

A DIGEST OF SILVICULTURAL RESEARCH
AT GREEN RIVER, NEW BRUNSWICK

by

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ABSTRACT

This report lists all silvicultural projects conducted at Green River, New Brunswick, since 1945, by the Maritimes Forest Research Centre of the Canadian Forestry Service and its antecedent agencies. It is mainly a summary of each project giving the number, title, status, objective, work done, and reports written: the results are not summarized. However, some generalized results are included in an introductory section, and brief summaries of most of the publications are included.

RESUME

On trouvera dans le présent rapport un répertoire complet de tous les projets sylvicoles mis en oeuvre depuis 1945, à Green River, Nouveau-Brunswick, par le Centre de recherches forestières des Maritimes du Service canadien des forêts et les organismes qui l'ont précédé. Il s'agit principalement d'un résumé de chacun des projets avec son numéro, le titre, le statut, le but visé, le travail accompli, et des rapports écrits à son sujet. Les résultats obtenus ne sont pas résumés. Cependant, certains résultats d'ordre général sont inclus dans une section d'introduction ainsi que de brefs sommaires de la plupart des publications.

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INTRODUCTION

This report is a summary of all the silvicultural research conducted in the Green River Watershed of northwestern New Brunswick by the Maritimes Forest Research Centre (MFRC) and its antecedent agencies.

In 1945, a research program in management, silviculture, and mensuration was begun as part of a larger program called the Green River Project, which was initiated to study the spruce budworm. The management and protection problems associated with an expected outbreak of this forest pest were the focus of much of the early work, but emphasis gradually shifted to studies of silvicultural problems, in particular to trials of planting softwoods, cleaning and thinning in young fir stands, and controlling mountain maple. Ecological assessments and studies in forest productivity were also conducted.

Most of the information in this report has come from the following unpublished sources: (a) project summary statements prepared for each project during the period 1940 to 1960, (b) administrative files, and (c) reports contained in what is known as the Maritime Binder Report File. Additional information has been obtained from persons working on the only project still active, "Tree and Stand Growth Modelling, project MC-12".

In the following sections, groups of projects are discussed according to subject and only general results are given. It is hoped that these generalizations are meaningful, reasonably correct, and are not over-simplified. The final section is a potpourri of miscellaneous projects and studies not part of the Green River series.

The appendix contains a summary statement for each of the projects in the Green River series, M-400 to M-450, similar statements for an older Green River project, M-6, and for a Maritime project on mountain maple, M-98, which was largely conducted at Green River. Each summary statement includes the number, title, when initiated, present status, objective, a brief description of the work done and a list of all known written reports. Generally, the results of each project are not included, but the important results in most of the published reports are summarized. Reprints of some of these publications are available

at the MFRC. The unpublished reports were produced in limited numbers and in most cases are available only in the Report File at the MFRC; photocopies of these can be supplied on special request. A list of miscellaneous reports, not part of any particular project but containing material of interest, is also included.

In addition to the material presented here and that in the files and records mentioned, a set of index maps and detailed layout maps are available from the staff of MFRC responsible for project MC-12.

DEVELOPMENT IN NATURAL STANDS

Many different projects were established at Green River to study the growth and development of natural stands or to monitor developments in the natural forest. In all, 14 projects monitored everything from vegetation development following a wildfire, to the effects of the spruce budworm outbreak (1950 to 1957) on softwood regeneration and immature softwood stands. The most extensive studies were on five Research Blocks established in different parts of the watershed (Fig. 1). The reports included information on standing volume, growth rates, and amount of reproduction by the original cover types in each block at the time of measurement.

The data on growth and development for naturally developing stands on the Research Blocks reveal that the Green River forest is fast-growing. For example, a spruce-fir stand that originated following a wildfire in 1899 showed a standing merchantable volume, at 53 years of age, of about 2540 ft³/acre, a mean annual increment of 48 ft³ of merchantable wood per acre. Similar and sometimes higher growth rates have been observed in other studies.

NATURAL REGENERATION

Five projects were established to assess natural regeneration in cutovers and to identify the factors contributing to or hindering natural regeneration success (M-422, M-430, M-431, M-434, and M-435). Data on stocking, and the number of seedlings per acre were obtained in

most of the selection and partial felling trials, and in two shelterwood trials which were conducted in softwood stands (M-418 and M-442).

Except in the mixedwood stands with a mountain maple understory, natural regeneration is generally moderate to abundant. This regeneration is comprised of and is roughly in the same proportions as the tree species in the main stand or the former main stand. An exception is the regeneration of spruce which is frequently less than the proportion of spruce in the former stand.

In cutover softwood forests, regeneration is frequently patchy; areas having sparse regeneration are interspersed with areas having very dense regeneration. This condition is particularly characteristic of balsam fir. The type of logging operation, particularly the size of slash piles and the damage to advance growth, appears to have been the main factor contributing to the patchy distribution of natural regeneration. The most serious regeneration problem on the watershed is the lack of suitable regeneration in the mixedwood forest where mountain maple is prevalent.

MOUNTAIN MAPLE AND ITS CONTROL

Early in the history of the Green River Project, mountain maple was recognized as a curse on the rich mixedwood sites (middle slopes in the southern part of the watershed and upper slopes and hilltops in the northern boreal forest). Several projects were established to study the silvics of mountain maple and to assess various means of control, such as herbicide application, controlled burning of slash, and scarification (M-410, M-417, M-424, M-437, and M-441). Planting has been conducted on many of these applied control trials (M-98).

Regeneration of mountain maple is mainly by root-collar sprouting, by seed, and to a lesser extent by stem layering. The whole plant (clump) has to be killed to control its further development. Herbicide application (aerial and ground application of brushkill), burning slash, and scarifying have been tried on a small scale with little success. Both the aerial and ground (mist blower) applications of brushkill proved ineffective. Usually a good "top-kill" was obtained but the remaining living stems sprouted vigorously. Scarification and piling

the removed debris are fairly effective but much space is lost where the debris is piled. Burning also appears effective if a hot slash burn can be achieved but conditions suitable for hot slash burning are infrequent, if not rare, at Green River.

Plantings can be readily established in scarified and burned areas but these may require release from naturally developing vegetation. The J.D. Irving Company is successfully converting large areas of natural mixedwood and hardwood forest (some with mountain maple) to softwoods (mainly spruce) by crushing the mixed- and hardwoods and replanting, followed by one to three herbicide treatments to control unwanted hardwood shrubs and trees.

PLANTING TRIALS

Early planting trials at Green River were attempted in a cutover mixedwood stand, on winter strip roads, and on bulldozed haul roads to ascertain whether reforestation could be undertaken and whether the planting of spruce on strip and haul roads might contribute to a higher spruce component in the next stand (M-419 and M-433). A third trial was established to assess the problems and successes of converting a cutover tolerant hardwood stand to softwood by scarifying and planting white spruce (M-444). Later, several plantings were established in conjunction with trials for controlling mountain maple (M-98). Nearly all the plantings showed good to excellent early survival, except where the seedlings were planted in deep humus or where they were smothered by luxuriant lesser vegetation (grasses, raspberry, and bracken fern) and snow. Survival and growth over the longer term have not been favorable because severe competition developed in many of the plantings. The locations of all planting trials are shown in Fig. 1.

No follow-up measurements have been conducted in any plantation since 1968. Remeasurement assessment might provide much information useful in a reforestation program.

THINNING TRIALS

One thinning trial in an immature (30-year-old) softwood stand was established in 1948 by Fraser Companies Ltd. in cooperation with the

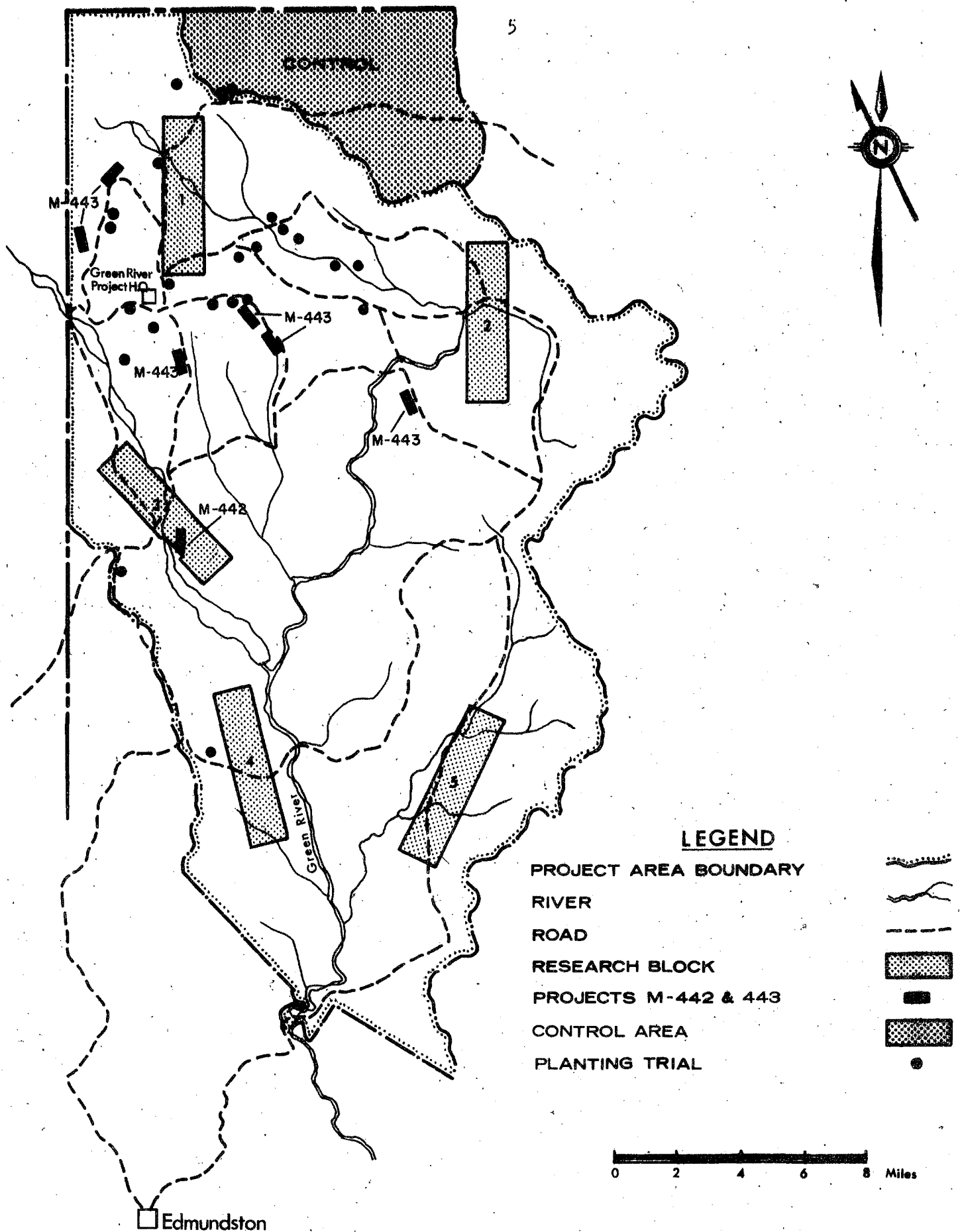


Fig. 1. Sketch map showing Green River Project Area and Locations of Research Blocks, Spacing Studies, A Shelterwood Experiment and Planting Trials.

Pulp and Paper Research Institute of Canada (M-447), and in 1953 an individual tree release study was established by staff of the MFRC in a similar stand (M-432). Both trials suffered severe defoliation by budworm in the 1950's but the MFRC project provided much data on individual tree growth rates.

A series of thinning trials in young, (about 10-to 20-year-old) fir stands was established in 1959, 1960, and 1961 and a fourth trial was established in 1967 (M-443) (Fig. 1). Each trial consisted of one or two blocks each containing several residual spacings and control plots. Remeasurements and "touch-up" thinning treatments have been maintained in all of these trials and the project is currently active as project MC-12 study 02-011. No attempt is made to present any results here. The individual tree data are on computer tape and growth rates in the different spacings are being compiled as remeasurement data are collected.

MISCELLANEOUS PROJECTS

Several projects in selection felling or partial cutting were established in mature softwood stands (M-408, M-425, and M-428) but had to be discontinued because all stands suffered severe wind damage except those in project M-408, where wind damage was moderate. Thus, partial felling cannot be recommended for mature softwood stands at Green River.

Other projects investigated tree utilization and amount of cull (M-416), problems of collecting suitable height/age data (M-438), and problems of site classification (M-420, M-421, M-440, and M-446).

A major study "Production in Immature Fir Stands" (M-450) was conducted between 1962 and 1970. Many of the results have been published and individual tree data have been transferred to the active study MC-12-02-011.

Several other field trials or experiments, not part of the Green River series, were done, partially or wholly, in the Green River Watershed. They are identified and are briefly described as follows:

(a) Former Maritime Project M-95: Balsam Fir Provenance Plantings, 1956 Sowing

The work was done in several areas in the Maritimes but most of the provenances are represented in a planting established in 1960 on the Macdonald Brook burn in the northwestern part of the watershed. The establishment report is listed with the miscellaneous reports (MacGillivray 1963).

(b) Former Maritime Project M-353: Preliminary Trials of Norway Spruce in the Maritime Provinces, 1957 Sowing

This project at Green River includes one trial planting of many of the provenances tried elsewhere in the Maritimes. Several provenances of Norway spruce and some white spruce were planted in the spring of 1961 on a scarified hilltop above the Green River Field Station, adjacent to the road from the Field Station to Third Lake.

Little work has been done on this planting since its establishment. Hardwood competition was given a herbicide treatment in late summer, 1972.

(c) Former Maritime Project M-360: Red Spruce Provenance Test 1959 Germination

In 1963, red spruce seedlings were planted on a scarified hilltop just south of the junction of the main road from Iroquois Gate to the Green River Field Station, and the road to Basley Depot.

Records are filed under Experiment 18-A of study 02-022 of Maritime project MC-08. Little work has been done on this planting since its establishment. Hardwood competition was given a herbicide treatment in 1972.

(d) Hydro-Axe Trial

A trial of the hydro-axe was established in 1972 near the Green River Field Station to determine if shrub and tree growth could be destroyed in a cutover mixedwood slope. The area is about one-quarter mile from the Station on the road to the Kedgwick Watershed and just down slope from sample areas under project M-437. Spruce was planted in 1973, but this planting failed because grass and snow smothered the seedlings.

(e) Marttiini Plow Demonstration

In the fall of 1971, the Marttiini cutover plow was demonstrated in various locations throughout the Maritimes. One location was about 1 mile from the Green River Field Station on the road to Third Lake. This area was planted by MFRC staff in the spring of 1972, but the planting has never been formally assessed. A report on the establishment of these plowing trials is listed under miscellaneous reports (Wile 1974).

(f) 1968 Planting: Belone Brook Road

In May 1968, staff of the MFRC planted an area, scarified by Fraser Companies Ltd. along the Belone Brook Road, with seedlings of balsam fir, spruce, pine, and Douglas fir. No formal reports or assessments have been made on this planting.

Appendix A

Summary of each project

Miscellaneous reports

M-400: Forest Management Plan, Green River Management Area

Initiated: 1945

Status: In abeyance: Files on this project were transferred to study M-002 (Stand Development, Growth and Management Planning, Green River Watershed of northwestern New Brunswick) in 1967. Study M-002 has been in abeyance since 1971 following completion of the second 10-year remeasurement on the Research Blocks (Details are given in the next five statements).

Objective: To prepare a management plan for the Green River Watershed that will:

- (1) provide a continuous supply of white spruce and balsam fir pulpwood for the Edmundston mill of Fraser Companies Ltd.
- (2) eradicate the danger of insect infestation by silvicultural means, specifically to minimize losses from a spruce budworm outbreak anticipated within the next 8 years (after 1947).
- (3) demonstrate the proper management of a large spruce-balsam fir forest.

Work Done: General information on the forest and the status of spruce budworm at Green River, data on forest types and volumes collected by Fraser Companies Ltd. on temporary sample plots, and data on stand volumes and growth collected by the MFRC on Research Blocks 1 to 5 from 1945 to 1949 were used to prepare a management plan in 1950. A summary of this plan was published in 1955.

The allowable-cut figure for softwood was revised upwards in 1958 by Fraser Companies Ltd. and again (slightly) in 1965 by a sub-committee of the Green River Work Committee.

Published Report:

Nickerson, D.E. and A.B. Vincent. 1955. A summary of the management plan for the Green River area of New Brunswick. Can. Dep. North. Aff. and Nat. Res., For. Res. Div., Tech. Note No. 7.

The plan provided for (1) clear cutting large stands of merchantable fir and spruce in the northern part of the watershed which were thought to be highly susceptible to damage from an expected budworm outbreak; (2) gradual conversion, where possible, to partial cutting every 20

years; and (3) an annual allowable cut of 50,000 cunits for the first decade, gradually increasing to an annual cut of 75,000 cunits by the year 2010.

Unpublished Report:

Nickerson, D.E. 1950. Green River management plan. Binder Report No. 80 at MFRC.

M-401: Research Block No. 1, Green River

Initiated: 1945

Status: In abeyance: Files on this project were transferred to study M-002 in 1967. No work has been conducted on Research Block No. 1 since the 1970 remeasurement.

Objective: To obtain information on forest conditions and data on volumes and growth in a 4000-acre area in the northwestern part of the Green River Watershed to assist in producing and updating a management plan for the watershed.

Work Done: Six hundred and eleven, 0.1-acre line plots were established in Block 1 in 1945. In 1950, 599 of the plots were remeasured. It was then decided to reassess all acceptable plots every 10 years. In 1960, 576 were remeasured and 229 were partially remeasured in 1970. Reports on stand conditions, rates of growth, amounts of reproduction, etc. were prepared after establishment and after each remeasurement. Most of this block was cut over for softwood pulpwood in the 1940's, some of it after the plots were established in 1945.

Published Report:

Vincent, A.B. 1955. Development of a balsam fir and white spruce forest in northwestern New Brunswick. Can. Dept. North. Aff. Nat. Res., For. Res. Div., Tech. Note No. 6.

The 1950 remeasurement of the 600 0.1-acre line plots established in this research block in 1945 revealed that:

(1) For uncut stands, the periodic net merchantable volume increment of softwood was only 34 ft³/acre/year.

- (2) Mortality was high during the remeasurement period.
- (3) Softwood reproduction was rated adequate on about 79% of the area: the poorest reproduction occurred on cutover mixedwood.

Unpublished Reports:

Nickerson, D.E. 1946. Report on initial examination of Research Block No. 1. Green River management area. Binder Report No. 24 at MFRC.

Vincent, A.B. 1951. Report on 1950 remeasurement of Research Block No. 1. Binder Report No. 47 at MFRC.

Hughes, E.L. 1963. Forest Development on Research Block 1, north-western New Brunswick, 1950 to 1960. Mimeo Report 63-M-22. Binder Report No. 364 at MFRC.

Meikle, O.A. 1972. Forest growth and development on Research Block 1 in the Green River Catchment, 1950 to 1970. File Report at MFRC.

M-402: Research Block No. 2, Green River

Initiated: 1946

Status: In abeyance: Files on this project were transferred to study M-002 in 1967. No work has been conducted on Research Block No. 2 since 1961.

Objective: To obtain information on forest conditions and data on volumes and growth in a 4000-acre area in the northeastern part of the Green River Watershed to assist in producing and updating a management plan for the watershed.

Work Done: About 640, 0.1-acre line plots were established in 1946 in Block 2. Remeasurement of all acceptable plots was conducted in 1951 (636 plots) and 1961 (627 plots). No remeasurement was conducted in 1971. This is the only Research Block that does not provide some growth and development data for the second 10-year remeasurement cycle (1961 to 1971).

Reports on forest growth and developments were prepared after establishment and following remeasurement in 1951 and 1961. Most of this block was cutover for softwood pulpwood just prior to, or immediately after, the 1961 remeasurement.

Unpublished Reports:

Nickerson, D.E. 1947. Report on initial examination of Research Block No. 2, Green River. Binder Report No. 25 at MFRC.

Vincent, A.B. 1952. Report on 1951 remeasurement of Research Block 2. Binder Report No. 64 at MFRC.

Goldrup, B.T. 1963. Forest development on Research Block 2, Green River. Mimeo Report 63-M-22. Binder Report No. 366 at MFRC.

M-403: Research Block No. 3, Green River

Initiated: 1947

Status: In abeyance. Files on this project were transferred to study M-002 in 1967 and no further work has been done.

Objective: To obtain information on forest conditions and data on volumes and growth in a 4000-acre area in the west central part of the Green River Watershed to assist in producing and updating a management plan for the watershed.

Work Done: In 1947, 626 permanent 0.1-acre line plots were established in Block 3. The block was completely remeasured in 1957 (620 plots) and partially remeasured in 1967 (234 plots). Reports on forest conditions, stand volumes, and growth rates were prepared after establishment and after each remeasurement. Some softwood stands in the southern part of this block were cut-over for pulpwood between 1935 and 1940; the northern half was cut-over for softwood pulpwood in the early 1950's.

Published Report:

Hughes, E.L. 1967. Forest development in northwestern New Brunswick 1947-1957. Can. Dep. For. Publ. No. 1054.

The most interesting developments for Research Block 3 for the period 1947 to 1957 were:

(1) Periodic annual net increment (including wood harvested) of fir and spruce averaged $31 \text{ ft}^3/\text{acre}$. Periodic annual gross increment for these species averaged $44 \text{ ft}^3/\text{acre}$.

(2) New stands of fir and spruce develop rapidly in most cutover softwood stands but fir and spruce reproduction is not adequate in mixedwood

where cutting of softwoods and mortality of birch have resulted in the rapid growth of mountain maple.

(3) Yields from the study area could be increased to about 60 ft³/acre/year by using all species, and by silvicultural management designed to increase stocking.

Unpublished Reports:

- Nickerson, D.E. 1948. Report on the initial examination of Research Block No. 3, Green River. Binder Report No. 26 at MFRC.
- Hughes, E.L. 1960. Report on remeasurement of Research Block 3, 1957. Binder Report No. 281 at MFRC.
- Meikle, O.A. and E.L. Hughes. 1971. Forest growth and development on Research Block 3 in the Green River Catchment, 1947 to 1967. File Report at MFRC.

M-404: Research Block No. 4, Green River

Initiated: 1948

Status: In abeyance: Files on this project were transferred to study M-002 in 1967. No work has been conducted on this block since the 1968 remeasurement.

Objective: To obtain information on forest conditions and data on volumes and growth in a 4000-acre area in the southwestern part of the Green River Watershed to assist in producing and updating a management plan for the watershed.

Work Done: Block 4 was established in 1948 near Halfway Depot when 621, 0.1-acre line plots were established and measured. All acceptable plots were remeasured in 1958 and a partial remeasurement was conducted on 160 plots in 1968. Reports on forest conditions, stand volumes, growth rates, and amounts of reproduction were prepared after establishment and after the two remeasurements. Softwood and mixedwood stands in this block were cut-over for softwood pulpwood in the 1930's.

Unpublished Reports:

- Nickerson, D.E. 1949. Report on initial examination of Research Block No. 4, Green River management area. Binder Report No. 27 at MFRC.

Hughes, E.G. 1962. Progress Report: Stand development on Research Block No. 4, northwestern New Brunswick. Binder Report No. 331 at MFRC.

Meikle, O.A. 1972. Forest Growth and development on Research Block 4 in the Green River catchment, 1948 to 1968. File Report at MFRC.

M-405: Research Block No. 5, Green River

Initiated: 1949

Status: In abeyance: Files on this project were transferred to study M-002 in 1967. No work on this block has been conducted since the 1969 remeasurement.

Objective: To obtain information on forest conditions and data on volumes and growth in a 4000-acre area in the southeastern part of the Green River Watershed to assist in producing and updating a management plan for the watershed.

Work Done: About 640 plots were established in Block 5 in 1949. Most of these plots were remeasured in 1959 and 152 plots were remeasured in 1969. Reports on cover types, volumes, and growth rates were prepared after establishment and after the two remeasurements. Cutting in a portion of the softwood and mixedwood stands was conducted just prior to the 1959 remeasurement; the remainder of the softwood and mixedwood types were cut-over for softwood pulpwood in the early 1960's.

Unpublished Reports:

Vincent, A.B. 1950. Report on initial examination of Research Block No. 5, Green River. Binder Report No. 28 at MFRC.

Hughes, E.L. 1963. Forest development on Research Block 5, Green River project area, 1949 to 1959. Mimeo Report 63-M-1. Binder Report No. 354 at MFRC.

Meikle, O.A. 1972. Forest Growth and development on Research Block 3 in the Green River catchment, 1949 to 1969. File Report at MFRC.

M-406: Interpretation of Aerial Surveys

Initiated: 1947

Status: Closed 1954

Objective: To check aerial data, by ground cruise, with particular reference to age-class, stand description, and growth.

Work Done: Data on tree age, height, and diameter class were collected from temporary sample plots. Information was used by the Forest Inventories Section, Forestry Branch, Ottawa to prepare forest-type maps of the Green River Watershed.

Reports: Nil

M-407: Net Periodic Merchantable Increment, Mature Mixedwood, Green River

Initiated: 1946

Status: Closed 1967

Objective: To establish whether net periodic merchantable volume increment can be obtained from periodic tallies of a few permanent plots; one plot to be cut and the wood scaled at establishment and others to be cut at various intervals.

Work Done: Four 1-acre plots were established in 1946. The trees of one plot were felled and the wood scaled in 1947. The three remaining plots were remeasured in 1956. A second plot was harvested and the wood scaled in 1956-57. The plots were remeasured in 1966 but no further work has been done.

The results of the work to 1957 indicated that this method of obtaining the net periodic increase in the merchantable volume of sound wood was impractical, mainly because the proportion of cull varied from plot to plot. However, the data on growth and development were informative and the results have been published.

Published Report:

Hughes, E.L. 1960. Nine years of developments in a mature mixedwood stand, Green River, New Brunswick. For. Chron. March 1960.

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Growth data collected on three permanent 1-acre plots established in 1947 and remeasured in 1956 indicate:

- (1) growth capacity of the site may be as high as 79 ft³/acre/year.
- (2) birch trees weakened by "dieback" do not compete with softwoods, and
- (3) mortality of birch attributed to dieback, is causing the stand to evolve from a mature mixedwood to an irregularly-aged softwood stand.

Unpublished Reports:

Vincent, A.B. 1950. Establishment of Project M-407 - Net periodic merchantable increment mixedwood stands. Binder Report No. 29 at MFRC.

Hughes, E.L. 1958. Net periodic merchantable increment, mature mixedwood stand, Green River. Binder Report No. 196 at MFRC.

M-408: Purvis Brook Cutting Experiment, Research Block No. 1, Green River

Initiated: 1946

Status: Data and files on this project were transferred to Study M-012 in 1967. Closed 1970.

Objective: (1) To test the commercial feasibility and to record the effects of partial cutting in typical mature stands in Section No. 1 of the Green River Management Area,

(2) to lessen the danger of spruce budworm infestation by cutting mature balsam fir, and

(3) to obtain accurate cost data.

In 1959, G.L. Baskerville restated the objectives; (1) to determine the feasibility of managing the area for maximum yield under the periodic selection system, (2) to record the effects of partial felling, and (3) to determine the relative silvicultural merits (e.g. total yield) of this form of silviculture in comparison with clear cutting.

Work Done: In 1946, an 85-acre, maturing softwood stand was selected in the southern part of Research Block No. 1 in which to study periodic partial fellings. Stand data were collected on permanent sample plots: the stand was marked for felling and was partially cut in the winter of

1946-47. Post-cut data were obtained in 1947. In 1956, the permanent sample plots were remeasured and trees were marked prior to a second partial felling operation in the early winter of 1956-57. Post-cut tallies were again obtained in 1957.

In 1966, plots in the study area were retallied, the stand was marked for its third felling, and was harvested during the following winter. This is the only partially-felled areas at Green River where the residual stand was not damaged severely by wind: all other stands suffered such severe damage after 1947 and 1959 windstorms that the projects were closed.

Published Reports:

Baskerville, G.L. 1960. Conversion to periodic selection management in a fir, spruce and birch forest. Can. Dept. North. Aff. Nat. Res., Res. Div., Tech. Note No. 86.

A patchy, uneven-aged stand of fir, spruce, and birch is being converted, by partial fellings at 10-year intervals, to a periodic selection system of management.

Although mortality in this stand has been high, mostly windfall of decadent fir, a comparison of the 1956 stand structure with that of a theoretical selection form, indicates a rapid approach to the selection structure.

Croome, G.C.R. 1970. A Trial of selection management in a mature fir-spruce-birch forest. For. Chron. Vol. 46, No. 4, August 1970.

This report presents the results of converting a patchy several-aged stand to a selection form, following three periodic partial fellings in 1947, 1956, and 1966. Although the forest as a whole now has an uneven-aged structure, there are only a few small areas of true selection forest. Growth of merchantable wood has increased over the past 10 years and is now 0.9 cord/acre/year; this is slightly higher than the growth on an adjacent commercial clear cut (1947) but the standing volume on the clear cut is higher.

It is suggested that the selection system might be suitable for small companies and woodlot owners, provided skilled labor and management are available.

Unpublished Reports:

Nickerson, D.E. 1947. Investigation of wind damage on partial cutting area - Research Block No. 1 Green River. Report on file M-012 (M-408) at MFRC.

Vincent, A.B. 1950. File report, 1946-1949 - Partial cutting experiment Purvis Brook, Research Block No. 1, Green River management area. Binder Report No. 30 at MFRC.

Nickerson, D.E. 1950. Wind damage in partially cut stands Green River N.B. Report on file M-012 (M-408) at MFRC.

Hughes, E.L. 1957. Progress report, 1956 - Purvis Brook cutting experiment Research Block 1, Green River. Binder Report No. 161 at MFRC.

Baskerville, G.L. 1959. Purvis Brook cutting experiment, Research Block 1, Green River. Binder Report No. 224 at MFRC.

Croome, G.C.R. 1968. Purvis Brook cutting experiment Research Block 1, Green River. Internal Report M-26 at MFRC.

M-409: Salvage Cutting on Old Log Cuts, Green River

Initiated: 1949

Status: Closed: Project was withdrawn following preliminary discussions

Objective: Not established

Work Done: Nil

Reports: Nil

M-410: Fire as a Control of Mountain Maple, Green River

Initiated: 1948

Status: Closed in 1950

Objective: To find the effect of fire on mountain maple

Work Done: Five 1-acre permanent sample plots (P.S.P. 15-19) were established in 1948 in stands of mountain maple along the road from Summit Depot to Pemouet Brook. Fire guards were prepared around some of these plots in preparation for controlled burning and detailed descriptions

of trees, shrubs, and ground vegetation were obtained on each plot. Controlled burning was not conducted and the project was closed. The plots were later used in projects M-417 and M-419.

Unpublished Report:

Vincent, A.B. 1948. Establishment of Project M-410. Fire as a control of mountain maple. Binder Report No. 31 at MFRC.

M-411: Lake Branch Cutting Experiment (1899 Burn), Research Block No. 3, Green River

Initiated: 1947

Status: Closed 1956

Objective: To develop suitable commercial cutting methods for application to second-growth stands so that continuous yield may be maintained and hazard from spruce budworm may be kept at a minimum.

Work Done: About 500 acres of a 44-year-old spruce and balsam fir stand on Research Block 3 were selected. One-tenth of this stand was to be partially felled each year (after marking). No cutting was ever conducted.

Unpublished Report:

Vincent, A.B. 1948. Establishment of Lake Branch experimental cutting area. Binder Report No. 32 at MFRC.

M-412: Green River Volume Tables and Diameter - Height Curves

Initiated: 1949

Status: Closed in 1954

Objective: To maintain a complete file of volume tables and diameter-height curves for Green River.

Work Done: Some local volume tables were assembled in 1949-50 but this project was closed because such data are an integral part of particular projects.

Reports: Nil

M-413: Net Periodic Merchantable Increment, Second-Growth Softwood
P.S.P. 5, 6, 7, and 8 Green River

Initiated: 1947

Status: Closed 1958

Objective: To determine the net periodic merchantable increment in a second-growth softwood stand.

Work Done: Four 1-acre sample plots were established in 1948 in a second-growth softwood stand in Research Block 3. Felling and scaling was to be similar to that under project M-407. No harvesting was conducted and the project was closed.

Reports: Nil

M-414: Comparison of Costs Between Partial Cutting on the Purvis
Brook Experimental Cutting Area and Contiguous Clear Cut

Initiated: 1949

Status: Closed in 1954

Objective: To compare costs of partial-cutting and clear-cutting operations.

Work Done: Costs were recorded in different felling operations and a cost comparison was made and appended to the report on project M-408 (Binder Report No. 30 under project M-408).

Reports: Nil

M-415: Comparison of Costs Between Partial Cutting on Lake Branch
Cutting Area and Adjacent Clear Cut

Initiated: 1949

Status: Closed

Objective: See project M-414

Work Done: Nil

Reports: Nil

M-416: Cooperative Utilization Studies

Initiated: 1947

Status: Closed 1950

Objective: (1) To provide information on the amount of cull being encountered and the wastage of sound wood at present taking place on clear-cutting operations for spruce and fir pulpwood on the Green River management area,

(2) to provide cull factors and factors for allowable waste so that inventory or operating cruise estimates, based on volume of living trees with no regard for cull, may be corrected to read in terms of the obtainable amount of sound spruce and fir pulpwood of merchantable size, and,

(3) to develop suitable methods of achieving the above purposes.

Work Done: In 1948, 15 stands were selected for cutting. Standing volumes were compiled from standing tree measurements, then the stands were felled, the trees were cut into pulpwood lengths, and the wood was piled and scaled. The amount of cull and waste was measured. Eleven additional samples were selected, cut, and measured in 1949 and a further 12 samples were obtained in 1950.

For all 38 samples, cull varied from 1.3 - 19.4%, and waste varied from 0.5 - 16.9%.

Published Report:

Nickerson, D.E. 1949. A Possible Source of Error in Determining Converting Factors for Four-Foot Wood. Can. Dom. For. Serv. Silvicultural Leaflet No. 30.

Accurate measurements of the volume of piled wood were obtained for a series of utilization studies. It was found that diameter measurements taken on only one side of the piles (the side next to the haul road) produced high estimates with errors ranging from 1.0 to 4.5%. It was necessary to measure diameters of individual sticks on both sides of each pile to obtain an accurate estimate of cubic volume.

Unpublished Reports:

Nickerson, D.E. 1950. Cull and waste on pulpwood operations on Green River management area, 1948. Binder Report No. 33 at MFRC.

- Vincent, A.B. 1950. Cull and waste on pulpwood operations, Green River management area, 1950. Binder Report No. 34 at MFRC.
- Nickerson, D.E. 1950. Cull and waste on pulpwood operations, Green River management area, 1949. Binder Report No. 141 at MFRC.

M-417: Release of Young Conifers from Shrub Vegetation (P.S.P. 18 and 19

Initiated: 1948

Status: Closed. Data and files were transferred to project M-449 in 1959, to study M-012 in 1967, and is now closed.

Objective: To find the effect of releasing suppressed spruce and fir reproduction from shrub competition.

Work Done: Two 1-acre plots, originally established for project M-410, provided one control plot and one where all spruce and fir reproduction was given crown release to a radius of 3 ft. The two plots were remeasured in 1949 (after cleaning) and again in 1951, 1953, and 1958. Several reports and publications were prepared on the effect of releasing small softwood reproduction.

Published Reports:

Vincent, A.B. 1954. Release of Balsam Fir and White Spruce Reproduction from Shrub Competition. Canada Dept. North. Aff. Nat. Res., Div. For. Res. Silvicultural Leaflet No. 100.

A mixedwood stand, cut-over for softwood pulpwood in 1941, had developed into a dense stand of mountain maple 8 yr later. The mountain maple displayed a dense, closed canopy up to 14 ft high and about 6800 stems/acre. Stocking to softwood varied in the study area from 40 to 60%, all overtopped by the shrub canopy. By 1953, the annual growth of softwood seedlings released in 1949 was about three times greater than similar unreleased seedlings.

Baskerville, G.L. 1959. Softwoods respond to weeding. Pulp & Pap. Mag. Can. Woodl. Rev. Aug. 1959.

The release treatment of 1949 was still effective in 1958, by then about 450 softwoods per acre had grown above the mountain maple canopy. On the control plot, all softwoods were still overtopped. The greatest

relative response to the treatment was displayed by softwood seedlings that were 2 ft high in 1949. Their growth in the following 9 yr was 6.8 times greater than similar seedlings in the control plot.

Baskerville, G.L. 1961. Response of young fir and spruce to release from shrub competition. Can. Dept. For. Tech. Note No. 98.

See results under Baskerville, G.L. 1959. Softwoods respond to weeding.

Unpublished Reports:

Vincent, A.B. 1950. Release of young conifers from shrub competition.

Binder Report No. 38 at MFRC.

Vincent, A.B. 1952. Release of young conifers from shrub competition.

Binder Report No. 64 at MFRC.

Vincent, A.B. 1953. Release of young conifers from shrub competition.

Binder Report No. 99 at MFRC.

M-418: Shelterwood Cutting in a Spruce-Balsam Stand, 70-Year Burn, Green River

Initiated: 1950

Status: Closed 1954. Unauthorized cutting of white birch spoolwood caused the premature closing of this project.

Objective: To find the intensity of initial shelterwood cutting that will best encourage advance reproduction of spruce and fir on a 70-year-old burn, north of Research Block 3, Green River.

Work Done: Nine 1-acre plots were established in a 20-acre softwood stand in a modified Latin square design and treatments were assigned as follows: 60% removal, 30% removal, and uncut control (3 replications). Transects were run and trees were cut in 1950 to obtain information on reproduction. Stand tallies on the 1-acre plots and reproduction records on the transects were obtained before and after cutting in 1950, 1951, and 1953. Disturbance by unauthorized cutting in 1952 ruined this experiment and the project was closed.

Published Report:

Vincent, A.B. 1952. Logging damage to spruce and fir advance growth.

Can. Dept. North. Aff., Nat. Res. Div. For. Res. Silvicultural
Leaflet No. 69.

About 37,000 balsam fir and 260 spruce seedlings per acre were present as advance growth in a 60-year-old stand of fir and spruce in 1950. Two levels of harvest felling were conducted in this stand in 1950: 30% and 60% of the merchantable volume were removed in different blocks. Neither treatment destroyed more than 22% of the seedlings less than 3 ft high. However, about 59% of the advance growth above 3 ft in height was destroyed.

Unpublished Reports:

Vincent, A.B. 1951. Shelterwood cutting in spruce-balsam stand, 70-year-old burn, Green River. Binder Report No. 50 at MFRC.

Vincent, A.B. 1951. Remeasurement of reproduction one year after shelterwood cutting, Green River, New Brunswick. Binder Report No. 51 at MFRC.

Vincent, A.B. 1954. Shelterwood cutting in a mature spruce-balsam stand on a 70-year-old burn, Green River. Binder Report No. 114 at MFRC.

M-419: Planting Spruce in Mixedwood Cutover, P.S.P. 15, 16, and 17

Initiated: 1950

Status: Closed 1967

Objective: To determine whether white and red spruce can compete against shrubs when seeded and planted in a mixedwood cutover three years after cutting.

In 1953, two of the plots were heavily sprayed with brushkill and the objective of the trial was changed to read "The planted stock will be used to record growth data at such time as it appears desirable to make the necessary measurements".

Work Done: Three 1-acre plots originally established for project M-410 were used for this experiment. Red and black spruce wildlings from Acadia Forest Experiment Station were planted on plot 15 in June 1950. Seeding, as planned, was not conducted on plot 16: plot 17 was the original control plot. Vegetation conditions and/or mortality and height growth of the planted seedlings were recorded in 1950, 1951, 1953, and 1960. In August 1953, plots 15 and 16 were heavily sprayed with brushkiller and the original objective was abandoned (see above).

Published Reports:

Baskerville, G.L. 1962. A ten-year test of transplanted wild black and red spruce. For. Chron. Vol. 38, No. 4.

This trial indicates that black and red spruce seedlings can be lifted and outplanted with fair success. The black spruce seedlings exhibited a slightly superior growth rate in the first ten years.

Baskerville, G.L. 1963. White birch and pin cherry may not suppress young balsam fir. Can. Dept. For., For. Res. Branch. Mimeo Report 63-M-24.

While remeasuring spruce seedlings in 1960, it was noted that volunteer balsam fir seedlings were growing about equally well in an unsprayed area as they were in an area where the hardwood had been sprayed with herbicide seven years earlier. Hardwood development had been slowed considerably in the sprayed plot. In this instance, the hardwood competition was white birch and pin cherry. The lack of suppression to softwood seedlings displayed by these two species is in sharp contrast to the severe suppression of softwood when growing under mountain maple (project M-417).

Unpublished Reports:

Vincent, A.B. 1951. Planting in mixedwood cutover, Green River.

P.S.P.'s 15 and 16. Binder Report No. 44 at MFRC.

Vincent, A.B. 1952. Planting in mixedwood cutover, Green River.

Binder Report No. 66 at MFRC.

Vincent, A.B. 1953. Planting in mixedwood cutover Green River.

Binder Report No. 97 at MFRC.

Baskerville, G.L. 1962. Survival and total height in 1960 of natural black and red spruce seedlings planted in 1950. Project file M-419. (Also Binder Report No. 317 at MFRC).

M-420: Determination of a Forest Site Classification by Analysis of
Green River Increment Borings

Initiated: 1949

Status: Closed 1950

Objective: To study the possibility of developing a site classification system from increment borings.

Work Done: Radial increment data collected from 27 reconnaissance centres and five research blocks were used to compile height/age curves for "free" growing balsam fir at Green River. In general, the results were inconclusive.

Unpublished Report:

Bowen, M.G. 1950. Determination of a forest site classification by analysis of Green River increment borings. Binder Report No. 35 at MFRC.

M-421: Forest Site Types in the Green River Watershed

Initiated: 1949

Status: Closed 1967

Objective: "To establish a correlation between the nature of the plant community and site quality".

Work Done: No work was done on this project until 1952 when H.D. Long sampled some of the vegetation and soils near Summit Depot (Green River Field Camp). In 1953, W.G.E. Brown assisted by staff from the Maritimes Forest Research Centre conducted a more detailed assessment and set up a simple classification of forest and site quality. In 1957, O.L. Loucks developed a different site classification system based on work done at the Acadia Forest Experiment Station and Green River. His classification was based primarily on soil characteristics. Later the effects of local climate on species occurrence and distribution in the watershed were studied.

Unpublished Reports:

Brown, W.G.E. 1953. Site classification at Green River, New Brunswick.

Memorandum on file M-421 at MFRC.

Loucks, O.L. 1957. Site classification during 1957 at Acadia and Green River. Binder Report No. 186 at MFRC.

Loucks, O.L., G.L. Baskerville, and D.G. Mott. 1961. Studies of climatic variations in relation to topography at Green River. Binder Report No. 308 at MFRC.

M-422: Balsam Fir Regeneration Trends Following Moderate to Heavy Pulpwood Cuts in Softwood Stands, Green River

Initiated: 1950

Status: Closed 1962

Objective: To study the establishment and survival of balsam fir regeneration after pulpwood cuts in softwood stands to determine if subsequent stand replacement can be forecast from early records of seedling establishment.

Work Done: About 165 milliacre quadrats were located in two cutovers: the first was cut to a minimum stump diameter of 10 inches, the second to a five-inch stump diameter. Residual stands were tallied and reproduction recorded on the milliacre quadrats in 1951. Reproduction was tallied by species in 1952, 1953, and 1954: a special attempt was made to record the number of seedlings by year of origin and the mortality of each year's seedlings. Accurate data were difficult to obtain because (a) the removal of brush and advance growth in each milliacre quadrat changed natural conditions markedly, (b) the marking of individual seedlings with toothpicks proved unworkable, and (c) abnormally heavy browsing by deer caused extensive physical damage in the quadrats. In 1954, it was recommended that the project be closed because of the above difficulties.

Published Report:

Vincent, A.B. 1956. Balsam fir and white spruce reproduction on Green River Watershed. Can. Dept. North. Aff. Nat. Res., For. Res. Div. Tech. Note No. 40.

The following conclusions are based primarily on this special study of reproduction; but data were also used from the Research Blocks and from four other studies of reproduction (projects M-430, M-431, M-434, and M-435):

(1) Reproduction of spruce and fir on the cutover lands of the Green River Watershed generally provides an adequate new stand.

(2) The new stand may not be as uniform as the previous one, being too dense in some places and too open in others.

(3) On mixedwood sites, shrubs which suppress the advanced reproduction should be treated to reduce the establishment period for the new stand.

(4) The condition and distribution of seedlings on softwood cutover may be improved by more care during cutting, and by lopping tops and scattering slash.

Unpublished Reports:

Vincent, A.B. 1951. Balsam fir regeneration trends. Binder Report No. 52 at MFRC.

Vincent, A.B. 1952. Progress Report 1952. Balsam fir regeneration trends. Binder Report No. 82 at MFRC.

Vincent, A.B. 1954. Progress Report 1953. Balsam fir regeneration trends. Binder Report No. 101 at MFRC.

Vincent, A.B. 1955. Balsam fir regeneration trends. Binder Report No. 120 at MFRC.

M-423: The Origin of Young Growth Following Pulpwood Operations in Varying Forest Types, Green River

Initiated: 1950

Status: Closed 1951

Objective: To determine the proportion of advance reproduction of spruce and balsam fir in a new stand, after a mature spruce-balsam stand is cut for pulpwood.

Work Done: Preliminary planning indicated that the problem should be studied as part of project M-422.

Reports: Nil

M-424: The Formation of Stands of Mountain Maple, Green River

Initiated: 1950

Status: Closed 1953

Objective: To trace the development of stands in which mountain maple forms a conspicuous part.

Work Done: Ten small temporary sample plots were established in cut-over and uncut stands. All vegetation was tallied and on part of each plot destructive sampling was conducted to obtain age and growth rates for mountain maple. Other silvical characteristics of the species were noted.

Published Report:

Vincent, A.B. 1953. Mountain maple. Can. Dept. Res. Dev., Div. For. Res. Silvicultural leaflet No. 80.

This investigation of the silvics of mountain maple indicates that the species is most common on the mixedwood slopes, it spreads rapidly after cutting of softwoods in these mixedwoods, and when abundant, it forms a complete canopy that suppresses softwood seedlings for 30 or more years.

Unpublished Report:

Vincent, A.B. 1952. A study of the formation of stands of mountain maple, Green River Watershed, New Brunswick. Binder Report No. 63, at MFRC.

M-425: Diameter-Limit Cutting on a Commercial Scale on the Green River Watershed

Initiated: 1950

Status: Closed 1956

Objective: To evaluate, after diameter-limit cutting in mature softwood and mixedwood types; (1) the growth and mortality of the residual stand, (2) the amount, size, and distribution of advance growth, and (3) the logging damage incurred by the advance growth and its subsequent mortality and growth.

Work Done: Twelve 0.4-acre plots were established before cutting in a mature softwood stand. One part of the stand was cut to a 10-inch stump diameter, one part to a 5-inch stump diameter and the third part was retained as a control. Data were collected on the main stand and on reproduction (notes were made on lesser vegetation and soils) before and after cutting in 1950, in 1951, 1953, and 1955.

Unpublished Reports:

Vincent, A.B. 1952. A commercial diameter-limit cutting on the Green River Watershed. Binder Report No. 55 at MFRC.

Vincent, A.B. 1954. Remeasurement of mortality, windfall, and reproduction three years after diameter-limit cutting. Binder Report No. 116 at MFRC.

Baskerville, G.L. 1956. Diameter-limit cutting on a commercial scale on the Green River Watershed. Binder Report No. 152 at MFRC.

M-426: The Structure of the Balsam Fir Understory in Two-Storied Stands, Green River

Initiated: 1951

Status: Closed 1956

Objective: To determine the structure and growth by size and age classes of second-story balsam fir in the Green River Watershed.

Work Done: Ten single-examination 1/40-acre plots were located in five "thicket stands": Five in dense portions of the stands and the other five in more open portions. Stem positions and crown projection maps were prepared and a sample of trees from each plot were felled for the collection of stem analyses data. Four similar plot samples were obtained in mature stands for comparison purposes.

Published Report:

Vincent, A.B. 1962. Development of balsam fir thickets in the Green River Watershed following the spruce budworm outbreak of 1913-1919.
Can. Dept. For. For. Res. Branch. Tech. Note No. 119.

The stands selected for study in 1932 were even-aged, 32-34-years old, at a height of 1 ft. Most trees had developed from advance growth released by the budworm-caused mortality in the previous mature softwood stand. Density in 1952 varied from 960 to 5320 stem per acre. Diameter and height growth, crown size, and merchantable volume per acre were depressed in the stands of high density, although dominant stems were least affected. Merchantable volume varied from 0 in the stand of highest density to 1560 cubic feet per acre for the lowest density.

Unpublished Reports:

Vincent, A.B. 1954. The development of balsam fir stands in the Green River Watershed following the spruce budworm outbreak in 1913-1919. Binder Report No. 188 at MFRC (Also used as a thesis in fulfilling requirements of a M.Sc.F. degree program by Mr. Vincent).

Vincent, A.B. 1955. The development of balsam fir thickets in the Green River Watershed following the spruce budworm outbreak of 1913-1919. Binder Report No. 137 at MFRC.

M-427: Stand Deterioration and Succession in Overmature Softwood and Mixedwood Stands, Green River

Initiated: 1951

Status: In abeyance. Data and files from this project were transferred to study M-013 in 1967 and this study is now in abeyance.

Objective: To study (1) the natural deterioration of overmature softwood stands and (2) the development of a new stand and its associated vegetation.

Work Done: Two permanent 0.6-acre plots were established in 1952 in a mature softwood stand in the south end of Research Block 1. The location of each tree was mapped and the species, diameter, crown projection, etc. were recorded. Data on reproduction and lesser vegetation were collected on transects of milliacre quadrats. Remeasurement data were collected in 1963 and 1972.

Published Report:

Baskerville, G.L. 1965. Deterioration and replacement in two overmature forest stands. Can. Dept. For. Publ. No. 1125.

The progress of stand deterioration and replacement is described for overmature softwood and mixedwood stands. The major developmental difference is the vigorous invasion of the mixedwood stand by mountain maple in contrast to the formation of an evenly-distributed softwood advance growth under the softwood stand.

Unpublished Reports:

Vincent, A.B. 1953. A study of stand deterioration and succession in overmature softwood and mixedwood stands, Green River. P.S.P. 45 and 46. Binder Report No. 89 at MFRC.

Baskerville, G.L. 1964. Deterioration and replacement in two overmature forest stands. Can. Dept. For., For. Res. Branch Mimeo Report 64-M-14.

M-428: Selection Cutting in Mature Spruce-Balsam Stands, Green River

Initiated: 1952

Status: Closed 1958

Objective: To determine the silvicultural effects and accurate costs of periodic selection fellings, Cutting Method 1, as outlined in the Green River Management Plan by D.E. Nickerson.

Work Done: A 50-acre stand of mature softwood was selected; all trees were tallied, timber was marked for removal in the first cut, the cutting operation was completed, and a post-cut tally was obtained. An examination of the area in 1958 indicated that further work under this project was unfeasible because of excessive windfall (mainly in 1953 but in later years as well). The project was closed in 1958 and the area was clear-felled in 1959.

Unpublished Report:

Vincent, A.B. 1953. Selection cutting in a mature spruce-fir stand, Belone Brook Green River watershed. Binder Report No. 84 at MFRC.

M-429: Plant Succession after Logging and Fire, Green River

Initiated: 1952

Status: Closed 1963

Objective: To get a graphic picture of the evolution of plant succession on two areas recently burned in the Green River Watershed.

Work Done: Stereo-pair photographs were obtained for nine locations in a 1948 burn and for four locations in a 1949 burn, both burns in the northwestern part of the Green River Watershed. Vegetative cover by abundance classes was recorded for each photo location. The locations were rephotographed in 1958 but the vegetation was too high to permit photography in 1963. The data collected on abundance were insufficient to allow continuation of this project.

Unpublished Report:

Vincent, A.B. 1952. Plant succession after logging and fire. Binder Report No. 83 at MFRC.

M-430: Logging Damage to Spruce and Fir Advance Growth During Pulpwood Cutting, Green River

Initiated: 1952

Status: Closed 1957

Objective: To determine the amount, under different cutting conditions, of damage to spruce and fir advance growth, and to attempt to find ways by which damage may be lessened or avoided.

Work Done: Eighteen 0.2-acre plots were established in nine locations. One plot at each location was in a stand designated to be stump-cut, the other plot in an area designated for tree-length yarding. Detailed records of advance growth by species and size class were obtained before cutting operations commenced. The results from this project were incorporated with other data in the preparation of Tech. Note 40 (See Reports under project M-422).

Unpublished Report:

Vincent, A.B. 1954. Logging damage to spruce and fir advance growth during pulpwood cutting, Green River. Binder Report No. 113, at MFRC.

M-431: A Study of Softwood Reproduction on Cut-Over Lands, Green River

Initiated: 1952

Status: Closed 1957

Objective: To determine (1) the adequacy of reproduction, based on visual estimates; (2) areas where reproduction is lacking; and (3) whether any association exists between presence or absence of reproduction and any particular topographic features, forest types, or method of logging.

Work Done: Information on general conditions and data on residual stand, sapling stand, and reproduction were obtained for nine cutovers.

Destructive sampling of the reproduction on a 1/40-acre plot allowed for the division of reproduction into two classes (a) advance growth which originated before the harvest cuts and (b) new regeneration that occurred after cutting. Data and information on this study were incorporated in Tech. Note No. 40 (See project M-422).

Unpublished Reports:

Vincent, A.B. 1954. Softwood reproduction on cut-over lands, Green River. Binder Report No. 107 at MFRC.

M-432: Thinning in the Balsam Fir Understory of Two-Storied Softwood Stands, Green River

Initiated: 1953

Status: Closed 1969

Objective: To determine the effects of thinning around selected crop trees in the balsam fir understory of two-storied softwood stands.

A secondary objective for the 1968 remeasurement was the collection of detailed stem-analysis data and dry-weight determinations for 48 of the selected trees.

Work Done: A 3 x 4 factorial design replicated 10 times, for a total of 120 individual stems in the 3-, 4-, and 5-inch dbh classes, was established in the northern part of the Green River Watershed in 1953. Crown release was effected by felling stems near the selected trees. The four treatments

were: no release, and three levels of release, 1 to 3, 3 to 5, and 5 to 7 ft between crowns. Complete individual tree measurements, including crown projection maps, were obtained for each selected crop tree.

Remeasurement data were collected in 1958, 1963, and in 1968. In 1968, about 48 trees were felled for stem analysis data. The area was moderately defoliated in 1954 and severely defoliated in 1957 by spruce budworm. Insecticide was sprayed on the area in 1955.

Published Report:

Baskerville, G.L. 1961. Development of immature balsam fir following crown release. Can. Dept. For., For. Res. Div. Tech. Note No. 101.

Five-year growth response for balsam fir given crown release treatments of 1 to 3, 3 to 5, and 5 to 7 ft indicate:

(1) Crown release led to increased growth in basal area, but the degree of release had little influence on the rate growth.

(2) Basal area increment was primarily related to initial breast height diameter, to crown width, and to a derived competition factor.

(3) Although the relationship of basal area increment to additional factors such as initial crown surface area, intercrown distance, and live crown ratio were also studied, much variation in the increment data remained unexplained.

Unpublished Reports:

Vincent, A.B. 1954. Thinning in the balsam fir understory of two-storied stands, Green River. Binder Report No. 106 at MFRC.

van Raalte, G.D. 1969. Some relationships between spacing, foliage weight and volume increment in balsam fir. Can. Dept. Fish. For. For. Br. Int. Rep. M-57.

M-433: Preliminary Planting Trials with White Spruce on Strip Roads, Green River

Initiated: 1953

Status: Closed 1968

Objective: To determine if any problems exist in reforesting strip roads by planting white spruce.

Work Done: Each year from 1953 to 1957 inclusive, about 2400 white spruce seedlings were planted on strip roads (1953 to 1955) or on bulldozed haul roads (1956 and 1957). Accurate counts, by row and strip, were made at establishment and survival counts were made each year until 1960. Survival counts for particular planting years were obtained from 1961 to 1968 (but not always the same plantings) when field work was discontinued. Some of the plantings were highly successful, others were failures. Mortality was high where deep humus occurred and where competing vegetation developed rapidly on the strip roads. Although survival generally was better on bulldozed roads, these seedlings were often chlorotic and showed poor growth many years after planting.

Published Report:

McLeod, J.W. 1961. Planting white spruce on haul roads in northwestern New Brunswick. Can. Dept. For., For. Res. Br. Mimeo 61-20. (Also Binder Report No. 309 at MFRC).

About 12,000 white spruce were planted on winter strip roads and bulldozed haul roads between 1953 and 1957. Various ages of seedling and transplant stock and three provenances (Riding Mountain National Park, Manitoba; Acadia Forest Experiment Station; Green River, New Brunswick) were used. By 1960, all plantings showed satisfactory to excellent survival (62 to >90%) except the 1953 plantings of Riding Mountain stock on winter strip roads where survival varied from 25 to 65%. The high mortality rates in the 1953 planting were attributed to severe competition from bracken, raspberry, and grass which together with snow smothered the seedlings.

Unpublished Reports:

Vincent, A.B. 1953. Establishment Report, Part I (1953). Preliminary planting trials with white spruce on strip roads, Green River, 1953-1957. Binder Report No. 98 at MFRC.

Vincent, A.B. 1954. Establishment Report, Part II (1954). Preliminary planting trials with white spruce on strip roads, Green River, 1953-1957. Binder Report No. 115 at MFRC.

Baskerville, G.L. 1955. Establishment Report, Part III (1955). Preliminary planting trials with white spruce on strip roads, Green River, 1953-1957. Binder Report No. 136 at MFRC.

- Hughes, E.L. 1957. Establishment Report, Part IV (1956). Preliminary planting trials with white spruce on strip roads, Green River, 1953-1957. Binder Report No. 184 at MFRC.
- Baskerville, G.L. 1958. Establishment Report, Part V (1957). Preliminary planting trials with white spruce on strip roads, Green River, 1953-1957. Binder Report No. 194 at MFRC.
- Baskerville, G.L. 1959. Progress Report. Preliminary planting trials with white spruce on strip roads, Green River, 1953-1957. Binder Report No. 210 at MFRC.
- Olive, R.J. 1960. Progress Report. Preliminary planting trials with white spruce on strip roads, Green River, 1953-1957. Binder Report No. 284 at MFRC.
- McLeod, J.W. 1962. Progress Report. Preliminary planting trials with white spruce on strip roads, Green River. Binder Report No. 326 at MFRC.
- McLeod, J.W. 1963, 1964, and 1965. Three brief file reports covering partial remeasurements in 1962, 1963, and 1964, on file M-433 in closed project file.

M-434: The Effect of Slash Piles on the Establishment, Survival, and Growth of Spruce and Fir Reproduction, Green River

Initiated: 1952

Status: Closed 1956

Objective: To determine the effects of slash piles on spruce and fir advance growth and subsequent regeneration.

Work Done: Ten slash piles in strip cutovers of various ages were examined. The size and depth of the pile, and reproduction under the slash were recorded. Similar information was collected on reproduction in nearby areas without slash. Some of the information gained from this project was used in Tech. Note No. 40 (See project M-422).

Unpublished Report:

Vincent, A.B. 1954. The effect of slash piles on the establishment survival and growth of spruce and fir reproduction, Green River. Binder Report No. 109 at MFRC.

M-435: Examination of Small Openings in Spruce-Fir Stands to Determine Whether They Tend to Favor the Reproduction of Spruce

Initiated: 1954

Status: Closed 1956

Objective: To test the hypothesis that microclimate conditions in small openings in forest stands favor the regeneration of spruce over balsam fir.

Work Done: Data on reproduction in one 1-acre and five 1/40-acre openings, and under complete stand cover were obtained. Results were inconclusive or negative regarding improved conditions for spruce. Data and results were incorporated in Tech. Note 40 (See project M-422).

Unpublished Reports:

Vincent, A.B. 1955. Examination of small man-made openings to determine incidence of spruce seedlings. Binder Report No. 119 at MFRC.

M-436: The Effects of the Spruce Budworm Outbreak on Softwood Reproduction

Initiated: 1954

Status: Closed 1970

Objective: To study the effects of the spruce budworm outbreak on spruce and fir reproduction.

Work Done: In August 1954, groups of 4-milliacre permanent quadrats were established in 2-by 2-chain grids in five locations: two, K-1 and K-2, in the Kedgwick control area which was not sprayed against budworm and three, G-6, G-9, and G-13, in the Green River Watershed where spraying was conducted as necessary. (The code numbers refer to areas being sampled for budworm populations by the Division of Forest Biology, Canada Department of Agriculture.) Total counts, by species, of all reproduction and 1-ft height classes were obtained for each sample. For each specimen of spruce and fir reproduction the degree of defoliation was recorded. Remeasurement of all quadrats was conducted in 1955, 1956, 1957, 1958, 1959, 1960, and 1964.

Unpublished Reports:

Vincent, A.B. 1955. Establishment report - Effects of the current spruce budworm outbreak on spruce and fir reproduction, Green River. Binder Report No. 127 at MFRC.

Baskerville, G.L. 1956. Effects of the current spruce budworm outbreak on softwood reproduction, Green River. Binder Report No. 142 at MFRC.

Hughes, E.L. 1957. Remeasurement Report, 1956 - Effects of the current spruce budworm outbreak on spruce and fir reproduction, Green River. Binder Report No. 180 at MFRC.

M-437: Spraying Mountain Maple with Brush Killer, Green River

Initiated: 1953

Status: Closed 1961

Objective: To investigate the silvicultural and economic feasibility of controlling mountain maple by spraying (herbicide).

Work Done: Although this project was initiated in 1953 it was not until 1955 that six test plots were chosen and aerially sprayed with "brush killer" on July 4. A damage map was prepared in August 1955 and permanent 1/40-acre plots were established by Fraser Companies, Ltd. The sample plots were remeasured by the Forestry Branch of the Can. Dept. Fish. For. in 1957 and 1960. Similar trials were simultaneously conducted at the Casault Forest Reserve near Causapscal Village in Quebec.

Unpublished Reports:

Morais, Roger. 1956. Report on the aerial application of herbicides on mountain maple, Casault Forest Reserve, Quebec and Green River limits, New Brunswick. Report by Canadian International Paper Company on file M-437 at MFRC.

Baskerville, G.L. 1958. Spraying mountain maple with brush killer Green River. Binder No. 204 at MFRC.

M-438: Correlation of the Relationship Between Height, Age, and
Yield of Spruce and Fir, and Site, Green River

Initiated: 1954

Status: Closed 1967

Objective: To determine if the height/age relationship of unsuppressed dominant and codominant spruce and fir is a suitable measure of site on the Green River Watershed.

Work Done: About 25, 0.1-acre sample plots were established in softwood and mixedwood stands at Green River. Tree diameter tallies for these plots were obtained. Specially selected dominant and codominant balsam fir and spruce (about 240 trees) were felled and the stems were measured at breast height to ascertain age, and above breast height to determine height growth during 40 years. Poor results were obtained by this first trial but the data were regrouped on a different site classification scheme which indicated more clearly the relationship between height/age and site.

Additional field sampling was conducted by Hughes and Loucks in 1956 when differences in height/age were detected according to O.L. Loucks' site classification. The differences were small and more field work was required. The field work was conducted but detailed analyses were not completed. All the researchers encountered difficulty in finding truly free growing stems that had not suffered top damage from wind, insects, or mammals sometime during a 40-year growth period.

Unpublished Reports:

Vincent, A.B. 1954. A preliminary study of the correlation of the
height-age relationship of spruce and fir, and site, Green River.

Binder Report No. 118 at MFRC.

Loucks, O.L. 1955. Review of stem analysis plots at Green River.

Binder Report No. 134 at MFRC.

Hughes, E.L. 1956. A preliminary study of the correlation of the
height/age relationship of spruce and fir, and site, Green River.

Binder Report No. 156 at MFRC.

M-439: Mortality in Fir Thickets Arising from the Spruce Budworm Outbreak of 1913-19, Green River

Initiated: 1955

Status: In Abeyance: Data and files were transferred to study M-013 in 1967 which is also in abeyance.

Objective: To obtain a detailed record of the course of mortality in fir thickets of varying density.

Work Done: Twelve 1/40-acre plots were established in 1955, four in each of three densities; 1000, 3000, and 5000 stems/acre. All trees were tagged and measured for dbh, total height, crown size, etc.

Remeasurement data were collected in 1960, 1965, and 1970. In 1975, a partial remeasurement (diameter and crown position) was conducted.

Separate sampling was conducted under project M-439 to assess stem growth following release (competing crowns were held back by wire) and to obtain some detailed stem analysis data (Duff and Nolan technique).

Unpublished Reports:

Baskerville, G.L. 1957. Establishment report - Mortality in fir thickets arising from the spruce budworm outbreak of 1913-1919, Green River. Binder Report No. 162 at MFRC.

Little, C.H.A. and G.L. Baskerville. 1962. Growth sequence analysis and stand development. Binder Report No. 323 at MFRC.

M-440: The Effect of Site on Stand Composition and Yield, Green River

Initiated: 1955

Status: Closed 1967

Objective: To determine the influence of site on stand composition and density for specific history types, and to set up an area close to Summit Depot on which various classifications can be demonstrated.

Work Done: An 8-acre demonstration area was set up immediately south of the Summit Headquarters on which a strip cruise was conducted. A site trail was established through part of this area. Data from the Research Blocks were used to test site classifications.

Unpublished Reports:

Loucks, O.L. 1955. Report of Green River site classification work.

Binder Report No. 135 at MFRC.

Baskerville, G.L. 1956. Establishment Report - Green River site demonstration area. Binder Report No. 149 at MFRC.

Loucks, O.L. 1957. The effect of site on stand composition and yield, Green River. Binder Report No. 189 at MFRC.

M-441: Ground Spraying for the Control of Mountain Maple, Green River

Initiated: 1955

Status: Closed 1969

Objective: To investigate the practicability of controlling mountain maple by applying herbicide with the Swingfog (a ground spray application).

Work Done: Twelve 0.4-acre plots were established in areas where mountain maple was common; four plots with mountain maple in each of three height classes; 0-6, 6-12, and over 12-ft. For each height class, two plots were treated with 2, 4, 5-T at a rate of three pounds acid equivalent (a.e.) per acre and two plots were treated at a rate of four pounds a.e. per acre. All stems on the sample plots within each treated area were tagged, measured, and rated for condition. Remeasurements were taken in 1956, 1957, and 1960. Work on mountain maple was also done under project M-98. This latter study was closed in 1969.

Unpublished Report:

Baskerville, G.L. 1956. Establishment Report, 1955 - Ground spraying for the control of mountain maple, Green River. Binder Report No. 153 at MFRC.

M-442: Shelterwood Cutting in a 40- to 50-Year-Old Softwood Stand, Green River

Initiated: 1956

Status: Active

Objective: To determine the intensity of shelterwood cutting that will encourage the regeneration of spruce and fir, and lead to the establishment of a future stand.

Work Done: Nine 8-acre compartments, three in each of three blocks, were established in 1956 in a maturing stand of softwood of fire origin on Research Block 3. Two shelterwood treatments and a control were randomly assigned to the three compartments of three blocks. In 1957, two permanent sample plots were established in each compartment of the randomized block design. The plots were measured and regeneration plots were established prior to cutting operation in 1959. Regeneration was measured in 1963. In 1969, all plots and milliacre quadrats were remeasured and the residual stands were harvested. In 1975, all milliacre quadrats were retallied and a report is now being prepared.

Published Report:

Baskerville, G.L. 1965. Shelterwood cutting in a 40- to 50-year-old softwood stand, Green River, N.B. Can. Dept. For. Mimeo Report 65-M-2 (Also Binder Report No. 390 at MFRC).

Residual basal areas of 80 and 60% of original average basal area were the two treatment levels established in 1959. By 1964, there were greater numbers of seedlings per acre in all treatments, including controls and the number of seedlings over 0.5-feet in height had increased markedly. The author concluded that the regeneration had not responded to the increased light conditions as rapidly as expected and final fellings should be delayed until at least 1966.

Unpublished Report:

Baskerville, G.L. 1959. Establishment Report Shelterwood cutting in a 40- to 50-year-old softwood stand, Green River. Binder Report No. 239 at MFRC.

M-443: Cleaning and Thinning Young Fir, 1959

Initiated: 1957

Status: Active. This project was transferred to study M-011 in 1967 and is now project MC-12 study 02-011.

Objective: To determine and compare the growth and development of young fir stands following various degrees of cleaning and thinning.

Work Done: Work under this project includes thinnings and remeasurements in four different trials.

Trial 1	Thinned 1959	Blocks I & II	Remeasured 1964, 1969, 1974
Trial 2	Thinned 1960	Blocks III & IV	" 1965, 1970, 1975
Trial 3	Thinned 1961	Blocks V & VI	" 1966, 1971
Trial 4	Thinned 1967	Block VII	" 1972

Treatments were established in each block so that the residual softwood stands had spacings of 4 x 4, 6 x 6, or 8 x 8 feet. (Some blocks have additional spacings.) Permanent sample plots (tagged tree) were established in each treatment in each block and in control plots. Work on establishment, thinning, and remeasurement has been done by staff of the Canadian Forestry Service nearly every year since 1957. In 1975, all tagged-tree data were put on punched cards to facilitate computer compilation.

Unpublished Reports:

Baskerville, G.L. 1959. Establishment Report: Cleaning and thinning young fir, 1959. Binder Report No. 240 at MFRC.

Baskerville, G.L. 1961. Establishment Report. Cleaning and thinning young fir, 1960. Binder Report No. 302 at MFRC.

Akerley, B.J. 1961. Establishment Report: Cleaning and thinning young fir, 1960. Binder Report No. 318 at MFRC.

Akerley, B.J. 1962. Establishment Report: Cleaning and thinning young fir, 1961. Binder Report No. 332 at MFRC.

Baskerville, G.L. 1965. Cleaning and thinning young fir 1959.

Progress Report. Can. Dept. For., Mimeo Report 65-M-6 (Binder Report No. 394 at MFRC).

Baskerville, G.L. 1969. Field measurements of specific CO₂ exchange rates for fir and spruce in two canopies. Can. Dept. Fish. For., For. Branch. Internal Report M-49.

van Raalte, G.D. and W.L. Malloy. 1972. Oven-dry weight of individual trees of seven species by components. Can. Dept. Environ. For. Branch. Internal Report M-71.

M-444: Conversion of Sugar Maple Hilltop Stands to Spruce

Initiated: 1956

Status: Closed 1967

Objective: (1) To test the hypothesis that decadent tolerant hardwood stands can be made productive by destroying the hardwoods and planting white spruce.

(2) To disclose what problems, if any, will arise in carrying out the prescribed treatments.

Work Done: Each year, 1956, 1957, and 1958, 1-acre of a cutover tolerant hardwood stand was scarified to produce about 50% bare soil and eliminate competition. In the autumn of the same year, each acre was planted with about 400 white spruce seedlings (some red pine and tamarack were planted on a small portion of one area in 1956).

Tallies of natural regeneration and reinvasion of the treated (bare soil) areas, and survival counts of the planted stock were obtained in 1957, 1958, and 1962. Brief progress reports were written in 1957 and 1958.

Surviving planted spruce were released from overtopping hardwood reproduction of natural origin in 1968.

Unpublished Report:

Cunningham, G.C. 1957. Conversion of sugar maple hilltop stands to white spruce. Binder Report No. 187, at MFRC.

M-445: The Development of 30- to 40-Year-Old Softwood Stands During and Following the Current Spruce Budworm Outbreak

Initiated: 1956

Status: In Abeyance: Data and files were transferred to study M-013 in 1967.

Objective: To follow the trend of mortality and stand development in an immature softwood stand during and following the current spruce budworm outbreak.

Work Done: Ten 0.1-acre permanent sample plots were established in the Kedgwick Control Area (Forest Biology Plot K-2) which had not been sprayed for budworm. Individual tree data were recorded in 1956 for each plot. Dead trees were counted in 1957, 1958, and 1959. Complete plot remeasurement was conducted in 1961, 1965, and 1970.

Published Report:

Baskerville, G.L. 1960. Mortality in immature balsam fir following severe budworm defoliation. For. Chron. Vol. 34 No. 4.

A 40-to 50-year-old stand of balsam fir in the Kedgwick Control Area, which was not sprayed for budworm control, was severely defoliated by the spruce budworm from 1952 to 1954 and again in 1956. About 52% of the stems alive in 1956 were dead in 1959, leaving a stand of 1,073 living trees per acre with 84 ft² of basal area. Most of these stems had dead tops and slow diameter growth in 1959.

Unpublished Report:

Hughes, E.L. 1957. Establishment Report, 1956 - The development of 30- to 40-year-old softwood stands during and following the current spruce budworm outbreak. Binder Report No. 183 at MFRC.

M-446: The Ecology of the Site-Types on the Green River Watershed

Initiated: 1956

Status: Closed 1962

Objective: To study the presence, distribution, and vigor of the forest vegetation on the recognized site-types on the Green River Watershed.

Work Done: Forest classifications and environmental descriptions were reviewed (Loucks 1962) before beginning the project. Sampling was established in different parts of the watershed, mainly on the Research Blocks of known forest types. Detailed records of vegetation, soil, soil moisture, position on slope, etc., were obtained in 1959.

Published Report:

Loucks, O.L. 1962. Ordinating forest communities by means of environmental scalars and phytosociological indices. Ecol. Monographs Vol. 32: 137-166.

This is a highly technical account of identifying and classifying forest communities or ecosystems.

Unpublished Reports:

Loucks, O.L. 1959. A review and discussion of literature on forest site classification and environment description. Binder Report No. 211 at MFRC.

Loucks, O.L. 1960. Ordinating forest communities by means of environmental scalars and phytosociological indices. Binder Report No. 294a at MFRC.

Loucks, O.L. 1960. Appendices to the report on project M-446 -- Ordinating forest communities by means of environmental scalars and phytosociological indices. Binder Report No. 294b at MFRC.

Cater, M.R. 1960. A relationship between sugar maple distribution and aspect in northwestern New Brunswick. Binder Report No. 296 at MFRC.

M-447: Effects of the Spruce Budworm on Thinned Fir, Green River

Initiated: 1958

Status: Closed 1967

Objective: To assess the effects of severe defoliation by the spruce budworm on the development of 40-to 50-year-old balsam fir, thinned in 1948 to spacings of 6 x 6, 8 x 8, and 10 x 10 ft.

Work Done: Six one-acre plots, four treatments and two controls were established by Fraser Companies Ltd. and the Pulp and Paper Research Institute of Canada (PPRIC) in 1948. The four treatments were: free low thinning, and spacing thinnings to 6 x 6, 8 x 8, and 10 x 10 ft.

Responsibility for future work was transferred to the MFRC in 1956.

Remeasurement data were collected in 1958 and 1963, but no reports were written.

Reports: Nil

M-448: Economic Partial Cutting in Immature Fir-Spruce (Fraser Companies, Limited, 1959)

Initiated: 1958

Status: Closed

Objective: (1) To study the problems of regeneration and growth following cutting in immature fir-spruce stands.

(2) To assess the response of immature fir stands to partial cutting.

Work Done: Staff of the Forestry Branch (now CFS) advised Fraser Companies Ltd. concerning the establishment of partial felling trials in the Plaster Rock Division [objective (1)] and in the Quisibis Watershed [objective (2)]. Several immature softwood stands were partially felled and sampled by Fraser Companies, Ltd. There is no record of any work having been done in the 1960's.

Reports: Nil

M-449: Maintenance of Permanent Plots, Green River

Initiated: 1959

Status: Closed 1968

Objective: To provide for the orderly maintenance and remeasurement of permanent sample plots after specific projects were closed.

Work Done: Permanent sample plot records from various closed projects, notably M-407, M-417, M-425, M-427 and M-432 were to be transferred to this project but such transfer was never done formally. Although some maintenance and remeasurement was done in the 1960's on some of these projects, shortage of staff and resources resulted in the closure of this project in 1968.

About 1958, sample plots were established in a stand, referred to as the Green River burn: these were remeasured in 1963.

Published Report:

Baskerville, G.L. and W.C. Calvert. 1967. An exceptional black spruce stand. Can. For. Serv., MFRC Inf. Rep. M-X-13.

This exceptional black spruce stand is located in the Kedgwick Control Area. The even-aged stand averaged 103 years at stump height in 1965. It contained 510 living stems/acre, averaging 68 ft in height and 9 in in diameter. The basal area was 233 ft² and the total volume was 7,024 ft³/acre.

Unpublished Report:

Baskerville, G.L. 1960. Report on the Green River burn. Binder Report No. 283 at MFRC.

M-450: Dry-Matter Production in Immature Balsam Fir Stands

Initiated: 1962

Status: Closed. In 1967, data and files on this project were transferred to M-011, a study on the influence of stand density on productivity in fir-spruce forests (project MC-12 study 02-011).

Objective: To determine and compare production in six young fir stands with densities of 700, 1000, 1500, 2000, 3000, and 5000 stems/acre.

Work Done: A total of 140 trees from three plots each, of the above-noted densities, were sampled for above-ground components, and 154 root systems were excavated to derive volume and weight of roots.

Published Reports:

Baskerville, G.L. 1962. Production in forests: Can. Dept. For., For. Res. Branch Mimeo Report MD-322-62 (Binder Report No. 322).

This report is a detailed review of literature on the basic mechanisms of production in a forest ecosystem. The forest provides for the fixation of solar energy for the production of matter and its distribution within a tree or stand. Understanding the basic mechanisms of production should lead to improvements in silviculture: "the manipulation of forest stands to control the quantity and quality of useful material produced".

Baskerville, G.L. 1964. Some interrelationships of silviculture and logging. Woodlands Review Section Pulp and Paper Mag. of Can. June 1965 (Binder Report No. 380 at MFRC).

Data collected for natural even-aged balsam fir stands of 700, 1000, 1500, 2000, 3000, and 5000 stems/acre were used to illustrate the results of silvicultural treatment such as early cleaning and thinning. The author shows how silvicultural control (of density) can alter stand structure to produce not necessarily more merchantable wood, but a forest which is cheaper to harvest. Optimum density for this type and age of stand is 700 stems/acre.

Baskerville, G.L. 1965. Estimation of dry weight of tree components and total standing crop in conifer stands. Can. Dept. For., For. Res. Branch Mimeo Report 65-M-1. (Binder Report No. 389 at MFRC).

The distribution of dry weight among five tree components (stem-wood, bark, branches, foliage, and roots) of balsam fir from 1 to 10 inches in diameter is discussed. Component dry weight and total standing crop were estimated using methods based on (a) every tree summation, (b) stand tables, and (c) a short-cut technique using "average" trees. It was concluded that the technique using average trees was inaccurate and should be used only where an approximate estimate of biomass is desired.

Baskerville, G.L. 1966. Silviculture, logging and money. Woodlands Review Section, Pulp and Paper Mag. Can. Feb. issue.

The author discusses stand development for a naturally-developing dense stand and for similar stands given early cleaning and thinning. He shows lower harvesting costs for the thinned stands and shows that "savings in harvesting costs such as those indicated in this example should be considered as part of the output of the silvicultural investment, as opposed to our traditional concept of considering only the value of the increased wood production. Indeed the primary value of silviculture may be increased efficiency in harvesting".

Unpublished Reports:

Baskerville, G.L. 1963. Dry matter production in immature fir stands. Can. Dept. For., For. Res. Branch Mimeo Report 63-M-16 (Binder Reports No. 355 and 365). Note: The above report is based on a thesis submitted to the Graduate School of Yale University in partial fulfillment of the requirements for the Ph.D. degree.

Baskerville, G.L. 1964. Distribution of dry weight in immature balsam fir trees. Can. Dept. For., For. Res. Branch Mimeo Report 64-M-6, Binder Report No. 373 at MFRC.

Baskerville, G.L. 1964. Dry-matter production in immature fir stands, roots, lesser vegetation and total stand. Can. Dept. For., For. Res. Branch Mimeo Report 64-M-12, Binder Report No. 379 at MFRC.

M-6: Green River Experimental Cutting Area

Initiated: 1938

Status: Closed 1961

Objective: To test certain cutting methods in mixedwood forests and to discover what technique fosters the greatest amount of softwood reproduction and greatest post-cutting growth of softwoods.

Work Done: Five mixedwood areas, selected in the southern part of the watershed, were treated as follows:

1. Standard clear cut (of softwoods) in 1939
2. Clear cut in 1939 except two spruce seed trees per acre; all large hardwoods girdled
3. Uncut control
4. Clear cut 1938, tractor logged
5. Sap-peeled clear cut in 1937.

A total of 355 rectangular 0.1-acre plots, set out in transects were sampled. Scalped seedbeds were prepared in each area. Initial records were obtained after the felling operations of 1939 when precut stand conditions were established by stump counts. Parts of treatment areas 1 and 3 were disturbed by unscheduled cutting in 1943. All acceptable plots were remeasured in 1944 and 1949 when the project was closed. A review of the project in 1958 indicated some value might be gained by a further remeasurement, therefore, in 1959 and 1960 areas 2, 3, and 4 were remeasured. This last remeasurement was not reported.

Published Report:

Vincent, A.B. 1951. Experimental cutting in mixedwood stands, Green River, New Brunswick. Can. Dept. Res. Dev. Div. For. Res. Silvicultural Leaflet No. 58.

Skidding and yarding by tractor resulted in more regeneration of both softwoods and hardwoods than where the seedbed was disturbed more lightly by horse yarding and forwarding. Leaving white spruce seed trees did not provide for more spruce seedlings.

Unpublished Reports:

Clarke, W.B.M. 1940. Interim report on the establishment of the Green River experimental cutting area, Madawaska County, N.B..

Binder Report No. 3 at MFRC.

Vincent, A.B. 1950. Report on 1949 remeasurement of the Green River experimental cutting area. Binder Report No. 36 at MFRC.

M-98: Silvical Characteristics of Mountain Maple, *Acer spicatum* Lam

Initiated: 1962

Status: Closed 1969

Objective: To determine the silvical characteristics of mountain maple that relate to its control, and to determine its distribution in the Maritime provinces in relation to environmental factors.

Work Done: In 1963 about 60 root systems of clumps of mountain maple were excavated in northwestern New Brunswick. The origin of all shoots was determined by careful analyses of the "underground" portions.

After determining that this species is spread primarily by stump sprouting and to a lesser extent by layering, two control trials were established:

(i) Slash in a recent cutover near Second Lake was control burned in Sept. 1967. Seedlings of white, black, and several provenances of Norway spruce were planted the same year.

(ii) A cut-over mixedwood stand on an upper slope position near the Wild Goose Valley was scarified in 12-ft strips using a root-rake, in October 1966. Seedlings of white, black, and Norway spruce, Douglas fir and Japanese larch were planted on the scarified strips in May 1967.

No work has been conducted on these trials since 1968.

Published Reports:

Post, L.J. 1965. Vegetative reproduction of mountain maple. Can.

Dept. For. Pub. No. 1097.

This author found after extensive excavation of the root systems of mountain maple clumps that vegetative reproduction of this species is mainly by stump sprouts. Layering occurs, when stems are pressed to the ground, but is of minor importance. True root suckers were not found.

Post, L.J. 1969. Vegetative reproduction and the control of mountain maple. Pulp Paper Mag. Can. October 17 issue.

Mountain maple does not form root suckers but sprouts vigorously around the root collar and layers readily when stems, still attached to a root system, are pressed to the ground. To control this species only stems need to be killed. Burning slash on mountain maple thickets is effective immediately after a harvest operation. For well-established stands, uprooting clumps with a bulldozer is recommended, as it is effective and cheaper than using herbicides. A root-rake is a better tool than a bulldozer blade and a lifting action is best.

Post, L.J. 1970. Dry-matter production of mountain maple and balsam fir in northwestern New Brunswick. Ecology. Vol. 51, No. 2.

Measurements of dry matter production obtained in even-aged stands of mountain maple and balsam fir indicate (i) the annual weight increment of mountain maple is constant while that of balsam fir increases with age (up to 25); (ii) by age 25 the total dry-matter production of a balsam fir stand is 2.3 times, and the current production is 3.7 times, that of mountain maple.

Unpublished Reports:

Post, L.J. 1964. Vegetative reproduction of mountain maple. Can. Dept. For. Mimeo report 64-M-10.

Post, L.J. 1966. Experimental establishment of spruce on tolerant hardwood lands. Can. Dept. For. Inf. Rep. M-X-6. (Binder Report No. 397 at MFRC).

Matheson, E.T. 1968. Planting of softwoods at Wild Goose Lake, Green River, Spring 1967. File M-98 at MFRC.

Matheson, E.T. 1968. Planting of softwoods on a controlled burn near Second Lake, Fall, 1967. File M-98 at MFRC.

Post, L.J. 1969. Choice of polyvinyl chloride fabrics for shading plants. Can. Dept. Fish. For. Bi-Mon. Res. Notes Vol. 25, No. 1.

Miscellaneous Reports

(Not assigned to a particular project)

Loucks, O.L. 1956. Site classification, as applied to silviculture and management. Binder Report No. 252 at MFRC.

Baskerville, G.L., E.L. Hughes, and O.L. Loucks. 1960. Research Work of the Forestry Branch in the Green River Project. For. Chron. Vol. 36, No. 3.

This report presents a summary, to 1960, of all the research work conducted by the Forest Research Division of the Canada Forestry Branch in the Green River Project.

MacGillivray, H.G. 1963. Balsam fir provenance planting 1956 sowing. Dept. For., For. Res. Branch Mimeo Report 63-M-7. (Project M-95). Data and files with H.G. MacGillivray at MFRC.

Wile, B.C. 1974. Trials of a Marttiini reforestation plow in the Maritime Provinces, 1971. File report No. 63 at MFRC.

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