1976

Dickey-Lincoln School Lakes Citizen's Committee : Briefing Book

James B. Longley

Citizen's Committee

DICKEY-LINCOLN SCHOOL LAKES

CITIZENS' COMMITTEE

BRIEFING BOOK

NAME: _____

DICKEY-LINCOLN SCHOOL LAKES

CITIZENS' COMMITTEE

BRIEFING BOOK

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DICKEY-LINCOLN SCHOOL LAKES PROJECT

MILESTONES

Origins of the Dickey-Lincoln School Lakes project can be linked to the continuing scientific interest in harnessing the natural energy concentrated in the coastal regions of Northern Maine and neighboring Canadian provinces.

The idea of harnessing the powerful tidal pools in Passamaquoddy Bay and in tapping hydroelectric power holds a special appeal in a region historically short of energy resources.

Studies dating back to 1919 addressed the technical and economic aspects of a number of tidal power proposals. In essence, the present Dickey-Lincoln School hydroelectric project concept is a distillation of these investigations.

Some important milestones should be noted in understanding the evolution of the Dickey-Lincoln School idea over the last twenty years.

Chronology of Events

1956

August - In accordance with provisions of the Boundary Water Treaty of 1909, the U.S. and Canadian governments requested the International Joint Commission to study the feasibility of constructing a tidal power project at Passamaquoddy Bay for the purpose of supplying baseload electricity to Maine and New Brunswick.

1959

October - An exhaustive three-year engineering study concluded that the tidal project at Passamaquoddy, including an auxiliary conventional hydroelectric facility on the St. John River at Rankin Rapids, Maine, was not economically justified. The Rankin Rapids component had been added to compensate for the inherent inability of a tidal system to generate a sustained volume of base power.

The study estimated that development of the project would cost $630 million to install 700 megawatts of capacity to meet the projected baseload requirements for Maine and New Brunswick.

1961

May - President Kennedy ordered the Department of the Interior to review the joint commission's findings to determine if advances in energy technology, consumption patterns and overall economic considerations would make the project economically feasible.

1963

July - On the basis of new forecasts by the Federal Power Commission, the Department of the Interior asserted that the Passamaquoddy project could be justified if redesigned to generate peak, rather than baseload, power for a wider geographic area encompassing the New England states, portions of upstate New York, New Brunswick and Nova Scotia.

Because of adverse environmental impact on the Allagash River, now a designated "wilderness waterway," the proposed Rankin Rapids component was discarded in favor of an alternative location on the Upper St. John River at Dickey, Maine, just upstream of the point where the two rivers converge.

Construction of a re-regulating dam at Lincoln School, 11 miles downstream, was proposed to counter the problem of extreme fluctuations in river flow caused by the intermittent peak power operation of Dickey's power plant.

Total ultimate installed capacity of the combined Passamaquoddy and Dickey-Lincoln School Lakes projects was projected at 1,750 megawatts with total construction costs of nearly $1 billion.

To perform further studies ordered by the President, an advisory board was formed comprised of the Department of the Interior and the U.S. Army Corps of Engineers. Interior examined economic aspects, power and transmission requirements, marketing and downstream benefits. The Corps concentrated on field studies and engineering design.

1964

August - The advisory board findings were incorporated in the Secretary of Interior's review of the original joint commission report. The review, as circulated to State and Federal officials for comment, proposed immediate authorization for construction of both the International Tidal Power Project and the Upper St. John River Hydroelectric Complex.

1965

July - Results of the review with comments from Federal and State officials were transmitted to President Johnson for action.

However, new power values provided by the Federal Power Commission, reflecting the development of larger more economical generating plants by the industry, showed that Passamaquoddy, by itself, could not be economically justified. Dickey-Lincoln School still retained its favorable benefit-to-cost ratio and was reindorsed for immediate authorization.

For the first time Dickey-Lincoln School had assumed an independent identity.

President Johnson recommended that Congress authorize immediate construction of Dickey-Lincoln School based on an installed capacity of 794 megawatts at a cost of $218.7 million.

1965

October - Congress adopted the President's recommendation by authorizing the project in the Flood Control Act of 1965. Funds were appropriated for preliminary planning and design.

November - Planning and design work was begun by the New England Division, Corps of Engineers.

1966

September - The House Committee on Public Works ordered its staff to re-examine the project's economic feasibility.

October - Funds to continue planning and design were included in the Public Works Appropriation Act for FY 1967.

1967

March - The report of the staff investigation, noting that the project continued to have a favorable benefit-cost ratio, was inserted into the record of hearings conducted by the House Appropriations Subcommittee on Public Works.

November - Funding for ongoing planning and design was deleted from the FY 1968 Appropriation Act, thereby terminating all project activities.

1968 and 1969

The project's economics were reviewed annually by the Corps of Engineers and continued to show a favorable benefit-to-cost ratio. However, no funds were appropriated by Congress to resume planning.

1970

January - Implementation of the National Environmental Policy Act established the Council on Environmental Quality. The Act requires the preparation of an impact statement for any proposed Federal activities likely to affect the environment.

1970 to 1973

Benefit-to-cost ratios still showed the project to be economically justified on the basis of annual updating. No funds were made available for additional planning.

1974

July - Congress requested the General Accounting Office to review the project's benefit-to-cost ratio.

August - Renewed Congressional support for the project as a response to the energy crisis resulted in action to add $800,000 to the FY 1975 Public Works Appropriation Act to resume advanced planning and engineering.

November - The New England Division of the Corps of Engineers resumed work on the project seven years after prior activity had been terminated.

1975

June - The GAO audit report suggested that because of the project's size and complexity that no definitive assessment of its economic worth could be made until planning and environmental studies were completed.

In its analysis, the GAO verified the Corps construction estimates of $522 million for an 830 megawatt facility including transmission and the resultant 2.6-1 benefit-to-cost ratio.

1975

December - The Public Works Appropriation Act for FY 1976 passed by Congress included an allocation of $2.5 million to continue planning, engineering and environmental studies for a fifteen month period.

1976

April - Governor James B. Longley announces formation of a Maine Citizens' Committee to determine State impacts of Dickey-Lincoln School Lakes.

DICKEY-LINCOLN SCHOOL LAKES, MAINE

FACT SHEET

I. GENESIS.

Dickey-Lincoln School Lakes evolved as a result of a study of the Development of Tidal Power at Passamaquoddy, a system of tidal bays studied since 1919 by both private and public engineers. The most comprehensive report was that completed by the International Joint Commission in April 1961 after 3 years of study and a cost of $3 million. The Commission concluded that the project was not economically feasible under the then existing conditions. At the request of President John F. Kennedy, the Commission report was reviewed to determine if the project was feasible in view of the advanced engineering techniques and prevailing economic conditions. In July 1963, a report was submitted to the President, which concluded that application of a different use-concept of power coupled with advanced engineering techniques would result in a favorable report.

On July 16, 1963, the President directed the Departments of Interior and Army to make additional studies to supplement the July 1963 report. An Army-Interior Advisory Board on Passamaquoddy and Upper Saint John River was formed. Interior performed power studies, power transmission, marketing benefits and other economic aspects. The Corps of Engineers developed the physical components of the project.

The Study Committee completed its evaluation in August 1964, and submitted its report to the Secretary of the Interior. Recommendations included: early authorization of the Passamaquoddy Tidal Project and Upper Saint John River Developments and early construction of the project to develop low cost firm power for Maine and peaking power for the remainder of New England.

The Secretary of the Interior submitted a report on 9 July 1965 to President Johnson summarizing the August 1964 report. Subsequent to August 1964, a review updated the power benefits. The power rates were reduced due to larger, more economical developments by the power industry since the previous analyses. The reduction caused the benefit-to-cost ratio for the Passamaquoddy Power Project to fall below unity (.86 to 1). The benefit-to-cost ratio for Dickey-Lincoln School Lakes was a sound 1.81 to 1.

October 1975

One recommendation included in the July 1965 report approved by President Johnson was:

> "Immediate authorization, funding, and construction of the Dickey and Lincoln School projects on the Saint John River and their associated transmission system. Construction would be contingent upon completion of necessary arrangements with the Canadian government. This would also have the immediate and major by-product of preserving the famed Allagash River in Maine, one of the few remaining wild rivers east of the Mississippi River."

The Dickey-Lincoln School Lakes Project was authorized by the 1965 Flood Control Act, Public Law 89-298 dated 27 October 1965, substantially in accordance with the plans included in the August 1964 report.

II. PROJECT DESCRIPTION.

A. Physical Characteristics

Dickey Dam is located on the Upper Saint John River immediately above its confluence with the Allagash River near the Town of Dickey and 28 miles above Ft. Kent in Aroostook County, Maine. As authorized the dam would be an earthfill structure impounding a reservoir with gross storage capacity of 7.7 million acre-feet for power, flood control and recreation. The reservoir area would total 86,000 acres at maximum pool elevation of 910 feet mean sea level (msl). Three dikes would be located in saddle areas along the reservoir perimeter to prevent overflow into adjacent watersheds.

Dickey Dam would have a total length of 10,600 feet and a maximum height of 335 feet above streambed. Its outlet works consist of a 26-foot diameter concrete lined tunnel, 2,130 feet long. The power facilities include eight generating units at 95,000 Kilowatts (KW) for a total installed capacity of 760,000 KW. The project would be operated for peaking power purposes.

Lincoln School Dam is located on the Upper Saint John River, 11 miles downstream from Dickey Dam. It provides for an earthfill dam impounding a reservoir with useful storage capacity of 24,000 acre-feet for purposes of regulating discharges from Dickey Dam and for power generation. Its reservoir would encompass 2,150 acres at its maximum pool elevation of 610 feet msl.

Lincoln School Dam would be 1600 feet long and have a maximum height of 85 feet. Its power facilities consist of two units at 35,000 KW each for a total installed capacity of 70,000 KW. The project would be operated as a base load power plant.

The construction cost for the dams and appurtenances totals $463.0 million based on 1 October 1975 price levels.

B. Operational Characteristics

The project would be operated principally as a peaking power plant. In this role the project would not be a high energy producing (i.e. Killowatt-hours) facility. A peaking power project is designed to operate for short periods of time to meet critical daily peak demands. It has quick starting capability and provides spinning reserve for load protection. Typical peaking plants are hydroelectric projects - both conventional and pumped storage - and gas turbine units. On the other hand, base load power is provided by large efficient fossil-fueled or nuclear steam plants which operate virtually continuously and as a result are high energy producing installations. However, these latter plants are not suitable for peaking use and load protection because of economic and operating considerations. The 1970 National Power Survey published by the Federal Power Commission notes that the current trend towards construction of very large fossil-fueled and nuclear steam-electric base load units has increased the need for plants designed specifically for meeting daily peak demands.

In addition to its reliability, a hydroelectric facility has a lower operating cost than alternative power sources because it does not rely upon costly fuels. Water is a continuous and clean source of power. Beyond the economic aspects, there would also be an annual savings in natural resources. To produce an equivalent amount of electrical energy, fuel consumption - dependent upon the type of alternate - would total 1.7 million barrels of oil or 600,000 tons of coal, or 9.2 billion cubic feet of gas.

C. Generating Time

The operation of Dickey Dam's power facilities is very flexible and can vary on any given day to meet a specific peak demand. The project is capable of generating to full capacity about 2½ hours per day for seven days a week or 3½ hours daily for five days a week. During periods of peak demand the generating time could be increased to seven hours per day, seven days per week if desired.

The Lincoln School reregulating dam can normally operate 10 hours per day seven days a week. When the Dickey project operates 7 hours per day, the Lincoln project is capable of generating energy 24 hours per day.

In the event of an electrical blackout, the project is capable of generating electricity for a continuous period of up to 35 days. Under normal operating conditions, the project will generate energy 12 months per year.

D. Construction Period

Construction of the project, including all necessary land acquisition, will require approximately 7½ years. Initial power-on-line would be scheduled 6½ years after initiation of construction and total power-on-line would be realized one year later.

III. PROJECT ECONOMICS.

A. General

The project's average annual benefits are currently estimated as follows: (1 October 1975 Price Levels)

Benefit	Amount
Power	$56,549,000
Flood Control	83,000
Area Redevelopment	1,067,000
Recreation	1,250,000
Total Benefits	$58,949,000

The average annual cost of the project reflecting amortization of the initial investment and annual operation and maintenance cost totals $22,850,000. This results in a benefit-to-cost ratio of 2.6 to 1.

1. Power

As noted, power would be the principal benefit realized through construction of the Dickey-Lincoln School Lakes Project. On-site annual power generation of 1.2 billion kilowatt hours would result from the total installed capacity of 830,000 KW. Additional power generation of 350 million kilowatt hours would also be gained by downstream Canadian power plants due to regulated flows from Lincoln School Lake of which 50% would be allocated to the United States.

The peaking power capability of the project would provide an estimated 14% of the New England peaking power capacity required in the mid-1980's.

2. Flood Control

The flood control benefit results from elimination of flood damages below the project site. Fort Kent, located about 28 miles below Dickey Dam, has experienced ten floods during the past 48 years of record. The most recent floods occurred in May 1961, May 1969, April 1973 and May 1974. The May 1974 flood stages exceeded the record flood of April 1973 and caused damages estimated at $3.0 million. These losses would be prevented by the project. In view of the uncertain status of Dickey-Lincoln School Lakes and the recurring flood problem at Ft. Kent, a small local protection project has been formulated under Section 205 of the 1948 Flood Control Act, as amended,

that will provide some degree of protection to the Town of Ft. Kent. The proposed dike and pumping station will protect to a 100 year frequency flood level and be limited principally to the commercial center of Ft. Kent. The project has been approved by the Governor of Maine and is currently under design. Construction is dependent upon the availability of future appropriations.

Dickey-Lincoln School Lakes would provide full protection to the entire Ft. Kent area and other downstream areas.

3. Redevelopment

The Area Redevelopment benefit represents the effect of added employment resulting from the project. The Dickey-Lincoln School Project is located in the part of Aroostook County which is classified as a Title IV (1) Economic Development Area denoting an area of substantial and persistent unemployment. Numerous employment opportunities would arise and the associated wages related to project construction and future operation and maintenance would result in substantial relief to the economically depressed area.

4. Recreation

The recreation benefit is a preliminary estimate of general recreation, hunting and fishing use developed at the close of earlier preconstruction planning activity. As presently envisioned limited facilities such as campsites, comfort stations and boat launching ramps would be provided. A preliminary recreational master plan will be developed - in conjunction with appropriate State and Federal agencies - in the early stages of current planning effort.

B. Economic Analyses

The justification for authorization of all Corps of Engineers' projects is measured in terms of the benefit-to-cost ratio. The economic analysis used to develop this yardstick is based on standards prescribed by Senate Document No. 97, 87th Congress, entitled Policies, Standards and Procedures in the Formulation, Evaluation and Review of Plans for Use and Development of Water and Related Land Resources. Total project benefits for Dickey-Lincoln School Lakes are comprised of at-market power, total downstream energy, flood control, recreation and area redevelopment type benefits. The power benefits for Dickey-Lincoln School Lakes are equated to the cost of privately-financed equivalent alternative sources of power. The unit power values, furnished by the Federal Power Commission, are based on gas turbines for that portion of project power expected to be marketed in the Boston area for peaking purposes and a combined cycle generation plant as an alternative for that portion to be marketed in Maine.

The project cost is evaluated on an annual basis reflecting amortization of the investment and annual operation and maintenance expenses. The cost has been increased to provide for the transmission of power by adding 50 percent of the annual cost of a line between the

project and Boston. It has been assumed that the remaining one-half of the annual cost will be derived from the wheeling by others of off-peak power. The interest rate used in the economic evaluation is 3¼% and the period of analysis is 100 years. Attached as Table I is a summary of the economic analysis.

The 3¼ percent interest rate used in the economic analysis has been the subject of considerable discussion. Accordingly, an explanation of the derivation of this rate is appropriate. The interest rate is in accordance with a Water Resources Council (WRC) regulation implemented in December 1968. This regulation revised the method of computing the interest rate as previously outlined in SD 97. The regulation permitted an exception, however, for those projects already authorized such as Dickey-Lincoln School Lakes which was authorized in 1965. The exception noted that if an appropriate non-Federal agency provided - prior to 31 December 1969 - satisfactory assurances that requirements of local cooperation associated with the project would be met, then the previous interest rate would be retained. At Dickey-Lincoln School Lakes, local cooperation would be required for the cost sharing of recreational facilities. Assurances were received from the Governor of Maine by letter, dated 24 February 1969, that the non-Federal requirements would be fulfilled at the appropriate time. As a result, the interest rate was retained at 3¼%.

The WRC subsequently established new principles and standards for water resource planning effective in October 1973. A section of these new standards included the provision for increasing the interest rate to 6-7/8%. However, the Water Resources Development Act of 1974, enacted by the Congress on 7 March 1974, included a section which requires that interest rates used for water resource projects be consistent with the implementation of the December 1968 WRC regulation. Accordingly, the 3¼% interest rate remains firm for Dickey-Lincoln School Lakes. The prevailing rate for new water resource projects is 6-1/8%. As a point of interest if Dickey-Lincoln School Lakes were evaluated on this higher rate the benefit-cost ratio would be 1.5 to 1.

The Corps of Engineers also uses a procedure referred to as an "Economic efficiency test." The objective of an ideal system operation is to meet area power demands at least cost to consumers. Therefore the least costly addition to a region's capacity could be considered as a yardstick for purposes of making a decision regarding such additions. The "economic efficiency test" provides for such a determination. Basically the test provides for a comparison of the costs of providing an equivalent amount of power from the most feasible alternative, likely to develop in the absence of the project, evaluated on a basis comparable with the determination of the Federal project costs (with respect to interest rate i.e. 3¼%, taxes and insurance). The Corps "economic efficiency test" indicates that the annual at-market charge for Dickey-Lincoln School Lakes power amounts to $22,850,000

while alternative equivalent power charges amount to $45,758,000. This results in a ratio of 2.0 to 1 in favor of Dickey-Lincoln School Lakes. This means that even if private utilities could obtain financing equivalent to the Federal rate, water resource benefits could be provided by Dickey-Lincoln School at half the cost of the most feasible alternatives likely to develop in its absence. The attached Table II illustrates the "economic efficiency test".

C. Repayment Analysis

The above analyses are used to define the economic worth of the project. The financial value of power, however, is determined through the repayment analysis. Marketing of electric power from Federal projects is the basic responsibility of the Secretary of Interior as authorized by Section 5 of the 1944 Flood Control Act. Repayment rates must be sufficient to recover costs of power production and transmission including annual operation and maintenance expenses. The total investment allocated to power must be repaid over a reasonable period of years. As a matter of administration policy, this period has been specified as 50 years. On 29 January 1970, the Secretary of Interior, under his administrative discretion to establish power rates, instituted new criteria for determining interest rates for repayment purposes for projects not yet under construction. The current interest rate used for Dickey-Lincoln School Lakes repayment under this revised criteria is 6-5/8%. The resulting analysis shows that power from Dickey-Lincoln School Lakes could be marketed at 35.23 mills/Kwh as compared to 43.91 mills/Kwh for the private alternatives. On an annual basis this represents a savings of about $10.8 million.

The difference between the economic analyses previously described and the repayment analysis warrants further clarification. This has caused a considerable amount of misunderstanding and misinterpretation. The economic analyses - both for the benefit-to-cost ratio determination and the "economic efficiency test" are economic parameters measuring a project's worth. These analyses are not unique to Dickey-Lincoln School Lakes. The benefit-to-cost ratio is employed universally by the Corps in measuring a project's economic justification. The "economic efficiency test" is also universally used by the Corps in conjunction with projects having generation of electric power as a project purpose. The economic analyses utilize a 3¼% interest rate and 100-year period of evaluation. On the other hand, the repayment analysis - which will ultimately be computed by the Department of Interior - is a financial measure which determines the appropriate price at which bulk power must be marketed to return the total annual investment allocated to power. For this analysis, an interest rate of 6-5/8% and a 50-year repayment period are used.

IV. ENVIRONMENTAL STUDIES.

A. General

Detailed data essential to a comprehensive environmental

evaluation consistent with the National Environmental Policy Act of 1969 (NEPA) were not developed for Dickey-Lincoln School Lakes during earlier preconstruction planning which was terminated in the fall of 1967, prior to passage of NEPA. With the resumption of activity in 1974, environmental studies and preparation of an Environmental Impact is receiving priority attention. A final Environmental Impact Statement must be on file with the Council on Environmental Quality prior to initiating any land acquisition or construction.

An initial activity in environmental studies was the preparation of a scope-of-work for the Environmental Impact Statement, completed in August 1975. The scope-of-work is the plan of action for developing a comprehensive Environmental Impact Statement. It identifies all significant environmental, social and economic impacts induced by the project and recommends methodology for measuring and evaluating these impacts. Contracts are underway with private consulting firms to develop data and analyze the various impacts.

B. Project Effect on the Allagash River

Construction of the Dickey-Lincoln School project will have no adverse effect on the Allagash River. The Dickey Dam site is located on the Upper Saint John River immediately above its confluence with the Allagash River. Consequently, the impoundment would have no effect on its outstanding free flowing characteristics.

C. Effect of Reservoir Drawdown

Dickey Lake is distinguished as a multi-purpose seasonal storage reservoir and is designed to regulate river flows for at-site and downstream power generation, flood control and water quality. Inherent with these functions is a pattern of seasonal change in storage content and accompanying pool stage fluctuation.

The New England Division of the Corps of Engineers has conducted computer simulation studies which, among other things, identify the extent of these reservoir fluctuations. The characteristics of the project were analyzed by continuous simulation of operation using 41 years of hydrologic record. These studies indicate that during the summer season from June to October the lake level would normally fall or rise only slightly, depending upon hydrologic and electric load conditions.

During a normal year the pool would be nearly full in June, following the spring refill period, and then fall about 1.5 feet by the first of October. Pool fluctuations due to daily power operations would be minute, generally less than 2 to 3 inches. The normal pool fluctuation during the summer season would be about 2 feet. The maximum drawdown experienced during the summer months for the 41 years of simulation was 4.5 feet.

Much has been written about the so-called "bath tub ring" effect due to drawdown. The exposed bottom for the normal summer drawdown of 2 feet would be about 1500 acres, equivalent to a 35 foot wide strip around the 350 mile periphery of the lake. Maximum drawdown, normally about 20 feet, would occur each year during the winter months when snow would effectively cover the exposed areas. The minimum power pool level of 868 feet msl occurred once during the 41 year simulation and was in the month of March just prior to the spring refill season. The difference in lake area between the full pool level at 910 feet msl and the minimum pool is 32,000 acres.

V. MARKETING OF POWER

The concept developed during the earlier studies envisioned the marketing of 725,000 KW of Dickey-Lincoln School Lakes output as peaking power to the Boston, Mass. area and the remaining 105,000 KW principally as base load power in the Maine market. This marketing concept is being reviewed by the Department of Interior.

The Department of Interior will be responsible for marketing the electric power from Dickey-Lincoln School Lakes per authority of Section 5 of the 1944 Flood Control Act. This statute requires that power be sold in such a manner as to encourage the most widespread use thereof at the lowest possible rates consistent with sound business practices. Section 5 further directs that preference in the sale of power and energy is to be given to public and cooperative power interests.

It will not be known how much power will be available to private utilities until Interior finalizes its marketing plans. Marketing studies currently being conducted indicate that power will probably be available to private utilities. Historically, the Department of Interior has not proceeded with definitive marketing and transmission plans until construction of the project is underway and the power-on-line date is capable of being met with some degree of certainty. Prior to that time, their studies are of sufficient depth to determine marketability and evaluate the financial feasibility of the power installation.

The existence of the New England Power Pool (NEPOOL) - comprised of the major utilities within New England - provides an effective vehicle through which Dickey-Lincoln School Lakes output could be utilized to the mutual benefit of New England. A report dated November 21, 1974 submitted to the New England Planning Committee of NEPOOL stated that, "the Dickey project capacity would be fully effective capacity to the interconnected New England system if it were dispatched in a peaking assignment during the 1985-1986 power year. The enormous storage reservoir makes it possible to use Dickey with maximum flexibility. It can run at full capacity whenever

it is needed and can sustain that power level for the duration of any peak that the system experiences. It makes an ideal source of reserve with quick response, a fact that is most valuable to have as an option open to those responsible for load dispatching."

VI. CURRENT STATUS

Planning and design, previously terminated in late 1967 due to lack of funds, was resumed in the Fall of 1974 with the allocation of $949,000 in Fiscal Year 1975 (July 1974 through June 1975) funds. The only work accomplished in the interim was the annual updating of project costs and benefits. Construction costs were escalated using selective cost indices for specific work items. The power benefits have been updated annually by the Federal Power Commission.

Efforts and Activities currently under way:

Environmental -

- Prepared a "Scope-of-Work" for accomplishment of an Environmental Impact Statement.
- Aquatic Ecosystem & Fisheries Analysis.
- Terrestrial Ecosystem (Vegetation & Wildlife Analysis).
- Social - Economic Impacts Analysis.
- Archeological Studies.
- Power Alternatives Study.
- Water Quality Studies.
- Seismic Studies.
- Geological Studies.
- Preparation of an Environmental Impact Statement.

Project Planning & Engineering -

- Hydrology and Hydraulic Studies.
- Hydropower Studies including feasibility of modifying authorized units to provide pumped storage capability.
- Recreational Concept and preliminary planning.
- Real Estate planning and gross appraisals.
- Surveying and Mapping of Construction Sites.
- Construction Materials surveys.
- Highway Relocation Studies.
- General Layout and Design Activities.
- Updating of Project Cost Estimates & Development of Project Economics Data.

Coordination has been and will continue to be established with appropriate Federal, State and local agencies; Canadian interests and private interests as project planning and engineering progresses.

Since renewal of project planning in late 1974 it has become apparent that much environmental baseline data is lacking for this remote area of northern Maine. Also in view of the seven year hiatus in planning and design, project features must be reviewed and redesigned as required to reflect criteria changes and current conditions. Therefore, the prime current objectives are to: collect environmental baseline data; prepare an Environmental Impact Statement; revise project features and general design to reflect current requirements and conditions; and, prepare updated project cost estimate and economic analysis to reflect changes.

TABLE I

DICKEY-LINCOLN SCHOOL LAKES

ECONOMIC ANALYSIS - ANNUAL COSTS AND BENEFITS (October 1975 P.L.)
(Based on 3-1/4% interest rate and 100-year project life)

TOTAL INVESTMENT - DAMS	
Construction Cost of Dams	$463,000,000
Interest During Construction	37,900,000
Total Investment	$500,900,000
Capital Recovery factor 100 yr. life	.03388
ANNUAL COSTS - DAMS	
Interest and Amortization	$ 16,970,000
Operation and Maintenance	1,850,000
Major Replacements	323,000
Loss of Land Taxes	128,000
Sub-Total Dams	$ 19,271,000
TOTAL INVESTMENT - TRANSMISSION LINES	
Construction Costs of Transmission Line	$162,120,000
Interest During Construction	7,900,000
Total Investment	$170,020,000
ANNUAL COSTS - TRANSMISSION LINES	
Interest and Amortization	$ 5,760,000
Operation and Maintenance	884,000
Major Replacements	514,000
Sub-Total Trans. Lines	$ 7,158,000
TOTAL ANNUAL COSTS	
Dickey-Lincoln School Lakes	$ 19,271,000
Transmission (50%)	3,579,000
ANNUAL COSTS	$ 22,850,000
ANNUAL BENEFITS (See next page)	$ 58,949,000
B/C RATIO	2.58 to 1

TABLE I (Cont'd)

DICKEY-LINCOLN SCHOOL LAKES

ECONOMIC ANALYSIS - ANNUAL COSTS AND BENEFITS (October 1975 P.L.)

ANNUAL BENEFITS	
Marketed in Maine	
105,000 kw x .95 x $45.00	$ 4,489,000
372,000,000 kwh x .95 x $.0215	7,598,000
Marketed in Boston	
725,000 kw x .905 x $27.00	17,715,000
782,000,000 kwh x .929 x $.032	23,247,000
Downstream	
350,000,000 kwh x $.010	3,500,000
Sub-Total Power	$56,549,000
PREVENTION OF FLOOD DAMAGES	83,000
RECREATION	1,250,000
REDEVELOPMENT	1,067,000
TOTAL ANNUAL BENEFITS	$58,949,000

Kw = Kilowatts
Kwh = Kilowatt hours

TABLE II

DICKEY-LINCOLN SCHOOL LAKES

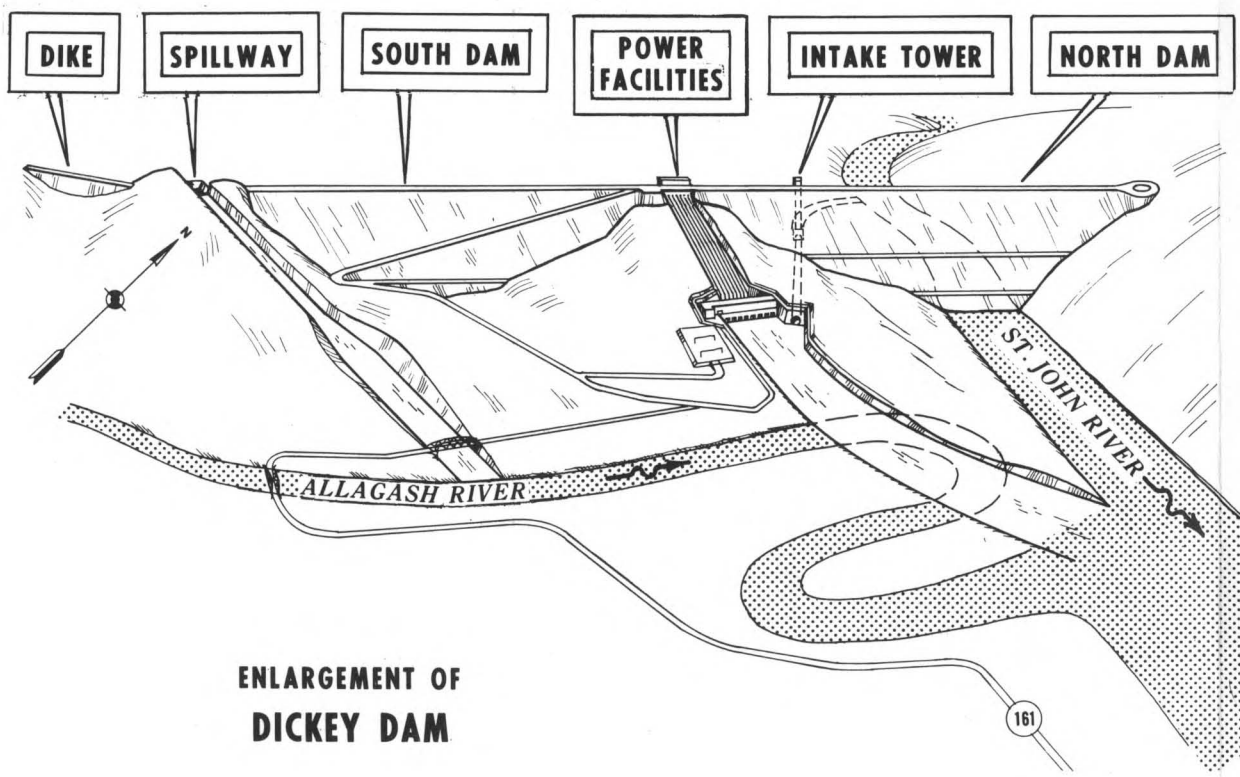
ECONOMIC EFFICIENCY TEST

(Comparably financed i.e. 3-1/4%)

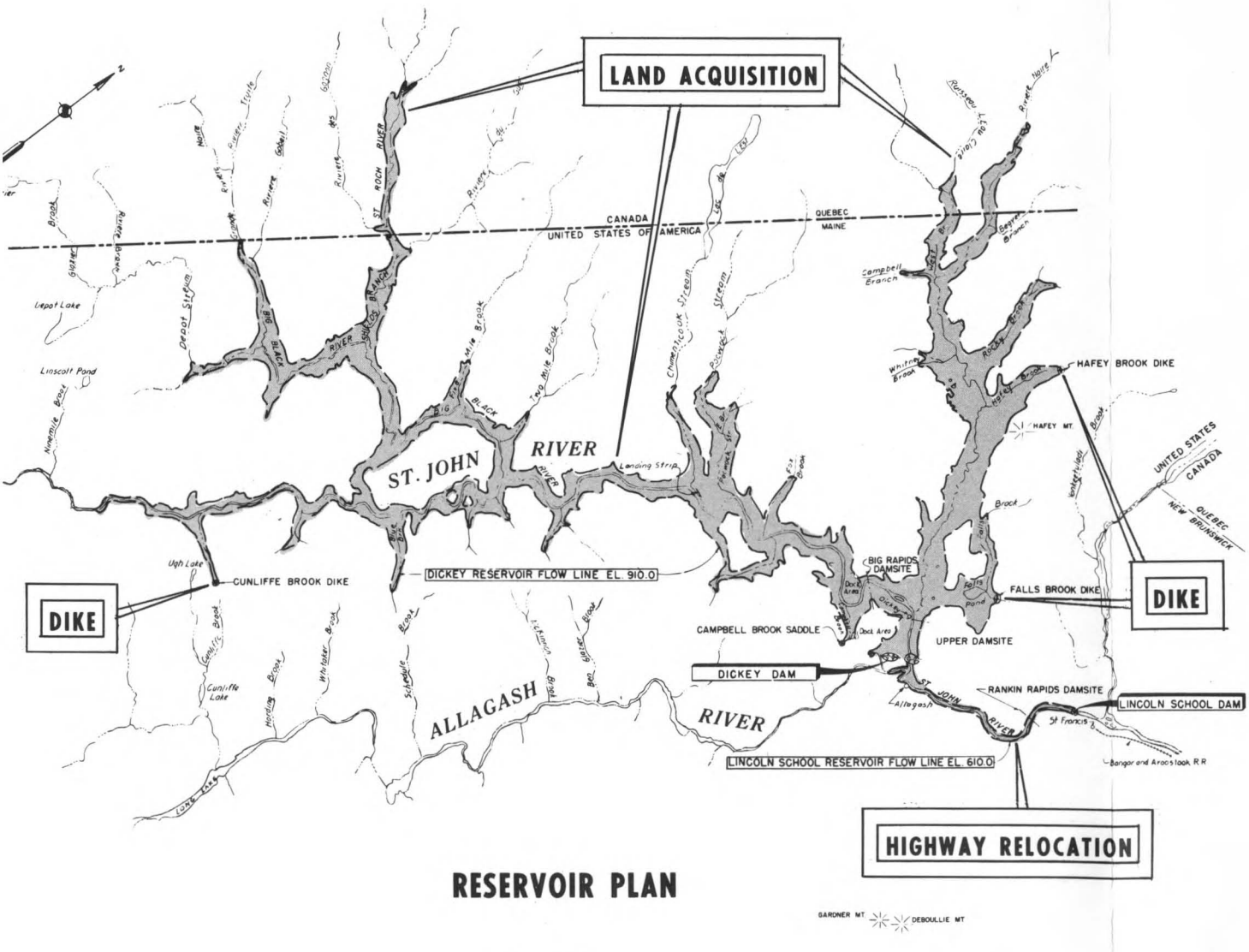
ALTERNATIVE COSTS

Power marketed in Maine		
105,000 kw x .95 x $18.00		$ 1,796,000
372,000,000 kwh x .95 x $.0215		7,598,000
Power marketed in Boston		
725,000 kw x .905 x $11.00		7,217,000
782,000,000 kwh x .929 x $.032		23,247,000
Downstream		
350,000,000 kwh x $.010		3,500,000
	Sub-Total	$43,358,000
*Adjustment for flood control		83,000
*Adjustment for recreation		1,250,000
*Adjustment for redevelopment		1,067,000
	Total Alternative Cost	$45,758,000
	Annual Cost, Dickey-Lincoln School	22,850,000
	Comparability Ratio	2.0 to 1

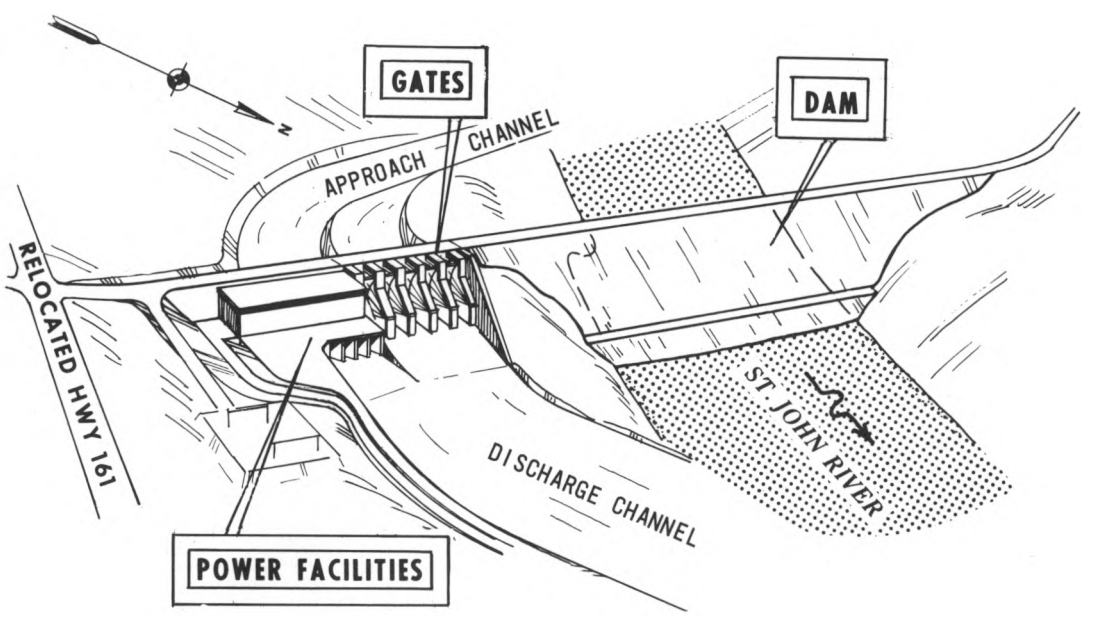
*Flood control, recreation and redevelopment benefits which are provided incidentally to construction of Dickey-Lincoln School would be foregone by the alternative. Therefore, the values of these benefits are added to the alternative in order to obtain a valid comparison.



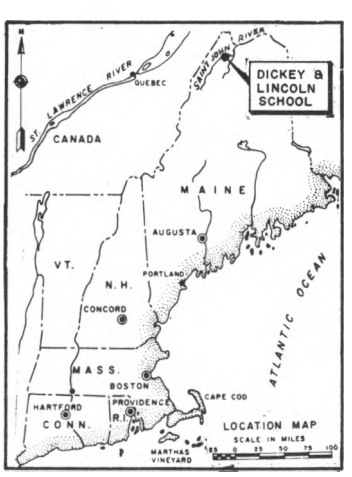
ENLARGEMENT OF
DICKEY DAM



RESERVOIR PLAN



ENLARGEMENT OF
LINCOLN SCHOOL DAM



UPPER SAINT JOHN RIVER
WATER RESOURCES DEVELOPMENT

DICKEY AND LINCOLN SCHOOL LAKES
MULTIPLE PURPOSE PROJECT
INCLUDING POWER

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS

DICKEY-LINCOLN SCHOOL LAKES

FEDERAL LEGISLATION PERTINENT TO THE DEVELOPMENT OF THE DICKEY-LINCOLN SCHOOL LAKES PROJECT

22 December 1944, Pub. Law 534, 78th Congress-Flood Control Act of 1944.
Rights of States. Section 1 declared policy of Congress to recognize rights and interests of the States in water resource development, and requirement for consultation and coordination with affected States (58 Stat. 887, 33 U.S.C. 701-1).
Power Disposition. Section 5 provided for disposal by the Secretary of the Interior of surplus electric power from Corps projects (58 Stat. 890, 16 U.S.C. 825-f).

12 August 1958, Pub. Law 85-624-Fish and Wildlife Coordination Act. Provided that fish and wildlife conservation receive equal consideration with other project purposes (72 Stat. 563, 16 U.S.C. 661).

9 July 1965, Pub. Law 89-72-Federal Water Project Recreation Act-Uniform Policies. Required consideration of opportunities for outdoor recreation and fish and wildlife enhancement in planning water resources projects. Recreational use of the project will be coordinated with other existing and planned Federal, State, or local recreational developments. Non-Federal bodies will be encouraged to operate and maintain the project recreational and fish and wildlife enhancement facilities. If non-Federal bodies agree in writing to administer the facilities at their expense and to pay one-half the separable first cost, the recreation and fish and wildlife benefits shall be included in the project benefits and project cost allocated to recreation and fish and wildlife. Fees may be charged by the non-Federal interests to repay their costs. If non-Federal bodies do not so agree, no facilities for recreation and fish and wildlife may be provided except those justified to serve other purposes or as needed for public health and safety. However, project land may be acquired to preserve the recreational potential. If within 10 years after initial project operation there is no local agreement the land may be used for other purposes or sold (79 Stat. 213, 16 U.S.C. 460-1-12).

22 July 1965, Pub. Law 89-80-Water Resources Planning Act-Water Resources Council Established. Established a Water Resources Council. Membership in 1975 included the Secretaries of Interior, Agriculture, Army, Health, Education and Welfare and Transportation and the Chairman of the Federal Power Commission. Associate members are the Secretaries of Commerce, and of Housing and Urban Development; and the Administrator of the Environmental Protection Agency. Duties of the Council include formulation of policies to be followed by Federal agencies in planning and developing water and related land resources projects and review of plans developed regionally for those purposes and periodic assessment of National water needs. The Act establishes river basin commissions and provides for financial assistance to the States (79 Stat. 244, 42 U.S.C. 1962).

1 January 1970, Pub. Law 91-190-National Environmental Policy Act. Section 101 established a broad Federal Policy on Environmental Quality (83 Stat. 852, 42 U.S.C. 4331).
Agency Requirements. Section 102 directed that policies, regulations, and public laws, will be interpreted and administered to the fullest extent possible in accordance with the policies of the Act, and imposes general and specific requirements on all Federal agencies (83 Stat. 853, 42 U.S.C. 4332).
Five Point Statement. Section 102 (2) (c) required a five-point environmental impact statement (EIS) on proposed Federal actions affecting the environment (83 Stat. 853, 42 U.S.C. 4332).
CEQ Established. Section 202 established the Council on Environmental Quality (83 Stat. 854, 42 U.S.C. 4341). The duties and functions of the Council are outlined under Section 203 (83 Stat. 855, 42 U.S.C. 4343).

2 January 1971, Pub. Law 91-646 Uniform Relocations Assistance and Real Property Acquisition Policies Act of 1970. Section 201 established a uniform policy for the fair and equitable treatment of persons displaced as a result of Federal and Federally assisted programs in order that such persons shall not suffer disproportionate injuries as a result of programs designed for the benefit of the public as a whole (84 Stat. 1895, 42 U.S.C. 462).
Displacement Payments. Section 202 outlined the moving and related expense payment for persons displaced by Federal programs and projects (84 Stat. 1895, 42 U.S.C. 4622). NOTE: Section 210 of the bill made the same benefits available to persons displaced by programs and projects of state agencies with Federal financial assistance.

28 Dec 1973, Pub. Law 93-205-Conservation, Protection, and Propagation of Endangered Species. Repeals the Endangered Species Conservation Act of 1969. Directs all Federal Departments/Agencies to carry out programs to conserve endangered and threatened species, in consultation with the Secretary of the Interior (or Commerce in appropriate situations), and to preserve the habitat of such species. (87 Stat. 884)

7 March 1974, Pub. Law 93-251 - Water Resources Development Act of 1974.

Fish and Wildlife Enhancement. Section 77 amends the Federal Water Project Recreation Act to increase the Federal share of costs for fish and wildlife enhancement to 75 percent.

Interest and Discount Rates. Section 80 directs the interest rate for discounting future benefits and computing costs be based on Water Resources council formula published 24 Dec 1968. It also calls for study and report by the President on principles and standards, discount rates, and cost sharing.

7 May 1974, Pub. Law 93-275 - Federal Energy Administration Act of 1974. Establishes the Federal Energy Administration as an independent agency in the Federal government. This agency shall advise the President and the Congress on national energy policy and take actions to meet the energy needs of the nation. (88 Stat 96)

24 May 1974, Pub. Law 93-291 - Preservation of Historical and Archeological Data. The Secretary of the Interior shall coordinate all Federal survey and recovery activities authorized under this expansion of the 1960 Act. The Federal construction agency may transfer up to 1 percent of project funds to the Secretary with such transferred funds considered nonreimbursable project costs. (88 Stat. 174)

11 Oct 1974, Pub. Law 93-438 - Energy Reorganization Act of 1974. Establishes the Energy Research and Development Administration (ERDA) as an independent executive agency to include the non-regulatory functions of the Atomic Energy Commission (AEC) and certain energy R&D functions from the Department of the Interior, the National Science Foundation, and the Environmental Protection Agency. Abolishes the AEC. (88 Stat. 1233)

EXECUTIVE ORDERS

Executive Order 11514, 5 March 1970, Protection and Enhancement of Environmental Quality. Section 2 of the order outlines the responsibilities of Federal Agencies in consonance with Title I of the National Environmental Policy Act of 1969.

Executive Order 11593, 13 May 1971, Protection and Enhancement of the Cultural Environment. Section 2 of the order outlines the responsibilities of Federal Agencies in consonance with The National Environmental Policy Act of 1969, The National Historic Preservation Act of 1966, The Historic Sites Act of 1935, and the Antiquities Act of 1906. Section 3 outlines specific responsibilities of the Secretary of the Interior including review and comment upon Federal agency procedures submitted under this order.

-- NOTES --

DICKEY-LINCOLN SCHOOL LAKES

GLOSSARY OF TERMS

Acre-feet:	A unit of volume one acre in surface and one-foot deep. One acre-foot equals 43,560 cubic feet or approximately 326,000 gallons.
Base Load:	That portion of the total power demand which exists 100 percent of the time during a given period.
Benefit-to-Cost Ratio:	The quotient when the annual projected dollar benefits are divided by the annual projected costs.
Capacity:	The load for which a generator, transmission system or station is rated.
Energy:	That which does or is capable of doing work. It is measured in terms of the work it is capable of doing; electric energy is usually measured in kilowatt-hours. The term is not synonymous with capacity.
Environmental Impact Statement:	A presentation and discussion of changes in the natural, social and economic conditions resulting from proposed action including an examination of alternatives and consequences of no action.
Gas Turbine:	An alternative form of peak power generation similar in operation to a jet aircraft engine wherein liquid of gaseous fuel is burned.
Hydroelectric Power Plant:	An electric power plant utilizing falling water to operate turbines to drive an electric generator.
Impoundment:	A reservoir.
Installed Capacity:	The total generating capability of a power station or system.
Nuclear Power Plant:	An electric generating station utilizing the energy from a nuclear reactor as the source of power used to produce base-load power.

GLOSSARY OF TERMS
(Cont'd)

Peaking Capacity:	Generating equipment normally operated only during the hours of highest daily, weekly or seasonal loads.
Peak Load:	The peak portion of the total power demand amounting to about 20-25 percent of the maximum demand.
Pumped Storage Plant:	A hydroelectric power plant wherein electricity is generated for peak load usage utilizing water pumped from a lower to an upper storage reservoir using excess energy available during off-peak periods.
Re-regulating Reservoir:	A reservoir used for the purpose of regulating the flow of water discharged from an upstream reservoir.
Spinning Reserve:	Generating capacity ready to take a load. Includes capacity available in generating units that are operating at less than their capability.
Unity:	The condition where the annual benefits of a project are equal to the annual costs.

-- NOTES--

NEWS ABOUT DICKEY-LINCOLN SCHOOL LAKES
Volume 1 / Number 1 / April 1976

U.S. Army Corps of Engineers, New England Division • 424 Trapelo Road • Waltham, Massachusetts 02154

Human Factors Also Considered in Measuring Environmental Impacts

Although no construction is involved, there will be plenty of digging for information this summer to identify socio-economic and archeological impacts of the Dickey-Lincoln School Lakes project.

Other Environmental studies which deal with the physical changes likely to occur if the project is constructed are continuing on schedule. These surveys are directed at analyzing the aquatic and terrestrial ecosystems in the project area. A plan for recreational use of the reservoir is being developed and the overall feasibility of the project will be compared with alternative power sources.

Much of this work, which will appear in the draft environmental impact statement, is being performed by independent contractors.

The Corps of Engineers is insisting that environmental issues be impartially presented and that total objectivity be observed in preparing and presenting the impact statement.

Examine Project's Effects on Local Communities

The Edward C. Jordan Company, Inc., of Portland, Maine has been engaged by the U.S. Army Corps of Engineers to conduct studies assessing economic and social conditions in communities near the project site. County-wide, state and regional economic impacts will also be examined.

Colonel John H. Mason, who heads the Corps New England Division, believes that "Dickey-Lincoln's total environmental impact can't be determined without considering the needs and desires of the people whose lives will be directly affected."

About 30,000 people reside in the immediate area comprised of Dickey, Allagash Plantation, St. Francis, St. John, Frenchville, Fort Kent, Madawaska, Eagle Lake, Ashland, Van Buren and Presque Isle.

Construction of the multi-million dollar Dickey-Lincoln School project would create economic growth potential in an area of persistent unemployment and low per capita income. But, the project will exert pressure which could cause severe disruption on community life unless careful planning is pursued.

Issues and concerns of major importance are the provision of services such as housing, public safety, health, education, recreation, transportation and sanitation during the 7-1/2 years needed to complete construction of dams and reservoirs.

Evidence of Early Settlements Sought

Historical and archeological sites in the St. John Valley area of the proposed Dickey-Lincoln School Lakes project will be inventoried this summer by the University of Maine at Orono. Dr. David Sanger, UMO associate professor of anthropology will direct the project.

Significant archeological and historical areas will be located by the UMO team, Dr. Sanger said, and an assessment made of each site on whether or not it meets the criteria for placement in the National Register of Historic Places. This will require walking the entire area to examine possible sites and, in some cases, digging in areas where sites may be buried.

The completed report will include a detailed plan of how to rescue or salvage the historic and archeological values pinpointed in the area should the Dickey-Lincoln School project be implemented.

Dr. Sanger anticipates uncovering Indian sites dating as far back as 10,000 years; evidence of various European cultures at the sites of early lumbering communities; and possible Acadian settlements.

Maine Planning Director Named Governor's Liaison Representative

Governor James B. Longley has named Maine planning director Allen G. Pease of Hollis as his personal liaison representative in connection with the Dickey-Lincoln School Lakes hydroelectric project.

Mr. Pease will coordinate activities of Maine agencies working with the U.S. Army Corps of Engineers in

preliminary planning and design activities. Much of this effort will be directed to assuring that State goals and policies are followed in the development of the project's environmental impact statement and to minimize any negative impacts should the project be approved for construction.

A former associate professor of political science at the University of Maine's Portland-Gorham campus, Mr. Pease served briefly as a special advisor to Governor Longley on government operations before appointment to his current post last July. He is also Chairman of the Capitol Planning Commission and heads the Governor's Cabinet Management Committee on Development. Previously, he served as an administrative assistant in the office of former Governor Kenneth M. Curtis.

Mr. Pease is a 1950 graduate of Colby College and earned a master of arts degree in political science at Ohio State University.

A publication of the New England Division of the U.S. Army Corps of Engineers circulated without charge in the interest of stimulating public discussion and involvment in an open planning process where all viewpoints may be expressed.

Despite Some Ups & Downs

WATER TESTING CONTINUES YEAR ROUND ON THE ST. JOHN

1

In the case of Dickey-Lincoln, you can expect some ups and downs.

Thanks to the skill of helicopter crews and equipment assigned to the Aviation Division at Fort Devens Army Air Field, the program for monitoring water and air quality conditions on the St. John River and its major tributaries now continues year-round.

Personnel of the Water Control Branch, U.S. Army Corps of Engineers, New England Division and scientists from the U.S. Environmental Protection Agency are now able to conduct surveys at the Dickey-Lincoln project site which encompasses some of the most remote terrain in the continental United States. Nine missions have been completed to date.

As depicted in these photos of field operations technicians have encountered temperatures as low as −20 degrees. While some substances must be analyzed on the spot, most of the testing is performed at the EPA's regional laboratory in Needham, Massachusetts. A mobile laboratory staffed by EPA will be operating in the project area this spring.

Regular monitoring is essential to obtain accurate measurements of the physical and chemical properties found in water specimens so that environmental impacts of the project can be identified.

Without current reliable base data, available only through controlled on-site sampling, future conditions could not be predicted with confidence even when the most advanced computer modeling techniques are applied.

2

Water quality studies are vital to the future use of the St. John River Valley for development of a hydroelectric power complex. EPA will continue to monitor water quality conditions so that enough data will be available to evaluate the extent to which construction of the project would permanently disturb the area's ecologic balance.

1) Captain Charles Thompson, U.S.A., has matters under control for this picture landing.

2) An Atomic Spectrophotometer helps EPA chemist Paul Groulx to detect metallic content of sample taken at the project area.

3) EPA staff engineer, Fred Freeman (right) has the attention of Ed Taylor in measuring contents of air samples taken above the St. John River watershed.

4) Edward Taylor, Chief of Chemistry Section at EPA's Needham, Mass. lab, ignores —20 degree temperature reading to pick up snow sample on the Big Black River.

Special thanks go to the U.S. Air Force and the Maine National Guard for logistical support provided to the on-going test program.

3

4

St. John River Waters May Be Key Factor In Region's Energy Future

A Federally-financed hydroelectric complex at Dickey and Lincoln School in northern Maine was first authorized by Congress in 1965 for the purpose of harnessing the natural flow of the Upper St. John River as an energy resource.

Two earthfill dams would impound enough water to produce 1.2 billion kilowatt hours of bulk power annually for use in New England.

Development of Dickey-Lincoln School would add 830,000 kilowatts to New England's power supply. Most of this power would be fed into the regional grid for immediate use during periods of peak demand. A portion of the project power will be reserved for distribution as base power to Maine communities. In accordance with Federal law, preference in allocating the project's energy will be given to municipal and other publicly owned utility systems.

The main reservoir area at Dickey would be 86,000 acres, most of which is now being utilized for lumbering purposes. Some 55 miles of the St. John River would be flooded. Construction of the dams, including land acquisition and power generating equipment has an estimated cost of $463 million plus $162 million for transmission lines (October 1975 price levels). Except for project costs apportioned for flood control and recreation — about six percent of the total — all remaining construction and operating expenses will be recovered through the sale of power over a 50-year period.

Hydroelectric power is economically attractive. Generation is virtually pollution free and no nonrenewable resources are consumed. However, the cost of initial construction is high. Changes in the physical, social and economic environment will be significant in the immediate project area.

News about Dickey-Lincoln School Lakes

HY-LITES

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SPARKS . . .

The New England Power Planning group (NEPLAN) in West Springfield, Mass. has issued new power demand projections. The figures indicate that the ten-year annual growth rate forecast through 1986 for the area serviced by the New England Power Pool is 24% lower than the actual annual growth experienced in the 1963-1973 decade. The present forecast predicts that demand will increase by 5.6% annually. Projections of total power consumption in New England by 1985 have been reduced 9.4% from the NEPLAN forecasts prepared last year. The 1985 estimate was reduced to 23,831 megawatts compared to 26,298. (Ed. Note — About one-fifth of the total is considered in the peaking category.) . . . A Corps of Engineers' publication, "An Ecological Glossary for Engineers and Scientists," compiled by the Institute of Ecology can be obtained without charge by contacting the Public Affairs Officer, U.S. Army Corps of Engineers, New England Division, 424 Trapelo Road, Waltham, Mass. 02154.

Engineering and planning personnel from NED conducted a general briefing for 60 senior forestry students at a seminar on March 3rd on the University of Maine campus at Orono . . . Writer Myron Levin, in his article published in the March edition of **Up-Country**, advises anyone planning to canoe the length of the St. John River to schedule the trip between late-May and mid-June when the river is neither a raging tyrant nor a disappointing trickle. Mr. Levin made the trip a year ago.

The pages of **Hy-Lites** are open for the expression of all points of view and reader questions, letters and articles will be considered for publication. Circulation of this publication is free of charge.

New, Portable Unit Designed By NAI Used in Fisheries Study

NAI-designed backpack unit.

NAI's recent fisheries survey at the site of the proposed hydroelectric project in the wilderness of northern Maine, required portable and lightweight electric fish shockers which could be easily moved through wooded regions from one study site to another. Since no such equipment was available on the market design and fabrication of a suitable unit were assigned to NAI's Ocean Engineering Department.

George Krause, NAI Electronic Technician, was given the task, and with technical advice from Mr. Alexis Knight, of the U. S. Department of Agriculture, Fish and Wildlife Services, designed a backpack unit which met all field requirements. Mr. Krause gave special attention to the design of safety features within the system to prevent any possibility of electrical shock to the operator. Three of the units were fabricated, and all proved to be extremely effective in the field. The electrofishing technique is used to stun fish in order to facilitate capture. After they are weighed and measured, the fish can then be returned unharmed to the water.

Fact Sheet Available

Readers interested in further details concerning the present status of the Dickey-Lincoln School Lakes project are requested to write for a free copy of the current Fact Sheet.

Field Interviews Begin April 12th To Collect Socio-Economic Data

Several hundred households in the Upper St. John River valley will be selected for interviews in connection with the socio-economic impact studies.

The survey will begin on April 12 and continue through mid-May.

Interviews will be conducted in Dickey, Allagash Plantation, St. Francis, St. John, Fort Kent, Frenchville, Madawaska, Eagle Lake, Ashland and Van Buren.

NEWS ABOUT DICKEY-LINCOLN SCHOOL LAKES
Volume 1 / Number 2 / July 1976

DIGGINGS

U.S. Army Corps of Engineers, New England Division • 424 Trapelo Road • Waltham, Massachusetts 02154

Busy Summer As Fact Finders Seek Data On Dickey-Lincoln Environmental Impacts

Vital field work continues this summer in the Upper St. John River Valley.

Colonel John H. Mason, head of the New England Division of the U.S. Army Corps of Engineers stressed that all of the information will be used in the preparation of the Environmental Impact Statement (EIS) and for preliminary design and engineering purposes.

The National Environmental Policy Act of 1969 requires the Corps of Engineers to compile and present detailed assessment of the project's potential impacts before construction is approved.

Significant environmental data collection activities scheduled this summer in the St. John Valley include:

• Fisheries sampling and habitat evaluation downstream from the damsite to Grand Falls, and fish sampling in 27 tributary streams.

• Verification of wildlife habitats in the project area at locations originally identified through interpretation of aerial photographs. The work will be performed in cooperation with the U.S. Fish and Wildlife Service of the Department of Interior, and the Maine Department of Fisheries and Wildlife.

• Investigation of sites of potential archeological value under the direction of Dr. David Sanger of the University of Maine, Orono.

• An inventory of rare and endangered flora.

• A creel census and fishery utilization study supervised by U-Maine faculty member Dr. Richard Hatch.

• Household and business interviews for analysis in the socio-economic portion of the environmental impact statement.

• Recreational resource analysis and development of recreation alternatives and impacts by the Northern Maine Regional Planning Commission.

Technical work is proceeding to acquire information for design and engineering. These activities include:

• On site water quality sample testing using a mobile laboratory staffed by technicians from the U.S. Environmental Protection Agency.

• Establishment of ground control for structural features and topographic surveys.

• A seismic survey to detail underlying geologic formations in the area.

• Subsurface exploration and ground reconnaissance to locate sources of rock and earth borrow proximate to the project site for use in dam construction.

In addition to the mobile laboratory, drill rigs extracting subsurface samples will be on site. A number of recording stations have been equipped to continuously monitor natural conditions in the valley.

An Army helicopter and crew from Fort Devens has been assigned to assist Corps field activities, flying out of Allagash with the support of the Maine Army National Guard.

Colonel Chandler Will Succeed Retiring Colonel Mason

Colonel John P. Chandler will succeed Colonel John H. Mason as Division Engineer of the Corps' New England Division in August when Colonel Mason retires from active military service at Waltham, Massachusetts headquarters.

A native of Cambridge, Massachusetts, Colonel Chandler entered the Army in 1944 as an enlisted man and was commissioned in the Regular Army in 1949 upon graduation from the U.S. Military Academy at West Point. He has held command and staff assignments in the United States and overseas and served most recently as Deputy Commandant for Combat Training Development, U.S. Army Engineer School, Fort Belvoir, Virginia.

Colonel Chandler holds three master of science degrees; civil engineering, Harvard University; mathematics general, Rensselaer Polytechnic and business administration, George Washington University. He is also a graduate of the U.S. Army Command and General Staff College, and the Industrial College of the Armed Forces and is a registered professional engineer.

Colonel Mason began his military service as an enlisted man during World War II and will complete more than 28 years of active duty. He and Mrs. Mason expect to reside permanently in the New England area.

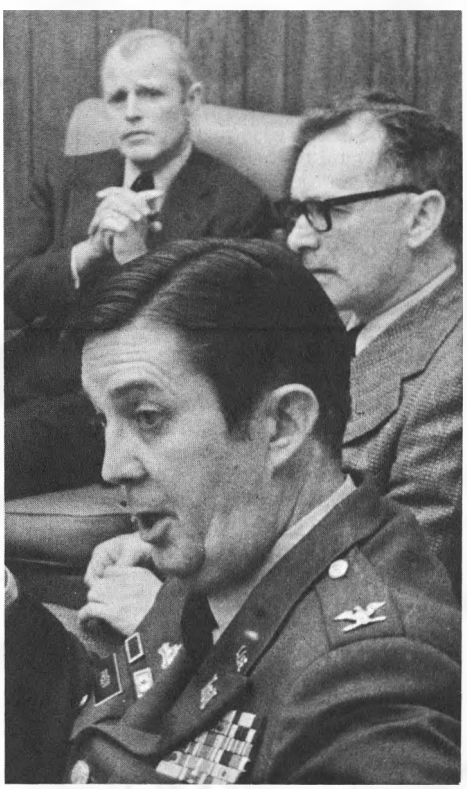
Governor Longley Appoints Ten to Impact Committee

AUGUSTA, Maine — Governor James B. Longley has named ten distinguished Maine residents to serve on a special citizens' committee to assess impacts on the state of the proposed Dickey-Lincoln School hydroelectric power project.

John Robinson, President of Firstbank, Farmington will chair the committee.

Serving with Mr. Robinson are Stanley Salwak, President, University of Maine, Presque Isle; Richard Hill, Department of Industry, University of Maine, Orono; James E. Halkett, New England Life, Bangor; Professor William Shipman, Department of Economics, Bowdoin College, Brunswick; State Senator Edward P. Cyr, Madawaska; Professor Sam Butcher, Chemistry Department, Bowdoin College, Brunswick; Attorney James E. Patterson, Ellsworth; Karen S. Snow, Caribou and Charlotte Porter, Presque Isle.

The first regular meeting was held in Bangor on 14 June.

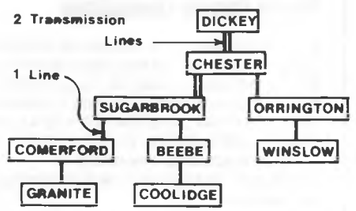


Governor Longley (rear) and Chairman Robinson attentively follow the discussion as Colonel Mason addresses members of the Citizens' Committee.

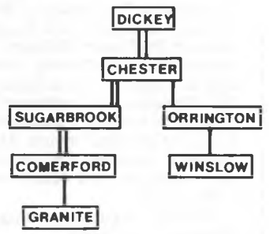
A publication of the New England Division of the U.S. Army Corps of Engineers circulated without charge in the interest of stimulating public discussion and involvement in an open planning process wherein all viewpoints may be expressed.

SYSTEM PLANS

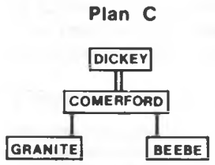
Plan A



Plan B



Plan C



DICKEY/LINCOLN SCHOOL TRANSMISSION STUDY AREA

U.S. Department of the Interior

27 May 76

Interior Department Schedules Meetings To Discuss Transmission Studies

Informational meetings sponsored by the U.S. Department of Interior have been scheduled at six locations to discuss procedures being employed in planning and evaluating alternative transmission systems to link Dickey-Lincoln School to the New England Power grid.

Three public meetings will be held in Maine; on July 14 at the University of Maine, Presque Isle; on July 15 at Bangor City Hall; and on July 16 at the Augusta Civic Center.

Meetings are also slated for July 19 at the Concord, N.H. Public Library; on July 20 at the Berlin, N.H. City Hall and on July 21 at Montpelier City Hall.

All meetings will begin at 7:30 p.m.

Further information can be obtained by contacting the Department's Bangor Field Office (207) 942-8271.

Seek Best Routes To Link Dickey Power to N.E. Grid

The U.S. Dept. of the Interior (USDI) is responsible for marketing power produced by federal projects and transmitting and distributing this power at lowest possible rates. As a part of the overall feasibility assessment, studies have started on marketing, system planning and transmission corridor location for delivery for Dickey-Lincoln School power to the New England transmission system. USDI work involvement requires close contact with the U.S. Army Corps of Engineers; however, the focus of their studies is separate.

Electrical System Plans Identified

USDI system planning studies have progressed to the point of identifying three basic electric system plans (see map). These plans, developed in cooperation with New England Power Planning (NEPLAN), call for transmission lines connecting with termination points in Maine, New Hampshire and Vermont.

The three plans would achieve widespread power distribution through interconnection with transmission lines presently feeding the regional grid. Various plans are being studied to determine which one would best serve the electrical needs of the region, and they are also being compared from an environmental viewpoint. A single system plan will be selected.

Environmental Studies

Environmental evaluation of each system plan is being conducted from an office newly established in the Federal Building, Bangor, Maine. This office is engaged in studies designed to identify and analyze corridors for each plan. Corridors and system plans will be ranked in order of their total environmental impact on (1) existing land use; (2) physiography; (3) planned land use; (4) transportation systems; (5) existing rights-of-way; (6) forestry and timber use; (7) ecologic resources; (8) scenic/aesthetic values; (9) parks and recreational areas and (10) historic and archaeologic resources. The Department has contracted with VTN Consolidated, Inc. of Cambridge, Massachusetts to assist in the corridor environmental studies. Corridor identification and evaluation is scheduled for completion by September 1976.

The Department will prepare an Environmental Assessment Report summarizing the system planning and environmental aspects of the three system plans to be presented for public review and comment in October. A preferred system plan and the transmission line corridors associated with this plan will be selected by the Department.

Route Studies

A more detailed level of analysis, referred to as "route studies", will be initiated upon selection of alternate corridors. The Department will then develop routes within each corridor. Detailed environmental impact and engineering studies will be performed on these routes to provide basic data for an Environmental Impact Statement.

Public Input Solicited

The Department will be requesting public comment throughout both the transmission corridor and environmental studies. Efforts to encourage public involvement will include the use of fact sheets, news releases and public meetings. Full consideration will be given to public comments in making system plan, corridor, and route decisions. Inquiries are encouraged and should be directed to Mr. L. Wilkerson, Resident Office Manager, U.S. Dept. of the Interior, Bangor, Maine, 04401, Tel. (207) 942-8271, ext. 406.

News about Dickey-Lincoln School Lakes

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02154

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE, $300

POSTAGE AND FEES PAID
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DOD-314

8418
-6M 46P
09 MR. FORREST P. DEXTER, JR.
UNIV. OF ME AT FARMINGTON
SCIENCE RESEARCH CENTER
FARMINGTON ME 04938

Relocation Benefits Explained To Valley Residents

Families living in the project area who will be displaced in the event the Dickey-Lincoln School project is ultimately approved for construction may be entitled to substantial relocation benefits in addition to fair-market payment for their property.

Morris Phillips, Chief of the Real Estate Division in the Army Engineers New England Division, indicates that each household has been contacted directly for the purpose of explaining the various options available to permanent residents under provisions of recently enacted Federal law.

Although no acquisition or relocation can be accomplished until construction funds are appropriated by Congress, special measures are being taken to allow maximum time for each eligible family to consider its relocation needs. Free advisory services will also be available if requested.

The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 guarantees that decent, safe and sanitary housing will be available to people who must relocate because their homes have been acquired. In the case of homeowners, the Act authorizes supplementary payments of up to $15,000 to obtain replacement housing meeting these standards if the market value of their present property is insufficient.

Some 150 families in St. Francis and Allagash will be required to relocate according to preliminary studies.

Tenants are entitled to supplementary payments of up to $4,000 to rent decent, safe and sanitary housing for a period up to four years, or to make a downpayment on the purchase of a dwelling which meets the above standards.

DICKEY-LINCOLN SCHOOL LAKES
Estimated Acreage Requirements

	Dickey	Lincoln School
Reservoir Impoundment	86,000	2,620
Shoreline buffer zone, Islands & Structures	38,000	380
TOTAL	124,000*	3,000

*Includes 5,700 acres in Canada.

NOTE — Environmental studies may suggest that additional acreage is needed to replace loss of wildlife habitat.

Surveys Underway to Determine Presence of Rare Plant Life

Surveys of rare plant life in the project area are now being conducted by Dr. Charles Richards of the University of Maine, Orono.

Information acquired in the survey will be presented in the draft environmental impact statement.

Federal law requires special measures to avoid actions which could jeopardize the existence of endangered species or destroy their natural habitat.

Field surveys will be conducted in the Upper St. John River Valley during the weeks of June 28-July 2 and July 26-30.

Dr. Richards is a member of the Department of Botany and Plant Pathology and Director of the University's Herbarium.

Personnel from the Army Engineers New England Division will assist in the field surveys which are being performed in cooperation with the Maine State Planning Office's Critical Area program.

Bicentennial Exhibit Set For S. Portland July 26-28

The U.S. Army Corps of Engineers Bicentennial Exhibit, "Let Us Try", will visit the South Portland Mall July 26, 27 and 28.

The fifteen-minute multi-screen, multi-image, audiovisual presentation tells the story of the Corps of Engineers 200 years of service from their beginning in 1775, to their present-day role in the development and management of the Nation's water resources. Admission to the exhibit is free.

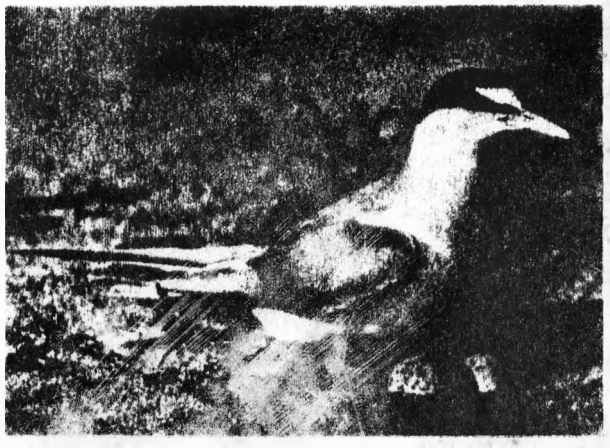
Maine's Critical Areas Program

What are Critical Areas?

Critical areas are officially recognized (Registered) areas which contain natural features of state significance — either highly unusual natural features, or outstanding examples of more common features. Critical areas, on both public and private land, may include exceptional plant or animal habitat, areas of great geological or historical interest, and outstanding scenic areas. They may or may not be well-known to the public. Some examples of critical areas include colonial bird nesting sites, naturally occurring rhododendron stands, significant fossil deposits, and scenic gorges and waterfalls.

Why are Critical Areas Important?

Critical areas are a highly significant part of our natural heritage. They provide important opportunities for general natural history education, serving as museums and classrooms for student groups, conservation organizations, outdoor clubs, and individuals. Critical areas also serve as study areas for professional researchers involved in investigations of undisturbed natural features. Areas with particularly good specimens of plant or animal species, or with populations of unusual species, provide "breeding stock," thus helping to maintain diversity and stability in the natural system. In some cases, these areas may have the capacity for recreational use, providing space for such activities as sightseeing, hiking, canoeing, photography, and art. In some cases, these areas also have outstanding scenery.



What is Maine's Critical Areas Program?

Recognizing that the proper identification and assessment of critical areas in Maine should be a major part of comprehensive planning activities, the 108th Legislature in 1974 enacted "AN ACT Establishing a State Register of Critical Areas." Under this legislation the State Planning Office has the responsibility to develop a Critical Areas Program for the purpose of identifying, documenting, and encouraging the conservation of critical areas. An eleven-member Critical Areas Advisory Board has been created to advise and assist the State Planning Office in this en-

What About the Conservation of Critical Areas?

Conservation of critical areas is dependent upon the cooperation of the landowners, and may, with the owner's consent, involve management agreements and the sale or donation of property rights. At the present time however, the primary emphasis in the Critical Areas Program is placed on the registration of critical areas.

The State Planning Office attempts to maintain a close relationship with the owners of critical areas. In order to protect the landowner's assets and privacy, as well as to attain the primary objective of preventing damage to critical features, wide dissemination of information on critical areas will not be encouraged.

To allow time to respond in the event of an imminent threat to a registered critical area posed by activities such as roadbuilding, clearing for powerlines or commercial development, the landowner is required by the Critical Areas Act to give the State Planning Office 60 days notice before such activities are undertaken on the area. If the proposed activity is of concern, the State Planning Office will contact the owner, as well as appropriate government and private organizations, to try to work out an arrangement whereby the threat may be avoided.

If the critical area no longer possesses the values for which it was recognized, removal from the Register will be considered by the Board.

Further Information

Suggestions on areas which might be included on the Critical Areas Register are welcomed. For more information on the Critical Areas Program, contact the Maine State Planning Office, 184 State Street, Augusta, Maine 04333. Telephone (207) 289-3155.

October, 1975

Cover photograph: Natural Resources Council
Other photographs: Patrick W. Grace

Design: Phoebe McGuire

What are the Phases of the Critical Areas Program?

The Critical Areas Program consists of two phases: registration and conservation. Since the importance of various natural features cannot be established until a detailed inventory has been made, initial emphasis has been placed on the registration of critical areas. We must know what critical natural features are present, and where they are located before further conservation efforts are undertaken.

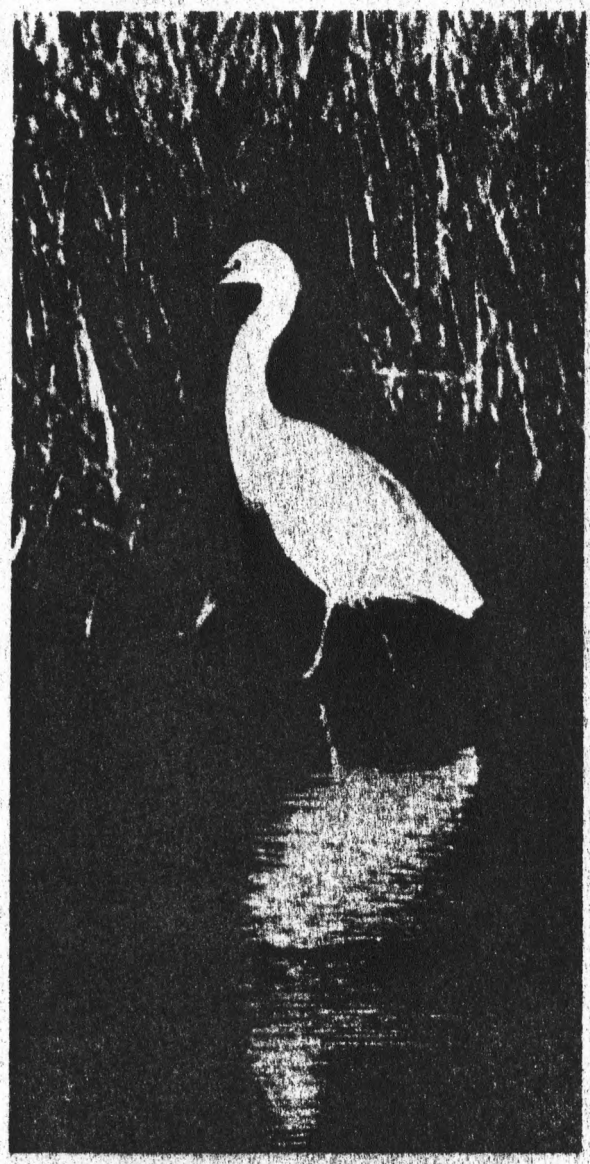
What is the Registration Process?

The registration process begins with the identification of subjects (potential critical area types such as: waterfalls, heron rookeries, and rhododendron stands) for investigation under the Critical Areas Program. Priorities are then established as to which subjects will be looked into first, second, third, etc. A planning report is then prepared on the top priority subject. This planning report presents information relevant to the Critical Areas Program, specifically, which areas of the type under consideration should be considered further for registration. The planning report is the result of systematic, thorough, and detailed investigation of the subject, including contact with the landowners of potential critical areas and field investigation.

Following review of the planning report, recommendations for registration of specific areas may be made to the Critical Areas Advisory Board by the State Planning Office. A preliminary decision is then made on the registration of each area recommended for consideration. If the preliminary decision on a particular area is favorable, the landowner is notified that it is being considered for registration and is given sixty (60) days to express his or her feelings to the Board.

After the 60 day waiting period has expired, the Board again reviews the information on the area including the landowner's suggestions, if any, and decides whether or not to include the area on the register.

The Critical Areas Register is a public document available for inspection at the State Planning Office.



TOPICS BEING CONSIDERED FOR THE PREPARATION OF PLANNING REPORTS

FOR THE CRITICAL AREAS PROGRAM

BOTANY

Black Gum, Nyssa sylvatica

Coastal White Cedar, Chamaecyparis thyoides

Marl Pond

Jack Pine, Pinus banksiana

Beach-head Iris, Iris hookeri

Rose Root Stone crop, Sedum rosea

Bird's Eye Primrose, Primula laurentiana

Marsh-Feelwort, Lomatogonium rotatum

Spice bush, Lindera Benzoin

New Jersey Tea, Ceanothus americanus

Sweet Pepperbush, Clethra alnifolia

Clammy Azalea, Rhododendron viscosum

Showy Lady's Slipper, Cypripedium reginae

Showy Orchis, Orchis spectabilis

Beach Plum, Prunus maritima

Whorled Pogonia, Isotria verticillata

Small Whorled Bogonia, Isotria medeoloides

Dwarf Primrose, Primula mistassinica

Small round leaved Orchid, Orchis rotundifolia

Calypso Orchis, Calypso bulbosa

Slender Rock-Brake, Cryptogramma stelleri

Botany (continued)

Eastern Holly Fern, Polystichum braunii

Aroostook Sedge, Carex eleuchycarpa

Bog Reed-grass, Calamagrostis inexpansa var. novae-angliae

American Globe-Flower, Trollius laxus

Square-stemmed Monkey-flower, mimulus ringens var. colpophilus

Booth's Rattlesnake-root, Prenanthes boottii

Silver Whitlow-wort, Paronychia argyrocoma var. albimontana

Orono Sedge, Carex oronensis

Auricled Twayblade, Listera auriculata

White Pine, Pinus strobus

Red Pine, Pinus resinosa

Hemlock, Tsuga canadensis

Red Spruce, Picea rubens

White Spruce, Picea glauca

White Oak, Quercus alba

Red Oak, Quercus rubr

Beech, Fagus grandifolia

Sugar Maple, Acer saccharinum

White Birch, Betula papyrifera

Shagbark Hickory, Carya ovata

Old growth beech/sugar maple forest with an association and high diversity of herbaceas species that includes bloodroot Sanguinaria canadensis, hepatica Hepatica americana, and Maiden-hair Fern Adiantum pedatum

A general report on salt marshes

A general report on bogs (peatlands)

ZOOLOGY

Laughing Gull

Blue back trout

Sunapee trout

Atlantic Sea run salmon

Water fowl

a. Eider ducks

b. Others

Common Seal

Gray Seal

High species diversity, rocky intertidal localities and tide pools

HISTORY

Petroglyphs

Coastal Shell Middens

Indian stone quarries

Early colony settlement sites

SCENERY

The development of a methodology to define and evaluate scenery in Maine.

GEOLOGY

Waterfalls

Gorges

Cirques

Reversing waterfalls

Sea Cliffs

Mountain Cliffs

Eskers

Coastal Marine beaches

a. sand

b. gravel

Multiple tills

Bedrock geology, coastal York County

Coastal fossil tree stumps

White water rapids on major streams and rivers

For further information about the Critical Areas Program, or contractual arrangements for the above subjects, contact:

Harry Tyler, Planner/Biologist
Resource Planning Division
State Planning Office
189 State Street
Augusta, Maine 04333
Telephone: (207) 289-3154

September 10, 1976

Recd 4 Oct 76

S-30

EXCITER

September 1, 1976

SPECIAL BULLETIN

Introducing...

KILOWATT SAVING TIME

Kilowatt Saving Time, or KST, is a new CMP program that can help our customers hold down future electricity costs by shifting their electrical consumption.

WHAT IS IT?

KST is the time of the year--and it happens every year between mid-December and late January--when our electrical system must work the hardest. It's usually for just a few hours, between 4 and 8 p.m. on a cold windy winter evening when our customers are cooking, heating and using electricity for many other purposes all at once. We call it our annual "peak."

CMP must plan for those few hours each year and be prepared not only to meet that big demand for power, but also to have reserve power available in case of emergency.

Energy (KWH) and capacity (KW) used during the annual peak periods are costly --and this means increased costs to the Company and to our customers whenever that peak is increased. Energy charges for fuel are reflected in customers' electric bills almost immediately through higher fuel adjustment charges while capacity charges are reflected through higher rates in the future.

Since the peak electrical demands are created by our customers, and since the costs of meeting those peaks ultimately must be passed on to them, we are going to ask our customers to help us keep their electricity costs down. They can do it by shifting use of non-essential electrical appliances to off-peak periods (late night and early morning) on cold winter days--during Kilowatt Saving Time. We won't ask them to give up electrical convenience --just to shift it to later hours.

HOW WILL IT WORK?

The normal task of providing electricity involves constantly watching the changes in power demands and meeting those demands with the most economical power available. The cost per kilowatt hour to meet an excessive peak demand goes up since less efficient and more expensive generating plants must be employed to meet those peaks. When we see the peak hour approaching, and the trend usually begins early in the day, we'll tell customers through news media "it's... Kilowatt Saving Time." They can help us avoid an excessive peak by postponing use of non-essential electrical appliances until after eight. Biggest savings can be made by avoiding use of hot water (dishwashers, clothes washers, baths and showers), and by delaying use of ovens, ranges, clothes dryers, irons and electric space heaters. People with electric heating can help by turning down thermostats, especially in unused rooms.

HOW CAN YOU HELP?

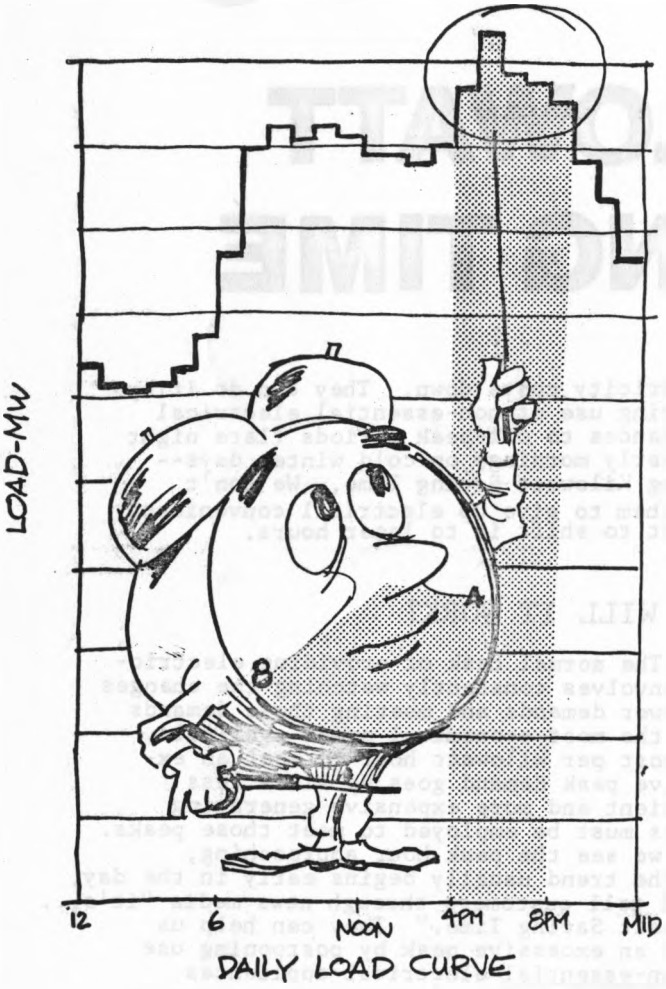
The Company will begin an information program to let customers know about KST

Central Maine Power

MAINE YANKEE

long before we expect our annual peak. We'll do this with TV, radio and newspaper ads as well as through news releases and information in the Lamplighter.

The important message for our customers to get is that by shifting their electrical use away from KST hours (4 to 8 p.m.), they can help hold down future electric bills. Plainly speaking, it will help the Company hold the line against rising costs. While the fuel adjustment charge has the most immediate effect on the customer, the added capacity requirement (new generating plants) to meet excessive peaks will have a longer range effect on increasing electricity costs.



DAILY LOAD CURVE

CMP employees and retirees can help shave the peak during KST by cutting down as much as possible on non-essential electrical appliances such as dishwashers, clothes dryers, ovens and others. You can also help by passing the KST message along to other customers. With your help and that of our customers we can keep the annual peak within bounds--and costs within a reasonable range.

Because of your efforts and those of our customers (especially in making wise use of electricity), we have been able to keep our electric bills among the lowest in New England. With your continued help we can retain that position despite constantly rising costs.

Central Maine Power Company
Public Relations Department
9 Green Street
Augusta, Maine 04330

FOR RELEASE AFTER 6:00 P.M.

AUGUSTA, MAINE, March 8, 1974---Central Maine Power Company today announced that in view of the changing economics of power production combined with oil shortages and the national goal of regaining greater self-sufficiency in energy supply, the Company will not oppose a Congressional appropriation this year for further planning of the Dickey-Lincoln School federal hydro-electric project on the St. John River in Northern Maine.

Responding to many inquiries in recent days about CMP's position this year, company Chief Executive William H. Dunham and President E. W. Thurlow released a joint statement revealing that CMP has been re-evaluating its position in the face of changing conditions and that the two had met on Tuesday of this week in Washington with the Maine congressional delegation to make company views known.

The two officials stated that while in the past decade it was clear to the Company that the Dickey project could not supply power as economically as other sources, under the changed conditions of today, with our oil prices up over 500% in the last six months, the project merits a new review.

"We recognize", they said, "that there are many legitimate environmental considerations which in the past have led to strong opposition to the project from environmental groups and which should be weighed in the filing of a comprehensive environmental impact statement on the project before construction is begun. However, CMP intends to take no position on these factors which involve a

....more....

decision the people of Maine and federal authorities will have to make."

Dunham and Thurlow concluded "We feel that any continued studies by the Army Corps of Engineers should be conducted in collaboration with the planning arm of the New England Power Pool and in discussions with the New Brunswick Electric Power Commission to insure that the designs for construction and operation of the project can best fit the long-range electric needs of the regions involved. If it is found on the basis of a realistic study that the project can be reasonably justified and should be constructed, CMP would not oppose it provided the power is made available without discrimination to all consumers through the existing electric systems and without injury to them."

- 30 -

Statement By

Norman J. Temple
Vice President

Central Maine Power Company

to the

Energy Committee, 107th Legislature

December 18, 1975

NEPOOL--the New England Power Pool--officially came into being on September 21, 1972, when the NEPOOL agreement was accepted for filing by the Federal Power Commission. However, NEPOOL actually was established a year earlier, on November 1 of 1971. The New England Power Exchange, or NEPEX, which coordinates major electric power generation and transmission in New England has been in operation since June 1, 1970. NEPOOL is a product of many years of intensive planning, negotiations and legal research, over a period of some six years.

All of the costs and assessments as well as the interchange agreements reached under NEPOOL are filed with and subject to regulation by the Federal Power Commission.

The rules and regulations, the planning, the operation, and the agreements of NEPOOL involve utilities in all six New England states, all types of ownership--public, private and cooperative--and all forms of generation--hydro, fossil-fired and nuclear. To date, 36 participants representing over 98 percent of the power requirements of New England are NEPOOL members.

The two major components of the NEPOOL agreement are NEPEX, the operating arm, and NEPLAN, the planning wing.

Since NEPOOL went into operation it has been recognized as one of the most advanced and sophisticated bulk power supply

systems in the country--a model for efficient power pool operation--a model not only nationally but internationally as evidenced by visits from foreign governments as well as power pool representatives from within the United States. The Swedish power industry, for instance, recently sent us three representatives to investigate how our practices might apply to their situation in Sweden. The aim of NEPOOL is, of course, to provide a reliable, adequate supply of bulk power to the region and to supply this power from the most economic forms of generation available at the time, depending upon load conditions and fuel availabilities. This principle, called "economic dispatch", is the basis for assuring that all customers of NEPOOL member companies receive the benefits which can be derived from an intergrated generating and transmission system while at the same time assuring that customer service is retained in the hands of the local companies so personal contact and responsibility is maintained. The NEPOOL agreement itself defines the objectives of the pool as follows:

> "The objectives of NEPOOL are, through joint planning, central dispatching, cooperation in environmental matters and coordinated construction, operation and maintenance of electric generation and transmission facilities owned or controlled by the Participants and through the provision of a means for more effective coordination with other power pools and utilities situated in the United States and Canada,
>
> (a) to assure that the bulk power supply of New England and any adjoining areas served by participants conforms to proper standards of reliability, and

(b) to attain maximum practicable economy, consistent with such proper standards of reliability, in such bulk power supply and to provide for equitable sharing of the resulting benefits and costs." (Section 4.1).

These objectives of NEPOOL are in agreement with policy goals expressed by both the Congress and the Federal Power Commission. NEPOOL has worked well since its inception and has carried out the efforts of the New England electric industry to meet the needs of the six state region in a time of world unrest, fuel supply instabilities, and rapidly rising energy costs.

CENTRAL MAINE POWER COMPANY

General Office — 9 Green Street — Augusta, Maine 04330

December 18, 1975

To: Members of the Energy Committee
107th Legislature

In response to correspondence from Ted Potter, Legislative Assistant to the Committee, we are pleased to supply answers to questions raised by the Committee to assist in gaining a working knowledge of the New England Power Pool and its impact on the State of Maine.

1. How many states and which states are involved in the NEPOOL system?

   All six New England states are involved in the New England Power Pool. Membership in NEPOOL is open to all electric utilities in New England regardless of size or type of ownership. To date 36 participants representing over 98% of the power requirements of New England are NEPOOL members.

2. How does the NEPOOL system function:

   a. How much of the energy needs of each state in the NEPOOL system is produced by each individual state?

      Under terms of the NEPOOL agreement the utilities within each state must make provisions, either through direct ownership or contractural purchases, for the necessary capacity to meet their own energy needs.

   b. In cases in which the states cannot produce the power that each one requires, from where is the power derived in order for each state to meet the demand?

      When a state cannot produce the power which is required, either as a result of scheduled or unscheduled outages, the power is made available by NEPEX from the other NEPOOL participants.

   c. Since each state in NEPOOL utilizes out-of-state sources of power, how are power rates devised to include the costs of all power sources?

Members of the Energy Committee
107th Legislature

Individual utilities can make three different types of purchases:

(1) A unit purchase contract, under which the company receives a block of output from that unit and the cost of power reflects actual cost of construction and operation of the particular unit.

(2) Joint ownership, where two or more utilities join together to gain economies of scale in the construction and operation of a unit and the power costs reflect the actual joint ownership costs.

(3) Under the NEPOOL agreement a participant can purchase various NEPEX energy services available from the Pool.

d. How does NEPOOL regulate and control the interstate flow of energy in order to help each state meet its energy demands?

New England Power Pool operates a New England Power Exchange at West Springfield, Massachusetts, with four satellite centers, one of which is located at Augusta, Maine. A computer at the master center, integrated with satellite computers in the regional centers, continuously monitors the availability and cost of all generation and dispatches required generation to meet the load in the most economic manner possible.

The computer updates some 23,000 items of information every 20 seconds, and in some cases, every two seconds.

3. Do the NEPOOL states "import" power at times that each state could furnish the power without seriously affecting its own supply? Please explain.

It is permissible for a company to purchase energy from the Pool, even though it could produce the needed energy from its own generation, if Pool dispatch is more economical. This transfer of energy is called economy flow as defined under Pool agreement.

4. What plans are being supported or devised by NEPOOL to help the states meet their future power needs? What are the present feasible alternatives for meeting growing energy needs?

Members of the Energy Committee
107th Legislature

Under the Pool agreement NEPLAN which is the planning arm of the organization provides the overall generation expansion and transmission projections for the Pool, utilizing input from each participant. A summary of this plan can be found beginning on Page 2 of the July, 1975, NEPOOL Summary of Operations July, 1975.

In addition to this latest NEPOOL Summary of Operations, we are also enclosing for the information of the Committee (1) NEPOOL Summary dated December 1, 1972, which contains a table of organization and outlines the organization and activities of NEPOOL, NEPEX and NEPLAN and (2) a booklet on the New England Power Exchange (NEPEX).

We are also enclosing the Electric Council of New England Statistical Bulletin for 1974 which contains basic information and data which we believe members of the Committee will find most helpful.

Sincerely,

Norman J. Temple, Vice President and
Manager of Public & Employee Relations

NJT/ked

Enclosures

CENTRAL MAINE POWER COMPANY

General Office — 9 Green Street — Augusta, Maine 04330

October 20, 1975

Senator Howard M. Trotzky, Chairman
Subcommittee on the Feasibility of
Hydroelectric Power for Maine
Senate Post Office
State House
Augusta, Maine 04330

Dear Senator Trotzky:

E. W. Thurlow has asked me to reply to your September 24, 1975, letter regarding the October 22, 1975, hearing before the Energy Committee on the hydroelectric power study.

Attached are answers to the twelve questions enclosed with your letter.

I plan to attend the hearing on the twenty-second in company with Charles E. Monty, Vice President of Production Operations, and Ralph L. Bean, Assistant Chief Engineer.

Sincerely,

Norman J. Temple
Vice President

Enclosures

Q. 1 - Where are the undeveloped and abandoned hydroelectric dam sites on the river or rivers upon which your firm operates?

PART I - UNDEVELOPED

A. 1 - Central Maine Power has undeveloped hydro sites on the Dead, Kennebec, Saco, and Androscoggin rivers as listed below, which have potential for development at some point in the future based on need for peaking power and future economics:

UNDEVELOPED HYDROELECTRIC POWER PLANT SITES IN CMP TERRITORY

River Basin	Site	Capacity (KW)	Estimated Yearly Generation (KWH)
Dead River	Poplar Falls	285,000	156,000,000
	Appletree	560,000	290,000,000
Kennebec	Caratunk	125,000	135,000,000
	Cold Stream	250,000	295,000,000
Saco	Steep Falls	6,500 *	43,000,000
Androscoggin	Gilead	6,500 *	34,000,000

The annual energy output from the development of all of these projects would produce an estimated 953,000,000 kilowatt hours or less than two months production from Maine Yankee at current levels.

Generally these plants can be developed economically only as peaking plants which would operate, dependent upon available water, for about two hours a day. CMPCo. has no requirement for additional peaking power until the 1990's.

* Development would be for base/intermediate load adsignment.

Q. 1 - Where are the undeveloped and abandoned hydroelectric dam sites on the river or rivers upon which your firm operates?

Part II - RETIRED

A. 1 - Refer to following table:

River	Plant	Capacity KW	KWH Yearly Generation[3]	Comments
Little Androscoggin	Barker Mills[1]	300	1,065,000	Sold to H & L Russell Co. 1/4/61. No generating equipment remains.
Crocker Pond	Dennistown[1]	100	244,000	Sold to Frederick Bragdon 8/21/72. Power House dismantled.
Toddy Pond	Orland[1]	500	2,322,000	Water rights sold to St. Regis 3/1/65. Generating plant dismantled.
Little Ossipee	Ledgemere[2]	320	1,900,000	Last used 1953; power house gone; dam still used for storage by CMPCo.
Ossipee	Kezar Falls[2]	350	2,207,000	Sold to Lawrence Smith 3/27/74. No generating equipment remains.
Highland Lake	Bridgton[1]	360	745,000	Dam sold to State 2/28/69. No generating equipment remains.
Goose	Belfast[1]	425	858,000	Sold dam and land to Frederick and Belle Young, 1964 and 1968. No generating equipment remains.

[1] Average generation for the last ten years of plant life.

[2] Estimated generation.

[3] Annual energy output from all listed plants represents less than Maine Yankee produces in one-half day.

Q. 2 - Why hasn't your firm developed these potential (undeveloped) power sites?

A. 2 - These potential power sites have not been developed because there is no need for additional peaking power until the 1990's. The annual energy output (kilowatt hours) is small compared to the capacity which must be constructed at high capital cost. The viability of these projects for future development is dependent on willingness to pay a higher price for limited energy available and on the need for peaking power in the 1990's.

Q. 3 - Why have some dam sites been abandoned (retired)?

A. 3 - Over the years CMP has retired some small hydro operations because the power cost in relation to output was excessive, or in several instances because equipment failed and the cost to make necessary repairs was prohibitive in relation to energy potential from the facility. CMP has never "abandoned" any of its hydro sites in the sense in which this term is normally used. We have always arranged for a sale or a transfer to municipalities or to a local property owners group.

Q. 4 - Roughly, what would the cost be to rehabilitate the abandoned dams to make them operable?

A. 4 - Costly engineering studies, estimated at $15-20,000 per site would be required to give a definite figure. The situation differs with each of the retired plants. Our Engineering Department has been studying possible redevelopment of the Barker Mills Dam on the Androscoggin, which had a capacity of 300 kilowatts at the time it was retired in 1950. Any redevelopment would be at 2,500 kilowatts and in 1980 dollars when redevelopment could be completed, cost is estimated at $4,822,000 or $1,928 per kilowatt. Estimated cost per kilowatt hour in 1980 would be 8¢, compared to 2.56¢ average per kilowatt hour charged to CMP customers in 1974.

While the Brunswick-Topsham hydro facility does not fall into the category of abandoned or undeveloped site, it represents a site with potential for redevelopment. Therefore, CMP does plan to redevelop this hydro facility from a present capacity of 2,300 kilowatts to 12,000 kilowatts at an anticipated cost of $13 million, or $1,083 per kilowatt. The facility is now producing 8 million kilowatt hours annually. When the redevelopment is completed in 1980, estimated yearly generation is 80 million kilowatt hours at an anticipated generating cost of 3¢ per kilowatt hour.

Q. 5 - Approximately what would the cost be to develop the presently undeveloped dam sites along the river/s upon which your firm operates?

A. 5 - CMP's latest engineering estimates place the cost of developing the sites listed in Question 1, Part I, at $490,000,000 for total capacity of 1,233,000 kilowatts (or $400 per kilowatt at today's costs) and estimated annual energy of 953,000,000 kilowatt hours. This represents a kilowatt hour cost of about 10¢, compared to 2.56¢ per kilowatt hour average charge to customers on the CMP system in 1974.

Q. 6 - How much power could be generated by the rehabilitated dams? (a very rough estimate will be acceptable)

A. 6 - We assume this question refers to dams listed under Question 1, Part II, abandoned (retired) hydro plants. At levels of generation at time of retirement, 9,341,000 kilowatt hours would be generated annually, or less than Maine Yankee now produces in one-half day.

(Refer to Answer Question 1, Part II).

Q. 7 - How much power could be generated by the development of the presently undeveloped dam sites? (a very rough estimate is acceptable)

A. 7 - Less than one billion kilowatt hours (953,000,000) or less than two months production from Maine Yankee at current levels of operation.

(Refer to Answer, Question 1, Part I).

Q. 8 - How much of the power generated by the abandoned and undeveloped dam sites would be peaking power, base load power, and intermediate power?

A. 8 - Except for a few small dams, all would be peaking power projects.

CENTRAL MAINE POWER COMPANY

General Office — 9 Green Street — Augusta, Maine 04330

October 20, 1975

Senator Howard M. Trotzky, Chairman
Subcommittee on the Feasibility of
Hydroelectric Power for Maine
Senate Post Office
State House
Augusta, Maine 04330

Dear Senator Trotzky:

E. W. Thurlow has asked me to reply to your September 24, 1975, letter in which you raise five questions relating to pumped storage hydroelectric facilities. The answers to these five questions are attached.

Some background information on the subject of pumped storage hydro may be helpful.

New England has been a leader in this method of generation. The first pumped storage hydroelectric facility in the United States was built in 1928, the 32,000 kilowatt Rocky River plant in Connecticut. More recently a million kilowatt pumped storage hydroelectric facility was built at Northfield Mountain in Massachusetts. License applications for this project started in 1963, construction commenced in May, 1967, and the plant became fully operational in October, 1973. Cost of the plant was $140 million or $140 per kilowatt. New England Electric System has constructed a 600,000 kilowatt pumped storage facility at Bear Swamp, also in western Massachusetts. Application for licenses started in 1968, construction began in 1970, and the plant became operational on September 1, 1974. Cost of the facility was $114 million or $190 per kilowatt.

Central Maine Power developed plans for a pumped storage project in the upper Kennebec region, and in 1959 obtained legislative approval to build the plant at some future time when peaking power requirements justified the project.

Pumped storage is a load management tool to transfer energy from off-peak periods, when demand is lower, to peak periods of use. While the size of the plant may add to the total capacity available, pumped storage hydro plants are not a source of increased energy. Since it requires approximately three kilowatts of pumping power to pump the water to an upper reservoir nights and weekends for

every two kilowatts of plant output, pumped storage operation results in a net consumption of energy. The economy of pumped storage hydro is dependent upon the availability of very low cost off-peak pumping power.

If you have additional questions as your discussions with the committee progress, don't hesitate to contact me.

Sincerely,

Norman J. Temple
Vice President

Enclosures

Q. 1 - Do you believe there is a need for pumped storage facilities in Maine?

A. 1 - Pumped storage facilities are developed to provide peaking power for short durations. Central Maine Power will not need additional peaking power on its system which would require construction of a major pumped storage facility prior to 1990.

Q. 2 - If there is, does Central Maine Power plan to develop the pumped storage facilities? When would they be put on line?

A. 2 - Central Maine Power has been studying pumped storage facilities in Maine since the 1950's, and in 1959, the company presented its plans to the Maine Legislature and received legislative approval to construct such a facility on the upper Kennebec at such time as the power is needed. The company, therefore, would plan to develop pumped storage facilities when conditions require. Our best estimate is that this type facility would be required in the 1990's.

Q. 3 - What do you "guesstimate" the cost to be to develop the pumped storage sites?

A. 3 - Based on current costs our engineers estimate a pumped storage hydroelectric plant would cost $200 to $250 per kilowatt of capacity.

Q. 4 - If Central Maine Power intends to develop pumped storage sites, where would the facilities be constructed?

A. 4 - Central Maine Power studies on the upper Kennebec have been in the Rowe Pond area as the upper reservoir and Wyman Lake as the lower reservoir. The Federal Power Commission has done a survey of potential pumped storage sites and the New England River Basins Commission issued a report on the subject in July, 1973. The Federal Power Commission's 1970 National Power Survey on page II-1-104 list undeveloped pumped storage sites in Maine as follows:

A. 4 (continued)

Maine	River	Cap.	Average Annual Gener. (MWH)	Useable Power Storage (1000 acre ft.)	Gross Static Head (ft.)
Rowe	Kennebec	1,000	440,000	24.1	785
Rangeley	Androscoggin	1,000	440,000	26.1	940
Moosehead	Piscataquis	1,000	440,000	3.7	1,958

The New England River Basins Commission Report entitled "An Environmental Reconnaissance of Alernative Pumped Storage Sites in New England", July, 1973, page 105A, lists the following pumped storage sites in Maine:

	Per NERBC Task Force		Per NEPLAN	
	Capacity MW	Ave. Head (ft.)	Capacity MW	Ave. Head (ft.)
Bingham #3 (Lost Pond) - Site #44	1,900	900	1,000	863
Pleasant Ridge - Site #51	1,900	820	1,900	790
te Leo - Site #47	1,450	856	1,000	847
Robinson Pond - Site #52	*7,930	781	2,000	806
Oquossoc - Site #50	*5,300	515	1,000	524

*This report states that these probably would not be developed to this much capacity.

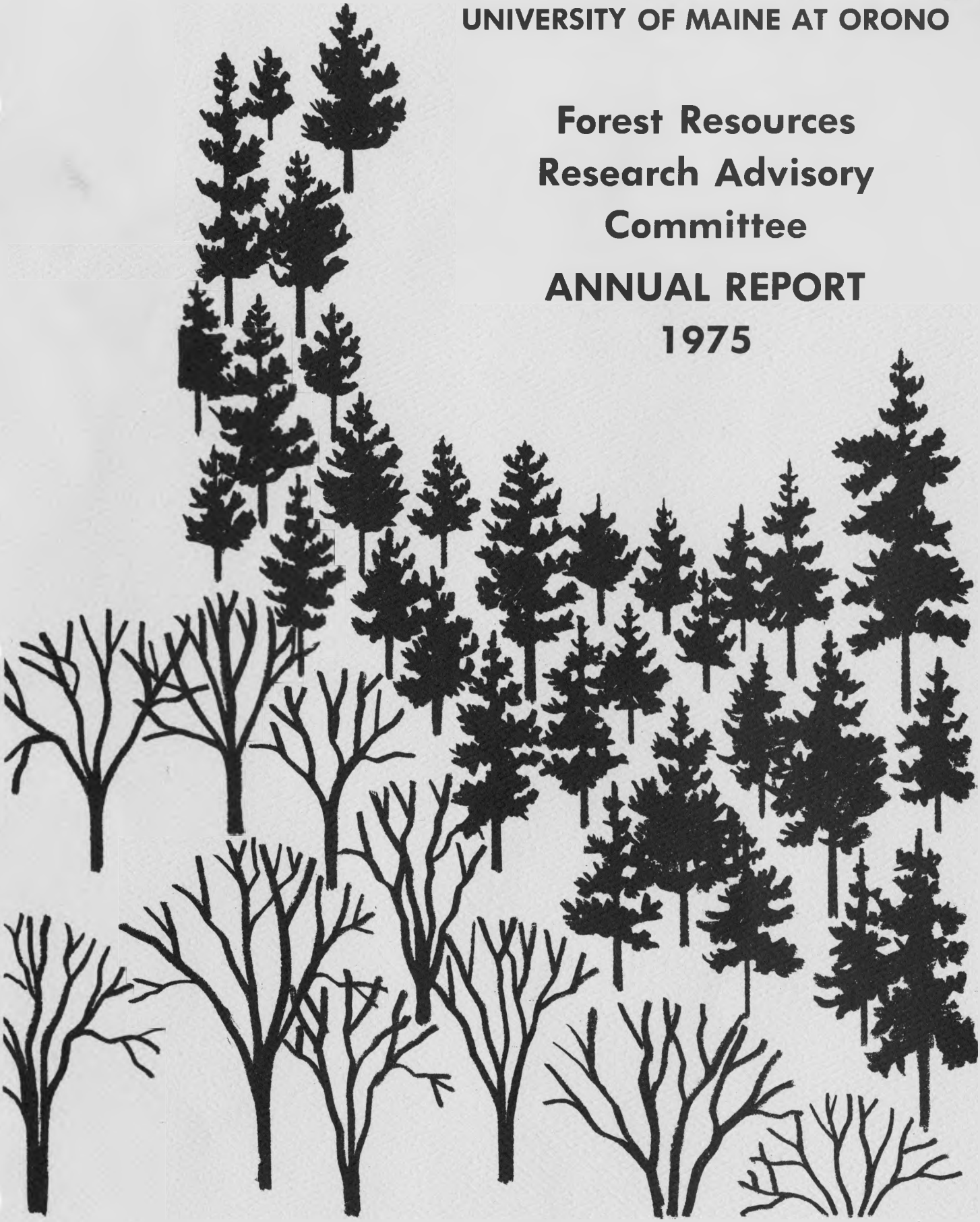
Q. 5 - What type of power and how much power would the facilities generate? (peaking, intermediate, baseload)

A. 5 - Pumped storage hydroelectric facilities are used for peaking purposes only. It should be understood they are not a source of energy (kilowatt hours) but actually are a net consumer of energy since it takes approximately three kilowatts of off-peak pumping power during nights and weekends to get two kilowatts when the water is released to generate at peak periods.

UNIVERSITY OF MAINE AT ORONO

Forest Resources Research Advisory Committee

ANNUAL REPORT 1975



LIFE SCIENCES AND AGRICULTURE EXPERIMENT STATION
UNIVERSITY OF MAINE AT ORONO

FOREST RESOURCES

RESEARCH ADVISORY COMMITTEE

1975 ANNUAL REPORT

George W. Weiland, *Chairman*

Morris R. Wing, *Vice Chairman*

Keith E. Miller, *Secretary*

School of Forest Resources

College of Life Sciences and Agriculture

University of Maine at Orono

Orono, Maine

CONTENTS

FOREST RESOURCES
RESEARCH ADVISORY COMMITTEE
1975 ANNUAL REPORT

On January 28, 1974, President Howard Neville made the following comment in his convocation speech:

> *"We will establish a Center for the Advanced Study of The Forest Industries which will draw from current faculty of the University and from technical and management staffs in forest products industries the multi-disciplinary research teams necessary to address the interrelated technological, economic, environmental and management problems of industry."*

This was a challenging mandate and the impact would be felt most heavily in the School of Forest Resources and in the College of Life Sciences and Agriculture Experiment Station.

Prior to, but supporting President Neville's emphasis on forest industry research, an ad hoc committee representing broad forest resources interests in Maine had been meeting in order to develop and implement a coordinated research effort.

A resolution of this emphasis and effort came about in April, 1974 when President Neville established the Forest Resources Research Advisory Committee with the following commitment to its members:

> *"I would hope that in time the Committee will significantly influence the University in setting priorities to assure that our research efforts will truly meet the needs of the State."*

The twelve-member committee of interrelated and varied interests was founded for the purpose of working with the Director of the School of Forest Resources to advise him on priorities related to his responsibilities as they broadly relate to all facets of forestry and wildlife research, including economic, social, biological, and managerial aspects. The Committee will also advise on research priorities for the State and will assist the Director in action programs to carry out objectives.

F.R.R.A.C.'s second year was one of action by individual members of the committee and of the sub-committees. Dr. Sam Butcher presented an excellent paper on the teaching loads in the School of Forest Resources and the College of Life Sciences and Agriculture. The paper shows a substantial increase in students per faculty member. The effects of such structuring has created some adjustment in the amount of time available for student-teacher conference and some changes in class sizes and programming.

One of the mandates of the committee was to set priorities to assure that the University research efforts will truly meet the needs of the state. Papers were prepared and presented on the Prospective Research Areas for the three main major areas of concern - Forestry, Wildlife and Wood Technology and Products Utilization.

The Committee decided to move ahead on developing a proposal for research on the Intensive Management of Forest Resources in Maine. This proposal covered several of the research areas recommended in the prospective research area reports. A full report on the status of this proposal is included in the feature article by George Weiland.

Mr. Lewis Bissell, Extension Agent, will be retiring in May 1976. The value of this service was reviewed and the committee passed the following resolution: *"The Advisory Committee supports the extension program and would recommend that the program be continued with two extension agents."* It was also suggested that some review be made to determine what other efforts should be made in the area of extension service. Wildlife extension service possibilities were discussed.

Personnel highlights for the year included the election of Director Knight to the McIntire-Stennis Advisory Board; resignation of Dr. Sanford Schemnitz who will become the Chairman of the Wildlife Department at New Mexico State University at Las Cruces; resignation of Dr. Michael Zagata who has become the Field Director of the Wildlife Society in Washington, D.C.; and, the selection of Dr. James Gilbert, University of Washington, and Dr. Terry May, University of Colorado as replacements. We were saddened by the death of Associate Professor Charles E. Schomaker and welcomed Dr. Robert Shepard to fulfill the responsibilities in that position.

The terms of four members of the staff expired on December 31, 1975. Three of these members were renominated: Maynard Marsh, George Carlisle and John Sinclair. Dr. Sam Butcher, Bowdoin, requested that he not be considered for renomination. Richard Barringer, Commissioner of the Department of Conservation was placed in nomination. President Neville has approved the nominations and appointed the members to the Committee. The Committee has found that it does have a challenge and can provide certain knowledge and advice to the School. It is our objective to continue to serve in this capacity and expand in those areas where we can be of service.

THE COOPERATIVE FOREST RESOURCES RESEARCH UNIT

--From Conception to Reality in 1975--

George W. Weiland
Chairman, FRRAC

The recognition of the need for a well coordinated and broadly supported capability for intensive forest management research was the prime motivation in the formation of the Forest Resources Research Advisory Committee. In 1975 this need found expression as a definitive concept, and the concept matured into a reality.

At the conclusion of FRRAC's 1974 Fall Meeting the main orientation of the Committee was one of developing general priorities in forest resources research within the established research programs at the School of Forest Resources and Experiment Station. The promotion of additional public and private support for research was being deferred until the Committee could gain the necessary understanding and build the appropriate framework for an expanded research effort. Fortunately certain events took place during the closing weeks of 1974 which provided the Committee with the opportunity to progress much more rapidly towards this objective.

Officials of the Great Northern Paper Company contacted Director Fred Knight and expressed that Company's interest in increasing its support for forest research at the University. This willingness for support was translated into action early in 1975 when Director Knight with the endorsement of his faculty members drew up the first draft of a proposal for a Cooperative Forest Resources Research Unit. Concurrently, a FRRAC subcommittee was formed to assist Director Knight in this work. This was not a simple task for there were many opinions expressed on funding, priorities, facilities, scientists, and administration. Following an intensive proposal development effort and a wide and careful review, a practical consensus was reached. The final proposal for the Cooperative Research Unit was adopted in August 1975. It is included in the Appendix of this report.

This proposal called for forest landowners to support a cooperative research unit at the rate of 3¢ per acre per year. The cooperative unit would be under the aegis of the School of Forest Resources and would complement existing research programs. Its main thrust would be to accomplish priority research within three broad program areas, namely protection, management, and utilization. The near-term goal would be to provide support for four scientists; the long-term goal would be to double the size of the unit in order to meet the forest resource research needs of the State.

Solicitation for funds began in earnest in the fall and the response was positive and significant. When it became evident that $180,000 had been pledged annually for five years, the Sub-committee recommended, subject to approval by the University, that three lead scientists be recruited for the Cooperative Unit.

Thus within the span of one year an idea was put forward, a concept developed, and support found to put in place a unique and stimulating new dimension to forestry research in Maine. Those involved can be proud of this progress all the while realizing the sizable challenge that lies ahead in completing the recruiting of scientists, determining research priorities, promoting and developing a cohesive and efficient working unit, and making known the research results for the fuller and more effective use of Maine's forest resources.

* * * * * * * * * * * * * * * * * *

MEMBERSHIP (1975)

FRRAC SUBCOMMITTEE

ON THE COOPERATIVE FOREST RESOURCES RESEARCH UNIT

The members of the subcommittee appointed or to be appointed to set priorities and review proposals for the Cooperative Research Unit are as follows:

Mr. Robert Bartlett, Great Northern Paper Company

Dr. Barton M. Blum, U. S. Forest Service

Dr. Fred B. Knight, School of Forest Resources

Mr. John Sinclair, Seven Islands Land Company

Mr. Morris Wing, International Paper Company

Mr. George Weiland, Dead River Company

Two Additional Members from Cooperators

FOREST RESOURCES RESEARCH ADVISORY COMMITTEE
1975-76 MEMBERSHIP

Richard Anderson, Director (1977)*
Maine Audubon Society
57 Baxter Boulevard
Portland, Maine 04100

Richard Barringer, Commissioner
Department of Conservation (1978)
State Office Building
Augusta, Maine 04330

Barton M. Blum, Project Leader
U. S. Forest Service (1976)
Northeastern Forest Experiment Station
U.S.D.A. Building
University of Maine
Orono, Maine 04473

George Carlisle, President (1978)
Prentiss & Carlisle, Inc.
107 Court Street
Bangor, Maine 04401

Fred E. Holt, Director (1977)
Bureau of Forestry
State Office Building
Augusta, Maine 04330

Donaldson Koons, Professor (1976)
Colby College
Waterville, Maine 04901

Maynard Marsh, Commissioner (1978)
Department of Inland Fisheries & Game
State Office Building
Augusta, Maine 04330

Keith E. Miller (1977)
Superintendent
Acadia National Park
Bar Harbor, Maine 04609

Henry W. Saunders, Vice President
Saunders Brothers (1976)
180 Forest Street
Westbrook, Maine 04092

John G. Sinclair, President (1978)
Seven Islands Land Company
15 Columbia Street
Bangor, Maine 04401

George W. Weiland (1977)
(Chairman of Committee)
Vice President
Dead River Company
55 Broadway
Bangor, Maine 04401

Morris R. Wing, Regional Manager (1976)
Northern Division
Dept. of Woodlands, Maine Region
International Paper Company
Jay, Maine 04239

Ex Officio:

Malcolm W. Coulter, Associate Director
School of Forest Resources
Nutting Hall, University of Maine
Orono, Maine 04473

Edwin L. Giddings
Assistant to the Director
School of Forest Resources
Nutting Hall, University of Maine
Orono, Maine 04473

Fred B. Knight, Director
School of Forest Resources
Nutting Hall
University of Maine at Orono
Orono, Maine 04473

Albert D. Nutting
Director Emeritus
School of Forest Resources
Oxford, Maine 04270

Frederick E. Hutchinson, Vice-President
Research and Public Services
Coburn Hall
University of Maine at Orono
Orono, Maine 04473

*Appointment through December 31 of year indicated.

SCHOOL OF FOREST RESOURCES

STUDENT PROFILE

Year	Four-Year Undergraduates			Two-Year Forestry	Graduate	Others	Totals
	Freshmen	Soph. Jr. Sr. Forestry	Soph. Jr. Sr. Wildlife				
1964	71	108	42	0	9	5	235
1969	104	95	92	63	25	2	381
1973	150	160	130	81	37	36	594
1974	134	225	151	95	44	68	717
1975	147	247	196	111	53	114	868

FACULTY AND STAFF (January 1, 1976)

Fred B. Knight, Director and Dwight B. Demeritt Professor of Forest Resources
Malcolm W. Coulter, Associate Director for Wildlife and Professor of Wildlife Resources
Edwin L. Giddings, Assistant to the Director and Associate Professor of Forest Resources
*Richard J. Campana, Professor of Forest Pathology
Thomas J. Corcoran, Professor of Forest Resources
*John B. Dimond, Professor of Forest Entomology
*Harold C. Gibbs, Professor of Wildlife Resources
Ralph H. Griffin, Professor of Forest Resources
Howard L. Mendall, Professor of Wildlife Resources and Leader of Cooperative Wildlife Research Unit
James E. Shottafer, Professor of Wood Technology and Head, Forest Products Laboratory
*Roland A. Struchtemeyer, Professor of Forest Soils
Harold E. Young, Professor of Forest Resources and Head, Complete Tree Institute
Marshall D. Ashley, Associate Professor of Forest Resources and Director, Summer Camp Programs
Richard A. Hale, Associate Professor of Wood Technology
Norman P. Kutscha, Associate Professor of Wood Technology
Ray B. Owen, Jr., Associate Professor of Wildlife Resources
Arthur G. Randall, Associate Professor of Forest Resources and Director, Associate Degree Program
Voit B. Richens, Associate Professor of Wildlife Resources, and Assistant Leader, Cooperative Wildlife Research Unit
Wallace C. Robbins, Associate Professor of Forest Technology

Faculty and Staff Continued

Craig E. Shuler, Associate Professor of Wood Technology
James C. Whittaker, Associate Professor of Forest Resources
Chester F. Banasiak, Assistant Professor of Wildlife Resources
David S. Canavera, Assistant Professor of Forest Resources
James R. Gilbert, Assistant Professor of Wildlife Resources
Carl E. Korschgen, Assistant Research Professor of Wildlife Resources
Terry A. May, Assistant Professor of Wildlife Resources
Robert K. Shepard, Jr. Assistant Professor of Forest Resources
Gary A. Simmons, Assistant Professor of Forest Resources
William D. Lilley, Instructor in Forest Resources
Lewis P. Bissell, Extension Forester
Timothy O'Keefe, Extension Forester
Andrew S. Clauson, Research Associate in Wildlife Resources
Roger F. Taylor, Superintendent of University Forest
Barton M. Blum, Project Leader, U. S. Forest Service and Faculty Associate
Hewlette S. Crawford, Research Wildlife Biologist, U. S. Forest Service and Faculty Associate
Robert M. Frank, Research Forester, U. S. Forest Service and Faculty Associate
Howard E. Spencer, Jr., Leader, Migratory Bird Project, Maine Department of Inland Fisheries and Game and Faculty Associate
Robert I. Ashman, Professor Emeritus of Forestry
Gregory Baker, Professor Emeritus of Forestry
Frank K. Beyer, Associate Professor Emeritus of Forestry
Albert D. Nutting, Director Emeritus
Henry A. Plummer, Associate Professor Emeritus of Forestry

*Cooperating Faculty Member in the School of Forest Resources.

WILDLIFE RESEARCH

Malcolm W. Coulter

Wildlife research at UMO began in 1935 when the Maine Cooperative Wildlife Research Unit was organized in what then was the Department of Forestry. Staffed by two scientists (one federal, one university) and supported by the Maine Department of Inland Fisheries and Wildlife, U.S. Fish and Wildlife Service, Wildlife Management Institute and the University, this new partnership was one of 10 similar Units located in some of the major ecological zones across the Nation. The Research Unit provided the impetus for the first formal training programs at UMO. The degrees of B.S. and M.S. in Wildlife Management were authorized. By the summer of 1936, the two scientists, supported by two eager, new graduate assistants, were afield on their first research projects; at the same time the outlines and laboratory exercises for formal classes in wildlife were being prepared.

Early research highlighted studies of the life history and biology of game species as well as study of habitat needs. At that time even the basic details for many facets of the life history, food habits, reproductive potential and similar topics for some species were poorly documented.

Today--40 years and approximately 250 publications later--the wildlife research team at Orono totals 9 professional staff, 23 graduate assistants and 4 scientists from other agencies or departments who hold adjunct appointments in the School. The Cooperative Wildlife Research Unit that provided the nucleus for a program in 1935 is still active and intact and continues to function as an entity, but as an integral part of the whole effort. Since 1935, a total of 77 advanced degrees have been earned by students from many states, three provinces of Canada, Norway and Cameroon.

Pressures for admission to the program, at both undergraduate and graduate levels, is high. During the past few months, as an example, almost 100 applications for graduate study were received from undergraduates of many schools. In late March the number had been screened to 20 applicants, all with 4 year averages above 3.0 (B), competing for only two openings available this year to work on research projects.

The 16 current research projects are funded by a variety of agencies and organizations both within state and out-of-state. Much of the support is for study of particular problems important to the sponsor. Examples of these are: The Impact of Highways upon Wildlife, financed by the Department of Transportation; The Influence of Commercial Clearcuttings upon Wildlife, supported by U. S. Forest Service; and, a grant from the U. S. Fish and Wildlife Service for studies of colonial nesting seabirds along the Maine coast. In each of these examples the project has developed

in response to a contemporary problem. Need for the highway study has been heightened by recent requirements for environmental impact statements. Conflicting views about clearcutting together with a lack of long-term experience with the practice in this region in general led to the need to examine wildlife response to commercial clearcutting. And, the seabird project became a high priority topic with the increasing prospect of offshore oil exploration.

The outlook for new research in wildlife is excellent. Projected changes in forest land management offer many new opportunities for more effective forest-wildlife management. Rising demand for wood products means more intensive forest management. Implied are shorter rotations, more permanent road systems, fertilization, utilization of more native tree species or parts of species, and probably some concentration of effort on the more productive sites. Each of these directions offer certain advantages and opportunities from the viewpoint of wildlife management.

Research tends to reflect the concerns of the period. The greatest concern in wildlife three decades ago centered on the game species. Interest in and the need for research upon game species continues. But, there is increasing public concern about non-game and endangered or threatened species, and consequently more research everywhere is being directed to non-game species ranging from eagles and ospreys, to warblers and wolves.

At first glance one well may question the value or need (or priority) for such research. However, there are increasing pressures to alter land management strategies to benefit or safeguard threatened, rare or endangered species. The Kirtland warbler program in Michigan is a classic example. Recommendations for management of rare or endangered species need to be based upon solid information. Without such data we face the prospect of poorly based regulations or recommendations. Generally we know much less about some of these non-game species than of the game animals more intensively researched during the past several decades.

Here at Maine we are directing some research to eagles, coyotes and song birds. In the case of the latter, one project involves documenting the succession of bird species that follow forest harvesting methods. Early results are beginning to look rather fascinating and suggest that the commercial forest may be one of the best places for those interested in seeing a large variety of birds. Likewise, preliminary results of research with marten are raising questions about the animals presumed need for large blocks of mature spruce-fir forest. A mixture of types and age classes may be better--at least as judged now on the basis of 60 pine marten, each ear tagged, that graduate students have been following in northern Maine for the past year. Recommendations eventually coming from such studies likely will be far different than those based on the general information previously available; and, probably better for the species as well as the land managers concerned.

In the area of big game, I believe that we are long overdue in initiating a long-term research project concerning deer yard management and also moose management. Ideally the deer project should be carried out on public

lands where experimental management plans could be designed and executed over several years with the imput and expertise of scientists at the University, in the U. S. Forest Service, State Department of Inland Fisheries and Wildlife and from industry and others. Earlier research in Maine, plus experience working with deer yard management in Maine and New Hampshire, offers an excellent base of information for designing some problem oriented research relevant to Northern New England.

It seems highly probable that we will need much more research concerning moose. With rapidly expanding populations--apparently responding to the forest patterns that regenerate following the newer harvesting methods--this big game species is assuming a greater role as a definite influence in our forest ecosystem. In addition, it has tremendous appeal from an aesthetic viewpoint as well as from its values as a game species. I doubt that we can long afford to overlook the problems that loom on the horizon associated with a rapidly expanding herd of large herbivores.

There are many other problems too numerous to list here that also deserve careful review and study. The new research about moose, deer, and non-game species present challenging problems for the wildlife team. In trying to meet the many needs we look forward to working cooperatively with all interested groups.

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CAPSULE COOP UNIT PROJECT REPORT - TREE IMPROVEMENT

David Canavera

The University of Maine at Orono, under the direction of Assistant Professor Dave Canavera, is presently involved in a comprehensive tree improvement program designed to develop the best possible planting stock for the State of Maine. Projects underway include provenance tests of black spruce, jack pine and white birch (to determine the best seed source for planting in Maine) and progeny tests of carefully selected white spruce, balsam fir and white birch.

The results of these studies will be used in the establishment of seed orchards and seed production areas both of which will provide the first genetically improved seed for reforestation in the State. For the future, plans are now being made to establish provenance tests of Scotch pine, Douglas-fir, Japanese and European larch, and Norway spruce. Arrangements have also been made to test various pine and birch hybrids along with several foreign birch species. All of the seedlings are being raised in a specially constructed greenhouse that provides optimum growing conditions to the seedlings. Using this system, seedlings can be grown to plantable size in a period of 16 weeks.

APPENDIX

PROPOSAL FOR RESEARCH ON THE INTENSIVE MANAGEMENT OF FOREST RESOURCES IN MAINE

School of Forest Resources
and
Forest Resources Research Advisory Committee
University of Maine at Orono

August 15, 1975

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SUMMARY OF A

PROPOSAL FOR RESEARCH ON THE INTENSIVE MANAGEMENT

OF FOREST RESOURCES

NEED: In view of recent increased use of timber from Maine lands and projected accelerating demands for forest products, it is incumbent on all forest landowners, forest managers, and the wood using industry of Maine that we strive to obtain maximum productivity of our greatest renewable natural resource. The potential for increased growth and utilization is well documented and offers a unique opportunity for economic growth and stability in Maine.

An important key to this realization is more quality research in forest protection, management, and utilization that will ensure the necessary technological advances and the basic understanding of our total forest resource.

SOLUTION: This proposal calls for the establishment under the aegis of the School of Forest Resources and within the Experiment Station of a Cooperative Research Unit for intensive forest resources protection, management, and utilization. Initially, the Unit will require a minimum of four full-time scientists, but it will have to be expanded to eight to ten scientists if current research needs are to be met.

The estimated average annual cost per scientist is $60,000 including salary, technical staff, travel, supplies and equipment, fringe and administrative costs. Thus the initial funding required for the project would be approximately $240,000 plus $24,000 overhead for the minimum number of four scientists. Presently, the facilities at the School of Forest Resources can accommodate up to four scientists. Expansion beyond this level will require additional facilities.

Control of the Unit will be the responsibility of the Director of the School of Forest Resources. All research will be done under an approved research plan. Scientists will prepare plans, the Director will endorse them, and a select sub-committee of the Forest Resources Research Advisory Committee will review and make recommendations within a priority system.

EMPHASIS: The thrust of the Unit will be to accomplish priority research under three broad program areas with emphasis on the following projects:

1. Forest Protection Program

    a. Spruce budworm research
    b. Other insect problems
    c. Fire research
    d. Forest diseases
    e. Animal damage
    f. Weather effects

2. Forest Management Program

   a. Spruce-fir silviculture
   b. Hardwood silviculture
   c. Conifer silviculture
   d. Regeneration
   e. Tree improvement
   f. Wildlife habitat management
   g. Fertilization

3. Forest Utilization Program

   a. Harvesting and transportation
   b. Erosion control
   c. Economics and marketing
   d. Wood products, technology and processing
   e. Non-wood products

PROPOSAL FOR

RESEARCH ON THE INTENSIVE MANAGEMENT OF

FOREST RESOURCES

March 6, 1975

The need for more research on the Forest Resources of Maine has been expressed by many people. It is generally recognized that the work now in progress is providing answers to many pressing problems, but, in view of the significance of the Forest Resources to the economy of Maine it is generally felt that a substantial increase is needed.

The production, protection, and utilization of the forest resources of Maine depend upon strong technological advances and continuing development of the basic understanding of all aspects of the resource. The forest resources research would include reforestation and management of land for the maximum production of crops of timber and other related products; management of watershed lands to improve and protect resources against flood and erosion; protection of forest land and resources against fire, insects, diseases and other destructive agents; utilization of wood and other forest products for all productive reasons from energy needs to quality veneer; development of policies for management and harvesting based on sound principles; and other related studies that will lead to the fullest and most effective use of the forest resource (Appendix A).

There are many ways in which organizations could be formed to do research. Our belief is that the best way to accomplish this is through a single coordinated effort by all interested in the resource. We have jointly

come to the conclusion that Maine cannot afford a splintered effort but instead should expand from the organization already established. Thus, we propose that the research be done under the general direction of the School of Forest Resources and within the Experiment Station. Interdisciplinary efforts would be encouraged as in the past so that a maximum benefit could be derived toward improved productivity and use of our resource.

Currently forestry research is supported largely by funds from the Federal Government and the State of Maine. Several individual projects are supported by private land owners and managers who have expressed a desire for greater support of research in a coordinated fashion. More must be done to assure that the pressing requirements on our Maine forests will be met. This can be accomplished only through a large effort by industry.

The overall program may be visualized better by an explanation done in a step-wise fashion as follows:

1. The Research Organization and Budget
2. The Supporting Requirements
3. Facilities
4. Research Proposals
5. Control of Operations
6. Relationship to Current Problems
7. Implementation

RESEARCH ORGANIZATION AND BUDGET - The industrial research funds would become a part of the current budget of the School of Forest Resources. The additional responsibility of this added restricted budget would require a much larger time contribution to research by the Director of the School of Forest Resources. Thus, the School's organization would require the reinstatement of an Associate Director for Forestry; a parallel position to the Associate Director for Wildlife position in the School.

The additional funding would come mainly from the forest industries of Maine. It would be logical to identify the support within the School by a specific name emphasizing the idea of intensive management and utilization of the resource.

> The identification could be - "Cooperative Unit for Research on the Intensive Management and Utilization of Forest Resources." Such a long title rather clearly expresses the purpose of the organization. A more concise title might be more appealing.

Major projects would be developed within the Cooperative Unit each with an overall program leader. Three suggested programs are listed in Appendix A. Program leaders would develop a comprehensive program analysis with a list of priorities for future research. Some projects might include one scientist with supporting help while others could

include several. For example, the scope would depend upon recommendations from the advisory committee to the School from various industry representatives, from private citizens and from scientists.

Scientists would be hired to do research and not as teachers and, therefore, would not have specific course teaching requirements at the undergraduate level. Some of the teaching staff from the School or other Administrative Units with partial research assignments might be active on projects and would draw support to do priority research. The Unit should have flexibility to accomplish the greatest good for the total forest industry of the State.

The minimum goal in terms of new scientists should be four. Presently, there are facilities available for this number at the School of Forest Resources. This would require a minimum of $240,000 per year plus overhead (estimated to be $24,000). This minimum is based on the idea of a viable research organization with an average cost of about $60,000 per scientist as illustrated in the following tabulation:

Scientist Salary	$20,000
Wages for Technician, Graduate Student, and Secretarial support	15,000
Travel	5,000
Supplies & Equipment	10,000
Fringe	7,000
Administrative	3,000
	$60,000

Expansion of the Unit could be accomplished by increments of this magnitude.

Current expressed research needs indicate a requirement for 8 to 10 scientists. This would double the size of the minimum starting Unit and cost approximately $500,000. Expansion of this magnitude should take place in an orderly, planned manner, possibly over a 10-year period, and will require additional facilities.

This total budget is not large compared to that being invested in other parts of the country, but it is enough to permit an effective research effort on the pressing problems ahead. There are several examples in other sections of the country of successful research organizations; two that are well known are the Georgia Forest Research Council and the Oregon State University Research Laboratories. Each differs from this proposal and from each other; both involve large amounts of funds and both have produced results of significance to the supporting industries.

SUPPORTING REQUIREMENTS - Supporting staff are a vital part of the research program and little can be accomplished if only scientists are hired. Thus, each scientist would have the assistance of at least one technician and one secretary would be needed by every five scientists. There would also be help in the form of summer aides and graduate students. All of these would require travel expenses, equipment, and supplies. Without such support, research cannot effectively be accomplished. Each project proposal would account for such support. The Director would be supported by administrative funds set aside to provide necessary travel and publication funds to assure that the supporting industries are well informed on the accomplishments of the Unit.

FACILITIES - The School of Forest Resources has space for the minimum additions (four scientists) but does not have room for the expanded Cooperative Unit. New specialized laboratories will eventually be required to house some of the scientists. The overall progress of the Unit would be held up if such facilities are not developed.

Several alternatives are available:

(1) A laboratory could be constructed behind the present facility. This would have the advantage of being closely integrated with all the research staff of the School and the Unit. This might be a direct addition to the present building or it could be separate.

(2) The laboratory could be built in the Demeritt Forest near the present forest buildings. The construction would possibly be less expensive though laboratory equipment costs would remain high.

(3) A year around field research center could be established on industrial land near a research location. This alternative has definite merits but it should be located within a reasonable driving distance of campus.

These alternatives are all expensive but must be viewed with decisiveness and very soon after the Cooperative Unit is established.

RESEARCH PROPOSALS - No research will be done by personnel of the Unit without an approved research plan. It is anticipated that such a plan would contain carefully defined objectives, detailed design for executing the work and an assessment of the capability of obtaining the results expected (Appendix C).

Scientists will prepare their detailed plans and will submit them to the Director for his endorsement. The Director will then forward them to an appointed sub-committee of the School of Forest Resources Research Advisory Committee for their recommendation.[1] The scientist may be requested to appear before the sub-committee to present details of plans. After this

[1]The sub-committee will be composed of members of the advisory committee and contributors to the Unit.

review the responsibility of the Director will be to forward the completed and approved proposal to the Experiment Station for additional approval or to return the rejected proposal to the scientist with an explanation of the action.

CONTROL OF OPERATIONS - The operations of the Unit will be under the control of the Director of the School of Forest Resources, within his assignment of responsibility to the President of the University via Director of Experiment Station and V. P. for Research and Public Services. All scientists and supporting help will report directly to the Director and will be responsible to him. All funds expended in the Unit will be under his control though other people in the University outside the School may request and receive support from the Unit. Scientists hired by the School for research in the Unit will generally not carry academic appointments.

RELATIONSHIP TO CURRENT PROGRAMS - The industry has current agreements with several faculty members on research. These have assurances of support for from three to five years based upon approved research proposals. These projects--Tree Improvement Project, Fertilization Project, and Spruce Budworm Remote Sensing Project--would be absorbed in the Unit with a written agreement that the research would be supported at least at assured levels for the time period guaranteed. Current funds available to the research program are presented in Section VII, 1974-75 Research Funds.

The Cooperative Unit is being developed to assure the accomplishment of priority research. We expect to use all available help in reaching our goals and thus, would invite research proposals from all sources. This authority to approve funds locally does not apply to Federal and State funds which require review of proposals by the Cooperative State Research Service of the U.S.D.A. Though these funds have a different process for approval the Unit will have a positive effect on expenditures of those funds as efforts on all of the forest resources research will be directed toward needs of Maine citizens. It will be the Director's responsibility to integrate the efforts so that the maximum benefit can be achieved for all aspects of the resource. An example of funding of research from three sources is presented in the flow chart, Appendix B.

IMPLEMENTATION - The basic outline has been provided, now we must start the programming. The following are suggested steps:

(1) Sub-Committee of School Advisory Committee, School Executive Committee, and Director of the Experiment Station review proposal. Director of School drafts revisions with compromises as required and agreed, and obtains approval from University administration.

(2) Sub-Committee recommends method of funding from cooperators and a procedure for assuring continuity.

(3) Industry sets up mechanism for implementation and provides funds to commence operations.

(4) University and industry leaders sign agreements.

(5) Proposals are presented to committee for approval.

EMPLOYMENT OF SCIENTISTS FOR THE COOPERATIVE RESEARCH UNIT

The initial funding proposed is $240,000 plus an estimated 10% overhead which equals $264,000 per year. This amount would include the support of research already committed to fertilization, tree improvement, and spruce budworm surveys plus an annual allotment for publications and expenses of the Director of the School.

The following project personnel will be hired as soon as possible:

1. Forest Protection Program - A forest scientist with experience in Forest Entomology will be hired to direct this program. His first responsibility will be to prepare a program analysis for the spruce budworm. This scientist should have one degree in forestry and a strong interest in the area of silviculture.

2. Forest Management Program - A forest scientist with experience in research on broad aspects of silviculture will lead this program area. This person would be expected to analyze the needs in the spruce-fir and hardwood forest types and to do research on the top priority needs identified.

3. Forest Management Program - The third scientist will be a member of the management team. This individual will work on regeneration problems that have been identified already as a high priority research need. These problems require close teamwork with the tree improvement and fertilization scientists already on the School of Forest Resources staff.

4. Forest Utilization Program - The fourth scientist will be the program leader in the Utilization area. His particular specialization will be in economics with special interest in marketing. The individual will work closely with the other scientists in the Unit and in the School of Forest Resources.

5. One secretary will be hired full time to work with the Unit personnel.

The above are the initial group of employees to work in the Cooperative Unit. All would be on the job within the first 12 to 18 months after the cooperative agreements for the Unit have been signed. Expansion of the research and the Unit personnel staff would depend upon further needs and progress of the overall program.

BASIS OF FUNDING

There are several bases and combinations thereof by which cooperators could raise supporting funds--land acreage, volume of timber production, volume of manufactured products, number of employees, etc. Because the initial emphasis of this research effort will be on protecting basic forest resources and increasing forest productivity, it has been concluded that the most equitable and rational basis for funding is on total forest land acreage.

There are approximately 7 million acres owned by pulp and paper companies and 3½ million acres under large private and other forest industry ownerships. These lands are generally under planned management, and the owners and managers of these holdings have traditionally exhibited high interest in long-term protection and production of the resource. The initial funding is being sought from this class of ownership. The ones who are most likely to use the results of constructive research are being asked to support the research.

A figure of 3¢ per acre per year is judged to be the rate necessary to meet the annual required funding of $264,000 for the first five-year period. At 3¢ per acre, the 10½ million acres theoretically would yield $315,000 and exceed the initial requirements. Realistically, a full and complete response is unlikely. However, to the extent the program is over-subscribed in any one year, a reduced amount will be requested in the subsequent year.

As this research program develops, it will undoubtedly become appropriate to expand the base of support and funds will be sought from others who have an interest in the forest resources of Maine.

RESEARCH PRIORITIES

An appointed Sub-Committee of the Forest Resources Research Advisory Committee (F.R.R.A.C.) working in conjunction with the Director of the School of Forest Resources and the Cooperative Unit scientists will establish research priorities for the Unit. This system will ensure that the broadest and most intensive consideration will be given to what is relevant in the protection, management, and utilization of forest resources of Maine.

One of the first tasks of the Sub-Committee, whose membership will be representative of supporting cooperators, will be to develop a specific method for priority establishment and review. As a first step in this direction, Sub-Committee member John Sinclair initiated a request to a broad representation of land management foresters to determine their priority recommendations. The following tabulation indicates the response to this request:

Program and Research Projects	Percent of Respondents Expressing Priority Interest
1. Forest Protection Program	
a. Spruce budworm research	67%
b. Other insect problems	30%
c. Fire research	26%
d. Forest diseases	15%
e. Animal damage	0%
f. Weather effects	11%
g. Water resources	7%
2. Forest Management Program	
a. Spruce-fir silviculture	41%
b. Hardwood silviculture	37%
c. Conifer silviculture	30%
d. Regeneration	11%
e. Tree improvement	19%
f. Wildlife habitat manipulation	41%
g. Fertilization	30%
h. Soil and site relationships	37%
i. Mensuration including growth and yield	22%
j. Public relations and law enforcement	8%
k. Fire as a management tool	7%
l. Thinning	15%
3. Forest Utilization Program	
a. Harvesting and transportation	56%
b. Erosion control	11%
c. Economics and marketing	33%
d. Wood products, technology and processing	41%
e. Non-wood products	37%
f. Complete tree and forest utilization	48%

Recently, a similar request for an expression of research priority interest was initiated by Barton M. Blum, Project Leader, Northeastern Forest Experiment Station. This request specifically left out Spruce Budworm and other forest protection concerns as this is not part of the work at the Orono Project. This information in detail will be made available to the Sub-Committee for its consideration. A summary of the results follows:

1. Forest Management Program	
a. Silviculture	35%
b. Soils and site relationship	25%
c. Economics of intensive management	8%
d. Mensuration including growth & yield	8%
e. Tree improvement	3%
2. Forest Utilization Program	
a. Harvesting and transportation	2%
b. Economics and marketing and complete tree and forest utilization	10%
c. Non-wood products	3%

APPENDIX

A

Research programs and projects that would be possibilities for consideration by the Unit:

1. Forest Protection Program

    a. Spruce budworm research
    b. Other insect problems
    c. Fire research
    d. Forest diseases
    e. Animal damage
    f. Weather effects

2. Forest Management Program

    a. Spruce-fir silviculture
    b. Hardwood silviculture
    c. Conifer silviculture
    d. Regeneration
    e. Tree improvement
    f. Wildlife habitat management
    g. Fertilization

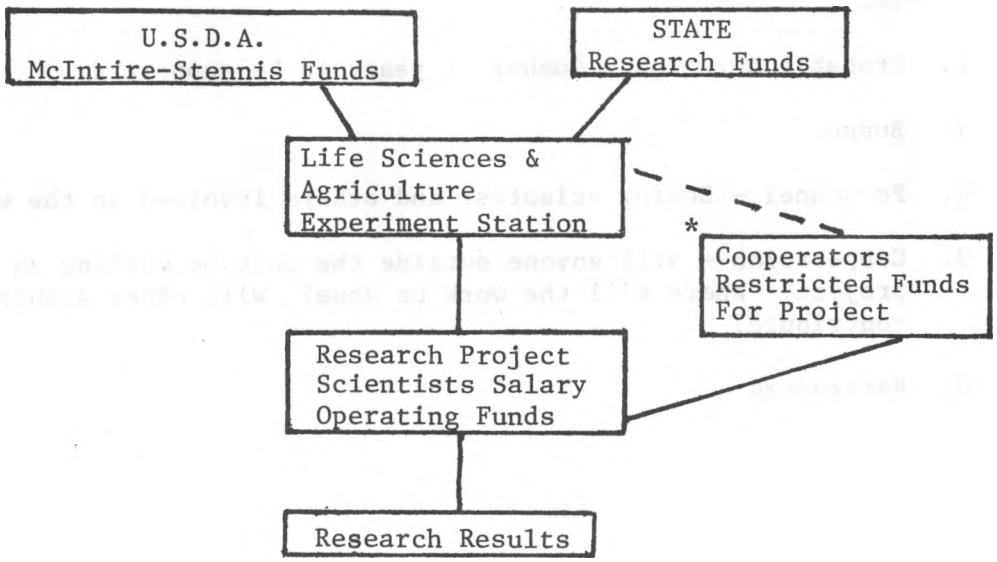
3. Forest Utilization Program

    a. Harvesting and transportation
    b. Erosion control
    c. Economics and marketing
    d. Wood products, technology and processing
    e. Non-wood products

APPENDIX

B

Flexibility to accomplish the priority research for the cooperators requires that we use the best talents available. This includes both the scientists hired directly for the project and those working on other projects on campus. This would involve projects supported entirely by the Unit and others partially supported in this way. Such projects, with funding from several sources, are already in existence in the School. The following is an example of the way in which funds might be utilized on a research project.



*Dotted line indicates approval of the Research by Station. Solid line indicates support for operation of the project.

APPENDIX

C

Format for proposals to do research in the Cooperative Unit.

1. Title - Concise and to the point.

2. Objectives - Research objectives should be concise and objective.

3. Justification - Why is the work needed?

4. Review of Literature - This should reveal that the scientist has made a thorough search and that the already completed work is thoroughly understood.

5. Procedure - The details of the work to be done must be presented so that all reviewers will understand what the scientist will do.

6. Probable Duration - Number of years to be supported.

7. Budget

8. Personnel - Senior scientist and others involved in the work.

9. Cooperation - Will anyone outside the unit be working on the project? Where will the work be done? Will other agencies contribute?

10. References

Recd Oct 16, 76
Am Assn of Foresters

DRAFT

Report of the Society of American Foresters Wildlife Committee and the Professional Wildlife Group on

IMPROVEMENT, MAINTENANCE AND PROTECTION OF FISH AND WILDLIFE HABITAT

January 8, 1976

DRAFT

DRAFT

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IMPROVEMENT, MAINTENANCE AND PROTECTION OF FISH AND WILDLIFE HABITAT

Introduction

While in many instances the forest practices required to achieve the several goals for forest management are mutually supportive in their application on the ground, it is not always so. As with the other goals contained in this document, the achievement of this goal may in certain circumstances require sacrifices in others or vice versa. That is to say the forest practices necessary to achieve one goal are in some cases not compatible with the practices needed to achieve another.

Decisions as to which practices to employ in such a case should be made with full knowledge of the tradeoffs that are involved. Such an analysis of tradeoffs and the hard decisions that follow are even called for within the broad goal of managing forest land to "improve, maintain, and protect wildlife habitat" because what may be a desirable practice for one species of wildlife may not be for another. The information contained in this section is presented in the spirit of informing landowners, managers, and others of what the effects of various silvicultural treatments and other forest practices are on * wildlife species. Information is presented here for both those persons who wish to manage their forest acreage primarily for wildlife and those who see wildlife as incidental.

It is not the intent of this document to provide "cookbook" methods of managing wildlife habitat, specific recommendations for the management of any land unit for the benefit of wildlife should be made by a qualified professional who considers the specific stand and site characteristics.

This report includes a general statement on the relationship between forest practices and wildlife in Maine and, in subsequent sections, more detailed information on the effects of forest practices on each of the major species groups in the state. Each of these latter sections contains an overall statement, an identification of habitat of particular importance, and recommendations on forest practices.

As the name implies, habitats of particular importance are those which deserve special managment consideration because of their importance to wildlife.

General

A key concept in grasping the impact of this section is that the wildlife species present on a piece of land and their numbers are a direct function of land management practices. Thus, whatever is done or not done to a parcel of forest land affects wildlife.

The suitability of habitat is determined by the food, water and cover it supplies within the home range of the species. In Maine, forest practices influence wildlife primarily through their effects on food and cover. Not only are the species of vegetation important in satisfying these requirements directly or indirectly, but the interspersion of vegetative types is also extremely important. In general, small units (a few acres in size) of diverse vegetative types are most favorable for the wildlife species in Maine today. Diversity as used here includes its various aspects of species composition, age classes represented, and condition of the trees.

In general, the ideal vegetative pattern needed to favor the variety of wildlife species in Maine consists of small, irregularly shaped, interspersed forest stands varying from brush and seedlings to mature trees, from northern hardwoods to spruce and fir, and from young thrifty stands to those which contain dead and dying trees. The wide variety of habitat requirements for our wildlife species clearly points to the value of maintaining diversity within our forests. Generally diversity can be obtained under either even-age or selection silviculture. To obtain a desirable degree of diversity within our forests under even-age silviculture clear cut units should generally be less than 20 acres in size, the specific desirable for a parti ea being dependent upon the species being managed for and site conditions. Short cutting cycles (5-15 years) are also generally desirable as they help to provide a continuous supply of food and cover in the younger age classes. Maintaining forest openings of a few acres in size and non-forest uses, such as agriculture, are also important in achieving the variety most beneficial to wildlife.

Practices which remove the hardwood component of mixed wood stands whether accomplished through the use of herbicides or mechanical means are undesirable * as they reduce diversity. This is particularly important in the case of stands in the seedling and early sapling stage.

Landowners are encouraged to consider all wildlife when making decisions regarding the nature, timing, and rate of application of pesticides, herbicides, fertilizers, or other chemical amendments to the forest ecoystem.

In insect control programs the least persistent chemical compounds with the least toxic properties to aquatic organisms should be used. Research on alternative, species specific forest insect pest control measures, such as biological control, should be encouraged. These alternatives should be utilized and analyzed for performance whenever and wherever possible.

The following sections present more detailed information on important wildlife species groups in Maine.

BIG GAME

Species Included

White-tailed deer, moose and black bear are classified as big game species in Maine. Although conveniently grouped by size, two of the species, deer and moose, also show a common family relationship evident in their characteristics. All of the big game species in Maine are usually associated with forest habitat, but their status within the state varies.

General habitat requirements and influences of forest practices

Early stages of forest succession are important habitat components for both moose (Peterson, 1955) and deer (Severinghaus and Cheatum, 1956). Both animals are browsers and dependent, particularly during fall and winter seasons, upon regenerating tree and shrub growth occurring in forest openings. A variety of woody plant species comprise their diets and many species are used commonly by both deer and moose. Notable differences in summer food habits is evident in the commonly observed high use of aquatic vegetation by moose. Deer, in contrast, are more dependent upon terrestrial herbaceous vegetation at that season.

Differences in winter use of forest stands is also characteristic of the two species. Both animals occupy shelter-providing cover types when uncrusted snow depths restrict travel. However, studies of deer and moose association in New Brunswick (Telfer, 1968) suggest that shelter occupied by deer under conditions of 12 to 20 inches are not used by moose until snow depths exceed 36 inches. Consequently, relative to deer, the leg-length advantage of moose permits them to use the open food-producing habitats during a greater portion of the winter season. Height advantage also elevates moose to food supplied out of reach of deer and height plus greater mass allows moose to "walk-down" and browse the tops of small saplings. Greater mobility of moose in snow also permits use of higher elevations than deer occupy during the winter (Telfer, 1967, Kelsall and Prescott 1971).

Bear are omnivorous in their food habits. Studies in Maine indicated that their annual diet consists of 77 percent vegetable matter, 8 percent animal matter (mainly insects and carrion), and 15 percent debris and trash (Spencer, 1966). Diet varied seasonally, with major components of vegetable matter changing from grasses, sedges, and herbs in the spring, to wild fruits in the summer, and mast and fruit in the fall. Desirability of a diversity of habitat including early stages of forest succession, is implied in the black bears' diet. However, since individual bear tend to roam over large areas, the degree of interspersion of forest stands required probably is less than necessary for optimum deer or moose habitat.

Forest practices which create diversity and maintain a moderate proportion of the forest area in the early stages of succession are favorable to big game species.

Abandoned fields, burns and other non-stocked sites have high value to big game, particularly in the spring season. Maintaining such openings for wildlife use should be an alternative consideration to artificial forest regeneration.

Habitat of particular importance

Deer wintering areas

Areas included and importance

Winter concentration on a small portion of their habitat is a commonly observed behavioral pattern throughout the white-tails' northern range. This behavior pattern, often called "yarding" is a complex response which may involve physiological (Severinghaus, 1953), psychological (Moen, 1968), and sociological (Mattfeld, 1975) preferences or needs. Nevertheless, logically it can be assumed that the behavior has high survival value under severe wintering conditions (Gill 1957, Ozoga, 1968).

In northern Maine, deer commonly concentrate in fairly mature (35+ feet in height), dense (70+% crown closure) coniferous cover adjacent to streams and ponds or lake shores (Banasiak, 1961). Those high value shelter stands provide lesser snow depths and more protection from heat loss than adjacent mixed or hardwood covers. Food supplies, however, are generally low within the best shelter stands and are more available at edges or within mixed and hardwood stands, depending upon stage of succession. Both the shelter providing softwood and the food providing hardwood and mixed growth stands are important components of deer wintering areas. Degree and duration of deer concentration varies annually depending upon winter severity. Consequently, boundaries of deer wintering areas are elastic, retracting and expanding as weather and snow conditions modify deer activity. Usually, but with many exceptions, deer tend to concentrate in the same general area each winter. Local cutting operations may temporarily attract and hold deer, and mild winters may disrupt usual concentration behavioral patterns.

Because deer wintering areas occupy a small segment of the animals annual range and are used during the most stressful period of the year, they are important in the white-tails' welfare. Their potential as locales for habitat management practices is generally recognized (Gill, 1957, Verme, 1965, and others).

Forest practice standards

The objectives of timber management for maintaining the quality of deer wintering areas is to provide both shelter and food for deer on a sustained basis. Softwood stands within a deer wintering area should be managed to sustain their shelter values and the hardwood and mixed growth stands should be managed to sustain deer food production (Gill, 1957).

Adequate shelter values for deer are provided by coniferous forests where a portion of the stands are composed of either spruce, fir, cedar, hemlock, or mixtures in which these species predominate and which range upward from 35 feet in height and have crown closure of 70 percent or higher (Gill, 1957). Stands of this classification should be in units large enough to provide the needed reduction in wind velocity and reduced snow depths.

In considering winter shelter needs of deer within the State of Maine, we must recognize the differences, particularly in regard to weather and snow conditions, that exist among the various sections of the state. From an accumulation of biological, climatological and land use data (Banasiak, 1961, Gilbert, 1972) eight Wildlife Management Units have been delineated (Figure 1), Appendix. In considering forest management practices for maintaining adequate winter shelter for deer we have grouped management units that have similar winter weather and snow characteristics in table 1, and also indicated the minimum portion of the deer winter shelter area that should be maintained in adequate cover at all times in grouped Wildlife Management Units.

Table 1. Minimum percent of shelter area that should be in adequate cover

Wildlife Management Unit	Minimum percent of shelter area in adequate cover
1, 2, 3,	50
4, 5	35-50
6, 7, 8	25-35

The major deer food producing forest types are northern hardwoods, spruce-fir, and spruce-fir hardwoods. In these food producing hardwood and mixed wood stands when uneven aged management is practiced care should be exercised to create large enough opening in the forest canopy to stimulate the production of browse. Periodic timber harvests, in both the shelter and food producing forest stands, at 5-15 year intervals insure the ideal variety of age-classes among the forest stands while simultaneously providing sustained winter shelter values food production for deer.

Where forest stands of several different age-classes currently exist within a deer wintering area only minor modifications of forest management pracatices will be required to meet the objectives. Forest lands that have been historically subjected to even-aged management in large blocks should be harvested by, first, removing mature or over-mature stands, and then working toward harvesting in smaller units to provide a variety of stand age-classes.

The preceeding is intended as a guide for managing deer wintering areas in Maine. Specific recommendations for harvesting timber within any particular deer wintering area should be made on an individual site basis.

SMALL GAME

Species included

* The small game animals of importance as a recreational hunting resource in Maine are the partridge, or ruffed grouse, snowshoe hare, woodcock, and gray squirrel.

General habitat requirements and influences of forest practices

With the exception of the gray squirrel, these species are more abundant in woodland areas that are in the younger stages of forest growth. Grouse and woodcock favor forest stands that have a high composition of aspen and birch interspersed with alder runs. Gray squirrels prefer mature hardwood stands containing mast producers such as oak and beech. Snowshoe hare are more abundantly distributed in coniferous forest stands.

Forest management practices for the benefit of grouse should be directed to those forest stands containing aspen or poplar. These stands should contain at least 10 aspen trees per acre and preferably more, (Gullion, 1972 and 1975). The younger, regenerating stands (0-10 years old) furnish food and cover for young grouse. Alder runs are also used by grouse broods and are also a prime feeding area for woodcock, (Gullion, 1972), Lincinsky, 1972), and (Mendall and Aldous, 1943). Young, sapling hardwood and mixed growth stands (10-20 years old) provide breeding and winter cover for grouse and are used as nesting and feeding cover for woodcock. Pole-sized hardwood and mixed growth stands (25-35 years old) provide winter feed for grouse (male aspen buds and birch catkins) and also summer and fall feed for woodcock, (Gullion, 1972), (Schemnitz, 1970) and (Mendall, 1943). The creation and maintenance of small forest openings is particularly important to provide nocturnal and mating habitat for woodcock. Grouse use hardwood stands over 20 years old for nesting cover, (Gullion, 1972).

Forest management practices for the benefit of snowshoe hare should be directed to those forest stands containing a high composition of conifers. Recently cut-over areas with abundant vegetative growth are used as feeding areas by hare. Dense young conifer or mixed growth stands with dense, low vegetative cover are preferred protective habitat, (Behrend, 1962), (Bider, 1961), (Bookhout, 1962), and (Brocke, 1975). Older conifer, or mixed growth stands, (over 15 feet in height) with an open understory are used as travel lanes between protective cover units and feeding areas (Brocke, 1975).

To maximize the benefits for small game timber harvesting should provide at least four distinct age-classes of timber growth on a sustained basis. The age-class distribution should include: regenerating stands, 0-10 years old; sapling stands, 10-20 years old; pole stands, 20-30+ years old, and mature growth. For optimum small game production the four distinct age-classes of timber growth should all be represented and sustained on a relatively small area of land, (40-60 acres).

RARE WILDLIFE SPECIES IN MAINE

Species Included

An authoritative list of rare species (used in the sense of species which have extremely low populations in the state) of forest wildlife in Maine does not exist. Species of forest wildlife which are thought to be rare in Maine include: the Cooper's hawk, bald eagle, yellow nosed vole, northern bog lemming, long tailed shrew, water shrew, Canada lynx, and wood turtles.

General habitat requirements and influences of forest practices

The habitat requirements of the species listed above are too numerous to be enumerated. In the case of these species, perhaps even more than in the case of others, landowners and managers are strongly urged to work with the responsible government agencies to conserve the habitat of these species. Further, landowners are encouraged to contact the appropriate agencies if they identify the habitats of these species on their holdings. The following is a brief discussion of some of the relevant state and federal programs.

From the federal perspective, endangered species are those in danger of extinction through out all or a portion of their range, while threatened species are those likely to become endangered in the foreseeable future in

all or a significant portion of their range. The Federal Register contains the "official" list but it does not enumerate all the isolated populations and subspecies, such as the northern bald eagle, throughout the nation. The Maine Department of Inland Fisheries and Wildlife is compiling a state list with a recovery plan for other species included. The recovery plan will designate critical habitat areas and identify actions which should or should not take place on these lands. Recommended actions involving critical habitats may include the development of regulations, land and water acquisitions and leasing arrangements. Public agency and landowner cooperation will be necessary to implement the plans.

Habitat of particular importance

In general, this category includes the habitat of the previously enumerated species or portions of it, e.g., most sites particularly important to them. Areas included in this category and recommendations for forest practices within them should be handled on a case by case basis.

NON-GAME WILDLIFE SPECIES

Species Included

Non-game wildlife includes all the birds, mammals, reptiles and amphibians not classified as game.

General habitat requirements and influences of forest practices

Non-Game species from an integral part of the forest ecosystem by aiding in such processes as nutrient cycling, insect control, and seed dispersal. Some non-game species may compete with man for the timber resource, others are food for game animals and many are aesthetically appealing to the general public. Because of the vast array of non-game species and their differing habitat requirements no one management approach can benefit all species.

The variety and numbers of non-game species are most favored by a diverse forest. Landowners are encouraged to maintain snags, stubs, and wolf trees widely dispersed over their holdings because they provide nesting, feeding, and escape cover for many non-game birds and mammals. Wherever possible the disruption of small streams, pools and boggy areas should be avoided because of their value to many non-game species for reproduction, feeding, and bathing.

Habitat of Particular Importance

This category may include highly significant portions of the habitat of these species, e.g., colonial bird nesting sites. Landowners are encouraged to work with appropriate agencies on the management of these areas.

WATERFOWL

Species Included

The species in this group include but are not limited to the following: the black duck, wood duck, golden-eye, hooded merganser, ring necked duck,

American merganser, mallard, and Canada goose.

General habitat requirements and influences of forest practices

Wetland habitats are essential to the well-being of these species by providing their feeding and nesting habitat. While wood duck, golden eyes, and hooded mergansers are partial exceptions to the above statement because they nest in cavities in trees, even they normally nest in close proximity to wetlands. Thus, the maintenance of wetlands in a productive natural condition is of primary importance to this group of species.

Habitat of particular importance

Wetlands

Areas included and importance

All marshes, swamps, and open water areas in bogs. These areas are essential to the maintenance of waterfowl and other wildlife populations

Forest practice standards

The following major land use practices involved in commercial timberland operations may effect wetland habitat and waterfowl populations:

(1) road construction
(2) timber harvesting
(3) insect control
(4) dam maintenance and waterlevel control

Drainage and filling of wetland areas during road construction should be avoided, and where wetland areas must be crossed, provisions for circulation between the bisected areas should be provided by adequate culverts or bridging. The importance of beaver flowages to Maine's breeding waterfowl population is well documented and such areas should be managed and encouraged whenever possible. The maintenance of hardwoods adjacent to streams and/or active beaver colonies is beneficial to beaver populations and helps ensure maintenance of the colony and hence their benefits to waterfowl. When harvesting areas adjacent to wetlands that support populations of cavity nesting waterfowl (wood duck, hooded mergansers, and golden-eye), some mature trees (wolf trees) should be left to provide a supply to natural cavities for these species. The invertebrate food supply is of particular importance to female waterfowl prior to and during the nesting period and to the ducklings during their first several weeks of life. Hence, the use of insecticides adjacent to wetlands should be avoided to prevent destruction of these critical food supplies.

The fate of dams previously constructed in conjunction with timber transportation and water storage should be carefully evaluated. Coordination of these evaluations between landowners, fisheries, and wildlife biologists is encouraged since these dams could provide effective water level control devices and thereby increased waterfowl production. Destruction or deterioration of these dams would result in the loss of much valuable waterfowl habitat.

UPLAND FURBEARERS

Species Included

The species in this group include: the red fox, coyote, raccoon, fisher, marten, bobcat, weasel, and skunk.

General habitat requirements and influences of forest practices

These species are favored by a diverse forest with stands in the various age classes from seedlings to maturity. In general, land management consistent with the recommendations in the section on small game would cause an increase in the numbers of upland furbearers although these animals can benefit from even-aged blocks larger than those needed for small game. Where possible one den tree should occur in every five acres for the benefit of these species.

AQUATIC FURBEARERS

Species Included

Species in this group include: the beaver, otter, mink and muskrat.

General habitat requirements and influences of forest practices

These species are dependent upon water and adjacent uplands. Because of their territorial nature, high populations of otter and mink are not possible on a sustained basis.

High quality beaver habitat results from fire or timber harvesting that result in the regeneration of hardwood. The land area important to beaver occurs within 300 feet of water in areas where stream gradients are relatively flat. Regeneration cuts for beaver should occur at about 15-year intervals and each age class should occupy an area of about 15 acres. This would supply food for one colony of beaver and would result in one to two colonies per mile of stream. A compromise in habitat management for beaver is the type of management recommended for small game.

Otter and mink require fish and other aquatic life as part of their diet thus a well managed fishery is needed. They also utilize small animals that are associated with openings in the forest. Management of habitat for fish and other game and fur bearing animals satisfies the habitat and food requirements for mink and otter.

FISH AND ASSOCIATED AQUATIC LIFE

Species Included

Aquatic wildlife species particularly fish.

General habitat requirements and influences of forest practices

A large percentage of Maine's total area consists of commercial forests, noncommercial forest land, and waterways. The forest environment significantly influences the quality of water that originates in and flows from these lands. It maintains conditions favorable for supporting the variety and abundance of fish species found in Maine's flowing and standing waters. Trout and salmon are especially dependent on cool, clear water for their survival.

* The forest environment also contributes to the esthetics of recreational experiences associated with the utilization of Maine's fishery resources. Good forest management practices will maintain aquatic habitat and the surrounding environment in order that the fish and wildlife resources which they support might be perpetuated to be enjoyed now and for the future.

Man's uses of land and water resources can significantly affect the quantity, quality, and diversity of aquatic habitat, influencing the fishery resources and the use opportunity which they offer. Activities that alter one or more of the basic physical, chemical, or biological characteristics of aquatic habitat can influence, sometimes dramatically, the composition of fish species through changes in conditions necessary for the survival of less adaptable species, especially trout and salmon. Forest management activities, timber harvesting operations, and the construction of land management roads which affect water temperature, concentrations of dissolved gases, especially oxygen, light penetration in water, or the actual physical condition of the aquatic environment can be detrimental to fish populations.

* 1. Deposits of logs and slash in stream channels may restrict fish movements, smother spawning grounds, cause chemical changes in the water, inhibit or destroy esthetic values associated with the natural surroundings.

2. Cutting trees to the water's edge permits much greater exposure to sunlight causing the abnormal warming of waters, sometimes beyond the tolerance limits of coldwater species.

3. Sedimentation results from the erosion of soil from the ruts made by vehicles, from stream corssings, and from unproper road location and construction. Often it is not limited to small areas, its effects can be felt many miles downstream in a drainage. Silt inhibits light penetration in the water necessary for photosynthesis, the basis of all food chains in aquatic habitats. Silt coats the gill filaments of fish and may cause death. Sedimentation reduces the abundance of bottom-dwelling invertebrates, and may reduce or eliminate suitable salmonid spawning and nursery areas.

4. Insecticides used to control harmful forest insects may kill fish or essential aquatic organisms in the food chain.

5. Improperly placed culverts may block fish movements.

* 6. New logging roads increase access to once remote areas, often increasing fishing pressures in certain waters, especially small trout ponds, resulting in a decline in fishing quality and/or a deterioration in wilderness experiences associated with fishing in remote areas.

Habitats of particular importance

Surface water

Areas included and importance

All surface waters including lakes, ponds, rivers, and streams. These areas are essential to the well being of the aquatic wildlife species and other groups.

Forest practice standards

The following standards will maintain aquatic habitat in lakes, ponds, and natural streams:

1. Forest management activities, timber harvesting operations, and the construction of roads should be conducted in such a manner as to prevent the introduction of soil sediments, slash and other waste material, and toxic
* chemicals into surface waters, and to preserve the esthetic qualities of the shorelines. Standards under goals 3 and 4 that will improve maintain and protect the forest soil and water resources will also conserve aquatic habitat and the fishery resources. Standards under goal
* 6 that will improve, maintain and protect the visual qualities of forested shoreland areas will preserve the esthetics associated with and important to waterbased recreational experiences.

2. At times, when the ground is not forzen, mechanical skidding operations should not be conducted in shoreline areas especially susceptible to erosion, such as areas with steep slopes and fragile soils. Alternative methods that will not disturb the forest soil should be utilized.

3. A buffer strip of vegetation should be maintained along all perennial streams. This strip should include all vegetation that helps to stabilize stream banks and that needed to provide shade and thus maintain low stream water temperatures. Timber stands involved should be maintained in a healthy condition by partial cuts.

4. The bottoms of culverts should be installed at streambed elevation to facilitate fish passage.

5. Landowners and land managers should cooperate with the Maine Department of Inland Fisheries and Wildlife and other state agencies in the identification, management, and protection of waters of scientific, educational, or special recreation significance in order to assure water quality and habitat conditions critical to the perpetuation of aquatic communities and to maintain recreational * opportunities of high esthetic value. For example, new permanent roads should be located as far as practicable from remote waters identified as having special significance. This will prevent abnormal increases in fishing pressure, and subsequent declines in fishing quality, that often result when once remote waters become easily accessible.

This report was prepared by the following persons at the request of the Maine Chapter of the SAF.

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Glossary

Abandoned roads	Roads no longer used for the purposes for which they were constructed.
Anadromous fish	Fishes that spend most of their lives in the sea but return to freshwater to spawn, e.g. Atlantic salmon, striped bass and alewives.
Aquatic	Growing or living in or upon water.
Bog	A tract characterized by a very acid, peat soil and a water table close to the soil surface, supporting low vegetation, e.g. sedges, mosses and shrubby plants though it may also carry tree growth, more acid and more continuously wet than a marsh.
Bottom dwelling invertebrates	Aquatic invertebrates usually associated with the bottoms of lakes, ponds, streams and wetlands, e.g. crayfish, mayfly larvae and caddis worms.
Browsers	Animals that feed on the buds, shoots, and leaves of woody growth, e.g. white-tailed deer and snowshoe hare.
Cavity nester	Animals that nest in holes in trees or similar cavities above the ground surface, commonly used in reference to waterfowl and woodpeckers.
Cold water species	Any aquatic species requiring cool water and high concentrations of dissolved oxygen for normal life processes.
Colonial bird nesting sites	Sites used by those birds habitually nesting in large numbers within a small land area, e.g. heron rookeries and bank swallow colonies.
Community	A naturally occurring assemblage of plants and animals that live in the same environment and are mutually sustaining and interdependent.
Deer wintering areas	Areas in northern climates in which deer seek food and protection from winter winds and deep snow. A deer wintering area generally includes dense softwood stands used for shelter and adjacent areas of shrubs, tree seedlings and sprouts that provide browse.
Den tree	Any living or dead tree with cavities showing evidence of use by mammals (e.g. clawmarks, droppings) for rearing young or as a refuge.

Food chain	The series of steps of eating and being eaten by which the energy stored by plants is passed through the community.
Fragile soils	Those soils especially sensitive to compaction or erosion due to their slope, drainage, texture, or structure.
Game	Those animals so defined by law and habitually hunted or trapped for food and/or particular products, and/or for sport, including trophies.
Habitat	The place where an organism lives and its surroundings, both living and nonliving.
Herbaceous plants	Any plant that does not develop persistant woody tissue above ground.
Home Range	The area in which an animal spends all or most of its time and activities each day. The home range is highly variable depending upon species, age, season, and habitat quality.
Interspersion	The intermingling of different habitats of varying size and shape; a mosiac of habitats and/or stands.
Invertebrate	Any animal lacking a backbone.
Lakes and Ponds	Bodies of surface water of varying size that have no perceptible flow and are relatively permanent in nature occurring within land masses.
Marsh	A tract characterized by a predominately inorganic soil, supporting low vegetation, less acid and less continuously wet than a bog- often only intermittently innundated.
Natural streams	Water courses in which water flows in a defined channel or bed throughout the year, developed and maintained without interference by man.
Omnivorous	Eating both animal and plant matter as food.
Persistant chemical compounds	Chemical compounds that maintain their structure for long periods in spite of changes in temperature, humidity, etc. or their location in the environment.
Range	1. The geographical and altitudinal limits within which a species normally occurs. 2. The geographic area in which individuals of a species are found in various seasons and years and which provides them with the essentials of life, e.g. food, cover and water.

Recreational experience	The sense of enjoyment that an individual human obtains from a thing or activity not considered as work or routine by that individual.
Salmonid	Any member of the salmon family, including salmon, trout, whitefish, grayling and the chars.
Sedimentation	The process of deposition of mineral particles in stream beds or elsewhere once water movement no longer keeps the particles suspended.
Silt	Soil particles between 0.05 and 0.002 mm in diameter.
Succession	The natural and orderly sequence of progressive replacement of one community by another over a period of time until a relatively stable and self-perpetuating community occupies the area.
Swamp	A tract characterized by a soil that is slightly acid, neutral, or slightly alkaline and a water table at or above the soil surface (the water often moving perceptibly), supporting not only low vegetation but also reeds and woody vegetation including trees.
Toxic chemical compounds	Chemical compounds that are dangerous or harmful to life.
Waters of scientific, educational or recreational significance	1. Lakes, ponds and natural streams with important freshwater or anadromous spawning and nursery areas, that support rare or unique fish populations or aquatic communities, or which offer high quality angling experiences.
Wetlands	Any poorly-drained, uncultivated tract, whatever its vegetational cover and soil, including marshes, swamps, open water and bogs.
Wilderness experience	The exhilaration of the human senses associated with experiencing wildness and/or solitude.
Wildlife	All non-domesticated animal and plant life.

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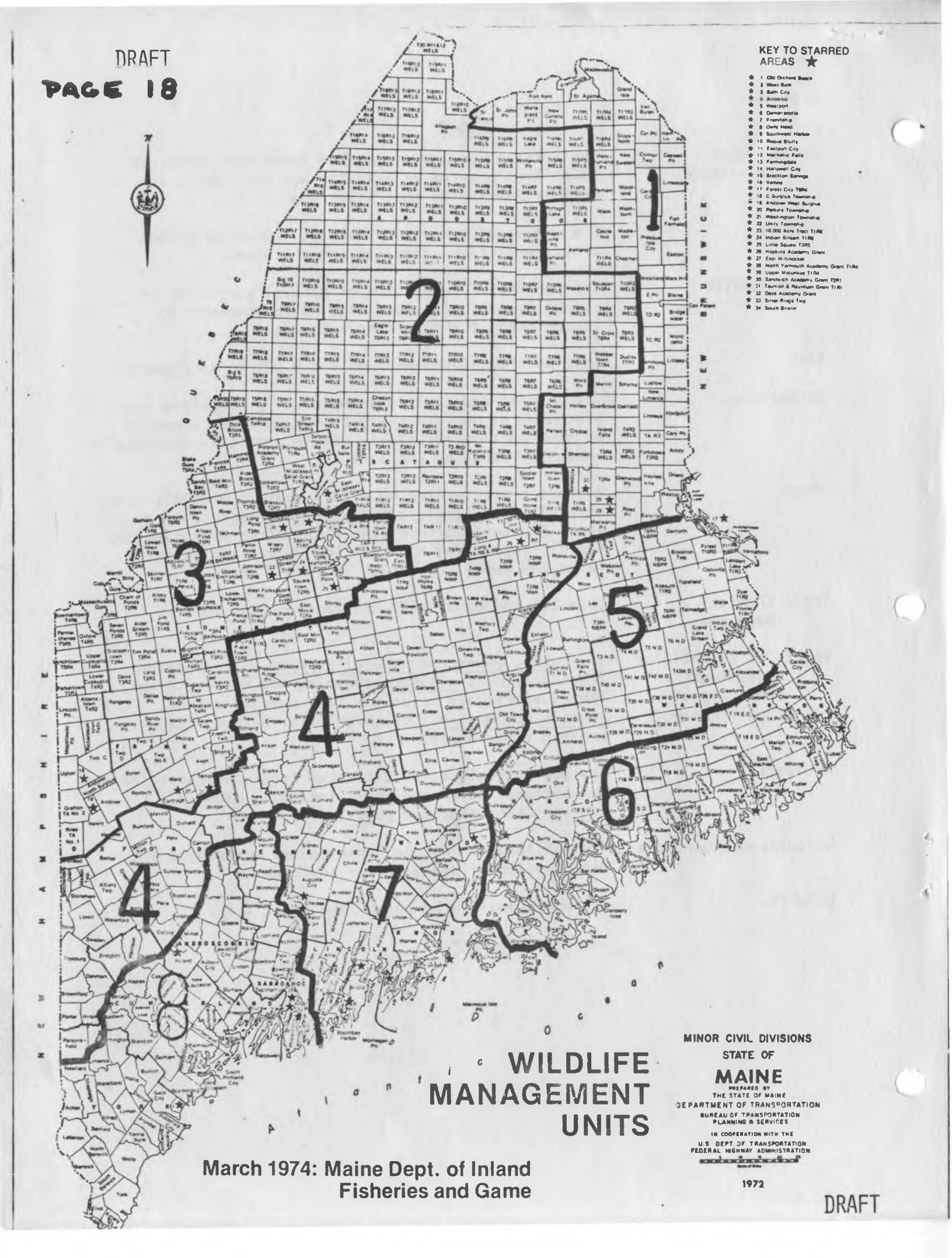

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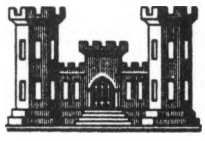
To: Forrest Dexter 8 Oct 76



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RELIABILITY CRITERIA

FOR

GENERATION PLANNING IN NEW ENGLAND

BY

ROBERT O. BIGELOW

Presented to the Henniker Conference

August, 1976

A. INTRODUCTION

In January of 1973, the Planning Committee of the New England Power Pool (NEPOOL) undertook a review of the loss-of-load probability (LOLP) criterion of one day/ten years, which had formed the basis of reliability calculations in generation planning to that time. This was done in conjunction with parallel studies on forced-outage rates and interpool ties. Particular emphasis was placed on differentiating between wide-spread loss of load and lesser problems such as voltage reductions. Since that time, a number of studies have continued to implement and update the results of the 1973 review.

Three separate aspects of generation reliability were involved. The first led to the concept of using estimated frequency of requiring various steps of NEPOOL emergency procedures to evaluate generation reliability. The second concerned itself with interpool ties and the application of reliability criteria on an annual performance basis rather than on a peak period basis, as had been done in the past. Also included were analyses of some of the problems which arise through planning for maintenance on a levelized risk basis, as done in capacity planning simulation programs, versus actual maintenance experience. The third developed a comparison of computer-derived planning estimates of system performance with actual operating experience.

Presented herein is a summary in which the various individual aspects of

the problem, as developed in these three studies, were put together. This, in turn, has led to a new reliability criterion for generation planning in New England, and we believe it has had considerable influence on the approach being taken by our neighbors in the New York Power Pool.

B. RESULTS

1. The new basis for evaluating generation reliability is expressed on an annual basis in terms of risk of exposure to, or estimated frequency of, key steps in the NEPOOL emergency operating procedure for conditions where generation is short. These are described in the appendix to this report. Also described in the appendix is the method of calculating reliability and using the results to estimate frequency of emergency conditions. The results are expressed in terms of estimated system performance on a power year basis, i.e., November 1 to October 31, which is appropriate for a winter-peaking system like New England. The overall result is, we believe, a consistent and meaningful criterion for assessing generation adequacy in terms that can be understood by management, regulatory personnel, and the general public.

Figure 1 shows how this approach relates reserve needs to a New England generation reliability criterion. In reading Figure 1, it should be noted that the percent reserve required for a specific level of reliability will vary as a function of the sizes and types of units in the generation mix. NEPOOL studies indicate, however, that levels of risk or exposure to various steps in emergency operating procedures have a consistent relationship to incremental changes in percent reserve over a wide range of system configurations representative of system conditions anticipated in the next ten to twenty years. Expected tolerances or "bandwidth" are indicated in Figure 1.

The horizontal axis of Figure 1 represents incremental changes in

percent reserve above and below a reference value which is required for a specific risk level. The zero or reference reserve in Figure 1 corresponds to a risk level not to exceed one day in ten years disconnecting customers and thereby interrupting load. This is a risk level which the NEPOOL Planning Committee is currently using as a basis for generation planning in New England. A more detailed analysis of this risk level can be developed by referring to Figure 1. The estimated frequency of having to disconnect customers due to a shortage of generating capacity falls between .05 and .1 day per year (i.e., once in ten to twenty years). For radio and TV appeals and request for voluntary reductions by large customers, the estimated frequency of occurrence is between .4 and .8 day per year (once in 1.2 to 2.5 years). The estimated frequency of voltage reductions and curtailment of interruptible loads is five to eight times per year. The impact of incremental changes in percent reserve above or below this risk level can be read directly from Figure 1. This gives a meaningful measure of what a change in reserve level is likely to accomplish in terms of system performance as it affects the public directly.

2. Ties to neighboring pools have significant impact. These ties are being evaluated both in terms of the transmission capability within and between the pools and in terms of the generation reliability of neighboring systems. The approach is to establish a New England generation criterion and to assess ties on the basis that the neighboring systems will be designed to the same reliability criterion, unless there is specific information that the outside system is designed on a less reliable basis.

3. If one assumes for New England the reference criterion of one day maximum in ten years disconnecting customers and an equivalent risk level

in New York, the ties to the New York Power Pool appear to improve New England's reliability equivalent to a reserve increase of approximately four percent of peak load. As the systems grow, so must the tie capability if this relationship is to continue. On this basis, the present ties, which have a capability of approximately 1,050 mw, will be adequate to obtain all mutual reliability benefits available between New England and New York out to the early 1980's. Beyond that point, mutual benefits between these systems appear to be limited by tie capacity, unless a further increase in transfer capability is made.

4. One of the important features of this review was a check of generation-planning-program results versus actual experience for the three years, 1971 through 1973. The results showed a good correlation when actual maintenance experience, including overruns from original schedules, was included. This is illustrated in Table 1. Data input to these runs included the most recently available forced-outage-rate data, as developed from EEI statistics and applied to New England conditions.

When the program was rerun with an optimized maintenance schedule developed by the capacity planning program using estimated scheduled maintenance requirements, the results showed a substantially more reliable system than actual. The discrepancy introduced by assuming an idealized maintenance schedule appears to be equivalent to about four percent more reserve on the system. Further analysis indicated that this four percent discrepancy between program predictions and actual experience was primarily due to maintenance overruns, with optimized timing a secondary factor.

5. Figure 2 shows required reserves in New England based on a NEPOOL 1973 forecast, which is out of date numerically but which illustrates a number of issues which came out of this review. Reserves were calculated assuming the reference criterion of disconnecting customers one day in ten years. Curves are shown in Figure 2 for four sets of assumptions as follows:

a. New England in isolation with optimized maintenance.

b. New England with New York ties and optimized maintenance.

c. New England in isolation with corrections from maintenance experience in 1971 - 1973.

d. New England with New York ties and corrections from maintenance experience in 1971 - 1973.

Note that Curves "a" and "d" are essentially identical.

These curves illustrate specific application of the results in the foregoing Items 1 through 4 to conditions for the next ten years as anticipated at the time the 1973 forecast was prepared. Note again that, for a given level of reliability, reserve requirements change significantly as the mix of generating unit sizes and types changes. Also shown are the impacts of recognizing ties to New York and actual maintenance experienced in 1971 - 1973 versus the optimized schedules. Note also that the reliability effect of increasing or decreasing reserves from the values shown in Figure 2 can be read directly from Figure 1 in terms of NEPOOL emergency operating procedures.

C. CONCLUSIONS

The NEPOOL Planning Committee has adopted the following changes in generation planning practices as a result of this study:

1. NEPOOL has established its generation planning criteria on the basis of estimated exposure to steps in NEPOOL emergency operating procedures, as illustrated in Figure 1.

2. Generation is being planned to a risk level not to exceed one day in ten years disconnecting customers, with due allowance for required maintenance and expected forced-outage rates. The 1971 - 1973 studies indicated that this corresponded to an LOLP of one day in one year on the capacity program we had been using. Recent analysis of operating experience, however, has indicated that conservation efforts

of the past few years have had a more than proportionate impact on the elements of load, which are susceptible to voltage reductions and requests for voluntary curtailments. As a result, it appears that the relief which can be achieved by these steps has been reduced. On a preliminary basis, therefore, we believe that our criterion will now translate into an LOLP of approximately one day in 2.2 years.

3. Realistic annual unit maintenance requirements including overruns estimated from studies representative of actual field experience, as well as expected improvements therein, are being estimated in the reliability calculations made to plan the generation system designed to meet the selected New England reliability criterion.

4. A periodic review of appropriate annual maintenance, including overruns, needed to represent both actual experience and expected improvements referred to in Conclusion 3 above for use in future planning studies, has been assigned to a special task force formed jointly by representatives of the NEPOOL Operations and Planning Committees and their respective staffs.

5. Ties to neighboring systems are being included in the evaluation. Benefits so determined reflect best information available on the neighboring system's plans, but normally the benefits assumed thereby will not exceed what could be achieved if the neighboring system was designed to the same level of reliability as is selected for New England.

TABLE 1

1971 - 1973 CALCULATED AND ACTUAL RISK PROFILES

(Weekdays)

	1971 (260 days)		1972 (260 days)		1973* (220days)		1971-73* (740 day	
	Calc.	Act.	Calc.	Act.	Calc.	Act.	Calc.	Act
Norm. Oper.	217.70-237.77	208	169.00-199.62	179	169.00-191.73	189	555.70-629.12	576
30 Min. Reserve to 0	22.23- 42.30	52	60.38- 91.00	81	28.27- 51.00	31	110.88-184.30	164
Volt. Red.	1.33- 2.50	11	8.75- 13.50	4	3.40- 5.84	4	13.48- 21.84	19
Radio-Tv	.11- .21	1	1.52- 2.35	1	.36- .63	2	1.99- 3.19	4
5-Min. Reserve to 0	.03- .05	0	.52- .84	0	.10- .18	0	.65- 1.07	C
Discon. Cust.	.01- .02	0	.27 - .47	0	.04- .09	0	.32- .58	C

*Through October, 1973 only, since November and December were distorted by the energy crisis.

FIGURE 1

NEW ENGLAND RISK PROFILE vs. INCREMENTAL RESERVES

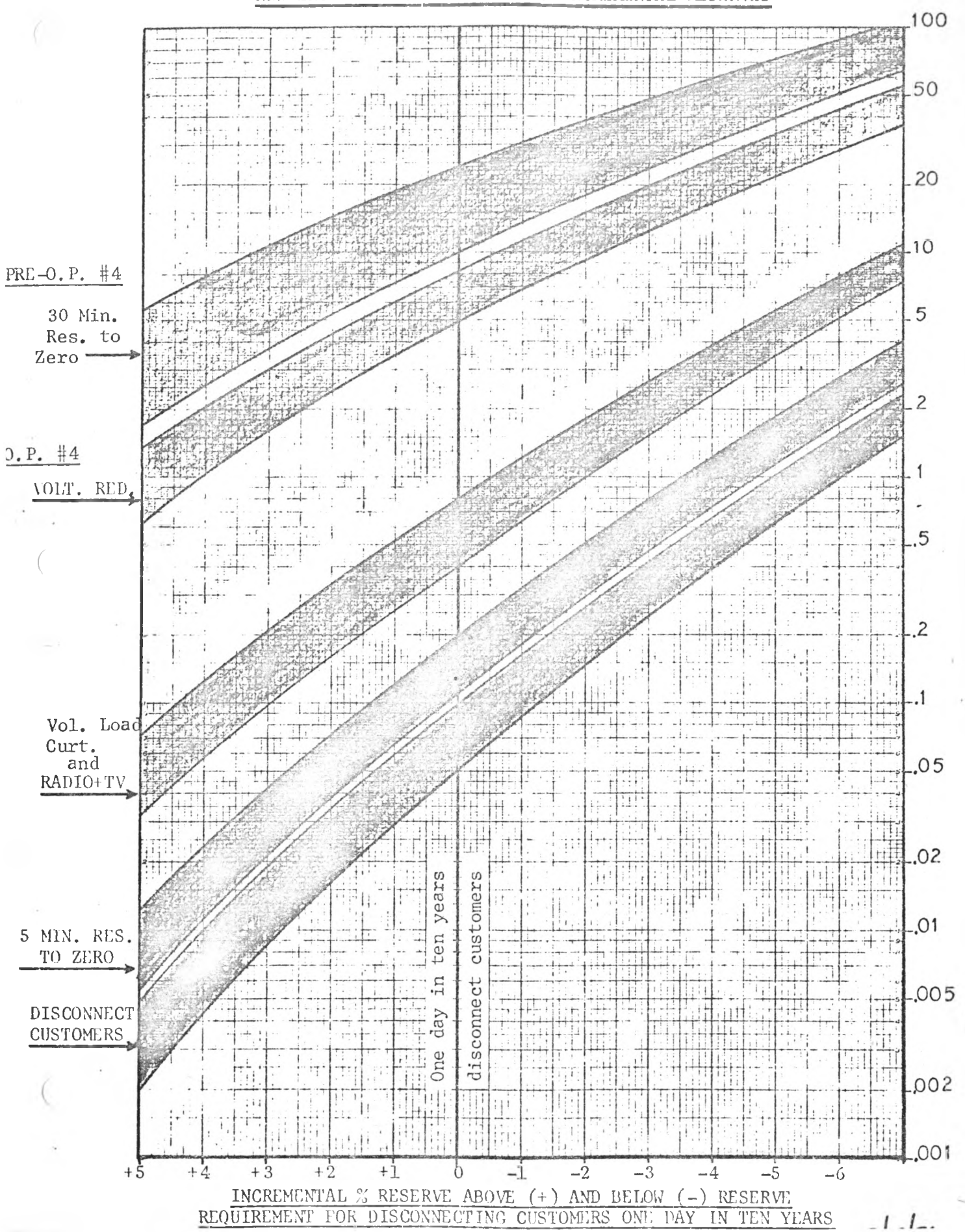
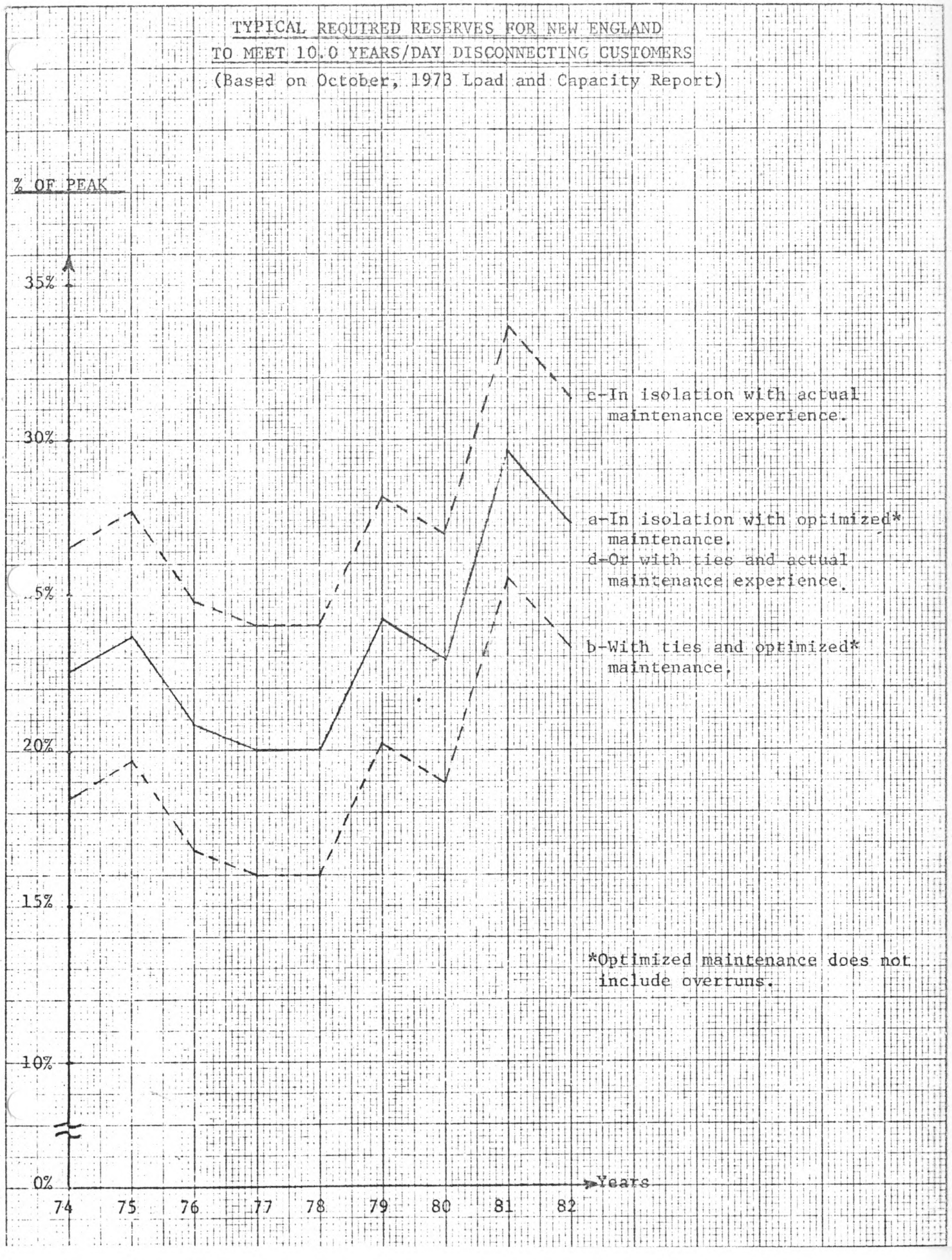


FIGURE 2


TYPICAL REQUIRED RESERVES FOR NEW ENGLAND
TO MEET 10.0 YEARS/DAY DISCONNECTING CUSTOMERS
(Based on October, 1973 Load and Capacity Report)
% OF PEAK
35%
30%
25%
20%
15%
10%
0%
74
75
76
77
78
79
80
81
82
Years
c-In isolation with actual maintenance experience.
a-In isolation with optimized* maintenance.
d-Or with ties and actual maintenance experience.
b-With ties and optimized* maintenance.
*Optimized maintenance does not include overruns.

APPENDIX

DEVELOPMENT OF RELIABILITY CRITERION

I. THEORETICAL BASIS

A. Definition of Reliability

The definition of reliability associated with a generating system can be stated as: the probability that the generating system will function without loss of load during the time period under investigation.

The probability that the generating system will fail to function as desired is the complement of reliability. Stating this as a mathematical relationship:

$$P\ (\text{Failure}) = 1.0 - \text{Reliability}$$

The current reliability criterion of 10 years/day is derived from the probability that the system will fail once in ten years, which is 0.0003846. This is obtained from the following:

$$\text{Probability of Failure} = \frac{\text{Number of Failures}}{\text{Number of Chances of Failure}}$$

$$= \frac{1 \text{ Day}}{10 \text{ years} \times 260 \text{ weekdays/year}}$$

$$= \frac{1}{2600}$$

$$= 0.0003846$$

$$\text{Reliability} = 1.0 - P\ (\text{Failure}) = 1 - 0.0003846 = 0.9996154$$

B. Measurement of System Reliability

System reliability may be measured by calculating the probability that the system will be in a specified margin state. For any system condition, the available system capability minus system load is referred to as "MARGIN". Margin is affected by a number of variables. Uncertainty in some of these makes it appropriate to evaluate margin in a context of probability of achieving this margin based on a probabilistic analysis of the following parameters:

1. System Load, defined in terms of a normal distribution of weekday peaks for each of 13 four-week periods in a year.
   a. Mean
   b. Standard Deviation
2. System Capability, total megawatts itemized by:
   a. Size of Units
   b. Type of Units
   c. Mix of Units
   d. Forced Outage Rates of Units
   e. Scheduled Maintenance Requirements
   f. Interconnections (Ties)

Both the system weekday peak-hour loads and available capability are treated as probability functions in the following Figure A.

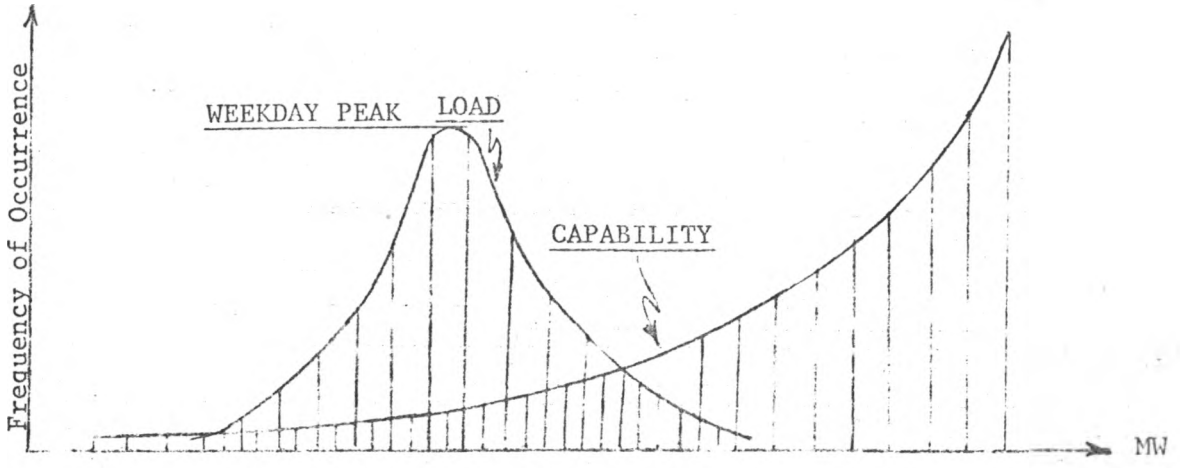


FIGURE A

Combining the load and available capability density functions will result in the margin density function. The margin density function approximates the form shown below by Figure B.

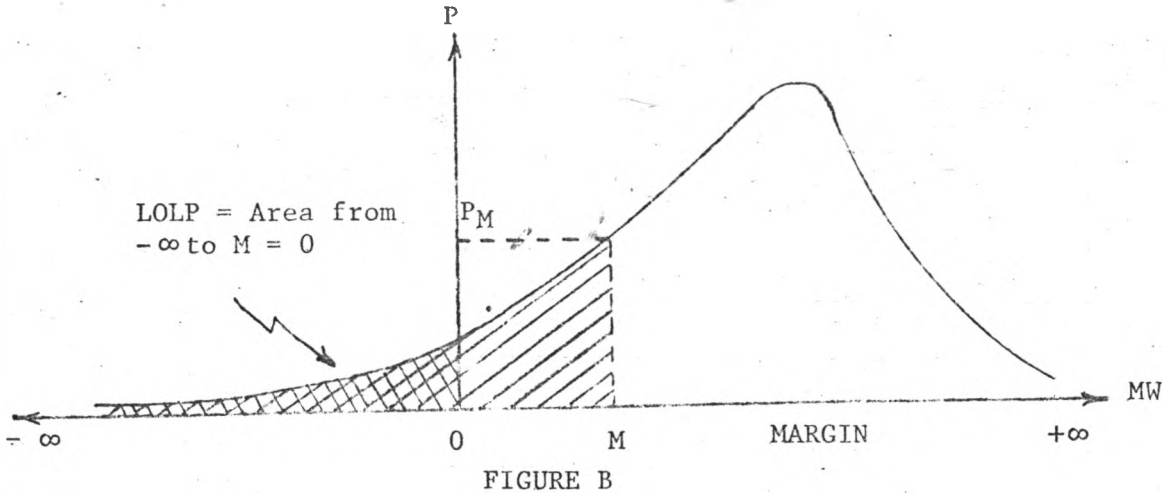


FIGURE B

This figure is used to determine the probability P_M of margin M occuring on the system. The area under the margin density function between $-\infty$ and M represents the probability that a given margin M or less will occur. This relationship can be converted to a cumulative margin distribution function which approximates the form of Figure C.

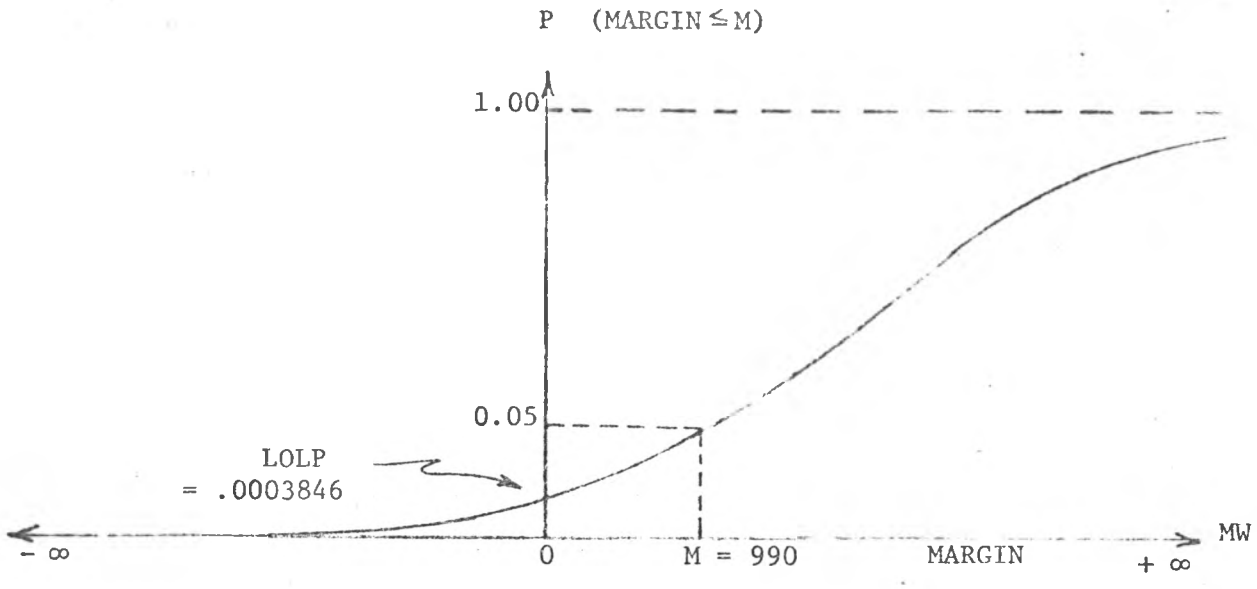


FIGURE C

Cumulative Margin Distribution Function

The following examples clarify the use of this curve. The numbers used are based on a reliability case of 10 years/day.

Example 1. What is the probability of having 990 mw or less margin on the system?

The probability of having 990 mw or less can be read off the curve directly directly as .05.

Example 2. What is the probability of having more than 900 mw margin on the system?

This probability is merely the complement of the probability of M ≤ 990 mw, which is 1 - 0.05 = 0.95.

C. Interpretation of Reliability

The measure of reliability previously used in New England is the loss of load probability (LOLP) method. This method is widely used in the utility industry and is defined as the probability that the margin is equal to or less than zero. This LOLP point has been indicated on the curve in Figure C. It is a measure of the probability that there will be insufficient generation to meet the expected loads and represents all possible combinations of load and capacity that yield zero or negative margin.

This measurement of reliability does not adequately describe the current method of operation under NEPEX with its centralized dispatch and system control. Investigation of NEPEX operating procedures suggests a more realistic method of measuring loss of load. This procedure provides a guideline for remedial action designed to maintain various amounts of operating reserve when the load plus 1.5 times the largest unit exceeds the generating capacity. Some steps of this operating procedure introduce additional generating resources, while others effectively reduce the load on the system.

APPENDIX

II. NEPEX EMERGENCY OPERATING PROCEDURE

Normal operating procedure with the New England Power Pool requires that an operating reserve be available to the NEPEX dispatcher as follows:

1. Five-minute reserve - Reserve capacity equal to the largest loading of any unit connected to the system must be available to the dispatcher within five minutes of any contingency.

2. Thirty-minute reserve - Reserve capacity equal to 0.5 times the largest loading of any unit on the system must be available to the dispatcher within thirty minutes of any contingency.

Presently, the largest rated unit on the NEPOOL system is 767 mw; so that the total operating reserve (5-minute plus 30-minute) which should be available under normal operating conditions is 1.5 x 767, or 1,150 mw.

NEPEX has set up an emergency operating procedure (No. 4) to provide a series of actions which will be taken on the system if capacity margins are reduced below acceptable levels and there is insufficient generation to meet the load. These actions can be summarized in four steps, which are shown graphically on the attached Figure D and are tabulated below:

Tabulation of NEPOOL Emergency Procedures

1. Step 1 is a series of actions which the dispatcher can take to mobilize all possible sources of supply but which will not be perceived by the public as having any direct impact on their service. These include bringing the thirty-minute reserve to five-minute status and arranging for all sources of emergency capacity which can be obtained from neighboring pools or from possible industrial sources. If loads grow, no further action will be taken until the thirty-minute reserve has gone to zero and the five-minute reserve has been reduced to a point that to cover the loss of the largest single unit would require remaining

capacity plus relief which can be obtained by voltage reductions and removal of interruptible loads which can be effected within five minutes.

2. Step 2 involves actual implementation of voltage reductions of up to 5% and curtailment of contractually interruptible loads. As indicated on Figure D, NEPOOL estimates at the time of the study were that, with a 13,000 mw peak, approximately 300 mw of relief could be realized by this method. From this point on, no further action will be taken if loads grow until the five-minute reserve is one-third of the unit, or 255 mw in this case.

3. Step 3 is the next level of action, which represents a substantially more significant impact on service to the public. It involves specific requests to major commercial and industrial customers to curtail load, cutback production, or even shut down on a voltuntary basis. It also includes direct appeals to the public by radio and TV. It has been estimated that a little less than 500 mw or relief can be achieved by these means.

4. Step 4 is the final and most drastic step available when all other means of relief have been exhausted. It involves implementation of a specific program to disconnect customers directly, in order to maintain the energy balance and the integrity of the system. It is not planned to go this last step until the operating reserve approaches the zero mark. Obviously, as the system approaches this condition, its ability to withstand transient disturbances and avoid cascading blackouts has been greatly diminished by the gradual elimination of its operating reserve. This is the level upon which we are basing our design and which we have stated should not be permitted to occur more often than once in ten years.

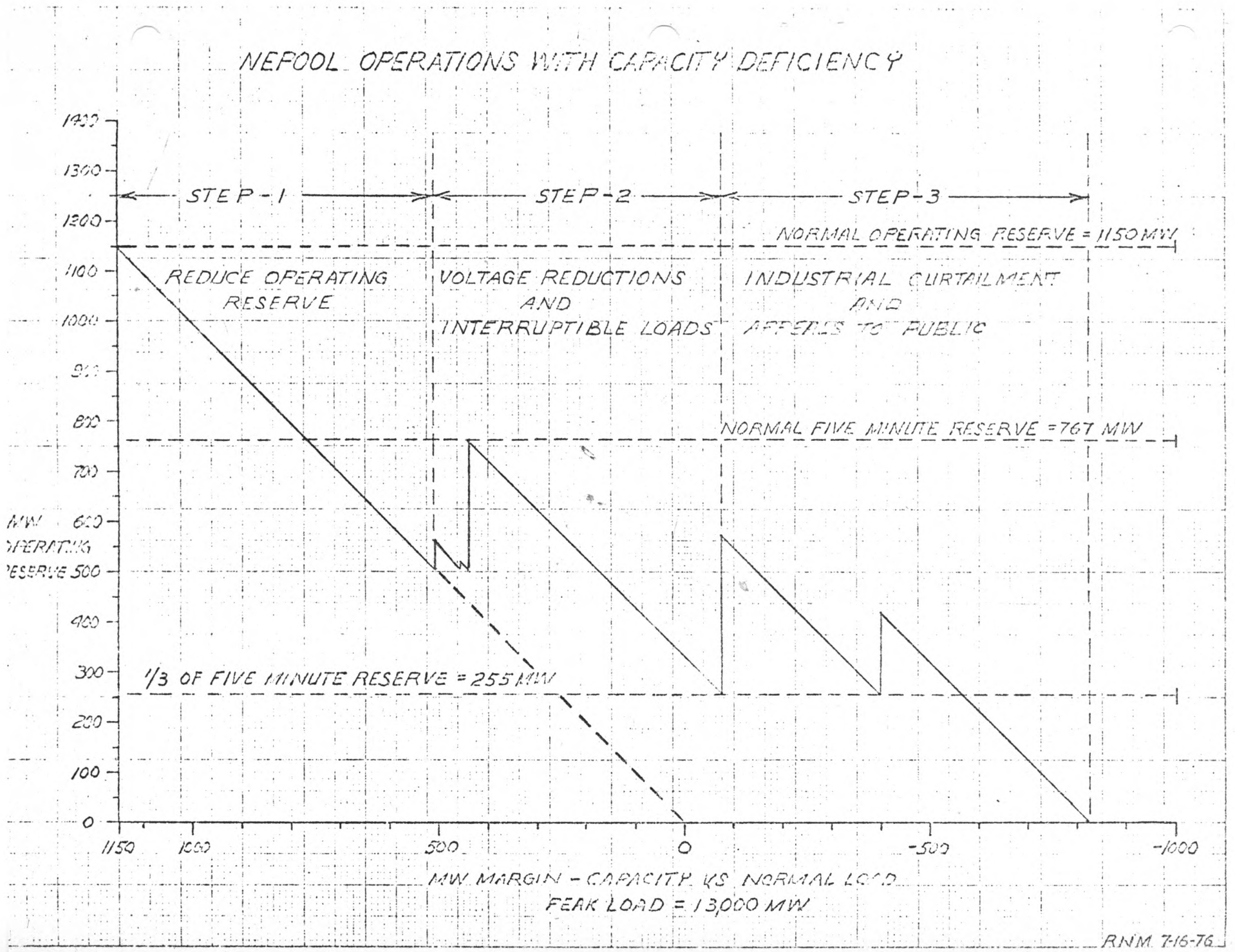

NEPOOL OPERATIONS WITH CAPACITY DEFICIENCY
STEP - 1
STEP - 2
STEP - 3
NORMAL OPERATING RESERVE = 1150 MW
REDUCE OPERATING RESERVE
VOLTAGE REDUCTIONS AND INTERRUPTIBLE LOADS
INDUSTRIAL CURTAILMENT AND APPEALS TO PUBLIC
NORMAL FIVE MINUTE RESERVE = 767 MW
1/3 OF FIVE MINUTE RESERVE = 255 MW
MW OPERATING RESERVE
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
1150
1000
500
0
-500
-1000
MW MARGIN - CAPACITY VS NORMAL LOAD
PEAK LOAD = 13,000 MW
RNM 7-16-76

FIGURE 2

17

APPENDIX

III. APPLICATION TO GENERATION PLANNING

Measurement of system reliability through the application of the cumulative margin distribution function to NEPOOL emergency procedures is illustrated by Figure E. This is the "Risk Profile" approach, which has the following advantages:

1. It provides a basis for detailed analysis of system reliability not provided by a single LOLP value.
2. It relates the system reliability to an established operating procedure and furnishes results which can be correlated with actual experience.
3. It can be explained in terms of operating procedures that directly affect the public.

The approach used is designed to measure system reliability in terms of the probabilities associated with various values of margin resulting from different system conditions. This will allow differentiation between widespread loss of load and lesser problems such as voltage reductions. The analysis can also be extended to investigate the probabilities associated with various values of margin for systems meeting a variety of reliability criteria.

A program has been developed which extends the standard LOLP probability calculations to generate the cumulative margin distribution shown in Figure E. It is capable of determining the probabilities associated with various system margin conditions over a large range of values.

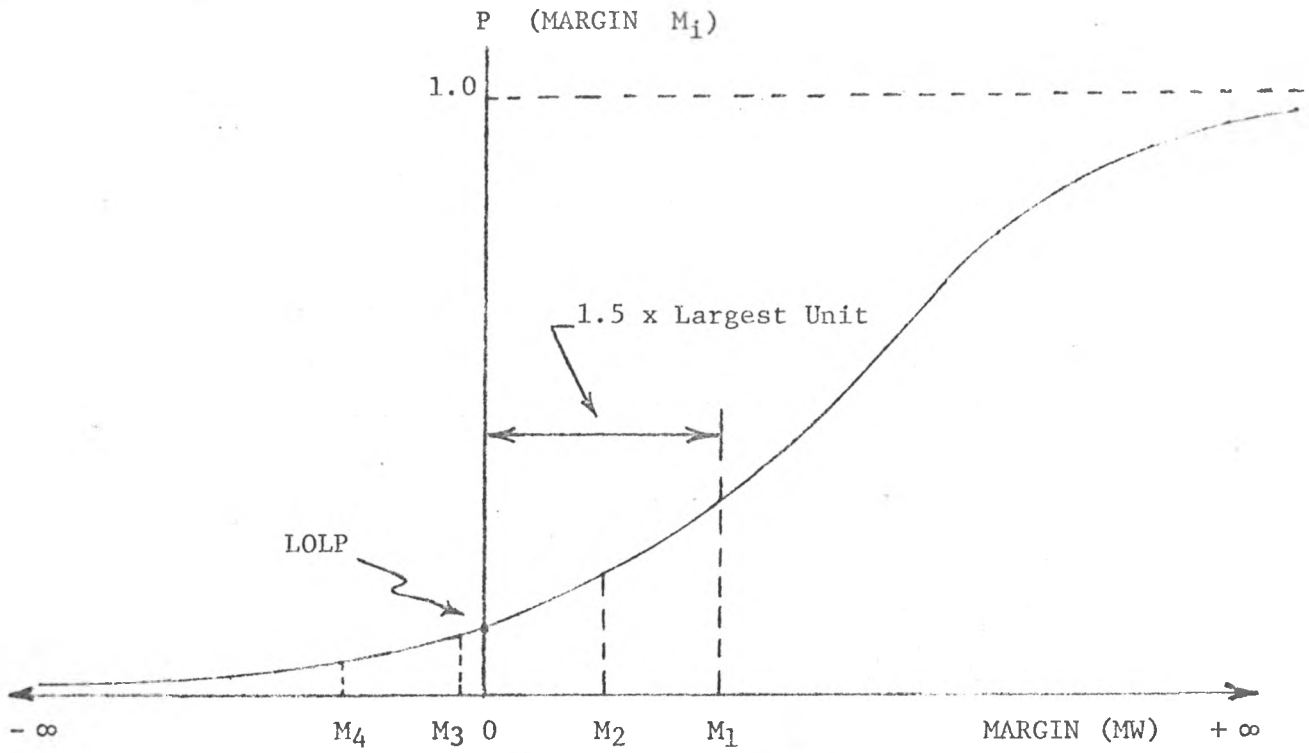


FIGURE E

MARGIN	OPERATING PROCEDURE NO. 4 REGIONS
M_1 or less	Step 1 - Reduce operating reserves
M_2 or less	Step 2 - Voltage reductions and interruptible loads
M_3 or less	Step 3 - Industrial curtailments and appeals to the public
M_4 or less	Step 4 - Disconnect customers

Notes made by F.P.D. Jr. from the program "On The Line" on Channel 6 T.V. Portland, Maine 7-8 p.m. 11 August 1976

This program interviewed Chairman Halsey Smith and Vice-Chairperson, Roberta Weil of the "Commission on Maine's Future." It also accepted questions from the t.v. audience in Bangor and Portland.

- Can't make Maine into a national park, we must eat.

- Few large centers of population, new industry is likely to go to areas like Portland, Lewiston, Bangor.

- "Is Maine's work force prepared to undertake big jobs?" Labor force is intelligent, trains easily, Voc-Tech Schools do a good job. We must maximize jobs in Maine for new trainees. U.M.O. and U.M.P.G. trying to develop business training to fill business and management jobs so companies won't have to go out of state to get this type of employee.

- Great problem for Maine industry is marketing out of state.

-"Why isn't a lot of waste land and forest land developed for the tourist industry?"
We want to see tourism develop into a 4 season industry.

- Electricity is cheaper in Maine than in other N.E. states, due to Maine Atomic - we need more nuclear power.

- We want to develop areas which are now mountain and forest, and not have all development in a thin strip along the coast.

- "Who makes up the Commission?" Legislature set up the rules. They are: 1. from each county
2. from each of the eight planning districts
27 citizens, 12 legislators (6 senate, 6 house)
3. head of State Planning Office
a total of 40
There are low income people, no blue collar people, no fishermen or laborers, no Indians - no one would serve from these groups. All work is volunteer, no pay, and costs are high to each person.

- Commission gets out to see people on an individual basis and tries to represent all people in the state.

-"Idiots from somewhere else trying to tell us how to live."

- We are talking about <u>options</u> for Maine. What direction do we want to go in dealing with Canada, other states, the oceans, industry, etc. <u>Options</u> for <u>your</u> future. We are not planners which impose rules or laws! Government is here because people have skirked their job. We are not making a master plan, we are trying to find <u>options</u> for Maine people to choose from.

- "What about government decision on a nuclear power plant?" Get on the horn to your congressional delegation and protest if you don't want electricity.

- "How many on the Commission are Mainers?" "What about U.M. graduates?" 25 of the 40 are Mainers. Roberta Weil is a 10th generation Mainer although not a "Mainer" - her grandfather left the state as no jobs in Maine. She came back to see what could be done so Mainers could earn a living in Maine.

- There are no conclusions yet - they are just in mid-course.

- "What about cultural things, especially in the rural areas of Maine?" Rural areas of Maine seem left out of cultural events as populations are so small and distances so great. However, this is one of many things that is being looked into by the Commission.

Maine Commission on the Future

184 State Street

Augusta, Maine 04330

Next meeting open to the public at the Augusta Civic Center,
Tuesday, 17 August, 9:30-4:30

Lewiston Sun 27 Oct 76

CMP President Asserts Nuclear Power Needed

PORTLAND, Maine (AP) — The president of the Central Maine Power Co. said Tuesday night that the nation's energy requirements cannot be met without the use of nuclear power.

Elwin W. Thurlow complained that the nation lacks an energy policy to meet its needs because there are "too many people with sponge-rubber backbones in Washington, D.C."

The chief executive officer of Maine's largest electric company made the statement in remarks prepared for delivery to businessmen here.

Thurlow said that while New England currently enjoys substantial energy reserves, shortages of electricity are threatened in the early 1980s.

"The margin of safety between reliable power and potential shortages can only be maintained if we continue to plan and construct for the future and remove the very real barriers that now exist to an adequate energy supply," he said.

"There is no way that I can see that the national energy requirements can be met without nuclear power."

CMP operates Maine's only atomic power plant at Wiscasset and has invested in three out-of-state nuclear plants. It has proposed construction of a second nuclear plant for Maine at Sears Island, a project to generate 1.2 million kilowatts of electricity at a cost of more than $1 billion.

Continued from Page One

He said the project has been stalled, "not because of safety problems, not because of financial problems but because we ran up against the formidable barrier of bureaucratic ambiguity."

Thurlow said CMP will not make an investment in the plant until federal officials spell out requirements for building the plant on a site located above a geological fault caused by the movement of glaciers between 12,000 and 22,000 years ago.

He said the ability of electric utilities to provide enough energy to meet demands is threatened by uncertain fuel supplies, unclear national energy policies and indecisive leadership at all levels of government.

Thurlow maintained that remaining sources of hydroelectric power are sufficient only to meet the demands of peak hours of electrical use.

He said the growing national concern over dependence on imported oil reduces the reliance on petroleum as a long-range source of fuel.

While coal is plentiful, lack of a national policy has hindered its development, he said.

Conservation won't help alleviate growing demands of an energy-intensive economy, according to Thurlow, and attempts to return to the use wood stoves and ice boxes represent a "strange and short-sighted policy."

Over the next 10 years, CMP estimates that demands for electricity will increase by an average of 6.5 per cent a year in Maine. He said that in the first three-quarters of 1976, CMP sales of electricity jumped by 10.8 per cent for residential customers and total sales have grown by 8.2 per cent.

Lewiston Sun 26 Oct 76

Dickey-Lincoln Project Committee Views Area

FARMINGTON — Members of the governor's advisory committee on the proposed Dickey-Lincoln Project have taken a first-hand aerial look at the impact area in northern Maine.

Forrest P. Dexter Jr., director of the committee's office located on the University of Maine at Farmington campus, said the group flew over the St. John River Valley area.

"The committee felt that it should have as much first-hand knowledge of the area as possible," Dexter said. He added that several committee members have been familiar with the area for many years, and that others plan to take canoe or jeeps trips in the location of their first opportunity.

Conducting the flight was Roy Gardner of Allagash, a member of the fifth generation of his family to work and canoe in the proposed project area.

Lewiston Sun, July 17, 1976

Dickey Power Routes

BANGOR, Maine (AP) — Three routes are being considered for high-voltage transmission lines carrying power generated by Dickey-Lincoln, according to engineers involved in the proposed northern Maine hydroelectric project.

A spokesman for the U.S. Department of Interior told an informational hearing here Thursday night that two of the routes would involve 345,000-volt lines between the St. John River dams and the Chester substation outside Lincoln.

The other route would carry a 400,000-volt line, larger than any in operation in New England, directly to Comerford, N.H., near the Vermont border.

The Lincoln lines would branch off to either Winslow or Orrington, where they would tie in with the existing power grid, or to the Rumford area, where the lines could branch out in various directions.

Maine Times 10/29/76

Dickey opponents use strong language

The proposed Dickey-Lincoln hydroelectric project has come under more criticism from Aroostook County citizens. At the final meeting of a special governor's committee studying the project, opponent Ezra James Briggs of Caribou called it "Bills [Hathaway] billion dollar boondoggle." He said he wouldn't "give $1.39 for it," citing environmental reasons. State Sen. Edward Cyr, a proponent of the project and member of the governor's committee, was called a "monster" by opponent Greg Jalbert of Fort Kent. Jalbert said Cyr wants to destroy the St. John River, where dams would be built and a huge lake created. Several students at the University of Maine at Fort Kent called for Cyr's removal from the supposedly impartial committee, charging he has a conflict of interest.

N-Waste Disposal Posing a Problem

By GARY THATCHER
The Christian Science Monitor News Service

AIKEN, S.C. — Men in white hard-hats climb the scaffolding, checking the soundness of the newly poured concrete walls. They are working on a controversial new "garbage can."

This huge tank — and six others being built here at the U.S. Energy Research and Development Administration (ERDA) Savannah River plant — is at the center of a controversy over how best to handle high-level radioactive waste.

Each tank eventually will hold 1.3 million gallons of the waste — by-products of the three nuclear reactors here that turn out plutonium and tritium for the U.S. nuclear weapons program.

But environmentalists warn the wastes are dangerous in their own right — perhaps threatening U.S. citizens today, and looming as a lethal legacy for future generations.

Most assuredly, future generations will inherit the radioactive wastes which will be dangerous for perhaps thousands of years. But the issue is in what kind of package they will be wrapped — and how quickly.

Since this plant opened in 1953, the wastes have been kept in liquid form. They have gradually filled some 30 tanks, and now total nearly 20 million gallons.

There is widespread agreement the wastes eventually will have to be solidified before they are ultimately disposed of. But there is no clear-cut federal policy on how to solidify them or where to bury them.

ERDA already has solidified some waste on a small scale, and it is likely the final plan adopted by the federal government will involve embedding the waste in huge chunks of glass or ceramic.

These solids could then be buried underground in places where water is unlikely to reach them. The most likely place: salt domes in New Mexico.

By a spate of court challenges — some already filed, some to be launched in the next few weeks — the Natural Resources Defense Council (NRDC) hopes to force the government to reveal its timetable for solidifying and burying the substances.

NRDC spokesmen point out the Savannah River complex is in a high-risk earthquake zone. They say a rupture of the tanks could send the dangerous liquids into the ground water, and ultimately into the public water supply.

ERDA officials concede that since 1953 eight tanks have developed cracks and one has actually leaked. But they say the results were not serious, and add that a major disaster in the future is unlikely. However, they do admit some older tanks are in need of replacement.

NRDC's aim is to halt work on the new tanks and force ERDA to obtain construction licenses from another federal agency, the Nuclear Regulatory Commission (NRC).

Approval by NRC would require public hearings, voluminous paperwork, and almost certain delays in construction. Environmentalists might even be able to block construction of the tanks permanently, just as they have halted work on commercial nuclear reactors until the waste disposal problem is addressed.

But, ERDA says, without a place to store wastes, the federal government might have to slow down or perhaps halt production of nuclear weapons. Thus, national security needs and environmental concerns seem headed on a collision course in the courts.

But until decisions are reached, the wastes pile up. And white-hatted workers scramble to build more tanks (each with a price tag of approximately $7 million). ERDA officials plan 20 more tanks here at Savannah River by 1981. But it is an open question whether they will ever be built.

Council cuts Dickey dam sessions

AUGUSTA - In a statement to be submitted by Christian A. Herter III, Executive Director of the Natural Resources Council (NRC) and in a letter addressed to the Army Corps of Engineers from NRC's attorney, the Council objected strenuously on Oct. 14 to the timing and nature of the so-called public "open comment" meetings being held this week on the proposed Dickey-Lincoln project.

The NRC also pointed out that insofar as it has been able to determine, several of the consultants retained by the Corps to assess the environmental, social and economic impacts of the project have had neither adequate funding nor time to carry out their work adequately.

"The Dickey-Lincoln hydroelectric dam proposals for Maine's St. John River have been on the drawing boards for over 15 years," Herter said. "Even through some of the consultant's work has been substantially completed, the Corps has made little effort to make the information thus obtained available widely ot the public. As a consequence, many citizens cannot be expected to be sufficiently informed about the project so as to voice their specific concerns at this time."

"The public meetings should have been preceded by a public discussion of the scope of work and methodologies to be used by the consultants in preparing their reports and a dissemination of information to the public about the known impacts, problems, risks, and alleged benefits of the project," he said.

In the light of these deficiencies in the planning and review process required by National Environmental Policy Act, the NRC is asking the Corps of Engineers to postpone the proposed date for issuance of draft environment impact statement on the propos dam structures from June, 1977, November, 1977, the date that t draft environmental impa statement on the transmissi lines and the marketing of pow is to be released.

The NRC also asked the Corps disseminate the informati already obtained to the public that future public meetings w result in a meaningful exchange information and opinion, inste of people being asked to respo to a project and a plan they don really have an opportunity yet t fu'ly understand.

Despite these shortcomings, th NRC indicated that it was going t attempt in good faith to par ticipate in the planning an review process as it was no being undertaken.

The last "open comment meeting presently scheduled is t be held at the University of Main Fort Kent, at 7:30 p.m. on Octobe 20. The NRC urged the Main citizens to let their views b known at the remaining meetin

6 ST. JOHN VALLEY TIMES MADAWASKA, MAINE 04756 October 20, 1976

Commentary

Dickering over Dickey-Lincoln

"There will be jobs, new department stores, demands for apartments and selling prices that will line everyone's pockets."

It keeps running in dollar signs through the heads of local businessmen. But how would you like it if you awoke one morning to find that you, your neighbors and your whole community would have to move, not only out of your homes, but off the land families have lived on for well over one hundred years?

Not only that, but the hills and valleys you have known all your life would be destroyed. No. Not by an atomic attack, but by our federal government constructing a hydro-electric dam at Dickey-Lincoln.

It is very easy for people downstream in Fort Kent, Madawaska and Van Buren to welcome Dickey- Lincoln as a Godsend for their hungry pockets, but let the federal government announce that a dam will be built that will flood them out. I can almost hear the dickering of farmers and small businessmen as they vie for higher prices for property that has been passed down for generations.

From where did the notion come that great affluence will result for peoples of the Valley if Dickey-Lincoln is constructed? There is a great surge to construct new buildings and modernize others so "if Dickey-Lincoln comes....." and the sentence trails off into great expectations.

Have we not done enough damage to the Valley in tearing down and modernizing our old buildings. People travel from all over America to see historic Fort Kent and all that is left is the Blockhouse. It is a miracle that someone did not saw that up years ago for stove wood. After all the Dickey house was torn down and the town did not choose to buy the old Page home preferring to install a shopping center in its place.

Maybe if we try hard enough, we can make the St. John Valley look like the rest of middle class America with square one-story houses that can only be distinguised from each other by the numbers on their doors. Then perhaps the people surging in during the construction period of Dickey-Lincoln will feel right at home. We must keep with the times.

From where did the idea come that tourists will travel to the far end of northern Maine to vacation on another of Maine's many lakes? Maine is not so densely populated that her other lakes are overcrowded. Who wants to travel many miles for a vacation near a lake surrounded by mudflats in July and August? And do not forget that these mudflats will create prime breeding grounds for Maine's horde of flies.

Yes, there may be a boom during those years of construction but there sure is going to be a bust afterward. Of course, there may be some who are not interested in a quiet picturesque place to live, but would rather grab the money and run, leaving the problems of empty shops and buildings to those who think of the Valley as home.

Rec. 10/28/76 BD

Send copy to Dr. Rich Robinson Chas Lawrence U. of Me. Ft Kent

Earth Science Notes

BY FRED C. AMOS

Build a Teton Dam

Without getting involved in the technical aspects of the failure of the Teton Dam on June 5, which will be under investigation for some time, the general situation can be created on a stream table. You can focus your students' attention on the hazards of damming up large bodies of water by building an unforgettable model simulating a real disaster. As adults, they may be motivated to question future issues involving dams, be more careful in selecting camp sites, and shop more wisely for property.

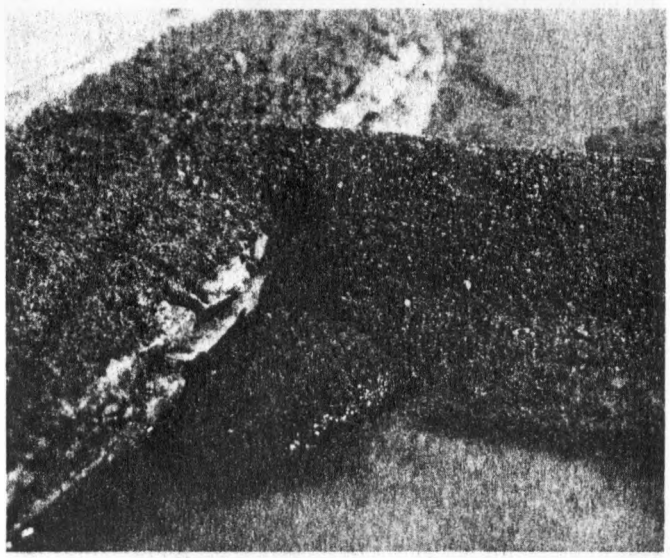
Of course, no geological setting can be exactly duplicated in a scale model, but the stream table is still an effective teaching tool. Follow these instructions and you can start a lively discussion about the work of water and the role of various earth materials in the failure of the dam.

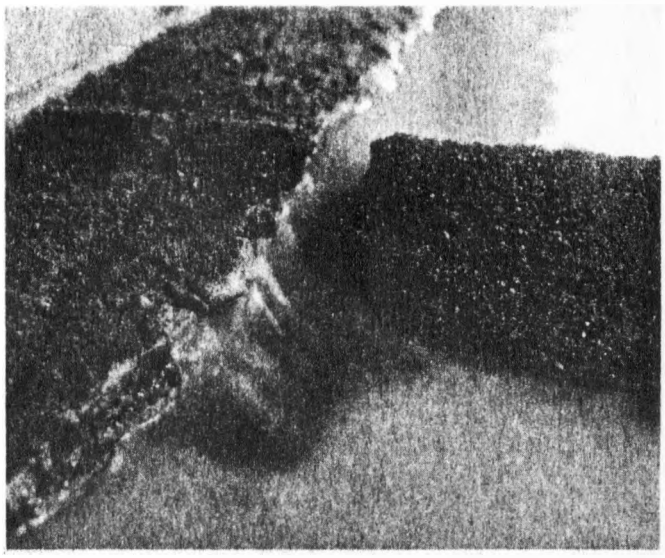
Set the stream table on a firm level surface. You will need 1 lb. of dry powdered clay, 15 to 20 lbs. of dry sand, and a way to run up to 5 gallons of water through the system. Lastly, you need about 10 lbs. of blocky sandstone, shale, or similar rock, split into thin flat slabs about 3/8" to 1/2" thick. Try the rock in water; it should not break down easily upon soaking.

With the rock slabs, build a flat stone wall 3 or 4 layers thick, about 3" to 5" wide and about 2 ft. long against the side wall of the stream table. This rock wall is one side of the stream valley. The other side of the stream table is the opposite valley wall. Before laying the bottom layer of rock slabs, sprinkle 1/8" of dry clay on the bottom of the stream table as a bed for the slabs. Push the rocks together as snugly as you can; leave no great cavities or voids between them. If these cracks are more than 1/8" wide, pour in some dry sand to fill them as you build the wall. Don't fill all the cracks.

Sprinkle a thin layer of dry powdered clay, about 6" wide, on the bed of the stream table perpendicular to the midpoint of the rock wall, straight across to the opposite wall of the stream table. This is the base of the dam. Sprinkle a layer of sand atop the clay layer. Repeat the clay, more sand, etc., making each layer narrower, so the dam will be about 6" thick at the base, with a ridge at the top, flat sloping front and back sides, and about 3" high. The dam should also extend over the rock wall for several inches; the top of the dam is about 1/2" higher than the rock wall.

Gradually but steadily, fill the reservoir behind the dam with water. The dam will moisten as water slowly soaks through it, but should not leak openly. You should see water flowing out of the rock wall downstream just in front of the dam. In a few minutes, perhaps rapidly, you will see water eroding the dam at the place where it butts against the rock wall. This is where the Teton Dam also failed. A little chasm will develop and the whole end of the dam will collapse, releasing the flood in a great surging wave.





Prior to building the Teton Dam, the engineers suspected water might leak through the rock walls—even the valley floor—and they tried to seal them with concrete. Color photos just after the disaster showed lush green vegetation on the steep rock canyon wall, both above and below the dam. This indicates the presence of water in the rock against which the dam was built. In the model, this water "bypass" at the end of the dam erodes the earthen material. It is not safe to conclude that the Teton Dam failed for the same reason your dam collapsed. However, the similarity is striking if you get illustrated articles with which to compare your dam. See *Time*, June 21, 1976 and *Science*, July 2, 1976.

How about getting your students to investigate and report on any earthen dams in your area? Maps of danger areas can be drawn; a topographic map makes an excellent base for this.

Teton Dam Collapse: Was It a Predictable Disaster?

Theoretically, what happened could not happen. But it did.—GILBERT G. STAMM, commissioner of the Bureau of Reclamation, explaining the failure of the Teton Dam, *New York Times*, 9 June

All this was predictable three years ago . . . —ROBERT R. CURRY, professor of geology, University of Montana, quoted in *Time*, 21 June

The shocking collapse of the Teton Dam in southeastern Idaho on 5 June has spawned a number of inquiries aimed at uncovering the cause of the disaster. But even before the findings are in, charges have been made that the Bureau of Reclamation, the federal agency in charge of building the dam, recklessly ignored warnings that the geology of the area was unsuitable and that the structure would be unsafe.

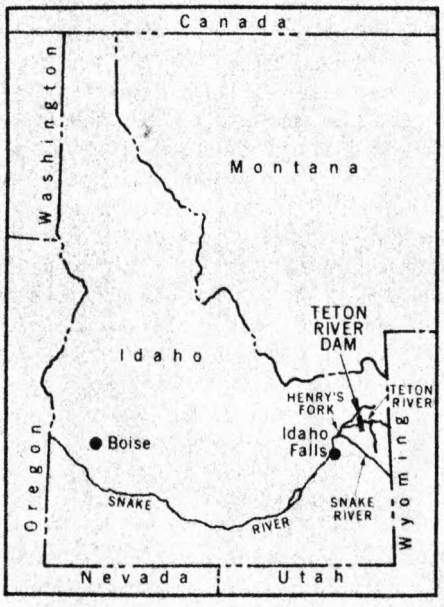
These allegations have been widely circulated in the press. The Washington *Star* reported that the Bureau was "warned by government geologists more than three years ago that the Teton River Dam in Idaho was dangerous and should not be built. The warnings were ignored and the dam burst Saturday. . . ." Similarly, *Newsweek* asserted that "one of the most tragic elements in the disaster was that it had been warned against in advance."

But such charges seem wide of the mark. The fact is that, while several geologists and environmentalists did indeed raise questions about the dam project, not one of them is known to have challenged the structure's safety under such normal conditions as appear to have prevailed at the time the dam collapsed. At this point it is not clear whether the dam failed through some unforeseen and perhaps unforeseeable fluke of nature, or through malfeasance on the part of contractors and inspectors, or because the Bureau goofed up and built the structure in an unsuitable location. But, if the latter is the case, the real tragedy of the affair may be, not that the Bureau refused to heed prior warnings, but that the Bureau made a mistake in engineering judgment and there was no one around both willing and able to second-guess its decision.

The Bureau, which is a subunit of the Interior Department, is one of the major dam builders in the country. In its 74-year history, it has designed and constructed more than 300 major dams, including such well-known giants as Hoover Dam on the Colorado River between Arizona and Nevada and Grand Coulee Dam on the Columbia River in Washington. Some 250 of these dams are of earthfill construction—as was the Teton Dam. According to the Bureau, "all of those dams, with the single exception of Teton, have performed satisfactorily."

The Teton Dam was intended as a multipurpose facility that would provide irrigation water, flood protection, electrical power, and water-based recreation. It was built across a deep, narrow canyon on the Teton River, in the watershed of the Snake River, about 44 miles northeast of Idaho Falls in southeastern Idaho. The dam rose some 300 feet above the streambed and was about 3200 feet long at its crest; it held a reservoir that extended roughly 17 miles up the canyon.

Some 10 million cubic yards of selected earth materials—dug mainly from the bed of the reservoir area—were used to build the multilayered structure. The center of the dam was a mixture of clay, silt, sand, gravel, and cobbles tightly compacted by tamping rollers to form a core that Bureau engineers consider virtually impervious to water. This was overlain by four additional layers of materials of various kinds. Bureau engineers, on the basis of preliminary investigations, doubt that the dam itself was the cause of the catastrophe.



The most likely explanation, according to the Bureau, is that water got around the dam by traveling through the right wall, or abutment, of the river canyon, whereupon it triggered the washout that led to the dam's collapse. The Bureau had recognized in designing the project that leakage through the highly fractured rock formations might pose serious problems. So it worked out with its key contractors an extensive grouting program aimed at plugging the leaks. A trench was dug into each abutment to remove the upper 70 feet of rock, which was deemed too jointed and fractured to be readily sealed. Then grout—a mixture of cement, sand, water, bentonite, and calcium chloride—was injected under pressure into holes drilled into the rock at the bottom of the trench. The holes were in three parallel lines spaced 10 feet apart. Holes in the two outer lines, or curtains, were separated from each other by 20 feet; those in the center curtain were 5 to 10 feet apart, depending on the spacing needed to achieve "closure," the point at which a hole refuses to accept the grout mixture, indicating that cracks in that area have been completely filled. When grouting was complete, the 70-foot trench was filled with supposedly impervious earth materials.

The Bureau felt confident that it had constructed an essentially watertight barrier. The grout holes reached downward, in some cases, to 300 feet or more. And the three parallel grout curtains extended some 1000 feet into the abutment beyond the edge of the canyon. There was also a single grout curtain across the canyon floor, and grout was injected into other areas where fissures were detected. In theory, there was no way that water could get around or under the grouting without traveling a long and circuitous route through the rocks, presumably returning to the river some distance downstream where it would pose no threat to the dam structure. The Bureau was so proud of its grouting achievement that one of its engineers has actually prepared a paper for publication describing how it was done.

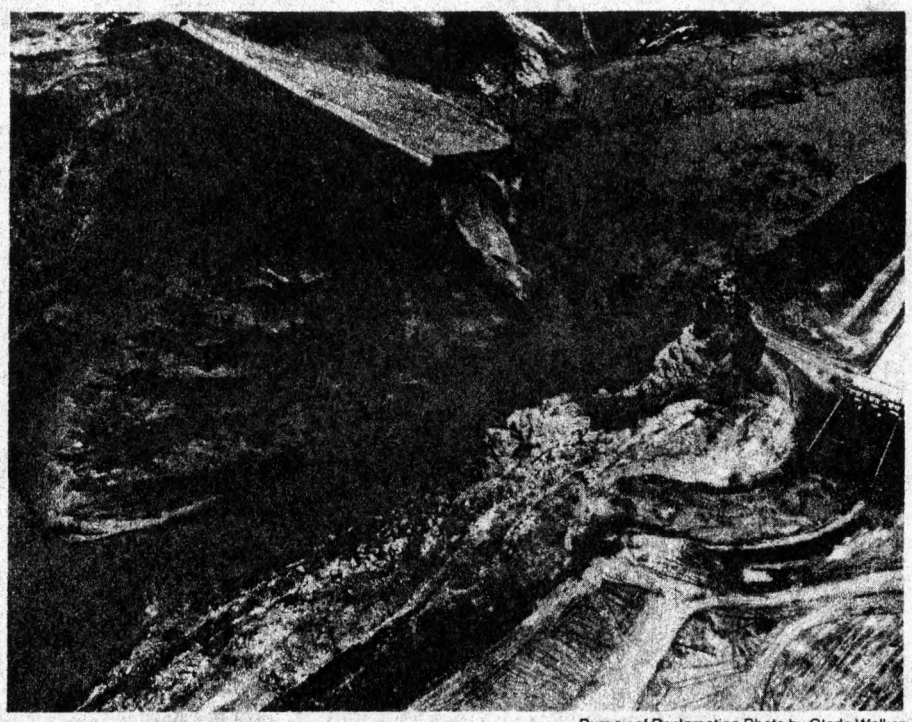
Yet something clearly went wrong. The dam had just been completed and the reservoir was nearly full for the first time when catastrophe struck. As the reservoir rose, some small springs issued

from cracks in the rock well downstream of the dam; these caused no concern because they are often encountered in such situations and they posed no threat to the dam. Then, on 5 June, at 8:30 a.m., water was reported leaking from two points in the right abutment close by the dam. One leak was at the junction of the dam and the right abutment some 130 feet below the crest of the dam; the other was at the downstream toe of the dam near the valley floor. Contractors tried to fill the holes with large rock and to channel the flow of water away from the dam; the structure itself did not appear to be in critical danger because no erosion was taking place. Then suddenly, at about 10 a.m., a large leak developed in the dam itself, on the downstream face, about 15 feet from the right abutment and some 130 feet below the crest, at roughly the same elevation as one of the earlier leaks. The new leak grew rapidly in size and started to wash away material from the downstream slope of the dam, thereby weakening the structure. At 11 a.m. a whirlpool developed on the upstream side of the dam, indicating that water was now pouring directly through the dam in some quantity. Two bulldozers that tried vainly to plug the opening had to be abandoned by their operators and were lost in the rapidly widening hole. At 11:57 a.m. the dam was finally breached and a tremendous wall of water surged through the opening; some 40 percent of the dam was swept away.

What caused the collapse? A preliminary report by H. G. Arthur, the Bureau's director of design and construction, cited the fact that leaks were first observed in the abutment as evidence that water traveled through the abutment and not through the dam itself, although this judgment was "not conclusive." Assuming the water did travel through the abutment, Arthur cited two possible paths. It might have traveled through a defect in the grout curtain, a possibility Arthur found "difficult to accept because of the care with which the grout curtains were constructed and the fact that three curtains were provided where normally only one curtain is constructed." Or it might have traveled some 1000 feet into the abutment, gone around the end of the grout curtain, and then doubled back by some unexpected route to reemerge at the face of the dam instead of downstream, as is usually the case. The preliminary investigation was "unable to pinpoint the cause of the failure," Arthur reported.

In the wake of the catastrophe, some commentators have suggested that the Bureau should never have pushed ahead with the dam because it received ample warnings that the structure would be unsafe. But that interpretation of events requires a rather complete rewriting of history. The fact is that none of those who are supposed to have warned the Bureau ever explicitly raised the possibility of such a dam failure.

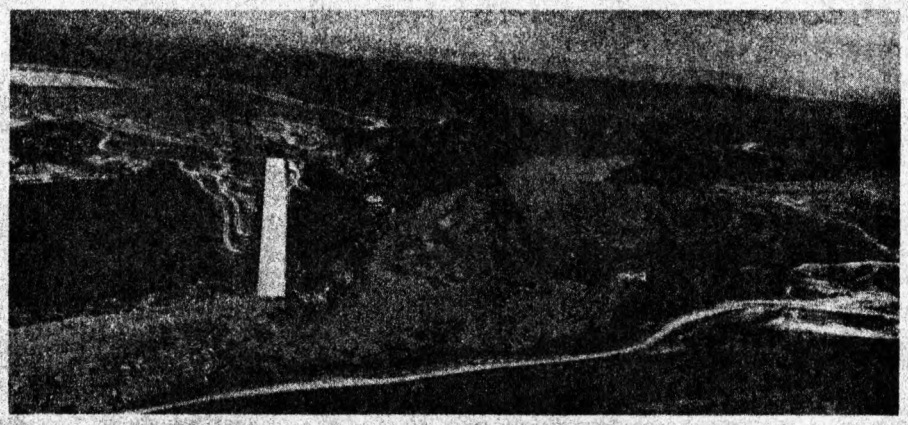
One source of such warnings, for example, was supposedly the U.S. Geological Survey, a sister agency of the Bureau of Reclamation within the Interior Department. But the letters and memoranda that have been cited to illustrate the Survey's concern do not even mention the possibility of water leakage causing a dam failure. For the most part, they are concerned with possible earthquake hazards based on the fact that southeastern Idaho is a region of high seismic risk and is crisscrossed by geologically young faults.



Bureau of Reclamation Photo by Glade Walker

Remains of Teton Dam. Downstream side at top of photo.

The most widely quoted Survey document was an internal memorandum written by geologist David L. Schleicher on 26 December 1972. It asserted that "flooding in response to seismic or other failure of the dam" would make an earlier flood "look like small potatoes." And it concluded: "Since such a flood could be anticipated, we might consider a series of strategically placed motion-picture cameras to document the process of catastrophic flooding." But Schleicher told *Science* that, while he no longer remembers just what he meant by those lines, he is virtually certain he was concerned only about possible seismic hazards. He said he used "melodramatic" language to communicate those concerns to "three of my buddies" within the Survey, but that he certainly wasn't predicting that the dam would fail. "I wish I had predicted the problems," he said. "I'm



Bureau of Reclamation Photo by Glade Walker

View of Teton Dam after collapse of structure.

appalled that we didn't anticipate these other potential hazards. I wonder how they could have passed us by."

Schleicher's memorandum was never forwarded to the Bureau of Reclamation. But a report signed by Schleicher and three other geologists was forwarded to the Bureau in June 1973; it discussed the seismic hazards but left out Schleicher's "melodramatic" paragraph. "At no time did the Geological Survey issue a prediction that the dam would fail," states Vincent E. McKelvey, the Survey's director.

As a result of the Survey's concerns, an array of seismographs was installed in and around the dam to study possible activity along faults in the area. The instruments recorded the seismic noise generated by the dam's failure and the ensuing flood but showed no evidence whatever of any earthquake that might have caused the failure. "We are quite confident it was not caused by an earthquake," McKelvey says.

Another supposed source of prior warning about the dam's safety was a lawsuit filed by several environmental groups in an effort to block the dam because of its adverse environmental impacts. One witness at the trial—a former employee at the dam site—testified that she was on a survey team which found that several test holes drilled in the reservoir floor soaked up water at a high rate, indicating that there might be serious leakage. But the thrust of her testimony (which was disputed by Bureau of Reclamation experts) was that the leakage might harm water quality downstream or make it impossible to fill the reservoir. The lawyer who prosecuted the case—Anthony Ruckel, of the Sierra Club's Legal Defense Fund—told *Science*: "I did not raise the possibility of leakage causing a dam failure. The safety issue had never occurred to me." He also noted that "environmentalists don't have the experts or the ability to prove a dam is unsafe in advance."

The most vociferous critic of the Bureau's performance has been Robert R. Curry, professor of geology at the University of Montana at Missoula, who first made public Schleicher's memorandum. Curry has been quoted in some press reports as virtually predicting in advance that the failure would happen. But he told *Science* that neither he nor anyone else to his knowledge explicitly warned that the geological conditions in the area would cause the dam to burst. He says such predictions lie outside the expertise of geologists, who can point to hazards in the rock structure but are not qualified to say what effect such hazards will have on an engineering project such as a dam. Still, Curry believes that the Bureau of Reclamation, which employs both engineers and geologists, "could have predicted" the failure and was "irresponsible to ignore the geological hazards."

In speculating on possible mechanisms for the failure, Curry says that the young volcanic rocks in the area tend to contain lots of voids that are not interconnected, making it difficult to pump in grout and be sure it forms a continuous curtain. He also suggests that the pressure of the water in the reservoir might have compacted the porous rocks, possibly fracturing the grout or otherwise opening a pathway for water.

A quickie investigation into the causes of the catastrophe has been launched by an interagency task force; and a longer-term, independent investigation will be conducted by a blue-ribbon panel of eight outside experts, headed by Wallace L. Chadwick, of Los Angeles, a member of California's Earth Dams Board. Some Bureau of Reclamation engineers believe it will be necessary to dig an exploratory tunnel or tunnels into the abutment before it will be possible to determine just what caused the disaster that theoretically couldn't happen.

—PHILIP M. BOFFEY

Kennedy Hearings: Year-Long Probe of Biomedical Research Begins

Senator Edward M. Kennedy (D-Mass.), as chairman of the Senate health subcommittee, has just begun what he describes as a "year-long process of review and examination of public policy in the areas of biomedical and behavioral research." Out of this may come legislation that substantially reshapes the National Institutes of Health (NIH), by mandating a new emphasis on clinical research and the assessment of new biomedical technology.

". . . Our comittee does not come to these hearings with any deep distrust or disillusionment with biomedical and behavioral research," Kennedy declared at the outset of the first day's session. But as the morning wore on, it became apparent that though "disillusionment" may be too strong a term to express his feelings, "dissatisfaction" certainly is not. For more than a year now, Kennedy has been challenging the research community to throw itself into activities that would show it is responsive to its social obligations (*Science*, 20 June 1975) and he leaned on that theme as heavily as ever. His subcommittee colleague Richard S. Schweiker (R-Pa.) was even more persistent, indeed, strident, in asking scientists to tell him why they have not done more for him (the public) lately. It is going to be a rough, and extremely important, year.

By design, legislative authority for several NIH programs expires next year. The cancer and heart programs, training grant authority, and special initiatives in genetics and diabetes are among programs that will be up for renewal, making 1977 an ideal year during which to wipe the slate clean and begin again, should Congress decide it wants to. The questions foremost in the Senate's mind are whether research is being directed at the problems that most concern the taxpaying public and whether the fruits of research are being rapidly and broadly disseminated. The opening premise seems to be that the answer to each question is "probably not."

Lead-off witnesses on day 1 (16 June) of the hearings were the seven members of the Kennedy-initiated President's Biomedical Research Panel* who have just completed a 15-month study of the nation's research effort as sponsored by NIH and the Alcohol, Drug Abuse, and Mental Health Administration (ADAMHA). The panel report, com-

*Franklin D. Murphy, Times Mirror Corporation, Los Angeles; Ewald W. Busse, Duke University Medical Center; Robert H. Ebert, Harvard Medical School; Albert L. Lehninger, The Johns Hopkins University School of Medicine; Paul A. Marks, Columbia University; Benno C. Schmidt, J. H. Whitney and Company, New York; David B. Skinner, University of Chicago Hospitals and Clinics.

Maine Environment

BULLETIN OF THE NATURAL RESOURCES COUNCIL OF MAINE

June 1976

NRC BEGINS PETITION DRIVE AGAINST DICKEY-LINCOLN

The petition enclosed in this issue of the Bulletin represents the continuing concern of the NRC to halt the Dickey-Lincoln hydroelectric project. From now until the first of the year we will be gathering signatures of persons opposed to the damming of the St. John River to provide peaking power electricity. The draft environmental impact statement on Dickey-Lincoln will be available for comment in early 1977. The Natural Resources Council would like to present the Army Corps of Engineers and the Governor's Advisory Committee on Dickey-Lincoln as many names as possible within the next seven months.

The dams will destroy 90,000 acres of the northern Maine woods and render inaccessible another 20,000. Dickey-Lincoln will send almost 90% of its power to Boston, and will destroy one of the last remaining wilderness areas in the Eastern United States. The NRC, which has opposed Dickey-Lincoln since 1968, will be the principal focus of opposition against this federal water project. The NRC's detailed position has been circulated frequently over the past three years and copies of our economic and environmental arguments are available by writing the NRC office.

We need volunteers to help in gathering signatures. If each member who receives this petition can fill it with signatures and return it to the NRC, we will have no fewer than 60,000 names. If you can gather more signatures than the 20 on the enclosed petition, let us know and we'll send you another.

Individuals who sign need not be Maine residents, and need not be of voting age. However, the more signatures from Maine we can collect, the more effective the impact will be. This petition does not call for a referendum vote, but will simply serve to demonstrate that there are thousands of individuals opposed to this project.

This is the single most effective way that you, as a member of the NRC, can help protect the northern portion of the State. PLEASE do your best to fill out the enclosed petition.

by Chris Herter

IN THE CORNER

THE IMPORTANCE OF YOUR HELP ON DICKEY-LINCOLN

Last month Governor Longley appointed a ten-person committee to study the Dickey-Lincoln Hydroelectric Project, and to provide for him an independent appraisal of its worth to the State of Maine. This committee will be holding public hearings over the next 7 to 8 months around the State to accept public input, and their influence on the fate of the project cannot be underestimated.

Traditionally, the Governor of a state in which a federal water project is planned is the individual whose approval or disapproval is measured most heavily by the Corps of Engineers. As the political and economic battle shapes up, the Governor must know how the public feels on this issue. If you are one who has never taken seriously the power of letters to your elected officials, I ask you to put that theory aside. In the final analysis, I believe that the ultimate decision will be a political one, and you must be heard from if we are to win this battle.

The NRC has opposed this project for what seems to be forever (see MAINE ENVIRONMENT, August, 1975). In one year we will all know whether our efforts have been worthwhile, whether that mystique of the northern Maine woods will still be with us. We will know whether the State will lose over $20 million annually in wood products, whether the reaches of the St. John will be dammed. It is the single most important issue for the NRC, and for the citizens of Maine, that will be resolved in the near future.

The petition in this issue is the beginning. Your individual letters and letters of your friends will come next. There are many non-environmentalists in this state who feel as we do, and before the first of the year the Governor must hear from all segments of Maine society. The period from now until January is crucial. In the same way that the NRC helped establish the Allagash Waterway, let us all aid in preventing this financially unsound and environmentally destructive project.

Politicians do listen.

by Chris Herter

PETITION TO
SAVE THE ST. JOHN RIVER VALLEY
(DICKEY-LINCOLN DAMS)

We, the undersigned, protest the destruction of: 1) the homes of 238 families (plus the displacement of many hundreds more for transmission lines); 2) the beautiful St. John River, one of the finest trout streams and spring time white water canoe areas in the United States; and 3) 88,000 acres of productive timber land and wildlife habitat, including deer yarding areas.

We also protest the building of the Dickey-Lincoln Dams because: 1) the project is economically, socially and environmentally irresponsible; 2) much cheaper alternatives (dikes and flood control planning) are readily available to provide better flood control more quickly to communities such as Ft. Kent along the St. John River, which have long needed such protection; and 3) the pump-back component of the project would consume and thus waste substantially more energy than it would produce.

Lowell Sun 3/9/76

Does New England need Dickey-Lincoln dams?

It is 5 p.m. on a sultry summer day in 1986 in Boston.

Air conditioners fiercely vibrate and house lights blaze brightly as people return home from work. New England Power Pool (NEPOOL) technicians, facing a room-length map of the New England electricity system, have started up one plant after another.

Then the "big one," the 1.2 million-megawatt *Dickey-Lincoln hydroelectric complex at the northern tip of Maine, is harnessed.*

Water in the 57-milelong lake behind the 262-foot Dickey dam wall begins to rush through mighty generators. Onlookers see that the colossal, two-mile-wide Dickey dam, like the pyramids in the sands of Egypt, stands out in sharp contrast to the rugged landscape.

The above is ficticious — now. Whether there will ever be a Dickey-Lincoln power project will probably be decided by this time next year, after completion of an environmental impact statement.

This is the first of our articles on the controversial proposal.

BY WARD MOREHOUSE III

ALLAGASH, MAINE — The battle that has raged for a decade over whether or not to build one of the world's largest hydroelectric power systems here on the upper St. John's River is gathering momentum.

Within the next year, the fate of the proposed Dickey-Lincoln School federal power project should be clear.

Proponents see Dickey-Lincoln putting New England on an equal footing with other regions of the nation that have cheaper federal power. To opponents, the project would destroy 57 miles of the wild, pollution-free St. John River — and possibly mean higher electricity rates for New Englanders.

The upper St. John is perhaps the last feasibly major source of hydroelectric power left in New England. The two-mile-wide Dickey dam would rise more than 300 feet just upstream of where the St. John meets the Allagash River. A second dam, 11 miles downstream at Lincoln School, would be 87 feet high and 1,290 feet across.

Weighing the facts

Major factors bearing on the decision to go ahead with Dickey-Lincoln include:

The proposed complex would supply 15 per cent of the region's "peaking" power electricty needs in the mid-1980s. Peaking power is that electricty needed to meet surges in demand when all other sources are producing at full capacity. Proponents argue that Dickey-Lincoln will help reduce the need for private utility peaking facilities in New England.

— Dickey-Lincoln would inundate roughly 90,000 acres of timberland behind the two dams. The environmentalist coalition known as the Friends of the St, John says that about 17,600 of the 90,000 acres are "deer yards," areas which enable deer to survive severe winters. On the other hand, Dickey-Lincoln would provide a big boost to the towns of Allagash, St. John, St. Francis, and Fort Kent, providing needed jobs for the underemployed and unemployed.

— An environmental impact study will be completed in January, 1977. As draft sections of the statement become ready this year, the U.S. Army Corps of Engineers, which is responsible for Dickey-Lincoln planning, will be holding public meetings with residents of the towns most affected by Dickey-Lincoln. However, the formal review process may not begin until early next year.

— The federally funded power complex is expected to generate electricity more cheaply than private utilities. Already "Public power" rates offered by many municipal light companies in New England are generally about 15 per cent cheaper than private electric companies' rates.

Calculations prepared by the corps to measure the costs and benefits of the project indicate that on an annual basis the project will return $1.50 for every $1 expended. This is using what the corps calls a "conservative" 6⅛ per cent interest rate for federal water resources projects. The U. S. General Accounting Office and some top regional economists have said the corps cost-benefit analysis is accurate.

— Many environmental groups made a late entry into the debate over Dickey-Lincoln. The Massachusetts Audubon Society did not take a formal published position on the project until October, 1970, according to Audubon spokesman Alan Mrogan.

Now environmentalists are the chief opponents of Dickey-Lincoln — supplanting the private utilities. Today most of the region's investor-owned utilities are expressing lukewarm "public" support for the project. They do not want to be criticized for opposing something wheih could provide cheaper power than many of their own facilities dependent on high-priced Arab oil. But the Boston Edison Company is still spending $5,000 annually to fight Dickey-Lincoln.

— Congress has increasingly supported Dickey-Lincoln in the wake of the 1973 Arab oil embargo and quadrupling of oil prices.

A leading proponent of Dickey-Lincoln, Sen. Edmund M. Muskie (D) of Maine, feels that the energy crisis has "improved the project's chances of passage and final construction, but it is too early to predict a victory before the environmental impact statement is out."

As currently authorized, Dickey-Lincoln would have an initial generating capacity of 830 megawatts. But the corps is exploring the feasibility of later adding 390 megawatts. (One thousand megawatts can supply the continuous electricity needs of a city of 1 million people.)

Latest costs of the project as calculated by the corps:

— The two dams would cost $463 million to construct as of October 1975 — up from $388 million in July, 1974.

Transmission required for the project is currently estimated at $163 million. The Bonneville Power Administration of the U.S.Department of Interior is studying the cost of tying into the existing New England Power Pool (NEEPOOL) grid. This study is expected to be completed this spring.

The cost rises to $711 million if the interest during construction is included. The prevailing interest rate used by the Corps is 6⅛ per cent.

The cost of real estate, including relocation of families in the dam site, is estimated to be $24.6 million.

— No cost for environmental damage, such as that to deer grounds, has been calculated. "Before you can put a dollar value on this type of thing you have to know exactly what is there," says Richard Reardon, Dickey-Lincoln project manager for the corps. "That's what we are doing now."

Latest benefits:

— About one-third of Dickey-Lincoln's energy would be marketed in Maine. As of October, 1975, this was valued at $12 million a year.

— About $3.5 million in benefits would be realized by Canadian power plants downstream of Dickey-Lincoln, and half of this increased Canadian power would come back to the U.S.

— About $41 million worth of electricity would be marketed to lower New England as peaking power.

— Recreational benefits are calculated at $1.25 million a year.

— The area redevelopment benefit — the value of employment opportunities for the unemployed of underemployed — amounts to $1 million annually, according to the corps.

Economist impressed

"I'm impressed by the thoroughness of the corps cost analysis," says James M. Howell, vice president and chief economist of the First National Bank of Boston. "I went into the analysis opposing Dickey-Lincoln and came away supporting it . . . There is a positive benefit as compared to cost, and a hydro facility that could provide 14 per cent of New England's peaking power needs is indeed significant."

Michael Ventresca, a spokesman for the Massachusetts Chapter of the Sierra Club, says the "project has stirred up tremendous furor; no matter what you do with it you are going to destroy the St. John."

Mr. Ventresca admits that flood damage in the area is a legitimate concern, however. In 1974, flooding from the St. John caused an estimated $3 million in damage to Fort Kent and the surrounding area; the year before, damage was estimated at more than $1 million. Town officials say flooding this spring may set a record.

A proposed $2 million, 4,000-foot-long, 15-foot-high dike to protect the Fort Kent business district is still awaiting funding approval from the Corps of Engineers, but this dike will not stop the flooding of farmland.

The issue of what the landowners pay in taxes is a particularly controversial point. Peter Bradford, a commissioner with the Maine Public Utilities Commission, says the tax issue was thoroughly aired before the Allagash River became a state wilderness preserve in 1966.

"The whole question of land values along the Allagash embarrassed the land companies no end," he says.

Land tax losses estimated

The Corps of Engineers estimates that Dickey-Lincoln would result in the loss of $120,000 a year in taxes. The Seven Islands Land Company which manages 79 per cent of the land that would be flooded by the federal project, says this loss is underestimated.

"Some 88,000 acres would be inundated by the reservoir," says Edward Meadows, communications director of the Seven Islands Land Company. "Conservatively estimated, this land could produce at least 60,000 cords of renewable wood fiber annually, having an estimated value to the state economy of $12 million per year. In addition, the location of the reservoir will cause a major disruption of the existing privately constructed road system on another 529,000 acres."

Dickey-Lincoln has focused increasing attention on a secondary question involving forest land: "Are the land companies indiscriminately cutting down timberland around the St. John River and thus contributing to the flood problem in the St. John Basin?"

Some environmentalists charge that the practice of taking down all the trees in certain places — called "clear-cutting" — has contributed to riverbank erosion and follding.

"Clear-cutting definitely contributes to erosion and follding," Mr. Ventresca says. "I don't know why state environmentalists have allowed this. Clear-cutting should be banned."

Christopher Herter, executive director of the Maine Natural Resources Council, says that while only "selective clear-cutting" is permitted, environmentalists need to do a better job trying to curb this practice near the St. John River. Mr. Herter feels that more action against clear-cutting was not taken in the past because "it's awfully hard to know what is being done on provate land."

While debate rages on taxes and land use, the cost of the project rises. "It won't be too long before Dickey-Lincoln is over $1 billion, but in this industry, I don't think there is any source of power you can rule out," says John Stevens, vice president of the New England Electric Company. With the "dramatic increase in the cost of fuel, you have to consider hydroelectric power like Dickey-Lincoln all the more," he comments.

Dickey-Lincoln Hydroelectric Project: Pro and Con

To the Editor:

Myron W. Levin's recent article [December issue] about the proposed Dickey-Lincoln hydroelectric project, like much of the material put out by Dickey-Lincoln opponents, was distressingly one-sided and simplistic.

Mr. Levin, in his rush to condemn Dickey-Lincoln, ignores the complexity of the issue. With an utter disregard for significant facts, he reduces Dickey-Lincoln to a muddled plot by which a great deal of money would be spent and a vast expanse of nature massacred for the sake of a little bit of electricity. No sensible person would support such a scheme. But, then, no such scheme exists — except in the propaganda of certain Dickey-Lincoln opponents.

There simply is much more to Dickey-Lincoln than Mr. Levin has chosen to mention, which explains why the project is supported by so many reasonable people — not the least of whom are a distinct majority of New England's governors, senators and congressmen; residents of the area in Maine in which the project would be built; advocates of consumer-owned electric utilities, such as the American Public Power Association and the Northeast Public Power Association; New England labor leaders; and the Consumers Federation of America.

New England needs more electric power. Dickey-Lincoln would provide more electric power — and in a financially feasible manner. Recent cost estimates indicate that, contrary to Mr. Levin's claim, Dickey-Lincoln would cost considerably less than a billion dollars. In a sense, though, the cost is irrelevant since the federal government would recoup whatever it spends on the project by selling the electricity that Dickey-Lincoln generates. Moreover, financial projections indicate that Dickey-Lincoln would have a benefits-to-cost ratio of 2.6 to 1, which means that if, for the sake of argument, the project were to cost $1 billion, it would return $2.6 billion.

The project would operate principally as a peaking power plant, which means that it would operate for relatively brief periods to meet daily peak demands. Mr. Levin misses the point when he criticizes Dickey-Lincoln on the grounds that it would supply only 1 per cent of the power that New England will be using in 1985, which is the date the project is due to become functional. The purpose of a peaking power plant is not to generate large amounts of electricity but, rather, to supplement base load plants at times each day when the demand for electricity is greatest. Dickey-Lincoln would supply approximately 10 per cent of New England's peaking power, which compares favorably with the most effective peaking power plants in the nation.

The threat which, according to Mr. Levin, Dickey-Lincoln poses to the St. John River and the surrounding wilderness may be more a matter of fancy than fact. Certainly, this threat has been exaggerated by the more hysterical environmentalists, such as the so-called "Friends of the St. John," whom Mr. Levin identifies as Dickey-Lincoln's principal opponents. But the environmental question remains unresolved and, most likely, will remain unresolved unless the U.S. Senate authorizes a much-needed environmental impact study.

Ironically, Dickey-Lincoln opponents are now even trying to prevent the environmental study, which, clearly, is a stance that can only serve to diminish the credibility of the environmental movement. One can only conclude that Dickey-Lincoln opponents are fearful that the horror stories they have spread about the project would be dispelled by a well-researched, unemotional, scientific study.

There is a great need for objective reporting about Dickey-Lincoln. There is no need for the sort of slanted article written by Mr. Levin. Indeed, such articles are a disservice to New England consumers who need the full story if they are to make decisions that will improve their situation.

JACK WARK
Information Director
Northeast Public Power Assn.
Littleton, Mass.

Travesty

To the Editor:

Enclosed is a letter I received from Sigurd F. Olsen of East Ely, Minnesota, in response to your article on the St. John River dam in Maine (December issue), which I sent to him:

"All I could say when I went over the plans for the Dickey-Lincoln project on the St. John River was 'Damn the Army Corps.' They can never let any river alone, and this especially would be a travesty. Why doesn't the government put them to work building more pollution control plants, revegetating headwaters everywhere, and putting their power and strength to reclaiming the present coal mine stripping, especially in the West. No one has ever thought of that, it seems, but that is the kind of work they should be doing and could do well.

"The only hope on the Dickey-Lincoln project is to marshall public opinion. I am meeting with the vice president of the Wilderness Society, Frank Barry, who used to be one of the solicitors in the Department of the Interior, and I'll ask his advice.

"I know Maine is a tough nut to crack, as was evidenced by the Allagash River issue, and they want to call the tune. However, there is a rising wave of environmental opposition that can be mustered."

Mr. Olsen was formerly president of the Wilderness Society and is the author of a number of books about U.S. and Canadian wilderness.

PAUL CREAR
Severance, N.Y.

SUN (M)
LEWISTON, MAINE
D. 47,085

FEB 24 1976

New England Newsclip

Joint Power

The concept of a cooperative effort by Maine and New Brunswick for the development of tidal power, either in the Bay of Fundy or Passamaquoddy Bay, is a good one. An international effort could make tidal power a reality after six decades of consideration in this country.

Last week, Gov. James B. Longley conferred with Richard B. Hatfield, premier of New Brunswick, to discuss joint power development. Longley represented the New England governors and Hatfield the five eastern provinces of Canada. Further discussions are planned for the future.

The Canadian official expressed interest in "some sort of financial participation" in the proposed Dickey-Lincoln School project. Both he and Longley saw an even greater common interest in tidal power development.

There is a large area for mutual benefits from a joint effort, despite the fact that a political line divides the region between the U.S. and Canada.

Any arrangement would have to be made by Washington and Ottawa, through diplomatic channels.

SUN (M)
LEWISTON, MAINE
D. 47,085

FEB 23 1976

New England Newsclip

Dickey Dam Impact

The first environmental impact study of the proposed Dickey-Lincoln School hydroelectric project on the St. John River in northern Maine is being conducted by the Army Corps of Engineers. The results are expected to be ready in the fall.

Meanwhile, the estimated cost of the project has continued to rise, along with inflation. The latest figure, based on Oct. 1, 1975 prices, is $463 million. The current study by the Crops will include updating the cost estimate and an economic analysis. The cost no doubt will rise again. There is no way to determine whether the benfit-to-cost ration previously calculated by the Corps, 2.6 to 1, will stand.

There would be two dams in the proposed project, designed to generate a combined 1.2 billion kilowatt hours of electricity annually to provide more basic power for Maine consumers and to meet peak loads in New England.

The site of the proposed project is upriver from the Allagash River, so that there would be no effect on that flowage.

But the dams would create a large new lake in what is now wilderness. That has aroused environmentalists against it. In addition to producing power, the dams would provide flood control and recreational development. All of those facets are to be studied by the engineers. There has been no comprehensive impact study in the past, since federal law only recently has required the filing of Environmental Impact Statements.

If the results of the ongoing study are favorable, and Congress provides the necessary funding, it will take more than seven years for the dams to be built.

Bangor Daily News

14 BANGOR, MAINE, WEDNESDAY, FEBRUARY 11, 1976

IN OUR OPINION

Something Lost. . .

For a week he had been camped beside the water as it gushed through the rapids, but even in that brief span of time he noticed that the force of the St. John had diminished.

The river, once a challenge for canoeist and fly fishermen, was dying, and as it died it was disappearing — the new reservoir was swallowing its banks and drowning its roar and the river's trout swimming hard against the current to find oxygen and cooler water.

The animals, the deer and the bear, the otter and the porcupine, had abandoned their dens and their beds and were headed for higher ground.

The pine and the spruce, which had once swayed in the wind that rippled the deadwaters, appeared to be sinking; and in the distance, where the center of the new Dickey reservoir would be, an expanse of them was hidden below the surface of the new lake, but their tops, like spires, could be seen here and there above the water.

Eventually, he knew, the raw, wild character of one of the East's last wilderness refuges would be replaced with the broad, placid features of the Dickey and Lincoln reservoirs — two manmade bodies of water that would cover seven-tenths of one per cent of Maine's total forest area.

The value of the wilderness, its scenic beauty and its history, its potential for pulpwood, firewood and lumber had been weighed against the need for surges of electrical energy that would satisfy a bare 10 per cent of New England's power demands during peak periods of the day.

And the St. John, as he and Maine had known it, had lost.

As he stood there watching the river die, he realized that the value of the dam was not in its value as a replacement for oil in the race to satisfy wasteful consumption of electricity.

He realized that the true value of something, like the Dickey-Lincoln Dam, is often not its intrinsic worth, but in what has to be given up to obtain it....

* * * *

The above is fiction, fiction of the future. And it's our way of saying that we hope it never becomes fact.

It's also our way of saying that we're against the dam.

Patriot Ledger 6/27/75

Dickey-Lincoln Project Not Worth It

By BOB FINNIGAN
Patriot Ledger Staff Writer
First of three parts

Last year's energy scare brought the on-again, off-again Dickey-Lincoln hydroelectric power project back into the spotlight. It remains to be seen whether it will stay there this time or fade away as it has so often in the past five decades.

'Quoddy Proposal

The idea to dam the wild St. John River in Maine first came up in the 1920s as a key part of the Passamaquoddy Tidal Project, brainchild of engineer Dexter Cooper, which was to harness the gigantic Bay of Fundy tides on the Maine coast for electric power.

The dam, at the Rankin Rapids site, would have backed up both the St. John and Allagash Rivers in Northwest Maine. Their purpose was to provide "fill-in" power in the Quoddy tidal sequence.

Rankin was abandoned as a site in the late '50s and Dickey Township, just above the entrance of the Allagash, was substituted. During the Kennedy Administration, the Passamaquoddy Project was found economically unsound. But the St. John concept was allowed to stand on its own.

In 1964, the Army Corps of Engineers planned a two-dam system for the project, with the bigger at Dickey and other 11 miles downstream at Lincoln School. They were to provide approximately one billion kilowatt hours of electricity, base-load for Maine and peaking power for southern New England, each year.

It is that proposal, basically unchanged in a decade, around which today's controversy rages. If Congress approves pre-planning money, $1,060,000 this year, ($800,000 last) for the second year in a row, Dickey-Lincoln would have some true momentum behind it. That is why this year's decision is so vital in the battle between energists and environmentalists.

Minimal Power

Dickey-Lincoln would indeed provide useful power. But by modern standards, it would be minimal power. Only one-fourth as much, for instance, as is produced at Boston Edison's Pilgrim Station.

It would save precious oil. Approximately 1.7 million barrels a year. But it would be at the cost of the last, the very last, free-flowing wilderness river in the Eastern United States. Surely, that is precious, too.

The dam at Dickey would be big: 9,260 feet long, 340 feet high, 65 million cubic yards of fill. This fill, incidentally, would be obtained by falttening the scenic and productive Deboullie Mountain area about 20 miles southeast of the dam sites. Dickey would be the 11th largest dam in the world, bigger than Aswan, which the Russians built for Egypt to control the Nile.

The Lincoln dam would regulate the big flow of water released at Dickey so there wouldn't be a tidal wave downstream for 2.5 hours each day that Dickey is operating. Lincoln would be 1,290 feet long, 87 feet high and need 2.2 million cubic yards of fill. In addition, five dikes would be needed to keep the backed-up water from spilling into other watershed regions and some 150 miles of new transmission lines would be needed to tie Dickey-Lincoln into existing grid systems.

The St. John's flow fluctuates widely during the year, from a rip-snortin' river in spring to a mere rock-strewn trout brook in summer and fall. The flow goes from 79,000 cubic feet per second down to a possible 130 CFS. So it will take two years to fill the dam's reservoir, which would be 300 feet deep at the face of the dam.

At high water, the dam would flood 89,000 acres; at low, 55,000. Therefore, there would be 34,000 acres of mostly-mudflat "bathtub ring."

The lake would completely cut off 200,000 more acres of prime timberland from the rest of the U.S. It would be accessible only from Canada, unless more money was spent on roads and bridges. Most of this land (the near 300,000 acres) has been harvested twice in this century already. The land that will be ruined with dam site, reservoir and fill digging (110,000 acres) can produce possibly 40,000 cords per year, at a value of $9 million.

The river itself would be totally ruined, backed up for some 57 miles to the historic Seven Islands Landing area. Gone would be one of the acknowledged best trout fisheries in the nation, some of the East's best white-water canoeing, 17,600 acres of deer area (with 2,200 deer), and the natural habitat of moose, black bear, osprey and merganser.

For what?

According to Congress, relying on Corps of Engineers' reports: 1. additional electrical generation for New England; 2. jobs; 3. flood control for Fort Kent, a downstream town which has an annual spring disaster; 4. public power, cheaper for the consumer.

Peaking Power

Dickey-Lincoln will provide only peaking power for New England, since the dam can only generate 2.5 hours per day. Any more would wipe out the reservoir in months. The corps says the dam won't be ready until at least 1985. Boston has six hours of peaking time each day NOW, So another source would be needed for 3.5 hours daily even if Dickey-Lincoln is built.

Unemployment is an extreme problem now. Maine, with 50,000 jobless out of a 428,000 labor force , has an unemployment rate of 11.7 per cent. In its latest estimate, the corps wouldn't start construction until 1978 and would need 120 men. It would escalate until 1983-84 when highs of 2,380 and 2,310 men would be needed.

Therefore, there is no immediate relief for an immedaite problem. In 1987, the completed dam would need 40 skilled technicians to run it. Any employment by the project would be of a cruel boom-and-bust nature, to say nothing of the same type economy which would hit the region for a mere half-dozen years.

There is no doubt that Dickey-Lincoln would provide badly-needed flood control for Fort Kent (pop. 4,575), the biggest town in the St. John region and the seat of pro-Dickey sentiment for obvious reasons.

Ft. Kent has been flooded 10 times in the past 35 years and the two worst were in the past two years, including $2 million damage in 1974. However, protection would not be afforded until 1984 by the Dickey project. Even the people in the river town would admit that the problem is more serious than that and getting worse each year.

Local Reaction

"We need that dam to save our town," said Claude Dumond, town manager. "Even if they build the dike, it won't help people further down the river in Frederickton (New Brunswick). This is potato country and all our land is being washed down the river. It's all right to preserve the river for conservationists, but our young people are leaving the valley because there's nothing here for them."

But, like everywhere else, reactions to the dam do vary.

"The people in Fort Kent are all for the dam, but it's not going to wipe out their town, their homes," said Dexter Moore of Dickey. "Most folks here don't want the dam and we've never even been asked by anyone from the government or Corps of Engineers how we feel about it. They just want to come in and take our homes away from where we've lived all our lives."

The dam site in Dickey, a hamlet of 600 persons with an amazing amount of new construction going on, would be between the Route 161 roadbridge (the face of the dam) and the point opposite St. Peter's Catholic Church.

"Even though they don't care what we think, we're going to get a petition together against the dam," Moore added. "There aren't even going to be many jobs for people up here without union cards and there aren't many of those. And hell, we only pay about $15 a month for electricity. How much lower can they get that?

"If they weren't putting town officials on their payrolls at $400 a week as consultants, we'd have more organized resistance. But, we're getting it together, believe me."

Cheaper Solution

The corps does have a much-cheaper solution to Ft. Kent's flood problems and much quicker, too. It is a dike, costing $1.8 million and taking 18 months to build. Therefore, Dickey-Lincoln is not even Ft. Kent's only hope. Nor the best.

There is little doubt that Dickey-Lincoln would save some money for consumers. But the prime savers would be municipal and rural electric associations to whom the Department of the Interior would sell most of its Dickey power. They represent just 10 per cent of the users in New England.

The corps estimates the savings would be $11.7 million a year. But we spend $1.6 billion a year now. The savings would be only three-quarters of one per cent of the over-all cost.

But a savings is a savings, right? Well, how about saving a rare river?

The actual cost of putting up Dickey-Lincoln is another story. More has been done with addition and subtraction than Houdini could ever have done with a trunk and a padlock.

Meanwhile, the upper reaches of the St. John River have scarcely been changed since the waterway was discovered by Samuel de Champlain on June 24, the feast of St. John the Baptist, 1604.

Man changes so much around him, so often. Why can't we leave one piece of our world, our own New England free? Free and wild, as nature would have it.

Boston Globe
March 24, 1975

Dickey dam consultants confirm cost

By Stephen Wermiel
Globe Washington Bureau

WASHINGTON — A new study by a private engineering firm in Boston largely confirms controversial cost estimates by the Army Corps of Engineers for the proposed Dickey-Lincoln hydroelectric project in northern Maine.

The study, conducted by Stone and Webster Engineering Corp. under contrac t to the Corps' New England Division, is the first such update of costs for the public power project since planning was resumed late last year.

Another recent study, by the planning committee of the New England Power Pool, found that if the hydroelectric project were built, its power could be integrated into the power needs of New England. This marked a reversal of position by private utilities.

The proposed project — to include dams, reservoirs and power plants at the towns of Dickey and Lincoln School on the St. John River — has been a perennial battle in Congress.

It was studied for several years until 1967, when all funding was cut off. Interest was rekindled in the current fiscal year.

Stone and Webster analyzed and updated the cost of the dams, reservoirs and power plants but did not revise cost estimates for land acquisition, relocation and other government expenses.

A copy of the report obtained by The Globe shows the Corps estimates — challenged for a decade by private utility companies in New England — to be well within range of the Stone and Webster figures.

The Corps figure for dams, reservoirs and power plants (84 percent of the total cost of construction), based on price levels last July, was $323.6 million. The Stone and Webster estimate, based on Jan. 1, prices, is $350.7 million.

The updated cost figure is 8.4 percent higher than the Corps figure. But allowing for inflation during the period, the estimates appear compatible.

Officials of the Corps' New England Division have kept the report under wraps while they study it and have had no comment. But they are known to be privately elated by the Stone and Webster estimate.

The estimate, however, does not represent the real cost of the project. If other construction costs (land acquisition, etc.) were included at the same 8.4 percent inflation rate, they would raise the estimate to $417.5 million.

That figure includes neither construction of electric transmission lines, previously estimated at $123 million by the Corps, nor interest during construction.

According to testimony from division chief Col. John Mason in Washington several weeks ago, the Corps is concentrating on preparation of a detailed environmental impact statement and completion of design and planning for the project.

33,600 acres of mudflats foreseen

Water insufficient, Dickey critic says

By Arthur Frederick
United Press International

AUGUSTA, Maine — The proposed Dickey Lincoln Hydroelectric project could result in more than 30,000 acres of exposed mudflats during part of the year. Maine Natural Resources Council director Clifford Goodall has told the legislative Committee on Energy.

Goodall said last Wednesday the hydroelectric project is flawed because the area would not have enough water to operate efficiently.

The Dickey Lincoln dam would create a long, slender lake instead of a lake concentrated in one area, and dropping the level of the lake to make room for spring runoff waters would result in 33,600 acres of exposed mudflats, he said.

"Hydroelectric projects rquire water, and there just isn't that much water up there," Goodall said. "Passamaquoddy has the water. Dickey Lincoln has practically none."

"If you're going to dam up all this water in the spring, you have about a 10-month span in which you are going to let it out," he said.

Sen. Edward Cyr (D-Madawaska), who sponsored the bill to set up an Authority to build the project, said the dam would be financed through the sale of bonds, and would not cost the state any money.

"This Authority only pertains to the creation of the Dickey Lincoln School project," he said. "The Authority would have no rights to sell electricity privately."

Dickey Lincoln would not only create its own electricity, but would allow Canadian power plants already on the river to install other turbines to generate more electricity, Cyr said. He said the electrical production could increase from the present 644,000 kilowatts to more than two million kilowatts.

Dickey Lincoln would generally be a "peaking power" facility — that is, it would provide power during the peak periods of the day, usually between 4 p.m. and 6 .p.m. Cyr said the project would provide 10 percent of the peaking needs of the entire New England region.

Goodall said the estimated cost of the project in 1974 was $356 million.

"Our figures are now $566 million, and the Boston Edison Co. says the plant could cost up to $1 billion," he said.

Goodall said the Army Corps of Engineers, which has been studying the feasibility of the project, is thinking about scaling the project down to a simple pump-storage facility, which would cost much less money.

"Peaking power is the most wasteful, blatant use of energy we have, and that's what Dickey is for," he said. "Our future is in forest products and Dickey would hurt our economy, not help it."

Goodall said the Natural Resources Council favors the Passamaquoddy project because it would generate base powr rather than peaking power.

Quincy Patriot Ledger

3/75

N.E. Utilities Well Organized To Battle Dickey-Lincoln

EDITOR'S NOTE: Lobbying techniques used by electric companies to defeat the proposed government-run Dickey-Lincoln hydroelectric project in Maine are discussed in the second of a three-part UPI series on the utility industry's 40-year war against public power in New England.

By DAVID M. ROSEN

BOSTON (UPI) — In November of 1965 the private electric companies of New England produced a document called "A Report for Action on the Dickey-Lincoln School Project."

The report outlined a 16-point public relations and lobbying program to defeat the public power project, initial funding for which has just been approved by Congress.

The action program, compiled by three utility public relations executives for the Electric Coordinating Council of New England (ECCNE), called for "establishment of a top notch congressional relations team" of lobbyists and "establishment by each electric company of a budget for travel and expenses for members of the team plus a maximum of $1,000 for congressional receptions."

In addition, the program called for: a new press kit, editorials and commentaries for newspapers to use in opposition to public power, anti-Dickey Lincoln speakers for public appearances through a speakers bureau, extensive contacts with unions and suppliers to enlist their support, and an advertising campaign through a New York agency.

James Lydon, vice president for public relations at Boston Edison Co., said the report was not formally adopted by ECCNE. He conceded, however, that most of its recommendations were put into effect and similar techniques are being used now to fight the proposed Massachusetts Power Authority.

Lydon said internal memoranda dealing with lobbying against the Massachusetts authority exist, but he declined to make them available.

Power Loop

The action report was followed by announcement of a $1.5 billion construction project called the Big 11 Power Loop, a series of 11 plants which the industry said would reduce power rates 40 per cent by 1980.

This information was conveyed to Congress by ECCNE in a fact sheet dated Feb. 28, 1966 restating the industry's opposition to Dickey-Lincoln. The sheet said Dickey was unnecessary in light of Big 11

Many public power advocates, including U.S. Rep. Michael J. Harrington, say the Big 11 was a public relations gimmick, and a top industry executive has testified under oath that there was no advance industry planning for the project.

Albert A. Cree, then chairman of ECCNE, said in a 1966 Congressional hearing, "You asked if I had a copy of a study of the one-system basis for Big 11. I said I knew of no such study."

Cree was asked, "Is that full page ad of the Big 11 Power Loop the only document that exists as to the study of the one-system basis in New England?"

He responded: "So far as I know it is."

Lydon said Big 11 cannot be called a publicity gimmick, "because all the plants have been built and are operating and are saving consumer's money."

Asked if customer bills have gone down 40 per cent, Lydon said "of course not." He said the price increases are due to higher fuel costs, inflation and higher property taxes.

While denying that Big 11 was a "gimmick," Lydon acknowledges that the campaign was concocted for the utility industry by a New York advertising agency as a means of "telling the people what we were doing."

"The agency took our existing plans for power plants and said 'why don't you call it the Big 11,'" he said.

In May 1966 the House Appropriations Committee heard testimony on the Army Corps of Engineers' request for $1.2 million to plan Dickey-Lincoln. The request was cut back to $800,000.

The Senate approved the full $1.2 million sending the matter to a conference committee which recommended $1.1 million. The House accepted the compromise but attached rider calling for a study by the Appropriations Committee staff.

The staff reported in 1967 that Dickey-Lincoln would save consumers money. It said power from the project would be "significantly cheaper than the most likely alternatives."

This triggered another round of lobbying by the utilities and after a series of votes and conference committee reports, the House finally voted against Dickey Lincoln 263-118 on Nov. 7, 1967.

The firm, Stone and Webster, found that the project would cost about $350 million, about $17 million more than the Corps had estimated. With land acquisition and inflation, Stone and Webster said the project could cost up $417 million.

Next: The continuing battle.

New York Times
26 August 1974

Maine Dam Project Sparks New Debate

By JOHN KIFNER
Special to The New York Times

DICKEY, Me., Aug. 25—They are talking about building a dam larger than the Aswan Dam in Egypt here on the St. John River in the northernmost part of Maine, where the pavement ends and the roads become dirt logging trails leading into thousands of miles of forest in the Allagash wilderness.

They have been talking about it now for more than a decade, but last winter's energy crisis has lent a new momentum to a proposal once snickered at in Washington as a pork barrel project. In the public works bill passed earlier this month, Congress included $800,000 for the Army Corps of Engineers to plan an impact study of the project.

With a current official price tag of half a billion dollars — probably more by the time the dam is built, its opponents say — the project would back up the waters of the St. John and its tributaries for 53 miles, covering 88,600 acres of forest with an artificial lake.

For about an hour-and-a-half a day, the dam could produce hydroelectric power to feed into the New England energy network at peak demand.

The long history of political controversy over the Dickey-Lincoln Dam has seen a curious shifting of political alignments. Environmentalists are now allied with private power companies and timbering interests against the dam, while consumer advocates and proponents of public power stand with local businessmen who regard the project as a "shot in the arm" for the area's economy.

The proposed dam has been talked about for so long that it has a kind of shadow reality: The big contour maps of the Allagash that many people display in their homes or offices here show both the present river system and the outline of the lake that would be created if the dam is built.

The project has its origins in a long-abandoned scheme to harness the energy of the tides in the Passamaquoddy Bay off the Maine coast; the dams here were to fill in the power gaps.

The plan calls for an earth-filled dam nearly two miles long—the 11th largest in the world — stretching between two mountains here. Eleven miles downstream, a second, smaller dam would be built near an old schoolhouse that gives the project its full name: the Dickey-Lincoln School Dam.

'Authorized' in 1965

Congress "authorized" the Corps of Engineers to proceed with the dam in 1965, but refused to appropriate any money, the result of the opposition, among others, of coal-state Representatives and fiscal conservatives.

In the ensuing years, New England electric companies lobbied heavily against the bill, but now, in ill-repute after last winter's rising electric bills, the proponents of private power find it politically unfeasible to fight new energy sources.

The most vocal opposition is from a recently organized, Boston-based coalition of 21 conservation groups, including the Sierra Club, the Wilderness Society and college outdoor organizations. The coalition, called the Friends of the St. John, contends that project would eliminate a prime white-water canoeing river, destroy the habitat of deer, moose and bear and ruin trout fishing streams in one of the last remaining major wild areas in the East.

'Boondoggle' Project

Representative Silvio O. Conte, the liberal Massachusetts Republican who led the unsuccessful fight to kill the project, describes it as a "boondoggle" that would produce "only a small, tiny, infinitesimal fraction" of New England's power needs. He also contends that the Corps of Engineers is not interested in the environment. "They just want to stay in business," Mr. Conte says of the Corps of Engineers. "This is a way to perpetuate themselves."

But Representative Michael J. Harrington, a Massachusetts Democrat who is a leading supporter of the proposed dam, sees it as a "foot in the door" for public hydroelectric power and a Tennessee Valley Authority-style "yardstick" to set against the costs asserted by private power companies.

At this time of the year, the St. John is a broad, shallow stream; its depth can be measured in inches. But the melting snow turns the river into a powerful stream that has overflowed its banks seven times in the last 10 years.

Warm weather last winter caused alternate thawing and freezing that built up jagged layers of ice holding the waters back. On May 2, when the ice jam broke, water and chunks of ice swirled downstream through the streets of Fort Kent, causing several million dollars of damage and sweeping away the topsoil from the potato fields along the river.

A Change of Attitude

The flood was a crucial event for Robert Jalbert, a prominent lawyer in Fort Kent who also is a registered Maine guide. Mr. Jalbert, whose real love is the woods and streams of the Allagash region, always opposed the proposed dam. But now he has decided that it must be built.

The key to his change of attitude, Mr. Jalbert says, was the change in the lumbering industry in recent years, caused by the introduction of the "skidder," a big vehicle used fo rdragging and pushing trees and other tools that have vastly increased the amount of timber that can be cut.

The result, according to Mr. Jalbert and other woodsmen here, is that so many trees are stripped away that the hillsides cannot absorb the water, the unshaded snow melts faster, and the quicker, bigger runoff causes floods.

"It's a capitalistic system and they own that land," Mr. Jalbert, who is a registered Republican, "they believe they have to harvest it like a garden."

"Its an economic situation and there isn't the willingness to pay the price to change it," he added. "But if they continue lumbering on the same intensity, there will be increasing floods of greater proportion."

The corps of Engineers has a plan for flood dikes to protect Fort Kent, but Mr. Jalbert and others maintain that the dikes will not protect the valley's farmland.

One of the major local proponents of the dam is Harry Etscovitz, the owner of a Chevrolet dealership in Fort Kent who, a decade ago, was part of a businessman's group that sent Congressmen a reprint of an article in Business Week magazine about energy problems in the hope that construction of the dam would help the region's economy.

Among the benefits he envisions is a recreational lake that would bring more tourists to this remote area. "You can imagine a constant flow of people from New York and Boston coming to see the lake," he said.

In the sparse settlements near the end of the paved road, where the potato fields have given way to forests and raspberry patches, there are mixed feelings.

Divided Opinions

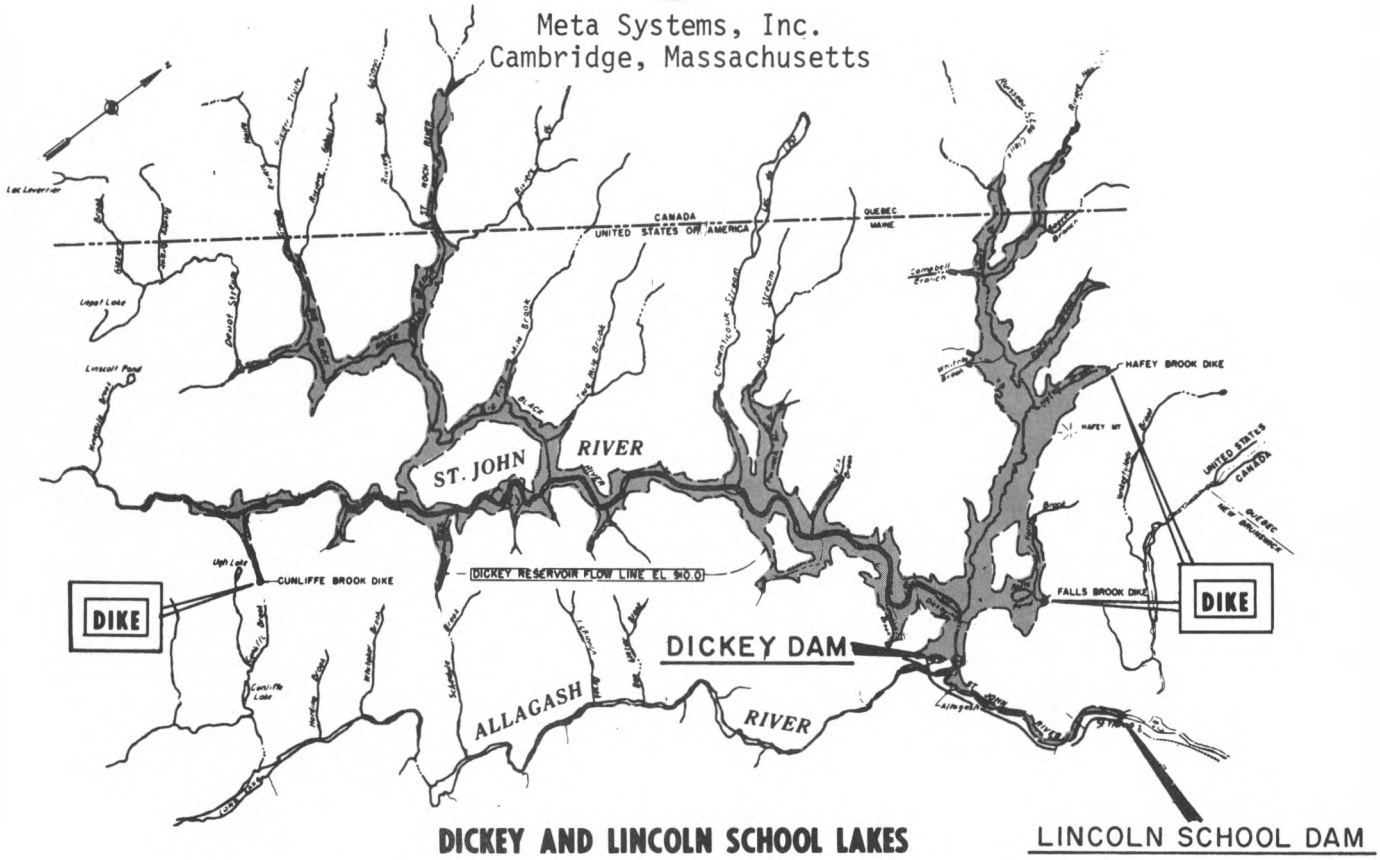
Gus Kelly, a lumberman for 40 years, said that "most of the people" favor the project because the only work here was in the woods and the dam would mean construction and maintenance jobs. A short distance down the road, his brother, John, who is 67 years old and also a lumberman, said "the majority of the people don't want it.

"They shouldn't flood that beautiful river—people never realize what they have," said John E. Gardner, a former chief fire warden here who is bitter over many of the things he has seen men do in the forest.

But Ash Peasely, the area's state forest ranger, says: "Where else can they build a hydroelectric dam and displace so few people? I think it's a needed thing for the country and they can't afford to fool around with it anymore. The woods are cut back bad along the St. John River anyway."

Summary of Scope
of Work
Environmental Impact Statement
for the Dickey-Lincoln School Lakes Project
prepared for the
Corps of Engineers, New England Division
under
Contract No. DACW33-75-C-0062
by

Meta Systems, Inc.
Cambridge, Massachusetts



DICKEY AND LINCOLN SCHOOL LAKES
RESERVOIR PLAN

September 1975

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Overview

The Dickey-Lincoln School Lakes project poses a particular challenge for the preparation of an environmental impact statement. Determining the environmental impacts of any project is not easy for several reasons: the complexity of human and environmental systems and their interrelations are difficult to conceptualize; the determination of what constitutes a "complete" environmental impact statement is difficult; and the state-of-the-art for "measuring" impacts, many of which are extremely hard to quantify, is not well developed. The calculation of benefit/cost ratios, in particular, remains a topic of intense debate for many public investment projects because of the difficulty of defining benefits or costs to account for long-range effects. In short, many aspects of the Impact Statement process remain in an evolutionary phase.

Dickey-Lincoln School, besides being subject to all the common impact statement complications, is heir to several additional complications. First, the proposed project is a multi-purpose impoundment which makes it necessary to consider multi-dimensional impacts. Second, the project is interregional in its reach. The Saint John River Basin would supply the power benefits largely to users

elsewhere in the New England region where there is high demand for peaking power. The incidence of benefits and costs falls in complex patterns. Next, the National Environmental Policy Act (NEPA) did not exist when Dickey-Lincoln School went through the most active round of planning (in 1967) in its long history. The planning that was done at that time is not tailored to the NEPA procedural requirements that now must be fulfilled. Some stages of the process outlined by NEPA have been initiated, while other steps that would better preceed the environmental impact statement (such as the investigation of alternatives and the finalization of design factors) are not complete. The information that was collected on such things as wildlife species and populations is out of date and must be re-collected; new state regulations now exist and must be satisfied. Because the area is remote and relatively unpopulated, data is still scarce and inconsistent. In the long interim between 1967 and 1974 new technology such as modeling the effects of an impoundment on a river system have become available and have to be applied.

Two major developments since 1967 --- the increased concern over environmental quality and the recent indicators of serious energy problems --- have also complicated the

assessment of impacts from Dickey-Lincoln School. The new interest in preserving relatively unspoiled areas of the nation for recreational, aesthetic and ecological reasons has intensified interest in the Saint John River as a natural resource because it happens to be in an area perceived to be undeveloped. The project is large enough to noticeably reduce such acreage in the region. The problem of determining the value of the river in its current state now and in the future is particularly knotty. The energy crunch, on the other hand, has increased the sense of urgency for developing new domestic sources of energy, and the Saint John River represents one of the last large sites with potential for producing hydroelectric power in the northeast portion of the country. Finally, the Dickey-Lincoln project will have varying impacts in the short run (during construction or 8 to 10 years) and in the long run (life of the project or 50 years). The process of assessing impacts must reflect the dynamic nature of the project and cannot rely on static models.

These factors all contribute to the conceptual, procedural and methodological difficulties for an impact statement on the Dickey-Lincoln School project. It is the purpose of this scope of work to address these complexities by evaluating the data existing now, specifying data which must be

collected to complete analyses, suggesting some methodological approaches to analyses of the data, and providing some background information on several of the areas which must be addressed in the Impact Statement.

Approach

Section 1 of the report "Scope of Work for the Environmental Impact Statement of the Dickey-Lincoln School Lakes Project" briefly describes the approach to the Impact Statement assumed in the report. The scope of work is based on the following assumptions. First, the preparation of the Impact Statement will be managed to insure integration of the outputs from the various contractors. Second, the Impact Statement will be prepared with the participation of the public, including interested individuals both within and outside of the area. Third, priorities among tasks must be set in order to obtain a thorough, complete Impact Statement at a reasonable cost.

At some extent of analysis, the cost of an impact statement can outweigh the value of the information generated for decision-making. Therefore, the three scopes of work are structured around two phases of analysis. The first phase is a reconnaissance-type analysis to determine the relative importance of the issues, impacts or variables.

This exploratory phase includes review of existing information and pertinent data and the state-of-the-art for analysis. The second phase of analysis is entered only if the first phase indicates the need for more in-depth study. The second phase may include data-gathering, modeling and other detailed analytical investigations.

Another important assumption underlying the Scope of Work is that the major pertinent decisions about the project -- physical features, designs of facilities, construction schedule and related policies, project operating roles and related labor and resource inputs over time -- will be specified by the Corps to the contractors. Where such specification is not possible, the Corps will insure that the contractors make in common the necessary assumptions about those parameters.

Finally, it is assumed that the Impact Statement work will be carried out in light of all the laws, regulations, procedures, policies and guidelines which must be satisfied at both federal and state levels.

The major analyses for the Impact Statement are required in three areas: the physical and biological systems affected by the project; the social and economic systems affected; and the range of alternatives to the project's mix of power,

flood damage reduction and recreation benefits.

In each case, estimation of conditions without the project over time, including likely changes in the existing conditions (a range of possibilities may be necessary where great uncertainty exists as in the economic conditions of the area), is the starting point for analysis. Another important contribution to analysis comes from the perceptions and attitudes of the various interest groups and general public affected by the project. These views set the limits of tolerance for change; however, they can be affected by information generated and communicated during the Impact Statement process. Thus, the delineation of views must be a dynamic process which requires the involvement of the public throughout the preparation of the Impact Statement. These current and forecast conditions (and accompanying attitudes) are those against which to measure the conditions with the project, the net difference being defined as the impacts of the project.

For manageability, because of the complex interconnections of the systems involved, the scope of work for the physical and biological systems is divided into three parts: the geological and physical environment; aquatic ecosystems; and terrestrial ecosystems. In each case, analysis will be required for five time periods: pre-construction; construction;

reservoir filling; adjustment after filling; and long-term average or useful life of the facility.

The ecosystems involved are further divided into: (a) upstream from the Dickey Reservoir, on the mainstem and tributaries (UP); (b) Dickey Reservoir proper (DR); (c) the littoral ecosystem of Dickey Reservoir (DRL); (d) Lincoln School Reservoir (LS); (e) the river downstream from Lincoln School dam (DWN); and (f) the terrestrial ecosystem of the drainage basin of Dickey Reservoir (IH = island habitat; MH = mainland habitat; PI = periodically inundated zone). Figures S-1 and S-2 present two views of the habitat and ecosystem areas.

The social and economic systems covered by the Scope of Work include (a) local -- in the immediate area of the project, including both the urban areas and the rural and semi-rural areas in between; (b) the state of Maine; (c) adjacent and downstream areas in Canada; and (d) the New England region which supplies most of the Maine recreationists and would be the major user of the energy output of the project. Figure S-3 shows the geographical area in which the social and economic systems lie.

Table S-1 summarizes the analysis that will have to be undertaken for the systems and time periods described.

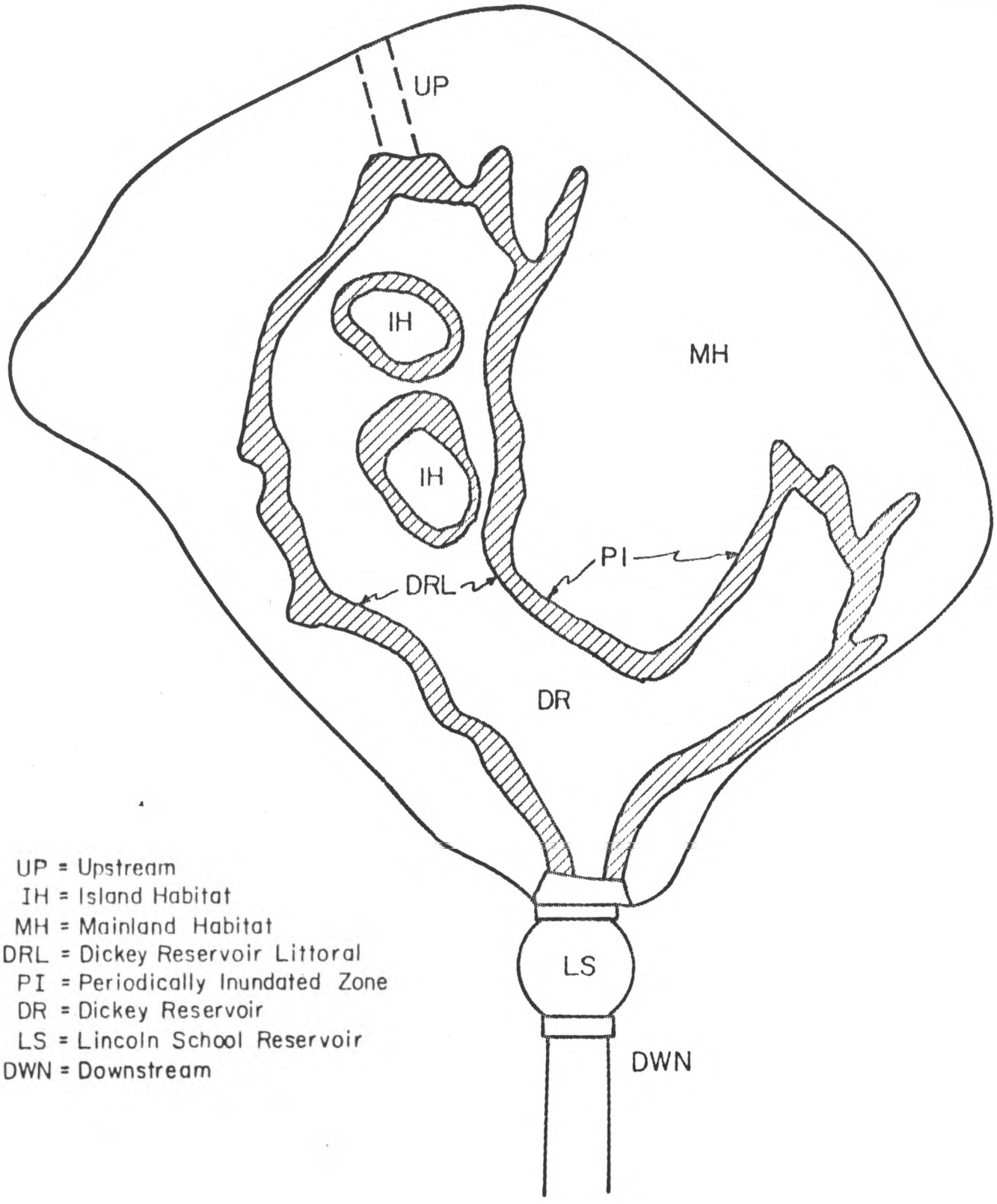

Figure S-1

Ecosystem Areas

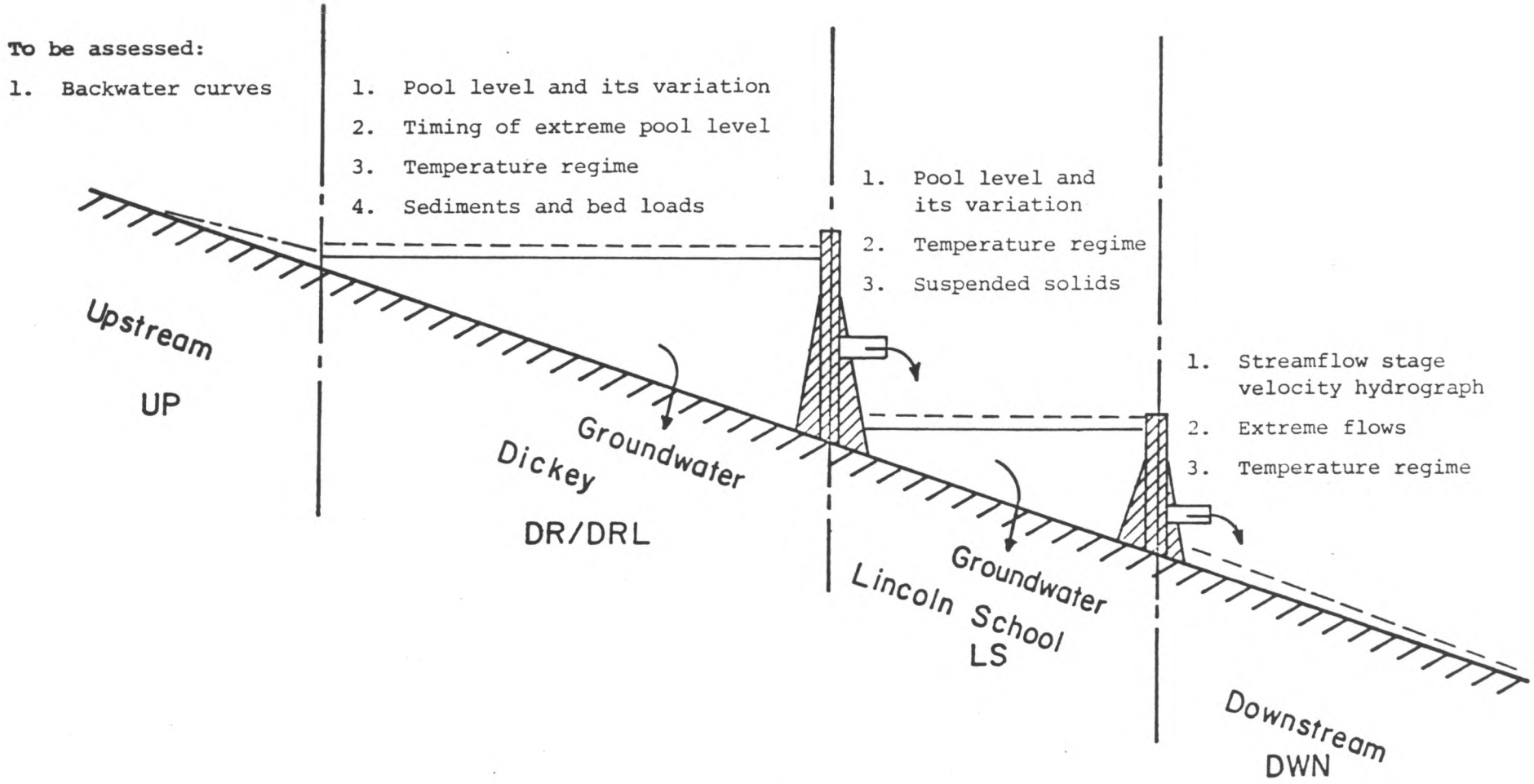

Figure S-2

Reaches of the Dickey-Lincoln Project

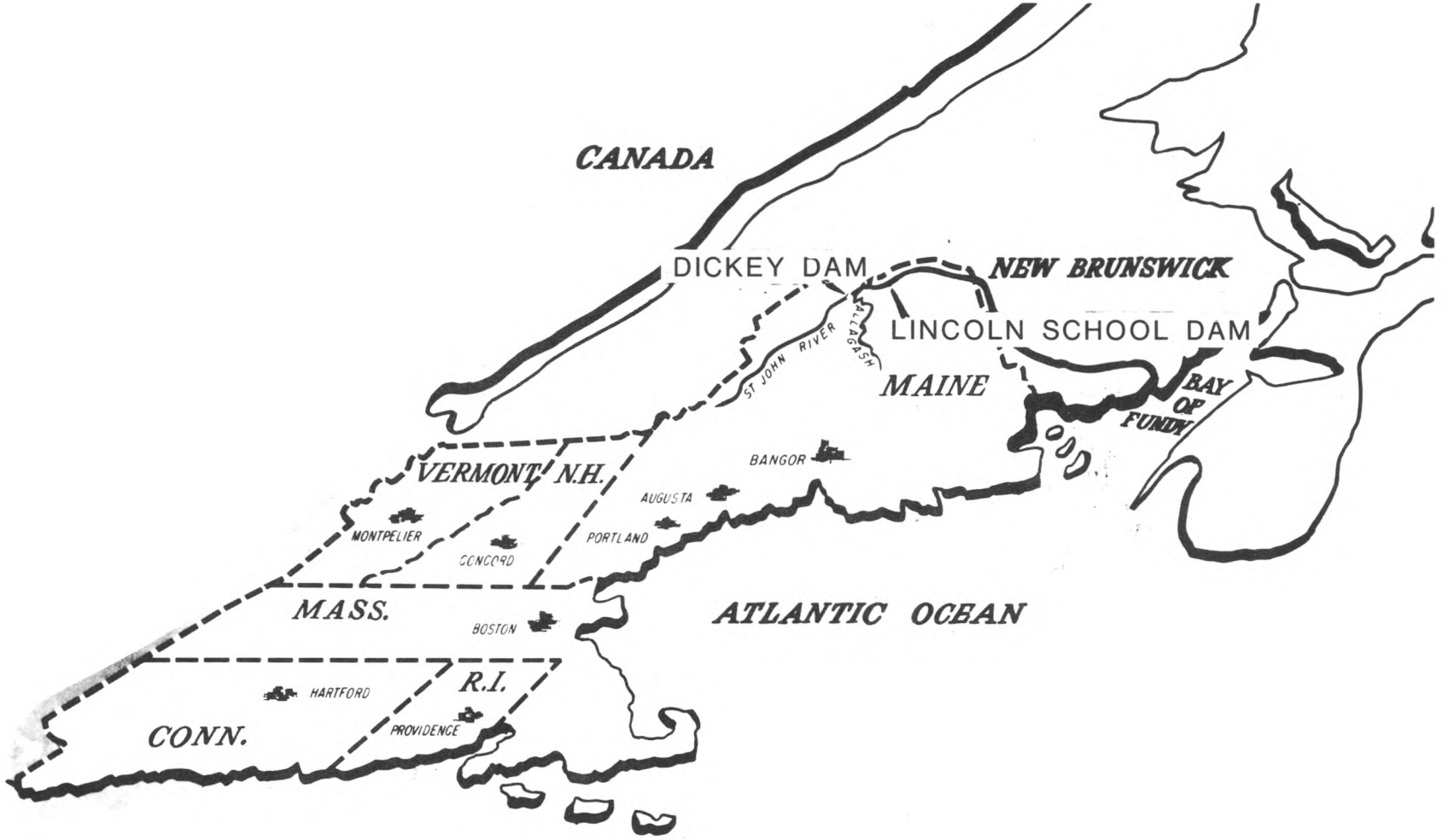
CANADA
DICKEY DAM
NEW BRUNSWICK
LINCOLN SCHOOL DAM
MADAWASKA
ST JOHN RIVER
MAINE
BAY OF FUNDY
BANGOR
VERMONT
N.H.
AUGUSTA
MONTPELIER
PORTLAND
CONCORD
MASS.
ATLANTIC OCEAN
BOSTON
R.I.
HARTFORD
CONN.
PROVIDENCE

Figure S-3

Table S-1

Time Period and Location for Major Impact Analyses

Ecosystem / Social and Economic Analysis \ Time Period		Pre-Construction	Construction	Reservoir Filling	Adjustment After Filling	Long Term Average
Aquatic	Upstream (UP)	X	---	---	---	X
	Dickey Reservoir (DR)	---	---	X	X	X
	Dickey Littoral Zone (DRL)	---	---	X	X	X
	Lincoln Reservoir(LR)	---	---	---	X	X
	Downstream (DWN)	X	X	X	---	X
Terrestrial	Mainland Habitats(MH)	X	X	---	X	X
	Island Habitats (IH)	---	---	X	X	X
	Periodically Inundated Zone (PI)	---	X	---	X	X
Social & Economic	Local	X	X			X
	Maine	X	X			X
	Canada	X	---			X
	New England	X	---			X

X = detailed analyses required

--- = basic but less detailed analyses required

An (X) in the matrix designates the points where significant impacts are highly probable and substantial analysis is required. Where a dashed line symbol appears (---), either impacts appear less significant, analysis is of a simple quantitative or qualitative kind, or it is not a time/location where analysis will provide any further or more detailed information about the impacts on the systems.

Scopes of Work

Volume 1 of the report presents the scopes of work for the Impact Statement in three sections: Section 1, physical environment and ecosystems; Section 2, human systems; and Section 3, alternatives. Regardless of the contracting arrangements made to carry out the Scope, each contractor will share a common scope. First, the same basic assumptions about the project design, construction and operation must be agreed upon by all parties with the Corps. Second, data must be gathered cooperatively where possible and shared among all parties. Third, all contractors should be prepared to contribute to the public involvement program. Fourth, contractors should meet regularly with the Corps and its advisors to facilitate coordination.

Physical Environment and Ecosystems

The scope of work on the physical environment and ecosystems is based on a review of previous attempts to evaluate the Dickey-Lincoln School project. Review of the eight overlapping efforts since the 1950's reveals a significant lack of information on the physical characteristics of the area or data about the ecosystems which the project impact upon. Therefore, the first section of this scope discusses some of the known sources of data as well as the types of data which still need to be collected and the analyses of the physical characteristics pertinent to analyses of the ecosystems. Since the first serious proposals for hydroelectric power development of the Upper Saint John River were put forth in the 1950's, eight more or less overlapping attempts -- ranging from agency reports to journalistic accounts -- have been made to evaluate the impact of this development on the basin's fish, wildlife, and forest resources. All of these efforts have relied almost exclusively on the preliminary field survey of the fishery of the Upper Saint John by Warner (1957), on the aerial surveys of deer yards conducted by the Maine Department of Inland Fisheries and Game, and on scattered field observations tempered by the professional judgments of the staff of that department.

Taken together these reports have focused on identifying potential impacts of the proposed impoundment on the fish, wildlife, and terrestrial resources. Beyond itemizing stream miles, forest acres inundated, etc., the only effort to quantify the impacts has concerned the deer populations. In all cases, these attempts have been deficient to the extent that they have neither considered the uncertainty of their conclusions nor suggested what additional data would be desirable.

There has not been a systematic study of the impacts of the project on the aquatic and terrestrial ecosystems. In addition, there is no systematic analysis of existing data or collection and analysis of new data. Still, these reports are useful as background against which to carry out the impact analysis now required.

The new or revised data required falls into two categories: the collection or modeling of such data as climatological information, geological surveys, and hydrological data; and the collection of data to support the analysis of the ecosystems such as deer and fish populations, terrestrial and littoral flora species and populations, and so forth.

In some cases both types of information can be gathered in a coordinated effort. It is suggested that

the water quality sampling program outlined in Table S-2 be carried out in conjunction with sampling of fish species and population which should include a creel census, fish species enumeration (by electrofishing), young of year survey, species composition and condition factors.

The first three studies are of primary importance to the Impact Statement, while the last two are useful but not critical. However, since the last three studies could be completed with only a small additional amount of data recorded during the electrofishing, it seems feasible and desirable to carry out all five studies.

For terrestrial data, because estimates of deer and other species populations, normal carrying capacity, and actual hunter harvest are exceedingly difficult to obtain with reasonable degrees of confidence, it is suggested that the alteration of deer or other terrestrial or avian populations and their utilization be assessed by professionals experienced in the area. The assessment should indicate as explicitly as possible the techniques employed for quantification of the various parameters. If the new assessments of the most likely worst conditions do not indicate significant (to be determined) alterations of use or state (population), then further data refinement, verification and reassessment would not be warranted.

Table S-2

Water Quality Sampling

Parameter	Assessments* A	B	C	D	Sampling Category
Flow	X	X	X	X	1
Suspended Solids		X			1
Detritus (TOC, total and filtered)			X	X	1
Nutrients - Total N	X		X		1
- Total P**	X		X	X	1
Turbidity and Color	X	X			1
Total Dissolved Solids			X		1
Ionic Species			X		1 (-)
pH		X			2 cont.
Temperature		X			2 cont.
Dissolved Oxygen		X			2 cont.
Alkalinity		X			2 grab
Chlorophyll a	est.	X			2 grab

* Assessments A - impoundment trophic level, 2 methods

B - net 1^{o} productivity of tributaries

C - 2^{o} productivity and fishery yield of impoundment

D - Sedimentation characteristics, and possible nutrient source or sink in the impoundment.

** Total phosphorus should include identification of 3 species dissolved particulate bound and precipitationally introduced. These are rain collection samples.

Table S-2 (continued)

Sampling Categories:

1	weekly during high flows, monthly remainder of study.
1(-)	(ionic species) at least once high and low flows, to be determined by observation of similarities and variation.
2 cont.	36 hour "diurnal" instrumented.
2 grab	2 or more samples obtained during diurnal sample period.

Series A could be collected by touring crews from each station.

Series B requires about 3 days per site sample, a profile of 3 or more samples be taken from each station, so that conditions of high and low water can be estimated.

It is assumed that the Corps will complete most of these physical studies particularly those closely related to project design (such as temperature and water quality). The studies required include flow and temperature analyses, sediment and deposition studies, geological site analyses, and seismic studies. The most crucial of these are the flow and temperature regimes with and without the project. A number of these studies have already been initiated by the Corps* and information will be provided to contractors as it becomes available.

The collection of field data is also required to complete the physical environment and ecosystem analysis. Data collection is crucial to any impact statement; however, there are currently no rules of thumb for limiting such collection. There is a tendency to assume "the more, the better." In the meantime, priorities must be set to define data requirements. For the Dickey-Lincoln School project, the collection effort should focus on information that is useful in describing present conditions and in developing causal models for impact assessment.

Collection of some data, like the analyses suggested in the work tasks, can occur in stages. In many cases,

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* Specifically the Corps is undertaking the following programs: a) recording temperature and conductivity at three locations, b) periodic sedimentation sampling at Dickey and c) selective water quality parameters bi monthly at 10 locations in the upper Saint John Basin.

reconnaissance field studies can be carried out to determine whether detailed measurements appear critical or useful for required analyses or whether sites warranting further investigation (such as geological or archaeological) are located in the project area. If the reconnaissance work so indicates, further (and if need be, more detailed) studies can be made during the Impact Statement period. In some cases (particularly historical and archaeological data) collection can then proceed on a continuing basis after the Impact Statement is submitted and even during construction to obtain data of scientific value. Some data collection -- such as water quality parameters and fish species and population -- can be collected simultaneously with proper organization. Other studies -- such as creel census can be combined with studies on-going in the area such as user data being collected by the North Maine Woods.

It is assumed that these studies will be carried out by the contractor assigned to the analysis of the ecosystems or under direct supervision of the Corps.

The work packages required for the analysis of impacts on aquatic ecosystems are, briefly, as follows:

Work Package AE 1: Establish the environmental conditions without the project over time.

This work package involves describing the five reaches of the project (upper basin (UP) -- above the maximum pool level of the proposed Dickey Reservoir; Dickey Reservoir area (DR); Dickey littoral zone (DRL); Lincoln School area (LS); and Downstream as far as alteration of water quality and flow regime affect the ecosystem (DWN) quantitatively (where possible) in terms of: (1) fish species and abundance, habitat, shellfish, other invertebrates, and primary and secondary productivity; (2) current economic activities and their residuals as they affect the aquatic ecosystem including the implications of the implementation of Public Law 92-500 and other relevant state and national laws and possible trends; and (3) dissolved oxygen, fecal coliforms, chlorinated hydrocarbons, nutrients, and other water quality parameters. (Economic activities and trends should be consistent with those used in the social and economic analysis.)

From this description, projections of future aquatic ecosystem conditions should be carried out under two sets of assumptions used in the economic baseline projection: (1) extension of recent trends; and (2) more intensive forest management, agricultural practices, and recreation use.

Work Package AE 2: Estimate the future state of the aquatic ecosystems with the project over time.

For this work package, various degrees of sophistication in analysis will be called for. Initial analyses of impacts should assume the worst conditions appropriate to the reach and time period under consideration. For example, analysis of the long-term average impact of oil pollution in the Dickey impoundment might assume that all of the oil from a subdrainage area would be discharged into a relatively quiescent arm of the reservoir -- thereby maximizing the concentration in a section of the reservoir with minimum mixing. If the resulting analysis indicates minimal impact, no more extensive analysis would be required.

If a potentially significant impact were indicated or if the analytic uncertainty were too great, a more sophisticated approach (i.e., a model with greater spatial or temporal resolution and/or with a greater number of considered variables) would be necessary. This would include refinement of input estimates and other assumptions based on data collected in the sampling program.

Again, analysis is for the five time periods and five reaches.

Work Package AE 3: Compare the status of the aquatic ecosystems without and with the project to determine the significant positive and negative impacts.

The work packages for the terrestrial ecosystem are the following:

Work Package TE 1: Establish the existing terrestrial ecosystem conditions without the project over time.

The state of ecosystem conditions should be described for three areas (mainland habitat [MH]; periodically inundated zone [PI]; and island habitat [IH]) in terms of (1) vegetative cover, soil depth, surface slope, wildlife and waterfowl species and abundance, primary productivity, and secondary productivity and (2) current economic activities (especially forestry activities) and their residuals as they affect the terrestrial ecosystem, including the implementation of relevant state and national laws and probable trends in private management practice. (Economic activities and trends should be consistent with those used in the social and economic analysis.)

On the basis of this description, projections of terrestrial conditions should be carried out under two sets of

assumptions used in the economic baseline projection: (1) extension of recent trends and (2) intensive forest management, agricultural practices, and recreational use.

Work Package TE 2: Estimate the future state of the terrestrial ecosystem with the project over time.

Estimates should be made for the five time periods in the three identified terrestrial habitats. Consideration must be given to such project-induced effects as increased construction-related population and visitors; road relocations, materials transport and disposal; clearing schedule for removing vegetation; forage and edge effects. After construction, factors such as increased recreation and changed economic land use must be considered as well as the new environmental conditions which may prove beneficial to various wildlife and birdlife species.

Work Package TE 3: Compare the state of the terrestrial ecosystem areas during the various time periods with and without the project to determine positive and negative impacts.

Human Systems

The Scope of Work on the human systems affected by the project focuses on the social and economic structures of the local area, the state and the New England and international regions. As with the physical and biological systems,

a profile of current conditions and a forecast of the likely conditions in the future without the project are necessary as a point of comparison to with project conditions.

The local economic profile must be stated in terms of (1) the basic employment of the local area (the mix of agriculture and industry which provides the continuing basis for employment); (2) second level employment (the business and industry which support the basic employment sectors); (3) population (strongly influenced by employment and wages); (4) public services (all tax-provided services); and (5) private services (those provided by private entrepreneurs).

Forecasting the local economic profile over time will require consideration of two key areas -- forestry and tourism -- which are likely to have significant influence on the economic status of the area. Two possibilities should be used to make projections: continuation of current use of natural resources and more intensive use of the forestry and recreational resources.

The social profile of the local area should include information about the communities, families, institutions and culture of the Upper Saint John River Basin. Although not easy to "analyze," the description of these systems can provide a qualitative background for assessing the impacts of the proposed project on the local values, customs and

quality of life. This social profile can be compiled through an interview/survey process.

Work packages for analysis of impacts on human systems are, briefly, as follows:

Work Package SE 1: Establish the existing economic and social conditions of the project area without the project over time.

This work package involves a basic inventory of information on local population, employment, wages, public facilities and services, business, industry and the recreational and economic patterns of the area. Once the inventory and current trends are established, it is necessary to analyze the possible major changes of trends which are likely to occur in two areas: forestry and recreation. For forestry, possible new markets and technical improvements, damage of future crops by the spruce budworm, and the world-wide conditions influencing the forestry industry should be considered. In recreation, the value of the river in its free-flowing condition should be considered in light of a possible trend toward more intensive use of rivers (and relatively undisturbed areas) for recreation. Transportation and economic conditions are also related factors.

These intensive use scenarios for forestry and recreation use should be stated in terms of value of the resource and basic employment jobs produced in the local area.

This work package also involves documenting the social and cultural views of the basin residents and others who will be affected by the project.

The survey should seek opinions by geographic locality (local and by town, state and region) and by interest groups (farmers, workers, businessmen, officials, lumber industry, environmentalists, recreationists, etc.) on both the existing values held and attitudes about possible changes in traditional ways of life and values.

Work Package SE 2: Determine the social and economic conditions in the local area with the project over time.

This work package must take into account two major factors: the details of the construction schedule which will influence employment and population and the amount of preparation for the project undertaken by the local area with the help of the Corps of Engineers, state and federal officials and construction contractors.

Work Package SE 3: Assess the short-term and long-range social and economic impacts of the project in the local area by comparing without and with project conditions.

Work Package SE 4: Determine the social and economic impacts of the project on the state of Maine.

This work element requires assembling information on the economic conditions, employment, power supply, and recreational patterns of the state. From this base, projections of future patterns can be projected assuming both current and intensified levels of resource utilization. Using the information about the construction schedule of the project, the impact of the project on current conditions can be estimated and comparisons of with and without project conditions made.

Work Package SE 5: Estimate the impact of the project on the adjacent and downstream areas of Canada that would be affected by the project.

The package will require estimation of current conditions related to power generation, flood damage reduction and recreation in Canada. Factors such as the current capacity of

downstream Canadian hydropower plants, average annual flood damage, and recreational patterns of Canadians in Maine should be considered.

Work Package SE 6: Assess the impact of the project on the New England region.

On the New England regional level there are two major impacts to consider -- power and recreation.

The information required for this analysis includes the current generation capacity for power, the current use loads and growth rates for demand; the current trends in recreation use (such as the interest in free-flowing rivers and relatively undisturbed woodlands). These projections will need to be discussed descriptively as quantitative data may not present the complete picture, particularly in the area of social consequences.

In particular, the help of experts in New England archaeology, anthropology, history and other scientific areas (geology, in particular) must be sought to determine the probable impacts on the body of scientific knowledge of potential importance to the regional and national scientific communities. Refer to the existing state and federal laws and regulations on the preservation of historical sites and sites of informational or scientific value.

Alternatives to the Project

Dickey-Lincoln School provides a specific mix of benefits. There is an approximate order of importance: peaking power supplied to the New England power grid (of regional importance); flood damage reduction for some areas adjacent to the Saint John River in the U.S. and in Canada; base power (and some peaking) generally sufficient for local distribution; increased power potential for hydroelectric plants in Canada; and recreation on the reservoir. There is no feasible single-structure alternative to Dickey-Lincoln School that can provide generally the same mix of services to the same geographic constituency. The configuration of the Saint John Basin and the region appears to preclude an alternative multi-purpose project of the same character as Dickey-Lincoln School. Thus the analysis of alternatives to Dickey-Lincoln School involves alternatives or combinations thereof which will either substitute for specific outputs of the proposed project or achieve some other equilibrium position between supply and demand for those outputs.

The study of alternatives therefore falls into three major categories: alternatives for power, alternatives for flood damage reduction and alternatives for recreation.

For each of the three types of alternatives, the general analytical approach includes three steps. First, the present condition of the market or demand for each of the project outputs must be determined. Second, the future demand for each output must be forecast under two conditions: with trends continuing as they appear at the present time and with trends changed by likely shifts in consumer patterns (such as reduced demand for peak-load energy or increased recreational use of rivers). Third, the alternatives for a type of project output and with each other on the basis of their resource costs, environmental impacts, social and economic impacts and feasibility of implementation.

An alternative is viable only if it can be implemented. There are many complex institutional issues, costs, and combinations of technological, environmental and political factors that determine the feasibility of an alternative. For purposes of this study, a criterion for screening alternatives is their likelihood of implementation based on environmental, technical, political and economic factors. In the case of alternatives for project output particularly, it is important to note that not all of the options (e.g., for reducing demand or supplying energy to meet the load curve) require the same level of analysis since some of the options are technically less attractive, involve exorbitant costs, require long lead times to implement or require

considerable adjustments on the part of a large portion of the population. In general, each alternative, or combination of alternatives, must be examined for the impacts considered for Dickey-Lincoln School, though at a lesser level of detail, to provide a basis for comparison and decision-making.

The alternatives to the power supplied by Dickey-Lincoln School include peaking sources, baseload sources, and demand reduction measures. The power that would be supplied by Dickey-Lincoln School would feed into the complex grid of the New England Power Pool (NEPOOL). No one component of the NEPOOL grid can be successfully analyzed in isolation because a combination of power supply sources and market factors determine what particular array of NEPOOL contributors is used to meet the demand curve. If one supply becomes disfunctional (such as a nuclear plant shut down for inspection) or too high priced (oil fired units), the system can adjust by drawing more heavily on another. Thus, the analysis of alternatives to energy supplied by the Dickey-Lincoln School project must, to a limited extent, consider some of the likely new sources of baseload power which could shift existing, less efficient supplies into the peaking position that would be contributed by Dickey-Lincoln School. The environmental, social and economic impacts of these sources should be compared to those of activating Dickey-Lincoln

School in the peaking position even though the comparison cannot be detailed because the possible sources cannot be site-specific.

Because the project has a relatively long life, it is also necessary to consider some potential alternatives which may not yet be widely installed or implemented. Among those options are the following:

-- combined cycle gas turbine and steam generating plants; recovering up to 40 percent of the heat loss in burning;

-- compressed air storage for peaking;

-- advanced cycle gas turbines;

-- total energy systems integrating power generation with heating/cooling systems;

-- solid waste burning;

-- fuel cells; and

-- tidal power.

All of these possible sources of energy would provide peaking power except for the combustion of solid waste which can provide baseload power for areas with sufficient waste supply.

The other major but widely accepted peaking possibility is pumped storage for which a survey of likely New England sites exists.

At this point in time, solar (including wind) generation of electricity appears to be a more distant possibility for which the technology is not well-defined or tested.

By the same token, the foreseeable economics and technology for conversion of waste wood to methanol do not indicate a major supply source.

Measures to reduce demand for peaking power, which also must be included in the analysis of alternatives, are of two basic types: economic constraints such as peak load pricing; and general load reduction by such devices as restriction of power supplied, a widespread use of alternative energy inputs (solar heating or wind power) on local levels.

The principal short-term option for reducing demand is a rate increase -- either a simple increase across the board with the existing rate structure essentially intact (declining rate structure) or a rate schedule structured to be horizontal or increasing.* This means not only eliminating any promotional rates, such as for electric space heating, but also in effect charging more for the marginal unit of use than for the initial kilowatt-hours.

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* The incidence of these options or the question of who bears the burden of rate changes should not be overlooked in examining the alternatives. However, the analysis of alternatives must describe the effects of various options so that decisions can be made in other chambers.

It is of special importance -- bearing in mind that Dickey-Lincoln School is primarily a peaking power plant -- that the analysis consider also the effect of price structure designed to discourage the use of power at peak times. A great deal of discretionary load could be either eliminated or shifted into the off-peak period if the economic incentive were sufficient to justify the capital cost that this would entail (on the part of the electricity users).

It is likely that the energy conservation efforts that the society has undertaken over the past year or two are far smaller in scope than what could eventually be realized. The longer term in this case means primarily that period of time which it takes electricity users to respond to the higher prices. It would include the period needed to install additional insulation, convert electric resistance heaters to heat-pumps, and replace incandescent lights with flourescent. Eventually, solar hot-water and space heaters and solar air-conditioning may well compete with electricity. Therefore, the analysis must make specific reference to the timed changes imposed by this alternative.

There are three major alternatives for flood damage reduction. A flood control reservoir at the Dickey or Lincoln School sites or a series of smaller reservoirs along the Saint

John River could provide protection from flooding. A second option is to construct levees or dikes. A third is to remove structures subject to damage from the flood plain. The first alternative is likely to be expensive and to have impacts quite similar to the proposed project. A dike system would provide only partial protection and could have the negative side-effect of encouraging greater development in the flood plain. The third possible alternative can be disruptive socially, but the long-run impacts both economically and environmentally are likely to be positive.

Recreational alternatives are simply to improve access to the river and to expand existing recreation areas. The most difficult aspect of this analysis is forecasting demand for various recreational alternatives. Demand for wilderness fishing and canoeing versus lake-water recreation will be dependent on a wide range of factors from ability to pay to reach remote sites, geographic location of population, personal preference and publicity to general economic conditions.

The work packages for analyses of alternatives are briefly summarized as follows:

Work Package ALT 1 Identify the basic assumptions which will guide the analysis of alternatives and decide on the framework for the analysis.

This work stage will require the review of available models and analytic frameworks appropriate for this study. It is important that the methodology emphasize the distinction between identifying alternatives and ranking them. Great care must be taken in choosing models, and their underlying assumptions and simplifications must be thoroughly understood and delineated. This stage also includes obtaining the current load forecast for the NEPOOL system and northern Maine.

Work Package ALT 2 Determine the least-cost combination of alternatives which will meet the NEPOOL forecast in the absence of Dickey-Lincoln School.

This phase of the analysis involves determining the costs of the various alternative sources of energy (both short- and long-term, conventional and non-conventional, base and peak load). For each alternative the costs, environmental impacts and implementation feasbility should be considered to determine the cost-minimizing combinations to meet the load forecast.

Work Package ALT 3 Determine the sensitivity of the load forecast to various alternatives for

demand reduction; modify the forecast to account for possible changes in demand in order to assess the viability of Dickey-Lincoln School and the stability of the least-cost mix of alternatives in terms of the new forecast.

This work package requires examination of the possible control measures which could influence the reference forecast and development of a modified forecast to reflect varying demand patterns. It is important how the evaluation of Dickey-Lincoln School and alternatives to it accounts for those demand control measures which are seen by many concerned citizens as alternatives to the construction of major centralized power facilities.

If indicated, a new least-cost option may have to be developed.

Work Package ALT 4 Develop, evaluate and compare environmental and social and economic costs and impacts of power generating alternatives with and without Dickey-Lincoln School.

Work Package ALT 5 Develop, evaluate and compare alternatives for flood damage reduction.

This work package involves ascertaining the current damage potential in flood plains below the project and projecting the future damage potential if current development trends continue. The impacts of the three main types of flood damage reduction measures should be compared to the impacts of Dickey-Lincoln School.

Work Package ALT 6 Develop, evaluate and compare alternatives for recreation.

For this work package it is necessary to determine the present recreation use of the area and project use under two conditions: continuation of present trends, and increased demand for low density outdoor recreation. The use of the free-flowing, including increased access to and development of it, and of other nearby water recreation sites should be considered primary alternatives.

Public Involvement

The final section of Volume One is a discussion of the value and means of involving the public throughout the Impact Statement process. Because the Dickey-Lincoln School project was interrupted for nearly seven years, it is in a peculiar stage of its planning and design. The lag in time requires major updating of previous design and data; yet much of the design work was never completed and so must first be finalized. This state of affairs makes a public involvement program all the more important to facilitate the process of informing the public about the changing status of the project work. Likewise, because so much revision is on-going, it is possible to make more substantial use of citizen ideas and inputs to the project.

Citizen views, attitudes, values and concerns are also important to assessing the impacts of the project. In some cases, the views of citizens are the only tool with which quantitative measures of forecasted change can be given relative weightings. These views can serve as "sign posts" to alert the Corps to questions it needs to answer for concerned citizens.

For a public involvement process to work, it must be accessible, flexible and adaptive to varying needs. Some citizens have the interest and time to be involved on a frequent and substantive basis. Others are only able to attend public hearings and still others, perhaps a majority, participate only insofar as they receive information via the media. Attitudes also differ; some citizens cannot or will not put aside their biases about a project while others come prepared to offer constructive ideas as well as to listen and learn. It follows that any participation structure must include mechanisms to speak to and hear all these people, whatever their persuasion.

Four key mechanisms for reaching the broadest possible public include the following: a Citizens Advisory Committee (CAC), "response shops" and other ways to facilitate communication among parties, Corps public hearings, and a coordinated media program. No one element is sufficient in and of itself and none are mutually exclusive. Neither are these approaches intended to exclude additional approaches to public involvement.

A CAC would serve two purposes: first, to insure that groups who have demonstrated an interest in the project are represented during the process of Impact Statement preparation,

and second, to provide a "distant early warning" system for identifying issues requiring special attention.

The CAC members should include a representative collection of people from the basin, concerned state agencies, Maine and regional conservation groups, local planning groups, and the academic system of the state. Representatives of private business and industry might also be included.

Because the CAC can include only a limited number of people from each area impacted by the project and because people in different places are concerned about a variety of different issues, response shops are a good approach for public involvement. These are particularly important to residents of areas local to the site who are disinclined to speak their minds through the media or in large public meetings. Response shops should be designed so that the Corps and its technical contractors can be directly responsive to the questions of local people, and can subsequently incorporate the feedback they receive into their work.

A third mechanism is the public meetings which the Corps is required to hold during the Impact Statement process. Care to direct the information provided to the particular interests of different locations and to insure that the information is the most current possible should

help these meetings overcome some of the inherent shortcomings of large public presentations.

A variety of media channels can be used to reach the broadest possible audience locally, regionally and nationally (i.e., Washington, D.C.). The coordinated media program could provide the broad-based coverage which a newsletter or other one-dimensional approach could not match.

On-going newspaper, radio and television coverage should include the schedules, times, places and topics of all public meetings; findings of contractors as they complete phases of their work; discussions of issues from opposing points of view; notes from response shops and reports from advisory committee meetings and public hearings; and answers to reader and audience questions.

The information provided to media coordinators should be well-written, devoid of obscuring jargon or technical language, and varied to reach different audiences.

To carry out the program of two-way communication between the Corps and the various groups and individuals who are interested in the preparation of the Impact Statement on Dickey-Lincoln School, the team for the Impact Statement could include a public involvement staff empowered to

function as a "zipper" -- to bring together the technicians and the public, to interact between them in ways that facilitate understanding and communication, to help knit together the ideas, concerns and technical data that will go into the environmental and social and economic assessment.

To carry out its liaison role, this zipper group would be expected to develop and maintain working relationships with a wide variety of public and private interested parties concerned with the Dickey-lincoln School project. The staff should be able to communicate the concerns of these groups to the technical contractors and the Corps.

To facilitate information-sharing among the various contractors and the public, the public involvement staff could coordinate regular meetings with the technical contractors to keep current on the available data. The public involvement staff must be committed to intensive contact with people -- both formally and informally -- throughout the Impact Statement process.

The coordination of the possible public involvement activities is schematically represented in Figure S-4. The media program would be continuous as needed. The response shops and meetings of the Citizens Advisory Committee would be periodic, frequent enough to keep the committee informed on contractor progress and the public

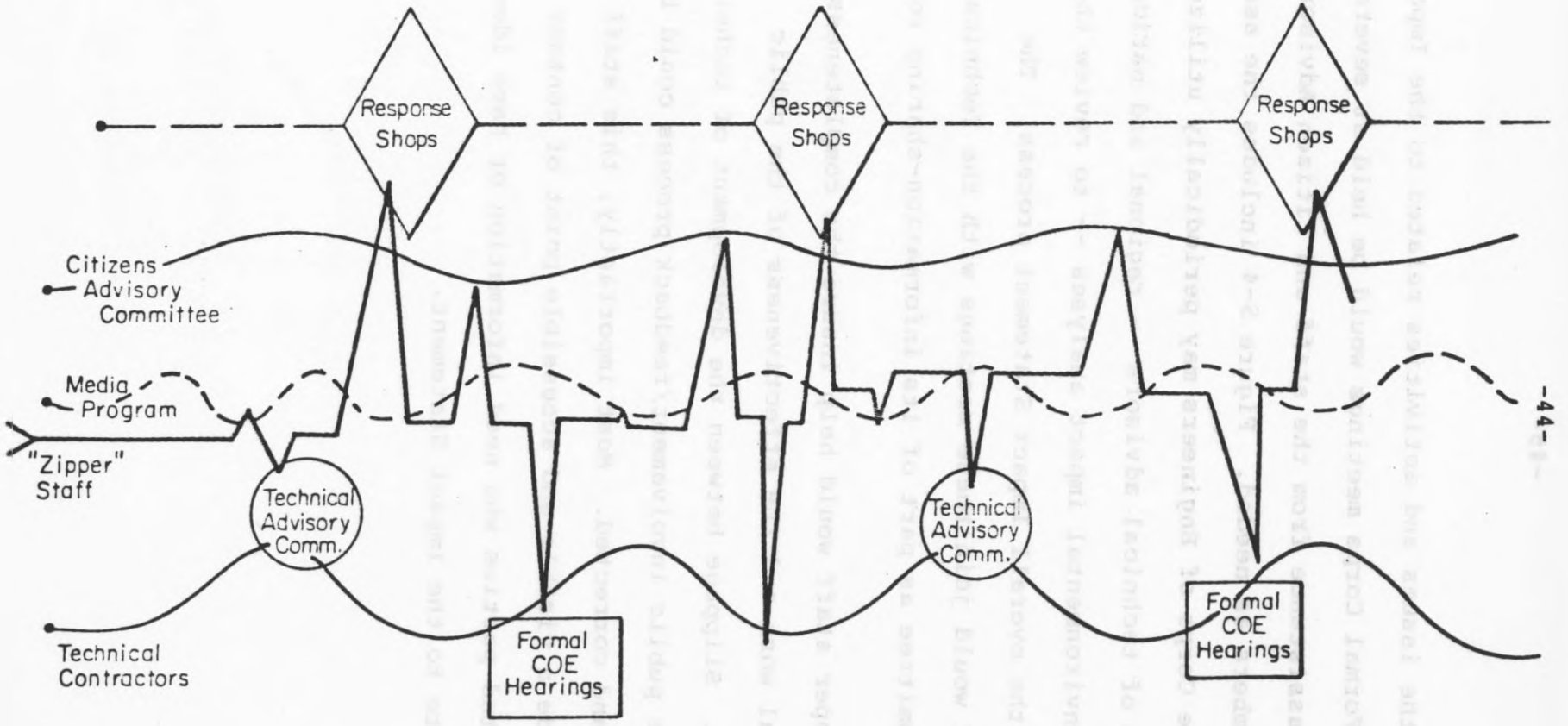

Figure S-4

Coordination of Public Involvement

informed on the issues and activities related to the Impact Statement. Formal Corps meetings would be held at several points with assistance from the staff and Citizen Advisory Committee members as needed. Figure S-4 includes the assumption that the Corps of Engineers may periodically utilize a small team of technical advisors -- regional and national experts on environmental impact analyses -- to review the progress of the overall Impact Statement process. The zipper staff would join these meetings with the Technical Advisory Committee as part of its information-sharing role.

The zipper staff would help insure the completeness of the technical work and the effectiveness of the public involvement. Slippage between the development of technical work and the public involvement/feedback process could be identified and corrected. Most importantly, this staff would provide a visible and accessible point of contact for all interested parties who need information or have ideas to contribute to the Impact Statement.