained sandy loams derived from granitic glacial till. The Massabesic location is in a 4 ha block that was clearcut and prepared as a planting site in 1970 on the northern unit of the forest. The soils are well drained sandy loams derived from water worked glacial till derived from granitic plus fine-grained sedimentary rocks. At both locations 10- x 10m plots were established and birch crop trees were selected on approximately 2- x 2m spacing. In May, 1975 all vegetation except crop trees was mowed using Husqvarna 165R brush clearing saws. Crop trees were lightly pruned using hand pruning shears.

Treatments		1976 Diameter Growth	
		Massabesic	Bartlett
O	- Control; no weeding and thinning or fertilizer	.49a	.35a
W&T	- Weed and thin only	.53ab	.58ab
L	- W&T + 3.6 metric tons/ha dolomitic limestone	.52ab	.51ab
N	- W&T + 400 kg/ha nitrogen	.88cd	.92cd
NL	- W&T + N + L	.93cd	.94cd
P	- W&T + 200 kg/ha phosphorus	.61abc	.71bc
PL	- W&T + P + L	.50a	.56ab
NP	- W&T + N + P	1.21de	1.15d
NPL	- W&T + N + P + L	1.16de	.88cd
NPK	- W&T + N + P + 100 kg/ha potassium	1.18de	1.13d
NPKL	- W&T + N + P + K + L	1.42e	1.15d
NPKLX	- N+P+K+L + release from overstory competition only	.83bcd	.84cd

Lime applied by hand to surface in fall 1975; fertilizers, spring 1976. Design is randomized complete block with 3 replications at Bartlett and 5 at Massabesic. Measurements are 10 central crop trees per plot. Mowing will be repeated as needed to keep competing vegetation down.

Average tree dimensions at the start of the 1975 growing season were:

	Height,m	Diameter,cm	1974 Height growth,cm
Bartlett	2.9	1.6	38
Massabesic	2.0	1.0	27

NE1104-47

1976-77 Volume growth cm^3/tree

Massabesic

Volume growth = $V_{77} - V_{75}$

$V = (\frac{1}{2}B_2)\,11t$

Average volume growth cm^3/tree

2800
2400
2000
1600
1200
800
400

ab
ab
ab
ab
ab
bc
bc
a
ab
ab

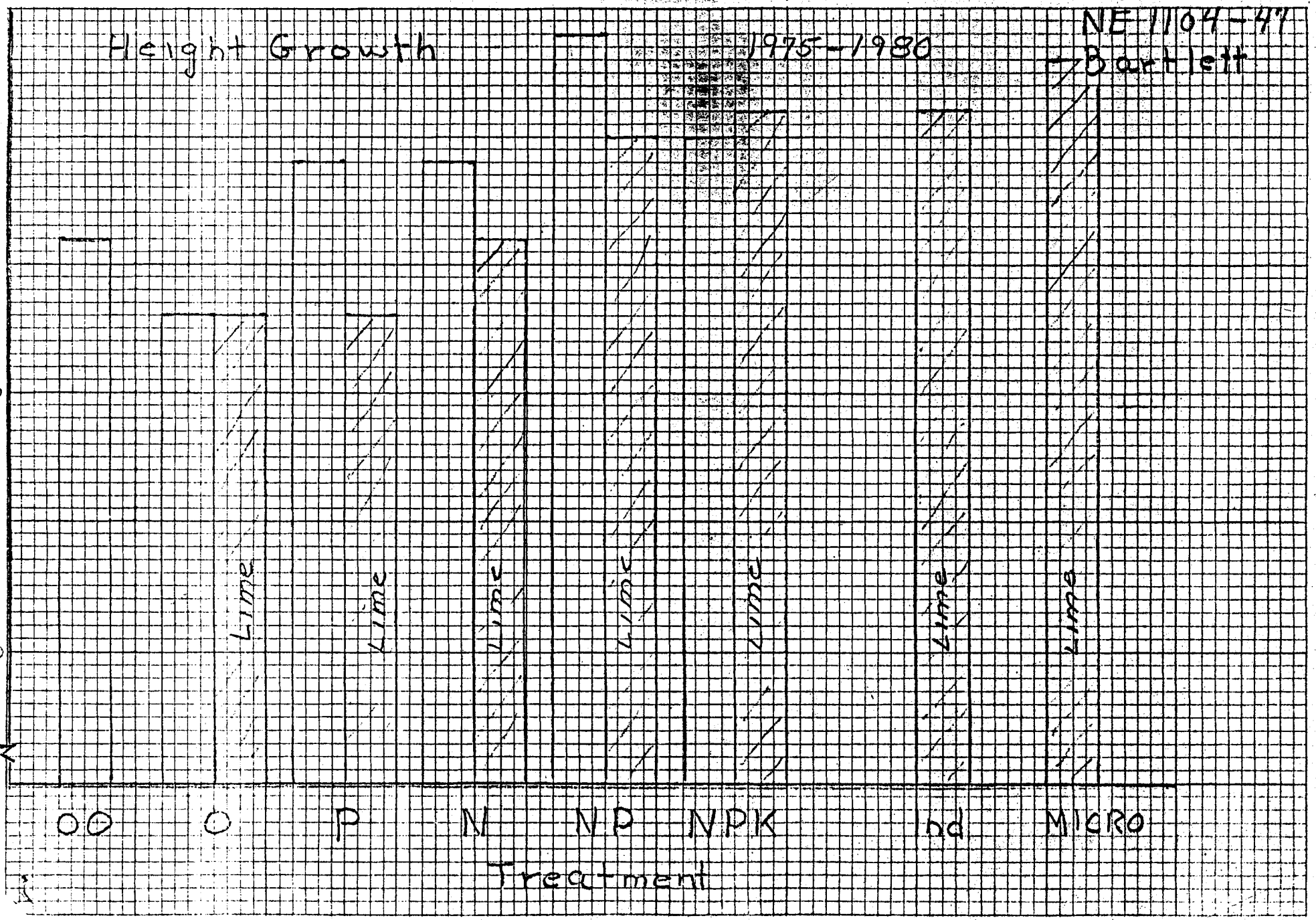
No lime
Lime

Thin

ND
NOV
IND

Diameter Growth 1975-80

NE 1104-47
Bartlett



REHABILITATION STUDY

CPT. 18 & 20

BARTLETT EXP. FOREST

1968

SCALE 1 " = 2 CHAINS

Gross Area - 7.10 Acres

Study Area - 5.28 Acres

Plot Size - 1.1 x 4.0 Chains = 0.44 Acres

TREATMENTS

A - Control

B - Direct Seeding

C - Seed + Lime + Fertilizer L

D - Seed + Lime + Fertilizer H

QUANTITIES

Seed - 1.5 lbs. per acre (YB-1.0:PB-0.5)

Lime - 1 ton/acre

Fertilizer L - 0.5 ton/acre (NPK:15-10-10)

Fertilizer H - 1.5 tons/acre (NPK:15-10-10)