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United States Department of Energy

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ENVIRONMENTAL IMPACT STATEMENT
DICKEY-LINCOLN SCHOOL LAKES TRANSMISSION PROJECT
MAINE, NEW HAMPSHIRE AND VERMONT

U.S. Department of Energy
Federal Building
Bangor, Maine 04401

March 1978

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ENVIRONMENTAL IMPACT STATEMENT

DICKEY-LINCOLN SCHOOL LAKES TRANSMISSION PROJECT

Prepared by

U.S. Department of Energy
Federal Office Building
Bangor, Maine 04401

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Summary

Maine Historic Preservation Commission
New Hampshire Division of Historic Preservation
Vermont Division of Historic Preservation

Androscoggin Regional Planning Commission, ME.
North Kennebec Regional Planning Commission, ME.
Northern Maine Regional Planning Commissions, ME.
Penobscot Valley Regional Planning Commission, ME.
North Country Council, N.H.
Central Vermont Planning Commission, VT.
Chittenden County Regional Planning Commission, VT.
Northeast Vermont Development Association, VT.

<u>NOTE</u>: The eight Regional Planning Commissions above act as area-wide A-95 Coordinators. As such, they forward requests for comments to appropriate towns and local agencies and coordinate Draft EIS review. All organized towns along the alternative routes are included in this review process.

Boise Cascade Corp., Rumford, ME.
Brown Paper Company, Berlin, N.H.
Dead River Company, Bangor, ME.
Diamond International Corp., Old Town, ME.
Dunn Heirs, Ashland, ME.
G. Pierce Webber, Bangor, ME.
Georgia Pacific Corp., Woodland, ME.
Great Northern Paper Co., Millinocket, ME.
J.M. Huber Corp., Old Town, ME.
International Paper Co., Jay, ME.
St. Regis Paper Co., Bucksport, ME.
Scott Paper Co., Winslow, ME.
Seven Islands Land Co., Bangor, ME.
James W. Sewall Company, Old Town, ME.

Associated General Contractors of Maine

Business & Industry Association of New Hampshire
Carpenter's Local 621, Brewer, ME.
Economic Resources Council, ME.
Industrial Development Council of Maine
International Brotherhood of Electrical Workers, MA.
Maine AFL-CIO
Maine Electric Cooperative Association
Maine Citizens for Dickey-Lincoln
Maine State Chamber of Commerce, Portland, ME.
Valley Residents Against Dickey-Lincoln, Ft. Kent, ME.
Vermont State Chamber of Commerce

A-95 Coordinator, Boston, MA.
American Rivers Conservation Council, D.C.

Maine Association of Conservation Commissions
Maine Forest Products Council, ME.
Massachusetts Water Pollution Control
New England Governor's Conference, MA.
New England Regional Commission, MA.
New England River Basins Commission, MA.
New Hampshire Association of Conservation Commissions
Office of Legislative Research, Hartford, Conn.
Society of American Foresters, ME.

American Association of University Women, ME.
Audubon Society of Maine
Audubon Society of New Hampshire
Appalachian Mountain Club, MA.
Bates Outing Club, ME.
Colby Environmental Council, ME.
Connecticut River Watershed Council
Conservation Law Foundation of New England, MA
Conservation Society of Vermont
Friends of the St. John, MA.
Institute of Natural and Environmental Resources,
Univ. of N.H., Durham, N.H.
Garden Club Federation, ME.

Green Mountain Club, VT.
Land Use Foundation of New Hampshire
Land & Waters Resources Institute, UM-Orono, ME.
League of Women Voters, ME.
Midcoast Audubon Society, ME.
National Audubon Society, Inc., Washington, D.C.
National Wildlife Federation, Bar Harbor, ME.
Nature Conservancy, MA.
Nature Conservancy, N.H.
Natural Resources Council of Maine
Natural Resources Council of Vermont
New England Natural Resources Center, MA.
New Hampshire Wildlife Federation, N.H.
Penobscot Paddle & Chowder Society, ME.
Sierra Club, MA
Society for Protection of New Hampshire Forests
SPACE: Statewide Program to Conserve Our Environment, N.H.
Sportsman Alliance, Gardiner, ME.
Sunkhaze Chapter of Trout Unlimited, Bangor, ME.

Bangor Hydroelectric Company
Boston Edison Company, MA.
Central Maine Power Company
Eastern Maine Electric Coop.
Eastern Utilities Associates Service Corporation, MA.
Fitchburg Gas and Electric Light Co., MA.
Green Mountain Power Corp., VT.

Maine Public Service Company
Massachusetts Municipal Wholesale Electric Company, MA.
Municipal Electric Association of Vermont
New England Electric Gas and Electric Associates, MA.
New England Electric Service, MA. (NEES)
New England Power Planning, MA.
Newport Electric Corporation, R.I.
Northeast Public Power Association, MA.
Northeast Utilities Service Co., Conn (NESCO)
Public Service Co. of New Hampshire
United Illuminating Company, New Haven Conn. (EUA)
Vermont Electric Power Company

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Preface

PREFACE

This draft environmental impact statement (EIS) will describe the environmental impacts of transmission plans of the Department of Energy (DOE) for the proposed Dickey-Lincoln School Lakes Project. Electric power produced by the project is to be integrated into the New England electric system if the project is constructed.

The preparation of this draft EIS originated in the Department of the Interior and was transferred to the newly created Department of Energy on October 1, 1977.

A draft EIS for the project, including the dams, powerhouses, reservoirs, dikes, etc., has been completed by the U.S. Army Corps of Engineers and filed with the Council on Environmental Quality. The Corps' draft statement and this EIS will be combined into a single, joint final EIS for the project and the associated transmission facilities. The final EIS is to be filed with EPA in August 1978. The Corps' draft EIS is supported by 10 appendices. Copies of the Corps' draft and its appendices have been distributed throughout the six New England states and may be read at designated repositories.

Copies of this draft EIS on transmission facilities associated with the project, together with its 10 appendices, have been placed in the same repositories as well as in repositories in several other communities where the impacts are of interest. These places include:

REPOSITORIES

Connecticut

Hartford	State Library
Storrs	University of Connecticut

Maine

Allagash	Town Hall
Ashland	Town Council
Auburn	Androscoggin Regional Planning Commission
Augusta	Natural Resources Council
Augusta	State House Law and Legislative Library
Bangor	Department of Energy - Federal Office Building
Bangor	Penobscot Valley Regional Planning Comm.
Bangor	Public Library
Biddeford	McArthur Public Library
Brunswick	Bowdoin College - Longfellow Library
Caribou	Northern Maine Regional Planning Commission
Castine	Maine Maritime Academy - Nutting Memorial Library
Farmington	University of Maine
Fort Kent	Chamber of Commerce
Fort Kent	University of Maine
Jackman	Town Hall

Lewiston	Bates College
Machias	University of Maine -Merrill Library
Madawaska	First Selectman
Orono	University of Maine - Raymond H. Fogle Library
Portland	Portland Public Library
Portland	University of Maine - Documents Department
Portland	University of Maine - Law Library
Portland	University of Maine - Acquistions Librarian
Portland	University of Maine - Center of Research - Advanced Study
Presque Isle	University of Maine
Springvale	Nasson College - Anderson Learning Center Library
St. Francis	First Selectman
Unity	Unity College
Waterville	Colby College - Miller Library
Waterville	Public Library
Winslow	North Kennebec Regional Planning Commission

Massachusetts

Amherst	University of Massachusetts
Boston	Boston Public Library
Boston	Department of Energy
Boston	State Library - Fingold Library
Cambridge	Harvard Graduate School of Design - Gund Hall
Cambridge	Harvard - Widener Library
Cambridge	Massachusetts Institute of Technology
Chestnut Hill	Boston College, Babst Library
Lowell	University of Lowell - Alumni Memorial Library
Waltham	Brandeis University - Goldfarb Library
Waltham	U.S. Army Corps of Engineers
Worcester	Worcester Polytechnical Institute - Gordon Library

New Hampshire

Concord	State Library
Durham	University of New Hampshire - Ezekiel W. Dimond Library
Franconia	North Country Council
Groveton	Public Library
Hanover	Dartmouth College - Baker Library
Hudson	Hills Memorial Library
Manchester	City Library

Rhode Island

Kingston	University of Rhode Island
Providence	Brown University
Providence	State Library

Vermont

Burlington	University of Vermont - Guy W. Bailey Memorial Library
Essex Junction	Chittenden County Regional Planning Commission
Montpelier	Central Vermont Regional Planning Commission

Montpelier	State Library
Montpelier	Vermont Free Library
South Royalton	Vermont Law School
St. Johnsbury	Northeast Vermont Development Association
St. Johnsbury	St. Johnsbury Athenaem

Individual appendices for this environmental impact statement are available in limited quantities on a need-to-know basis. They may be obtained by written request to:

Larry Wilkerson
Assistant Project Manager
Department of Energy
Federal Office Building, Room 209
Bangor, Maine 04401

Section 1

Description of the Proposal

1.0 DESCRIPTION OF THE PROPOSAL

1.01 Introduction

1.01.1 Authority

The Flood Control Act of 1944 assigned the authority and responsibility for marketing and transmission of electric power generated at Federal hydroelectric projects to the Department of the Interior (DOI). This authority was transferred to the Department of Energy (DOE) by the legislation which established the new department. It became effective October 1, 1977. Power generated at the Dickey-Lincoln School Lakes Project would be marketed under the basic power marketing guidelines set forth in section 5 of the Flood Control Act of 1944 (16 U.S.C. 1970 ed. sec. 825s). It provides that:

> "Electric power and energy generated at reservoir projects under the control of the Department of the Army and in the opinion of the Secretary of the Army not required in the operation of such projects shall be delivered to the Secretary of the Interior, who shall transmit and dispose of such power and energy in such manner as to encourage the most widespread use thereof at the lowest possible rates to consumers consistent with sound business principles, the rate schedules to become effective upon confirmation and approval by the Federal Power Commission. Rate schedules shall be drawn having regard to the recovery (upon the basis of the application of such rate schedules to the capacity of the electric facilities of the projects) of the cost of producing and transmitting such electric energy, including the amortization of the capital investment allocated to power over a reasonable period of years. Preference in the sale of such power and energy shall be given to public bodies and cooperatives. The Secretary of the Interior is authorized, from funds to be appropriated by the Congress, to construct or acquire, by purchase or other agreement, only such transmission lines and related facilities as may be necessary in order to make the power and energy generated at said projects available in wholesale quantities for sale on fair and reasonable terms and conditions to facilities owned by the Federal Government, public bodies, cooperatives, and privately owned companies. All moneys received from such sales shall be deposited in the Treasury of the United States as miscellaneous receipts." (Dec. 22, 1944, Ch. 665 5, 58, Stat. 890.)

The Congress authorized the Dickey-Lincoln School Lakes Project in the 1965 Flood Control Act, Public Law 89-298. President Lyndon B. Johnson signed the Act into law. It became effective October 27, 1965, and the DOI assumed responsibilities for planning for the marketing and transmission of power from the project.

Congress did not appropriate funds for the project in 1967, and very little planning was done for several years. Activity was limited to periodically updating the project benefits and costs based on cost index changes. Congress provided new funds for preconstruction planning after the "oil crisis" of 1973-74. Detailed studies have since been conducted.

Revised costs, benefits, and project design related to power are covered in Design Memorandum No. 3, "Hydropower Capacity and Project Economics," prepared by the New England Division, Corps of Engineers. Costs and benefits were further updated to reflect price levels as of March 1977. (Draft EIS, Dickey-Lincoln School Lakes, Corps of Engineers, August 1977.)

1.01.2 Background

When the Dickey-Lincoln School Lakes Project was first proposed it was linked closely with a large tidal project on Passamaquoddy Bay. Tides on the bay, a 30-mile long inlet on the U.S.-Canadian border between Maine and New Brunswick, have an average range of 18.1 feet. Engineers began to look into the feasibility of harnessing these tides to generate electricity about 1919. Later, they included hydroelectric projects on the St. John River in their overall plans. The river flows through both countries and empties into the Atlantic Ocean, north of the bay.

Among the dam sites studied on the river were the Dickey Dam and the Lincoln School Dam sites. They were considered as one project since Lincoln School Dam was to be built to reregulate flows released upstream by Dickey Dam, the larger of the two structures.

In the years that followed, a lot of planning and even some construction work was done on the tidal project. But in 1961, after a three year study, the International Joint Commission concluded that the tidal and St. John River projects were not economically feasible.

President John F. Kennedy asked that these findings be reviewed in the light of new engineering techniques and a different use concept for the power. A study committee completed an evaluation in August 1964, and in a report submitted to the Secretary of Interior, recommended early construction of the tidal project and dams on the Upper St. John River.

The Secretary noted that of several dams proposed for the river the Dickey-Lincoln School Lakes Project was preferable. Subsequent to 1964, a review was made to update the power benefits. The power rates had decreased due to larger, more economical developments by the power industries since the earlier analyses.

In a report dated July 9, 1965, which the Secretary of the Interior submitted to President Lyndon Johnson, the benefits-to-cost ratio for the Passamaquoddy tidal project was shown to be below unity (.86 to 1). The ratio for the Dickey-Lincoln School Lakes Project was 1.81 to 1. As a result, the Congress authorized the Dickey-Lincoln School Lakes Project under the Flood Control Act, Public Law 89-298, dated October 27, 1965. It did not authorize the tidal project.

1.01.3 Description of the Dickey-Lincoln School Lakes Project

The main purpose of the Dickey-Lincoln School Lakes Project is to generate electricity to meet future needs of New England consumers. The project would be financed by the Federal Government. It is located in northern Aroostook County in the St. John River Valley near the Canadian border.

The St. John River Basin has an area of 21,600 square miles, 7,400 square miles of which are in Maine. The balance of the basin lies in Quebec and New Brunswick, Canada. Downstream from the project site, beyond the confluence of the St. John and St. Francis rivers, the St. John River becomes the International Boundary. The main stream enters Canada near Grand Falls, New Brunswick, and flows through that Province to the sea. Seasonal flows of the river vary widely. Melt from winter snows cause large flows in April, May, and June. Minimum flows occur in July, August, and September and in January and February.

The annual spring runoff of the river would be captured in a large reservoir behind a dam located near the village of Dickey. The power plant at Dickey would be capable of generating about 1183 million kilowatt-hours (1183 GWH) of electricity annually (excluding pumped storage). Dickey Dam would be operated principally as a peaking plant. A peaking power plant is designed to operate for short periods of time, at high capacity, to meet critical daily peak demands. The power would be melded into the load resource curves of the New England Power Pool System for maximum benefits. Dickey Dam would release large surges of water through the turbines for relatively short periods of time. Lincoln School Dam would impound the releases from Dickey Dam, smoothing out the fluctuations of flows caused by the peaking operations at Dickey, and thus reregulate the river downstream. Lincoln School also would generate electricity. It could supply about 262 GWH annually.

Water releases from the Lincoln School Reservoir would increase generation capability at three dams in New Brunswick--at Grand Falls, Beechwood, and Mactaquac. Negotiations with Canada would result in benefits that would accrue to the project from the additional energy generated at the Canadian projects as a result of coordinated operation. It has been estimated that 175 GWH of the additional energy generated downstream would be available to the U.S. on an average annual basis. It would be marketed with the energy generated at the Dickey-Lincoln School sites.

The Dickey-Lincoln School Lakes Project would also reduce the threat of floods to the St. John River valley during the spring snowmelt. In recent years, floods along the river have caused extensive damage to Maine and New Brunswick communities.

The natural environment and the social and economic character of the immediate area around the project would be impacted. These impacts are discussed in the separate EIS written for the project by the New England Division of the Corps of Engineers.

The site of Dickey Dam on the St. John River is just above its confluence with the Allagash River, some 28 miles from Fort Kent, Maine. As authorized, the structure would impound a reservoir with a storage capacity of 7.7 million acre-feet for power, flood control, and recreation.

Dickey Dam would be an earthfill dam 10,200 feet long rising 335 feet above streambed. The reservoir water area would extend upstream into the Province of Quebec and total 134.4 square miles (86,000 acres) at a maximum pool elevation of 910 feet, above mean sea level.

The power facilities at Dickey would include four generating units rated at 190 megawatts (MW) each. One of these would be a reversible unit, that is, its turbine could be reversed and used to pump water from the lower reservoir behind Lincoln School Dam into the upper reservoir behind Dickey Dam during off-peak periods. This water would then be released later to help supply needs during periods of peak demand. The power facilities would be constructed so that two more reversible units of 190 MW each could be installed later. The installation of these additional units would depend on future power demands, Congressional authorization, and an adequate supply of off-peak energy for pumping.

Lincoln School Dam would be located on the St. John River 11 miles downstream from Dickey. It is to be an earthfill structure impounding a usable storage capacity of 32,450 acre-feet. The tailwater of Lincoln School Dam will extend upstream to Dickey Dam and 2 miles up the Allagash River. At the authorized level of generation at Dickey, the maximum pool elevation at Lincoln School would be 612 feet and the pool area 2,240 acres.

Lincoln School Dam would be 2,100 feet long. Its power facilities would consist of two units with a capacity of 30 MW each and one unit with a capacity of 10 MW. These generators would be operated to produce both peak and intermediate load factor power.

Planning studies for the project have addressed two levels of development. The project is authorized to have an installed capacity of 760 MW at Dickey and 70 MW at Lincoln School for a total nameplate capacity of 830 MW.

Hydroelectric units, such as those planned for this project, usually have an overload capability. Thus the overload ratings for the generators would be about 874 MW at Dickey and 80 MW at Lincoln School for a total of 954 MW of peaking capability.

Ultimate development of the project would call for installation of an additional 380 MW of pumped-storage capacity at Dickey Dam. The additional 380 MW of pumped-storage capability could be added when justified by power demands and the availability of sufficient low cost pumping energy. The planners now expect that these two units would be added between 1995 and the year 2000.

This ultimate development would increase the nameplate rating at Dickey to 1,140 MW and the project total to 1,210 MW. The overload rating for Dickey would be 1,311 MW for a total project peaking capability of 1,391 MW. Development of the project to the ultimate level would increase the peaking capability of the project.

1.01.4 Repayment of Transmission Costs

A DOI/DOE analysis has determined that revenues from the sale of power produced by the Dickey-Lincoln School Lakes Project will be sufficient to repay all costs allocated to the production and distribution of the power. This included interest on and the amortization of capitol costs for the project and the associated transmission facilities. The marketing arrangements would be consistent with section 5 of the Flood Control Act of 1944. Details of the analysis may be found in the Corps of Engineers' EIS.

Annual project costs for economic analysis are based on an interest rate of 3 1/4 percent, and a power repayment period of 50 years in accordance with existing Federal requirements. However, the Corps of Engineers has made additional analyses at an interest rate 6 3/8 percent which demonstrate that the project still has economic feasibility under these higher rates. These analyses are discussed in the Corps' EIS.

The studies have assumed that the earliest the Dickey-Lincoln School Lakes project could be completed is 1986. The power repayment period is set at 50 years. However, the project, like others of its type, is expected to continue to operate and generate power for 100 years or even longer.

1.02 Study Methodology

A phased approach was used to identify elements of the proposed action. This approach was designed to systematically narrow the focus of investigations and identify a solution which was adequate from an engineering standpoint and one which would have the least environmental impact. Figure 1.02-1 illustrates the three study phases which preceded the preparation of this EIS.

1.02.1 Phase I - System Planning Studies

Phase I officially began in 1975. It drew heavily on earlier work. This work included a 1974 preliminary system planning study. The study was prepared by the Dickey-Lincoln School Study Working Group of the New England Planning Committee, the planning organization of the New England Power Pool (NEPOOL). The working group consisted of members of the permanent staff of the Committee and the Committee's utility members. The 1974 report examined transmission requirements and the feasibility of the Dickey-Lincoln School Lakes Project at the level authorized then--830 MW without pumped storage facilities. The report concluded the project output as then conceived could be effectively coordinated with and integrated into the New England system by the mid-1980's.

In 1976, electrical engineers of the DOI, working closely with the New England utilities, completed a new technical study on how to integrate the power from the project while maintaining the stability and reliability of the system. The work of these engineers constituted a traditional system planning study. It identified five alternative plans of service, (Plans A-E) each with its own set of transmission lines and substation facilities. Each plan would adequately integrate the output of the project into the power pool (see figures 8.03-4 thru 8.03-8, Section 8).

The results and recommendations of these studies, based on load flow, stability, and cost analyses, are presented in the report, "Transmission System Planning Study," dated February, 1977 (Appendix A). This study assumed that NEPEX would control the project and dispatch the power, for maximum benefits in meeting the loads of the New England region.

When the studies were resumed in 1976 it was assumed that the Dickey-Lincoln School Lakes project would be completed by 1986. The study was based on projected loads, generation, and transmission facilities that were expected to exist on that date. Load projections have since been adjusted downward. The load estimate used in the system study is now more representative of the load level expected to exist in the 1990-91 period.

Based only on engineering and economic considerations, the study recommended the fifth alternative plan of service, Plan E. The study recognized that the final selection of a "best" plan of service must also consider environmental and field reconnaisance studies.

It is important to note that the electrical plans of service do not commit the sale of power to specific locations. For example, a review of the three western plans presented below might imply that the total power output would be sold in the States of New Hampshire and Vermont. This is not the case. Rather, these plans represent entry points to the then existing backbone New England power grid system which, in turn, provides delivery capability to areas throughout New England. The plans are designed to be part of--and satisfy the requirements of--the integrated New England transmission system. Facilities in each plan satisfy a number of transmission requirements including integration requirements, system load carrying capabilities, shifts of generation between plants, steady state and transient stability, and reliability of the New England power system.

Plan E is described in section 1.03.1. The four system alternatives are discussed in section 8 of this statement.

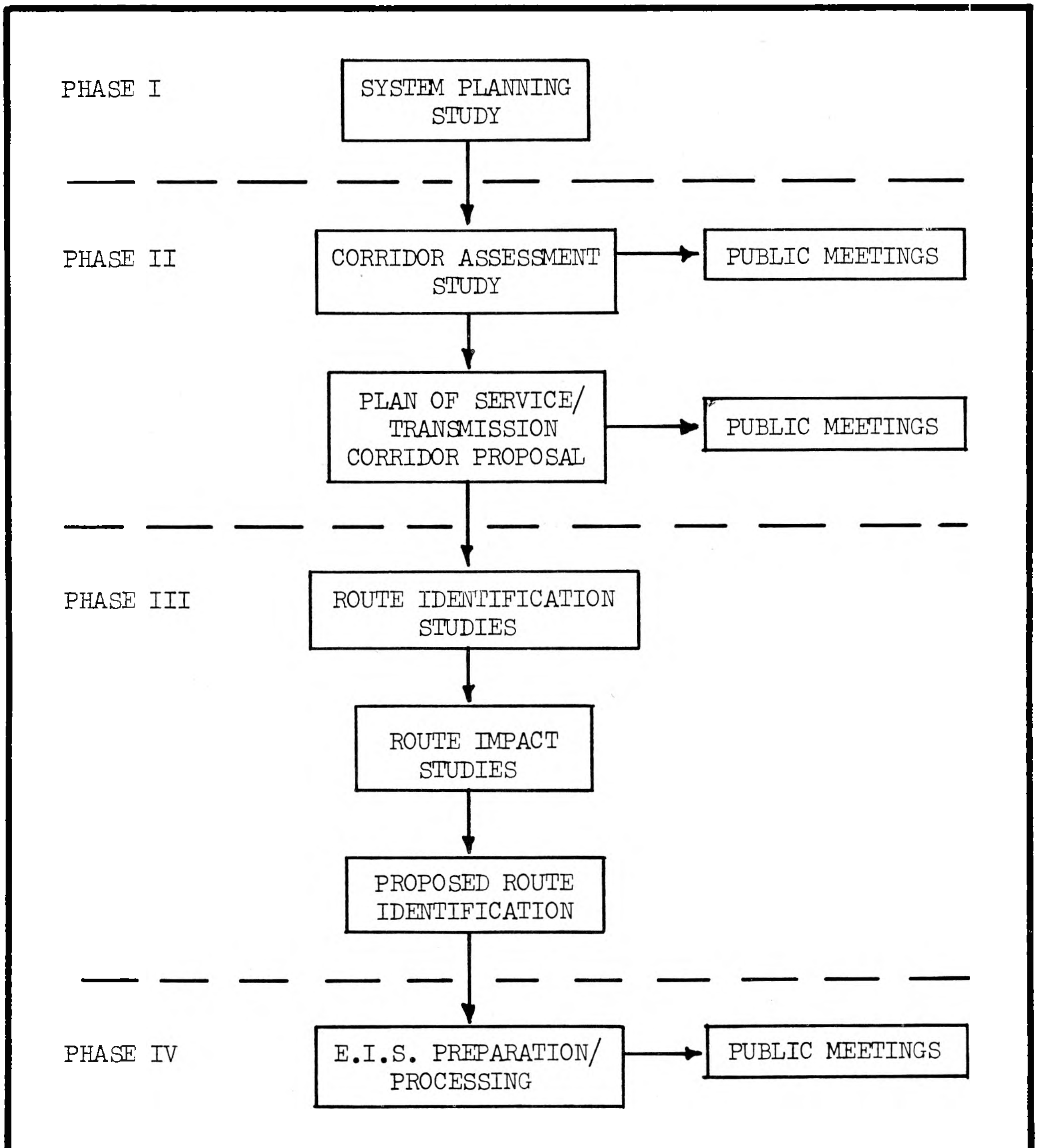
Plan E calls for the construction of two 345-kV alternating current (a.c.) circuits from the project site to Moore Substation over the same general route through western Maine as that of Plans C and D. Plan E differs from Plan D in that two 345-kV circuits would be suspended from a single row of double circuit, lattice steel towers. Plan D's circuits would be supported by parallel wood pole lines. Plan C calls for a direct current $\pm$ 400-kV transmission line. Plans A and B follow an eastern route through Maine.

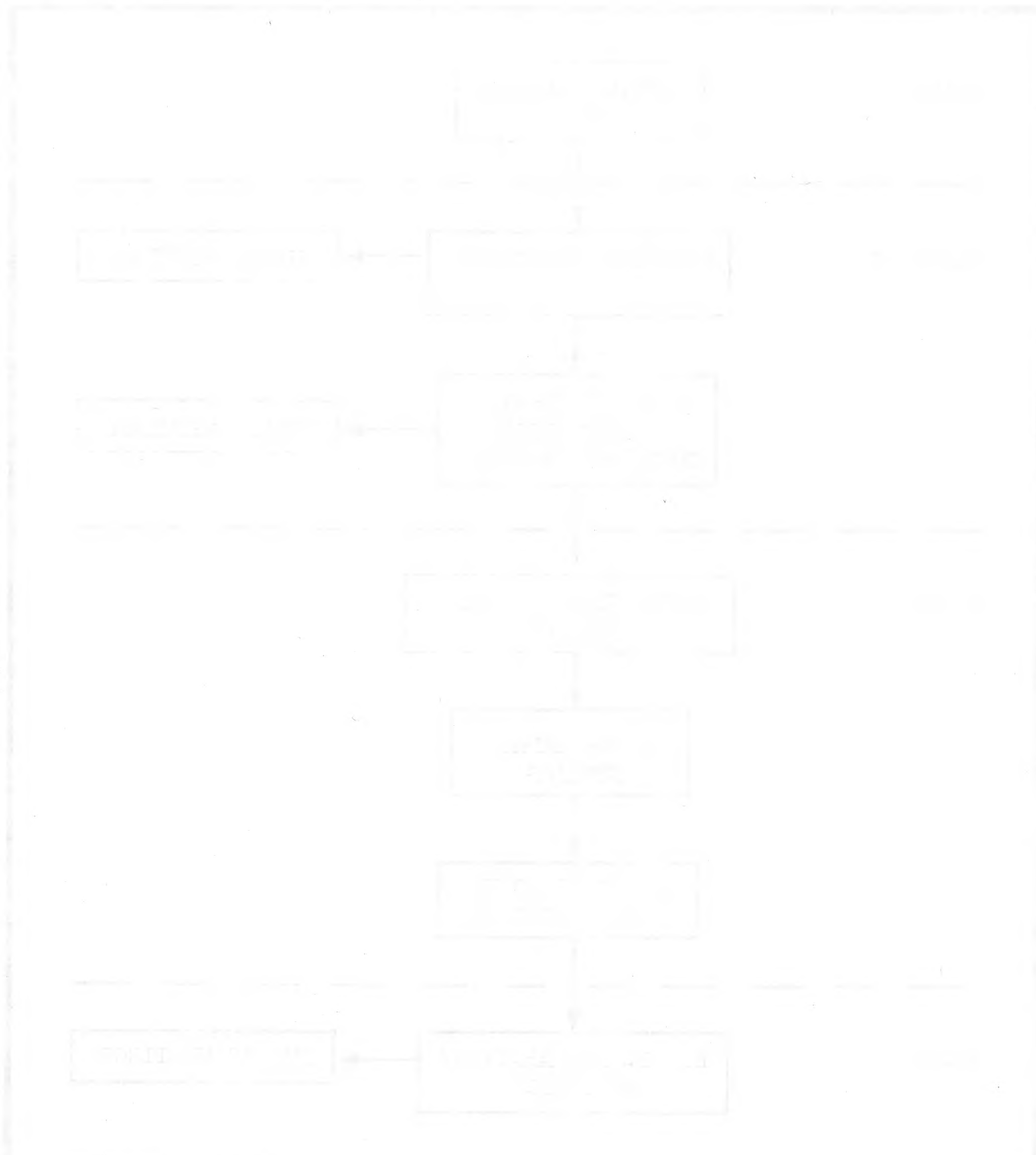
System Planning Study Assumptions

In developing alternate transmission plans for the Dickey-Lincoln School Lakes Project, system analysts made certain assumptions. For one, they assumed that two nuclear generating plants would be built at Sears Island, Maine, and that a third nuclear plant would be built in Vermont. It was also assumed that these plants would begin producing power prior

FIGURE 1.02-1

STUDY METHODOLOGY





to the completion of the Dickey-Lincoln School Lakes Project. But it was also recognized that some of the transmission associated with the nuclear units would be needed ahead of schedule to integrate Dickey-Lincoln School power into New England's main grid if the project was energized before the nuclear units. Plans for the three nuclear plants have since been changed. It is now assumed for the purposes of this report that the completion of all three plants will be deferred beyond the energization date of the Dickey-Lincoln School Lakes Project.

The system planning engineers have concluded that this change will not affect the western plans (C, D, and E) as much as it affects the eastern plans (A and B). For the western plans at the authorized level, only one additional line--the line from Granite to Essex substations--will be required.

Without the nuclear plants, the eastern Plans A and B would require two additional lines--the line from Winslow to Maxcy's and on to Maine Yankee and the line from Granite to Essex--at the authorized level.

Thus, without the three nuclear plants, the incremental additions are substantially greater for Plans A and B, than they are for Plans C, D, and E. This results in even greater impacts and costs for the eastern plans and further strengthens the justification for proposing a western alternative.

The transmission system planning studies found that Plan E is the lowest cost alternative that will meet technical requirements. It has a somewhat lower annual cost than its nearest rival, Plan D. Plans E and D are similar electrically. However, the right-of-way width for Plan E is substantially less because it calls for a double circuit line on a single set of steel towers rather than two single circuit wood pole lines constructed side by side.

Additional studies may be required if Dickey-Lincoln School is approved for construction, and if any major changes or developments occur which affect the basic assumptions of the transmission system planning study.

Information on the estimated costs for the five alternative plans is shown in detail in the Transmission System Planning Study (appendix A). DOI/DOE representatives consulted with NEPLAN member organizations to develop unit costs for the estimates. The costs reflect the experience of the DOI/DOE in developing transmission facilities and the experience of NEPOOL organizations in designing and constructing transmission facilities in New England.

As stated previously, the engineering studies for this effort have been performed cooperatively with NEPLAN. These studies resulted in "plan of service" alternatives which NEPLAN and the DOE agree are adequate. However, discussions with utilities in the region have not determined what organization would construct the facilities required to integrate the generation into the New England Power Pool System under Plan E. However, the Flood Control Act of 1944, which sets forth the general guidelines for marketing power from Federal projects, does state one criteria, that is that the Secretary shall "transmit and dispose of such power and energy in such manner as to encourage the most widespread use thereof at the lowest possible rates to consumers consistent with sound business principles. . ."

Tables 3 and 4 in the "Transmission Planning Summary" report (appendix C) compares the total investment costs and annual costs for the transmission facilities of all five alternative plans studied. Information there also allows a comparison of the annual costs for the transmission facilities under three assumptions of ownership: all Federal construction; combined Federal/non-Federal; and all non-Federal. The fact that the annual costs are substantially higher under the "all non-Federal" assumption is largely due to the difference in cost of money for the two types of construction, and the fact that approximately 27 percent of the non-Federal annual costs would be paid in taxes which would not be levied against a Federal facility.

1.02.2 Phase II-Corridor Assessment and Plan of Service Proposal

The purpose of phase II was to (1) identify a transmission corridor study area, (2) inventory, analyze, and map physical, biological, and social data, (3) identify alternative corridors, (4) rank the identified corridors and electrical plans based on their relative environmental impact, and (5) use this information along with the engineering, economic and location and reconnaissance information to evaluate and rank alternative system plans.

Corridor Assessment

The first environmental study undertaken for the DOI/DOE was an environmental data reconnaissance report prepared by Comitta Frederick Associates (CFA) of West Chester, Pa., in March, 1976. The purpose of this study was to identify what type of environmental data was available in Maine, New Hampshire, and Vermont. Given the availability of the information from the CFA effort, an environmental consultant, VTN Consolidated Inc., of Cambridge, Mass., was hired by the DOI to conduct the "Alternative Power Transmission Corridors study" (appendix B). DOI/DOE personnel managed this corridor study and furnished input on transmission engineering.

Study area boundaries were drawn to include all areas that could be considered as locations for any of the system facilities required for all of the five alternative system plans. Figure 8.03-1 in section 8 shows the study area. Its outline follows jurisdictional boundaries, including the International Boundary between the United States and Canada as well as county and town boundaries. The area encompasses 32,000 square miles in the northern parts of Maine, New Hampshire, and Vermont. VTN focused on environmental concerns and resources most threatened by the construction, maintenance, and operation of transmission facilities. A series of public meetings were held throughout the region to receive input on the priorities to be responded to when identifying corridors.

The contractor identified corridors (defined as linear areas 1 to 10 miles wide) of least impact for each plan of service identified in phase I. The corridors for each plan were ranked to identify the best location for the facilities for that plan. Corridors identified through the study are shown on figure 8.03-3, in section 8.

Corridors were ranked environmentally using two methods. A numeric system was developed first and then a qualitative method was used to double check the results of the numeric system. These two ranking methods in combination were used to identify the plan of service with the least impact.

Plan of Service Proposal

The five plans of service were then evaluated with respect to their environmental, electrical, and site engineering qualities.

Plan E was judged to be the best plan from both an engineering and environmental perspective. It became the proposed plan of service. A report titled "Transmission Planning Summary" (appendix C) published in November 1976 summarizes the status of our efforts to that point in time, the selection of Plan E as the proposed plan, and the logic or reasons for its selection.

The corridors for Plan E, indicated as the areas containing least impact potential, were carried forth into phase III for more detailed study.

1.02.3 Phase III-Route Identification and Evaluation

Phase III of the study was conducted by DOI location engineers and several New England area environmental consultants. Its purpose was to study in more detail the location and impact of alternative routes within the least impact corridors identified during phase II.

1.02.3.1 Route Identification Studies

Experienced engineers from DOI/DOE, headquartered in Bangor, Maine, performed the reconnaissance and location studies. Their findings are presented in a report "Transmission Reconnaissance Study," published July, 1977 (appendix D).

The reconnaissance effort reviewed the corridors recommended for system Plan E, and located alternative transmission line routes., (one-half mile wide) and substation and microwave sites.

1.02.3.2 Route Impact Studies

The DOI/DOE hired several consultants to study environmental impacts associated with the transmission line routes, substation, and microwave facilities as located by their engineers. These studies are described here briefly. Information resulting from the studies appear in subsequent sections of this EIS and the reports from each study are enclosed as appendices.

Geotechnical Impact Study

This study evaluated geotechnical conditions along alternative transmission routes and at substations and microwave sites. All proposed locations were analyzed for impact problems. The geotechnical studies were made under contract by Edward C. Jordan Company, Inc., of Portland, Maine. The firm's report, "Geotechnical Impact Study" published January 1978, is appendix F.

Geotechnical data was obtained from existing reports, maps, and color photographs (at a scale of 1" = 2,000'). Geotechnical conditions were often interpreted by means of indicators, such as slope, vegetation, and soil conditions. A limited amount of field work verified data.

The geotechnical data was described and analyzed in terms of impacts from construction, operation, and maintenance of the proposed facilities. Among other things, the study considered slope, soil stability, erosion, sedimentation, and potential disruptions to mining operations. Alternative routes were evaluated comparatively, ranked, and discussed by geotechnical related impacts.

Ecological Impact Study

This assessment included, but was not limited to, the study of wildlife, vegetation, and water resources in the area directly affected by alternative transmission routes, substations, and microwave facilities. The firm, Center for Natural Areas, of South Gardiner, Maine, which conducted the study, published its findings in a report, "Ecological Resources Impact Study," dated January 1978. This report is appendix E of this statement.

The wildlife assessment addressed habitat modification and change, species impacts, seasonal impacts, impacts resulting from increased access, and threatened species.

The vegetation impacts studied included permanent and temporary vegetation change, alterations to species composition, structure, form, density, indirect and direct impacts on aquatic flora, and impacts on threatened or endangered botanical species. The water portion of the study assessed the types, number, and extent of the water bodies impacted, drainage patterns impacted, and downstream effects on aquatic habitats.

The alternative routes were evaluated comparatively, ranked, and discussed by ecological impacts.

Socioeconomic Impact Study

The socioeconomic study described existing social and economic conditions and projected impacts. The study contractor, Edward C. Jordan Company, Inc., of Portland, Maine, has published its findings in a report, "Socioeconomic Impact Study", dated January, 1978. This report is appendix H of this statement.

Those impacts resulting from the construction, maintenance, and operation of alternative transmission line, substations, and microwave facilities, are assessed. The socioeconomic conditions associated with the construction and maintenance of Dickey and Lincoln School dams and related project facilities are covered in the Army Corps of Engineers draft EIS. The projected changes in existing or future conditions resulting from the project were expressed as impacts.

The socioeconomic study focused on such things as population changes, population distribution, increased demand for housing, effects on social organizations, impacts on commercial forestry, increased access, increased demand for recreation, increased direct employment, increased business and industrial income, increased secondary employment, increased public expenditures, changes in tax receipts, changes in property values, and changes in supply of goods and services. The alternative routes are evaluated comparatively, ranked, and discussed by socioeconomic impacts.

Land Use Impact Study

The land use study covered existing and planned land use. It considered those impacts resulting from construction, maintenance, or operation of transmission lines, substations, and microwave facilities. The study contractor, Edward C. Jordan Company, Inc., of Portland, Maine, published a report, "Land Use Impact Study," dated February 1978. It is appendix G of this statement.

The consultant inventoried and mapped existing, proposed, or planned land uses on or near alternative transmission routes and sites. Land use data was obtained from colored aerial photographs, existing reports and documents, aerial reconnaissance, official land use plans, and, interviews with public agencies and officials, land managers for large private holdings, and land development corporations.

The study considered land ownership and land use both public and private. The long-term productivity of land and related impacts are described geographically. The alternative routes were evaluated comparatively, ranked and discussed by land use related impacts.

Visual and Recreational Impact Study

Recreational and visual resources were combined in one study. It was made jointly by the DOI/DOE Team and Comitta Frederick Associates of West Chester, Pa. The study report, "Visual-Recreational Resources Impact Study," dated February 1978, appears as appendix I.

The consultant inventoried and mapped existing, proposed, or planned recreational resources on or near alternative transmission routes and sites. Recreational data was obtained from color aerial photographs, maps, and existing publications. It was supplemented by both aerial and ground reconnaissance. For the visual assessment, visually sensitive landscape phenomena were studied jointly by the consultant and the team. Visual data were extracted from USGS quadrangles, color aerial photographs, and existing documents and maps.

The study enumerated and evaluated impacts on both existing and potential recreational and visual resources and also suggested ways to mitigate those impacts. Impacts on recreational features which reflect more than 75 categories of active and passive recreational activities were assessed. The visual assessment addressed such factors as visual landscape quality, visual site attractiveness, viewer types, and visually sensitive urban land uses. Alternative routes were evaluated comparatively, ranked, and discussed by recreational and visual impacts.

History and Archaeological Impact Study

The study of historical and archaeological resources used procedures similar to those of a reconnaissance-level cultural resource study. The study contractor was the Public Archaeological Facility, Department of Anthropology, State University of New York, Binghamton, N.Y. The contractor's report titled "Historical-Archaeological Impact Study," dated February 1978, is appendix J of this statement.

The study was intermediate in that if the project is approved for construction, a more intensive survey will be conducted at a later time after the exact location of the proposed right-of-way, access roads, and structures are known.

The study contractor assessed potential impacts for the alternative transmission routes and for substations and microwave sites. The approach identified known cultural resources on the rights-of-way sites or near the proposed facilities and analyzed through a predictive analysis the probability of encountering cultural resources in unsurveyed areas. Sources of information included the National Park Service, State historic preservation officers, museums, academic institutions, historical societies, knowledgeable individuals, and national and state registers. Other information came from field investigations, published sources on local history, prehistory, anthropology, ethnohistory, and ecology. The predictive analysis considered the relationships between human behavior and natural resources such as vegetation, slope, elevation, and proximity to water. Alternative routes were evaluated comparatively, ranked, and discussed by cultural impacts.

1.02.3.3 Route Evaluation

Upon completion of reconnaissance and environmental impact studies an interdisciplinary evaluation session was held with the study contractors. In this session, alternative routes were compared with respect to their impact. Rankings of the alternative routes for each impact assessment topic are included in section 8. The proposed route constitutes the route considered to have least overall environmental impact. In many sections, the proposed route was unanimously ranked as having least impact. In some instances, the professional interests of participants did not lead to unanimity of preference. In these cases, compromises were discussed and a proposed location determined that was acceptable to all present.

1.03 Description of Proposed Facilities

The following facilities would be required for the proposed plan, which has been referred to as Plan E. The facilities fall into three general categories: transmission lines, substation facilities, and communication facilities. A facilities location map, figure 1, enclosed at the back of this EIS shows the location of these facilities.

1.03.1 Proposed Transmission Lines

At the authorized level of development, the proposed transmission lines would include:

1. Two 345-kV (a.c.) circuits from the project site to Moore Substation northwest of Littleton, N.H., over a route through western Maine and northern New Hampshire. The two circuits would be suspended from a single row of double circuit, lattice steel towers.

2. A 345-kV a.c. wood pole transmission line from Moore Substation to Granite Substation near Barre, Vt.

3. A 345-kV a.c. wood pole line from Granite Substation to Essex Substation a proposed facility near Burlington, Vt.

4. A 138-kV a.c. line from Dickey Dam to Lincoln School Dam. 5. A 138-kV a.c. line from Lincoln School Dam to Fish River Substation near Fort Kent, Maine.

1.03.2 Proposed Transmission Route

The proposed transmission line route was selected from a complex of alternative routes referred to as the route network (see figure 1). Individual route alinements within the network are termed links. Each link was given a number to distinguish it from all other alinements. The proposed transmission line route utilizes that combination of links considered to pose least overall environmental impacts.

For purposes of both analysis and discussion, a second level of organization is used in describing the proposed route. The route is divided into segments which isolate portions of the proposal between substations or terminal facilities. Five segments occur in the proposed route. They are: Segment A, Dickey Substation to Fish River Substation via Lincoln School Substation; Segment B, Dickey Substation to Moose River Switching Station: Segment C, Moose River Switching Station to Moore Substation: Segment D, Moore Substation to Granite Substation; and Segment E, Granite Substation to Essex Substation.

The proposed route is illustrated on figure 1. The links in each segment are:

Segment "A" Dickey-Lincoln School - Fish River Links: 3, 1A, 1B, 1, 1C. Length 29.4 miles.
Segment "B" Dickey - Moose River Links: 4, 5, 7, 8, 11A, 11 (1st 7.2 Mi). Length: 118.6 Miles.
Segment "C" Moose River - Moore Links: 11 (last 37.5 Mi.), 14A, 14, 15, 17, 17B, 18A, 20, 23, 22, 33, 34, 35, 36, 40, 41. Length: 136.1 miles.
Segment "D" Moore - Granite Links: 41, 42, 44, & 45. Length: 38.1 miles.
Segment "E" Granite - Essex Links: 45A, 45B, 46, 50, 52, 54, 49 & 56. Length: 43.3 Miles.

1.03.3 Design Criteria

Two basic 345-kV structure configurations are proposed for the project: (1) double circuit lattice steel structures and (2) single circuit wood pole structures. The double circuit structures would support two 345-kV circuits between Dickey Dam and Moore Substation. The configuration and dimensions of this structure are provided in figure 1.03-1. The height of this structure would range from 130 to 180 feet and average 165 feet. An average of five structures would be required per mile.

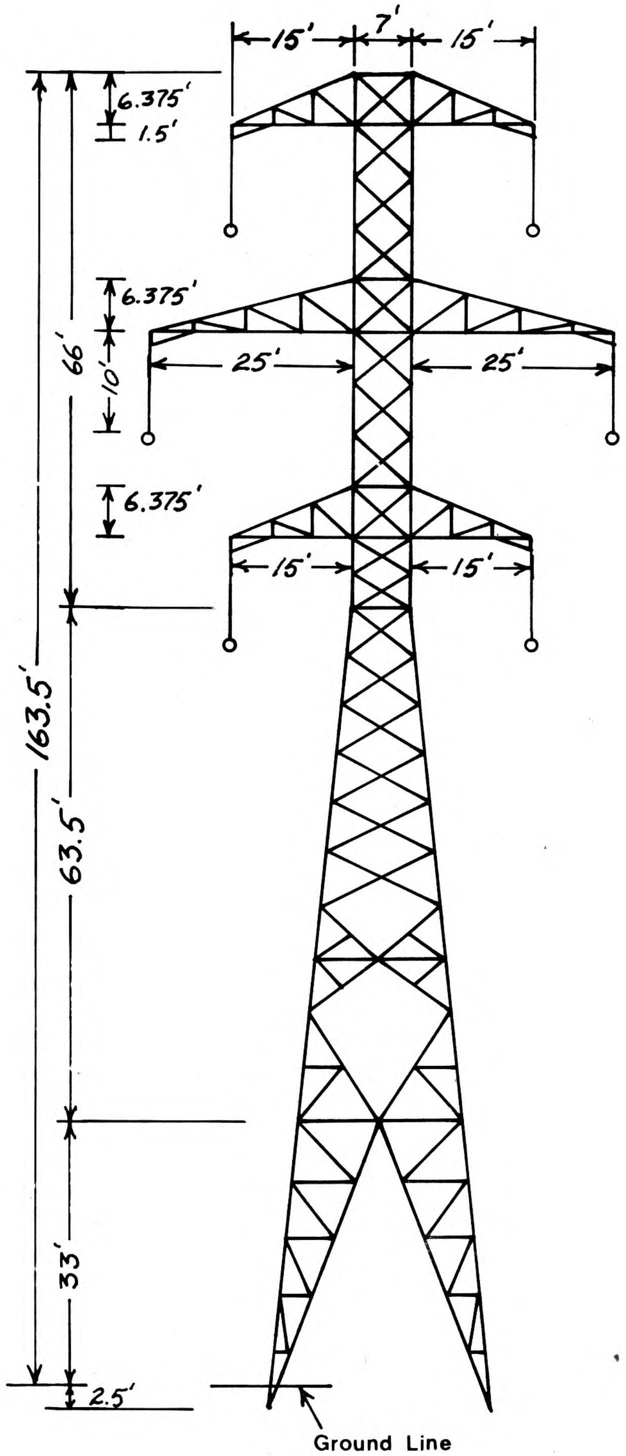
Single circuit wood pole 345-kV structures would be used between Moore and Granite and Essex substations. Figure 1.03-2 shows the configuration and standard dimensions of this structure. Where adverse impacts are identified in connection with the double circuit structures, two single circuit wood pole structures may be substituted. An average of 10 single circuit wood pole structures will be required per mile.

The majority of structures in a transmission line are "tangent" or "suspension" structures. They carry only the weight of the conductors, insulators, and fittings. They do not compensate for the tension placed on the conductors. Towers of a slightly different, stronger, design are used to carry or equalize stresses resulting from tension on the conductor. They are referred to as "dead end" structures and are required where the transmission route turns more than about five degrees, at terminals, and for excessively long spans, such as river crossings.

Steel 345-kV double circuit dead-end structures require much heavier members than suspension towers. The single-circuit 345-kV wood pole dead end transmission design requires the addition of a third pole and several guy wires to anchors buried in the ground.

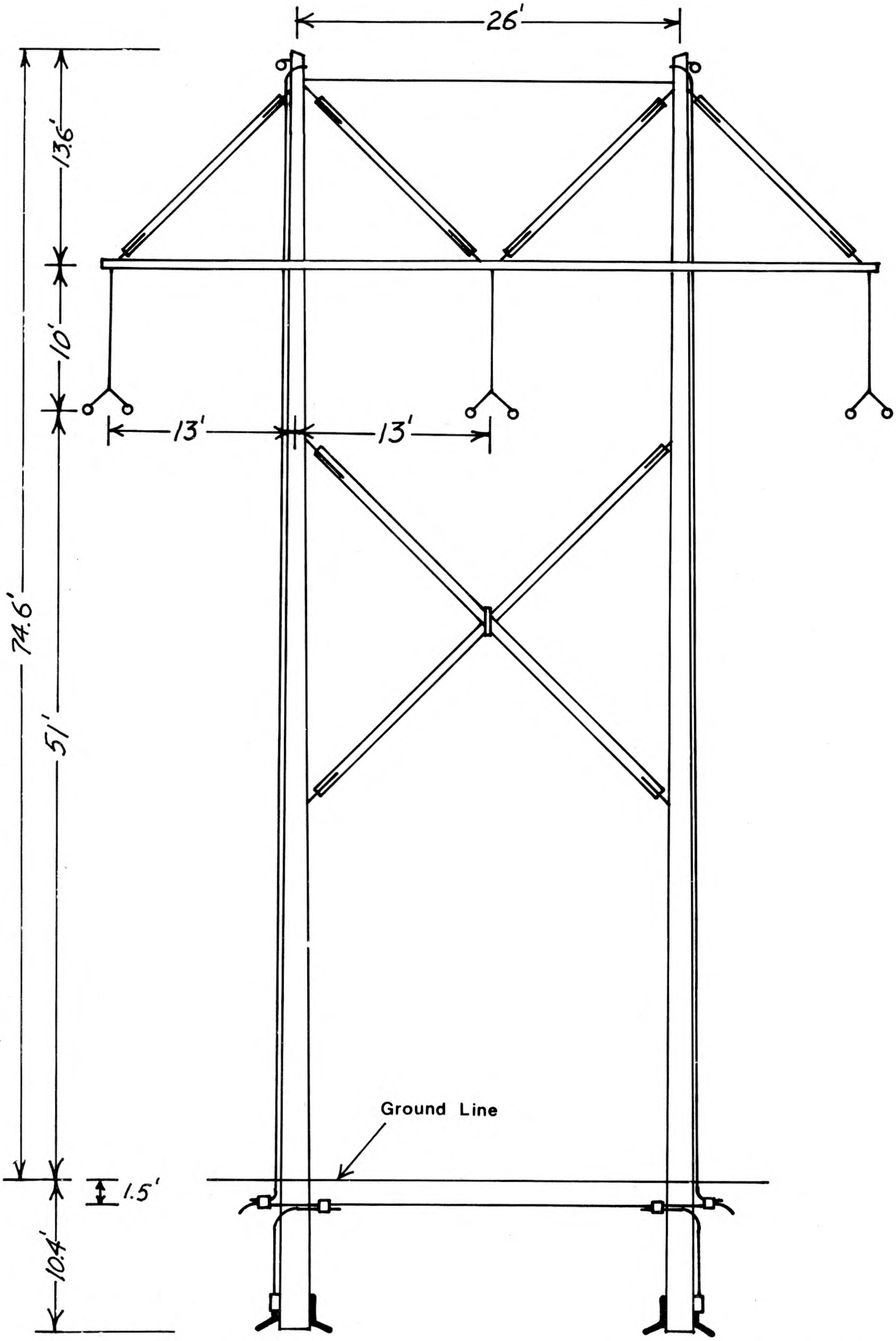
138-kV Structures

The proposed transmission line design for the 138-kv lines uses wood poles that are shorter, smaller in diameter, and closer together, than for the 345-kV design. About 10 such structures would be required per mile. Dead end 138-kV wood pole structures will require an additional support pole and guy wires.



345 KV DOUBLE CIRCUIT TRANSMISSION TOWER

FIGURE 1.03-1



345 KV SINGLE CIRCUIT TRANSMISSION STRUCTURE

FIGURE 1.03-2

Structure Footings

Footings for 345-kV double circuit towers are set in the ground at four points. Each tower leg requires a footing. The footing design may be varied to accomodate soil or bedrock properties. Typically, each tower leg is attached to a steel plate or grillage placed within an excavation and backfilled with excavated material or concrete.

An average footing occupies an area about 10 by 10 feet. The footing may be buried 15 feet deep where bedrock is not encountered. Where rock is encountered during excavation and if rock properties permit, holes are drilled in the rock and steel rods are grouted in the holes. These rods are either attached to a concrete footing or welded directly to a tower member and embedded in compacted backfill. Blasting may be required to excavate for a grillage footing if rock properties do not allow drilling and use of a rock footing.

Footing holes for single circuit, 345-kV wood pole structures are normally 3 feet in diameter and are augured to a depth of about 10 feet. Poles are set in the holes and backfilled with compacted earth or gravel. Where rock is encountered, blasting may be required.

Footing holes for 138-kV wood pole structures are about 2 feet in diameter and about 10 feet deep.

Conductors

The electrical current would be transmitted over cables with a diameter of about 1 inch. They are referred to as "conductors." Alternating current transmission lines, as are proposed for this project, require three conductors, each of which is referred to as a "phase". Each phase will have two conductors referred to as a "bundle." The bare conductors are insulated from the support structure by insulators, usually of porcelain. Air serves as the insulation between the phases.

Conductors are attached to the towers by means of glass, porcelain or fiberglass insulators. These insulators are designed to prevent electricity from flowing from the conductors to the structure and then to the ground.

Conductors are elevated to a height sufficient to minimize hazards to people and equipment on the right-of-way. The minimum heights to which electrical conductors must be elevated have been established in the National Electric Safety Code. The minimum conductor to ground clearance for a 345-kV line is 32.5 feet, and for a 138-kV line 26 feet. Additional clearance would be provided over highway, railroad, and river crossings.

Right-of-way Requirements

The transmission lines would be located upon land for which right-of-way easements would have been acquired from the landowners. Rights-of-way vary in width according to the type and voltage level of the transmission line, and allow for construction, operation, and maintenance of both the line and the necessary access roads. A 150-foot right-of-way width is assumed for each double circuit and for each single circuit 345-kV transmission design. The 138-kV transmission lines would require a 100-foot right-of-way. Right-of-way required in each of the three States is summarized in table 1.03-1.

The owner of the right-of-way property usually retains control and use of the property, subject to the provisions of the easement. Typical easement provisions would prohibit structures, the growing of tall trees, the storage of flammable materials, or other activities on the right-of-way that could be hazardous to people or jeopardize the reliability of the transmission line. Right-of-way uses that do not interfere with the transmission line or imperil people are generally encouraged.

Access Roads

Transmission lines are built and maintained with large machinery such as bulldozers, cranes, and trucks. Access to the right-of-way and the line is required for these vehicles.

Access roads for transmission lines are used for brief periods. They are not built to high standards of road design. They are not ususally surfaced, but rather are graded and maintained for use by construction and maintenance vehicles. In order to minimize erosion, drainage facilities such as dips and culverts are installed within the road bed. Ground that has been disturbed is repaired after construction or maintenance activities. Much of the roadway needed for construction can be seeded to grass or other plants after the line is built.

The complete location and design of access roads have not been determined. For the purposes of this study, it is assumed that:

1. Access roads will be graded to provide a travel surface - 14 feet wide.

2. Clearing and construction activities for access roads will disturb a total area averaging 20 feet wide.

3. The roads will not be surfaced with gravel except where poor soil conditions are encountered. It is estimated that 10 percent of new access road mileage will require gravel surfacing.

4. The amount of new roads required will depend on the extent to which existing roads can be used and the limits imposed by the terrain, bodies of water, or wetlands. (The availability of existing access is an important consideration in locating the line and other facilities.)

TABLE 1.03-1

TRANSMISSION LINE
RIGHT - OF - WAY REQUIREMENTS
PROPOSED ROUTE

TRANSMISSION LINES	MAINE		NEW HAMPSHIRE		VERMONT		TOTALS	
	Miles	Acreage	Miles	Acreage	Miles	Acreage	Miles	Acreage
138kV LINE (100 ft. R.O.W.)	29.4 mi.	356 ac.	0	0	0	0	29.4 mi.	356 ac.
345kV LINES parallel location (100 ft. R.O.W.)	0	0	13.0 mi.	158 ac.	59.0 mi.	715 ac.	72 mi.	873 ac.
non-parallel location (150 ft. R.O.W.)	177.4 mi.	3225 ac.	52.0 mi.	945 ac.	34.7 mi.	631 ac.	264.1 mi.	4801 ac.
TOTALS	206.8 mi.	3581 ac.	65.0 mi.	1103 ac.	93.7 mi.	1346 ac.	365.5 mi.	6030 ac.

Most of the new access roads would be on the right-of-way. However, new roads would occasionally have to be constructed outside of the right-of-way to provide access to it; this would necessitate the removal of additional vegetation. Tables 1.03-2 and 1.03-3 present estimated access road mileage both on and off rights-of-way.

Clearing Requirements

Vegetation that could interfere with the operation of the line is removed during construction. Clearing requirements are determined carefully to assure that only that vegetation that would interfere with the line is removed. Typically, a clearing plan is established through the use of photogrammetric techniques. The plan specifies clearing widths and the permissable vegetation heights along and at varying distances from the facility. It also considers vegetation species, height, growth rates, slope, and conductor elevation. Tall trees which are located off the right-of-way but which would hit the conductor if they fell are usually removed during clearing. The fee owner usually receives compensation for these "danger trees" which must be removed.

Impact assessments are based on the assumption that a 150-foot wide clearing is required for both single and double circuit 345-kV lines on new right-of-way; 100 feet of additional clearing is required where proposed lines will parallel an existing transmission line. A 100-foot clearing width is required for the 138-kV lines. However, actual clearing widths could be considerably less.

1.03.4 Construction Sequence

A transmission line is usually constructed using equipment that varies in size and weight according to the size and weight of the transmission towers being erected, the weather, and soil properties. Nearly all existing 345-kV transmission lines have been built using large mobile cranes. However, helicopters can be used to erect towers where access is a serious problem or where the environment is extremely sensitive. Smaller, lighter machinery is used to construct woodpole lines as compared with the double-circuit steel 345-kV lines.

Nearly all of the construction activities take place within the cleared right-of-way. Certain areas may be used several times during the construction process and for different activities. The heaviest activity occurs on access roads and tower sites.

Transmission lines are usually constructed by completing a series of sequential steps: (1) surveying, (2) access road construction, (3) right-of-way clearing, (4) structure site preparation, (5) excavation and installation of structure footings, (6) delivery of structures to the site, (7) structure assembly and erection, (8) conductor stringing and tensioning, (9) installation of counterpoise, and (10) site restoration and cleanup. Each of these activities is briefly described below.

TABLE 1.03-2

ACCESS ROAD REQUIREMENTS

	EXISTING ACCESS CONDITIONS	NEW ACCESS REQUIRED
Excellent Access	Where a transmission line lies within 300' of and parallel to existing roads, and where terrain is generally flat to gentle rolling. These roads would be used extensively for construction & maintenance purposes.	On Right-of-Way Roads: Off Right-of-Way Roads:
Good Access	Where existing roads are relatively abundant and frequently cross the transmission line r/w and would often be useful for construction and maintenance purposes. Where topography is flat to rolling and would not generally limit road construction within the r/w.	On Right-of-Way Roads: Off Right-of-Way Roads:
Fair Access	Where existing roads are infrequent and cross perpendicular to the transmission line r/w. These roads would receive limited use in construction and maintenance of the facility where topography is rolling and would limit road construction within the right-of-way.	On Right-of-Way Roads: Off Right-of-Way Roads:
Poor Access	Where roads do not exist that would serve the proposed facility. Topography is generally steep and/or water features are abundant requiring greater than normal access road length.	On Right-of-Way Roads: Off Right-of-Way Roads:

TABLE 1.03-3

PROJECTED ACCESS ROAD MILEAGE

	Location On ROW	Location Off ROW	Totals
Dickey-Lincoln School - Fish River	21 mi.[1] 51 acres[2]	16 mi. 39 acres	37 mi. 90 acres
Dickey - Moose River	88 mi. 213 acres	62 mi. 150 acres	150 mi. 364 acres
Mosse River - Moore	100 mi. 242 acres	87 mi. 211 acres	187 mi. 453 acres
Moore - Granite	4 mi. 10 acres	19 mi. 46 acres	23 mi. 56 acres
Granite - Essex	25 mi. 61 acres	23 mi. 56 acres	48 mi. 116 acres
Totals:	238 mi. 577 acres	207 mi. 502 acres	445 mi. 1,079 acres

1 estimated length
2 based on a 20' disturbance width

Surveying

Before construction starts, the proposed rights-of-way are identified, land ownership is determined, and permission to survey is obtained from the landowners. A survey is then conducted. Information and locations are obtained on elevation, land cover (vegetation height), roads, buildings, and water features within and near the right-of-way.

Information from the survey is mapped to help design the transmission line and access roads. Once these designs are completed, additional surveys are conducted to site these facilities within the right-of-way. Access roads and tower sites, are staked. A permanent marker is placed at the center of each tower site.

Access Road Construction

Access road construction follows; trees and brush along the road are cleared; merchantable timber is stockpiled; unmerchantable timber and slash is disposed of; stumps and root systems are removed from the road bed; culverts, drainage facilities, fences, and gates, are installed; and the road is graded. The roads are then used by contractors to transport personnel and machinery, merchantable timber, and transmission structures. conductors, etc. The roads are maintained throughout the contract period.

Right-of-Way Clearing

Once access to the right-of-way is provided, the transmission line right-of-way is cleared. A clearing plan assures that the only vegetation removed is that which is incompatible with the operation and maintenance of the line. Within the area to be cleared, a clearing advisory is provided. It indicates the permissable height of existing vegetation. The application of these techniques tend to result in removal of tall trees and the retention of low growing species.

Contractors are required to market all merchantable forest products produced by clearing. Non-merchantable wood products are normally disposed of by open draft burning. Stumps and small limbs are left.

Structure Site Preparation

Each tower site is prepared by removing all trees, brush, and stumps.

The clearing of structure sites normally takes place when the right-of-way is cleared. Non-merchantable wood products from these sites is disposed of along with that from the right-of-way. However, at tower sites all vegetation, including roots systems, is removed. An area adjacent to each structure site is graded to form a level surface for a crane when one is used to erect the tower. The area disturbed through site preparation varies with the type of structure being built. It is assumed that a 150 by 200-foot area will be disturbed at each 345-kV double circuit tower site. An area about 60 by 100 feet will be disturbed at both 345-kV and 138-kV single circuit structure sites.

Excavation and Installation of Structure Footings

After the tower sites are prepared, tower construction starts. The first step is to install the footings. Large equipment such as backhoes or soil auguers are used to excavate the footings. Trucks deliver footing materials to the sites.

Excavation and installation may require that rock be fractured and removed, that holes be drilled in bedrock for anchors, or that plywood forms be installed for concrete footings.

The footings are put in place using a small crane, and the excavation is then backfilled, compacted, and graded to the original contour of the land. Top soil is stockpiled during excavation and replaced after backfilling.

Delivery of Structures to the Site

Construction contractors usually establish several work and storage areas near the transmission line. These areas are accessible from major highways. Transmission structures are stockpiled at these places until needed on the right-of-way.

Large flat bed trucks transport tower members to the tower sites. Due to the weight, small mobile cranes load the material on and off the trucks. A number of delivery trips are required.

Structure Assembly and Erection

Steel towers are assembled in sections near the tower site. Each tower contains three components: the tower legs, the tower body, and the bridge. Conductors are suspended from the bridge, the uppermost part of the tower.

Each of these components is assembled on the ground by crews of men using a 35 to 100 ton capacity crane. Steel towers are assembled in 1 to 3 days per tower. Contractors make the most efficient use of personnel and equipment by assembling all the towers for a portion of line before erecting them. The towers are erected in sections.

Tower sections are lifted into place by a large 30 to 100-ton capacity crane. Members of the crew climb the tower as it is being erected and bolt each section in place.

Wood pole structures go up quite differently than steel structures. Fewer components are involved. The major components of a wood pole structure are: two or three support poles, crossarms, which are bolted to the support poles, and in some cases crossbracing between the poles. The bracing adds structural strength. The insulators are usually attached to the crossarm before it is lifted and bolted in place.

Conductor Stringing

Attaching the conductors requires procedures that avoid damaging or marring the conductor surface. This technique requires a pulling cable called a "sock line." It is strung through large pulleys attached to the insulators on the towers. The sock line can be pulled through the pulleys on a series of towers with a tractor or helicopter. Once the sock line is in position, one end is attached to the conductor which is delivered to the right-of-way on large reels. These reels are mounted on a machine that can control the rate of unwinding and the tension maintained on the conductor during the unwinding process. A large tractor equipped with special winches then pulls the sock line and the attached conductor through pulleys on the towers and into position. As much as 3 miles of conductor can be strung in one operation.

The conductor or conductors in each separate phase are pulled together. The operation would be repeated six times for a 345-kV double circuit line carrying six sets of conductors. The steel overhead ground wires are installed much the same way. However, they are smaller and do not have to be protected against marring. Once in place, conductors are securely attached to the insulators and construction is virtually complete.

Installation of Counterpoise

Counterpoise refers to a system of buried conductor cables that are installed to safely dissipate electrical current when a transmission line conductor faults to a tower. During such failures, electricity can move from the line to the earth through the structures. As many as six aluminum or copper wires, each up to 250 feet long, may be required at each structure. The wires are buried about 2 feet deep.

Site Restoration and Cleanup

The last construction step around the site of a tower or pulling operation is to shape the ground to its original contour.

Areas heavily disturbed during construction are seeded to grass or other plants to prevent erosion. All litter and leftover materials are disposed of. Equipment is removed.

1.03.5 Maintenance

The customary maintenance program for transmission facilities includes routine and emergency maintenance and repair of electrical equipment, tower structures, conductors, radio communication and control facilities, substation equipment, and buildings.

Many of the roads used in construction are not needed for maintenance or by the landowner. These roads are stabilized to prevent erosion by installing water bars, seeding ground cover, and rocking when necessary. They are then allowed to revegetate. Roads needed for maintenance are protected against erosion, but are kept passable by controlling vegetation.

The need for line maintenance work is based on inspections which are usually accomplished by helicopter. Two-man helicopter teams normally fly about 25 feet above the line and report damage to towers, conductors, insulators, guys, and crossarms. They also spot pole rot, washed out roads, hazardous vegetation, encroachments, and potentially dangerous material on the right-of-way. Aerial inspections may be supplemented by an occasional ground patrol of each line.

Emergency maintenance may be required when lines and tower structures are damaged by fires, severe storms, lightning strikes, or snowslides, or when support structures or insulators are intentionally damaged by rifle fire or other forms of vandalism. Maintenance crews are dispatched as soon as possible to the problem area.

If the project is constructed and the Federal Government builds the transmission facilities, it is estimated that about 21 men would be required to operate and maintain the transmission facilities associated with the Dickey-Lincoln School Lakes Project. Estimated annual manpower requirements and their costs are as follows:

	Estimated Man Years	Estimated Annual Cost
Transmission Line Maintenance	7	$300,000
Substation Maintenance	3	125,000
System Protection Maintenance	3	103,000
Power System Control Maintenance	6	244,000
Operations	2	43,500
Totals	21	$815,500

1.03.6 Vegetation Control Measures

The entity given the task of maintaining rights-of-way for the proposed transmission lines will have to remove hazardous vegetation with herbicides or mechanical cutting. Vegetation becomes hazardous when it grows too close to conductors.

Forecasts for the control of vegetation can usually be made about 1½ years in advance of need. Estimates are made of the exact location when control measures must be taken, the method to be used, and the kinds and amounts of herbicides to be applied. This is done for access roads as well as rights-of-way. The projected program is then adjusted for such uncontrollable factors as rainfall, temperature, and the severity of winter weather. The use of herbicides must comply with Environmental Protection Agency standards and other Federal standards; State laws, regulations and codes; manufacturers' labels; and agreements with landowners.

Foliage can be treated with herbicides and applied from either the ground or air. Aerial foliage treatment is an effective method of control in inaccessible terrain and for controlling uniform stands of high growing vegetation where selectivity is not necessary.

Basal treatment consists of applying a mixture of herbicide and oil on the lower trunk of the target vegetation about 2 feet above ground. When applied during the dormant season, this technique does not create the expanses of brown foliage that sometimes result from foliage treatment.

In the frill, notch, or cup method, a cut is made to the cambium layer of a tree, and liquid herbicide is poured into the cut. This can be done any time of year, but is most effective during dormancy. It is the safest method to use near streams or sensitive vegetation.

Soil treatment refers to a method in which herbicide pellets or granules are broadcast on the ground within the drip area of a tree or bush. Some pellets temporarily sterilize the soil. Others affect only the vegetation around which the pellets are applied.

The cutting and stump treatment method consists of cutting the brush and trees and then spraying the stumps with a herbicide to prevent sprouting. One problem with this method is how to dispose of the material that has been removed. If it is dragged away, desirable plants may be damaged. If it is run through a chipper and hauled away, equipment must be brought to the site.

Helicopters can usually be used to apply herbicides from the air. They are preferred over fixed-wing aircraft because the helicopters fly lower and slower and can more accurately direct the spray to target areas. Aerial application may affect nontarget vegetation. It is less selective than ground application. Hence, it is being used less frequently than in the past. Aerial application is often preferred, however, when selectivity is not important, when terrain is rather inaccessible, or when cost considerations are important.

The factors of drift and volatility must be considered in evaluating the effect of aerially applied herbicides on vegetation off the right-of-way. As a rule, herbicides are not applied by air within 100 feet of rivers, streams, and lakes because of the danger of drift. Drift is cut to a minimum by curtailing spraying whenever the wind velocity at ground level exceeds 6 miles per hour.

Smaller droplets tend to drift more than larger droplets. So various chemicals are often added to spray solutions to enlarge droplet size, either by increasing the viscosity of the solution or by producing a large globule that carries the herbicide. This assures that the amount of drift will be reduced and also that the application will be less affected by temperature. Controlling the size of droplets is not always desirable, however, because increased size may lessen the effectiveness of the application.

Volatility, the tendency of a chemical to vaporize, can result in contamination by a herbicide off the right-of-way; thus only low volatile herbicides are normally used by the electric utility industry.

Herbicides are also selected on the basis of how well they are absorbed by the soil or forest litter and how long they persist. Absorption by the soil or forest litter determines the amount of the chemical which is available to plant roots, the degree of leaching from the soil, and the ease with which the chemical will run off into surface waters. Herbicides can be fairly immobile in soil.

Chemicals remain in the environment until some reaction degrades them. The reactions can come about through photochemical or bacteriological processes or through decomposition of chemicals within plants.

1.04 Proposed Substations

Locations of the proposed substations and substation additions are shown on the facilities location map (figure 1). Substation facilities required at the authorized level of development would include:

1. A 345-kV/138-kV substation at Dickey Dam. It will include a braking resistor.

2. A 138-kV substation at Lincoln School Dam.

3. A 345-kV switching station near Moose River, Maine. It is referred to as Moose River Substation.

4. 345-kV terminal facilities would be added at Moore, Granite, Fish River, and Essex substations.

There are two basic kinds of electrical substations: transformation substations and switching stations. Transformation substations contain equipment which changes voltage levels. In a switching station the equipment controls power flow but does not change voltage.

Each substation would contain a control house. Control houses vary in size and complexity--from small meter shelters to larger installations needed to accomodate control, relaying, metering, and communications panels. In general, control houses for the proposed facilities would have from 150 to 1,000 square feet of floor space. Where required, sanitary facilities and work space would be provided.

New substation sites are identified with the aid of topographic maps, aerial photographs, and land use data. Potential sites are visited to determine the best locations. Normal engineering considerations include proximity to transmission lines, distribution systems, and load centers; drainage; visibility; soil type; access grading requirements; terrain; and vegetative features that could shield the substation from view or reduce its contrast with the landscape.

Designs which adapt the substation to its surrounding environment are prepared. Natural surroundings are often supplemented with planted trees and shrubs. Low-profile structures may be used to further reduce visual impacts.

The construction of substations, control houses, and maintenance buildings involves the establishment of a permanent entrance road about 20 feet wide with specified cut-and-fill slopes; clearing the site of trees, brush, and other vegetation; grading and surfacing; and placing concrete foundations. Underground conduit runs and an electrical grounding system will be installed. Support structures will be erected. Electrical equipment such as transformers, switchgear, and buses will be installed.

A metal chain link fence will be placed around the equipment. Subdued color schemes that blend with the surroundings would be used for environmentally sensitive areas. Landscaping may be used depending upon the visual characteristics of the adjacent land and the visibility of the facility.

Substation facilities are usually built by construction contractors. The construction time is related to the size and complexity of the particular facility. Normally it requires 6 to 12 months. The installation of equipment, making final electrical connections, and the testing and energization of the equipment will require additional time.

The construction equipment used and the size of the construction crew will vary with the size of the substation. Equipment used during construction of a substation may include graders, sheeps-foot rollers, scrapers, tractors, backhoes, power trenching machines, dump trucks, water trucks, rubber-tired cranes, and welding apparatus.

Substation construction crews usually range in size from 12 to 30 workers. They include carpenters, cement finishers, equipment operators, linemen, electricians, plumbers, pipefitters, welders, painters, and general laborers. The following substations are part of the proposed transmission facilities.

1.04.1 Fish River Substation

Fish River Substation is an existing 69-kV facility owned and operated by Maine Public Service Company. It would have to be expanded to accomodate the new lines. The site is about 1 mile south of Fort Kent, Maine, on Maine Highway 161 near Fish River. It is next to the highway and will not require new access. The expansion would require about 0.7 acre of land, and the installation of new 138-kV buswork, switchgear, and 138-kV transformation.

1.04.2 Lincoln School Substation.

This substation would be a new facility located near the Lincoln School Dam and powerhouse. The site is about 2 miles west of the town of St. Francis on Maine Highway 161. It would be less than one-fourth mile from the relocated highway. A short access road, plus about 0.7 acre of land will be required. Lincoln School Substation would be a switching station. It would send power generated at Lincoln School Dam to Fish River Substation or to Dickey Dam at 138-kV.

1.04.3 Dickey Substation

This substation would be a new facility located near the Dickey Dam powerhouse. The proposed site is adjacent to a garbage dump. Access to this site is developed. Dickey Substation will provide transformation between 345 kV and 138 kV. It will have equipment to switch and control Dickey power at both 345 and 138 kV. The equipment will include a braking resistor to help maintain the stability of the system during system fault conditions. The substation will require about 5.2 acres of land.

1.04.4 Moose River Switching Station

The proposed site for this facility is some 4 miles north of Moose River, Maine, and one-fourth mile from Maine Highway 201. An access road would have to be developed. The station would require about 4.1 acres of land. It would connect the two Dickey-Moore lines with switchgear. This would make it possible to isolate one section of line automatically and thus maintain the stability of the rest of the system.

1.04.5 Moore Substation

Moore Substation, an existing facility, is about one-half mile southwest of Moore Dam on the Connecticut River. About 5.2 acres of land would be required.

The existing access would be adequate to serve the new facilities. Transformers would have to be added at the station so that the 345-kV equipment could be connected with the existing 230-kV equipment. Some additional switchgear would also be required.

1.04.6 Granite Substation

Granite Substation is an existing facility. It is about 5 miles south of Barre, Vt., and 2 miles east of Williamstown in Orange County. The existing substation would be expanded, requiring the use of about 4.1 acres of additional land. Additional switchgear and 345 to 230-kV transformation would be required. The existing access is adequate.

1.04.7 Essex Substation

Essex Substation is a planned facility assumed to be in place and designed when the proposed line is energized. No additional land would be required.

1.05 Radio Communication and Control Facilities

A communication system would be required to provide power system control capability for the transmission lines associated with the Dickey-Lincoln School Lakes Project. The communication system would in effect be an extension of the existing New England shared microwave system.

The term "microwave" describes line-of-sight, point-to-point radio systems that operate in the 1710 to 1850 and 7125 to 8400 MHz frequency bands. The communication system would use three types of stations: active, passive, and VHF mobile repeater stations.

An active repeater station requires an access road. It usually is served by central station electric power, backed up by an on-site, self-contained emergency generator. The equipment is located in a one story building with 200 to 300 square feet of floor space. An antenna tower and a fuel storage tank are also usually located on the site.

A passive repeater station resembles a billboard in appearance, except that it is supported by a tower. This type of station can be built and maintained without an access road if helicopters are used. Power is not required. Maintenance after construction is infrequent. Radio signals from an active station strike the passive reflector are directed to the antenna of another active station.

The following stations would be needed for the new microwave facilities. (see figure 1, Facilities Location Map.)

1.05.1 Dickey Dam

Communication facilities at Dickey Dam Substation would include an 80-foot high antenna tower. Equipment would be housed in the control building or a small communications building. A clearing measuring about 50' x 50' would be needed for the microwave facilities.

1.05.2 McLean Mountain

An active repeater station would be constructed at this site. Developments would include a station service power line that could probably be built next to the access road, construction of the road itself, and a selectively cleared 100' x 100' plot. The access road would run from Maine Highway 161.

1.05.3 Pennington Mountain

This facility would consist of an active repeater station requiring central station power, a selectively cleared plot measuring 100' x 100', and an access road. The access road would run from Maine Highway 11. The station service line would probably parallel the access road.

1.05.4 Ashland

This facility would consist of an active repeater station. An existing power line parallels the highway adjacent to the site. The site is just north of Maine Highway 11 on farmland.

1.05.5 Oakfield

This facility would consist of an active repeater station. It would require electric station service power, a 100' x 100' selectively cleared plot, and an access road. The access road would run from an existing road located just north of the site. The power line serving the facility could probably follow the access road.

1.05.6 Hot Brook

This station is considered to be an alternate to the direct path from Oakfield to Bagley. It would be located near a New England Bell Telephone Company microwave station. The access road and an overhead power line are developed. Developments required for the new facility would include a short driveway and a selectively cleared 100' x 100' plot.

1.05.7 Bagley

This facility would be an active repeater station. It would also be located near a New England Bell Telephone Company microwave station. An adequate access road and an overhead power line run to the site. Development of the site would require a short driveway and a selectively cleared 100' x 100' plot.

1.05.8 Ferry

This facility would be an active repeater station. It would be located near a New England Bell Telephone Company microwave station. The site has an existing access road and a power line. The required developments would include a short driveway and a selectively cleared 100' x 100' plot.

1.05.9 Black Cap

This facility would consist of an active repeater station. It would be located near--or within--an existing station of the shared microwave system. The site is already served with an access road and has central station power.

1.05.10 Oak Ridge

This facility would be an active repeater station. It would require station service, a selectively cleared 100' x 100' plot, and an access road. The access road would be built from Upper Shirley Corner on Maine Highway 15. The power line could probably parallel the access road.

1.05.11 Parlin

This facility would consist of an active repeater station which would require electric station service power, a selectively cleared 100' x 100' plot, and an access road from Maine Highway 201. The power line would probably parallel this access road.

1.05.12 Moose River

A microwave station would be required at the Moose River switching station. The microwave facility would include an 80-foot self-supporting tower, electronic equipment housed inside a small control house, and electric station service power.

1.06 Construction Schedule

The proposed transmission facilities would have to be ready for energization when the first generating units in the power houses at the dams are ready for testing. Construction tentatively would begin 5 years prior to the date the generation is scheduled to begin. Thus, if we assume that the Dickey-Lincoln School Lakes Project will begin producing power in 1986, the construction of the transmission facilities would begin in the spring of 1981. The schedule for construction of the transmission facilities could be coordinated with that of the Corps to help minimize socioeconomic impacts in the project area. Table 1.06-1 shows the projected construction schedule for the transmission facilities.

1.07 Cost Estimates

The following table (table 1.07-1) shows cost estimates for the transmission facilities in the recommended plan. The estimates include investment costs with interest during construction (IDC) and annual costs at the authorized interest rate for the project of 3-1/4 percent and the prevailing (FY 1977) water resources interest rate of 6-3/8 percent. The cost estimates are current as of October 1977. Costs for the Dickey-Lincoln School Lakes Project are discussed in section 1.10 of the Corps' EIS.

TABLE 1.06-1

PROJECTED CONSTRUCTION SCHEDULE

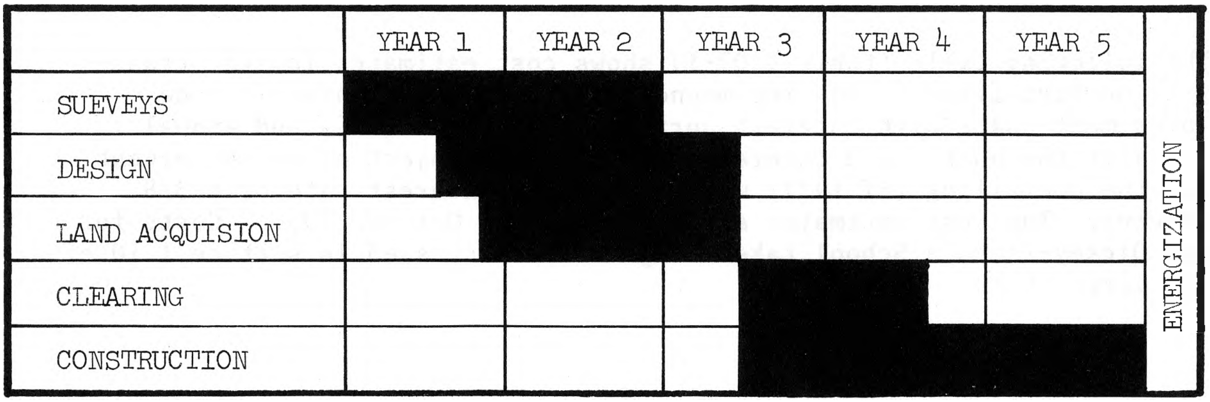


TABLE 1.07-1

COST ESTIMATES - TRANSMISSION FACILITIES FOR PLAN E
(3 1/4% Interest Rate)

	Investment ($000)		
	Materials And Construction	Interest During Construction	Total
Transmission Lines	113,900	8,430	122,330
Substations	30,440	1,860	32,300
Power System Control	2,000	120	2,120
Totals	146,340	10,410	156,750

COST ESTIMATES - TRANSMISSION FACILITIES FOR PLAN E
(6-3/8% Interest Rate)

	Investment ($000)		
	Materials and Construction	Interest During Construction	Total
Transmission Lines	113,900	16,970	130,870
Substations	30,440	3,710	34,150
Power System Control	2,000	240	2,240
Totals	146,340	20,920	167,260

2.0 DESCRIPTION OF THE ENVIRONMENT WITHOUT THE PROPOSAL

2.01 Geography

2.01.1 Regional Overview

The geographical space in which the Dickey-Lincoln School transmission facilities could be built encompasses some 32,000 square miles of northern Maine, New Hampshire, and Vermont. Thus, the study area for this statement is about 300 miles long and 100 miles wide. It is bounded on the north by Canada, on the east by Maine's eastern boundary, on the west by Lake Champlain, and on the south by a line drawn along the political boundaries of counties and towns.

The study area lies within the physiographic region known as the New England Province. See figure 2.01-1. This region consists of old, highly eroded, rounded mountains with highly dissected plateaus dotted with "monadnocks." Monadnocks are small mountains that stand above rolling topography (e.g., Mt.Blue, Maine; Mt. Ascutney, Vt.). The New England Province has two major physiographic subdivisions--the White Mountains and the New England Upland.

The White Mountain subdivision covers western Maine, north-central New Hampshire, and northeastern Vermont. The White Mountains consist largely of granite and other coarse grained igneous rocks resistant to erosion. The local relief ranges in elevation from 1,000 to 3,000 feet above mean sea level, but a number of peaks exceed 4,000 feet. The tallest is 6,288-foot Mt. Washington.

The New England Upland is an upraised peneplain, highly dissected by streams in narrow valleys. Most of the upland is gently rolling, but steep slopes are rather common. Elevations range from 1,000 to 2,000 feet.

Pleistocene glaciers shaped the main features in the region's landscape. These glaciers stripped way the rock mantle and early soils and left behind till sheets of unconsolidated, unweathered, rocky materials that formed thin, infertile soils. The soils often will not support crops.

The surface hydrology was also created by the glaciers whose deposits diverted the preglacial streams. Moraine deposits often blocked drainages, forming wetlands, large and small lakes, and countless bogs and marshes. Long chains of lakes were created in some valleys. The drainage pattern today is irregular and haphazard.

Forests cover 80 to 90 percent of the study area. The trees are mostly spruce, fir, and northern hardwoods. Most of the original stands were logged, cleared, or burned long ago, and the land today is covered with second or third growth timber.

Some 10 to 20 percent of the study area is occupied by farms or urban communities. Agricultural lands occur largely in northeastern Maine on what is called the Aroostook Plain. Farmlands are also found along the St. John, Connecticut, and Winooski rivers. Population density is low. It is lowest in northwest Maine and highest along the study area's southern fringe. Overall, land use can be classified as rural.

Most of the urban communities have a population of less than 5,000 persons. Many of the towns and cities are on rivers which once provided power for mills. Manufacturing is still important in many of these towns. Other major economic activities include recreation, farming, forestry, extractive industries, and vacation home construction.

A more detailed discussion of the region's geography appears in appendix B, "Alternative Power Transmission Corridors" and appendix D, "Transmission Reconnaisance Study."

2.01.2 Geographical Description of the Proposed Route

The following discussions describe commonly known geographic features near the proposed route. They are intended to serve as a geographic frame of reference. The discussions are organized under five headings which describe portions of the route between substations. See figure 1.

Dickey-Lincoln School-Fish River

This segment of the proposed route is 29.4 miles long. Beginning at the proposed Dickey Substation site on the west bank of the Allagash River, the route crosses the river and runs along the southeast side of the St. John River to the site proposed for the Lincoln School Substation. From here the route runs northeast between the St. John River and the bordering valley walls. The route passes south of St. Francis, Maine, and north of Bossy Mountain. Near the southern end of Stevens Hill southwest of Fort Kent, Maine, the route parallels an existing transmission line across the Fish River to Fish River Substation.

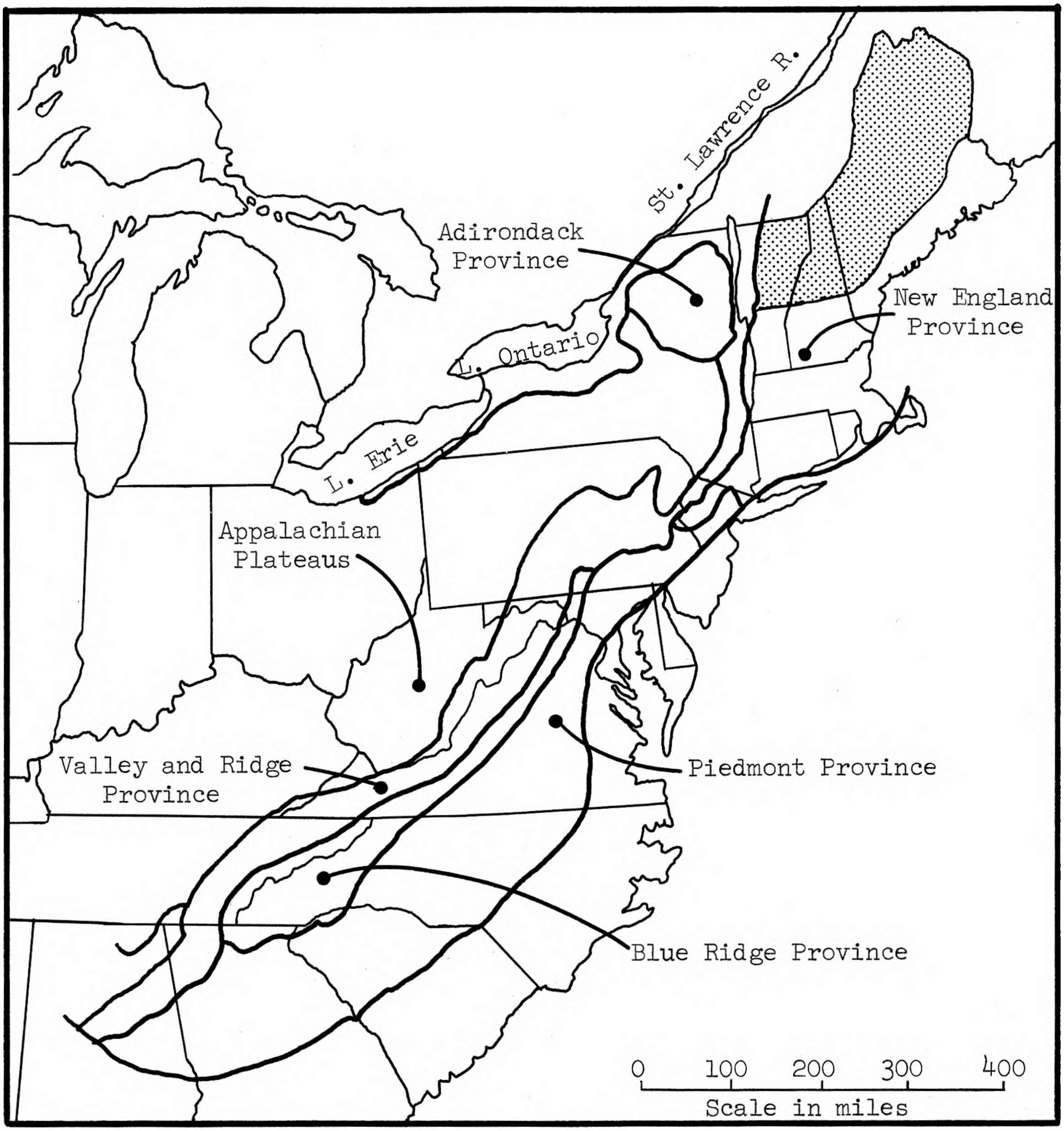
Dickey-Moose River

The proposed route from Dickey Substation to Moose River Switching Station northwest of Moose River, Maine, is 118.6 miles long. It roughly parallels the U.S.-Canada border at distances ranging from 6 to 20 miles.

The route begins at Dickey Substation and runs southwest parallel to the Allagash River for a distance of 1.5 miles. Then it continues southwesterly leaving the Allagash River and runs midway between the Allagash River and the St. John River. The route passes about 4 miles west of Clayton and Chemquasabamticook (Ross) lakes en route to a point one-half mile northwest of Baker Lake. Here the route turns south-southwest and passes about 1.5 miles west of Big Bog. South of Big Bog the route is roughly parallel to and 1.5 miles west of the North Branch of the Penobscot River. After a short distance, it turns at a point one-half mile west of Long Pond, runs south-southeast and passes through a low area in the Green Mountains. Beyond the Green Mountains, the route crosses the South Branch of the Penobscot River just west of Canada Falls Lake,

FIGURE 2.01-1

MAJOR PHYSIOGRAPHIC REGIONS [1]



[1]Reference: Alternative Power Transmission Corridors,
Appendix B - Volume 3

turns southwest, and follows a natural gap between the western extension of the Ironbound Mountain ridge and Boundary Bald Mountain east of Trickey Bluffs. The line roughly parallels Alder Brook in this area and passes to the south of Heald Pond. The route then crosses Maine Highway 201 and enters the Moose River Switching Station west of the highway about 3 miles north of Moose River, Me.

Moose River - Moore

This portion of the proposed route is 136.1 miles long. It crosses portions of Maine, New Hampshire, and Vermont. The route roughly parallels the U. S.-Canada border within Maine. It turns to a more southerly direction in northern New Hampshire and crosses into Vermont en route to Moore Substation on the Connecticut River.

The route begins at Moose River Switching Station and goes southwest to a crossing of the Canadian Pacific Railroad west of Holeb, Maine. At this point, the route turns south and follows the Moose River and the Middle Branch of Kibby Stream through mountainous terrain. It ascends the divide between Kibby and Bold Brook before decending southwest to the North Branch of the Dead River. It crosses this river and Maine Highway 27 at the southern end of the Chain of Ponds and crosses Bag Pond Mountain Ridge and the southern flank of Round Mountain. Then the route turns west and enters New Hampshire. Just beyond the New Hampshire State line, the route again turns southwest and passes east of First and Second Connecticut lakes. In the area of Round Top Mountain, the route angles south-southwesterly and parallels Dead Water Ridge to the west. At a point about 2 miles west of Diamond Pond, the route turns south and crosses the Colebrook Valley, passing one mile west of Kidderville, N. H. At the southern end of the Colebrook Valley, the route again enters mountainous terrain. Heading in a southerly direction, the route passes through Cranberry Bog Notch and parallels Nash stream to its junction with the Upper Ammonoosuc River. It crosses this river as well as Beach Hill before turning southwest. The route passes just south of Groveton, N. H., and along the northwestern slope of Cape Horn enroute to a crossing of the Connecticut River 2 miles south of Guildhall, Vt. The route then crosses the Connecticut River and enters Vermont. The route loops inland away from the Connecticut River at a distance of about 4 miles and then turns southwest and parallels the river to a junction with an existing transmission line which follows the northwestern edge of the Moore Reservoir. The proposed route parallels this transmission line for a distance of 3 miles to Moore Substation.

Moore-Granite

The proposed route between Moore and Granite substations is 38.1 miles long. It parallels existing transmission lines.

The route begins in New Hampshire at the Moore Substation adjacent to Moore Dam. It runs westward along the south and southeast side of the Connecticut River to Monroe where the line crosses the Connecticut River into Vermont. The route passes north and west of Barnet, Vt., then it follows the Connecticut River south for a short distance. Near McIndoe Falls past the southern flank of Blue Mountain, the route turns west crossing Wells River between the towns of Groten and South Ryegate.

From Wells River, the route continues west to a point 1 mile southeast of the William Scott Memorial Highway. Then it turns southwest and roughly follows this highway and Waits River to the vicinity of Haden Hill. There the route turns west passing south of the Knox Mountains and generally parallels Scott Memorial Highway at a distance south of the highway of one half to 3 miles enroute to Granite Substation. Granite Substation is 2 miles south of Graniteville near Barre, Vt.

Granite-Essex

The proposed route from Granite Substation to the Essex Substation is 43.3 miles long. It parallels existing transmission lines for much of its distance and is entirely within Vermont.

The route begins at Granite Substation and parallels an existing transmission line running northwesterly. The route roughly parallels the Stevens Branch of the White River 1 mile to the east. It passes one-half mile southwest of Barre, Vt., and 2 to 3 miles south of Montpelier, Vt. At a point about 2 miles south of Montpelier, the route turns northwesterly and begins to follow the Winooski River.

The first portion of the route along the Winooski River is a new alinement. It parallels the Winooski at a distance of about 1 mile until it reaches the area of Middlesex, Vt. Just south of Middlesex the route parallels an existing transmission line to its west. It goes south of the Winooski River to the area of Waterbury, Vt. One and one-half miles south of Waterbury, the route angles northwest again parallel to an existing line and crosses the Winooski River 1 mile east of North Duxbury. After crossing the river, the route turns west and follows the northern bank of the river valley through the Green Mountains. The route passes north of the towns of Bolton, Jonesville, and Richmond. Near the intersection of U. S. Highway 2 and Vermont Highway 117 two and one-half miles east of Williston the route turns north along another transmission line. It follows this line north along Highway 117 for a distance of about 1 mile. Then the route turns west and again crosses the Winooski River. The proposed route follows the river about 1 mile from its south bank to the Essex Substation 4 miles to the northwest. The Essex Substation site is on the south bank of the Winooski River 1.5 miles south of Essex Junction, Vt.

2.02 Geology

2.02.1 Regional Overview

The continental glaciers profoundly modified the surface geology of the study area. Some of these glaciers are believed to have been thousands of feet thick. New England was subjected to a series of these ice sheets. The last one retreated some 11,000 to 15,000 years ago.

Although the ice sheets did not change the elevations of the hills and mountains very much, they did create marked changes in the physiography, land forms, and surface materials. A brief reference was made to these physiographic changes in the previous section. The New England soils are typically rocky and often infertile. They resulted when the glaciers stripped away the original soil and soil mantle of New England and left behind a veneer of unsorted clay, sand, and rock fragments called till. In other places they exposed bedrock. The third kind of surface deposit occurring in the study area is alluvium which has been deposited along the streams and rivers and on the flood plains.

Glacial deposits are broken down into two main categories, these are "till" or "unstratified drift" and "stratified drift." The significant difference between till and stratified drift is that till lacks any obvious sorting of its components. Stratified drift deposits show the selective activity of water.

Eighty to 90 percent of the study area is covered by till. This till is composed of a heterogeneous mixture of silt, sand, clay, gravel, cobbles, and boulders. There are three kinds of till: basal till, superglacial till, and moraines. All three occur in the study area.

This widespread distribution of till over New England has important consequences. Because the till is of relatively recent origin in terms of geologic time, it has not weathered a great deal. The New England soil is comparatively young and extremely rocky.

In contrast to the till deposits, stratified drift is sorted distinctly according to the size and weight of its component fragments. This indicates it was formed in a fluid medium. The three main kinds of stratified deposits are: glacio-fluvial deposits, lacustrine deposits, and marine sediments. Glacio-fluvial deposits include all the materials deposited by water melting from the ice. Since they were deposited by running water, they are stratified in layers. There are two types of glacio-fluvial deposits--ice-contact and pro-glacial. The ice contact deposits include kames, kame terraces, and eskers.

Pro-glacial deposits are deposits laid down by water, but they formed outside the margins of the glacier as a result of the stream flows that came from the melting ice. They include "valley train" and "outwash plain" deposits. Valley train deposits are coarse to fine, sandy or gravely materials deposited in a valley downstream from the melting glacier. Outwash plain materials are horizontally bedded and sorted sands or gravels formed downstream from melting glaciers.

Glacio-fluvial deposits, besides being interesting landscape features, are potential sources for groundwater, especially when they occur near lakes or streams which can recharge these deposits. They consist of assorted sands and gravels and are a good source of highway and construction materials.

Eskers, kames, kame terraces, and valley train deposits are quite common in the study area. They do not have the same distribution as the till deposits and are confined largely to valley areas or to long finger-like ridges.

Lacustrine, or lake sediments, are most common in stream valleys and lowland areas. They mark the final melting stage of the ice sheets. The lake deposits formed in alternate layers. These deposits were transported by the water and laid down is stratified silts, clays, and sands. Usually these deposits do not make good aquifers because of the presence of fine sediments, especially clay, which lowers their permeability.

Marine sediments form in salt water. They are similar to lacustrine deposits. However, they do not show the alternating layers. As with lacustrine deposits, marine deposits may contain water-saturated zones. But due to the fineness of the sediments and the grain size of the clay, they do not yield water readily. Occasionally, wells in the more sandy marine deposits yield small supplies of water. Marine deposits are most common in the study area in eastern Maine toward the coast. These areas were once flooded by rising seas when the glaciers melted.

The third type of deposit in the study region, alluvium, is found along the rivers, streams, and on the flood plains. The alluvium came from glacier materials that were eroded from the surface and then redeposited by the streams and rivers as they made their way to the sea.

2.02.2 Geological Description of the Proposed Routes

The following description of geological conditions along the proposed routes represent a summarization of the information contained in appendix F, "Geotechnical Impact Study." The discussion covers five segments.

Dickey-Lincoln School-Fish River

The proposed route extends from Dickey to Fort Kent along the southeast side of the St. John River Valley. The topographic setting is one of moderate relief with mature stream development. Relief ranges from approximately 550 feet to slightly over 1,500 feet (M.S.I.). Most ridge and hill summits range between 1,300 and 1,400 feet. Bossy Mountain is located south of the proposed route west of the town of Fort Kent. Between Dickey and St. Francis, the St. John River is moderately restricted within the well defined valley walls. Below St. Francis to Fort Kent the river valley broadens with a moderately well developed flood plain.

Bedrock along the proposed route is of the Seboomook formation. This sequence of rocks is predominantly a cyclically bedded sequence of gray slate, sandstone, and some graywacke of Early Devonian age. The northeast trend of rocks in this area can be readily identified by the linear topographic expression that is the result of the differential erosion between the less resistant, highly fissile slates and the more resistant sandstone and graywacke beds. Slopes along the route range from low to excessive. The route crosses 15.8 miles classified as having "low" slope (0-10 percent), 11.3 miles having "moderate" slopes (10-15 percent), 2.8 miles having "steep" slopes (15-35 percent), and 0.7 miles having "excessive" slope (35 percent); which comprise 52 percent, 37 percent, 9 percent, and 2 percent of the route, respectively.

Dickey-Moose River

The proposed route extends southwest and south-southwest across relatively flat to moderately rolling topography (see section 2.01.2 for geographical description). Elevation ranges from approximately 1,000 to 1,600 feet over the route. Changes in relief are typically gradual and less than 200 to 300 feet. Glacial till is the predominant surface material with some outwash, ice contact, alluvial and alluvial mixtures. Peat and muck are found in topographic low areas and stream valleys.

The bedrock underlying the route consists entirely of metamorphic sedimentary rock of upper Silurian and lower Devonian age (Seboomook formation). Although the rocks have been tightly folded, only long grade thermalmetamorphism has occurred in this segment. The rock in this segment appear to be of the biotite metamorphic grade. The lithologic changes and geologic structure of the area appears to influence the topography. A massive argillaceous sandstone, including some volcanics, forms a zone of more resistant rocks from Lake Caucomgomoc through Seboomook and Canada Falls Lakes southwestward toward the Canadian border. These more resistant rocks of the Frontenac and possibly the Tarratine formation may also include the area around Green Mountain. In general, the volcanics and graywackes, due to differential erosion with the less resistant shales, slates, and phyllites, form the higher topographic areas.

Slopes along the proposed route from Dickey to Moose River are low to moderate. The route crosses 76.7 miles (65 percent of route) classified as having low slope, 39.4 miles (34 percent) having moderate slope, and 1.3 miles (1 percent) having excessive slope.

Moose River-Moore

The route runs from the Jackman-Moose River area southwestward through the hilly to mountainous terrain of northwestern Maine and northern New Hampshire to the Moore substation on the Connecticut River. Due to the rugged terrain, areas of steep to excessive slopes are encountered. The mountainous areas transversed are part of the northern extension of the White Mountains. In general, the summit elevations increase from Moose River area to the Groveton area of New Hampshire. The topography decreases from here to Moore Substation. Summit elevations around Groveton range from 2,000 to 3,600 feet. The predominant surface material is glacial till with some fine granular and potential aggregate sources located along the stream valleys. Potential soil stability, erosion and sedimentation problems exist along the steeper portions of this segment.

Underlying the route are metamorphosed sedimentary rocks ranging from Ordovician to Devonian in age. In many areas, volcanic rocks are interspersed with, and gradational to, the sequence of slates, shales, phyllites, and schists. The volcanic rocks, for the most part, were deposited contemporaeously to the adjacent metasediments and also range in age from Ordonvician to Devonian. Both mafic and acidic intrusives were injected into the sedimentary sequence during multiple periods of deformation from Ordovician to Mississippian time. Some syenite and serpentine rocks of unknown age are encountered along the route. In general, the intrusive rocks weather and erode more slowly than the volcanic sequence which in turn weathers and erodes more slowly than the sedimentary rocks giving rise to a complex topography. In many cases, however, local structural and lithological characteristics are the prime considerations in terms of topographic control.

Slopes along this segment of the proposed route are generally greater than encountered elsewhere. Low slopes comprise 51.7 miles or 38 percent of the route, 68.2 miles (50 percent) are classified as having moderate slope, 13.3 miles (10 percent) steep slopes, and 3.6 miles (3 percent) have execessive slopes.

Moore-Granite

This segment runs from Moore Substation on the Connecticut River west and southwestward across the hilly to mountainous terrain of east central Vermont. In general, the topography is moderately hilly with numerous isolated peaks with summit elevations between 2,000 and 3,000 feet.

With the exception that portion of the route along the Connecticut River, glacial till is the predominant surface material. Along the Connecticut River from Moore substation to Barnet, Vt., fine lacustrine/outwash deposits are generally exposed along the steeper valley walls.

The underlying bedrock consists of Ordovician and Devonian metamorphosed sediments and volcanics. These metamorphic rocks have been intruded by Ordovician and Devonian granite rocks, and in some cases, early intrusive rocks have been metamorphosed by more recent events. In general, the bedrock structure appears to subordinate lithology as primary control of topography. However, the large granite complex in the vicinity of Hardwood Mountain shows a strong correlation between topography and lithology. Steep to excessive slopes are encountered in several instances along the proposed route. In general, where these steeper slopes are crossed, a potential for soil stability, erosion and sedimentation problems may exist.

Low slopes occur along 15 miles of the route (39 percent), moderate slopes for 17.6 miles (45 percent), steep slopes for 3.9 miles (10 percent), and excessive slopes for 2.2 miles which is 6 percent of the route.

Granite-Essex

This portion of the proposed route extends from Granite Substation northwestward paralleling the Winooski River Valley through the Green Mountains to Essex Substation about 5 miles east of Burlington, Vt. The topography ranges from hilly to mountainous along the axis of the Green Mountains. In general, the Winooski River is a mature stream that has become entrenched into the terrain. Extensive lacustrine/outwash deposits, which are transitional to a marine deltaic sequence, occur throughout this area as a result of numerous lakes formed during the waning glacial period. These deposits are exposed along the valley walls and lower upper surfaces along most major streams. These lake and outwash materials often form the steep slopes along the moderately deep entrenched stream valleys. Those sediments, due to their high silt and fine sand fractions, are highly erodable when the surface soils are disturbed.

Relief along the route ranges from several hundred feet to nearly 1,000 feet. The higher percentage of steep to excessive slopes are mainly due to the steep valley walls of the entrenched streams throught this segment.

The bedrock underlying the route consists of Cambrian to Devonian metamorphosed sedimentary and volcanic rocks. Due to the long time span over which these rocks were formed and the variety of the tectonic and orogenic events that deformed them subsequent to their disposition, the proposed route crosses a great number of various lithologies. These varied lithologies range from dolomite and marble to crystalline schists and gneiss. Topography along the route is the result of a combination of lithology, structure, and local factors.

Slopes along the route from Granite to Essex are the most severe encountered by the proposed lines. Excessive slopes occur over 4.4 miles and comprise 11 percent of the route, steep slopes occur over 7.2 miles representing 17 percent of the route, moderate slopes occur over 16 miles for 39 percent of the route, and low slopes over 14 miles for 34 percent of the route.

2.03 Soils

2.03.1 Regional Overview

Geologists define soils as a surface zone of unconsolidated materials that have been altered by weathering. Soils in the study area came about through the breakdown of till and bedrock and an interaction with vegetation, weathering, precipitation, and climate. New England soils, which are comparatively young, formed after the last glacier receded some 11,000 to 15,000 years ago. Soils derived from till are stony. These soils continue to heave up boulders.

Many areas, especially in the mountains, were scraped clean by the glaciers. The soil there is very thin because bedrock takes a long time to break up and weather.

2.03.2 Description of Soil Properties Along the Proposed Route

The following descriptions of soil properties along the proposed route addresses two subjects: general soil characteristics and surficial materials.

The discussions on general soil characteristics describe soil associations along the proposed route, the landscape position in which they tend to be located, and their texture and erodibility. Much of this information comes from published soil surveys of the USDA Soil Conservation Service (SCS).

Surficial materials were inventoried as one element of the Geotechnical Impact Study, appendix F. The appendix contains detailed maps illustrating the locations of surficial deposits along the routes. Tables which summarize the distribution of surficial materials along each segment appear below.

Erosion potential was assessed by the Geotechnical Impact Study. Soil erosion potentials are expressed as slight, moderate, or high. Descriptions of erosion potential along segments of the proposed route are provided in table 3.03-1, section 3.03-2.

Dickey-Lincoln School-Fish River

General Soil Characteristics - Most of the soils on this segment of the proposed route have been mapped by the SCS. The medium intensity soil survey published by SCS indicates that two basic soil associations are found on this route. They are Thorndike-Howland and Stetson-Allagash-Hadley-Winooski associations. The Thorndike-Howland association consists of soils derived from glacial tills. Mostly shallow to bedrock Thorndike soils occur on the hills. The deeper, moderately well drained Howland soils are found in the lower areas. Topography is generally irregular in this association. Erodibility is classified as medium to slight.

The Stetson-Allagash-Hadley-Winooski association consists of soils formed in floodplains and terraces. They are composed of water-deposited sands and gravels and some silts. Soils of this association are found in most stream valleys along the route. Most of the soils in the association are well drained. Hadley and Winooski soils are floodplain soils found along streams and the St. John River. These soils have high erodibility. The well-drained Allagash and Salmon soils and the moderately well drained Madawaska and Nicholville soils are found on the lower terraces. These soils are mostly sandy and generally have medium erodibility. In wetter areas their erodibility is high. Stetson and Machias soils are found in the higher terraces and are usually more gravelly. These soils have low to medium erodibility.

Surficial Materials - The distribution of surficial deposits along the proposed route from Dickey to Fish River Substation is summarized in table 2.03-1. Surficial deposits along this segment are mostly deep glacial till and outwash.

TABLE 2.03-1

SURFICIAL DEPOSITS[1]
PROPOSED ROUTE

DICKEY-LINCOLN SCHOOL-FISH RIVER

Surficial Deposit Types	Miles Crossed	Percent of Route
Glacial Till (deep)	9.6 mi.	33%
Glacial Till (highgroundwater)	3.7 mi.	13%
Glacial Till (shallow depth)	3.6 mi.	12%
Glacial Till (shallow depth and high groundwater)	-	-
Bedrock	-	-
Outwash (deep)	10.7 mi.	36%
Outwash (high groundwater)	1.1 mi.	4%
Ice Contact	-	-
Alluvial	0.7 mi.	2%
Peat & Muck	-	-
Alluvial & Peat & Muck	-	-
Lacustrine/Outwash	-	-
Outwash & Alluvial	-	-

[1] Reference: Geotechnical Impact Study, appendix F.

Dickey-Moose River

General Soil Characteristics - Most of soils along this route have been formed in glacial tills. The SCS is presently conducting reconnaissance soil investigations in the area. Preliminary information indicates that soils of the Perham-Daigle Soil association are found along the route from Dickey to Allagash Stream and Doucie Brook. These soils are comparatively deep, usually more than 3 feet to bedrock. In the higher and steeper areas, shallow to bedrock soils are present. Perham and Daigle soils are silty to sandy and have a dense, compact substratum. Perham soils are well drained and are found on upper slopes. Daigle soils are poorly drained and are found on the lower slopes. Erodibility of these soils is medium.

In the southern section of the route, the glacial till soils have been identified as the Chesuncook-Telos-Monson association. These soils are silty and stony. Chesuncook and Telos soils have a firm, compact substratum. Monson soils are shallow to bedrock. Chesuncook soils are well-drained and are found on the upper slopes. Telos soils are poorly drained and are found in lower areas. Erodibility is medium. Soils of this type are common in northern Maine areas where steep slopes are present.

Most of the outwash soils on this route segment belong to the Colton-Stetson-Allagash association. These soils are usually gravelly and well-drained. Erodibility is low.

The areas of floodplain and alluvial soils are of the Hadley-Winooski association. Erodibility is high. These soils are of minor extent along the route.

Peat and muck areas are present in the lower areas of the segment. Peat and muck is highly erodible if disturbed.

Surficial Deposits - Surficial materials on the segments between Dickey and Moose River substations are almost exclusively glacial tills. Table 2.03-2 is a compilation of surface deposits. Glacial tills are encountered along 93 percent of the segment. Most of the glacial tills are deeper than 5 feet.

TABLE 2.03-2

SURFICIAL DEPOSITS[1]
PROPOSED ROUTE

DICKEY-MOOSE RIVER

Surficial Deposit Types	Miles Crossed	Percent Of Route
Glacial Till (deep)	66.2 mi.	56%
Glacial Till (high groundwater)	27.3 mi.	23%
Glacial Till (shallow depth)	16.3 mi.	14%
Glacial Till (shallow depth and high groundwater)	-	-
Bedrock	-	-
Outwash (deep)	1.6 mi.	1%
Outwash (high groundwater)	-	-
Ice Contact	0.1 mi.	<1%
Alluvial	1.0 mi.	1%
Peat & Muck	0.1 mi.	<1%
Alluvial & Peat & Muck	6.0 mi.	5%
Lacustrine/Outwash	-	-
Outwash & Alluvial	-	-

1 Reference: Geotechnical Impact Study, appendix F.

Moose River-Moore

General Soil Characteristics - Most of the soils on this route segment are derived from glacial till. Much of these soils are silty and stony. The silty till soils belong to the Chesuncook-Telos-Monson Soil association in Maine and the Calais-Buckland-Glover Soil association in New Hampshire. All these soils have formed in compact tills and have very firm substrata. The Chesuncook-Telos-Monson association may be more silty and of a colder temperature regime. Chesuncook and Calais soils are well-drained deep soils found near the tops of ridges and hills. Telos and Buckland soils are found along the base of slopes and the lower areas of the segment. They are more poorly drained. Monson and Glover soils are shallow to bedrock. Soils of these types are found from Jackman to Wilson Mills in Maine and on to Columbia, N. H. These soils have medium erodibility. South of Columbia, the till-derived soils are more sandy. Soils in this area belong to the Lyman-Berkshire-Marlow association and the more gravelly Becket-Skerry-Lyman association. Shallow to bedrock soils are common. Because of steep slopes, much of the area is well drained. The soils of these associations have low erodibility.

The till-derived soils in Vermont are more silty, and the erodibility of these soils is higher. They are soils of the Cabot-Peru-Marlow association. Much of this area is well-drained.

Along most large streams in the route, soils have formed on sandy water-deposited terraces. The Masardis-Adams association has sandy and gravelly soils of this type. Peat and muck soils are common with these soils. They are found in Maine along the Dead River and from Parmachenee Lake to Cupsuptic Lake. Other terrace soils belonging to the Windsor and Adams-Colton-Duane associations are found along the Mohawk, Jones, and Connecticut rivers and Akers Pond. Mixed outwash-alluvial soils of the Colton-Ondawa-Podunk association are found along the Swift Diamond, Upper Ammonoosuc and Connecticut rivers. Terrace soils have low erodibility.
Floodplain soils are found only in a small area of the segment. These soils of the Limerick-Winooski association are silty and have a high erodibility. The route crosses these soils at the Connecticut River floodplain between Northumberland, N. H., and Guildhall, Vt.

Surficial Deposits - Glacial tills are the dominant deposits encountered. (See table 2.03-3.) Tills occur over 89 percent of this route. These deposits are usually more than 5 feet deep. Alluvial, peat, and muck deposits are found on the route at the Upper Ammonoosuc and Connecticut River crossings.

TABLE 2.03-3

SURFICIAL DEPOSITS[1]
PROPOSED ROUTE

MOOSE RIVER - MOORE

Surficial Deposit Types	Miles Crossed	Percent Of Route
Glacial Till (deep)	78.7 mi.	58%
Glacial Till (high groundwater)	23.1 mi.	17%
Glacial Till (shallow depth)	22.0 mi.	16%
Glacial Till (shallow depth and high groundwater)	3.3 mi.	2%
Bedrock	-	-
Outwash (deep)	5.2 mi.	4%
Outwash (high groundwater)	-	-
Ice Contact	1.8 mi.	1%
Alluvial	1.9 mi.	1%
Peat & Muck	0.1 mi.	1%
Lacustrine/Outwash	-	-

[1] Reference: Geotechnical Impact Study, appendix F.

Moore-Granite

General Soil Characteristics - Almost all of this segment has soils which have formed in glacial till. However, there are some floodplain soils of the Limerick-Winooski Soil association. They are minor in extent. The most notable of these areas is along the Jail Branch of the Winooski River. The Connecticut River has been dammed where the route crosses and the floodplain normally associated with the river has been inundated. Terraces are found along many of the streams. The lower terraces along the larger rivers are mostly sandy, gravelly, and well-drained. These soils belong to the Adams-Windsor association. Soils of this association are also found on terraces along small streams. The largest areas of these soils are located near the Connecticut River, Wells River, Jail Branch, Stevens River, and Great Brook. Erodibility of the Adams-Windsor association is low.

On the higher terraces along the Connecticut River, soils have developed on old lake plains. These soils are commonly silty and are moderately well drained. Erodibility is high. Lake plain soils in this segment belong to the Hartland-Belgrade Soil association.

Soils formed in glacial till vary according to topography and location. In the New Hampshire section of the route soils belong to the Lyman-Marlow-Peru soil association. These soils are sandy to silty with a well-developed fragipan. On hills and ridges these soils may be shallow to bedrock. Berkshire soils which are sandy and have no fragipan are found in this association and are common in southern portions of the route. The Lyman-Marlow-Peru soil association has medium to low erodibility, but slopes are generally steep. The till soils from Connecticut River to Groton, Vt., are in the Colrain-Woodstock soil association. The soils found here in the rolling uplands of central Caledonia County are sandy to silty and mostly well drained. The soils of the Colrain-woodstock association are typically found along the ridges and hills of this part of the segment, and are shallow to bedrock in places. In the lower lying areas, soils belonging to the Paxton-Woodbridge association are found. These soils are similar to those of the Colrain-Woodstock association, but have a fragipan at a depth of 1 to 2 feet. Their erodibility is medium. The Colrain-Woodstock association has low erodibility.

In Groton, northern Topsham, and Orange, the soils again belong to the Lyman-Marlow-Peru soil association. These soils are generally found at higher elevations in this part of Vermont. Shallow to bedrock soils perdominate on the ridges and hilltops of this area.

The lower sides of the hills in this part of the route possess silty soils with well-developed fragipans. These soils of the Cabot-Buckland association have medium erodibility. Associated with the Cabot-Buckland soils are the Colrain-Woodstock association. These are sandier soils and are shallow to bedrock. Mostly of the ridges and hilltops in the lower Orange and Topsham have these soils.

In eastern Washington and western Orange counties, the till-derived soils become silty and have a very firm compact layer at 1 to 2 feet. These soils of the Glover-Calais-Buckland soil association, are generally found in the lower elevations of central Vermont. Much of the area is well drained. Shallow to bedrock soils are found along hilltops and steep slopes. Erodibility is medium.

Surficial Deposits - Glacial tills again are the dominant surficial category encounterd. Tills of shallow depth are frequently encountered. Table 2.03-4 shows the distribution of surficial deposits along this portion of the proposed route.

Granite-Essex

General Soil Characteristics - This route primarily has soils derived from glacial tills. Most of the till soils found along the segment are stony. Soils of the Buckland-Cabot association and the Glover-Calais-Buckland association are found from Granite substation to Montpelier. These soils are silty and have a firm, compact layer at a depth of 1 to 2 feet. Many areas are shallow to bedrock. Much of this part of the segment is well drained. The erodibility is generally medium. From Montpelier to Richmond much of the segment is near an interface of floodplain soils and till derived soils. The floodplain soils belong to the Hadley-Winooski-Limerick association and are found in the larger stream valleys along the entire segment. The valleys include the Winooski River, Dog River, and Stevens Branch of the Winooski River. The floodplain soils are generally silty and are highly erodibile. The till soils in the Montpelier to Richmond section of the segment belong to the Lyman-Marlow-Peru soil association. The soils are less silty than those of the Buckland-Cabot soil association. A well developed fragipan is found in them. Most of this area is in the Green Mountains and is shallow to bedrock. Erodibility of the soils in this association is medium to low. Slopes are generally steep.

In the section of the route from Richmond to Essex, most of the soils have formed in water deposited material. There are some small areas in this section with till derived soils which belong to the Peru-Cabot-Marlow soil association. These soils are deep and have a fragipan. They have medium erodibility. There are also some minor areas of till derived soils belonging to the Farmington-Nellis-Stockbridge soil association. The soils of this association are shallow to bedrock for the most part, and are generally more silty than the soils of the Peru-Cabot-Marlow association. They have medium erodibility. Large areas of floodplain soils of the Hadley-Winooski-Limerick soil association are found along the Winooski River.

Above the Winooski floodplain are extensive areas of terraces and old lake plains. Generally, the soils found on the terrances belong to the Adams-Windsor soil association. These soils are sandy to gravelly and are mostly well drained. The erodibility of this soil association is low. Soils of the Adams-Windsor association are also found on other terraces along the route. Most of the soils formed on the old lake plains belong to Hartland-Belgrade-Munson soil association. These soils

TABLE 2.03-4

SURFICIAL DEPOSITS[1]
PROPOSED ROUTE

MOORE-GRANITE

Surficial Deposit Types	Miles Crossed	Percent Of Route
Glacial Till (deep)	17.5 mi.	46%
Glacial Till (high groundwater)	3.9 mi.	10%
Glacial Till (shallow depth)	7.9 mi.	21%
Glacial Till (shallow depth and high groundwater)	-	-
Bedrock	-	-
Outwash (deep)	0.3 mi.	<1%
Outwash (high groundwater)	-	-
Ice Contact	0.1 mi.	<1%
Alluvial	0.7 mi.	2%
Peat & Muck	0.1 mi.	<1%
Alluvial & Peat & Muck	0.2 mi.	<1%
Lacustrine/Outwash	0.8 mi.	2%
Outwash & Alluvial	6.6 mi.	17%

[1] Reference: Geotechnical Impact Study, appendix F.

are found along the Winooski River, Snipe Island Brook, Crossett Brook, Mad River, and Dog River. The soils are silty and sometimes underlain by clay. Erodibility is high.

Near the Essex substation there is another area of soils that have developed in old lake plains. These soils belong to the Enosberg-Whately-Vergennes association. They are sandy near the surface and underlain by clay. Some areas have clayey surface soils. The soils of the Enosberg-Whately-Vergennes association have medium to high erodibility.

Surficial Deposits - Surficial deposits on the proposed route from Granite to Essex vary considerably from those on other route segments. Most of the soils crossed are shallow glacial tills. Lacustrine/outwash deposits occur over a distance of 8.3 miles. These deposits are typically fine to moderate in texture. They were deposited in glacial lake environments. Alluvial soils are also often encountered along this portion of the proposed route. Table 2.03-5 shows a breakdown of surficial deposits for this route.

2.04 Mineral and Aggregate Deposits

2.04.1 Regional Overview

Mineral exploration in the study region has largely been conducted by private corporations. Both reconnaissance and preliminary explorations have occurred. However, site specific information based upon this work is proprietary information not available to the public.

The mineral reported most frequently as occurring in the region is copper. From the area of Dickey south to northern New Hampshire--wherever volcanic rock occurs--copper deposits may occur. Minerals which occur in association with copper but in lesser amounts, are: zinc, lead, molybdenum, gold, and silver.

Current reconnaissance for mineral deposits in the study region are directed at identifying areas where copper ore may be high grade and thus feasible to mine. Several locations are reported to possess such deposits. However, since no plans to mine these resources are known, their importance will be greatest, perhaps, at some future date.

Aggregate sources within the study region are fairly abundant and occur mostly in valley floors adjacent to water features.

2.04.2 Mineral and Aggregate Deposits along the Proposed Route

No important mineral deposits are known to occur along the proposed route, and no developed mining facilities were encountered. The following areas occur in the general area of the route and to some extent may be considered as indications of the types of mineral resources which might be present. Caucomgomoc Mountain, Catheart Mountain, and Burnt Jacket Mountain located in Piscatequis and Somerset Counties of Maine contain copper resources.

TABLE 2.03-5

SURFICIAL DEPOSITS[1]
PROPOSED ROUTE

GRANITE-ESSEX

Surficial Deposit Types	Miles Crossed	Percent Of Route
Glacial Till (deep)	11.2 mi.	26%
Glacial Till (high groundwater)	1.1 mi.	3%
Glacial Till (shallow depth)	16.9 mi.	39%
Glacial Till (shallow depth & high grounwater)	-	-
Bedrock	-	-
Outwash (deep)	0.9 mi.	2%
Outwash (high groundwater)	-	-
Ice Contact	2.0 mi.	5%
Alluvial	2.7 mi.	6%
Peat & Muck	-	-
Alluvial & Peat & Muck	-	-
Lacustrine/Outwash	8.5 mi.	20%
Outwash & Alluvial	-	-

[1] Reference: Geotechnical Impact Study, appendix F.

Rump Mountain and Thrasher Peaks in the Oxford County area near the Maine-New Hampshire border were also identified as having some copper.

The Conway granite is located near Percy Peak and Long Mountain, northeast of Groveton, N. H., in Coos County. The Conway granite, in general, has been identified as an area for uranium exploration.

Several copper mines were opened in this same general area in the late 1800's but due to insufficient size and concentration were eventually closed.

Magnetite (iron ore) was mined at Burnside Mountain in Essex County, Vt., (Guildhall, Vt., area) for a short time prior to 1886. Lead in the form of galena was identified in this same general area.

Granite and slate mines occur in the general area of the route between Moore and Granite substations. These building materials have been a major economic resource in the Barre, Vt., area. Current mining interests are concentrated on a single intrusive granite mass in and around Barre, Vt.

Abandoned granite mines are located at Blue and Burnham mountains in the towns of Ryegate and Topsham, Vt.

Three copper mines were operated intermittently from about 1860 to 1919 in an area known as Dike Hill, in the town of Corinth, Vt. These mines were apparently closed due to a decline in copper prices rather than a shortage of ore.

The assessment of possible aggregate deposits along the proposed route relied upon the surficial deposit data presented in section 2.03. All clean, moderate to coarse textured granular deposits were assumed to be potential aggregate sources.

Aggregate sources were identified along all segments of the proposed route. Relatively extensive areas of aggregate deposits are predicted along the route from Dickey to Fish River Substation, which follows topographically low areas along the St. John River. A second area of relatively high aggregate potential is along the Winooski River between Granite and Essex Substations.

2.05 Climate and Air Quality

2.05.1 General Description

The National Weather Service describes the study area's climate as "changeableness of weather, large range of temperatures, both daily and annual; great difference between the same seasons in different years; equitable distribution of precipitation; and considerable diversity from place to place." Local factors which cause variations are, "varying elevations, types of terrain, and distance from the Atlantic Ocean" (appendix B).

Mountain elevations above 2,000 feet experience the most severe weather conditions in terms of extreme cold temperatures, heaviest precipitation, heaviest snowfall, greatest frequency of high winds, and greatest exposure. Alpine-tundra vegetation occurs above the treeline on the tops of the higher mountains and is indicative of severe climatic extremes. The treeline generally occurs at 4,800 feet on north slopes and at 5,200 feet on south slopes.

Temperature

The annual average temperature ranges from 41° Fahrenheit in the northern interior areas to 45° F in the southern river valleys and sea coast areas of southern Maine. Elevation, slope, aspect, and other local environmental features such as the degree of urbanization have an effect on temperature variation. At the summit of Mt. Washington, for example, the annual average temperature is 27° F, whereas the stations in its vicinity at much lower elevations report annual averages of 40° to 42° F. Temperature varies more from one location to another in winter than in summer. There are an average of 25 days with subzero readings in the southern areas and 60 or more per year in the northern areas and mountains.

The growing season, (i.e, the number of days between the last killing frost of spring and the first killing frost of autumn,) varies from almost 140 days in the southernmost areas to less than 90 days in the White Mountains. Within the study area, the growing season in the northernmost parts is considered to be less than 100 days.

Precipitation

Precipitation is spread evenly throughout the year and averages from 38 to 48 inches annually except on the higher mountains where it may be as high as 60 to 70 inches. Coastal storms bring heavy precipitation to the southern and eastern sections of Maine near the coast in winter.

The average annual snowfall varies widely from north to south and is related to elevation. For example, in New Hampshire, the summit of Mt. Washington receives nearly 185 inches of snow annually. Bethlehem, only 20 miles to the west, receives 70 inches per year. Snowfall varies greatly from year to year. In 24 years of records for Mt. Washington, the seasonal snowfall ranged from a maximum of 317 inches to a minimum of 135 inches. Monthly snowfall averages in different years vary even more than the yearly averages. Generally, the average annual snowfall is 55 inches in the southern portions of the study area to 110 inches in the northernmost portion.

Winds and Storms

The study area lies within the region of prevailing westerlies and winds coming from the northwest in the winter and from the southwest in the warmer part of the year. However, these generalizations may be affected by the influence of mountains and river valleys acting as barriers or tunnels, which may channel the winds perpendicular to their predominant regional direction.

Coastal storms, called "northeasters" are well known in New England. These storms, due to their coastal origin, are most prevalent in southeastern New Hampshire and southeastern Maine. Northeasters generate strong winds accompanied by heavy rain or snow. Sometimes they create ice storms.

In late summer or fall, storms of tropical origin may affect portions of the study area. Few such storms reach full hurricane force.

Tornadoes are not common. They occur once or twice a year and affect only small areas. Because so much of the land is forested and sparsely settled, most of the tornadoes are not seen or recorded. They do not do much damage. The peak months for tornadoes are June and July. The probability of a tornado striking any given spot is extremely remote.

Thunderstorms and hailstorms occur most often from mid-spring to early fall on an average of 15 to 20 days per year. The most severe storms are accompanied by hail which can ruin field crops, break glass, and damage property. Usually hail damage is slight, and the area affected is relatively small.

Glaze (ice) storms during winter produce hazardous travel conditions. But these storms are usually brief. A few have occured which were prolonged and widespread. They break trees and utility lines. In the design of transmission lines, ice load is an important factor to be considered.

Floods

Widespread major flooding is not a frequent phenomenon in the study area. The most common flooding occurs in the early spring when heavy rains combine with melting snows. Usually the snow melts earlier in the warmer downstream areas and is gone before thawing starts in the colder headwater areas. As a result, serious flooding does not occur during the spring runoff in most years. Major springtime floods occurred in 1895, 1896, 1923, 1936, and 1953. Less serious, fairly widespread floods occurred as a result of heavy rains in the fall of 1907, 1909, 1927, and 1950. Summertime storms bring about local flood conditions in small streams, but rarely affect the main stream flows.

2.05.2 Climate and Air Quality Influences

Two climatic factors, wind and ice, exert forces upon the transmission towers and conductors. Criteria for the design of transmission lines in response to wind and ice loading are set forth in the National Electric Safety Code (NESC) of the American National Standard. The February 28, 1977, edition of the NESC, Section 25, indicates that the proposed transmission lines would be located in an area classified as having heavy combined loading due to combined ice and wind.

Microclimatic conditions will be modified in response to vegetative clearing along the proposed transmission line. However, site specific information is not available in a form which would permit a descriptive narrative of microclimatic conditions along the proposed route. Sections 3.07 and 3.08, which describe the impact of the proposal, discusses the potential effects of microclimatic alteration upon vegetation and wildlife resources.

2.06 Surface Water

2.06.1 Regional Overview

Water is a fundamental and dominant resource in the study area. The water surface features have been determined largely by glacial activity, post glacial uplifting, erosion, and an average precipitation greater that 40 inches per year. The forest cover retains precipitation and releases it slowly thereby minimizing sedimentation and temperature changes.

Man's activities, such as settlement patterns, commerce, and transportation, have responded to the availability of water. Historically, grist mills were located on natural water courses. The settlement of nearby towns and villages followed. Later, other kinds of industry such as shoe factories and lumber mills, were located along the rivers and streams because they supplied water power and a means of transportation. This settlement pattern is still evident today in the population distribution along major water courses.

Farming in New England was oriented to water courses where the deeper, alluvial soils were less rocky and more productive, as compared with eroded soils on the hillsides. Water has combined with the forest and physiographic resources of this study area to produce an abundant esthetically pleasing environment. The region is a major area for outdoor recreation. Lakes and ponds which can support sailing, boating, fishing, and swimming have attracted vacation homes.

Water quality within the study area is relatively high. Vermont and New Hampshire have identified and mapped their Class A waters, which are waters rated highest as to quality. Maine has listed its waters in a publication titled, "Classification of Surface Waters" (State of Maine, 1975). The value of these waters for existing and potential sources for municipal supply is recognized as a major asset. Sensitive water basins in the study area are illustrated on map 7.4, map volume, appendix B.

Basins of high quality water in Vermont and New Hampshire are much smaller and more limited in number than those in northern Maine.

2.06.2 Aquatic Resource Inventory

Aquatic resources were inventoried through the Ecological Resource Impact Study (appendix E). The inventory techniques used included literature research, interviews with State biologists, and helicopter reconnaissance. Aquatic resources were categorized as: streams, defined as linear bodies of water with a downward direction of flow; wetlands, defined as areas where the soil is waterlogged by shallow, standing water for most of the year; and lakes. Streams as defined included rivers and brooks. Wetlands were distinguished by the dominant form of vegetation and classed as: bogs, marshes, or swamps. Lakes as defined included both ponds and lakes.

Information on geographical considerations, chemical and physical characteristics, and wildlife species associated with aquatic resources is presented in section 3 of appendix E. Table 2.06-1 lists the habitat, spawning needs and dominant food type of fish species which occur in waters along the route.

Groundwater conditions and the major sources of groundwater were also researched through the Ecological Resources Impact Study, thus information on groundwater resources also appears in appendix E.

2.06.3 Aquatic Resources along the Proposed Route

2.06.3.1 Inventory of Water Features

The previous section described the characteristics of aquatic systems. The following summarizes the number and types of such features occurring along the proposed route. The following information is summarized from that contained in the Ecological Resources Impact Study, appendix E and the Geotechnical Impact Study, appendix F.

Tables 2.06-2 through 2.06-6 list water features along each of the five segments. The tables provide information on the number of water features encountered, their names, and their general landscape position. The significance of these features as habitats for wildlife is discussed in section 2.06.3.2. Water Quality is discussed in section 2.06.3.3. The use of water features for such activities as recreation is covered under separate headings.

2.06.3.2 Aquatic Resource Ecological Values

This section discusses the value of water features on wildlife habitats. (An inventory of water features along the proposed route appears in section 2.06.3.1.)

Streams, wetlands, and lakes have been ranked according to their value as habitats (see appendix E). Values are assigned on a five point scale. For example, in ranking a stream for its value to trout fisheries, the stream with a ranking of 1 would have poor habitat for trout, while a stream ranked 5 would be an excellent trout habitat. Wetlands are ranked according to their ability to support a variety of wildlife. A large wetland with a number of interspersed vegetation types which is located near a permanent water body or stream would have a greater diversity of wildlife than a small, isolated wetland with homogenous vegetation. The former example would receive a 5 ranking and the latter a ranking of 1.

Lakes are rated according to size and the status of their fisheries. Large lakes with several good fisheries, or a single excellent fishery, would receive a ranking of 5. Small lakes with no reported fisheries receive a ranking of 1.

TABLE 2.06-1

FISH SPECIES OCCURRING WITHIN THE AREA[1]
CROSSED BY THE TRANSMISSION ROUTE

SPECIES	HABITAT		TEMPERATURE		SPAWNING AREA		FOOD				
	Streams	Lakes	Cold	Warm	Streams	Lakes	Fish	Insects	Benthic Invert.	Plankton	Detritus
Semotilus corporalis (Fallfish)	X	X	X	X	X	X	X	X	X	X	
Semotilus atromaculatus (Creek chub)	X		X		X		X	X	X		
Catostomus commersoni (White sucker)	X	X	X	X	X			X	X	X	
Catostomus catostomus (Longnose sucker)	X	X	X		X			X	X	X	
Ictalurus nebulosus (Horned pout)	X	X		X	X	X	X	X	X		X
Lota lota (Cusk)	X	X	X		X	X	X				
Gasterosteus aculeatus (Threespine stickleback)	X	X		X	X	X		X	X	X	
Pungitius puntitius (Ninespine stickleback)	X	X		X	X	X		X	X		
Micropterus dolomieui (Smallmouth bass)	X	X		X		X	X	X	X		
Lepomis gibbosus (Pumpkinseed sunfish)	X	X		X		X	X	X	X		
Perca flavescens (Yellow perch)	X	X		X		X	X	X	X		
Cottus cognatus (Slimy sculpin)	X	X	X		X		X	X	X		
Anguilla rostrata (American eel)	X	X	X	X			X	X	X		X
Coregonus clupeaformis (Lake whitefish)		X	X		X	X	X	X	X	X	
Prosopium cylindraceum (Round whitefish)	X	X	X		X	X		X	X	X	
Salmo salar (Land-locked salmon)	X	X	X		X		X	X			
Salmo gairdneri (Rainbow trout)	X	X	X		X		X	X			
Salvelinus fontinalis (Brook trout)	X	X	X		X		X	X			
Salvelinus namaycush (Lake trout)		X	X			X	X	X	X		
Salvelinus oquassa (Blue-back trout)		X	X		X					X	
Osmerus mordax (Rainbow smelt)	X	X	X	X	X		X	X	X		
Esox niger (Chain pickerel)	X	X		X		X	X	X	X		
Couesius plumbeus (Lake chub)	X	X	X		X		X	X	X	X	
Notropis cornutus (Common shiner)	X	X	X		X			X	X	X	
Phoxinus eos (Redbelly dace)	X	X	X			X				X	
Phoxinus neogaeus (Finescale dace)	X	X	X			X				X	
Rhinichthys atratulus (Blacknose dace)	X	X	X	X	X			X		X	
Rhinichthys cataractae (Longnose dace)	X		X		X			X			

[1] Reference: Ecological Resources Impact Study, Appendix E

TABLE 2.06-2

WATER RESOURCES[1]
PROPOSED ROUTE

DICKEY - LINCOLN SCHOOL - FISH RIVER

WATER RESOURCE TYPE	WATER RESOURCE NAME		# PERPENDICULAR CROSSINGS	# OBLIQUE CROSSINGS	# PARALLELS
RIVERS	Allagash R.		1		1
	Fish R.		1		
BROOKS	Petite Bk.				1
	Thibideau Bk.		1		
	Kelly Bk.		1		
	Factory Bk.		1		
	Wheelock Bk.			1	
	Sinclair Bk.			1	
	Camel Bk.		1		
	Negro Bk.		1		
	Casey Bk.		1		
	Wesley Bk.		1		
	Wyles Bk.		1		
	Wiggins Bk.		1		
	McClean Bk.		1		
	no names		10	4	
TOTAL:		30	22	6	2
LAKES			LOCATION		
			< 1/2 MILE	≥ 1/2 MILE	
TOTAL:		0	0	0	
WETLANDS			CROSSED BY ℄	BELOW ℄	ABOVE ℄
	no names		2		3
TOTAL:		5	2		3

[1]References: Ecological Resources Impact Study, Appendix E
Geotechnical Resources Impact Study, Appendix F

TABLE 2.06-3

WATER RESOURCES[1]
PROPOSED ROUTE

DICKEY - MOOSE RIVER

WATER RESOURCE TYPE	WATER RESOURCE NAME	# PERPENDICULAR CROSSINGS	# OBLIQUE CROSSINGS	# PARALLELS
RIVERS	Allagash R.			1
	S. Br. West Twin R.			1
	St. John R.		1	
	S. Br. Penobscot R.		1	
BROOKS	N. Br. West Twin Bk.	1		
	Ben Glazier Bk.	1		
	W. Br. Ben Glazier Bk.	1		
	McKinnon Bk.	1	1	
	Savage Bk.		1	
	Schedule Bk.		1	
	Johnson Bk.		1	
	Whittaker Bk.	1	1	
	Harding Bk.		1	
	Farm Bk.	2		2
	Cunliffe Bk.	1		
	Bk. from Ugh Lake	1		
	Agnes Pond Bk.			1
	Baker Bk.		1	
	Rainey Bk.	1		
	Abacotenic Bk.	1		
	Budwory Bk.		1	
	Little Penobscot Bk.		1	1
	Alder Bk.		1	1
	Upper Churchill St.	1		
	Holmes Bk.	1		
	Gilbert Bk.	1		
	Kelley Bk.	1		
	Little Gilbert Bk.	1		
	Campbell Bk.	1		
	Center Bk.	1		
	Mills Bk.	1		
	Sweeney Bk.	2		
	Fool Bk.	1		
	Knowles Bk	2		
	Comstock Bk.	1		
	Doucie Bk	2		
	Turner Bk.	1		
	McDonald Bk.	1		
	Carry Bk.	1		
	Norris Bk.	1		
	Dole Bk.	1		
	Hale Bk.		1	
	Heald St.	1		
	L. Br. Sandy St.	1		
	no names	24	18	3
TOTAL:	99	58	31	10

WATER RESOURCE TYPE	WATER RESOURCE NAME		LOCATION: < 1/2 MILE	LOCATION: ≥ 1/2 MILE
LAKES	Blue Pond		1	
	Trickey Ponds		1	
	Canada Falls Lake		1	
	Alder Pond		1	
	Baker Lake			1
	Long Pond			1
TOTAL:		6	4	2

WATER RESOURCE TYPE	WATER RESOURCE NAME		CROSSED BY ℄	BELOW ℄	ABOVE ℄
WETLANDS	no names		33	13	7
TOTAL:		53	33	13	7

[1]References: Ecological Resources Impact Study, Appendix E
Geotechnical Resources Impact Study, Appendix F

TABLE 2.06-4

WATER RESOURCES [1]
PROPOSED ROUTE

MOOSE RIVER - MOORE

WATER RESOURCE TYPE	WATER RESOURCE NAME	# PERPENDICULAR CROSSINGS	# OBLIQUE CROSSINGS	# PARALLELS
RIVERS	S. Br. Penobscot R.			
	Moose R.	1		
	S. Br. Moose R.			1
	Caribou Flow			1
	Cursuptic R.		1	1
	Upper Ammondusuc R.	1		1
	Connecticut R.	2		2
	Kennebago R.		1	
	Little Magalloway R.	1		
	Magalloway R.	1		
	W. Br. Mohawk R.		1	1
	Mohawk R.	1		
BROOKS	Bog Bk.	1		1
	Sandy St.	1		
	N. Br. Wood St.	1		
	McKenny Bk.	1		
	North Six Bk.	1		
	Kibby St.		1	
	Little Alder St.	1		
	Sable Mill Bk.	1		
	Middle Bk.		1	1
	Porter Bk.	1		
	Trestle Bk.			1
	Smith Bk.	1		
	M. Br. Cedar St.	1		
	E. Br. Deadwater St.	1		
	E. Br. Simms St.	1		
	Nash St.	1		3
	E. Br. Nash St.		1	
	Long Mountain Bk.	1		
	Ames Bk.		1	
	Dean Bk.	1		
	Neal Bk.	1	1	
	Scales Bk.		1	
	Cutting Bk.		1	
	E. Br. Sandy St.			
	Gander Bk.	1		
	Wood St.		1	
	East Bk.	1		
	Gold Bk.			1
	Bear Bk.	1		
	North Bk.	1		
	West Bk.		1	
	Moose Bk.		1	
	Branch Bk.		1	
	Rowell Bk.		1	
	W. Br. Cedar St.		1	
	Ferguson Bk			1
	Simms St.	1		
	Moran St.	1		
	(Middle Bk.)			
	(Bog Bk.)			
	Pike Bk.	1		
	Waterhole Bk.		1	
	Slide Brook	1		
	Roaring Bk.	1	1	
	Catbow Bk.	1		
	Mink Bk.	1	1	
	Miles St.	1		
	Halls Bk.		1	
	no names	51	34	11
TOTAL:	162	86	50	26

WATER RESOURCE TYPE	WATER RESOURCE NAME	LOCATION < 1/2 MILE	LOCATION ≥ 1/2 MILE
LAKES	Crocker Pond	1	
	Mud Pond	1	
	Long Pond	1	
	Twin Island Pond	1	
	Gander Pond	1	
	Nash Bog Pond	1	
	Moore Resevoir	1	
	Daymond Pond		1
	Chain of Ponds		1
	Round Mtn. Pond		1
	Neal Pond		1
	Miles Pond		1
TOTAL:	12	7	5

WATER RESOURCE TYPE	WATER RESOURCE NAME	CROSSED BY ℄	BELOW ℄	ABOVE ℄
WETLANDS	no names	39	14	2
TOTAL:	55	39	14	2

[1] References: Ecological Resources Impact Study, Appendix E
Geotechnical Resources Impact Study, Appendix F

TABLE 2.06-5

WATER RESOURCES[1]
PROPOSED ROUTE

MOORE - GRANITE

WATER RESOURCE TYPE	WATER RESOURCE NAME		# PERPENDICULAR CROSSINGS	# OBLIQUE CROSSINGS	# PARALLELS
RIVERS	Connecticut R.		1		2
	Wells R.			1	
	Watts R.			1	
	Stevens R.		1		
BROOKS	Bill Little Bk.		1		
	Scarrite Bk.		1		
	Manchester Bk.			1	
	East Bk.		1		
	Heath Bk.		1		
	Stevens Bk.		1		
	Carter Bk.		1		
	Smith Bk.		1		
	Darius James Bk.			1	
	Keenan Bk.			1	
	Jail Bk.		1		
	Coburn Pond Outlet				1
	no names		20	8	4
TOTAL:		50	30	13	7

LAKES			LOCATION < 1/2 MILE	LOCATION ≥ 1/2 MILE
	Coburn Pond		1	
	Lower Symmes Pond			1
	Pond (no name)		1	
TOTAL:		3	2	1

WETLANDS			CROSSED BY ℄	BELOW ℄	ABOVE ℄
	none named		4		1
TOTAL:		5	4		1

TABLE 2.06-6

WATER RESOURCES[1]
PROPOSED ROUTE

GRANITE - ESSEX

WATER RESOURCE TYPE	WATER RESOURCE NAME		# PERPENDICULAR CROSSINGS	# OBLIQUE CROSSINGS	# PARALLELS
RIVERS	Dog R.		1		
	Winooski R.		2		5
	Mad R.		1		
BROOKS	Cold Springs Bk.			1	
	Berlin Pond Bk.		1		
	Kelly Bk.			1	
	Joiner Bk.			1	
	Snipe Island Bk.			1	
	Stevens Bk.		1		1
	Jones Bk.		1		
	Crossett Bk.			1	
	Duck Bk		1		
	no names		34	19	4
TOTAL:		76	42	24	10

LAKES			LOCATION < 1/2 MILE	LOCATION ≥ 1/2 MILE
	Bolster Resevoir		1	
TOTAL:		1	1	

WETLANDS			CROSSED BY ℄	BELOW ℄	ABOVE ℄
	none named		2	2	
TOTAL:		4	2	2	

[1] References: Ecological Resources Impact Study, Appendix E
Geotechnical Resources Impact Study, Appendix F

Aquatic habitats along the proposed route are summarized with respect to the number and value of streams, wetlands, and lakes encountered. Descriptions of aquatic habitats of particular significance are also provided (see map volume, appendix E).

Dickey-Lincoln School-Fish River

Aquatic habitat values along this segment of the proposed route appear in table 2.06-7.

TABLE 2.06-7

AQUATIC HABITAT VALUES[1]
PROPOSED ROUTE

DICKEY-LINCOLN-FISH RIVER

Qualitative Values	Numeric Values	Streams (Occurences)	Lakes (Occurences)	Wetlands (Occurences)
LOW	1	9	-	-
	2	5	-	-
AVERAGE	3	1	-	4
	4	5	-	1
HIGH	5	3	-	-

[1] Reference: Ecological Resources Import Study, appendix E.

Information on fisheries within these water features follows:

Streams

This segment crosses the Allagash River about 2 miles above its confluence with the St. John River. The Allagash is a large river at this point and contains a good brook trout fishery. Excellent populations of brook trout are reported in Negro Brook, Wiggins Brook, and McLean Brook. The centerline crosses Wiggins Brook at a small wetland containing open water and dead trees. This wetland is of moderate value to wildlife. Petite Brook, Thibideau Brook, Factory Brook, and Wheelock Brook have high quality habitat for brook trout and are reported by Maine Department of Inland Fisheries and Wildlife to contain good to very good populations of brook trout. The Fish River, crossed about 2 miles above its confluence with the St. John River, is a large stream with very good populations of brook trout.

Dickey-Moose River

Table 2.06-8 shows values assigned to aquatic habitats along the route from Dickey to Moose River Switching Station.

TABLE 2.06-8

AQUATIC HABITAT VALUES[1]
PROPOSED ROUTE

DICKEY-MOOSE RIVER

Qualitative Values	Numeric Values	Streams (Occurences)	Lakes (Occurences)	Wetlands (Occurences)
LOW	1	12	-	-
	2	14	1	11
AVERAGE	3	17	1	27
	4	18	4	13
HIGH	5	4	1	-

[1] Reference: Ecological Resources Impact Study, appendix E.

Fisheries within these aquatic habitats are as follows:

Streams

Ben Glazier Brook, McKinnon Brook, and Whittaker Brook are reported by the Maine Department of Inland Fisheries and Wildlife to have excellent populations of brook trout. Turner Brook is crossed about 2 miles above its confluence with the Baker Branch of the St. John River. At the time of the aerial survey, logging operations in the brook's watershed were adding silt to the stream. Two branches of Knowles Brook which support excellent brook trout fisheries are crossed. The Baker Branch of the St. John River is crossed about 1 mile below Baker Lake. The river is large and supports a very good trout fishery. Excellent spawning and nursery facilities for salmon and brook trout are present both upstream and downstream from the lake.

Norris Brook and Dole Brook are medium-sized streams which are crossed about 2 miles above their confluences with the North Branch of the Penobscot River. Two branches of the Little Penobscot River are crossed and both are good trout streams.

The corridor parallels the south branch of the Penobscot River for about 2 miles and then crosses the river as it enters Canada Falls Lake. The South Branch of the Penobscot River, Hale Brook, Fish Brook, Alder Brook, Upper Churchill Stream, and Heald Stream all support good brook trout fisheries.

Lakes

Blue Pond is a shallow, 17-acre pond in mile 23 with a poor brook trout fishery. The route runs along the northwest shore of Baker Lake, a 1,231-acre lake with depths to 30 feet. It is long, wind-swept, and has extensive gravel beaches. Water quality for cold water game fish is good at all depths. BakerLake is managed for both brook trout and salmon. Large numbers of perch, suckers, chub, fall fish, and horned pout limit the trout populations but have less effect on landlocked salmon.

The route passes within a half mile of the shore of Long Pond. This 845-acre lake with depths up to 50 feet provides good habitat for lake trout. The lake has large population of whitefish and rocky shoals for spawning. The tributaries provide adequate spawning and nursery facilities to maintain a good brook trout fishery. A sport fishery for cusk also exists.

Canada Falls Lake (2,627 acres, maximum depth 24 feet) supports a good brook trout fishery. It has excellent spawning areas in tributaries, cool areas near the inlets, and springs for brook trout during warm weather. Whitefish are also present.

Trickey Pond is a small pond (23 acres, maximum depth 30 feet) adjacent to the centerline. It supports a good brook trout fishery. Rocky ledges around the pond shelter it from summer winds and allow thermal stratification to occur. The inlets are intermittent and of little value to brook trout which probably spawn along the gravel shoreline. One-fourth mile from the centerline is Alder Pond with an area of 37 acrea and maximum depth of 8 feet. Alder Pond supports a good population of brook trout. They spawn in the gravel along the shoreline and in the outlets and feed on the large populations of aquatic insects and small minnows.

Moose River-Moore

Aquatic habitat values assigned to water features along this segment are summarized in Table 2.06-9.

TABLE 2.06-9

AQUATIC HABITAT VALUES[1]
PROPOSED ROUTE

MOOSE RIVER-MOORE

Qualitative Values	Numeric Values	Streams (Occurences)	Lakes (Occurences)	Wetlands (Occurences)
LOW	1	27	-	1
	2	24	-	9
AVERAGE	3	14	2	31
	4	9	4	12
HIGH	5	7	2	2

[1] Reference: Ecological Resources Impact Study, appendix E.

Fisheries which occur within water features along this route segment are:

Streams

Sandy Stream, North Branch Wood Stream, McKenney Brook, Moose River, Kibby Stream, Gold Brook, North Branch Dead River, and Alder Stream are all reported to have good to very good brook trout fisheries.

The Kennebago River would be crossed at a point where it is small and smooth flowing. The Kennebago and two of its tributaries that are crossed provide spawning areas for brook trout from Kennebago Lake. The Cupsuptic River is an excellent brook trout stream. The Magalloway River is crossed about 2 miles upstream from Parmachenee Lake. It is an important spawning tributary for brook trout in Parmachenee Lake. The little Magalloway River supports an excellent population of brook trout.

Tributaries to the First and Second Conneticut Lakes would be crossed at seven points. They are stocked with salmon, brook, and lake trout. The Mohawk River has excellent habitat for trout and is stocked with rainbow and brook trout. The proposed centerline crosses three branches of Simms Stream which is stocked with brook trout. The route parallels Nash Stream for 5.5 miles. The centerline is within one-fourth mile of of the stream. When the Nash Bog Pond dam broke in the early 1970's, considerable damage was incurred in Nash Stream below the pond. However, the streamside vegetation is regenerating. Nash Stream is considered a high quality trout stream and is stocked with brook trout. Tributaries to the stream are crossed at six locations.

The Upper Ammonoosuc River is a large stream and an excellent habitat for trout. It is stocked with brook trout. The Connecticut River is a very good habitat for warm-water fisheries.

Lakes

Daymond Pond is an 11-acre pond one-half mile from the centerline. It is stocked with brook trout. Crocker Pond, adjacent to the centerline, is a 227-acre pond stocked with brook trout. Two small brook trout ponds lie on either side of the corridor. They are the 25-acre Mud Pond and 98-acre Lond Pond. Chain-of-Ponds has an area of 700 acres and a maximum depth of 106 feet. Sport fisheries include brook trout, salmon, and lake trout. There are sufficient spawning and nursery areas in the tributaries to maintain the former two species, but the lake trout are stocked. Also present are yellow perch and smelt. The route crosses Chain-of-Ponds at the outlet. Round Mountain Pond is a 75-acre brook trout pond one-half mile from the centerline.

The centerline follows within one-fourth mile of the western shore of Moore Reservoir and then crosses the Connecticut River just below the hydroelectric dam. In addition to warm-water fisheries, Moore Reservoir contains small populations of trout near cold-water inlets.

Moore-Granite

Aquatic habitats along the proposed route from Moore to Granite were assigned the following values:

TABLE 2.06-10

AQUATIC HABITAT VALUES[1]
PROPOSED ROUTE

MOORE-GRANITE

Qualitative Values	Numeric Values	Streams (Occurences)	Lakes (Occurences)	Wetlands (Occurences)
LOW	1	24	-	1
	2	10	-	3
AVERAGE	3	2	2	1
	4	1	-	-
HIGH	5	3	-	-

[1] Reference: Ecological Resources Impact Study, appendix E.

Fisheries which occur in the streams and lakes along this route are:

Streams

The route follows the southeast bank of the Connecticut River from the Moore Dam to the Stevens River and crosses 10 tributaries. All the tributaries are small. The Connecticut River is crossed 1 mile below its confluence with the Passumpsic River. At this point, the Connecticut supports good populations of smallmouth bass, brown trout, and rainbow trout. The Connecticut River has been proposed as a salmon restoration area but dams, such as Moore, and pollution have prevented salmon from becoming established. Stevens River is crossed one-half miles above its confluence with the Connecticut River and contains small population of brown trout. The Wells River has a very good brook trout fishery. The Waits River is crossed twice and supports a very good brook trout fishery. Jail Branch Brook is crossed and has an excellent brown trout fishery and is stocked with steelhead rainbow trout.

Lakes

Coburn Pond is a 5-acre pond adjacent to the centerline at mile 4. The centerline is one-fourth mile from the south shore of 38-acre Lower Symmes Pond. Both ponds support warm-water fisheries.

Granite-Essex

The aquatic habitat value of water features in this route are summarized in table 2.06-11.

TABLE 2.06-11

AQUATIC HABITAT VALUES[1]
PROPOSED ROUTE

GRANITE-ESSEX

Qualitative Values	Numeric Values	Streams (Occurences)	Lakes (Occurences)	Wetlands (Occurences)
LOW	1	25	-	-
	2	15	-	1
AVERAGE	3	3	-	1
	4	-	-	-
HIGH	5	5	-	2

[1] Reference: Ecological Resources Impact Study, appendix E.

Fisheries within the streams along this segment are:

Streams

The route crosses the Winooski River in two locations and runs parallel to the river for most of its length. It crosses a number of tributaries. The Winooski River has good rainbow trout, excellent brown trout, and small mouth bass fisheries.

Cold Spring Brook, a small, fast-moving brook, is crossed midway between its source and mouth. Stevens Branch has a very good brook trout fishery which is maintained by stocking.

The route crosses the main tributary to Bolster Reservoir as it enters the reservoir. Bolster Reservoir is part of the water supply system for the town.

Dog River is crossed. It is a large river which supports very good populations of stocked brook and brown trout.

Mad River is crossed one-half mile above its confluence with Winooski River. It is a large stream and has very good rainbow trout and brown trout fisheries.

2.06.3.2 Water Quality

Water quality standards and classification systems for the states of Maine, New Hampshire, and Vermont are similar. The classifications do not necessarily represent existing, actual water quality. Rather, they reflect goals for water quality in the classified body of water. In summary, the recommended-use classifications are:

<u>Maine</u>:

Class A: Public water supplies, bathing, and all recreational uses; prohibition of any waste discharge regardless of treatment.

Class B-1: Potable water supply after treatment; bathing, all recreational uses; may receive treated waster effluent that will not cause deterioration of the water quality below the B-1 classification.

Class B-2: As B-1, but with slightly less stringent technical requirements.

Class C: Non-contact recreation such as boating, fishing, and as wildlife habitat; coliform bacteria content deemed not harmful to general public health.

Class D: Usage for power generation, navigation, and industrial process waters.

<u>New Hampshire</u>:

Class A: Potentially acceptable for public water supply after disinfection: no discharge of sewage of other wastes.

Class B: Acceptable for bathing and recreation, fish habitat, and public water supply after adequate treatment; no disposal of sewage of wastes unless adequately treated.

Class C: Acceptable for recreational boating, fishing, and industrial water supply with or without treatment, depending on individual requirements.

Class D: Esthetically acceptable; suitable for certain industrial purposes, power and navigation.

<u>Vermont</u>:

Class A: Suitable for public water supply with disinfection when necessary; character uniformly excellent.

Class B: Suitable for bathing and recreation, irrigation, and agricultural uses; good fish habitat; good esthetic value.

Class C: Suitable for recreational boating, irrigation of crops not used for consumption without cooking; habitat for wildlife and common food and game fishes indigenous to the region; such industrial uses as are consistent with other Class "C" uses.

Class D: Certain industrial process needs consistent with other class "D" uses and for restricted zones of water to assimilate appropriately treated waters.

Water quality classifications along the proposed route are:

Dickey-Lincoln School-Fish River

Negro Brook and the Allagash River are classified "A" at this point. All other streams on this route are classified "B-1."

Dickey-Moose River

All streams along this route, are classified "A" with the exception of Upper Churchill Stream which is classified "B".

Moose River-Moore

The majority of the streams north of the Colebrook area along slightly more than one-half of the route are classified as "A" in water quality except for Kibby Stream and Gold Brook which are classified as "B".

From the Colebrook area south to the Moore Substation, the majority of streams encountered are classified as "B" quality. Exceptions are Ames Brook and Roaring Brook which are classified as "A" waters. Both are part of the Groveton, N. H., water supply system and are crossed by the route.

Moore-Granite

All streams along this route are class "B" waters.

Granite-Essex

The majority of streams along this route are classified as "B" waters. Exceptions are tributaries to the Bolster Reservoir which serves as the water supply for the twon of Barre, which are classified as "A" waters. Steven's Branch is classified "C".

2.07 Vegetative Communities

2.07.1 Regional Overview

The present-day vegetation of northern Vermont and New Hampshire is a complex mosiac consisting of northern Appalachian hardwoods and boreal conifers in a transition zone clearly dominated by climatic controls. No other region at this latitude in the Northern Hemisphere is as cold, except perhaps for northeastern China.

Much of the vegetation of northern Vermont and New Hampshire is a southern extension of Canada's vast boreal coniferous forest. Only on steep south-facing outcrops and in the milder river valleys do the more temperate flora make any real inroads into this region. Except for the presence of red spruce, which is essentially a northeastern U.S. endemic, the composition of the forest is much the same as in northern Quebec. Along the meandering stream flats where the cold and often saturated soils are slow in decomposing, nutrients are tied up as peat accumulates, and only the northern conifers, with their associated ground cover, can compete successfully for the limited resources. Frequently these "spire forests" open up into treeless bogs dominated by peat moss. A number of ericaceous shrubs, sedges, and orchids, a vegetation typical of the glaciated region of eastern Canada, are found in the bogs. In the mountains of the region where logging activities have not altered the landscape, northern conifers dominate the forest community, often in nearly pure fir stands.

In the deeper notches and north-facing rock ledges, where competition from more temperate species is less, a few remnants still persist of an arctic flora which occupied the area for a short time after the retreat of the continental ice sheet persist.

Although climate exercises strong control over the natural vegetation, the influence of man's activities is clearly evident throughout much of the area. This is especially true for the extensive northern hardwood forests occupying valleys and hillsides across the region. Dominated primarily by yellow birch, american beech, and sugar maple, though often with an abundance of conifers, these forests are viewed by Braun (1972) as an extension of the eastern deciduous forest biome. She recognizes two principal subdivisions of this northern hardwoods association in New England: the hemlock-hardwoods which are important in central and southern sections, and the spruce-hardwoods which occupy much of the northern lands.

Whether this hardwood association represents a true climax in the northern areas is open to question. Pease (1964) writes that a "primeval evergreen forest, chiefly of Picea rubens (red spruce), but with a good deal of Abies balsamea (balsam fir), originally covered most of New Hampshire's hills and mountains as well as areas at lower altitudes." Pease describes northern hardwoods only as second-growth vegetation in habitats modified by man, stating that "this forest at places passed for virgin hardwood, but where I have had opportunity of examining it I should judge it to be rather the result of a culling many years ago of the softwoods, which has given the hardwood species a better chance for a nearly unmixed growth, as seems to be the view of Chittenden (1905)."

There is little evidence that hardwood forests were common in northern sections prior to settlement. Evidence indicates that old-growth stands occurring in northern areas today occupy sites once dominated by red spruce (Leak, pers. comm.). The only remnants of what might be considered virgin hardwood forest in northern New England are restricted to more southerly locations. None are present along the proposed route. While virgin forest may have once extended northward in the Champlain and

Connecticut Valleys, the present dominance of second-growth hardwoods in northern Vermont and New Hampshire appears to be more an artifact of man's own creation; a vegetation well-suited to the climate and site conditions of the area. It is maintained in its present state largely through the discretion of the wood-using industry.

This industry has had a profound influence on normal patterns of age structure, diversity, and succession. Insects (particularly spruce budworm), diseases, fire, and weather have exerted important but usually limited effects. Lorimer (1977), for the years 1793-1827, estimated the recurrence interval of fire for a given site at 800 years, and for windthrow, 1150 years. In this essentially virgin forest, windfalls occurred along 2.6 percent of the transects, and burns along 9.3 percent. Fires, windthrows, and insect attack created natural openings in the forest which favor shrub growth and enhance the diversity of understory plants and wildlife. However, where extensive epidemic budworm attacks and fires have occurred, they have been followed by an even-aged forest.

2.07.2 Plant Communities

Plant communities along the route network were inventoried in the Ecological Resources Impact Study, appendix E. The following cover types were inventoried throughout the one-half mile route width.

Community Types	Designation	Community Types	Designation
Spruce-Fir Mature	SWM	Regenerating	SWR,MR,PBRM,HWR-
Pine-Hemlock Mature	PNM	Regenerating Abandoned Cultivated Field	RAF
Pine-Hemlock Regenerating	PNR	Row Crops	F
Cedar	CS	Other Fields	AF
Softwood-Hardwood Mature	SHM	Wetlands	BG,M,SP,AW
Poplar-Birch Mature	PBM	Open Water	OW
n. Hardwoods Mature	HWM	Existing Right-of-Way	ERW
		Man-Made	MM

Much of the vegetation of northern Vermont and New Hampshire is a southern extension of Canada's vast boreal coniferous forest. Only on steep south-facing outcrops and in the milder river valleys do the more temperate flora make any real inroads into this region. Except for the presence of red spruce, which is essentially a northeastern U.S. endemic, the composition of the forest is much the same as in northern Quebec. Along the meandering stream flats where the cold and often saturated soils are slow in decomposing, nutrients are tied up as peat accumulates, and only the northern conifers, with their associated ground cover, can compete successfully for the limited resources. Frequently these "spire forests" open up into treeless bogs dominated by peat moss. A number of ericaceous shrubs, sedges, and orchids, a vegetation typical of the glaciated region of eastern Canada, are found in the bogs. In the mountains of the region where logging activities have not altered the landscape, northern conifers dominate the forest community, often in nearly pure fir stands.

In the deeper notches and north-facing rock ledges, where competition from more temperate species is less, a few remnants still persist of an arctic flora which occupied the area for a short time after the retreat of the continental ice sheet persist.

Although climate exercises strong control over the natural vegetation, the influence of man's activities is clearly evident throughout much of the area. This is especially true for the extensive northern hardwood forests occupying valleys and hillsides across the region. Dominated primarily by yellow birch, american beech, and sugar maple, though often with an abundance of conifers, these forests are viewed by Braun (1972) as an extension of the eastern deciduous forest biome. She recognizes two principal subdivisions of this northern hardwoods association in New England: the hemlock-hardwoods which are important in central and southern sections, and the spruce-hardwoods which occupy much of the northern lands.

Whether this hardwood association represents a true climax in the northern areas is open to question. Pease (1964) writes that a "primeval evergreen forest, chiefly of Picea rubens (red spruce), but with a good deal of Abies balsamea (balsam fir), originally covered most of New Hampshire's hills and mountains as well as areas at lower altitudes." Pease describes northern hardwoods only as second-growth vegetation in habitats modified by man, stating that "this forest at places passed for virgin hardwood, but where I have had opportunity of examining it I should judge it to be rather the result of a culling many years ago of the softwoods, which has given the hardwood species a better chance for a nearly unmixed growth, as seems to be the view of Chittenden (1905)."

There is little evidence that hardwood forests were common in northern sections prior to settlement. Evidence indicates that old-growth stands occurring in northern areas today occupy sites once dominated by red spruce (Leak, pers. comm.). The only remnants of what might be considered virgin hardwood forest in northern New England are restricted to more southerly locations. None are present along the proposed route. While virgin forest may have once extended northward in the Champlain and

Detailed descriptions of the site preference; community composition and the succession and stability of each community type is provided in appendix E. The map volume to appendix E illustrates their distribution along the proposed route.

2.07.3 Vegetative Communities Along the Proposed Route

The following discussions summarize information contained in appendix E. The categories of vegetative communities inventoried along the proposed route are described in the preceding section. The total acreage of each community within the one-half mile wide proposed route is summarized in tables. The lineal mileage of each community crossed by the centerline of the route is also given.

Dickey-Lincoln School-Fish River

Table 2.07-1 summarizes the vegetative communities which occur along the proposed route from Dickey to Fish River substations. Most of the route crosses areas presently in forest cover. Areas in which agriculture or other activities have removed the forest cover constitute 12 percent of route acreage.

Mature stands of mixed hardwoods make up the most abundant category of vegetation encountered along the route. Mature softwood-hardwood and hardwood-softwood communities occur together on 43 percent of the route acreage.

The second most abundant cover type along the route is regenerating forest. It reflects the influence of commercial forestry along the route.

Dickey-Moose River

The proposed route from Dickey to Moose River Substation crosses an extensively forested area. The dominant cover category is regenerating forest. It constitutes 32.6 percent of both its areal acreage and its lineal length. The area traversed by the proposed route is largely commercial forestland. Therefore, the relative abundance of this cover category is predictable. Mature stands of spruce-fir and mixed hardwood-softwoods are the second most abundant cover types along the route. Table 2.07-2 provides additional information on vegetation encountered along the route from Dickey to Moose River Substations.

Moose River - Moore

The proposed route from Moose River to Moore Substation also is an area of extensive forest cover. Agriculture and other forms of land development together make up less than 2 percent of the acreage encountered along the route (see table 2.07-3).

Mature hardwood forest is the dominant land cover, occupying 30 percent of the route acreage and 31 percent of its length.

TABLE 2.07-1

VEGETATIVE COVER TYPES[1]
PROPOSED ROUTE

DICKEY-LINCOLN SCHOOL-FISH RIVER

Cover Types	Acres in Route[2]	Percent of Route Acres	Lineal Miles Crossed	Percent of Route Miles
Spruce-Fir Mature	686 ac.	8%	2.2 mi.	7%
Pine-Hemlock Mature	--	--	--	--
Pine-Hemlock Regenerating	--	--	--	--
Cedar	25 ac.	<1%	0.3 mi.	1%
Softwood-Hardwood Mature	1,901 ac.	21%	6.0 mi.	20%
Hardwood-Softwood Mature	1,911 ac.	22%	6.8 mi.	23%
Poplar-Birch Mature	64 ac.	<1%	0.4 mi.	1%
Hardwoods Mature	580 ac.	7%	2.3 mi.	8%
Regenerating	1,940 ac.	22%	6.6 mi.	22%
Regen. Aband. Cultivated Field	375 ac.	4%	1.8 mi.	6%
Row Crops	827 ac.	9%	1.7 mi.	6%
Other Fields	245 ac.	3%	0.8 mi.	3%
Wetlands	69 ac.	<1%	<0.1 mi.	<1%
Open Water	88 ac.	1%	0.2 mi.	1%
Existing R-O-W	--	--	--	--
Man-Made	157 ac.	2%	0.3 mi.	1%

[1] Reference: Ecological Resources Impact Study, appendix E.

[2] Acreage within a ½-mile-wide route.

TABLE 2.07-3

VEGETATIVE COVER TYPES[1]
PROPOSED ROUTE

MOOSE RIVER - MOORE

Cover Types	Acres in Route[2]	Percent of Route Acres	Lineal Miles Crossed	Percent of Route Miles
Spruce-Fir Mature	5,464 ac.	13%	15.9 mi.	12%
Pine-Hemlock Mature	--	--	--	--
Pine-Hemlock Regenerating	20 ac.	<1%	0.1 mi.	<1%
Cedar	--	--	--	--
Softwood-Hardwood Mature	8,495 ac.	20%	28.8 mi.	21%
Hardwood-Softwood Mature	5,784 ac.	14%	16.8 mi.	12%
Poplar-Birch Mature	134 ac.	<1%	0.5 mi.	<1%
Hardwoods Mature	12,975 ac.	30%	42.2 mi.	31%
Regenerating	6,243 ac.	15%	22.8 mi	17%
Regen. Aband. Cultivated Field	827 ac.	2%	2.4 mi.	2%
Row Crops	121 ac.	<1%	0.4 mi.	<1%
Other Fields	557 ac.	1%	1.6 mi.	1%
Wetlands	1,803 ac.	4%	4.3 mi.	3%
Open Water	192 ac.	<1%	0.3 mi.	<1%
Existing R-O-W	--	--	--	--
Man-Made	17 ac.	<1%	--	--

[1] Reference: Ecological Resources Impact Study, appendix E.

[2] Acreage within a ½-mile-wide route.

TABLE 2.07-2

VEGETATIVE COVER TYPES[1]
PROPOSED ROUTE

DICKEY-MOOSE RIVER

Cover Types	Acres in Route[2]	Percent of Route Acres	Lineal Miles Crossed	Percent of Route Miles
Spruce-Fir Mature	6,644 ac.	18%	21.9 mi.	18%
Pine-Hemlock Mature	--	--	--	--
Pine-Hemlock Regenerating	--	--	--	--
Cedar	98 ac.	<1%	0.3 mi.	<1%
Softwood-Hardwood Mature	4,996 ac.	14%	17.1 mi.	14%
Hardwood-Softwood Mature	7,584 ac.	21%	26.0 mi.	22%
Poplar-Birch Mature	272 ac.	1%	0.8 mi.	1%
Hardwoods Mature	3,872 ac.	1%	11.4 mi.	10%
Regenerating	11,829 ac.	33%	38.8 mi.	33%
Regen. Aband. Cultivated Field	--	--	--	--
Row Crops	--	--	--	--
Other Fields	35 ac.	<1%	<0.1 mi.	<1%
Wetlands	797 ac.	2%	2.2 mi.	2%
Open Water	96 ac.	<1%	<0.1 mi.	<1%
Existing R-O-W	--	--	--	--
Man-Made	71.9 ac.	<1%	<0.1 mi.	<1%

[1] Reference: Ecological Resources Impact Study, appendix E.

[2] Acreage within 2 ½-mile-wide route.

The second most prevalent type of vegetation is mature hardwood-softwood communities which occur over 20 percent of the route's acreage and 21 percent of its length.

Three vegetative categories occur in nearly equal amounts. They occupy nearly all of the rest of the route. These are: mature spruce-fir forests, 13 percent; mature hardwood-softwood forests, 14 percent; and regenerating forests, 15 percent.

Moore - Granite

Within this segment the proposed route increasingly encounters open agricultural areas. These areas occupy slightly more than 10 percent of the route's acreage. Forests are the dominant land cover. (see table 2.07-4)

Hardwood forests are the dominant vegetative category within the route. Pine-hemlock stands, not found in more northern portions of the route, occur on this segment. Mature hardwood-softwood and hardwood stands occupy over 45 percent of the route.

Granite - Essex

Mixed mature forest with softwood predominating is the largest forest cover category intersected by this portion of the route, (see table 2.07-5). It makes up about one-third of the cover intersected. The softwoods on this route are predominantly white pine as contrasted with the spruce and fir of more northerly route segments. Pure cedar stands, although a very small part of the total area affected, are more prevalent than on other segments.

More open or unforested lands are encountered on this route segment. The combination of farmfields and man made cover types account for 25 percent of the acreage.

TABLE 2.07-4

VEGTATIVE COVER TYPES[1]
PROPOSED ROUTE

MOORE - GRANITE

Cover Types	Acres in Route[2]	Percent of Route Acres	Lineal Miles Crossed	Percent of Route Miles
Spruce-Fir Mature	907 ac.	7%	3.1 mi.	8%
Pine-Hemlock Mature	186 ac.	1%	0.8 mi.	2%
Pine-Hemlock Regenerating	391 ac.	3%	0.2 mi.	<1%
Cedar	4 ac.	<1%	0.1 mi.	<1%
Softwood-Hardwood Mature	1,540 ac.	13%	5.2 mi.	14%
Hardwood-Softwood Mature	2,914 ac.	24%	10.4 mi	27%
Poplar-Birch Mature	23 ac.	<1%	0.1 mi.	<1%
Hardwoods Mature	2,613 ac.	21%	6.3 mi.	16%
Regenerating	708 ac.	6%	2.4 mi.	6%
Regen. Aband. Cultivated Field	1,320 ac.	11%	5.5 mi.	14%
Row Crops	150 ac.	1%	0.3 mi.	1%
Other Fields	1,121 ac.	9%	3.5 mi.	9%
Wetlands	108 ac.	1%	0.1 mi.	<1%
Open Water	130 ac.	1%	0.1 mi.	<1%
Existing R-O-W	--	--	--	--
Man-Made	71 ac.	1%	0.1 mi.	<1%

[1] Reference: Ecological Resources Impact Study, appendix E.

[2] Acreage within a ½-mile-wide route.

TABLE 2.07-5

VEGETATIVE COVER TYPES[1]
PROPOSED ROUTE

GRANITE - ESSEX

Cover Types	Acres in Route[2]	Percent of Route Acres	Lineal Miles Crossed	Percent of Route Miles
Spruce-Fir Mature	918 ac.	7%	2.6 mi	6%
Pine-Hemlock Mature	21 ac.	<1%	0.1 mi	<1%
Pine-Hemlock Regenerating	11 ac.	<1%	0.1 mi	<1%
Cedar	54 ac.	<1%	0.1 mi	<1%
Softwood-Hardwood Mature	3,908 ac.	29%	14.9 mi.	34%
Hardwood-Softwood Mature	1,690 ac.	13%	4.7 mi	11%
Poplar-Birch Mature	--	--	--	--
Hardwoods Mature	2,743 ac.	20%	9.8 mi	23%
Regenerating	172 ac.	1%	0.5 mi	1%
Regen. Aband. Cultivated Field	542 ac.	4%	2.2 mi	5%
Row Crops	--	--	--	--
Other Fields	2,819 ac.	21%	7.9 mi	18%
Wetlands	5 ac.	<1%	0.1 mi	<1%
Open Water	64 ac.	<1%	0.1 mi	<1%
Existing R-O-W	--	--	--	--
Man-Made	435 ac.	3%	0.2 mi	<1%

[1] Reference: Ecological Resources Impact Study, appendix E.

[2] Acreage within a ½-mile-wide route.

2.07.4 Rare, Threatened, or Endangered Plant Species

A number of plants that occur in Maine, Vermont, or New Hampshire have been officially designated (or proposed for such designation) by the U.S. Department of the Interior as threatened or endangered plants. Thus, they are or will be legally protected (see table 2.07-6).

In Maine, the following plants are protected by state law:

	Known Occurrence	Habitat
Rhododendron maximum	NK[1]	deep woods
Kalmia latifolia	NK	woods, pastures, thickets

In New Hampshire, there are no laws pertaining to rare wild plants.

In Vermont, the following plants are protected by state law:

	Known Occurrence	Habitat
Malaxis brachypoda	Ryegate	cedar swamps
Alnus crispa	NK	swamps or wet soil
Epigaea repens	Waterford, Chittenden County	woods
Astragalus blakei	NK	limestone cliffs
Calypso bulbosa	Caledonia Co.	cedar swamps
Potentilla tridentata	Duxbury	exposed, sterile soil
Cryptogramma stelleri	Caledonia Co. Chittenden Co.	shaded limy cliffs and ledges
Corallorhiza odontorhiza	NK	rich woods
Viburnum edule	NK	woods
Polystichum braunii	several locations	rich, damp woods
Gentiana amarella	NK	river banks
Draba incana	Chittenden Co.	wet ledges
Solidago calcicola	NK	damp, rich woods
Hedysarum alpinum, L. var. americanum	NK	limy river shores
Epipactis spp.	esp. Chittenden Co.	woods
Spiranthes spp.	several localities	general
Cypripedium spp.	several localities	woods, swampy woods
Rhododendron maximum	Marshfield	deep woods
Orchis spp.	Chittenden Co.	rich woods, limy soil
Tipularia discolor	NK	deep woods
Habenaria sp.	several localities	general
Pinus banksiana	NK	dry, sandy soil
Calopogon tuberosus	Chittenden Co.	bogs, swamps, meadows
Arethusa bulbosa	Chittendon Co., Groton	bogs, swamps
Rhododendron nudiflorum	NK	bogs, wet woods
Goodyera sp.	several localities	woods

T A B L E 2.07-6

Designated[1] Rare, Threatened, or Endangered Plant Species[2]
U.S. Department of the Interior

	HABITAT	REL. PROBABILITY OF OCCURRENCE	STATUS AND KNOWN OCCURRENCE		
			Maine	N. Hampshire	Vermont
Scirpus anchistrochaetus	margins of pools	2	--	--	E:NK
Astragalus robbinsii var. *jesupi*	ledges	3	--	E:NK	E:Burlington area
Isotria medeoloides	rich woods	4	E:Oxford Co.	E:NK	E:Burlington area
Calamagrostis inexpansa var. *novae-angliae*		3	E:Aroostook, Franklin, Oxford Cos.	E:NK	E:NK
Cypripedium arietinum	rich swampy woods usually on hillside	4	T:Aroostook, Oxford Cos.	T:NK	T:Chittenden Co., Barnet
Potamogeton hillii	ponds	2	--	--	T:NK
Geum peckii	wet ledges	3	--	E:Coos Co., Grafton Co.	--
Potentilla robbinsiana	alpine	1	--	E:NK	--

KEY: T = Officially "threatened"
E = Officially "endangered"
NK: Not known from counties or townships crossed by route network

[1] Or proposed for such designation.
[2] Reference: Ecological Resources Impact Study, Appendix E.

Paronychia argyrocoma var. albimontana	high altitudes	1	T:Franklin, Oxford Cos.	T:Coos Co.	--
Isoetes eatonii	tidal shores	0	--	T:NK	--
I. foveolata	pond shores	2	--	T:NK	--
Listera auriculata	moist woods	4	--	T:Coos Co., Colebrook	T:NK
Carex elachycarpa	shores of rivers	2	E:NK	--	--
Mimulus ringens var. Colpophilus	estuaries	0	E:NK	--	--
Carex oronensis	fields, marshes, thickets	2	T:NK	--	--
Prenanthes boottii	high altitudes	1	T:Somerset, Piscataquis, Franklin Cos.	T:Coos Co.	T:NK
Cardamine longii		0	T:NK	--	--
Scirpus longii	marshes, meadows	2	T:NK	--	--
Habenaria flava	springy meadows	3	T:Somerset, Oxford, Franklin, Piscataquis, Aroostook Cos.	T:Lancaster, Dalton	T:Chittenden Co. Barnet
H. leucophaea	bogs	3	T:Aroostook Co. (Crystal Bog)	--	--
Trollius laxus	swampy meadows	2	E:NK	E:NK	--
Pedicularis furbishiae	wooded river banks	1	P:St. John R.	--	--

	Known Occurrence	Habitat
Pogonia ophioglossoides	Caledonia Co., Chittenden Co.	swamps, bogs, pond-shores, meadows
Triphora trianthophora	NK	deep humus
Isotria verticillata	Chittenden Co.	woods
Primula mistassinica	NK	shores
Aplectrum hyemale	NK	rocky woods
Amelanchier bartramiana	Essex Co., Caledonia Co.	moist thickets
Asplenium cryptolepsis	Chittenden Co.	limestone cliffs, ledges
Asplenium viride	NK	crevices of limy rock
Liparius spp.	several localities	swampy woods
Listera spp.	Caledonia, Chittendon Co.	swampy woods
Pyrola minor	NK	cold, damp woods

The following plants, also protected by Vermont law, are alpine (higher altitude) species. There is no record of their occurrence on the proposed route in that state:

Vaccinium vitis-idaea	Castilleja septentrionalis
Vaccinium uliginosum	Arenaria groenlandica
Vaccinium cespitosum	Arenaria rubella
Pinguicula vulgarus	Saxifraga aizoon
Geocaulon lividum	Saxifraga oppositifolia
Empetrum nigrum	Saxifraga aizoides
Diapensia lapponica	Salix planifolia
Cryopteris fragrans var. remotiuscula	Salix uva-ursi
Lycopodium selago	Woodsia alpina
	Woodsia glabella

[1] Not known from counties or townships crossed by the route network.

In addition to the above species, certain species in New Hampshire have been considered unofficially "endangered" by botanists there (appendix E). A listing of species which are unofficially "rare" in the State of Maine, is in appendix E.

2.07.4.1 Rare, Threatened, or Endangered Plant Species Along the Proposed Route

The potential for encountering rare, threatened, or endangered plant species was evaluatedutilizing two procedures. The first recognizes that certain conditions of soils, slope orientation and exposure make the occurence of a rare plant species, or an assemblage of many uncommon species considerably more probable. In northern New England, there are several habitats that are relatively restricted in their geographic extent but are known to have some chance of harboring significant species. The following habitats meet this criteria.

Rock ledges, whether exposed or strongly shaded, may harbor several rare, threatened, or endangered plant species. The value of a ledge to rare plants depends on its orientation, availability of moisture, exposure, type of bedrock, and other factors. Northerly exposures tend to have slightly more unusual species. The potential presence of ledges was determined by reviewing topographic maps and slope data compiled by the E. C. Jordan Company (appendix F). All slopes greater than 35 percent were considered to have ledges with a potential for harboring rare plants. Steep slopes (15-35 percent) also may have ledges, but their occurrence is less likely and more dependent on local climatic and soil conditions.

Calcareous (e.g., limestone) bedrock and soil, especially exposed calcareous ledges, as well as bogs have a significant potential for supporting unusual plants. Calcareous soils are notably fertile and may support rich plant communities. Ponds and wetlands underlain by calcareous bedrock may also tend to be more fertile and productive. Areas that may contain calcareous bedrock were located by referring to bedrock geology maps for Vermont (1963), New Hampshire (1958), and Maine (1973). All such areas crossed by the line were designated as potential rare plant habitat.

Serpentine is a soft, greenish, metamorphic rock. When it occurs in large outcrops, an unusual assemblage of plants may be present. In contrast to calcareous outcrops, the flora is usually impoverished. However, some hardy species, which fare poorly under normal soil conditions due to intense competition, may reach unusual abundance on serpentine outcrops. Areas of potential serpentine were located on state geologic maps. All such areas crossed by the route were considered as potential rare plant habitat.

Cedar swamps (especially somewhat open ones) may contain rare species. The dense mossy ground cover is often acidic and suitable for several rare orchids and other unusual plants.

These habitats, referred to as "restricted types of significant botanical habitat", are quantified and discussed in subsequent pages.

The study also assessed the potential for encountering rare plants, using a broader focus and the vegetative cover categories previously discussed. It recognizes that although certain localized habitats have unusually high probabilities of harboring rare plants, any area has at least a small probability of hosting such species.

A scoring system was used to crudely rank each mile of the proposed route for rare plant potential based upon two variables: the highest percentage vegetative cover present, and, secondly, the presence or absence of water features.

The basis for this scoring system (1=low, 5=high) was the assumption that rare plants are most likely to occur in wet areas (wetlands, streams, and lakes, in that order) and in mature deciduous or mixed woods. Less important in the region are coniferous woods (excepting cedar swamps), and least important are areas dominated by regeneration or fields. Realistically, only the very oldest deciduous/mixed woods have an appreciable value to rare plants. This is due to less rich soils in younger woods, and the simple fact that older woods have spent more time in an undisturbed state favorable to colonization by, or maintenance of, rare species. In contrast, few rare plants have tolerated the disturbance implied by regenerating sites, or the heavy shading and nutrient-poor soils found in coniferous stands.

The system was applied as indicated in the following table.

TABLE 2.07-7

RARE PLANT OCCURENCE POTENTIAL[1]
SCORING SYSTEM

Highest percentage Cover Category in given mile	Water Features Present?	Score (1=Low, 5=High)
HWM[2], HSM, SHM	yes	4
HWM, HSM, SHM	no	3
SWM, PNM	Yes	3
SWM, PNM	no	2
RGN, RAF, PBM	yes	2
RGN, RAF, PBM	no	1
F, AF, MM	either	1

[1] Reference: Ecological Resources Impact Study, appendix E.
[2] See section 2.07.2.2 for key to cover type abbreviations.

The assigned score was raised one point if a "restricted type of significant habitat" was present in that mile (making 5 a possible score in a few cases).

Definitions used were applied only as guidelines, not as absolute criteria. The evaluator was allowed in a few cases to use his own judgment, taking into account cover types of secondary importance, disturbance potential, and other factors, and adjust the score suggested by the system.

Scores reflecting the considered potential for rare plant occurence along the proposed route are provided in the following discussions of segments.

Dickey-Lincoln School-Fish River

Restricted Type of Significant Habitat - Ledge areas occur along 2.7 miles of the route, or 9 percent of its length. Twenty-five acres of cedar swamp occurs within the route, constitut 12.9 percent of its acreage. The crossing of the Allagash River possesses a slight possibility for rare plants.

Rare Plant Species Potential - The proposed route from Dickey east to Fish River Substation has the lowest potential of the five route segments for harboring rare plants. Two miles are classified as having high potential (see table 2.07-8). One-half of the route is considered to have low or low to moderate potential for rare plant occurence.

TABLE 2.07-8

RARE PLANT SPECIES POTENTIAL
RATINGS[1]
PROPOSED ROUTE
DICKEY-LINCOLN SCHOOL-FISH RIVER

RATINGS	MILES CROSSED	PERCENT OF ROUTE
LOW - 1	6.3 mi.	21%
2	8.0 mi.	27%
3	8.1 mi.	28%
4	5.0 mi.	17%
HIGH- 5	2.0 mi.	7%

[1] Reference: Ecological Resources Impact Study, appendix E.

Dickey-Moose River

Restricted Type of Significant Habitat-This segment of the proposed route contains areas of cedar swamp, ledges, and calcareous bedrock and soils which possess high potential for rare plants. Ninety-five areas of cedar swamp (0.3 percent of route), 0.1 miles of ledge and a small area of calcareous soils, (less that 1 percent) occur on this segment.

Rare Species Potential - Table 2.07.9 shows ratings of rare species potential for the route from Dickey to Moose River. Ratings for this segment are comparable to those from Dickey to Fish River and are considerably lower than those of southern portions of the route.

TABLE 2.07-9

RARE PLANT SPECIES POTENTIAL[1]
PROPOSED ROUTE

DICKEY-MOOSE RIVER

RATINGS	MILES CROSSED	PERCENT OF ROUTE
LOW - 1	17.0 mi.	14%
2	41.8 mi.	35%
3	29.5 mi.	25%
4	27.3 mi.	23%
HIGH- 5	3.0 mi.	3%

[1] Reference: Ecological Resources Impact Study, appendix E.

Moose River-Moore

Restricted Type of Significant Habitat - Ledge areas are crossed by the route over 11.4 miles. These areas have high potential for unusual plants. Small areas of calcareous soils (1.0 mi.) and serpentine (0.4 mi.) occur on the route.

Other habitats that may host rare species are:

- A cranberry bog located in the town of Colebrook, N. H., which could harbor such rare plants as calypso.

- A classic spruce-fir swamp in the town of Guildhall, Vt., west of the Connecticut River. It is bisected by Catbow Brook and a narrow marsh. Black spruce, red spruce, and balsam fir dominate the swamp. Eastern Larch is scattered throughout it. The ground cover is primarily of peat moss and contains herbs normally associated with northern spruce-fir forests, including creeping snowberry. A yew, which is very infrequent in the spruce-fir swamps of northern Vermont, is also present. A large stand of white cedar, situated at the northern end of the swamp, may harbor a few orchids.

In this same general area, on the northwest side of Baldwin Hill, a stand of Northern hardwoods are found near calcareous bedrock. The presence of the tall fern, silvery spleenwork, indicates calcareous soils exist near the summit of the hill. This site may be expected to hold uncommon species, including some species of orchids.

In the township of Littleton, N. H., near Moore Substation, on a slope facing the Connecticut River, the corridor passes through a small but rich stand of mixed hardwoods. This area has been preserved by the New England Electric Company as the Littleton Dam Wildflower Area. Common northern hardwoods dominate the stand, but they are mixed with other trees having more southern distributions, namely basswood, hop hornbeam, and American hornbeam. The latter has its northern limits here. The area is noted for its groundcover, which includes an abundance of the rare sharp-lobed hepatica and such uncommon species as Asarum acutiloba, wild ginger, blue cohosh, and wicopy. This is also one of few New Hampshire locations for the rare wild leek (F. L. Steel, pers. comm.).

Rare Species Potential - This portion of the proposed route possesses the second highest ratings for rare species. Moderate to high and high ratings together account for 50 percent of the route's length (see table 2.07-10). This is due in part to the increased occurance of mature vegetative communities and water features.

TABLE 2.07-10

RARE PLANT SPECIES POTENTIAL[1]
PROPOSED ROUTE

MOOSE RIVER - MOORE

RATINGS	MILES CROSSED	PERCENT OF ROUTE
LOW - 1	7.6 mi.	6%
2	23.1 mi.	17%
3	36.8 mi.	27%
4	54.6 mi.	40%
HIGH- 5	14.0 mi.	10%

[1] Reference: Ecological Resources Impact Study, appendix E.

Moore-Granite

Restricted Types of Significant Habitat - Calcareous soils are encountered along 22 miles, or 57.7 percent of the route. Due to the fertility of these soils, the potential for encountering unusual plants and plant communities of unusual richness is considered high. Four acres of cedar swamp and 3.5 miles containing ledges occur on this route segment.

A striking stand of hemlock is present southeast of the route near Haden Hill, 5 miles east of Granite Substation. The entire stand was burled years ago by an infestation.

Rare Species Potential - This segment has the highest potential for rare plants. Ratings of moderate to high and high potential occur on 68 percent of its length (see table 2.07-11). The high ratings within this segment were derived largely from the vegetative cover. The relatively high diversity of vegetative types on this segment, reflects the area's potential for harboring rare plants.

TABLE 2.07-11

RARE PLANT SPECIES POTENTIAL[1]
PROPOSED ROUTE

MOORE -GRANITE

RATINGS	MILES CROSSED	PERCENT OF ROUTE
LOW - 1	4.8 mi.	13%
2	4.2 mi.	11%
3	3.1 mi.	8%
4	19.0 mi.	50%
HIGH- 5	7.0 mi.	18%

[1] Reference: Ecological Resources Impact Study, appendix E.

Granite-Essex

Restricted Type of Significant Habitat - Due to the steep to excessive slopes along this segment, ledge areas are fairly abundant. The route contains 9.3 miles of ledge area for 21.5 percent of its length. Fifty-four acres of cedar swamps occur on the route and may contain rare plants. Calcareous soils occur on 7 miles, or 16 percent, of the route.

On the north side of a ridge in Moretown--south of the Winooski River--near Middlesex is a stand of northern hardwoods located near calcareous bedrock. The presence of broadleaf sedge, Indian cucumber root, and blue cohosh indicate the existence of calcareous soils. Other uncommon plants, including some species of orchids, could grow here.

Rare Species Potential - This final segment of the proposed route is rated second lowest in terms of rare plant species potential. Table 2.07-12 shows its ratings.

TABLE 2.07-12

RARE PLANT SPECIES POTENTIAL[1]
PROPOSED ROUTE

GRANITE - ESSEX

RATINGS	MILES CROSSED	PERCENT OF ROUTE
LOW - 1	5.2 mi.	12%
2	8.7 mi.	20%
3	11.2 mi.	26%
4	10.2 mi.	24%
HIGH- 5	8.0 mi.	18%

[1] Reference: Ecological Resources Impact Study, appendix E.

2.08 Wildlife

2.08.1 Regional Overview

The distribution of the region's wildlife conforms to three forest zones. From northern Maine to a line in New Hampshire delineated approximately by Highway 26, both the vegetative cover and wildlife are predominantly boreal. Here, spruce-fir is the common forest type. Along the Connecticut River Valley and in western Vermont, the vegetation and wildlife have southern affinities. White pine, oak, great-crested flycatchers, and rufous- sided towhees occur frequently. The third zone is transitional. At times, it shows boreal aspects and at other times southerly aspects.

Table 2.08-1 shows geographic trends for each of the region's species and estimates their maximum abundance. Wildlife species vary within these regions. Narrative on the status and critical needs of the following species is provided in Appendix E:

White-tailed Deer	Mink
Moose	River Otter
Black Bear	Skunk
Red Fox	Muskrat
Gray Fox	Beaver
Eastern Coyote	Raccoon
Canada Lynx	Snowshoe Hare
Bobcat	Ruffed Grouse
Cougar	Woodcock
Fisher	Ringnecked Pheasant
Marten	Waterfowl
Long-tailed Weasel	Birds of Prey
Short-tailed Weasel	Reptiles and Amphibians

2.08.2 Wildlife Values along the Proposed Route

Discussions on wildlife values along the proposed transmission line are provided under the headings: "Terrestrial Values" and "Remoteness". The information provided represents a summarization of findings contained within the Ecological Resources Impact Study, appendix E.

<u>Terrestrial Values</u>

The type of vegetation, as well as its presence or absence, is acknowledged as being a crucial element in the distribution of wildlife. The cover type categories inventoried along the route, therefore, serve as the foundation for an assessment of wildlife potential. Other complex factors that influence wildlife abundance are not considered here.

Based upon knowledge of the region's wildlife species, each cover type was described with respect to the species which might live there. Based upon the life habits and needs of these species, habitats were also

TABLE 2.08-1

TERRESTRIAL VERTEBRA OCCURRING IN THE REGION [1]

Species	Scarcity (Overall)	Geographic Trends	Seasonal Occurrence: Spring	Summer	Fall	Winter
Common Loon	FC	N	X	X	X	(X)
Pied-billed Grebe	U	S	X	X	X	
Great Blue Heron	FC	-	X	X	X	(X)
Green Heron	FC	S	X	X	X	
American Bittern	U	-	X	X	X	
Canada Goose	R	-	Ⓧ	X	X	
Black Duck	C	N	X	X	X	(X)
Green-winged Teal	R	-	X	X	Ⓧ	
Blue-winged Teal	R	-	X	X	Ⓧ	
Wood Duck	U	S	X	X	X	
Ring-necked Duck	FC	N	X	X	X	
Common Goldeneye	FC	N	X	X	X	(X)
Hooded Merganser	U	-	X	X	X	
Common Merganser	FC	N	X	X	X	(X)
Turkey Vulture	R	S	X	X	X	
Goshawk	U	-	X	X	X	Ⓧ
Sharp-shinned Hawk	R	-	X	(X)	X	(X)
Cooper's Hawk	R	-	X	(X)	X	(X)
Red-tailed Hawk	FC	-	X	X	X	(X)
Red-shouldered Hawk	U	S	X	X	X	
Broad-winged Hawk	C	-	X	X	X	
Golden Eagle	R	N	X	(X)	X	
Bald Eagle	R	N	X	X	X	(X)
Osprey	U	N	X	X	X	
Marsh Hawk	R	-	X	(X)	X	
Peregrine Falcon	R	-	X	(X)	X	
Merlin	R	N	X	X	X	
Kestrel	FC	S	X	X	X	
Spruce Grouse	U	N	X	X	X	X
Ruffed Grouse	C	-	X	X	X	X
Pheasant	U	S	X	X	X	X
Virginia Rail	U	S	X	X	X	
Sora Rail	U	-	X	X	X	
Common Gallinule	R	S	X	X		
Killdeer	C	S	X	X	X	
Woodcock	C	-	X	X	X	
Common Snipe	C	-	X	X	X	
Spotted Sandpiper	C	-	X	X	X	
Herring Gull	U	S	X	X	X	(X)
Black Tern	R	S	X	X	X	
Mourning Dove	C	S	X	X	X	(X)
Yellow-billed Cuckoo	R	S	X	X	X	
Black-billed Cuckoo	U	S	X	X	X	
Great Horned Owl	FC	-	X	X	X	X
Barred Owl	FC	-	X	X	X	X
Long-eared Owl	U	-	X	X	X	X
Saw-whet Owl	U	N	X	X	X	Ⓧ
Whip-poor-will	U	S	X	X	X	
Common Nighthawk	U	S	X	X	X	
Chimney Swift	C	-	X	X	X	
Ruby-throated Hummingbird	FC	-	X	X	X	
Belted Kingfisher	FC	-	X	X	X	
Yellow-shafted Flicker	C	-	X	X	X	
Pileated Woodpecker	U	-	X	X	X	X
Yellow-bellied Sapsucker	FC	N	X	X	X	
Hairy Woodpecker	C	-	X	X	X	X
Downy Woodpecker	C	-	X	X	X	X
Black-backed 3-toed Woodpecker	U	N	X	X	X	Ⓧ
Northern 3-toed Woodpecker	R	N	X	X	X	Ⓧ
Eastern Kingbird	C	-	X	X	X	
Great Crested Flycatcher	FC	S	X	X	X	
Screech Owl	R	S	X	X	X	X
Eastern Phoebe	FC	-	X	X	X	
Yellow-bellied Flycatcher	FC	N	X	X	X	
Alder Flycatcher	FC	-	X	X	X	
Least Flycatcher	FC	-	X	X	X	
Wood Pewee	C	S	X	X	X	
Olive-sided Flycatcher	FC	N	X	X	X	
Horned Lark	R	-	X	X	X	(X)
Tree Swallow	A	-	X	X	X	
Bank Swallow	C	-	X	X	X	
Barn Swallow	FC	-	X	X	X	
Cliff Swallow	C	-	X	X	X	
Purple Martin	R	S	X	X	X	
Grey Jay	U	N	X	X	X	Ⓧ
Blue Jay	C	-	X	X	X	(X)
Common Raven	U	N	X	X	X	Ⓧ
Common Crow	A	S	X	X	X	(X)
Black-capped Chickadee	C	-	X	X	X	X
Boreal Chickadee	FC	N	X	X	X	X
White-breasted Nuthatch	FC	-	X	X	X	X
Red-breasted Nuthatch	C	-	X	X	X	X
Brown Creeper	C	-	X	X	X	X
House Wren	FC	S	X	X	X	
Winter Wren	C	N	X	X	X	
Long-billed Marsh Wren	U	-	X	X	X	
Short-billed Marsh Wren	R	N	X	X	X	
Mockingbird	U	S	X	X	X	X
Catbird	C	-	X	X	X	
Brown Thrasher	FC	S	X	X	X	
Robin	A	-	X	X	X	(X)
Wood Thrush	FC	S	X	X	X	
Hermit Thrush	C	-	X	X	X	(X)
Swainson's Thrush	C	N	X	X	X	
Veery	C	-	X	X	X	
Bluebird	R	S	X	X	X	
Golden-crowned Kinglet	FC	N	X	X	X	X
Ruby-crowned Kinglet	FC	N	X	X	X	X
Cedar Waxwing	FC	-	X	X	X	(X)
Loggerhead Shrike	R	-	X	X	X	
Starling	A	S	X	X	X	(X)
Yellow-throated Vireo	R	S	X	X	X	
Solitary Vireo	C	-	X	X	X	
Red-eyed Vireo	A	-	X	X	X	
Philadelphia Vireo	U	N	X	X	X	
Warbling Vireo	U	S	X	X	X	
Tennessee Warbler	FC	N	X	X	X	
Nashville Warbler	C	-	X	X	X	
Parula Warbler	C	-	X	X	X	
Yellow Warbler	FC	S	X	X	X	
Magnolia Warbler	A	N	X	X	X	
Cape May Warbler	FC	N	X	X	X	
Black-throated Blue Warbler	C	-	X	X	X	
Myrtle Warbler	C	N	X	X	X	
Black-throated Green Warbler	C	N	X	X	X	
Blackburnian Warbler	C	N	X	X	X	
Chestnut-sided Warbler	A	S	X	X	X	
Bay-breasted Warbler	FC	N	X	X	X	
Blackpoll Warbler	U	N	X	X	X	
Pine Warbler	R	S	X	X	X	
Palm Warbler	R	N	X	X	X	
Ovenbird	A	-	X	X	X	
N. Waterthrush	FC	-	X	X	X	
Mourning Warbler	FC	N	X	X	X	
Black and White Warbler	C	-	X	X	X	
Yellowthroat	A	-	X	X	X	
Wilsons Warbler	U	N	X	X	X	
Canada Warbler	FC	N	X	X	X	
American Redstart	A	-	X	X	X	
House Sparrow	C	S	X	X	X	(X)
Bobolink	FC	S	X	X	X	
Eastern Meadowlark	C	-	X	X	X	
Red-winged Blackbird	C	-	X	X	X	
Northern Oriole	FC	S	X	X	X	
Rusty Blackbird	FC	N	X	X	X	
Common grackle	C	-	X	X	X	
Brown-headed Cowbird	C	S	X	X	X	
Scarlet Tananger	FC	S	X	X	X	
Cardinal	R	S	X	X	X	X
Rose-br. Grosbeak	C	-	X	X	X	
Indigo Bunting	FC	S	X	X	X	
Evening Grosbeak	C	N	X	X	X	Ⓧ
Purple Finch	FC	N	X	X	X	Ⓧ
Pine Grosbeak	U	N	X	X	X	Ⓧ
Pine Siskin	C	N	X	X	X	Ⓧ
American Goldfinch	C	-	X	X	X	Ⓧ
Red Crossbill	U	N	X	X	X	Ⓧ
White-winged Crossbill	U	N	X	X	X	Ⓧ
Rufous-sided Towhee	C	S	X	X	X	
Savannah Sparrow	FC	-	X	X	X	
Vesper Sparrow	U	S	X	X	X	
Dark-eyed Junco	FC	N	X	X	X	X
Chipping Sparrow	FC	S	X	X	X	
Field Sparrow	FC	S	X	X	X	
White-throated Sparrow	A	N	X	X	X	(X)
Lincoln's Sparrow	U	N	X	X	X	
Swamp Sparrow	FC	-	X	X	X	
Song Sparrow	C	-	X	X	X	(X)
Rough-legged Hawk	U	S				X
Snowy Owl	R	N				X
Common Redpoll	U	N				X
Tree Sparrow	C	N				X
Snow Bunting	U	N				X
Snowshoe Hare		N				
Cottontail		S				
Deer		S				
Moose		N				
E. Cougar		N				
Parascalops breweri		-				
Condylura cristata		-				
Sorex cinereus		-				
Sorex fumeus		-				
Sorex palustris		-				
Microsorex hoyi		N				
Blarina brevicauda		-				
Myotis lucifugus		-				
M. Keeni		-				
Lasionycteris noctivagens		-				
Pipistrellus subflavas		S				
Eptesicus fuscus		-				
Lasiurus borealis		-				
L. cinereus		-				
Myotis subulatus		S				
Black Bear		N				
Racoon		-				
Marten		N				
Fisher		N				
Mustela ermina		-				
M. frenata		S				
Mink		-				
Otter		-				
Skunk		-				
Red Fox		-				
E. Coyote		S				
Canada Lynx		N				
Bobcat		N				
Woodchuck		S				
Chipmunk		-				
Red Squirrel		-				
Gray Squirrel		S				
N. Flying Squirrel		-				
S. Flying Squirrel		S				
Beaver		-				
Muskrat		S				
Peromyscus maniculatus		-				
P. leucopus		S				
Synaptomys cooperi		-				
Clethrionomys gapperi		-				
Microtus pennsylvanicus		-				
Pitymys pinetorum		S				
Mus musculus		S				
Zapus hudsonicus		-				
Napeozapus insignis		-				
Rattus norvegicus		S				
Porcupine		N				
Common Snapping Turtle		S				
Wood Turtle		S				
E. Painted Turtle		S				
Blandings Turtle		S				
Box Turtle		S				
Musk Turtle		S				
Spotted Turtle		S				
N. Water Snake		S				
E. Garter Snake		S				
N. Ribbon Snake		S				
Red-bellied Snake		S				
Green Snake		S				
Milk Snake		S				
Black Racer		S				
Red-spotted Newt		-				
Blue-spotted/Jefferson salamander		-				
Spotted Salamander		-				
Dusky Salamander		S				
Spring Salamander		S				
Red-backed Salamander		-				
Two-lined Salamander		-				
4-toed Salamander		S				
Marbeled Salamander		S				
American Toad		-				
Spring Feeper		-				
Gray Tree Frog		S				
Green Frog		-				
Bullfrog		S				
N. Leopard Frog		-				
Pickerel Frog		-				
Mink Frog		N				
Wood Frog		-				
Fowler's Toad		S				

SCARCITY of each species is rated as follows: R = rare, U = uncommon, FC = fairly common, C = common, A = abundant. We assigned no numerical value to these terms. They are meant only to be relative, i.e. "common" for a species of hawk means common relative only to other hawks; actual numbers may be only one-tenth those of a "common" songbird. Since abundance varies greatly in the region, we gave only the maximum abundance, e.g., although the ruby-crowned kinglet is listed as fairly common, this is true only in northern Maine -- elsewhere it is uncommon or rare.

GEOGRAPHIC TRENDS. Species designated "N" increase in a northerly and/or easterly direction along the route. "S" species increase in a southwest-erly direction. Species designated "-" show no marked geographic trend.

SEASONAL OCCURRENCE. An "X" indicates presence at that season. A circled "X" indicates substantially higher numbers at that season. Although most songbirds increase during spring and fall migration, we did not indicate this. A parenthesized "X" indicates substantially lower numbers at that season.

classified relative to its importance to each species. The results of this assessment is contained on table 2.08-2.

The approximate value of a given cover type to a particular wildlife species can be obtained by reviewing this table. However, as previously indicated, the focus of the wildlife assessment was oriented toward the ecosystem. The value, or importance, of a habitat is considered to be a function of the combination of wildlife species which use it and the extent to which they depend on it. Hence, a system was derived to express the relative value of the various cover types to a wide range of wildlife species.

Three separate measures of habitat value were calculated. The first of these express a habitat's ability to support wildlife species considered as rare, threatened, endangered, decreasing in numbers, or otherwise highly significant or vulnerable, according to State or Federal agencies, the National Audubon Society, and the ecological consultant for the project.

A second assessment was designed to express a habitat's ability to support wildlife species which are legally harvested (hunted or trapped) in one or more of the three states.

The third assessment considered all wildlife species and assumed that a habitat's worth is a measure of its ability to sustain overall species richness. Those habitats which support species with narrow habitat tolerances were stressed in this assessment.

The value of habitats encountered is described below for each segment. Values ranging from high to low reflect the relative value of these habitats for species of special concern, for harvested species, and for all species. Additional information on wildlife habit at evaluation procedures can be found in appendix E.

Also provided under the descriptions of terrestrial wildlife values is information on deer wintering areas; eagle, osprey, or heron nesting areas; and other site specific information considered to be of particular importance. Appendix E, map volume, shows the location of these sites.

Remoteness

A final measure of the wildlife values occurring along the route considered each habitat's remoteness. Remoteness is defined as the conditon of being distant from densely populated areas, as well as from concentrations of roads.

Remoteness is believed to be important to large raptors especially, and secondarily to nesting waterfowl, loons, herons, eastern cougars, eastern timber wolves, and mustellid furbearers. Excessive disturbance of these species may cause severe physiological stress resulting in behavioral and reproductive malfunctioning. In summer, disturbance may cause eggs to be exposed to predators or extreme temperatures, or young on the nest may simply be abandoned. In winter, disturbance such as from snow-mobiles may cause metabolic stress, which might be severe for species

TABLE 2.08-2

HABITAT PREFERENCE OF VERTEBRATE SPECIES[1]
OF THE MAINE - NEW HAMPSHIRE - VERMONT REGION

Key: Numbering: 5 = high preference or correlation
1 = low preference or correlation

Cover Types: (see page for exact definitions)

SWM:	Spruce-fir mature
PNM:	Pine-hemlock mature
PNR:	Pine regenerating
CS:	Cedar swamp
SHM:	Mixed mature with softwoods predominating
HSM:	Mixed mature with hardwoods predominating
PBM:	Poplar-birch mature
HWM:	Hardwood mature
RGN:	Forest regeneration
RAF:	Regenerating agriculture fields
F:	Row crop fields
AF:	Other fields
W:	Wetlands (excluding open water and unvegetated shoreline)
OW:	Open water (including unvegetated shoreline)
MM:	Man-made Features (buildings, gravel pits, garbage dumps, etc.)

Trophic Status

AP:	Aquatic predator
AH:	Aquatic herbivore
C:	Carrion-feeder
WRP:	Wide-ranging predator
WRH:	Wide-ranging herbivore
WRO:	Wide-ranging omnivore
LRP:	Low-ranging predator (but still wider-ranging than simply "P")
LRH:	Low-ranging herbivore (but still wider-ranging than simply "H")
LRO:	Low-ranging omnivore (but still wider-ranging than simply "O")
LRI:	Low-ranging insectivore (but still wider-ranging than simply "I")
H:	Herbivore (eats seeds, cones, leaves, roots, flowers, sap, etc.)
O:	Omnivore
I:	Insectivore

Principal Foods

F:	fish	B:	birds
I:	insects	R:	rodents
AV:	aquatic vegetation	BR:	berries
GS:	grass seeds	C:	carrion
DS:	deciduous seeds, buds, nuts, etc.	E:	earthworms
CS:	coniferous seeds, buds, cones, etc.	FW:	flower nectar

Wet Soils, Rocky Soils

+	some correlation or preference shown
-	negative correlation or aversion shown
0	probably no correlation or preference shown

[1]Reference: Ecological Resources Impact Study, Appendix E

TABLE 2.08-2 (cont,)

HABITAT PREFERENCE OF VERTEBRATE SPECIES[1]
OF THE MAINE - NEW HAMPSHIRE - VERMONT REGION

Species present in the region solely as migrants or strays are not included.
See preceding page for legend.

BIRDS	SWM	PNM	PNR	CS	SHM	HSM	PEM	HWM	RCN	RAF	F	AF	W	OW	MM	TROPHIC STATUS	PRINCIPAL FOODS	WET SOILS	ROCKY SOILS
Common Loon													5	5		AP	F	+	+
Pied-billed Grebe													5	5		AP	F,I	+	0
Great Blue Heron													5	3		AP	F	+	0
Green Heron													5	2		AP	F	+	0
Black-crowned Night Heron													5	2		AP	F	+	0
American Bittern													5	1		AP	F,I	+	0
Canada Goose											4	2	5	5		AH	AV,GS	+	0
Mallard													5	5		AH	AV	+	0
Black Duck													5	5		AH	AV	+	0
Green-winged Teal													5	5		AH	AV	+	0
Blue-winged Teal													5	5		AH	AV	+	0
Wood Duck													5	5		AH	AV,DS	+	0
Ring-necked Duck													5	5		AH	AV,I	+	0
Com. Goldeneye													5	5		AP	I	+	0
Hooded Merganser													5	5		AP	F,I	+	0
Common Merganser													5	5		AP	F,I	+	0
Turkey Vulture											1	5	5			C	C	0	+
Goshawk	5	2	2	3	5	5	5	4	4	4	1	3	3	1		WRP	B,R	+	+
Sharp-shinned Hawk	4	2	1	1	5	5	4	4	4	4	1	3	2			WRP	B,R	+	+
Cooper's Hawk	4	2	1	2	5	4	4	4	4	4	1	3	2			WRP	B,R	+	+
Red-tailed Hawk	2	3	2	1	3	3	3	3	4	4	3	4	4			WRP	B,R	+	+
Red-shouldered Hawk	2	2	2	1	2	3	3	3	4	4	3	5	5			WRP	R	+	+
Broad-winged Hawk	3	3	2	3	5	5	4	4	3	3	2	3	4			WRP	R	+	+
Rough-legged Hawk									1	1	2	5	3			WRP	R	+	+
Golden Eagle	1				1	1			4	3	1	3	4	3		WRP	B,R	+	+
Bald Eagle	1	1			1	1						1	3	5		WRP	F,C	+	0
Osprey	1	1			1	1							4	5		WRP	F	+	0
Marsh Hawk									1	1		3	5			WRP	R	+	0
Peregrine Falcon									3			2	5	4		WRP	B	+	+
Merlin	5			5	4	3			2	1	1	1	2			WRP	R,B	+	+
Kestrel									3	3	4	5	2			WRP	R	+	+
Spruce Grouse	5			3	1				4	1		1	4			H	CS,BR	+	0
Ruffed Grouse	1	1	1	3	4	4	3		5	5		1	2			H	DH,BR	0	0
Pheasant									4	5	3	4	1			H	GS	0	0

[1]Reference: Ecological Resources Impact Study, Appendix E

TABLE 2.08-2 (cont.)

BIRDS (continued)	COVER TYPES SWM	PNM	PNR	CS	SHM	HSM	PBM	HWM	RGN	RAF	F	AF	W	OW	MM	TROPHIC STATUS	PRINCIPAL FOODS	WET SOILS	ROCKY SOILS
Virginia Rail												1	5			I	I,GS	+	0
Sora Rail												1	5			I	I,GS	+	0
Com. Gallinule													5	3		I	I,GS	+	0
Killdeer											3	5	2	1		I	E,I	+	+
Woodcock				2			2		4	4		2	5			I	E,I	+	0
Com. Snipe											1	3	5			I	E,I	+	0
Spotted Sandpiper											1		3	5		I	I	+	0
Herring Gull													1	5		O	I,F	+	+
Black Tern													5	5		AP	F,I	+	0
Mouring Dove	1	3	4	1					5	5	4	5	3			H	GS	-	0
Yellow-billed Cuckoo								1	5	5			3			LRI	I	+	0
Black-billed Cuckoo								1	5	5			3			LRI	I	+	0
Screech Owl						1		3	4	4		2	5			WRP	R	+	+
Great Horned Owl	4	4	1	3	5	4	2	4	2	2	1	2	2		1	WRP	R	+	+
Snowy Owl											2	5	3			WRP	R	+	+
Barred Owl	4	4	1	3	5	5	2	4	2	2	1	2	3		1	WRP	R	+	+
Long-eared Owl	5	5	2	3	5	4	1	2	2	2	1	2	2			WRP	R	+	+
Saw-whet Owl	5	3	2	4	5	4	2	2	3	2	1	2	2			WRP	R	+	+
Whip-poor-will	1	4	5	1	4	4	2	3	5	5		2				I	I	-	0
Com. Nighthawk			1						1	1		3			5	LRI	I	+	0
Chimney Swift									1	1	2	2	4	3	5	LRI	I	+	0
Ruby-throated Hummingbird	2				4	4	5	2	3	3	1	2	3		1	H	FW	+	+
Belted Kingfisher													3	5	1	AP	F	+	-
Yellow-shafted Flicker	3	3	2	1	3	3	3	3	5	4	1	2	4			I	I	+	0
Pileated Woodpecker	3	5		3	5	4	2	2	1				4			I	I	+	0
Yellow-bellied Sapsucker	1			1	4	4	5	3	2	1			3			I	I	+	0
Hairy Woodpecker	2	2	1	1	4	4	5	4	3	1			2			I	I	+	0
Downy Woodpecker	1	1	1	1	2	2	3	2	5	5			3			I	I	+	0
Black-backed 3-toed Woodp.	5			2	1				1				2			I	I	+	+
Northern 3-toed Woodp.	5			2	1				1				2			I	I	+	+
Eastern Kingbird			1						2	3	4	5	4			I	I	+	0
Great Crested Flycatcher		1						5	2	1			3			I	I	+	0
Eastern Phoebe									1	1		1	5		4	I	I	+	0
Yellow-bellied Flycatcher	5			4	2								2			I	I	+	0
Alder Flycatcher									3	3			5			I	I	+	0
Least Flycatcher			1	1					5	5			1			I	I	0	0
Wood Pewee					1	2	3	5	1				1			I	I	+	0
Olive-sided Flycatcher	3			1	2	1			3	1			5			I	I	+	+
Horned Lark											4	5				H	GS	-	0
Tree Swallow									1	1	2	2	5	3		LRI	I	+	0
Bank Swallow											1	2	3	5	2	LRI	I	+	0
Barn Swallow											2	2	3	2	5	LRI	I	+	0
Cliff Swallow											1	2	4	2	5	LRI	I	+	0

TABLE 2.08-2 (cont.)

BIRDS (continued)	SWM	PNM	PNR	CS	SHM	HSM	PRM	HWM	RCN	RAF	F	AF	W	OW	MM	TROPHIC STATUS	PRINCIPAL FOOD	WET SOILS	ROCKY SOILS
	COVER TYPES																		
Purple Martin											1	5	3	2		LRI	I	+	0
Gray Jay	5				2								1			LRH	CS,I	+	0
Blue Jay	2	1		1	4	4	3	5	1	1			1			LRH	DS,BR	-	0
Com. Raven									1	1		3	2			LRO	C,GS,I	+	+
Com. Crow		2			1	1			1	1	5	4	2			LRO	GS,I,C	0	0
Black-capped Chickadee	3	2	1	1	5	5	4	4	3	3			4			LRI	I,CS	0	0
Boreal Chickadee	5				1				1				2			LRI	I,CS	+	0
White-breasted Nuthatch						1	1	5	1	1			3			LRI	I	0	0
Red-breasted Nuthatch	5	1		4	3	1							2			LRI	I	0	0
Brown Creeper	5	2		4	4	2		1					2			LRI	I	+	0
House Wren									3	5			1		1	I	I	+	0
Winter Wren	5			3	3	2			4	2			2			I	I	+	+
Long-billed Marsh Wren												1	5			I	I	+	0
Short-billed Marsh Wren												1	5			I	I	+	0
Mockingbird										5					3	H	BR,I	0	0
Catbird									3	4		1	5			H	BR,I	+	0
Brown Thrasher			1						3	5		1				H	BR,I	-	0
Robin	2	2	3	2	2	2	1	1	5	5	3	4	4			H	E,BR	+	0
Wood Thrush		3	2		3	4	1	5	2	2						H,I	I,BR	0	0
Hermit Thrush	3	1		4	5	5	1	1	2	1			3			I	I,BR	+	0
Swainson's Thrush	3		1	3	5	4	2	2	4	3			3			H,I	I,BR	+	0
Veery	1			4	3	4	1	2	5	5			5			H,I	I,BR	+	0
Bluebird									3	5		4	1			H,I	I,BR	0	0
Golden-Crowned Kinglet	5	4		4	2	1										I	I	+	0
Ruby-Crowned Kinglet	5			5	1								2			I	I	+	0
Cedar Waxwing									4	4		1	5	1		H	BR,I	+	0
Loggerhead Shrike										5		2				LRP	R,B	-	+
Starling									1	1	2	3			5	O	I,BR	0	0
Yellow-thr. Vireo					1	3		5					3			I	I	+	0
Solitary Vireo	3	1		2	5	4	1		2	1						I	I	+	0
Red-eyed Vireo	1			1	4	5	3	5	2	2			2			I	I	0	0
Phildelphia Vireo						1	2		5	5			3			I	I	0	0
Warbling Vireo						1		4					5			I	I	+	0
Black & White Warbler	1	2	1	1	2	3	2	4	3	2			5			I	I	+	0
Tennessee Warbler	2			5	3	2	1		2	1			3			I	I	+	0
Nashville Warbler			1	1	1	2			5	5		1	3			I	I	+	0
Parula Warbler	4	1		5	5	3			1							I	I	+	0
Yellow Warbler									1	5		1	2		3	I	I	+	0
Magnolia Warbler	3			1	3				5	1						I	I	+	0
Cape May Warbler	5				2	1			2							I	I	+	0
Black-throated Blue Warbler					3	4	4	5	1	1						I	I	-	0
Myrtle Warbler	5	4		5	3	2			2	1						I	I	-	0
Black-throated Green Warbler	5	2		4	4	2			3							I	I	+	0
Blackburnian Warbler	5	2		2	3	1			1							I	I	+	0
C estnut-sided Warbler								1	4	5		2	2			I	I	-	0

TABLE 2.08-2

BIRDS (continued)	SWM	PNM	PNR	CS	SHM	HSM	PBM	HWM	RGN	RAF	F	AF	W	OW	MM	TROPHIC STATUS	PRINCIPAL FOODS	WET SOILS	ROCKY SOILS
	COVER TYPES																		
Bay-bre	4			3	5	1			1							I	I	+	0
Blackpoll Warbler	5								2				1			I	I	+	+
Pine Warbler		5	3		1											I	I	-	0
Palm Warbler									2				5			I	I	+	0
Ovenbird	2	1	1	2	4	4	3	5	2	2			1			I	I	-	0
N. Waterthrush	1			1									5	2		I	I	+	0
Mourning Warbler									5	5		1	1			I	I	+	0
Yellowthroat									5	5		1	5			I	I	+	0
Wilson's Warbler									1	1			5			I	I	+	0
Canada Warbler	3			5	2	1			2	1			1			I	I	+	0
Am. Redstart	3	3	2	5	5	5	5	5	5	5			3			I	I	0	0
House Sparrow															5	H	GS	0	0
Bobolink											1	5	2			I,H	GS,I	0	0
E. Meadowlark			1							1	2	5				I	I.GS	0	0
Redwinged Blackbird										1	1	2	5			H,I	I,GS	+	0
Northern Oriole							1	1	4	5		4	3			I	I,BR	0	0
Rusty Blackbird											1	1	5			I	I,GS	+	0
Com. Grackle		5	5						1	2	1	2	3			I	I,GS	+	0
Brown-headed Cowbird	1	1	2	1	1	1	1	1	3	3	4	5	2			I	I,GS	0	0
Scarlet Tanager		1			3	4		5								I	I	0	0
Cardinal									3	5						I,H	I,BR	0	0
Rose-br. Grosbeak					1	2	2	3	4	4			5			I,H	I,BR	+	0
Indigo Bunting									5	5	1	3				I,H	I,GS	0	0
Evening Grosbeak	5				4	3	1		3	1			1			LRI	I,BR	0	0
Purple Finch	5	1			4	3			3	2			1			LRH	DH,BR	0	0
Pine Grosbeak	5				3	1			3	1			1			LRH	CS,BR	0	0
Com. Redpoll							1		1	1	1	5	2			WRH	GS	0	0
Pine Siskin	5	1			3	1			3	1			1			LRH	CS,DS	0	0
Am. Goldfinch									1	1		5	3			LRH	GS,DS	0	0
Red Crossbill	5	1			3	2										LRH	CS,I	0	0
Rufous-sided Towhee		1	5		2	2			4	4			1			H,I	GS,I	-	0
Savannah Sparrow											3	5	1			H,I	GS,I	0	0
Vesper Sparrow			1								1	5				H,I	GS,I	-	0
Dark-eyed Junco	3	1	1		4	3			5	5		1	2			H,I	GS,I	0	0
Tree Sparrow				1					5	5	2	3	2			H	GS	0	0
Chipping Sparrow	1	4	5	1	2	1			3	3		2				H.I	GS,I	0	0
Field Sparrow			1						2	2		5				H,I	GS.I	-	0
White-thr. Sparrow	3	1	2	4	4	4	2	2	5	5		3	4			H,I	GS,I	0	0
Lincoln's Sparrow									1	1		1	5			H,I	GS,I	+	0
Swamp Sparrow												1	5			H,I	GS,I	+	0
Song Sparrow			1						5	5		3	4			H,I	GS,I	0	0
Snow Bunting											2	5	1			WRH	GS	0	0

MAMMALS	COVER TYPES: SWM	PNM	PNR	CS	SHM	HSM	PBM	HWM	RGN	RAF	F	AF	W	OW	MM	TROPHIC STATUS	PRINCIPAL FOODS	WET SOILS	ROCKY SOILS
Parascalops breweri	3	5	5	1	3	3	4	4	4	4	1	4	1			I	I,E	0	+
Condylura cristata	4	1	1	5	4	4	2	3	4	4	2	4	5			I	I.E	0	+
Sorex cinereus	3	2	1	4	3	3	2	3	4	5	1	4	4			I	I,E	0	+
Sorex fumeus	3	4	4	4	5	5	3	4	2	2	1	2	3			I	I,E	+	+
Sorex palustris	1	1	1	1	1	1	1	1	2	2	1	2	5	3		I	I,E	+	+
Nicrosorex hoyi	3	2	1	3	3	3	2	3	4	5	2	3	4			I	I,E	0	+
Blarina brevicauda	3	2	1	3	3	3	2	3	4	5	1	3	4			I	I,E	0	+
Myotis lucifugus	2	2	1	1	2	2	2	3	3	2	2	2	5	4	4	LRI	I	+	+
M. Keeni	3	3	3	3	3	3	3	3	4	3	2	3	5	3	4	LRI	I	+	+
Lasionycteris noctivagens	4	4	3	3	4	4	4	4	3	3	1	1	4	2	4	LRI	I	+	+
Pipistellus subflavus	4	4	3	3	4	4	4	3	4	3	1	1	5	4	4	LRI	I	+	+
Eptesicus fuscus	4	4	3	3	4	4	4	3	3	3	1	1	5	3	4	LRI	I	+	+
Lasiurus borealis	4	4	3	3	4	4	4	4	3	3	1	1	5	2	4	LRI	I	+	+
L. cinereus	4	4	3	3	4	4	4	4	3	3	1	1	5	3	4	LRI	I	+	+
Sorex dispar	3	1	1	3	5	5	4	5	3	3	1	1	4			LRI	I		
M. Subulatus	4	4	3	3	4	4	4	4	3	3	1	1	5	2	4	LRI	I	+	+
Black Bear	2	1	1	1	3	3	3	4	5	5	2	1	2			WRO	BR,HS	0	+
Raccoon	2	2	1	1	3	3	2	3	3	3	4	2	5		3	O	I,HS	+	+
Marten	5	3	1	5	2	2	1	1	3	2		1	4			WRP	R,B	+	+
Fisher	4	3	2	4	5	4	3	2	4	4		1	4			WRP	R,B	+	+
Mustela ermina	3	2	1	3	3	3	2	2	4	4	1	3	5			LRP	R,B	+	+
M. frenata	3	2	1	3	3	3	2	2	4	4	1	3	5			LRP	R,B	+	+
Mink	2	1		2	2	2	2	2	2	2		1	5	4		LRP	R,B	+	+
Otter	1			1	1	1	1	1	1	1			5	4		WRP	F,I	+	+
Skunk	1	1	2	1	1	1	1	1	5	5	4	5	4			I	I,E	0	+
Red Fox	2	2	3	2	2	2	2	2	5	5	4	5	3			WRP	R,B	+	+
E. Coyote	2	2	3	2	2	2	2	2	5	5	4	5	3			WRP	R,B	0	+
Canada Lynx	3	1	1	4	4	4	2	1	5	5		1	4			WRP	R,B	+	+
Bobcat	3	1	1	4	4	4	2	1	5	5		1	4			WRP	R,B	+	+
Woodchuck									2	3	1	5				H	GS	-	+
Chipmunk	2	1	1	2	3	3	3	4	5	5		1	3			H	HS	0	+
Red Squirrel	5	5	2	3	3	2			1	1			1			H	CS	0	+
Gray Squirrel					2	3	1	5	1	1			1			H	HS	0	+
N. Flying Squirrel	5	3	1	5	5	5	2	2	4	2			4			I	I,DS	+	0
S. Flying Squirrel	2	2	1	2	4	4	4	5	4	2			4			I	I,DS	+	0
Beaver					1	1	4	2	3	3			5	3		H	DH,AV	+	0
Muskrat												1	5	3		H	AV	+	0
Peromyscus maniculatus	4	4	4	4	4	4	4	4	5	5	2	3	4			H,I	GS,I	0	+
P. leucopus	3	4	4	3	4	4	4	4	5	5	2	3	4			H,I	GS,I	0	+
Synaptomys cooperi	1			1					3	3		3	5			H,I	GS,I	0	+
Clethrionomys gapperi	4	1		5	4	4	1	3	3	3		1	4			H,I	GS,I	+	+
Microtus pennsylvanicus	1	2	3	2	3	3	3	3	5	5	1	4	5			H	GS	0	+
Pitymys pinetorum	2	2	2	1	4	4	2	5	4	5			3			H,I	GS,I	0	+
Mus musculus											2	1			5	H,I	GS,I	0	+
Zapus hudsonicus	1	1	1	1	1	1	1	1	4	4	1	3	5			H,I	GS,I	0	+
Napeozapus insignis	1	1	1	1	1	1	1	1	4	4	1	3	5			H,I	GS,I	0	+
Rattus norvegicus											2	1			5	H,I	GS,I	0	+
Porcupine	3	4	3	3	3	3	3	3	3	3	1	1	4			H	CH,DH	0	+
Opossum	1	2	2	2	3	3	1	4	5	5	4	4	3			H,I	I,BR	+	+
Snowshoe Hare	3	1	2	3	4	4	2	1	5	5		1	4			H	CH,DH	+	+
N. England Cottontail	1	1	2	2	2	2	1	1	4	5	3	3	4			H	GS,DH	0	+
Deer	4	2	1	4	3	3	3	3	4	5	3	3	2	1		LRH	DH	0	-
Moose	3	1		1	5	4	4	2	4	3		1	5	4		LRH	DH,AV	+	-
Mountain Lion	3	1	1	4	4	4	2	2	5	2			4			WRP	R,B	+	+

TABLE 2.08-2 (cont.)

REPTILES and AMPHIBIANS	SWM	PNM	PNR	CS	SHM	HSM	PBM	HWM	RCN	RAF	F	AF	W	OW	MM	TROPHIC STATUS	PRINCIPAL FOODS	WET SOILS	ROCKY SOILS
	COVER TYPES																		
Cm. Snapping Turtle													3	5		AP	I	+	0
Wood Turtle	1	1	1	1	1	1	1	2	1	1		1	3	2		H,F	I	+	0
E. Painted Turtle													3	5		I,H	I	+	0
Blanding's Turtle	1	1	1	2	1	1	1	1	1	1			3	5		I,H	I	+	0
Box Turtle	1	1	1	1	1	1	1	2	1	1		1	3	2		H,I	I	+	0
Musk Turtle													3	5		I,H	I	+	0
Spotted Turtle													3	5		I,H	I	+	0
N. Water Snake													3	5		AP	R,B	+	+
E. Garter Snake	1	1	1	2	2	2	1	2	4	4	3	5	4		2	LRP	R	0	+
Ribbon Snake												1	3	5		LRP	R	0	+
Red-bellied Snake	2	2	2	2	2	2	2	2	4	4	1	3	4			LRP	R	0	+
Brown Snake	2	2	2	2	2	2	2	2	4	4	1	3	4		4	LRP	R	0	+
Ringneck Snake	3	3	3	3	3	3	3	3	5	5	1	2	4			LRP	R	0	+
Smooth Green Snake									2	2	1	3	2			LRP	R	0	+
Milk Snake	2	2	2	2	2	2	2	2	4	4	1	3	4			LRP	R	0	+
Black Racer	2	2	2	2	2	2	2	2	4	4	1	3	4			LRP	R	0	+
Red-spotted Newt	1	1	1	2	2	2	1	2	1	1			5			I	I	+	+
Blue-spotted/Jefferson Salamander	1	1	1	2	2	2	1	2	1	1			4			I	I	+	+
Spotted Salamander	1	1	1	2	2	2	1	2	1	1			4			I	I	+	+
Dusky Salamander	1	1	1	2	2	2	1	2	1	1			5			I	I	+	+
Spring Salamander	1	1	1	2	2	2	1	2	1	1			5			I	I	+	+
Red-backed Salamander	1	1	1	1	2	2	2	2	2	2			3			I	I	+	+
Two Lined Salamander	1	1	1	1	1	1	1	1	1	1			5			I	I	+	+
4-toed Salamander	1			2									5			I	I	+	+
Marbled Salamander	2	2	2	2	2	2	2	2	2	2			3			I	I	+	+
Am. Toad	1	1	1	2	2	2	1	2	1	1		1	4			I	I	+	0
Spring Peeper	1	1	1	2	2	2	1	2	3	3		1	4			I	I	+	0
Gray Tree Frog	1	1	1	2	2	2	1	2	3	3			4			I	I	+	0
Green Frog													5	3		I	I	+	0
Bullfrog													4	3		I	I	+	0
N. Leopard Frog									1	1	1	2	5	1		I	I	+	0
Pickerel Frog									1	1	1	2	5	1		I	I	+	0
Mink Frog	1			3									5	1		I	I	+	0
Wood Frog	2	1	1	4	2	2	1	2	1	1			5			I	I	+	0
Fowler's Toad		3	3								1	2	2			I	I	0	0

like deer whose metabolic balance in winter is already very delicate in this region. Disturbance at any season can force individuals to disperse to habitats less able to support them, and can result in increased aggressive encounters with other individuals of their species. Increased access can also result in direct losses to individuals of a species through increased hunting, trampling of nest and eggs, and collision with motor vehicles.

Remoteness is important not only for its role in protecting individuals from severe stress, but also for its crucial role in making wildlife a significant esthetic resource to man. The value of a fishery may be at least half comprised of the total experience of casting on a wilderness trout pond miles from the sounds of loggers. Where man has seldom been with a gun, moose, deer, bear, beaver, and many other species are considerably more approachable and thus enjoyable. And here, rare plants and tall trees are more likely to have escaped trampling.

Remoteness values along the proposed route are expressed on a five-point scale. A score of five characterized a condition of greatest remoteness and least existing disturbance.

Dickey-Lincoln School-Fish River

This route is interspersed with good, productive habitats. However, the cold winters in this region severly limit the deer and perhaps other species. Estimated deer densities in the Aroostook Wildlife Management Unit are lowest of the eight wildlife management units in the state.

Moose are fairly abundant in this segment. They are more abundant in the forests than in the open areas. The general area crossed by the route contains the second highest moose population density of Maine's eight wildlife management units.

Bear are present but are not abundant. Showshoe hare are more common here than elsewhere. The hilly topography and a high forest-field ratio probably provides good habitat for nesting raptors.

Terrestrial Habitat Values

Terrestrial habitats along the route from Dickey to Fish River Substation are classified to be of moderate value for species of special concern, harvested species, and all species. Table 2.08-3 provides mileage figures on the distribution of habitat evaluations for the route. In comparison to other segments of the proposed route, this segment contains lowest habitat rankings. Areas which are exceptions and which received high rankings occur near the confluence of the Allagash and St. John Rivers and again near the Stevens Hills at the eastern end of this route.

TABLE 2.08-3

TERRESTRIAL HABITAT RATINGS[1]
PROPOSED ROUTE

DICKEY-LINCOLN SCHOOL-FISH RIVER

Values		Miles Crossed	Percent of Route
Species of Special Concern			
1	Low Habitat value	-	-
2		8.9 mi.	30%
3	Moderate Habitat Value	17.3 mi.	59%
4		2.2 mi.	8%
5	High Habitat value	1.0 mi.	3%
Harvested (Game) Species			
1	Low Habitat Value	-	-
2		10.9 mi.	37%
3	Moderate Habitat Value	17.0 mi.	58%
4		0.3 mi.	1%
5	High Habitat Value	1.2 mi.	4%
All Species			
1	Low Habitat Value	-	-
2		10.9 mi.	37%
3	Moderate Habitat Value	12.1 mi.	41%
4		5.4 mi.	19%
5	High Habitat Value	1.0 mi.	3%

[1] Reference: Ecological Resources Impact Study, appendix E.

Several deer wintering areas have been identified in the route between Dickey and Lincoln School substations. No eagle, osprey, or heron nesting sites were observed along this route.

Remoteness Values

Remoteness values for this segment are summarized in table 2.08-4.

TABLE 2.08-4

REMOTENESS VALUES[1]
PROPOSED ROUTE

DICKEY-LINCOLN SCHOOL-FISH RIVER

Values		Miles Crossed	Percent of Route
1	Low Remoteness	-	-
2		-	-
3	Average Remoteness	29.4 mi.	100%
4		-	-
5	High Remoteness	-	-

[1] Reference: Ecological Resources Impact Study, appendix E.

Dickey-Moose River

Winters along the route from Dickey to Moose River are too severe to support a large deer population. Moose, however, are at their prime, with densities of 0.95-2.33 per sq. mi. (F. Dunn 1976). Bear are abundant. Beaver, waterfowl, and marten are probably more common here than in any other area in Maine, and osprey and otter are relatively common.

Terrestrial Habitat Values

Habitat value ratings for species of special concern are high in this segment. Eighty-five percent of the segment is to go through areas considered to have moderate to high value as habitats for the rare, threatened or endangered species (see table 2.08-5). Areas receiving high rankings occur most frequently in the central half of the segment.

Habitat values for both harvested species and all species are also relatively high along this segment. The northern and southern extremes of the segment tend to be ranked as moderate in value for both harvested and all wildlife species. The central half of the segment would cross areas ranked as moderate to high in habitat value.

Remoteness Values

Remoteness values in this segment are the second highest encountered along the proposed route. Values along the segment are summarized in table 2.08-6.

TABLE 2.08-5

TERRETRIAL HABITAT RATINGS[1]
PROPOSED ROUTE

DICKEY-MOOSE RIVER

Values		Miles Crossed	Percent of Route
Species of Special Concern			
1	Low Habitat Value	-	-
2		18.0 mi.	15%
3	Moderate Habitat Value	60.5 mi.	51%
4		35.1 mi.	30%
5	High Habitat Value	5.0 mi.	4%
Harvested (Game) Species			
1	Low Habitat Value	3.0 mi.	3%
2		22.2 mi.	19%
3	Moderate Habitat Value	77.8 mi.	65%
4		10.9 mi.	9%
5	High Habitat Value	4.7 mi.	4%
All Species			
1	Low Habitat Value	1.0 mi.	1%
2		21.0 mi.	17%
3	Moderate Habitat Value	60.3 mi.	51%
4		33.3 mi.	28%
5	High Habitat Value	3.0 mi.	3%

[1] Reference: Ecological Resources Impact Study, appendix E.

TABLE 2.08-6

REMOTENESS VALUES[1]
PROPOSED ROUTE

DICKEY-MOOSE RIVER

Values		Miles Crossed	Percent of Route
1	Low Remoteness	-	-
2		-	-
3	Average Remoteness	70.4 mi.	59%
4		48.2 mi.	41%
5	High Remoteness	-	-

[1] Reference: Ecological Resources Impact Study, appendix E.

A total of eight deer wintering areas were identified along this segment. No eagle, osprey, or heron nesting sites were observed along the route. An area near the center of the route, near Big Bog, Little Bog, and Sweeney Bog, is thought to be a bald eagle nesting area, although no nests were found. Also, Trickey Bluffs, adjacent to the route near Canada Falls Lake, seem to offer good potential sites for breeding peregrine falcons, golden eagles, and other raptors.

Other noteworthy habitats encountered along the route include:

- A regenerating burn, north of Cunliffe Brook and west of the centerline. It is of high interest because it represents a significant "habitat island." The high density here of standing snags will provide excellent habitat for nesting woodpeckers and other hole-dwelling wildlife. An active red-tailed hawk nest was found just west of the burn and off the proposed route.

- A series of wetlands of high importance to moose and waterfowl is present 2 to 3 miles east of the route near its midpoint. In this area, the Big Bog-Little Bog-Sweeney Bog complex, 39 moose were observed during one visit in mid-June. Bald eagles may nest in this area, but no nests were found.

Two species of very rare insects are known to occur in the general vicinity of the Boundary Bald Mountain area. The northern bush-katydid (*Scudderia septentrionalis*) has been collected near the base of the mountain, and a wingless relict grasshopper, (*Podisma glacialis*), has been collected on the mountain's heath-like slopes.

Moose River-Moore

The mountainous, northern part of this route provides good habitat for bobcat and bear. Here, in Oxford County, coyotes reach their maximum abundance in Maine. This is also an important area for marten and otter. The route crosses at least two popular hunting regions: the area east of Connecticut Lakes, and Nash Brook valley. The area around Nash Brook valley supports a significant number of bear. Deer habitat, however, is not as good as on the more southerly segments. Although Moose are scarce, they do inhabit some scattered beaver flowages and streamsides marshes. In general, the fauna along this segment is characteristically boreal south to the Umbagog-Connecticut Lakes area where it becomes transitional.

Terrestrial Habitat Values

The wildlife habitat values are relatively high along this segment. The habitat values for species of special concern and harvested species are the highest encountered along the proposed route (see table 2.08-7). The highest values occur in the central portion of the route where it crosses through western Maine and northern New Hampshire.

Cover types along this segment are rated high as habitats for all species. More areas highly valued for species diversity are encountered in this route than in any other.

Remoteness Values

This route segment has the highest levels of remoteness encountered. Values for this route are summarized in table 2.08-8.

TABLE 2.08-7

TERRESTRIAL HABITAT RATINGS[1]
PROPOSED ROUTE

MOOSE RIVER-MOORE

Values		Miles Crossed	Percent of Route
Species of Special Concern			
1	Low Habitat Value	13.2 mi.	10%
2		38.7 mi.	28%
3	Moderate Habitat Value	44.0 mi.	32%
4		25.3 mi.	19%
5	High Habitat Value	14.9 mi.	11%
Harvested (Game) Species			
1	Low Habitat Value	7.5 mi.	6%
2		59.5 mi.	44%
3	Moderate Habitat Value	38.1 mi.	28%
4		22.2 mi.	16%
5	High Habitat Value	8.8 mi.	6%
All Species			
1	Low Habitat Value	4.4 mi.	3%
2		42.5 mi.	31%
3	Moderate Habitat Value	46.9 mi.	35%
4		33.7 mi.	25%
5	High Habitat Value	8.6 mi.	6%

[1] Reference: Ecological Resources Impact Study, appendix E.

TABLE 2.08-8

REMOTENESS VALUES[1]
PROPOSED ROUTE

MOOSE RIVER-MOORE

Values		Miles Crossed	Percent of Route
1	Low remoteness	-	-
2		8.3 mi.	6%
3	Average Remoteness	56.6 mi.	42%
4		58.4 mi.	43%
5	High Remoteness	12.8 mi.	9%

[1]Reference: Ecological Resources Impact Study, Appendix E

The proposed centerline crosses four deer wintering areas. Three additional deer yards were identified within the one-half-mile wide route. No eagle, osprey, or heron nests were identified along the route. The steep slopes abutting Nash Stream valley probably provide good habitat for nesting raptors. The Parmachenee Lake area, located 2 miles south of the route, has one of the few heron rookeries in inland Maine. Bald eagles are thought to nest in the Chain of Ponds area, but no nests or eagles were observed.

Moore-Granite

The high proportion of regenerating forest and agricultural lands along the route makes this area productive for deer. In addition, its hardwood covered ridges provide a good food supply and denning sites for relatively high numbers of bear.

Terrestrial Habitat Values

The terrestrial habitat values for this segment are lower than those for the other segments. Moderate and less than moderate values are assigned to most of the segment (see table 2.08-9). Thirty-nine percent of the route is classified as average value for species of special concern and less than average value for all species. Habitat values for harvested species are mostly average.

Remoteness Values

Remoteness values along this segment are the lowest encountered. They are summarized in table 2.08-10.

Two deer yards are crossed by the route where it follows an existing transmission line right-of-way. No eagle, ospey, or heron nesting sites were observed along the route. However, raptors are common in the area. Several species were seen in the Connecticut River Valley in June 1977. Six turkey vultures, which are uncommon in the region, were sighted.

About 1.5 miles of the State of Vermont's 1,850-acre Pine Mountain Wildlife Management Area is crossed near Groton, Vt. Due to a shortage of cover for grouse and woodcock, portions of this area have been selectively cut to improve their habitat.

Granite-Essex

This route is in a region that provides a diverse and productive environment for many species of wildlife. Game species are probably more abundant here than in any other segment. Reverting farmland and fields interspersed with forest create prime habitat.

Terrestrial Habitat Values

Habitats along the route have comparatively lower values than those of northcentral Vermont.

TABLE 2.08-9

TERRESTRIAL HABITAT RATINGS[1]
PROPOSED ROUTE

MOORE-GRANITE

Values		Miles Crossed	Percent of Route
Species of Special Concern			
1	Low Habitat Value	2.0 mi.	5%
2		13.0 mi.	34%
3	Moderate Habitat Value	17.3 mi.	45%
4		5.5 mi.	15%
5	High Habitat Value	0.3 mi.	1%
Harvested (Game) Species			
1	Low Habitat Value	2.0 mi.	5%
2		10.7 mi.	28%
3	Moderate Habitat Value	24.4 mi.	64%
4		1.0 mi.	3%
5	High Habitat Value	-	-
All Species			
1	Low Habitat Value	-	-
2		14.7 mi.	39%
3	Moderate Habitat Value	18.1 mi.	47%
4		5.3 mi.	14%
5	High Habitat Value	-	-

[1] Reference: Ecological Resources Impact Study, appendix E.

TABLE 2.08-10

REMOTENESS VALUES[1]
PROPOSED ROUTE

MOORE-GRANITE

Values		Miles Crossed	Percent of Route
1	Low Remoteness	3.6 mi.	9%
2		34.5 mi.	91%
3	Average Remoteness	-	-
4		-	-
5	High Remoteness	-	-

[1] Reference: Ecological Resources Impact Study, appendix E.

Cover types in terms of their value as habitats for harvested species are moderate to less than moderate value (see table 2.08-11).

Habitat values for species of special concern are mostly moderate. The eastern portion of the route, however, contains a fair amount of habitat considered to be of potential to rare, threatened, or endangered species. Given the high variety of habitats, species diversity is generally quite high.

Remoteness Values

Low to average levels of remoteness occur along this segment as shown in table 2.08-12.

Deer numbers are very high along the segment. Six deer wintering areas are encountered. One of these yards is near the end of the Montpelier-Barre Regional Airport. Due to a lack of suitable cover, nearby, the yard could be especially critical.

The western part of the segment is in an important east-west corridor through the Green Mountains. Three deer yards are crossed. The relatively low elevation may be important to wintering deer. No eagle, osprey or heron nesting sites are known to occur along this segment.

2.08.3 Rare, Threatened, or Endangered Species

2.08.3.1 Regional Overview

Species Listed on the Federal Endangered Species List

The Federal government considers the bald eagle (*Haliaeetus leucocephalus*), the peregrine falcon (*Falco pergrinus*), the eastern cougar (*Felix concolor cougaur*), and the Indiana bat (*Myotis sodalis*) as endangered wildlife species occurring within region impacted (DOI 1976) by the proposed action.

Species Identified by State Agencies

Each of the three states crossed by the proposed transmission line has developed listings of declining or endangered species. In Maine, legislation has been enacted to protect endangered species, though the actual list remains pending (Bollengier, et al. 1976). In addition, the State Planning Office is preparing planning reports for a few wildlife species they consider significant in Maine. Some individual species, however, have been protected by state legislation.

In New Hampshire, a listing of uncommon species has been prepared (Salber 1974), but legislation has not been enacted protecting State defined endangered species. However, legislation does protect some individual species.

TABLE 2.08-11

TERRESTRIAL HABITAT RATINGS[1]
PROPOSED ROUTE

GRANITE-ESSEX

Values		Miles Crossed	Percent of Route
Species of Special Concern			
1	Low Habitat Value	4.1 mi.	9%
2		9.0 mi.	21%
3	Moderate Habitat Value	19.9 mi.	46%
4		9.3 mi.	22%
5	High Habitat Value	1.0 mi.	2%
Harvested (Game) Species			
1	Low Habitat Value	1.7 mi.	4%
2		19.7 mi.	46%
3	Moderate Habitat Value	18.8 mi.	43%
4		3.1 mi.	7%
5	High Habitat Value	-	-
All Species			
1	Low Habitat Value	1.0 mi.	2%
2		14.2 mi.	33%
3	Moderate Habitat Value	19.8 mi.	46%
4		7.3 mi.	17%
5	High Habitat Value	1.0 mi.	2%

[1] Reference: Ecological Resources Impact Study, appendix E.

TABLE 2.08-12

REMOTENESS VALUES[1]
PROPOSED ROUTE

GRANITE-ESSEX

Values		Miles Crossed	Percent of Route
1	Low Remoteness	7.4 mi.	17%
2		21.8 mi.	50%
3	Average Remoteness	14.1 mi.	33%
4		-	-
5	High Remoteness	-	-

[1] Reference: Ecological Resources Impact Study, appendix E.

Endangered species in Vermont are protected by law.

Table 2.08-13 provides a listing of these species and their recognized status by Federal and State governments, and their probability of reproduction in the northern, transitional, and southern ecoregions.

2.08.3.2 Rare, Threatened, or Endangered Wildlife Species

Geographical information on areas presently inhabited by rare, threatened, or endangered species is quite limited for those areas traversed by the transmission line routes. Recognizing this, procedures were implemented in the ecological resources impact study to detect rare species and to project their potentials along the routes.

Helicopter field surveys were conducted in hopes of identifying such features as eagle, osprey, or heron nesting areas, as well as rare species.

No areas occupied by rare, threatened, or endangered species are known to occur along the proposed route. The route, however, does cross 22.1 miles of habitat considered to be highly preferred by species of special concern.

No rare, threatened, or endangered aquatic fauna also are known to inhabit water features along the proposed route. The Blueback Trout, the Finescale Dace and the Blacknose Darter were identified as occurring in water in proximity to alternate routes.

2.09 Socioeconomics

2.09.1 Regional Overview

Population Density and Growth

Population densities are very low in most of the study area. Northern counties are sparsely populated. The southern fringe areas have the highest densities.

From 1960 to 1970, New Hampshire's population growth rate was 21.5 percent, Vermont's 14.1 percent, and Maine's 2.3 percent.

New Hampshire's southernmost areas are becoming more urban. Industries are moving into southern New Hampshire because of lower taxes, amenities, and proximity to Boston. Rockingham, New Hampshire's southernmost county, grew by 40 percent between 1960 and 1970. The growth rate declines, to the north, reaching a low of minus 7.7 percent in Coos County, New Hampshire's most northern county. The average growth rate for New Hampshire counties in the study area is 11.2 percent.

The population growth of Vermont in the study area averaged 5.7 percent per county.

TABLE 2.08-13

HABITAT PREFERENCES & STATUS[1]
SPECIES OF SPECIAL CONCERN

	RECOGNITION						PROBABILITY			COVER TYPES														
	N.H.	Vt.	Me.	U.S.	CNA	NAS	S	T	N	SWM	PNM	DNR	CS	SHM	HSM	PFM	HWM	RGN	RAF	F	AF	W	OW	MM
Atlantic Salmon (anadromous)	X						4																	5
Blue-backed Trout			X						5															5
Round Whitefish	X			X				1	5															5
Finescale Dace	X						1	5	5															5
Blacknose Shiner	X						5	5	5															5
Musk Turtle					X		2	2															3	5
Spotted Turtle					X		1	1															3	5
Wood Turtle			X		X		4	3	2		1	1	1	1	1	1	1	2	1	1		1	3	2
Box Turtle					X		1	1			1	1	1	1	1	1	1	2	1	1		1	3	2
Blanding's Turtle	X				X		1	1			1	1	1	2	1	1	1	1	1	1			3	5
Black Racer					X		2	1			2	2	2	2	2	2	2	2	4	4	1	3	4	
Smooth Green Snake	X				X		4	4	3										2	2	1	3	2	
Marbled Salamander	X				X		1	1			2	2	2	2	2	2	2	2	2	2			3	
Four Toed Salamander					X		2	3	3		2												5	
Purple Salamander	X				X		4	4	3		1	1	1	2	2	2	1	2	1	1			5	
*Common Loon	X						3	5	5														3	5
*Great Blue Heron			X		X		3	4	4														5	3
Black-cr. Night Heron						X	2	1	1														5	3
*Am. Bittern						X	4	5	5														5	1
*Turkey Vulture					X		4	2												1	5	5		
Sharp-shinned Hawk	X					X	3	3	4		4	2	1	1	4	4	4	3	5	5	1	3	2	
Cooper's Hawk	X		X			X	3	3	4		3	2	1	2	4	4	3	3	5	5	1	3	2	
*Red-shouldered Hawk	X					X	4	4	2		2	2	2	1	2	3	3	3	4	4	3	4	5	
Golden Eagle	X		X				1	2	2		1				1				2			1	5	3
Southern Bald Eagle	X	X	X	(X)		X	1	2	2													1	3	5
Marsh Hawk	X					X	2	2	2													1	5	
*Osprey	X	X				X	1	2	5														3	5
Peregrine Falcon	X	X	X	(X)		X	2	1	1										1			1	3	5
Merlin						X		1	1		5			4	4	2			3	1	1	1	2	
Spruce Grouse	X							3	5		5			3	1				4	1		1	4	
Common Gallinule					X		2	1															5	3
Upland Sandpiper					X	X	3	3	1													5		
Black Tern			X			X	1	1	2														5	2
Yellow-billed Cuckoo						X	4	3	1									1	5	5			3	
Screech Owl					X		4	3	1							1		3	4	4		2	5	
Boreal Owl					X			1	3		5			1	5	3	2						2	
Red-headed Woodpecker						X	2	1											1	1		5	2	
*Black-back 3-toed Woodp.					X			2	5		5			2	1				1				2	
No. 3-toed Woodpecker	X						1	1	4		5			2	1				1				2	
*Bank Swallow					X		5	5	4		1										1	2	3	5 2
Rough-winged Swallow					X		4	3	1														3	5
Purple Martin	X					X	4	4	2												1	5	3	2 1
Carolina Wren					X		2	1										1	5	5			3	
Short-billed Marsh Wren					X	X	1	1	3													1	5	
Grey-cheeked Thrush					X				1		5				1									
E. Bluebird	X		X				4	4	2										3	4	1	5	1	
Loggerhead Shrike					X	X	1	1	1											3		2		
*Blackpoll Warbler					X		1	3	5	5								2				1		
Prairie Warbler					X		3	1				3						5	5		1			
Palm Warbler					X			1	5										2			5		
Pine Grosbeak				X	X				5	5				3	1			3	1			1		
*White-winged Crossbill					X			1	5	5	1			3	2									
Grasshopper Sparrow						X	1														5			
Opossum					X		3	1		1	2	2	2	3	3	1	4	5	5	4	4	3		
Arctic Shrew					X				2	5												3		
Long-tailed Shrew							4	4	4	3	1	1	3	5	5	4	5	3	3	1	1	4		
N. Water Shrew (S. pa lstris)			X		X				5	1	1	1	1	1	1	1	1	2	2	1	2	5	3	
Myctis keeni			X		X		3	3	3	3	3	3	3	3	3	3	3	4	3	2	3	5	3	4
Indiana Bat		X		(X)			2	1		4	4	3	3	4	4	4	4	3	3	1	1	5	3	4
Myotis subulatus			X		X		4	3	1	4	4	3	3	4	4	4	4	3	3	1	1	5	2	4
Pipistrellus subflavus			X		X		3	3	2	4	4	3	3	4	4	4	3	4	3	1	1	5	4	4
Hoary Bat	X						3	3	3	4	4	3	3	4	4	4	4	3	3	1	1	5	3	4
Marten	X	X					1	3	5	5	3	1	5	2	2	1	1	3	2		1	4		
Timber Wolf	X			(X)			1	2	3	3	1	1	4	4	4	2	2	5	2			4		
E. Grey Fox					X		3	2	1	2	2	3	2	2	2	2	2	5	5	4	5	3		
Mountain Lion	X	X		(X)				1	2	3	1	1	4	4	4	2	2	5	2			4		
Canada Lynx	X	X	X	X			1	2	5	3	1	1	4	4	4	2	1	5	5		1	4		
S. Flying Squirrel					X		3	2	1	2	2	1	2	4	4	4	5	4	2			4		
N. Bog Lemming					X			1	2	2												5		
Microsorex hoyi thompsoni	X							1	3	3	2	1	3	3	3	2	3	4	5	2	3	4		
Clethrionomys gapperi gapperi	X							1	3	4	1		5	4	4	1	3	3	3		1	4		
Yellow Nosed Vole	X		X					1	5	5			1	1							1	1		
Pine Vole					X		3	1		2	2	2	1	4	4	2	5	4	5			3		
E. Cottontail	X						1			1	1	2	2	2	2	1	1	4	5	3	3	4		
N. England Cottontail	X		X				3	2		1	1	2	2	2	2	1	1	4	5	3	3	4		
*Moose	X						2	5	5	1		1	4	4	4	2	5	4		1	5	4		

The species listed in this table have been officially or unofficially considered as rare, threatened, or endangered in the study region. The first six columns under the heading "Recognition" indicate the agency or institution which officially or unofficially has designated the species to be of some concern, either because of its rarity, its declining population, or its tendency to breed in colonies or in very localized situations. Authority (unofficial) for New Hampshire species was considered to be Salber (1974). Authority (official) for Vermont species was considered to be Title 13, Section 3651(3)(A), Vermont Statutes. Authority (very unofficial) for Maine species was considered to be a mimeographed, very preliminary, in-house, list of the Maine Department of Inland Fisheries and Wildlife (1974) entitled "Species of Concern." Additional authority (unofficial) for Maine listings were a recent series of planning reports issued by the State Planning Office as part of their Critical Areas Program. The column "U.S." indicates species either officially declared threatened or endangered by U.S.D.I. (circled X's) or recommended for special consideration in a letter from U.S. Fish and Wildlife Service to the Army Corps of Engineers dated 7 July, 1976 (uncircled X's). The column "CNA" refers to species selected from the Center's report to the Maine State Planning Office (Adamus and Clough 1976). The column "NAS" refers to species we selected from National Audubon Society's 1977 "Blue List", a listing of birds which are believed to be declining in numbers.

The columns entitled "PROBABILITY" give our estimate of how probable it is that the named species might actually breed in parts of the northern, transitional, and southern ecoregions (as defined on pages) that are crossed by the route network. This evaluation was based on our familiarity gained in the field with what microhabitats are present for these species directly on the proposed route. A rating of "5" indicates the species is known to inhabit the proposed route corridor, or almost certainly can be expected. A rating of "1" indicates a very low probability of occurrence. These numbers, we emphasize, reflect probability, not abundance. The remaining columns indicate the species' habitat preferences, as explained on pages
A key to the cover types abbreviations is given in table

* seen on right of way during field investigations

Although Maine grew at the rate of only 2.3 percent overall, its counties on the southern coast grew at the rate of 10 to 15 percent. Inland counties are either growing slowly or losing population.

Some population losses for the study area reflect increased mechanization in the timber and farming industries.

Seasonal Population Variation

The population figures go up considerably in Maine, New Hampshire, and Vermont during summer and to a lesser degree during winter. The people come to the three states mostly for outdoor recreation and to occupy summer homes. The summer population in New Hampshire is estimated to be 50 percent greater than the resident population.

Economic Activity

Major economic activities in the study area include forestry, recreation, farming, manufacturing, extractive industries, and the construction of vacation homes. The more important activities, forestry, recreation, and farming, are discussed below.

Recreation

The importance of recreation to the economies of the three states can hardly be overstated. (See section 2.12). The mountains, lakes, rivers, forests, and farms attract thousands of visitors each year. Recreational values are strongly tied to land preservation, open space, conservation, and the ecology. A recent survey in Maine indicates that more than 10 million persons visit Maine each year. It is estimated that they spend $1 billion a year and generate another $500 million in additional business activity.

Forestry

Forest lands cover most of Maine, New Hampshire and Vermont--90 percent of Maine, 86 percent of New Hampshire, and 73 percent of Vermont. The forest products industry employs thousands of persons in each of the three states and is an important source of tax revenues.

In Maine, for example, the forest products industry, employs 30,000 workers, or about one-third of the state's total number of employees in manufacturing. In 1974, the state's wood products were valued at $1,250 million, or about 40 percent of the total value of the state's manufactured goods.

The 1972 Timber Resources of Maine Report by Ferguson and Kingsley reported:

> --The total stumpage value for the 1970 harvest in Maine was $27 million. (Stumpage value is the value of standing timber before it is cut.)

--The value of the harvest to primary wood processing plants, such as sawmills, woodpulp mills, and veneer mills, was $118 million.

--The value of the final forest products added to Maine's economy was $413 million. (This value added is the difference between the costs of goods and services purchased by a manufacturer and the value of the products sold. It sums up the money paid for wages, salaries, taxes, profits, etc.)

Farming

The farming trend in the three states is toward larger, mechanized farms that produce more per acre. However, the total land area farmed in the three states has declined. The percentage of land area devoted to farming is greatest in Vermont where some 32 percent of the land is farmed. Agriculture is Maine's second largest industry. Cash receipts total more than $370 million a year. They hit a record $439 million in 1974. Maine ranks second in the nation for the production of its leading crop, potatoes. The potato crop is grown mostly in Aroostook Valley on rich limestone soil. Other important farm products include poultry, eggs, dairy products, apples, and blueberries.

In New Hampshire, agriculture is the third largest industry. The number of farms in the state has dropped precipitously from 15,800 in 1950 to 2,600 in 1976. The acreage farmed declined from nearly 2 million acres in 1950 to 560,000 in 1976. Most of the farms are in the southern part of the state. Farm areas are found along the Connecticut, Merrimack, Saco, and Androscoggin Rivers. The most important farm activities are dairying and cattle raising.

In Vermont, agriculture is the state's most important industry, and dairying is the most important farm activity. Dairying is concentrated along the Connecticut River Valley, in central Vermont, and in the Burlington area. Vermont derives a greater percentage of its farm income from dairying than any other state. Milk production and the number of cows are increasing. The number of farms, however, has dropped from 6,000 to 3,200 in the past 6 years. The farm areas in Vermont are spread rather evenly over the state.

Farm income figures for the mid-1960's show that Vermont farmers were selling about $100 million worth of milk annually in the New York and Boston markets. Eggs, chickens, and produce brought in another $20 million a year, maple syrup and sugar $2.5 million, and berries and fruits $2.5 million.

2.09.2 Socioeconomic Conditions along the Proposed Route

Social and economic conditions were profiled through an impact study (see appendix H). This evaluation was designed specifically to address those conditions that could be influenced by the proposed action. A pre-analysis to the study included interviews with town officials and residents along a recently constructed 345-kV transmission line in eastern Maine. Construction contractors were questioned about social or economic factors. Previous impact studies were reviewed. Findings from these investigations were used to structure the socioeconomic impact study approach.

A transmission line is a lineal feature, thus it traverses areas containing differing social and economic characteristics. A method for reflecting these differences was included in the study design. Areas in which social and economic conditions are similar were identified as regions. Minor differences within the regions were distinguished through the subregions. A total of five such regions and nine subregions were defined. (See figure 2.09-1.)

Socioeconomic conditions along the proposed route are summarized in table 2.09-2. Table 2.09-1 correlates the towns and socioeconomic regions that are crossed by each of the segments. Additional information on socioeconomic conditions is provided in appendix H.

TABLE 2.09-1

TOWNS/SOCIO-ECONOMIC REGIONS TRAVERSED BY THE PROPOSED ROUTE

Route Segments	Towns Crossed	Socio-Economic Region/Subregions Crossed
Dickey-Lincoln School-Fish River	Allagash Plantation, ME	I-A
	St. Francis, ME	I-A
	St. John Plantation, ME	I-A
	Fort Kent, ME	I-A
	Unorganized Townships and Plantations, ME	I-B
Dickey-Moose River	Unorganized Townships and Plantations, ME	I-B
	Moose River, ME	I-C
Moose River-Moore	Moose River, ME	I-C
	Unorganized Townships and Plantations, ME	I-B
	Pittsburg, NH	I-D
	Clarksville, NH	II-A
	Stewartstown	II-A
	Colebrook, NH	II-A
	Columbia, NH	II-A
	Odel, NH	I-D
	Stratford, NH	II-B
	Stark, NH	I-D
	Northumberland, NH	II-B
	Littleton, NH	II-B
	Guildhall, VT	III-A
	Lunenburg, VT	III-A
	Concord, VT	III-A
	Waterford, VT	III-B
Moore-Granite	Littleton, NH	II-B
	Monroe, NH	II-B
	Barnet, VT	III-B
	Ryegate, VT	III-B
	Groton, VT	III-B
	Topsham, VT	IV-B
	Orange, VT	IV-B
	Washington, VT	IV-B
	Williamstown, VT	IV-A
Granite-Essex	Williamstown, VT	IV-A
	Barre, VT	IV-A
	Berlin, VT	IV-A
	Moratown, VH	IV-B
	Duxbury, VT	IV-B
	Waterbury, VT	IV-B
	Bolton, VT	V
	Richmond, VT	V
	Williston, VT	V

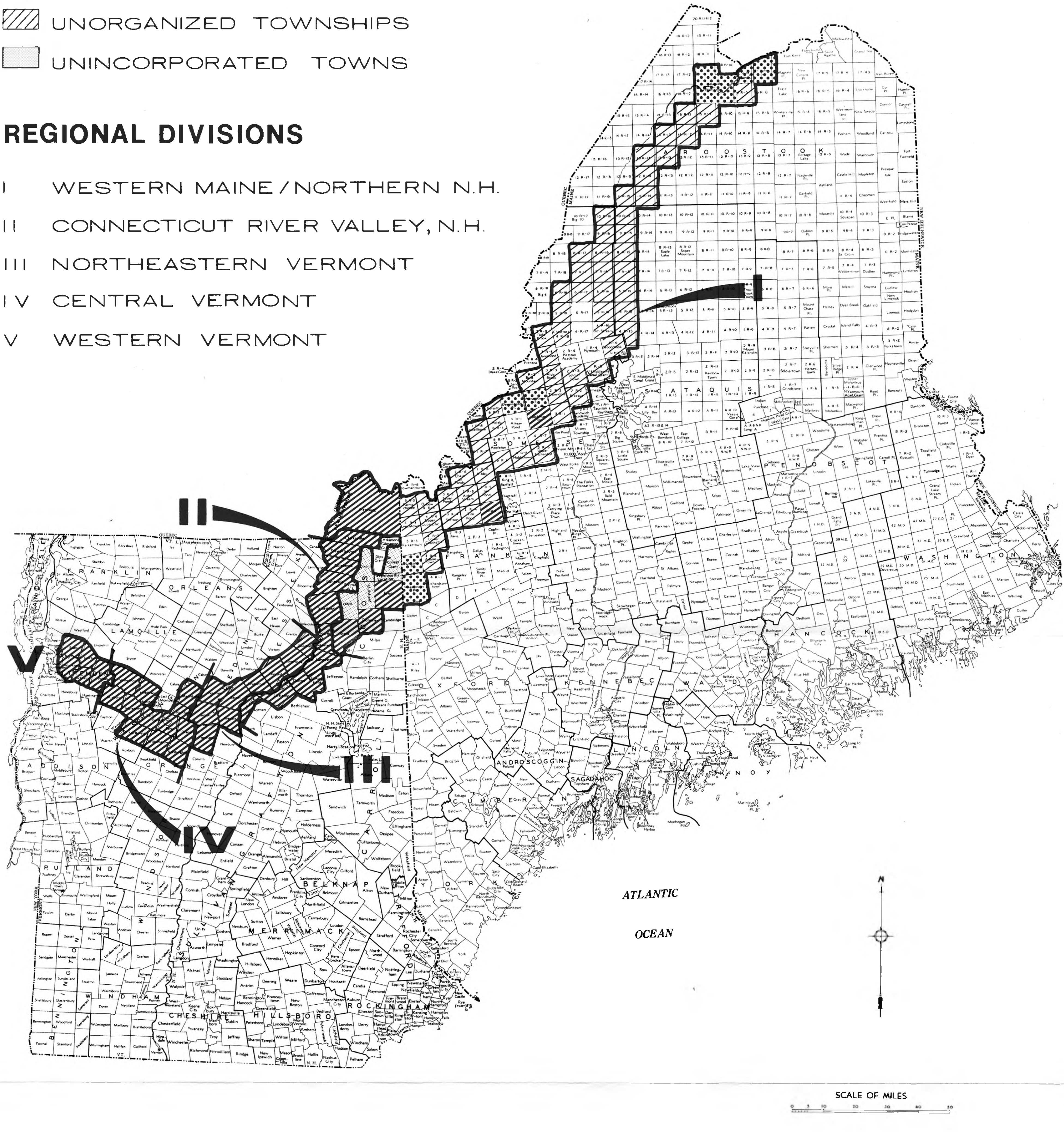
Figure 2.09-1

POLITICAL STRUCTURE

- TOWNS
- PLANTATIONS
- UNORGANIZED TOWNSHIPS
- UNINCORPORATED TOWNS

REGIONAL DIVISIONS

- I WESTERN MAINE / NORTHERN N.H.
- II CONNECTICUT RIVER VALLEY, N.H.
- III NORTHEASTERN VERMONT
- IV CENTRAL VERMONT
- V WESTERN VERMONT



Dickey/Lincoln School Lakes Transmission · E.I.S. Project
Environmental Assessment of Alternative Routes

TABLE 2.09-2

SUMMARY OF SOCIAL AND ECONOMIC
BASE DATA BY REGION AND SUBREGION

Region and Subregion	Population Density People/sq mi	Commercial Center[1]	Size of Commercial Center	Past Growth Rate	Projected Growth Rate	Date of Settlement	Temporary Housing Supply[2]	Emphasis On Local Planning[3]	Access to Population Centers[4]	Major Economic Activity
Region I	dispersed		N/A*	fluctuating	N/A	1800's	Small		Isolated	Timber harvesting, Recreation
I-A	24	Fort Kent	5,000	declining	N/A	Mid 1800's	N/A	Medium	Low	Agriculture
I-B	11		N/A	N/A	N/A	Not settled	N/A	(LURC) high	Isolated	Timber
I-C	11	Jackman	924	fluctuating	N/A	Early 1800's	Some	(LURC/local) High	Isolated	Timber
I-D	3	Pittsburg (Berlin[1])	805 15,000	moderate	N/A	Early 1800's	Numerous	Low	Isolated/ Low	Timber
Region II	dispersed	Littleton	5,000	fluctuating	Stable	Early 1800's	Numerous	Low		
II-A	19	Colebrook	2,000	fluctuating	Stable to slight increase	Early 1800's	Numerous	Low	Low	Manufacture Timber
II-B	50	Littleton	5,000	fluctuating	Stable to slight increase	Early 1800's	Numerous	Moderate	Moderate	Manufacture services
Region III	centers and dispersed	St. Johnsbury	12,000	fluctuating	Moderate	1700's	Numerous	High	Moderate	
III-A	18	St. Johnsbury	12,000	fluctuating	Moderate	Mid 1700's	Numerous	High	Moderate	Lt. manufacture/Agri.
III-B	21	St. Johnsbury	12,000	fluctuating	Moderate	Late 1700's	Numerous	High	Moderate	Commercial Recreational
Region IV	Centers settled	Barre-Montpelier	18,000	fluctuating	Moderate	1700's	Numerous	Moderate	Moderate	Service/trade Mining
IV-A	103	Barre-Montpelier	18,000	moderate	High	1700's	Numerous	Moderate	Moderate	Service/trade Mining
IV-B	32	Barre-Montpelier	18,000	fluctuating	Moderate	1700's	Numerous	Moderate	Moderate	Service/trade Mining
Region V	Centers Settled, 69	Burlington	35,000	high	High	Late 1700's	Numerous	High	High	Commercial Agriculture

TABLE 2.09-2

Region and Subregion	Labor Force[5]	Unemployment Rate	Economic Growth[7]	Median Family Income	Median Value of Housing	Tax Base[12]	Land Ownership Pattern[13]
Region I			Slow			Tree Growth	Paper Companies
I-A	4,180	13.2	Slow	$6,929	$9,400	Residential	Residential/Agriculture
I-B			N/A	N/A	N/A	Tree Growth	Paper Companies
I-C	778	12.0[6]	Slow	7,516	N/A	Residential/TG	Residential/Paper Company
I-D				7,810	10,800[9]	N/A	Paper Companies
Region II		6.8	Slow				
II-A	9,646	6.8	Slow	7,810	10,800	Residential/yield	Paper Companies/Residential
II-B	9,502	7.5	Slow	8,080[8]	11,100[10]	N/A	Residential/Agriculture
Region III	11,200	7.1	Slow				
III-A			Slow	7,307	9,100	Residential/ Industrial	Residential
II-B			Moderate	7,720	13,000	Residential/ Industrial	Residential/State
Region IV	29,500	5.4	Moderate				
IV-A			Moderate	8,937	15,700[11]	Residential	Residential/Commercial
IV-B			Moderate	8,937	15,700	Residential	Residential
Region V	51,000	5.7	High	10,757	21,000	Residential	Residential/Agriculture

2.10 Existing Land Use

2.10.1 Regional Overview

The Alternative Power Transmission Corridors Study, (appendix B) considered land ownership and land use within the region.

Land ownership categories included: Federally-owned lands, Indian lands/ reservation, stateowned lands, large institutional/semi-public lands, large private holdings, and parcel density/towns.

Land use categories included: urban centers, ex-urban development, town centers, open/agricultural lands, aerodromes, transportation, and electric transmission lines. Maps which identify land ownerships and land uses are enclosed in the map volume of appendix B.

The assessment focused on a study area which did not include a portion of Vermont located between Barre and Burlington. Changes in electrical planning assumptions subsequent to the completion of this assessment required an additional 345-kV circuit between Granite Substation and Essex Substation. The reconnaissance and environmental impact studies were expanded to include assessments for this line.

2.10.1.1 Land Ownership

<u>Private Lands</u>

Land ownership in the region is largely private. Most of northern and western Maine and extensive parts of northern New Hampshire and Vermont are large private holdings (see appendix B, map volume, map 5.4). They include lands owned by the major timber and land management companies. In Maine, the land holdings of International Papter, Scott Paper, Georgia-Pacific, Seven Islands, Diamond International, Saint Regis, and Great Northern Paper companies are within the study region. Several of these timber companies, plus Brown and Wagner Woodlands Company, have holdings in New Hampshire and Vermont.

Many large holdings are owned by combinations of individuals and companies. Each owner has a sole interest in a specific amount of acreage on which he must individually meet legal and taxation responsibilities. However, his lands are placed under common cooperative management which allows them to be managed as one large parcel.

Private lands were also classified with respect to parcel density to provide a reasonable approximation of the number of parcels that a power line corridor might impact. Classifications of high, medium, and low parcel density were made on a town basis. They reflect the number of parcels per square mile. This information was correlated with population densities for the towns to indicate the number of people that might be affected.

The following ranges were used for this classification.

Low Density	Medium Density	High Density
1-8 parcels/sq. mi.	8-28 parcels/sq. mi.	greater than 28 parcels/sq. mi.
0-7 people/sq. mi.	7-50 people/sq. mi.	greater than 50 people/sq. mi.

The pattern of parcel densities in the study area reflects low densities in the managed forests of northwestern Maine, northern New Hampshire, and Vermont (see appendix B, map volume, maps 5.5, 5.6 and 5.7.). Parcel densities are medium in the south and east where agricultural areas are encountered. At the southern and the western extremes of the study region, parcel density is high, reflecting such urban areas as Bangor, Waterville, and Lewiston, Maine; Plymouth and Newport, N. H.; and Ludlow and Montpelier, Vt.

Federal Lands

Federal lands in New England are comparatively small, (see appendix B, map volume, map 5.1.). However, the White Mountain National Forest in northern New Hampshire and western Maine covers 735,598 acres. It is the largest public land holding in New England and one of the most heavily used forests in the national forest system. It provides a variety of outdoor recreation opportunities as well as timber for wood product industries.

Indian Land/Reservations

Indian land/reservations is a category used to classify lands legally established as Indian reservation lands governed by tribal councils.

Presently, the only such lands within the study area are a series of islands within the lower Penobscot River of Maine, (see appendix B, map volume, map 1.6.). They comprise the Penobscot Indian Reservation. A lawsuit in behalf of several Maine Indian Tribes is pending in Federal courts. The outcome of this suit could increase the extent of Indian lands within Maine.

State Owned Lands

State owned lands in the study region are extensive but scattered. However, the size of each is generally less than 1000 acres, (see appendix B, map volume, map 5.2.). Included within this designation are state parks, state forests, state universities, public lots (Maine), and wildlife management areas.

Institutional/Semi-public Lands

The last category of land ownership found within the study area is classified as institutional/semi-public lands. These lands are owned by semi-public or nonprofit educational organizations or institutions. They are not extensive and are mostly in southwestern Maine and neighboring parts of New Hampshire and Vermont. See appendix B, map volume, map 5.3.).

2.10.1.2 Land Use

This section discusses the types of land use within the study region. The reader is referred to appendix B and its map volume.

Urban Centers

These areas are those centers of populations which have more than 1,000 inhabitants and cover an area more than 1 mile square. Urban centers occur largely along the southern and eastern edges of the study region. (See appendix B, map volume, map 1.1.).

Ex-urban Development

"Ex-urban development" is a land use classification used to describe areas that are less densely developed than urban centers. These areas have a density of at least one unit/10 acres and tend to be on the periphery of urban centers. Many are linear and occur along transportation corridors.

Ex-urban development is found mostly along the southern and eastern edges of the study region. (See appendix B, map volume, map 1.2.).

Town Centers

Town centers are those areas and populated places with the least development. They include small towns and villages appearing on USGS quadrangle sheets or official highway maps. (See appendix B, map volume, map 1.3). Town centers are numerous, except in the northwest portion of the study region.

Open/Agricultural Lands

This land use classification includes all lands devoid of forest cover which are presently used for agriculture or which are potential croplands.

Open/agricultural lands are distributed through the study region in a pattern corresponding to that of ex-urban development lands. They occur along the eastern border of Maine, throughout southern portions of the study region, along the Connecticut River, and throughout all but the northernmost portion of Vermont. (See appendix B, map volume, map 1.4.)

Aerodromes

This category includes heavily used aircraft landing sites on land and water. Transmission lines must be located at safe distances from such facilities in accordance with Federal Aviation Administration standards. Landing sites were mapped throughout the study region. (See appendix B, map volume, map 1.5.)

Transportation

Appendix A classifies and maps roads with respect to their use level as reflected by average daily traffic volume and by the density of their distribution. (See appendix B, map volume, maps 4.1-4.5.)

The region's most heavily traveled roads are its interstate highways. Four interstate highways occur in the study region; I-95 runs north-south through Maine, I-93 runs north-south through New Hampshire along the Merrimack River, I-91 follows the Connecticut River in a north-south direction within Vermont, I-89 runs northwest from Hanover, Vt., to Burlington, Vt.

A fairly well developed system of state highways exists throughout most of the region. However, portions of northwestern Maine are served solely by Maine Highway 201.

There are many local and timber haul roads throughout the region. Most areas are accessible by vehicle.

Electric Transmission Lines

The northern portion of the New England electric power grid is in the study area. Map 13.3, appendix B, map volume, shows the location of existing transmission lines.

Existing transmission lines tend to be oriented in a north-south direction and most of them are in the southern and western portions of the study region.

2.10.2 Existing Land Uses along the Proposed Route

Existing land uses along the proposed route were determined through the Land Use Impact Study, appendix G. In this assessment, land uses were inventoried at a greater level of detail than was possible at the corridor study level. This inventory was compiled using aerial photographs, field checks, and contacts with land use planning agencies and major land owners.

The categories were taken from the State of Maine Standard Classification System for Land Use Coding. Definitions for each of these categories is contained in appendix G.

Existing land use information along the proposed route is available in two forms. The land use maps enclosed as a map volume to appendix G are the most comprehensive source of land use data. The location of specific land uses with respect to the route may be determined by reviewing these maps.

The second form in which land use information is persented is tabular in format. Quantities of various land uses in each of the five route segments are included in tables accompanying the descriptions which follow. This information was taken from the land use maps and represents the numbers of land uses which occur throughout the one-half mile wide route. The width of proposed rights-of-way are of 100 feet (138 kV) and 150 feet (345 kV). Statistics in these tables reflect general land use conditions along the route rather than quantities of land uses impacted.

Information on recreational uses and commercial forestry along the route is provided in sections 2.12 and 2.14. Separate impact assessments were conducted on these topics.

Dickey-Lincoln School-Fish River

The proposed route from Dickey to Fish River is in a heavily forested area. The dominant land use for the segment is timber production. Two lumber mills occur along the route between Lincoln School and Fish River. Roughly 90 percent of the acreage on the route is being used for timber. (See table 2.10-1).

Residential development along the segment is sparce. One large cluster of dwellings is located east of the Lincoln School Substation at the Town of St. Francis. Most residential structures in the segment are along Highways 161 which follows the St. John River, and Highway 11, which is located along the Fish River near the eastern end of the segment. Agricultural areas, used largely for hay fields or row crops, also occur frequently within the route. In relation to the entire proposed route, 39 percent of the row crops are on this segment.

Most of the transportation routes on the segment are unpaved roads. Highway 161 is located at the southern edge of the route near St. Francis. The route crosses Highway 11 near Fish River Substation. The Bangor and Aroostook Railroad is located north of the route between St. Francis and Fort Kent, Maine.

Dickey-Moose River

Land use along the route from Dickey to Moose River is almost all commercial forestry. Most of the land along the route is privately owned. Large blocks of land are held by timber and paper companies. (See table 2.10-2).

The acreage figures that reflect mining on the route refer to gravel quarries along the roads. These quarries furnish material to surface timber haul roads.

Roads within the area crossed by the route are unpaved. They are used for commercial timber operations. The segment contains 112.4 miles of unsurfaced road within its one-half mile width. Most of these roads are perpendicular to the route. However, many also parallel the route.

Other types of land use development within this portion of the proposed route are few in number.

TABLE 2.10-1

EXISTING LAND USE[1]
DICKEY - LINCOLN SCHOOL - FISH RIVER

LAND USE CATEGORY	LAND USE TYPES	NUMBER OF UNITS IN ROUTE SEGMENT	TOTAL FOR ENTIRE ROUTE	SEGMENT % OF ENTIRE ROUTE
Residential				
	Single family 0 - 5	40	333	12%
	5 - 25	1	1	100%
	25+	0	3	0
	Multi-family	0	0	0
	Group quarters	0	0	0
	Mobile homes	0	81	0
	Seasonal homes	1	12	8%
Manufacturing				
	Light	30 acres	36 acres	83%
	Heavy	0	1 acre	0
Transportation				
	Railroads (in miles)			
	Abandoned	0	1 mile	0
	Passenger	0	5 miles	0
	Freight	6.5 miles	10 miles	65%
	Aircraft	0	1	0
	Roads			
	Limited access	0	8.3 miles	0
	Paved	2.75 miles	39.6 miles	7%
	Unpaved	33.5 miles	280.3 miles	12%
	Organized logging pattern (acres)	2.5 acres	117.5 acres	2%
Utilities		25 acres	1485 acres	2%
Trade				
	Commercial	0	8 units	0
	Institutional	0	3 units	0
Resource Extraction				
	Crops			
	Hay field	193.5 acres	2078 acres	9%
	Row	423.5 acres	1090.5 acres	39%
	Abandoned field	185.0 acres	1080.6 acres	17%
	Pasture	15.0 acres	491 acres	3%
	Dairy/livestock	3.0 acres	34 acres	9%
	Potato house/barns	3.0 acres	14 acres	0
	Poultry	0	2 acres	0
	Nurseries/plantations	11.0 acres	100 acres	11%
	Mining	0	121.5 acres	0
	Active	10.0 acres	99 acres	10%
	Abandoned	0	18 acres	0
	Maple sap extraction	0	363 acres	0

[1]Reference: Land Use Impact Study, Appendix G

[2]Within a One-Half Mile Wide Route

TABLE 2.10-2

EXISTING LAND USE[1]
DICKEY - MOOSE RIVER

LAND USE CATEGORY	LAND USE TYPES	NUMBER OF UNITS IN ROUTE SEGMENT	TOTAL FOR ENTIRE ROUTE	SEGMENT % OF ENTIRE ROUTE
Residential				
	Single family 0 - 5	7	333	2%
	5 - 25	0	1	0
	25+	0	3	0
	Multi-family	0	0	0
	Group quarters	0	0	0
	Mobile homes	0	81	0
	Seasonal homes	1	12	8%
Manufacturing				
	Light	0	36 acres	0
	Heavy	0	1 acre	0
Transportation				
	Railroads(in miles)			
	Abandoned	0.5 miles	1 mile	50%
	Passenger	0	5 miles	0
	Freight	0	10 miles	0
	Aircraft	0	1	0
	Roads			
	Limited access	0	8.3 miles	0
	Paved	0.5 miles	39.6 miles	1%
	Unpaved	112.4 miles	280.3 miles	40%
	Organized logging pattern (acres)	0	117.5 acres	0
Utilities		5 acres	1485 acres	<1%
Trade				
	Commercial	0	8 units	0
	Institutional	0	3 units	0
Resource Extraction				
	Crops			
	Hay field	0	2078 acres	0
	Row	0	1090.5 acres	0
	Abandoned field	0	1080.6 acres	0
	Pasture	0	491 acres	0
	Dairy/livestock	0	34 acres	0
	Potato house/barns	0	14 acres	0
	Poultry	0	2 acres	0
	Nurseries/plantations	3 acres	100 acres	3%
	Mining	118.5 acres	121.5 acres	93%
	Active	9.0 acres	99.0 acres	9%
	Abandoned	0	18.0 acres	0
	Maple sap extraction	0	363 acres	0

[1] Reference: Land Use Impact Study, Appendix G

[2] Within a One-Half Mile Wide Route

Moose River-Moore

The major land use along this route is forestry. (See table 2.10-3.) Residential areas occur in the Colebrook area where the segment passes through agricultural fields west of Kidderville, N. H., and again along the Connecticut River near Groveton, N. H.

The route parallels an existing transmission lines for a short distance near Groveton, N. H., and again as it approaches Moore Substation.

Moore-Granite

This segment of the proposed route parallels an existing transmission lines for its entire length. Land uses occuring along this route are summarized in table 2.10-4.

Residential dwellings are evenly distributed along the route. Areas traversed are more highly populated than previous segments. The route passes adjacent to Barnet, Vt.

Agricultural areas are commonly encountered. They are mostly hay fields or pastures of dairy farms. Agricultural areas are secondary in acreage to forest lands.

Granite-Essex

A major part of this route parallels existing transmission lines through thickly settled areas. Land use information on this segment is summarized in table 2.10-5.

The route is relatively close to several town centers. It passes one-half mile south of Barre, Vt., and within one-fourth mile of the villages of Middlesex, Bolton, Jonesville, and Richmond. The route passes one-half mile from the north-south runway of the Barre-Montpelier Regional Airport. The route crosses Interstate Highway 89 twice and is located near the highway for most of its length.

2.11 Planned Land Use

2.11.1 Regional Overview

Land use planning within the study region is conducted at three levels: state, regional, and local.

Maine, New Hampshire, and Vermont have state planning offices. In general, the state planning offices review all projects that could affect state resources. They act as coordinators for regional and local planning commissions. Coordination of Federal, State, and local land planning (A95) is handled through these offices. In Maine, a State agency, the Land Use Regulation Commission, has planning responsibilities for all unorganized townships, most of which are in northern Maine.

TABLE 2.10-3

EXISTING LAND USE [1]
MOOSE RIVER - MOORE

LAND USE CATEGORY	LAND USE TYPES	NUMBER OF UNITS IN ROUTE SEGMENT	TOTAL FOR ENTIRE ROUTE	SEGMENT % OF ENTIRE ROUTE
Residential				
	Single family 0 - 5	46	333	14%
	5 - 25	0	1	0
	25+	3	3	100%
	Multi-family	0	0	0
	Group quarters	0	0	0
	Mobile homes	1	81	1%
	Seasonal homes	3	12	25%
Manufacturing				
	Light	1 acre	36 acres	3%
	Heavy	0	1 acre	0
Transportation				
	Railroads (in miles)			
	Abandoned	0	1 mile	0
	Passenger	0	5 miles	0
	Freight	3 miles	10 miles	30%
	Aircraft	0	1 mile	0
	Roads			
	Limited access	0	8.3 miles	0
	Paved	6.6 miles	99.6 miles	17%
	Unpaved	106.4 miles	280.3 miles	38%
	Organized logging pattern (acres)	115	117.5	98%
Utilities		160 acres	1485 acres	11%
Trade				
	Commercial	0	8 units	0
	Institutional	1 unit	3 units	33%
Resource Extraction	Crops			
	Hay field	438.5 acres	2078 acres	21%
	Row	159 acres	1090.5 acres	15%
	Abandoned field	243.6 acres	1080.6 acres	23%
	Pasture	178 acres	491 acres	96%
	Dairy/livestock	8 acres	34 acres	23%
	Potato house/barns	0	14 acres	0
	Poultry	0	2 acres	0
	Nurseries/plantations	18 acres	100 acres	18%
	Mining	0	121.5 acres	0
	Active	26 acres	99.0 acres	26%
	Abandoned	2 acres	18.0 acres	11%
	Maple sap extraction	0	363 acres	0

[1] Reference: Land Use Impact Study, Appendix G

[2] Within a One-Half Mile Wide Route

TABLE 2.10-4

EXISTING LAND USE[1]
MOORE - GRANITE

LAND USE CATEGORY	LAND USE TYPES	NUMBER OF UNITS IN ROUTE SEGMENT	TOTAL FOR ENTIRE ROUTE	SEGMENT % OF ENTIRE ROUTE
Residential				
	Single family 0 - 5	68	333	20%
	5 - 25	0	1	0
	25+	0	3	0
	Multi-family	0	0	0
	Group quarters	0	0	0
	Mobile homes	0	81	0
	Seasonal homes	1	12	8%
Manufacturing				
	Light	0	36 acres	0
	Heavy	0	1 acre	0
Transportation				
	Railroads (in miles)			
	Abandoned	0.5 miles	1 mile	50%
	Passenger	0	5 miles	0
	Freight	0.5 miles	10 miles	5%
	Aircraft	0	1 mile	0
	Roads			
	Limited access	0	8.3 miles	0
	Paved	13.5 miles	99.6 miles	34%
	Unpaved	14.8 miles	280.3 miles	5%
	Organized logging pattern(acres)	0	117.5	0
Utilities		790 acres	1485 acres	53%
Trade				
	Commercial	0	8 units	0
	Institutional	0	3 units	0
Resource Extraction				
	Crops			
	Hay field	732 acres	2078 acres	35%
	Row	221 acres	1090.5 acres	20%
	Abandoned field	297 acres	1080.6 acres	27%
	Pasture	170 acres	491 acres	35%
	Dairy/livestock	5 acres	34 acres	15%
	Potato house/barns	8 acres	14 acres	57%
	Poultry	2 acres	2 acres	100%
	Nurseries/plantations	41 acres	100 acres	41%
	Mining	3 acres	121.5 acres	7%
	Active	9 acres	99.0 acres	9%
	Abandoned	5 acres	18.0 acres	26%
	Maple sap extraction	363 acres	363 acres	100%

[1] Reference: Land Use Impact Study, Appendix G

[2] Within a One-Half Mile Wide Route

TABLE 2.10-5

EXISTING LAND USE [1]
GRANITE - ESSEX

LAND USE CATEGORY	LAND USE TYPE	NUMBER OF UNITS IN ROUTE SEGMENT	TOTAL FOR ENTIRE ROUTE	SEGMENT % OF ENTIRE ROUTE
Residential				
	Single family 0 - 5	172	333	52%
	5 - 25	0	1	0
	25+	0	3	0
	Multi -family	0	0	0
	Group quarters	0	0	0
	Mobile homes	80	81	99%
	Seasonal homes	6	12	50%
Manufacturing				
	Light	5 acres	36 acres	14%
	Heavy	1 acre	1 acre	100%
Transportation				
	Railroads (in miles)			
	Abandoned	0	1 mile	0
	Passenger	5 miles	5 miles	100%
	Freight	0	10 miles	0
	Aircraft	1 mile	1 mile	100%
	Roads			
	Limited access	8.3 miles	8.3 miles	100%
	Paved	16.3 miles	99.6 miles	16%
	Unpaved	13.3 miles	280.3 miles	5%
	Organized logging pattern (acres)	0	117.5	0
Utilities		505 acres	1485 acres	34%
Trade				
	Commercial	8 units	8 units	100%
	Institutional	2 units	3 units	67%
Resource Extraction				
	Crops			
	Hay field	714 acres	2078 acres	35%
	Row	287 acres	1090.5 acres	26%
	Abandoned field	355 acres	1080.6 acres	33%
	Pasture	128 acres	491 acres	26%
	Dairy/livestock	18 acres	34 acres	53%
	Potato house/barns	6 acres	14 acres	43%
	Poultry	0	2 acres	0
	Nurseries/plantations	27 acres	100 acres	27%
	Mining	0	121.5 acres	0
	Active	45 acres	99.0 acres	46%
	Abandoned	12 acres	18.0 acres	63%
	Maple sap extraction	0	363 acres	0

[1] Reference: Land Use Impact Studv, Appendix G

[2] Within a One-Half Mile Wide Route

Regional Planning commissions are active within the study region. In Maine, the districts of the following planning commissions are within the study area: Northern Maine Regional Planning Commission (RPC); Penobscott Valley RPC; North Kennebec RPC; South Kennebec RPC; Androscoggin Valley RPC; and Southern Maine RPC.

In New Hampshire only one such council, The North Country Council, is within the study area. The Council's district includes the counties of Coos, Grafton, and Carrol, the northernmost counties in New Hampshire.

In Vermont, portions of eight regional planning districts are within the study area. These are: Northeastern Vermont Development Association; Central Vermont RPC; Chittenden County RPC; Two Rivers RPC; Upper Valley RPC; Ottauquechee RPC; and Southern Windsor RPC.

A large number of local or town planning commissions exist within the study region.

2.11.2 Planned Land Uses along the Proposed Route

An assessment of planned land uses along the proposed route was conducted as part of the Land Use Impact Study (appendix G).

Planned land uses are defined as those projected in comprehensive plans and land use planning documents. Categories for planned land uses are general. Time tables for implementation vary or are absent.

The categories used to classify planned land uses along the transmission segments are composites of categories used in a series of planning documents. The primary sources of planned land use information were the Maine Land Use Regulation Commission, the New Hampshire State Planning Office, and, in Vermont, town plans furnished by Chittendon County Regional Planning Commission, Central Vermont Regional Planning Commission, and Northeastern Vermont Development Association.

The categories for the proposed land uses are: village/commercial, urban residential, rural residential agricultural, public/semi public, industrial, management district (Maine only), development district (Maine only), conservation/resource protection, and unclassified.

Proposed land use maps are contained in appendix G. The map volume indicates the location of planned land uses along the transmission line segments. Table 2.11-1 shows mileages for each category crossed.

Planned land use information is, perhaps, most significant in terms of the restrictions to development that are implied by the various categories. For example, areas classified as conservation/resource protection generally possess important natural amenities. The maintenance of these amenities is sought by a planning body. The construction of a transmission line in such areas is viewed with less favor than it would be if built in a category that calls for development.

TABLE 2.11-1

PLANNED LAND USES ON PROPOSED ROUTE[1]
(ALL SEGMENTS)

PROPOSED LAND USE CATEGORIES	TOTAL MILES EACH CATEGORY % OF TOTAL ROUTE LENGTH	DICKEY/ LINCOLN SCHOOL/ FISH RIVER	DICKEY/ MOOSE RIVER	MOOSE RIVER/ MOORE	MOORE/ GRANITE	GRANITE/ ESSEX
Village/ Commercial	1.5 <1%					1.5 3%
Urban/ Residential	2.2 <1%			0.2 <1%		2.2 5%
Rural Residential/ Agricultral	32.4 9%			3.0 2%	6.3 17%	23.4 54%
Public/ Semi-public	0.4 <1%			0.1 <1%		0.3 1%
Industrial	3.2 1%					3.2 7%
Management District (Maine only)	171.9 47%	9.7 33%	107.7 91%	54.5 40%		
Development District (Maine only)	0 0					
Conservation/ Resource Protection	52.4 14%	1.0 3%	5.9 5%	23.7 17%	8.8 23%	13.0 30%
Unclassified	101.3 28%	18.7 64%	5.0 4%	54.6 40%	23.0 60%	

[1]Reference: Land Use Impact Study, Appendix G

2.12 Recreation

2.12.1 Regional Overview

The region contains an abundance of outdoor recreational opportunities linked to such natural resources as the mountains, lakes, rivers, and forests in the three states. Both New Hampshire and Maine estimate their peak summer populations to be 50 percent greater than the resident population because of an influx of visitors. Vermont's resources are also heavily utilized in summer. Recreation also brings many people to the states in winter.

Both public and private facilities have been developed throughout the region to accomodate recreation, such as: boating, canoeing, camping, hunting, fishing, swimming, picnicking, hiking, bicycling, skiing, scenic drives, wildlife viewing, snowmobiling, and visits to historic places or structures.

2.12.1.1 Public Recreational Facilities

The Alternative Power Transmission Corridor study (appendix B) discusses public recreation lands in three categories: Federal, State, and municipal. Maps 3.1-3.8 and 14.6 of the map volume, appendix B, indicate the location of public recreational facilities . Selected examples of each follow.

Federal Recreation Lands

The White Mountain National Forest is extremely valuable to New England as a recreational and natural resource. It is the most heavily used forest in the national forest system and is within a day's drive of the homes of more than 62 million persons. Popular summer activities in this forest are camping, sightseeing, and hiking, followed by rock 3climbing, berry picking, picnicking, and sports activities. In winter, downhill skiing attracts the largest number of visitors. Cross country skiing, snowmobiling, and ice climbing are also important. Both the Great Gulf and Presidential Range-Dry River Wilderness areas are within the White Mountain National Forest.

State Recreation Lands

There are three basic types of state-operated recreational facilities: state parks, state forests, and wildlife refuges and management areas.

Baxter State Park is an example of an important recreation area in the study area in Maine. This large, 201,018-acre park is in a sparsely settled area. It was established to provide a natural setting for outdoor recreational activities, such as camping, picnicking, hiking, cross country skiing, and mountain climbing. Climbing Mt. Katahdin is a popular park activity.

A slightly different state-operated recreational facility is the Allagash Wilderness Waterway in Maine. This linear park along the Allagash River in the wild lands of northern Maine is heavily used by canoeists and hikers.

An example of a Vermont state forest used for recreation is Groton State Forest in the northeastern part of the state. Facilities for boating, hiking, snowmobiling, and camping have been developed.

A good example of a State Wildlife Management area which accomodates recreational activities is the Lake Francis Wildlife Area in the town of Pittsburg in Coos County, N. H. This 2,351-acre wildlife management area accomodates such activities as hunting for upland game and deer, and fishing for brook trout and salmon.

2.12.1.2 Privately Owned Recreation Facilities

There are also extensive, privately developed recreation facilities throughout the study region. Examples include golf courses, ski areas, resort areas, campgrounds, and canoeing areas.

Locations of intensive recreation areas are shown on map 3.5, appendix B, map volume. Although these facilities are largely commercial, many are provided by the forest landowners and management companies at little or no charge to the public.

2.12.2 Recreational Resources Along the Proposed Route

Recreational resources along the route are identified in the Recreational/Visual Impact Study. (appendix I).

The resources encompass recreational use types, ownership, and activity areas. Information was gathered from various agencies and organizations and from existing publications, reports, booklets and maps. Field reconnaissance was conducted to verify this information.

Recreational resources were mapped (see map volume, appendix I). A wide range of recreational features were studied.

Dickey-Lincoln School-Fish River

The area along the route from Dickey to Fish River Substation offers a variety of developed and undeveloped recreational opportunities. The route frequently encounters linear recreational features. Eight maintained and nine unmaintained snowmobile trails are crossed or occur within the one-half mile wide route. These trails are used by several clubs in towns along the route. Routes 161 and 11 are fall foliage routes. Route 11 is also a sightseeing route and designated scenic highway. The Allagash, St. John and Fish Rivers, popular canoeing routes, are crossed or are in close proximity. The Allagash River, designated the Allagash Wilderness Waterway, is crossed near its confluence with the St. John River. A hiking trail along this river would be crossed by the route.

Other recreation related areas identified are: two seasonal residences; a public land parcel (crossed for 2 miles): and a proposed scenic lookout associated with visitor facilities at Dickey Dam.

Dickey-Moose River

This portion of the route is in a remote area, and convenient vehicular access to many areas does not exist. Thus, the type of recreational sites encountered are both undeveloped and of semi-wilderness character.

Examples of semi-wilderness character recreation sites along the route include a portion of the Allagash Wilderness Waterway within the viewshed of the transmission line; the St. John River and the South Branch of the Penobscot River both of which are crossed by the route and are candidates for the national wild and scenic river system; and Baker Lake, Canada Falls Lake, and Long Pond which are near the proposed route and all of which are designated "Great Ponds" (This classification is used by the State of Maine to denote remote characteristics.)

Other recreational areas identified along the route are: five undeveloped camping areas; a camp; a hiking trail (along Allagash near Dickey); both maintained and unmaintained snowmobile trails; and U. S. Highway 201 near Moose River Substation which is designated a fall foliage route.

Moose River-Moore

The diversity of recreational resources contained within this segment is due in part to the fact that the segment spans all of three states -- Maine, New Hampshire, and Vermont. It ranges from remote and undeveloped recreational base to one which is developed and highly accessible. The first such area extends from Moose River Substation to Connecticut Lakes. In this area, recreational opportunities are associated with such natural resources as great ponds, major rivers, and mountains. Few developed recreational facilities exist.

A second recreational identity extends from the Connecticut Lakes area near the New Hampshire/Maine state line to Groveton, N. H. In this area recreational resources are moderately developed.

The third identity extends along the rest of the segment. This portion contains intensive recreational use areas. They are accessible from such places as Groveton, Lancaster and Whitefield, N. H.

A number of recreational features were identified in that portion of the of the route between Moose River and the Connecticut Lakes area. Moose River and Kibby Stream, which are under study by the DOI for potential inclusion in the national wild and scenic river system, are crossed. Route 27, which follows the North Branch of the Dead River, is a designated scenic highway and is crossed by the route. This highway is aligned with the Arnold Trail, a national register historic site, which also is crossed by the route. Several water features used as canoe routes are crossed. A Great Pond, (Twin Island Pond), is adjacent to the route. Hiking trails are encountered in four locations, as are three proposed hiking trails. A parcel of public land is crossed in the area west of the Kibby Mountains. One maintained and 12 unmaintained snowmobile trails were identified along the route.

Developed recreational sites were encountered from the Connecticut Lakes to the Groveton area. The Connecticut Lakes Region is west of the route. This area is noted for its waterbased recreational opportunities. The route viewshed encompasses First Connecticut Lake and lands adjacent to Lake Francis which includes the Lake Francis Wildlife Area. In this same general area, Magalloway Mountain, which is west of the route, provides a vantage point for hiking trails.

The route crosses Highway 26 near Kidderville, N. H. This highway is designated fall foliage and sightseeing route. Four maintained snowmobile trails are also encountered. East of the route in the Colebrook area are Coleman State Park, Diamond Ponds and Dixville Notch. A recreational resort complex near Dixville Notch features a championship golf course and a skiing area.

The route south of the Colebrook area is close to Nash Stream and crosses the Upper Ammonoosoc River. These water features are recommended for inclusion in the New Hampshire wild and scenic river system and currently provide a variety of recreational opportunities.

From Groveton to Moore Substation, a portion of the route is close to the Connecticut River, an important canoeing route which is being studied for inclusion in the national wild and scenic river system. Routes 3, 102, and 135 in New Hampshire and Vermont are along this river and provide access to this area. These roads are used as fall foliage, sightseeing, and bicycling routes.

After crossing the Connecticut River, the route is located in a more undeveloped area. Recreational features encountered include hiking trails, a snowmobile trail, several bodies of water, and facilities which accommodate use of these waters. The Connecticut River and Moore Reservoir are the most heavily used waters.

Moore-Granite

This segment of the proposed route follows an existing transmission line. Public recreational lands are crossed. The route crosses the southern end of the Groton State Forest and the northern edge of the Pine Mountain Wildlife Management Area.

The route crosses several linear recreation features. These include the Connecticut River, a major canoe route; Route 135 in New Hampshire, a scenic road, fall foliage and bicycle route; Route 5 in Vermont, a scenic road; the Waits River and several other fishing streams; the Bailey Hazen Military Road, a historic site; and Highway 110, a fall foliage route and proposed scenic road.

The area in which the route crosses the Connecticut River is a proposed recreation and conservation area.

Granite-Essex

The recreational environment along this segment gets its identity from the Winooski River Valley. The Winooski River, and its tributaries, the Dog and Huntington rivers, and the Green Mountains combine to form a dramatic landscape for recreation. The route generally parallels the Winooski River and the major highway network in its valley. These highways integrate a number of recreational resource areas around Barre, Montpelier, Middlesex, Duxbury, Waterbury, Bolton, Jonesville, and Richmond. Major recreational features within the areas include Mt. Mansfield State Forest, Camels Hump State Park, the Long Trail, and a variety of scenic, sightseeing, and fall foliage routes, bicycle routes, and canoeing and fishing streams.

Before reaching the Winooski River, the proposed transmission route crosses a number of linear recreational features. These include Stevens Brook and the Dog River, fishing streams; Route 14, a scenic road and bicycle route; Route 89, a scenic road; Route 12, a bicycle route; and several snowmobile trails. The areas penetrated by the proposed route include Barre City Forest, Berlin Municipal Forest and a natural area valued for its geological significance. Along the Winooski River, the road networks function as recreational activities areas. Routes 100, 89, 2, and 12 serve as scenic roads, sightseeing and fall foliage routes, and bicycle routes. The Winooski River serves as a canoe route and is fished. Two important recreational features in the viewshed of the valley include Mt. Mansfield State Forest and Camels Hump State Park. Camels Hump, elevation 4,083 feet, serves as a natural area. It is the highest point along the proposed route. The Long Trail is crossed in the town of Bolton near Jonesville. Maintained by the Green Mountain Club, it extends 263 miles from the Massachusetts to the Canadian border. Other features along the route include Bolton Falls, a natural area; a small ski area with a memorial ski jump; streams designated as having high recreation potential; several historic sites; bicycle routes, and a proposed recreation and conservation area in Waterbury, south of Mansfield State Forest.

2.13 Visual

2.13.1 Regional Overview

The landscape of the study region is noted for its scenic or esthetic qualities (appendix B, figure A-4). Such amenities as diverse physiographic features, abundant lakes, rivers and brooks, and extensive forests that color richly in the fall offer scenic characteristics found in few other locations. These resources stimulate high recreational use and contribute substantially to the region's economy.

Visual resources within the study region were analyzed relative to three variables:

1. Existing features which contribute to high visual quality;
2. The ability of the landscape or areas within the landscape to conceal or absorb the visibility of a transmission line and;

3. The degree to which lands presently dependent on a quality visual setting might be affected by viewing a transmission line.

The analysis indicated that areas containing such features as lakes, which are important scenic elements and which offer little concealment, should be avoided. Similarly, exposure to such features as scenic highways also should be avoided. Western portions of the study region will have highest levels of visual sensitivity. Examples of the most sensitive areas are: the White Mountain National Forest, the Connecticut River Valley which contains Interstate Highway 91, the Allagash Wilderness Waterway, and areas along the Penobscot River. It has been nominated as a national wild and scenic river.

2.13.2 Visual Conditions along the Proposed Route

Visual assessments were concentrated along a route one-half mile wide, the center of which was assumed to the proposed alinement of the transmission line. Areas along the route from which the transmission facilities could be seen were termed viewsheds. These areas were also analyzed; they are shown on maps titled "Visual Sensitive Land Uses" contained in the map volume of appendix I, The Recreation/Visual Impact Study. Four visual attributes were used to evaluate the visual environment. They were site attractiveness, landscape quality, landscape absorption, and viewing audience.

The term "visual site attractiveness" is used to express the qualities of a "near" view that one might see along the route. Views were rated for quality as very high, high, moderate, low, or none. Site attractiveness levels along the route are illustrated in the map volume of appendix I.

"Visual landscape quality" was the term used to express qualities of "distant" views commonly referred to as scenery. Landscapes were given six ratings: exceptional, very high, high, moderate, low, and very low. Landscape quality levels are also illustrated in the map volume.

"Landscape absorption" is the term used to express the degree to which a landscape may hide or conceal the proposed facilities. Absorption was rated as high, moderate, low, or very low.

"Viewing audience" was the term used to express the occurrence of visually sensitive land uses within the viewsheds, i.e., residences, roads, passenger railroads, and historic sites. Residences were analyzed relative to clusters of 1 to 5 houses, 6 to 25 houses, or more than 25 houses. Roads were categorized according to the volume of traffic.

It was assumed that existing transmission lines close to the proposed route have modified visual qualities somewhat.

Dickey-Lincoln School-Fish River

Visual Landscape Quality - The existing landscape quality of this segment is rated somewhat above moderate. Areas of high landscape quality occur most commonly in that portion of the route between Dickey and Lincoln School substations. Low landscape quality occurs for a short distance at Fort Kent Mills, reflecting the area's urban character. Table 2.13-1 summarizes the landscape quality along the route.

TABLE 2.13-1

VISUAL LANDSCAPE QUALITY SUMMARY[1]
DICKEY-LINCOLN SCHOOL-FISH RIVER

Ratings	Miles Crossed	Percent
Very Low	-	-
Low	1.3 mi.	4.4%
Moderate	18.1 mi.	61.6%
High	10.0 mi.	34.0%
Very High	-	-
Exceptional	-	-

[1] Reference: Visual Recreation Resources Impact Study, appendix I

Visual Site Attractiveness - Site attractiveness values along this segment are largely moderate. Areas of high attractiveness occur at the crossings of the Allagash and Fish Rivers, and also where agricultural fields are crossed. Areas of low site attractiveness occur near the Bangor and Aroostook Railway, and a mobile home park.

Site attractiveness values for the route from Dickey to Fish River Substation are summarized in table 2.13-2.

T A B L E 2.13-2

TABLE 2.13-2

VISUAL SITE ATTRACTIVENESS SUMMARY[1]
DICKEY-LINCOLN SCHOOL-FISH RIVER

Ratings	Miles Crossed	Percent
None	-	-
Low	7.7 mi.	26.3%
Moderate	15.6 mi.	53.2%
High	5.7 mi.	19.5%
Very High	0.4 mi.	1.0%

[1] Reference: Visual-Recreation Resources Impact Study, appendix I

Visually Sensitive Land Uses - Viewsheds along the route from Dickey to Fish River encompass portions of the St. John River Valley. The valley holds a fairly large number of scattered rural residences and the village of St. Francis, Maine. Also within the viewshed are Routes 161 and 11. Table 2.13-3 summarizes the size and visually sensitive land uses occurring within the viewshed of this segment. Vegetation would often block views of the proposed line. Thus, many of these land uses would not be visually affected.

TABLE 2.13-3

VISUALLY SENSITIVE LAND USES[1]
DICKEY-LINCOLN SCHOOL-FISH RIVER

Viewshed Size	39,720	Acres
	62	Square Miles
Residences		
1 - 5 Units	78	Clusters
6 - 25 Units	13	Clusters
25+ Units	0	
Roads		
0 - 750 Average Daily Traffic Volume		
Lineal Mileage in Viewshed:	46.7	Miles
Number of Crossings:	3	
750 - 3000 Average Daily Traffic Volume		
Lineal Mileage in Viewshed:	3.5	Miles
Number of Crossings:	2	
3000+ Average Daily Traffic Volume		
Lineal Mileage in Viewshed:	0	
Number of Crossings:	0	
Passenger Railroads:	0	
Historic Sites:	2	
Transmission Lines Paralleled:	0.2	Miles

[1] Reference: Visual-Recreation Resources Impact Study, appendix I

Dickey-Moose River

Visual Landscape Quality - Visual landscape quality on this portion of the route is the lowest encountered. Values of low and very low are predominant because of the gently rolling topography and the general absence of major water features. Exceptions occur in the area of Canada Falls Lake, Boundary Bald Mountain, Iron Bound Mountains, and Trickey Bluffs. These areas and the southern end of the route were rated as very high.

Visual landscape quality values along this route segment are summarized in table 2.13-4.

TABLE 2.13-4

VISUAL LANDSCAPE QUALITY SUMMARY[1]
DICKEY-MOOSE RIVER

Ratings	Miles Crossed	Percent
Very Low	36.1 mi.	30.4%
Low	49.9 mi.	42.1%
Moderate	13.3 mi.	11.2%
High	4.5 mi.	3.8%
Very High	14.8 mi.	12.5%
Exceptional	-	-

[1] Reference: Visual-Recreation Resources Impact Study, appendix I

Visual Site Attractiveness - This portion of the route goes through wildlands. Thus, attractiveness derives from natural conditions. High ratings were given to marshlands and swamps, particularly cedar bogs and beaver dam swamps. Mature and regenerating forests occur along all but a very small portion of the route. Therefore, the occurrence of open grassland areas are also rated as highly attractive. Areas of very high attractiveness occur where surface water is present. Examples of such areas are Dole Brook and the South Branch of the Penobscot River. Forests in themselves are assigned moderate and low site attractiveness values. Sites attractiveness values for the route from Dickey to Moose River are summarized in table 2.13-5.

TABLE 2.13-5

VISUAL SITE ATTRACTIVENESS SUMMARY[1]
DICKEY-MOOSE RIVER

Ratings	Miles Crossed	Percent
None	0.3 mi.	0.3%
Low	42.2 mi.	35.5%
Moderate	73.0 mi.	61.5%
High	2.9 mi.	2.4%
Very High	0.2 mi.	0.3%

[1] Reference: Visual-Recreation Resources Impact Study, appendix I

Visually Sensitive Land Uses - The route from Dickey to Moose River Switching Station passes through commerical forest lands. Very few viewers will be exposed to the proposed line. As can be seen in table 2.13-6 few visually sensitive land uses occur within the viewshed. These occur at the extreme ends of the route near the substations.

TABLE 2.13-6

VISUALLY SENSITIVE LAND USES[1]
DICKEY-MOOSE RIVER

Viewshed Size:	98,160	Acres
	153	Square Miles
Residences		
1 - 5 Units:	6	Clusters
6 - 25 Units:	0	
25+ Units:	0	
Roads		
0 - 750 Average Daily Traffic Volume (ADT)		
Lineal Mileage:	40.5	Miles
Number of Crossings:	11	Crossings
750 - 3000 ADT		
Lineal Mileage:	2	Miles
Number of Crossings:	1	Crossing
3000+ ADT		
Lineal Mileage:	0	
Number of Crossings:	0	
Passenger Railroads:	0	
Historic Sites:	0	
Transmission Lines Paralleled:	0	

[1] Reference: Visual-Recreation Resources Impact Study, appendixI

Moose River - Moore

Visual Landscape Quality - This portion of the proposed route has very high levels of landscape quality. The route goes through mountainous terrain with high visual interest. Areas with exceptional landscape quality are: the Parmachenee Lake area; the Connecticut Lakes area; the area from the Connecticut Lakes south to the area of Cranberry Bog Notch encompasing portions of the towns of Clarksville, Stewartstown, Colebrook, and Columbia in northern New Hampshire; and the Connecticut River Valley area from Cape Horn near Groveton to the area near Lunenberg, Vt. Landscape quality levels along this portion of the route are summarized in table 2.13-7.

TABLE 2.13-7

VISUAL LANDSCAPE QUALITY SUMMARY[1]
MOOSE RIVER-MOORE

Ratings	Miles Crossed	Percent
Very Low	-	-
Low	-	-
Moderate	-	-
High	20.5 mi.	15.1%
Very High	82.5 mi.	60.6%
Exceptional	33.1 mi.	24.3%

[1] Reference: Visual-Recreation Resources Impact Study, appendix I

Visual Site Attractiveness - Overall site attractiveness levels for the route are rated as moderate. Areas of high site attractiveness occur at the Kidderville area, the Nash Stream area, the Upper Ammonoosuc Valley/Beach Hill area, and the Connecticut River Valley. The rest of the route has moderate or low levels of site attractiveness. Table 2,13-8 summarizes site values along the route from Moose River to Moore.

TABLE 2.13-8

VISUAL SITE ATTRACTIVENESS SUMMARY[1]
MOOSE RIVER-MOORE

Ratings	Miles Crossed	Percent
None	0.5 mi.	0.5%
Low	16.3 mi.	12.0%
Moderate	110.4 mi.	81.0%
High	8.2 mi.	6.0%
Very High	0.7 mi.	0.5%

[1] Reference; Visual-Recreation Resources Impact Study, appendix I

Visually Sensitive Land Uses - The northern half of the route passes through vast commercial forest lands in which few visually sensitive land uses occur.

On the southern half of the route, sensitive land uses occur within the viewshed. Concentrations of such uses occur in the Colebrook-Kidderville area, in the Upper Ammonoosuc River Valley, in the Groveton Area, and along the Connecticut River.

Table 2.13-9 summarizes the visually sensitive uses identified within the viewsheds of this segment.

TABLE 2.13-9

VISUALLY SENSITIVE LAND USES[1]
MOOSE RIVER-MOORE

Viewshed Size:	187,400	Acres
	293	Square Miles
Residences		
1 - 5 Units:	324	Clusters
6 - 25 Units:	7	Clusters
25+ Units:	3	Clusters
Roads		
0 - 750 Average Daily Traffic Volume (ADT)		
Lineal Mileage:	94.2	Miles
Number of Crossings:	22	
750 - 3000 ADT		
Lineal Mileage:	0	
Number of Crossings:	0	
Passenger Railroads:	2	Miles in Viewshed
	1	Crossing
Historic Sites:	6	
Transmission Lines Paralleled:	5.4	Miles

[1] Reference: Visual-Recreation Resources Impact Study, appendix I

Moore-Granite

Visual Landscape Quality - Landscape quality ratings for this portion of the route are predominately high. Areas which received moderate ratings occur primarily at the western end of the route south of Barre City and in the area of Granite Substation. Areas characterized as having very high quality occur near Blue and Whitcher mountains. This portion of the proposed route parallels an existing transmission line.

Visual landscape quality ratings for this portion of the route are summarized in table 2.13-10.

TABLE 2.13-10

VISUAL LANDSCAPE QUALITY SUMMARY[1]
MOORE-GRANITE

Ratings	Miles Crossed	Percent
Very Low	-	-
Low	-	-
Moderate	8.6 mi.	22.6%
High	21.5 mi.	56.4%
Very High	8.0 mi.	21.0%
Exceptional	-	-

[1] Reference: Visual-Recreation Resources Impact Study, appendix I

Visual Site Attractiveness - Site attractiveness values on this segment are predominantly moderate. Areas where agricultural fields are crossed occur in several places. These areas are rated as having high site attractiveness. An area south of Blue Mountain where the route crosses several small peaks has very high site attractiveness.

Site attractiveness values for this portion of the route are summarized in table 2.13-11.

TABLE 2.13-11

VISUAL SITE ATTRACTIVENESS SUMMARY[1]
MOORE-GRANITE

Ratings	Miles Crossed	Percent
None	-	-
Low	2.1 mi.	6.0%
Moderate	25.7 mi.	67.5%
High	9.7 mi.	25.5%
Very High	0.6 mi.	1.0%

[1] Reference: Visual-Recreation Resources Impact Study, appendix I

Visually Sensitive Land Uses - The route from Moore to Granite parallels an existing transmission line. Residences are distributed along much of the route. Concentrations of homes occur along the Connecticut River where the communities of Barnet and McIndue Falls, Vt., and Monroe, N.H. are within the viewshed. Residential viewers are also encountered near Groveton, N.H., and again near Granite Substation where rural residential development associated with the Barre-Montpelier area occurs.

High volume roads crossed by the routes are Interstate 91 (near Barnet) and Route 302 which is crossed at three locations.

Visually sensitive land uses along this portion of the route are summarized in table 2.13-12.

TABLE 2.13-12

VISUALLY SENSITIVE LAND USES[1]
MOORE-GRANITE

Viewshed Size	50,960	Acres
	79.6	Square Miles
Residences		
1 - 5 Units:	224	Clusters
6 - 25 Units:	3	Clusters
25+ Units:	5	Clusters
Roads		
0 - 750 Average Daily Traffic Volume (ADT)		
Lineal Mileage:	87.2	Miles
Number of Crossings:	24	Crossings
750 - 3000 ADT		
Lineal Mileage:	17	Miles
Number of Crossings:	4	Crossings
3000+ ADT		
Lineal Mileage:		
Number of Crossings:		
Passenger Railroads:	0	
Historic Sites:	14	
Transmission Lines Paralleled:	38.1	Miles

[1] Reference: Visual-Recretaion Resources Impact Study, appendix I

Granite-Essex

Visual Landscape Quality - This part of the route goes through populated areas. Large portions of the route parallel existing transmission lines. Moderate to low levels of landscape quality occur at both ends of the route near the Barre City area and Essex. High levels of landscape quality occur in the Winooski River Valley where the route goes through mountainous terrain. Areas close to the valley floor and next to developed areas are largely rated as having moderate landscape quality.

Visual landscape quality levels assigned to this route segment are summarized in table 2.13-13.

TABLE 2.13-13

VISUAL LANDSCAPE QUALITY SUMMARY[1]

GRANITE-ESSEX

Ratings	Miles Crossed	Percent
Very Low	10.0 mi.	23.1%
Low	-	-
Moderate	12.7 mi.	29.3%
High	20.6 mi.	47.6%
Very High	-	-
Exceptional	-	-

[1] Reference: Visual-Recreation Resources Impact Study, appendix I

Visual Site Attractiveness - Site attractiveness values along the route from Granite to Essex vary. They reflect a diverse set of conditions. The route passes near existing transmission lines, Route I-89, the Central Vermont Rail Line, mobile home parks, industrial areas, and quarries, all of which tend to be rated as having low to moderate levels of attractiveness. Parts of the route cross agricultural fields or pass near rock outcrops and water features such as the Winooski and Mad rivers which are rated high in attractiveness.

Site attractiveness values along the route are summarized in table 2.13-14.

TABLE 2.13-14

VISUAL SITE ATTRACTIVENESS SUMMARY[1]
GRANITE-ESSEX

Ratings	Miles Crossed	Percent
None	0.9 mi.	2.1%
Low	1.3 mi.	3.0%
Moderate	28.9 mi.	66.7%
High	11.2 mi.	25.9%
Very High	1.0 mi.	2.3%

[1] Reference: Visual-Recreation REsources Impact Study, appendix I

Visually Sensitive Land Uses - This segment of the route parallels existing transmission lines for much of its length. However, it also crosses areas of extensive land use development. Its viewsheds contain the highest number of visually sensitive land uses.

Residences are concentrated at the segment's eastern end, where it passes south of Barre City; near Middlesex and Waterbury where the route passes south of these two communities; and along the narrow Winooski River Valley where the route passes near the villages of Bolton, Jonesville, and Richmond.

About 27 miles of Interstate Highway 89 are in the viewshed. The highway is crossed twice.

A fairly large number of historic sites also are located in the viewshed, mostly at the northwestern end of the route.

Table 2.13-15 summarizes the visually sensitive land uses identified within the route's viewshed.

TABLE 2.13-15

VISUALLY SENSITIVE LAND USES[1]
GRANITE-ESSEX

Viewshed Size:	54,680	Acres
	85.4	Square Miles
Residences		
1 - 5 Units:	277	Clusters
6 - 25 Units:	22	Clusters
25+ Units:	10	Clusters
Roads		
0 - 750 Average Daily Traffic Volume (ADT)		
Lineal Mileage:	82.2	Miles
Number of Crossings:	19	Crossings
750 - 3000 ADT		
Lineal Mileage:	34.5	Miles
Number of Crossings:	5	Crossings
3000+ ADT		
Lineal Mileage:	27.5	Miles
Number of Crossings:	3	Crossings
Passenger Railroads:	0	
Historic Sites	34	
Transmission Lines	26.4	Miles

[1] Reference: Visual-Recreation REsources Impact Study, appendix I

2.14 Forest Resources

2.14.1 Regional Overview

Maine, New Hampshire, and Vermont are all largely dependent upon the extensive forests which cover 90 percent of Maine, 86 percent of New Hampshire, and 75 percent of Vermont. A combination of favorable climate, physiography, and the decline of agriculture has produced large areas of forest cover. Historically, the forest cover of the study area, particularly in Vermont, was viewed with mixed emotion. The forests provided construction materials, shelter, and a bountiful habitat for wildlife. At the same time they created an obstacle to farming which required cleared land.

During the late 1700's and early 1800's, farmers cleared large expanses of forest. In 1870, Vermont's forest covered only 32 percent of the State's total land area. Beginning in the late 1800's thousands of farmers left their land for urban life due to decreased soil productivity, increased competiton from the midwest, and higher pay in manufacturing industries. Thousands of acres reverted to forest during the past 80 to 100 years.

Most of the total forested land area within the three-states is considered to be commercial forest land (see table 2.14-1). This land is defined as producing or capable of producing crops of industrial wood (more than 20 cubic feet per acre per year) and is not withdrawn from timber utilization.

The commercial forest lands are owned mostly by private firms and individuals. Forest industries control about 40 percent of the commercial forest in Maine. This percentage is higher in Maine than any other state. Less than 0.5 percent of the commercial forest land in Maine is publicly owned. This figure is the lowest in the United States. Commercial forest lands contribute substantial revenues to the economies of the three States in the study area.

Water quality in the study area is largely dependent upon the existing, extensive, healthy forests. The forests store rain water and release it slowly controlling runoff and sedimentation and thus forests reduce potential damage by floods.

Outdoor recreational activities such as skiing, camping, fishing, hunting, hiking, and sightseeing are greatly enhanced by the attractive physical features of the forests. Forests together with water features and landforms offer a visually diverse landscape. Each year recreation contributes hundreds of millions of dollars to the economies of Vermont, New Hampshire, and Maine. Maine's Department of Economic Development estimates that recreation annually is a $450 million industry.

The forests provide a variety of habitats for a large number of diverse wildlife species. The extent and condition of forest habitat is important in maintaining the diversity of fish and wildlife species. The quality and quantity of these species is of prime concern to the three states because hunting and fishing generate revenue. The Department of Inland Fisheries and Game in Maine estimates that about $43 million a year is spent for hunting and fishing.

2.14.2 Forest Resources along the Proposed Route

2.14.2.1 Timber Types

The proposed route crosses a wide variety of forest sites and timber types. The acreages of forest land along the route are classified in

TABLE 2.14-1

LAND AREA ACCORDING TO LAND USE[1]

Land Class	Thousand Acres	Percent
Maine:		
Forest Land:		
Commercial	16,894.3	86
Productive-reserved	220.7	1
Unproductive	633.6	3
Total Forest Land	17,748.6	90
Nonforest Land:	2,048.5	10
Total Area:	19,797.1	100
New Hampshire:		
Forest Land:		
Commercial	4,692.0	81
Productive-reserved	48.7	1
Unproductive	237.8	4
Total Forest Land	4,978.5	86
Nonforest Land:	796.0	14
Total Area:	5,774.5	100
Vermont:		
Forest Land:		
Commercial	4,295	73
Productive-reserved	7	--
Unproductive	20	--
Total Forest Land	4,322	73
Nonforest Land:	1,615	27
Total Area:	6,150	100

[1] Reference: Alternative Power Transmission Corridor, appendix B, volume 3.

eight timber types: softwood (S), hardwood (H), softwood-hardwood mix (SH), hardwood-softwood mix (HS), cedar swamp (CS), pine-hemlock (PN), poplar-birch (PB), and forest wetlands (W). Forest acreage along the proposed route is presented in table 2.14-2.

The right-of-way clearing will be of variable width. This assessment assumes all rights-of-way cleared will be 150 feet wide for purposes of calculating acreages.

Timber-type acreages within Maine's unorganized towns were calculated using the forestland information contained on town tax maps. The Cooperative Extension Service maps of New Hampshire were used to derive timber acreages in that state. The vegetative cover information from the Ecological Resources Impact Study (appendix B) was used to determine timber acreages in Maine's organized towns and within the State of Vermont.

TABLE 2.14-2

ACRES OF FOREST LAND BY TIMBER TYPE[1]
ALONG THE PROPOSED ROUTE

	TIMBER TYPES[2]								
	S	H	SH	HS	CS	PN	PB	W	TOTAL[3]
Dickey-Lincoln School-Fish River	113	109	105	117	5		6	1	456
Dickey-Moose River	1,245	420	143	152	54			35	2,049
Moose River-Moore	587	855	368	387		18	10	36	2,261
Moore-Granite	25	90	32	132		24			303
Granite-Essex	47	170	261	150		1			629
TOTALS	2,017	1,647	909	938	59	43	16	72	5,698*

[1] Reference: Socioeconomic Impact Study, appendix H.
[2] Timber Type Abreviations are Explained above
[3] Exclusive of Wetlands

2.14.2.2 Timber Growth and Yield

Growth Current growth of forest lands along the corridor varies greatly. Maine's commercial forest land was growing at a rate of 42 cubic feet per acre per year in 1970 (forest industry lands averaged 46 cubic feet)(Ferguson and Kingsley, 1972). New Hampshire's forests grew 43.6 cubic feet/acre/year between 1958-1972 (Bernard and Bowers, 1974), and Vermont's forests reached a net annual growth rate of only 24 cubic feet/acre in 1972 (Kingsley, 1977). Data are not available for New Hampshire, but nearly 80 percent of Maine's and 66 percent of Vermont's lands are believed capable of growing over 50 cubic feet/acre/year.

Failure to achieve potential in all three states reflects overstocking with low-quality, slow-growing hardwood, and loss of intermediate growth through natural mortality in extensively managed softwood stands. The only empirical evidence of growth in terms of regional stand composition that was found during the research was Safford's (1968) study of 10-year average growth rates in the spruce-fir region of northern New England, table 2.14-3.

The table consolidates the eight timber types for use in the growth assessment. The category entitled "mixed" (M) combines "softwood-hardwood" (SH) and "hardwood-softwood" (HS), which are of about equal acreage. Acreage in the "cedar swamp" (CS) category is added to the softwood type.

Despite some limitations, Safford's study is considered to be the best available basis for estimating timber-type growth by species along the route. The growth-class breakdown of corridor types (15 percent regeneration, 52 percent poletimber. and 33 percent sawtimber) appears suitable close to the spruce-fir study's stand condition profile. Maine's average, all-species growth rate of 42 cubic feet, and New Hampshire's of 43.6, are close to Safford's overall 41 percent. Vermont's low growth of 24.0 cubic feet is acknowledged by a proportional reduction in the use of table 2.14-3 figures. Other minor adjustments were made in Safford's figures to calculate timber growth. The reader is referred to appendix H for additional explanation of timber growth analysis.

Timber Yield The product harvested from forest lands depends both on the capability of forest lands to produce timber of various kinds and quality, and secondly, the markets available for merchandising that timber. Table 2.14-4 summarizes the percentages of sawlog, veneer, boltwood, and pulpwood volumes harvested from major commercial species in Maine, New Hampshire, and Vermont in 1976, 1972, and 1972, respectively. Separate boltwood yields were not available for Maine, although the volume available from growing stock has been estimated (Kingsley, 1973).

2.14.2.3 Logging and Manufacturing

The volumes of softwood and hardwood roundwood products produced in the counties and states along the corridor during 1972 (New Hampshire and Vermont) and 1976 (Maine) are presented in table 2.14-5, along with the volumes of sawlogs exported from the states in which they were produced. Some of the export volumes flow between the three states, but much of it, especially from the regions of Maine and northern New Hampshire flows to the extensive lumber industry of southeastern Quebec.

Estimates of the numbers of establishments and employees, as well as payrolls involved in logging and primary wood processing, along the corridor are presented in tables 2.14-6 and 2.14-7. Total employment in logging is difficult to estimate because of the large number of individual entrepreneurs and small groups who participate in this work.

TABLE 2.14-3

TEN-YEAR AVERAGE ANNUAL NET GROWTH PER ACRE BY SPECIES IN NORTHERN MAINE, NEW HAMPSHIRE, AND VERMONT.[1]

	Stand Type[2]							
	Softwood		Mixedwood		Hardwood		All	
Species	Cubic Feet	%	Cubic Feet	%	Cubic Feet	%	Cubic Feet	%
Pine	1.5	3	0.2	1	0.1	--	0.8	2
Spruce	25.0	51	15.8	39	5.8	26	18.6	44
Fir	17.1	35	13.1	32	0.8	4	12.9	31
Hemlock	2.3	4	4.3	10	1.9	9	2.9	7
Cedar	2.0	4	2.0	5	0.1	--	1.5	4
Tamarack	0.1	--	--	--	--	--	--	--
All softwoods	48.0	98	35.5	87	8.7	39	36.7	88
Sugar maple	--	--	0.8	2	4.4	19	1.1	3
Red maple	1.5	3	3.7	9	1.9	9	2.3	6
Yellow birch	-0.8	-2	-0.1	--	0.2	1	-0.4	-1
Paper birch	0.4	1	1.0	2	0.4	2	0.6	1
Beech	0.1	--	0.1	--	3.5	16	0.7	2
Aspen	0.1	--	0.2	--	2.5	11	0.6	1
Other hardwoods	--	--	-0.1	--	0.8	3	0.1	--
All hardwoods	1.3	2	5.6	13	13.7	61	5.0	12
All species	49.3	100	41.1	100	22.4	100	41.7	100

Source: Safford, 1968

[1] Reference: Socio-Economic Impcat Study, Appendix H
[2] Softwood (66-100% softwood species)
Mixedwood (21-65% softwood species)
Hardwood (0-20% softwood species)

TABLE 2.14-4

PERCENTAGES OF ROUNDWOOD PRODUCTS IN MAINE, NEW HAMPSHIRE, AND VERMONT,[1] DERIVED FROM HARVESTS OF MAJOR COMMERCIAL SPECIES.[2]

	Maine (1976)[3]		New Hampshire (1972)[4]				Vermont (1972)			
Species	S	P[5]	S	V	P	O	S	V	P	O
White pine	64.2	35.8	97.9	0	0.6	1.5	97.2	--	2.8	--
Spruce-fir	46.9	53.1	52.4	0	47.5	0	49.0	--	50.3	0.7
Hemlock	40.0	60.0	89.1	0	10.1	0.8	89.7	--	10.3	--
Yellow birch			60.1	6.7	24.4	8.8	49.0	4.9	45.9	0.3
Paper birch	(32.3	67.7)	42.8	1.9	27.4	27.4	42.1	19.9	23.5	14.5
Hard maple	(all hardwood)		57.7	0.9	39.0	2.4	81.1	1.4	10.0	7.6
Soft maple			22.9	0.6	75.6	0.8	56.6	6.8	36.7	--
Beech			25.2	0.1	67.2	6.3	50.0	17.0	20.0	12.9
White ash			25.1	0.2	73.9	0.8	52.5	0.1	5.5	41.9

[1] Source: Socio-Economic Impact Study, Appendix H,

[2] Softwood sawtimber, hardwood sawtimber, and pulpwood statistics converted to cubic feet by factors of 252 ft. 3/MBF, 242 Ft.3/MBF, and 85 ft.3/cord, respectively. Product symbols: S(sawlogs), P(pulpwood), V(veneer), O(other)

[3] Source: Maine Forest Service, 1977a

[4] Source: Bones, Engalichev, and Gove, 1974

[5] Maine pulpwood residues transferred to pulpwood % from sawtimber volumes in proportion to sawtimber cut from all species except cedar

TABLE 2.14-5

PRODUCTION OF ROUNDWOOD IN SELECTED COUNTIES OF MAINE, NEW HAMPSHIRE, AND VERMONT, AND SAWLOG EXPORTS FROM EACH STATE[1]

County	Sawlog Production (MBF)		Sawlog Exports (MBF)		Pulpwood Production (Cords)	
	Softwood	Hardwood	Softwood	Hardwood	Softwood	Hardwood
Maine[2]	816,302	164,028	324,067	42,865	1,889,429	913,067
Aroostook	287,928	23,201	151,385	7,046	448,393	118,704
Piscataquis	137,640	20,865	82,183	5,449	338,938	92,746
Somerset	51,124	22,997	38,110	10,443	292,705	66,133
Franklin	22,199	26,228	11,569	4,693	46,960	100,511
Oxford	75,267	28,310	25,655	6,838	106,470	162,162
N.H.[3]	133,463	48,519	20,212	16,565	63,871	136,835
Coos	17,912	19,043	10,519	11,428	53,647	128,753
Grafton	21,092	11,644	4,256	2,689	2,835	2,988
Vermont[2]	55,224	69,949	16,665	18,569	56,894	78,623
Essex	4,377	5,902	3,274	5,403	17,906	46,435
Caledonia	7,014	1,618	4,673	218	6,753	7,223
Washington	5,239	3,398	49	438	1,341	0
Orange	3,809	3,006	1,003	832	12	47
Chittenden	1,618	2,217	55	159	24	318

1 Reference: Socio-Economic Impact Study, Appendix H
2 1976 data from the Maine Timber Cut Report (Maine Forest Service, 1988a).
3 1972 data from Bones, Engalichev, and Gove, 1974. Pulpwood volumes converted from cubic feet at 85 $ft.^3$/cord.

TABLE 2.14-6

PRIMARY WOOD PROCESSING ESTABLISHMENTS AND LOGGING FIRMS IN SELECTED REGIONS OF MAINE, NEW HAMPSHIRE, AND VERMONT.[1]

Region	Sawmill	Type of Establishment: Turnings & Squares	Pulpmill	Veneer Mills	Other	Logging Firms[2]
Maine County						
Aroostook	28	2	1	1	11	127
Piscataquis	8	2	0	2	0	72
Somerset	18	7	2	2	6	80
Franklin	5	7	1	3	0	57
Oxford	25	16	1	1	5	92
North. New Hamp.	35	--2	1	1	9	59
Northern Vermont	25	--2	1	3	22	50

Sources: Maine Forest Service, 1975; Maine Forest Service, 1976; U.S. Dept. of Commerce, Bureau of the Census, 1977.

[1] Reference: Socio-Economic Impact Study, Appendix H

[2] Individuals, partnerships, and corporations

TABLE 2.14-7

PRIMARY WOOD PROCESSING ESTABLISHMENTS, EMPLOYMENT, AND PAYROLL IN SELECTED REGIONS OF MAINE, NEW HAMPSHIRE, AND VERMONT--1972.[1]

Type of Establishment		Region: Northeastern Maine[2]	Western Maine[3]	Northern N.H.[4]	Northern Vt.[5]
(241[6])	Logging Camps, log contractors	325/2.6/18.2[7]	161/0.6/2.9	59/0.7/3.6	50/0-.2/D[8]
(242)	Sawmills and planing mills	86/.5-1.0/D	32/.5/3.1	35/.4/2.3	25/.2-.3/D
(249)	Misc. wood products	27/1.5/7.6	37/2.7/14.0	9/.4/2.4	22/.4/1.8
(262)	Papermills	9/6.6/23.0	3/J2.5/D	3/J2.5/D	2/.3-5/D

Source: U.S. Dept. Commerce, Bureau of the Census, 1977.

1 Reference: Socio-Economic Impact Study, Appendix H
2 Aroostook, Penobscot, Somerset, Hancock, Piscataquis, and Washington counties
3 Franklin and Oxford counties
4 Grafton, Coos, Carroll, and Belknap counties
5 Essex, Orleans, Caledonis, Orange, Lamoille, Washington, Franklin, Grand Isle, Chittenden, and Addison counties
6 Standard Industrial Classification
7 Data presented as: Establishments (no.)/Employees (1000's)/Payroll ($millions)
8 Data witheld to avoid disclosing figures for individual companies

Nevertheless, it is clear that substantial numbers of workers are involved in timber harvesting along the route. Logging is the primary source of employment in many of the small towns in western Maine and northern New Hampshire.

Four of Maine's primary wood processing plants are located within towns crossed by the proposed route: Fort Kent Fence Company (Fort Kent), Woodland Improvement Corporation (St. John Plt.), Stowell-MacGregor (St. Francis), and Leo Pelletier (Allagash Plt.). In Maine, the routes pass within 60 miles of several major pulp mills and a large number of the state's specialty product boltwood and veneer mills.

The route through northern New Hampshire passes through regions of low population and few processing facilities, but, as in Maine, the small towns in these areas depend heavily on logging for employment. The proposed route is within an economical pulpwood haul of Brown Company in Berlin, N. H., and two pulp and paper mills in western Maine. Sawlog and boltwood markets are likewise within reach.

Northern Vermont's forest economy rests more on logging than on primary processing. All of the state's 1972 hardwood pulpwood cut was exported to other states, primarily New Hampshire, as was 80 percent of its softwood pulpwood (mostly to New York) (Kingsley, 1977). Table 2.14-8 indicates that much of Vermont's sawlog output also leaves the state. Timber production grows progressively less important as the route runs west from Essex County, Vermont's most heavily forested county, to suburban Chittenden.

2.14.2.4 Wood Product Values

Stumpage and mill-delivered prices for sawlog, pulpwood, and boltwood products are given in tables 2.14-9 through 2.14-12 for northern and western Maine (1977 prices) and northern New Hampshire (1976 prices). Values added in harvesting, including transportation to the mill, can be inferred from these data.

Vermont presents a special case. Northern Vermont's stumpage values and roundwood prices are greatly influenced by markets in neighboring states to which much of that roundwood flows. Moreover, prices for Vermont's forest lands are tending more and more to reflect non-timber values so that one might question whether economic losses due to a transmission line can adequately be assessed from a forestry point of view. Vermont sugar maple forests also may carry values for maple sap proudction far in excess of timber stumpage prices. A good quality sugarbush in northern Vermont currently sells for $500/acre, with a top value for a previously untapped stand of as much as $800/acre.

2.14.2.5 Regional Demand for Timber

Unless the acreage removed from production by the route would actually be needed to avoid a shortage of timber raw material in the future, then its withdrawal has no impact on the timber economy. Such needs are always difficult to forecast, and tend to be regionally specific, but

TABLE 2.14-8

PRODUCTION OF ROUNDWOOD IN SELECTED COUNTIES OF MAINE, NEW HAMPSHIRE AND VERMONT, AND SAWLOG EXPORTS FROM EACH STATE[1]

County	Sawlog Production (MBF)		Sawlog Exports (MBF)		Pulpwood Production (Cords)	
	Softwood	Hardwood	Softwood	Hardwood	Softwood	Hardwood
Maine[2]	816,302	164,028	324,067	42,865	1,889,429	913,067
Aroostook	287,928	23,201	151,385	7,046	448,393	118,704
Piscataquis	137,640	20,865	82,183	5,449	338,938	92,746
Somerset	51,124	22,997	38,110	10,443	292,705	66,133
Franklin	22,199	26,228	11,569	4,693	46,960	100,511
Oxford	75,267	28,310	25,655	6,838	106,470	162,162
N.H.[3]	133,463	48,519	20,212	16,565	63,871	136,835
Coos	17,912	19,043	10,519	11,428	53,647	128,753
Grafton	21,092	11,644	4,256	2,689	2,835	2,988
Vermont[3]	55,224	69,949	16,665	18,569	56,894	78,623
Essex	4,377	5,902	3,274	5,403	17,906	46,435
Caledonia	7,014	1,618	4,673	218	6,753	7,223
Washington	5,239	3,398	49	438	1,341	0
Orange	3,809	3,006	1,003	832	12	47
Chittenden	1,618	2,217	55	159	24	318

1 Reference: Socio-Economic Impact Study, Appendix H
2 1976 data from the Maine Timber Cut Report (Maine Forest Service, 1988a)
3 1972 data from Bones, Engalichev, and Gove, 1974. Pulpwood volumes converted from cubic feet at 85 ft^3/cord.

TABLE 2.14-9

1977 STUMPAGE AND MILL-DELIVERED PRICES FOR SAWLOG PRODUCTS IN NORTHERN AND WESTERN MAINE.[1]

	Stumpage ($/MBF)[2]			Mill-delivered ($/MBF)[2]		
Species or Product	Zone 2[3]	Zone 6[4]	Zone 7[5]	Zone 2	Zone 6	Zone 7
White pine	51	39	31	121	122	112
Hemlock	30	16	16	86	70	83
Spruce	38	29	26	108	110	105
Fir	41	29	24	114	100	102
Cedar	30	25	16	--	100	90
White birch veneer	140[6]	75	42	175	238	212
White birch sawlogs	61	40	28	155	150	110
Yellow birch veneer	--	75	42	150	275	212
Yellow birch sawlogs	66	40	28	163	160	110
Hard maple veneer	--	40	--	--	145	--
Hard maple sawlogs	52	38	24	140	120	103
Beech	31	18	17	90	90	95
Aspen	26	17	14	87	78	70
Soft maple	32	22	18	93	100	100
White ash	59	58	25	171	225	--
Pallet logs	24	18	--	79	83	--

Source: Maine Forest Service, 1977b, 1977c.

1 Reference; Socio-Economic Impact Study, Appendix H
2 Most common price, unless otherwise indicated
3 Oxford, Franklin, Somerset, Cumberland, Androscoggin, and Kennebec counties, plus southern Piscataquis, western Penobscot and northern York
4 Northern Penobscot and southern Aroostook
5 Northern Aroostook
6 Highest price

TABLE 2.14-10

1977 STUMPAGE AND MILL-DELIVERED PRICES FOR PULPWOOD AND BOLTWOOD PRODUCTS IN NORTHERN AND WESTERN MAINE.[1]

Species	Stumpage ($/cord)			Mill-delivered ($/cord)		
	Zone 2	Zone 6	Zone 7	Zone 2	Zone 6	Zone 7
			Pulpwood			
Pine	3.50	---	---	28.00	---	---
Hemlock	4.75	5.00	4.50	33.25	36.00	---
Spruce-fir	8.75	8.75	8.75	38.75	39.50	40.75
Aspen	4.50	5.00	5.75	29.75	25.50	31.25
Other hardwoods	4.50	4.75	4.50	30.00	32.00	---
			Boltwood			
White birch	30.00	20.00	14.50	87.00	90.00	75.00
Yellow birch	29.00	---	14.00	75.00	---	---
Hard maple	25.50	---	16.00	64.00	---	80.00
Beech	17.50	---	---	49.00	---	---
Aspen	11.00	---	---	40.00	---	---
Soft maple	18.00	---	---	47.50	---	---
White ash	31.00	---	---	71.50	---	---
Cedar	---	---	7.50	37.00	---	45.00

[1] See footnotes for table 2.14-9.

TABLE 2.14-11

1976 STUMPAGE AND MILL-DELIVERED PRICES FOR SAWLOG PRODUCTS IN COOS AND GRAFTON COUNTIES, NEW HAMPSHIRE.[1]

		Stumpage ($/MBF)		Mill-delivered ($/MBF)	
Species or Product	Quality	Coos	Grafton	Coos	Grafton
White pine	avg.	30- 45	25- 60	90-120	80-120
Hemlock	avg.	25- 40	15- 30	90-115	60-100
Spruce/fir	avg.	17- 20	15- 45	55- 80	60-110
Yellow birch	sawlog	40- 80	40- 95	150-200	95-190
	veneer	80-120	100-150	125-375	125-325
Sugar maple	sawlog	40- 60	40- 75	120-160	80-220
	veneer	50- 90	60- 75	150-250	150-250
White birch	sawlog	45- 70	25- 80	110-190	70-190
	veneer	70-120	80+	150-250	175-250
Red maple	sawlog	15- 25	15- 25	70- 90	80
White ash	sawlog	45- 85	20- 80	100-225	75-190
Beech	sawlog	15- 25	10- 25	70- 95	70- 85
Red oak	sawlog	20- 30	20- 75	100-105	60-190
	veneer	55- 85	65+	250-325	140-225
Mixed hardwood (pallet & tie stock)	sawlog	15- 25	10- 25	80- 90	60- 80
Basswood	sawlog	---	10- 20	---	60- 75
	veneer	35- 50	---	140-180	140-200
Poplar	sawlog	10- 25	10	60- 80	75

Source: Engalichev and Sloan, 1977

[1] Reference: Socio-Economic Impact Study, Appendix H

TABLE 2.14-12

1976 STUMPAGE AND MILL-DELIVERED PRICES FOR PULPWOOD AND BOLTWOOD PRODUCTS IN NORTHERN NEW HAMPSHIRE.[1]

Species	Stumpage ($/cord)	Mill-delivered ($/cord)
	Pulpwood	
Spruce/fir	5.00- 8.00	35.00- 38.00
White pine	2.00- 2.50	30.00- 31.00
Tamarack	2.00- 4.00	33.00- 36.00 (high)
All hardwood	2.50- 4.50	31.00- 35.00
	Boltwood	
White birch	20.00-30.00	50.00- 90.00/cord
		100.00-135.00/MBF
Beech	10.00-15.00	37.00- 50.00/cord
		75.00-105.00/MBF
Sugar maple and ash	15.00-20.00	45.00- 75.00/cord
		95.00-130.00/MBF
Yellow birch	15.00-25.00	48.00- 65.00/cord
		75.00-120.00/MBF

Source: Engalichev and Sloan, 1977

[1] Reference: Socio-Economic Impact Study, Appendix H

TABLE 2.14-13

MAINE TREE GROWTH TAX LAW VALUATIONS AND TAX RATES FOR TAX YEAR 1977[1]

Territory	Rate[2]	Valuation ($/acre) Timber Type[2] S	M	H	Wetlands[4]	1977[5] State Valuation ($1000)
Organized						
Fort Kent	.0242	38.70	28.70	12.50	15.00	26650
St. Francis	.0252	38.70	28.20	12.50	15.00	1800
St. John Plt.	.0205	38.70	28.20	12.50	15.00	1800
Allagash	.0624	38.70	28.20	12.50	15.00	2400
Moose River	.0123	45.40	25.80	15.00	15.00	2250
Jackman	.0230	45.40	25.80	15.00	15.00	6600
Dennistown Plt.	.0226	45.40	25.80	15.00	15.00	900
Eustis	.0190	40.00	25.10	13.30	15.00	5400
Magalloway Plt.	.0257	37.50	25.10	13.30	15.00	1250
Lincoln Plt.	.0260	37.30	25.10	13.30	15.00	3150
Unorganized						
Arrostook	.0201	38.70	28.20	12.50	10.00	77544
Piscataquis	.0201	49.30	31.60	19.50	10.00	80035
Somerset	.0201	45.40	25.80	15.00	10.00	79780
Franklin	.0201	40.00	25.10	13.30	10.00	13626
Oxford	0201	37.30	25.10	13.30	10.00	12218

1 Reference: Socio-Economic Impact Study, Appendix H
2 Maine Municipal Association, 1977
3 Bureau of Taxation, 1976
4 Personal conversations with Bureau of Taxation personnel
5 Halperin, 1977

Herrick (1977) has recently offered some insight into future requirements for forest land in the Northeast. His study weighed the production potentials of forest land in the Northeast against several estimates of timber requirements for the year 2000. The results indicate that the greatest pressure for timberland would result from a combination of high demand with no significant change in price relationships and low-intensity management. Under these conditions, hardwood supplies would be critically short in Piscataquis and Somerset counties in Maine, and softwood shortages would occur in western Maine. Even with moderate demand, hardwood supplies will be tight in central and western Maine unless active management is undertaken. Softwood levels appear adequate in most of the region.

2.14.2.6 Property Taxes

Maine All Maine forest land parcels 500 acres and larger in area are taxed under the "Tree Growth Tax Law," (title 36 MRSA, sec. 572-584A) according to the productivity of the land for growing timber. Parcels between 10 and 500 acres in size may be enrolled under the law at their owner's option. No separate tax in levied on the timber. Under the productivity concept, tax assessment does not vary with the level of timber stocking. Non-forest lands--lands incapable of forest growth--are taxed according to fair market value.

Current county valuations by forest type, tax rates, and the 1977 state valuations of each organized town and the unorganized territories along the corridor are shown in table 2.14-13.

New Hampshire New Hampshire has an optional modified assessment law, which provides for the valuation of forest land according to current use, and a mandatory yield tax. Under the yield tax law, bare forest land remains subject to the general property tax at current use assessment, if so designated. Timber is taxed only when harvested, at a rate of 12 percent of stumpage value levied on the harvester.

Mill rates and assessed values range widely over the organized and unorganized towns along the route alternatives. 1976 rates varied from .01066 in Dixville to .07800 in Stark. The land valuation for one major forest landowner ranged in the year from $5.11/acre to $11.74/acre (average $6-$7) in unorganized towns, and up to $28.07/acre in organized Colebrook. The same landowner experienced assessment reductions of $53.26/acre to $24.50/acre and $45.00/acre to $9.00/acre through transfer to current use assessment in two towns between 1975 and 1976.

Vermont All Vermont forest land is assessed at fair market value according to its "highest and best use." The state has no special property tax provisions for forest land. Valuation ratios among different towns varied from 10 percent to 100 percent prior to July 1, 1977, by which date all towns were supposed to be assessing at 100 percent of fair market value.

2.15 Cultural Resources

The evaluation of of cultural resources, is mandated by two laws: the National Environmental Policy Act of 1969 (Public Law 91-190) (NEPA), and the National Historic Preservation Act of 1966 (Public Law 89-665 as amended) (NHPA). Cultural resource evaluations for transmission facilities associated with the Dickey-Lincoln School Lakes Project are designed to fulfill the requirements of these laws.

The corridors study (appendix B) contains the first of several evaluations of historic properties. This study identified and where possible avoided recognized historic properties within the region. Three classes of sites were considered: National Register historic sites; State Register historic sites; and potential state and national historic sites. The distribution of these historic properties is shown on maps 8.1, 8.2, 9.1, 9.2, and 9.3, in appendix B, map volume.

A second evaluation focused on a series of routes. It was structured to meet the requirements of a reconnaissance survey as defined in the Guidelines for the Location and Identification of Historic Properties Containing Scientific, Prehistoric, Historical, or Archaeological Data, Federal Code of Regulations. This study, the Historical/Archeological Impact Study, is appendix J. Should the project proceed to the construction phase, an intensive survey, would be conducted in association with State Historic Preservation Officers in Maine, New Hampshire, and Vermont.

2.15.1 Historic Resources-Regional Overview

An historic resource can be thought of as a manifestation of historic period activity or events which occurred within the region and which characterize its relationship to the rest of the world. Much historic literature on northern New England exists. A bibliography of this literature appears in appendix J.

Three trends best characterize the history of northern New England. They are: a pattern of warfare and boundary disputes; the development of land use based on the evolution of both subsistence and commercial agricultural settlements in western parts of the region; and the development of a type of land use based on the exploitation of forest resources in eastern parts of the region. These trends are discussed at length in appendix J.

2.15.2 Archaeologic Resources-Regional Overview

An understanding of northern New England prehistory is limited by incomplete knowledge, consequently, only a general overview is possible (see "An Overview of the Prehistory of Northern New England", appendix J).

Historic sites were defined as those sites containing structures or other surface remains. Archaeological sites are those sites without surface remains regardless of whether the site is from the historic or prehistoric period.

Archaeological resources, both historic and prehistoric, were more difficult to assess, because of their low visibility in this region.

Significant historical archaeological sites were found by general background research and interviews. Background sources for archaeological resources included the State Historic Preservation Offices, state surveys of historic resources, architectural informants, local historical societies, archives, museums, and libraries.

Yet, despite thorough research, large areas in the region are unsurveyed, and in those areas little is known about the existence, distribution and significance of cultural resources. To account for potential cultural resources in such areas, a predictive analysis was conducted based upon the relationships between human behavior and features of the natural environment, such as vegetation, slope, elevation, and proximity to water. A field sample was conducted to improve or validate the predictive analysis (see appendix J).

2.15.3 Cultural Resources along the Proposed Route

Historical and archaeological sites which were identified along the proposed route are presented in tables 2.15-1 through 2.15-5. Sites are indexed according to the source which identified them (Federal registers, State registers, or other source) and their relative location along the route. Sites within the route are those that lie within a corridor one-half mile wide. Sites within the viewshed are those that occur outside the one-half-mile-wide corridor but from which one could see the transmission line if it were built.

Probability judgments are also presented on the likelihood of encountering unknown archaeological sites. These assessments are based on a predictive analysis which is described in appendix J. The reader who seeks additional information on the impacts to cultural resources is referred to appendix J and its map volume.

2.16 Substation Sites

The areas where new substation facilities would be developed have been located (see figure 1, facility location map). However, exact sites have not been selected. No contacts with property owners have been made, and adjustments in site locations may be required to meet the needs of owners or to avoid environmental impacts.

Additional facilities are proposed are existing electrical substations. These are: Fish River Substation, Moore Substation, and Granite Substation.

At Essex Substation, the terminal facilities for the Granite-Essex line would be located within a substation presently planned for construction by Vermont Electric Power Company.

Dickey, Lincoln School, and Moose River substations, would be developed for this project and would require sites.

TABLE 2.15-1

CULTURAL RESOURCES[1]
PROPOSED ROUTE

DICKEY - LINCOLN SCHOOL - FISH RIVER

ARCHEOLOGICAL SITES

KNOWN SITES			SITE LIKLIHOOD			LOCATION RE: ℄		DESCRIPTION	LOCATION
NATIONAL REGISTER	STATE REGISTER	OTHER SOURCE	HIGH PROBABILITY	MEDIUM PROBABILITY	LOW PROBABILITY	WITHIN ROUTE	WITHIN VIEWSHED		
		X					X	Xavier Cyr Mill	St. Francis Township
		X					X	Indian Burial Ground & Jones Mill	St. Francis Township
			/	/		/		General Assessment	
0	0	2				0	2	Totals	

HISTORICAL SITES

STANDING STRUCTURES			LINEAL FEATURES			LOCATION RE: ℄		DESCRIPTION	LOCATION
NATIONAL REGISTER	STATE REGISTER	OTHER SOURCE	RAILROADS	INDIAN TRAILS	HISTORIC TRAILS/ROADS	WITHIN ROUTE	WITHIN VIEWSHED		
		X					X	Villa d'Aigle House	St. Francis Township
0	0	1	0	0	0	0	1	Totals	

TABLE 2.15-2

CULTURAL RESOURCES[1]
PROPOSED ROUTE

DICKEY - MOOSE RIVER

ARCHEOLOGICAL SITES

KNOWN SITES			SITE LIKLIHOOD			LOCATION RE: ℄		DESCRIPTION	LOCATION
NATIONAL REGISTER	STATE REGISTER	OTHER SOURCE	HIGH PROBABILITY	MEDIUM PROBABILITY	LOW PROBABILITY	WITHIN ROUTE	WITHIN VIEWSHED		
	X						X	Gorge on waterline	
				/		/		General Assessment	
0	1	0				0	1	Totals	

HISTORICAL SITES

STANDING STRUCTURES			LINEAL FEATURES			LOCATION RE: ℄		DESCRIPTION	LOCATION
NATIONAL REGISTER	STATE REGISTER	OTHER SOURCE	RAILROADS	INDIAN TRAILS	HISTORIC TRAILS/ROADS	WITHIN ROUTE	WITHIN VIEWSHED		
			X			X		Bald Mtn. Railroad - abandoned	Somerset Co., T.5 R.3
0	0	0	1	0	0	1	0	Totals	

[1] Reference: Historic/Archeologic Impact Study, Appendix J

TABLE 2.15-3

CULTURAL RESOURCES[1]
PROPOSED ROUTE

MOOSE RIVER - MOORE

ARCHEOLOGICAL SITES

KNOWN SITES			SITE LIKLIHOOD			LOCATION RE: ℄		DESCRIPTION	LOCATION
NATIONAL REGISTER	STATE REGISTER	OTHER SOURCES	HIGH PROBABILITY	MEDIUM PROBABILITY	LOW PROBABILITY	WITHIN ROUTE	WITHIN VIEWSHED		
	X						X	Fort Wentworth, 1775	
		X					X	Remains of fort - mid-18th century	N. of Guildhall, Vt.
		X				X		Cellar holes	NW. of Lunenberg, Vt.
				/		/		General Assessment	
0	1	2				1	2	Totals	

HISTORICAL SITES

STANDING STRUCTURES			LINEAL FEATURES			LOCATION RE: ℄		DESCRIPTION	LOCATION
NATIONAL REGISTER	STATE REGISTER	OTHER SOURCES	RAILROADS	INDIAN TRAILS	HISTORIC TRAILS/ROADS	WITHIN ROUTE	WITHIN VIEWSHED		
	X						X	Guildhall Common Area	City of Guildhall, Vt.
	X						X	Former Central School	City of Guildhall, Vt.
	X						X	Old Home Crawford	City of Guildhall, Vt.
	X						X	1820 House	Near Littleton, N. H.
		X				X		Frame house, 19th century	Guildhall Township, Vt.
		X				X		Frame house, 19th century	Guildhall Township, Vt.
			X			X		International Railroad of Maine (operated as Canadian & Pacific)	Holeb Township, Me.
				X		X	X	Connecticut River Trail	Northumberland, Littleton N. H., Guildhall, Concord & Waterford, Vt.
X					X	X	X	Arnold Trail	Dead River, Chain of Ponds, Rt. 16, Me.
1	4	2	1	1	1	5	6	Totals	

[1]Reference: Historic/Archeologic Impact Study, Appendix J

TABLE 2.15-4

CULTURAL RESOURCES[1]
PROPOSED ROUTE
MOORE - GRANITE

ARCHEOLOGICAL SITES									
KNOWN SITES			SITE LIKLIHOOD			LOCATION RE: ℄		DESCRIPTION	LOCATION
NATIONAL REGISTER	STATE REGISTER	OTHER SOURCE	HIGH PROBABILITY	MEDIUM PROBABILITY	LOW PROBABILITY	WITHIN ROUTE	WITHIN VIEWSHED		
	X						X	Archeologic site	
	X					X		Sm. aboriginal campsite, woodland stage	
	X					X		Lithic workshop, woodland stage	
		X				X		Indian path, blockhouse remains, reported Indian battlefield	Ryegate, Vt.
				/		/		General Assessment	
0	3	1				3	1	Totals	

HISTORICAL SITES									
STANDING STRUCTURES			LINEAL FEATURES			LOCATION RE: ℄		DESCRIPTION	LOCATION
NATIONAL REGISTER	STATE REGISTER	OTHER SOURCE	RAILROADS	INDIAN TRAILS	HISTORIC TRAILS/ROADS	WITHIN ROUTE	WITHIN VIEWSHED		
	X						X	Historic site no. 3	Caledonia County, Vt.
	X						X	Washington Creamery	Washington, Vt.
	X						X	Catholic Church, ca. 1890	Washington, Vt.
	X						X	Washington House - stagecoach stop	Washington, Vt.
	X						X	Universalist Church, 1848	Washington, Vt.
	X						X	Baptist Church, before 1858	Washington, Vt.
	X						X	E. P. Parker Hotel - stagecoach stop	Washington, Vt.
	X					X		Downing Lot Cemetery	Washington, Vt.
	X					X		Joseph Calef Place (Morin Place), 1795	Washington, Vt.
		X					X	Farmhouse, 19th century	Washington Co., Vt.
		X					X	Farmhouse, 19th century	Washington Co., Vt.
		X				X		Frame house, 19th century	Groton, Vt.
		X				X		Frame house, 19th century	Groton, Vt.
		X				X		Overlook Cemetery, 19th century	Concord, Vt.
					X	X		Bouville Route	Groton, Vt.
					X	X		Bailey-Hazen Military Road, 1776-1779	Ryegate, Vt.
0	9	5	0	0	2	7	9	Totals	

[1]Reference: Historic/Archeologic Impact Study, Appendix J

TABLE 2.15-5

CULTURAL RESOURCES[1]
PROPOSED ROUTE
GRANITE - ESSEX

ARCHEOLOGICAL SITES									
KNOWN SITES			SITE LIKLIHOOD			LOCATION RE: ℄		DESCRIPTION	LOCATION
NATIONAL REGISTER	STATE REGISTER	OTHER SOURCE	HIGH PROBABILITY	MEDIUM PROBABILITY	LOW PROBABILITY	WITHIN ROUTE	WITHIN VIEWSHED		
	X					X		Bolton Falls site - rockshelter	Washington Co., Vt.
				/				General Assessment	
0	1	0				1	0	Totals	

(continued)

TABLE 2.15-5 (continued)

CULTURAL RESOURCES [1]
PROPOSED ROUTE

GRANITE - ESSEX

HISTORICAL SITES									
STANDING STRUCTURES			LINEAL FEATURES			LOCATION RE: ℄		DESCRIPTION	LOCATION
NATIONAL REGISTER	STATE REGISTER	OTHER SOURCES	RAILROADS	INDIAN TRIALS	HISTORIC TRAILS/ROADS	WITHIN ROUTE	WITHIN VIEWSHED		
	X						X	Historic site type: 4H, site 10	Washington Co., Vt.
	X						X	Historic site type: 4H, site 11	Washington Co., Vt.
	X						X	Historic site type: 4H, site 12	Washington Co., Vt.
	X						X	Historic site type: 4H, site 13	Washington Co., Vt.
	X						X	Historic site type: 4H, site 14	Washington Co., Vt.
		X				X		Round wooden silo	Berlin, Vt.
		X					X	Brick foundation, 19th century	Berlin, Vt.
	X					X		Historic site type: 1, site 2	Orange Co., Vt.
	X						X	Historic site type: 4, site 3	Orange Co., Vt.
	X						X	Historic site type: 1H, site 4	Orange Co., Vt.
	X						X	Historic site type: 1, site 5	Orange Co., Vt.
	X					X		Roederer Place	Chittendon Co., Vt.
	X					X		Callahan Place	Chittendon Co., Vt.
	X					X		Tracy Place	Chittendon Co., Vt.
								Old Murray Farm	Chittendon Co., Vt.
								Machia Residence	Chittendon Co., Vt.
	X					X		Hugo Residence	Chittendon Co., Vt.
								Lavanway Residence	Chittendon Co., Vt.
								Quinn's Store	Chittendon Co., Vt.
								Jonesville Bridge	Chittendon Co., Vt.
	X						X	North Main Street Historic District	Richmond, Vt.
	X						X	Albert Townhouse	Chittendon Co., Vt.
	X						X	Sunshine Farm	Chittendon Co., Vt.
	X						X	Gleason Farm, Peet Residence	Chittendon Co., Vt.
	X					X		Westfall Farm	Chittendon Co., Vt.
	X					X		Route 20 Bridge	Chittendon Co., Vt.
	X						X	John Thompson House	Chittendon Co., Vt.
	X						X	Checkered House	Chittendon Co., Vt.
	X						X	Riverside Farm	Chittendon Co., Vt.
	X						X	Conant Tenant House	Chittendon Co., Vt.
	X						X	Historic site	Orange Co., Vt.
	X						X	Chapman Farm	Chittendon Co., Vt.
	X						X	Babcock House	Chittendon Co., Vt.
	X						X	Wisehart House	Chittendon Co., Vt.
	X						X	Historic site	Chittendon Co., Vt.
								Gentes House	Chittendon Co., Vt.
								Lapman House	Chittendon Co., Vt.
								Bland House	Chittendon Co., Vt.
	X						X	Willard House	Chittendon Co., Vt.
								Engels House	Chittendon Co., Vt.
								Witcher House	Chittendon Co., Vt.
								District School #2	Chittendon Co., Vt.
		X				X		Farm complex, 19th century	Barre, Vt.
		X				X		Farm complex, 19th century	S. Barre, Vt.
				X		X	X	Winoosk River Trail	Washington & Chittendon Counties, Vt.
				X		X	X	First Branch River Trail	Washington Co., Vt.
0	29	4	0	2	0	12	25	Totals	

[1]Reference: Historic/Archeologic Impact Study, Appendix J

2.16.1 Dickey Substation

The proposed site for Dickey Substation is on the west bank of the Allagash River southwest of the Dickey Dam site. It is west of the Michaud Tote Road, which follows the Allagash River. The site would be developed at the location of a sanitary landfill, or, depending on the need for this landfill, adjacent to it. The site is located on a gentle slope with deep glacial till deposits.

The vegetative cover at the site, except for the landfill, is a regenerating forest of mixed hardwoods and soft woods.

Wildlife habitat values for game species and species of special concern are average around the site. The potential for encountering rare plant species is average. The area is presently fairly remote.

Lands adjacent to the landfill are managed for timber. Southwest of the site, there is an organized logging road pattern. The site area is designated as a management district by the Maine Land Use Regulation Commission.

Recreational facilities in the general area are the Allagash River and a picnic area located along the Michaud Tote Road northeast of the site. A proposed hiking trail (associated with dam site development) would pass relatively close to the site.

Visual landscape quality in the area of the site is rated as moderate, and visual site attractiveness is low. The site may be viewed from a residence southwest of the site. The site could be seen from the Michaud Tote Road.

No historical sites are known in the area proposed for Dickey Substation, nor in its viewshed. The area is not considered to contain a high potential for archaeological site occurrence. An intensive archeologic survey would be conducted prior to any site development.

2.16.2 Lincoln School Substation Site

The proposed Lincoln School Substation site is near the Lincoln School Dam site. It is south of Route 160 about 2 miles west of St. Francis, Maine. The site is presently used to grow potatoes. About six single family residences are within a distance of one-half mile. The area is unclassified with respect to proposed land uses.

The site is relatively flat, deep glacial till.

Wildlife habitat values are minimal for most species. The remoteness value for the area is average.

With the exception of Route 160, which is used as a sightseeing route, no recreational features occur close to the site. A snowmobile trail, a boat launching facility, and a campsite are located 1 to 1.5 miles east of the proposed site in the area of St. Francis. A picnic grounds and camping area are about 1 mile west of the site near Rankin Rapids on the St. John River.

Visual landscape quality at the Lincoln School site is very high, as is its site attractiveness. A 1.5-mile stretch of Maine Highway 161 crosses the viewshed. Several residences and two medium density clusters of residences stand along the highway near the site.

No known sites of potential historic or archaeological significance occur at or close to the proposed site.

2.16.3 Fish River Substation

Fish River Substation is an existing facility on Maine State Highway 161, 1 mile south of Ft. Kent, Maine. The substation, owned by Maine Public Service Company, takes its name from the Fish River, which is one-fourth mile west of the site.

Residences are located both north and south of this existing substation. It would be expanded east of the present site. Land use documents show no planned land uses at this site.

Woodlands in the area of Fish River Substation are intermixed with agricultural crop lands. Regenerating and mixed mature forests are the dominant cover types. Wildlife habitat values for the substation area are less than average. The Fish River is well populated with brook trout.

No developed recreation facilities are located near the site. However, the general area is popular for snowmobiling. Route 161 is a fall foliage route.

Visual landscape quality is high; site attractiveness is low. The facility is viewed from residences, Highway 161, and from the Fish River, a canoe route.

No known sites of cultural significance exist near the site.

2.16.4 Moose River Substation

The proposed site for Moose River Switching Station is west of U.S. Route 201, 3 miles north of Moose River, Maine. Jackman, Maine, is about 4 miles to the south along Highway 201.

Topography at the site is gently sloping. Surficial deposits at the site are glacial tills. The depth to bedrock is shallow.

The East Branch of Sandy Stream is 0.1 mile west of the site. Vegetative cover at the site is mixed mature forest with softwoods predominating. Wildlife habitat values in the area of the site are average, as was the probability for encountering rare plants.

The site is located within Dennistown Plantation, an unorganized township. A single family residence is located along Route 201, one-fourth mile northeast of the site. The area is used to grow timber. The site is classified as a management district by the Maine Land Use Regulation Commission.

No developed recreational facilities are located close to the site. However, the general area is heavily used for snowmobiling and U.S. Highway 201 is used to view fall foliage.

Visual landscape quality at the site is very high. Site attractiveness is also high. The viewshed contains Highway 201 and a residence on the highway.

No known historical or archaeological sites exist in the site area. An intensive survey would be conducted prior to site development.

2.16.5 Moore Substation

Moore Substation is an existing substation on the New Hampshire side of the Connecticut River at Moore Dam. This facility would be expanded into an adjacent area to accommodate the proposed facilities.

Clearing for existing transmission lines has largely removed the forest cover near the substation. Mature hardwoods surround the cleared area. Wildlife habitat values are higher than average. Deer populations are high. Bear are fairly abundant.

No land use development, other than the dam, occurs close to the substation. As for future land use, the immediate area is classified as rural residential/agricultural.

The only recreational developments adjacent to the substation are the visitor facilities at Moore Dam. The Connecticut River and Moore Reservoir, however, receive heavy use for such activities as boating, picnicking, hunting, and fishing.

Visual landscape quality at the site is high; site attractiveness is moderate.

No historic or archaeological sites are known near the Moore Substation.

2.16.6 Granite Substation

Granite Substation is an existing facility. This substation is located on Baptist Street, about 1.5 miles south of the Barre Granite Quarry. The City of Barre is 5 miles to the north.

Additional facilities would be constructed adjacent to the existing substation. Based upon site characteristics, expansion is proposed within a pasture.

The land near Granite Substation is used for scattered agricultural fields and woodlots. Rural residences are located along the roads. No residences are presently located in the area proposed for substation expansion. However, a residence stands on the opposite side of Baptist road, and a second residence about 0.2 miles to the south. The area is classified as rural residential/agricultural for future land use.

Wildlife habitat values in the area of Granite Substation are average. However, the general area supports high numbers of deer.

No developed recreational facilities are found close to Granite Substation although Baptist Street is proposed as a scenic road. No historic or archaeological sites are known to exist near Granite Substation.

Visual landscape quality at the site and site attractiveness are both rated moderate. Baptist Street and several residences are in the viewshed.

2.16.7 Essex Substation

The site of the proposed Essex Substation is on the south bank of the Winooski River, 1 mile southeast of Essex Junction, Vermont. This facility is scheduled for construction by Vermont Electric Company. It is assumed the substation will include adequate space or facilities of this project.

2.17 Microwave Sites

Eleven microwave stations are required for the proposed transmission system (see figure 1, facility location map). A general description of existing conditions at each microwave site follows.

2.17.1 Pennington Mountain

The site is on Pennington Mountain, about 8 miles south-southeast of Eagle Lake, Maine, and east of Highway 11. The elevation of the summit is about 1,540 feet, this is 600 to 700 feet above the surrounding area. Drainage from the eastern half of Pennington Mountain flows through the tributaries of the West Branch of Beaver Brook. Westward, the area is drained by Pennington Brook.

Soils on the proposed microwave site are Thorndike soils, derived from glacial till and are shallow to bedrock. The soils are gravelly, generally silty and well drained. Howland soils are found in the lower areas along the streams draining the mountain. These soils are generally deeper and usually have a perched watertable just above a very firm substratum. Erodibility of these soils is medium.

The summit area can be reached from Highway 11 approximately 1.5 miles west of the site or from an unimproved gravel road that runs northeast from Highway 11 south of Pennington Pond. Access to the summit on most of the mountain would encounter steep slopes. An area on the southeast side of the mountain has moderate to steep slopes.

The predominant land cover at the site is mature hardwood forest. The site probably provides good habitat for bear at certain seasons of the year and moderate-quality habitat for deer and grouse.

This site has few recreation resources nearby due to its fairly remote location. Great ponds, as Silver Lake and Pennington Pond, and Highway 11, a designated scenic highway, lie about 3 miles away.

The overall existing visual landscape quality of the site is moderate. Visual site attractiveness is also moderate due to a mature woodland land cover.

Occasional camps and a seasonal residence are nearby. Logging access roads exist at the lower elevations.

2.17.2 Ashland

This site is located about 2 miles southwest of Ashland on Young Hill in Garfield, Maine. Its elevation is about 790 feet, or about 250 feet above the surrounding area. Drainage flows to the Machias and Aroostook rivers. Springs are found north of the site and a marshy area northeast of the site.

Soils on the site, formed in glacial tills, are mostly Plaisted and Howland soils. Plaisted soils are well drained, gravelly, and silty to sandy. Howland soils are moderately well drained and similar in texture to Plaisted soils. Both Plaisted and Howland soils have a very firm substratum but Howland soils are found in the lower areas of the site and have a perched watertable just above the substratum. Depth to bedrock is expected to be greater than 3 feet. The soils have medium erodibility.

Access to the site is over paved secondary roads from Ashland.

The site situated in a field that in alternate years is cultivated for potatoes is adjacent to Highway 11. A large antenna and a house are near the site.

The site has little potential for rare native plants. A calcareous formation north of the site (the Perham formation), does, however, have moderate potential as habitat for rare plants.

Wildlife potential at the site is very low. No popular game species are likely to inhabit the site. Value to nongame species is likewise limited.

The recreational resources near the site relate to the Machias and Aroostook rivers and various roads. The Machias River is a noted canoe route and fishing stream. The Aroostook is noted for fishing, canoeing, boating, and swimming. Highway 11 is a fall foliage and sightseeing route. The American Realty Tote Road, north of the site, provides access to hunters, while Lynch's Tote Road, south of the site, is an unmaintained snowmobile trail.

The rating for existing visual landscape quality at this site is moderate. Visual absorption is very low due to the hilltop location. Visual site attractiveness is high due to the proposed location of the facility in an actively cultivated agricultural field.

Visually sensitive land uses within 2 miles of the site include residences and farmsteads.

2.17.3 Oakfield Hill

This proposed site is about 4 miles south of the town center of Oakfield, Maine. It is south of South Road. The proposed site at an elevation of 1,200 feet is 600 to 700 feet above the surrounding area. The site is drained by Downing and Bear brooks. Both are tributary streams to the Mattawamkeag River. The site is heavily wooded. Rock outcrops appear along the east side of the summit area. The soils on the site are shallow to bedrock, usually 18 inches or less. They have formed in glacial tills and are well-drained, gravelly silts. Slopes are steep. On the more level areas, the soils are mapped as Plaisted, which are deep and well drained with a very firm substratum. Erodibility of the soils at the site is medium.

Access to the site appears to be most feasible from South Road, some 3,000 to 4,000 feet north of the summit.

The site is wooded. A mixed, mature forest with hardwoods predominates. The site is in a region with calcareous outcrops, which could harbor certain rare plants.

The recreational resources in closest proximity to the proposed site include maintained and unmaintained snowmobile trails. Unmaintained snowmobile trails encircle Sam Drew Mountain.

The existing visual landscape quality at this site is exceptional. It is situated in mountains with high topographic interest, variety, and contrast. Absorption is very low due to the mountaintop location.

Existing visual site attractiveness is moderate.

Oakfield and Red Bridge, Maine, are situated outside a 2-mile radius around the site. Within the radius are scattered farmsteads and residences.

2.17.4 Hot Brook

This site is adjacent to an existing microwave station approximately 3 miles southwest of Danforth, Maine. It is on the northwest side of Highway 169. The site at an elevation of 850 feet is 350 to 400 feet above the surrounding area. Drainage from the site flows northwestward toward Lower Hot Brook Lake and southeastward through Harding Brook to Crooked Brook. Both are part of the Bashahegan Stream drainage. The site is a partly wooded pasture.

The soils on the site are classified Plaisted and Thorndike. Depth to bedrock is greater than 3 feet, on Plaisted soils. Thorndike soils are shallow to bedrock, usually 18 inches or less. Both soils are gravelly silts to sands with stones and boulders. Immediately west of the site, the soils have a high watertable. The erodibility of the soils found on the site is medium.

Access to the site would be from Highway 169 which is less than one-half mile away. This approach appears to be moderately direct and has no significant topographical restrictions.

The land cover is mixed forest with hardwoods predominating. The Hot Brook lakes, one-half mile to the west, contain a warmwater fishery for smallmouth bass, white perch, and pickerel. Swampy terrain around the mountain provides good habitat for moose. The site itself has good cover for snowshoe hare and woodcock.

Recreational resources are located west along the Danforth municipal boundary. Lower Hot Brook Lake and Upper Hot Brook Lake are great ponds used for water recreation. Seasonal residences are situated around the lakes. An unmaintained snowmobile trail winds through the area from Owl Mountain to Hardwood Ridge and Kinney Cove.

The visual landscape quality rating for the site is moderate. Water and wetlands provide high interest, variety, and contrast. Absorption is very low due to the hilltop location. Site attractiveness is moderate.

Residences and farmsteads are scattered along Highway 169 and Baker Ridge Road east of the site.

There are also clusters of seasonal residences near Spinney and Kinney coves on Upper Hot Brook Lake. The town of Danforth lies about 3.5 to 4 miles northeast of the site.

2.17.5 Bagley Mountain

Bagley Mountain contains an existing microwave station. This site is 5.5 miles northeast of Lincoln, Maine, south of Bagley Mountain Road. The summit of Bagley Mountain is 850 feet high, or some 450 feet higher than the surrounding area. Drainage from the site flows northward into Smith Brook and southward toward Long Pond and Cambolasse Stream. Both are tributaries of the Penobscot River.

Soils at the site are classified as Plaisted. Bedrock is found at a depth of 3 feet or more. Slopes on the site are generally steep. Erodibility is medium. Bagley Mountain is underlain by granitic rocks. An access road and utility lines are at the site.

The land cover is mixed mature forest with hardwoods predominating. The area between the mountain and the Penobscot River is an important waterfowl and raptor migratory corridor. Long Pond supports a warmwater fishery of pickerel, hornpout, yellow perch, and white perch.

Recreational resources near Bagley Mountain relate primarily to water activities along the Penobscot River and the great ponds south of the site. The Penobscot River is a canoe route with challenging conditions at Sebonibus Rapids. Highway 2, a noted sightseeing route, is part of the Heritage Trail in Maine. South of the site, Cambolasse, Long, Egg, and Caribou ponds provide over 1,000 acres of surface water for recreational use. Clusters of seasonal residence are located along Cambolasse, Long, and Caribou ponds. Maintained snowmobile trails are located at the site and also along the great ponds. Rollins Mountain has a lookout tower.

Visual landscape quality of the site is exceptional. The area is mountainous with high topographic interest. Absorption is very low due to its mountaintop location.

Site attractiveness is low because the woods are succession species of moderate height.

Visually sensitive land uses within 2 miles of the site are farmsteads and seasonal residences on Cambolane, Long, and Egg ponds. Homes along the southwestern shore of Long Pond view Bagley Mountain. Highway 2 along the Penobscot River is bordered by residential and farm properties and the Maine Central Railroad Line.

2.17.6 Ferry

This site, an existing microwave station, is located 5 miles east of Milo, south of Piscataquis River. The site is approximately 450 feet in elevation and 250 feet above the surrounding area. The soils on the site are Plaisted and Howland soils. These soils have formed in glacial tills and have a very firm substratum. Plaisted soils are found in the higher areas. Howland soils, moderately well drained with a perched watertable just above the substratum, are found in swales and depressions on the site. Depth to bedrock is generally 3 feet or more. Howland and Plaisted soils have gravelly, silty, and sandy textures, their erodibility is medium.

An access road runs to the existing station and an adjacent farm. The land cover is a field surrounded by mixed forest with hardwood predominating.

Several types of recreational resources are near the site. They include a seasonal residence and a camp north of site and campsites along the road to Medford Center and along the Piscataquis River. The Piscataquis and Pleasant rivers north of the site are noted for canoeing. Another noteworthy recreational feature from which the proposed tower would be seen is Highway 16, a sightseeing route and part of the Heritage Trail system in Maine.

The proposed facility is in an area of rolling terrain whith low topographic interest. Water and wetlands interest is high due to the presence of the Piscataquis River and Freese Bog. Variety and contrast are low, although the proposed site is adjacent to farmland. The microwave facility now located at the site represents a low value intrusion and detriment to the existing visual quality of the site. The existing visual landscape quality rating for the proposed location is low. Absorption is very low because the proposed site is the highest elevation for several miles.

Visual site attractiveness is moderate.

Only a few roads and some scattered residences and farmsteads are within 2 miles of the site. Medford Center is 2 miles east. Other towns such as Derby, Boyd Lake, Milo, and LaGrange are considerably farther away. Farmstead residences are located directly adjacent to the site.

2.17.7 Black Cap

This site, an existing microwave station, is 3 miles south-southwest of East Eddington. The summit ridge ranges from 950 to 1,022 feet in elevation and is 600 to 700 feet above the surrounding area. The ridge has several other tower structures. The site has access from East Eddington by way of Black Cap Road.

There is almost no soil on Black Cap Mountain. Bedrock outcrops and rock land predominate. Where soils are found they are shallow to bedrock. These soils are well-drained, gravelly sands and have been formed in glacial tills. Their erodibility is high.

The surrounding forest is predominantly hardwoods. The mountain is within 5 miles of Flood's Pond, home of the threatened Sunapee Trout. Drainage from the mountain does not flow into Flood's Pond.

Recreational features near the proposed site include the Roberts Trail, named in memory of Alfred E. Roberts, an early settler, and a proposed recreation and conservation area. This area is proposed as open space in the Eddington Comprehensive Plan of 1971. The Katahdin Area Council Boy Scout Camp is located northeast in the town of Clifton. A series of great ponds used for water-based recreation lie south and east of Black Cap. The ponds include Fitts, Burnt, Little Burnt, Snowshoe, Hatcase, and Montainy. Hatcase and Montainy have seasonal residences along their shores.

The facility is proposed in an area of mountains with high topographic interest. Despite the presence of a rather large microwave facility and radio towers on the site, visual landscape quality is high. Absorption is very low due to the mountaintop location.

Because the proposed site is covered in mature woodlands, the site attractiveness rating is moderate.

Visually sensitive land used in the area are scattered farmsteads and residences along South and Black Cap roads and Highway 175. East Eddington is 3 miles north of the site on Davis Pond.

2.17.8 Oak Ridge

This proposed microwave site is on Oak Ridge along the eastern town line of Shirley, Maine. The elevation is approximately 1,660 feet, which is 250 to 400 feet above the surrounding area. Drainage flows radially from the summit to Coffee House Stream, Little Wilson Stream, Thompson Brook, and the West Branch of Thompson Brook.

Soils in this area are of the Thorndike-Howland-Plaisted association. They were formed in glacial till. Thorndike soils are shallow to bedrock. Howland and Plaisted soils are deeper and have a very firm substratum. Howland soils have a perched watertable above the substratum. Since most of the knolls and ridgetops found in this area are shallow to bedrock, Thorndike soils are expected to be found on the proposed site. Erodibility of these soils is medium.

The most direct access to the summit area is from Upper Shirley Corner about 3 miles to the west-southwest. Slopes vary from low to moderate on the west flank and moderate to steep on the south and east flanks of the mountain.

The mountain is rather remote. It is situated about 3 miles from the nearest paved road and 5 miles from the town of Greenville. A powerline right-of-way crosses the eastern flank of the mountain. Several logging roads and trails are present.

The land cover category at the site is mixed mature forest with softwoods predominating. Habitat is fair to good for bear, deer, and grouse. Beaver are abundant in the neighboring lowlands. They have dammed the slow flowing branches of Thompson Brook and Wilson Stream in several locations.

Calcareous Silour-Devonian sediments have been mapped immediately east of the proposed station. They may occur as far west as the proposed site. These sediments could possibly host rare plants.

Two linear recreational resources could observe the microwave tower. Highway 6/15 located west of the site is both a fall foliage route and sightseeing route. It is part of the Heritage Trail System in Maine. The Appalachian Trail southeast of the site is a national scenic trail. Hikers could observe the facility.

The site is in hills with moderate topographic interest, low water and wetlands interest, and low variety and contrast. This combination of visual characteristics is low in visual landscape quality. Absorption is very low due to the hilltop location.

Visual site attractiveness is moderate because the site is in mature woodland.

Visually sensitive land uses are restricted to occasional residences and farmsteads west of the site. Shirley Mills is located about 2.5 to 3 miles west-southwest of the site. Only secondary roads are within the general area of the site.

2.17.9 Parlin

This site is on a 2,600-foot mountain at the boundary intersections of Jackman, Long Pond and Misery Gore. The summit area is located about 1 mile east-northeast of Jackman Field on U.S. Highway 201 and 7 miles southeast of Jackman, Maine. The topography is mountainous. Drainage flows radially from the summit to tributaries of Bean Brook and Parlin Stream on the east, south and west and to tributaries of Mountain Brook.

The soils belong to the Peru-Marlow-Lyman soil association. These are sandy to silty soils which are generally well drained. Lyman soils are shallow to bedrock and are usually found along hilltops. Marlow soils may also be encountered. The erodibility of the soils is medium.

Slopes around the mountain are steep. It appears that access would be from U.S. Highway 201 near Jackman Field.

Although the mountain is within 1 mile of Highway 201, it is relatively remote due to steep slopes. However, old trails or logging roads do climb its slopes.

The predominant land cover at the site is mature spruce-fir. Wildlife species such as blackpoll and bay-breasted warblers, brown creepers, and marten, probably inhabit the site during certain seasons of the year.

Drainage from the mountain flows into Horeshoe Pond, which supports a moderate-quality and relatively inaccessible fishery for brook trout.

There are several recreational resources near the proposed site, the most noteworthy of which is Parlin Pond which has a number of seasonal residences along its shore. The Pond, however, does not view the proposed site. Recreational sites include Highway 201, a fall foliage and sightseeing route; unmaintained snowmobile trails to the north and east of the site; and Horseshoe Pond, a great pond and remote trout pond. The area around Horseshoe Pond, proposed for recreation and conservation use, and public land on Bean Brook Mountain may view the facility.

The existing visual landscape quality of this site is very high. It is characterized as mountains with high topographic interest - and low water and wetlands interest and variety and contrast. Absorption is very low due to the mountaintop location.

Visual site attractiveness is moderate for the proposed site is presently covered by mature woodlands.

Visually sensitive land uses within 2 miles of the proposed installation are scattered residences, tourist facilities along Highway 201, and roads.

2.17.10 McLean Mountain

This site is located approximately four miles south-southeast of St. Francis at the southern end of the McLean Mountain ridge line. The summit is 1,824 feet elevation with relief of approximately 800 feet above the surrounding area. The entire summit area is heavily wooded. The soils are shallow to bedrock with depths of 18 inches or less. The soils have formed in glacial till and are well drained. Many boulders and stones are found in these soils. Slopes are very steep and erodibility is medium to high.

The proposed site is underlain by gray slate containing minor amounts of graywacke and is part of the Seboomook formation. The topographic expression of McLean Mountain, is, in part, due to the more resistant graywacke bedrock materials.

Access to the summit will encounter steep to excessive slopes. Access to the site can either be made from the Back Settlement or the McKinley School areas of St. Francis.

The site is rather remote, being situated about four miles from the nearest secondary road. A logging trail crosses the ridge of the mountain.

The predominant land cover at the site is mixed mature forest with softwoods (mostly spruce and fir) predominating. Fair habitat is present for bear and deer, and habitat for grouse is probably good. The relative remoteness of the site makes it favorable for nesting birds of prey.

Most of the mountain drains into McLean Lake, which hosts a good brook trout fishery, as well as providing nesting cover for a few pairs of waterfowl.

There are several recreational features nearby. Maintained and unmaintained snowmobile trails range from south of McLean Mountain toward St. John Plantation and Bran Lake. In addition, McLean Lake is noted for its fishing, and Third Lake is a recognized intensive recreation area. All three lakes are great ponds. Wallagrass Stream and its tributaries are also noted fishing streams.

The proposed site and its environment are described as hills adjacent to mountains. Water and wetlands interest and variety and contrast are low; however, topographic interest due to the focus on the mountain is high. Visual scenic quality is rated high. Visual absorption is very low due to the mountaintop location.

Visual site attractiveness is moderate because the site is presently a dense woodland.

Visually sensitive land uses within 2 miles of the site, are largely absent. Only scattered residences may be found.

2.17.11 Lincoln School Passive Repeater Site

This site is located on the northwest side of the St. John River opposite the Lincoln School area. The summit has an elevation of 1,120 feet and is 400 feet above the river. Drainage from the site is to the St. John River. The heavily wooded site has shallow to bedrock soils.

Access to the site is limited by both the St. John and St. Francis rivers. Several logging roads enter the area from the southwest. This network of logging roads is from the St. John Bridge at Dickey, approximately 8 miles southwest of the site.

The site is not especially remote; only the river separates it from the potato farmlands of the St. John River valley.

The land cover at the site is mostly mature hardwood forest. Poplar and maple are typical species. The site offers good habitat for grouse. Its location near the open fields of the St. John River valley may make it good nesting habitat for certain hawks.

This site has a variety of nearby recreational resources. The majority of these resources relate to rivers. The resources include canoe routes along the St. John River and St. Francis River; Highway 161, a fall foliage route; and maintained and unmaintained snowmobile trails. Other recreational resources along the St. John River and in the town of St. Francis could observe the facility they include: Rankin Rapids Park and picnic area to the south; a camp site; and a boat launch to the east.

The area may be described as hills adjacent to mountains with moderate water and wetlands interest (provided by the St. John River), high topographic interest, and moderate variety and contrast, yielding a high existing visual landscape quality.

The visual site attractiveness of the proposed location is moderate.

Visually sensitive land uses near the site include: Highway 161, scattered farmsteads, and residences. The St. John River about one-half to three-fourths of a mile south of the site is used for recreational activities. St. Francis, one-half mile due east of the site, may view the installation.

2.18 Future Environment Without the Proposed Action

The environment described in Sections 2.1 - 2.15 reflects existing conditions along the proposed route. It is difficult to project future changes to these conditions objectively. The discussion on planned land use in section 2 indicates the goals of various planning agencies along the route. As these projections are considered to be as valid, as any, it is assumed that they reflect the future environment without the proposed action.

Those areas crossed by the proposed route have exhibited slow growth. Thus, one could assume existing conditions closely reflect future conditions barring unforeseen changes in the growth patterns of Northern New England.

Section 3

The Environmental Impacts of the Proposed Action

3.0 THE ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION

3.01 Ecological Interrelationships

This section is included to serve as an overview of possible impacts from the proposed transmission facilities. Table 3.01-1 shows the interrelationships that exist between the various ecological systems. The following actions describe the ecological impacts in more detail.

Explaination of Table 3.01-1

Ecological impacts are shown, although some are only remotely possible. Changes in the environment which might cause the impact are also listed. These changes are shown as (a) numbers used to indicate other impacts in the table or as (b) short phrases used to describe activities that might trigger the impact. The causes of impacts are defined as:

- Vegetation alteration - substitution of regeneration habitat for mature forest.
- Creation of corridor - removal of forest vegetation in a 150-ft wide swath.
- Access roads - Creation of dirt access roads where none are now present.
- Herbicide application - spraying of typical herbicide compounds.

Locations of impacts are shown in the first column. The location corresponds with the cause listed one column to the left. Duration corresponds with other items on the same row. Other definitions and abbreviations used include:

- Corridor - in the 150-foot right-of-way
- Adjac. to Corr. - adjacent to the corridor (within 50 feet).
- Watershed - in the watershed downstream of the right-of-way.

Duration - the term of an impact.

- L - long term (impact in column 1 persists to a significant degree for 20 years).
- S - short term (impact in column 1 persists to a significant degree for less than 20 years, and usually for less than 1 year, although secondary impacts it triggers (last column) may be long-term).

Magnitude - H = high; M = medium; L = low. This is a subjective estimate of the impact's magnitude, frequency, and extent - evaluated in terms of the percent of the area or population which reasonably could be affected.

Mitigation - A measure of the degree to which the adverse or potentially adverse impact can be alleviated by practical adjustments in construction and operation procedures.

TABLE 3.01-1

WORK TABLE FOR IMPACT EVALUATION[1]

	IMPACT	WHAT CAUSES IT ?	WHERE DOES THE IMPACT OCCUR ?	DURATION	MAGNITUDE	MITIGATION	CONFIDENCE	WHICH IMPACTS MIGHT RESULT?
1.	Increase surface runoff	construction vegetation alteration	watershed watershed	S L	L VL	H M	H H	2, 30
2.	Nutrient transfer from terrestrial to aquatic systems	1	watershed	L	L	L	H	16, 42
3.	Herbicide contamination of groundwater and surface water	herbicide application	watershed	S		H	M	15
4.	Alter drainage patterns and increase soil compaction	construction access roads	watershed watershed	L L	M H	H M	M H	20
5.	Increase soil temperature	20	corridor	L	M	L	H	
6.	Increase soil and air temperature fluctuations	20	corridor	L	M	L	H	
7.	Decrease duff layer of soil	vegetation alteration 1	corridor corridor	L	M	L	H	42
8.	Increase wind velocity	creation of corridor 20	adjacent to corridor	L	M	L	M	20, 40
9.	Increase snow depths on Right of Way	vegetation alteration	corridor	L	M	L	H	31
10.	Reduce temperatures beneath the snow	28	corridor	L	L	M	L	33, 27
11.	Increase physical damage to regeneration of right of way	28	corridor	L	L	M	M	23, 40
12.	Increase atmospheric ozone	powerlines subs./micro.	corridor	L	VL	L	VL	20
13.	Increase dust	construction	corridor	S	VL	H	M	42
14.	Increase fire hazard	powerlines subs./micro	corridor & adjacent to corridor	L	VL	H	M	
15.	Reduce survival and numbers of coldwater fishes	3 29 30	watershed	S L S	VL M L	M H H	L H M	
16.	Increase survival and numbers of coldwater fishes	2	watershed	L	L	-	L	
17.	Change streambank vegetation from woody to herbaceous or woody scrub	vegetation alteration	corridor	L	M	H	H	18, 29
18.	Increase herbaceous growth in wetlands	17	corridor	L	L	-	L	22, 23
19.	Destroy rare plants	construction 20 32 42 43	corridor corridor & adj.to corr. corridor & adj.to corr. corridor & adj.to corr. corridor & adj.to corr.	S L L L L	VL L L VL L	H L H H L	H L M VL VL	
20.	Alteration of forest microclimate	creation of corridor 4 8	corridor corridor & adj.to corr. corridor	L L L	M VL M	L M M	H L H	5, 6, 19, 31
21.	Stress some wildlife species by distrubing them more often and/or intensively	construction 28 25	corridor & adj.to corr.	S L L	M L M	M L L	M H M	
22.	Increase habitat for some wildlife species	18 vegetation alteration 23	corridor corridor & adj.to corr. corridor & adj.to corr.	L L L	L H H	- - -	L H H	23, 25
23.	Decrease habitat for some wildlife species	vegetation alteration 11 22	corridor	L L L	H VL H	- L -	H L H	22
24.	Increase amount/availability or prey preferred by predators	vegetation alteration	corridor & adj.to corr.	S L	M L	- -	H M	
25.	Increase opportunites for harvest of fish and wildlife	22 28	corridor & adj.to corr. corridor	L L	M L	- -	H M	21
26.	Increase habitat of wildlife requiring snags	40	adjacent to corridor	L	L	-	M	
27.	Reduce reproductive success of wildflowers	10	corridor	L	L	L	M	19
28.	Increase access and visitation by ORVs (especially snowmobiles)	creation of corridor	corridor	L	M	L	H	11, 21
29.	Increase stream water temperatures, and daily temperature fluctuation	17	corridor	L	M	H	H	15
30.	Increase siltation of streams	1 construction	watershed	L S	L M	M H	L H	15
31.	Alter the value to deer of their wintering areas	20 28	adjacent to corridor adjacent to corridor	L L	M L	M L	M L	
32.	Kill or stress non-target plant species by herbicide application	herbicide application	corridor & adj.to corr.	L	VL	M	M	19
33.	Stress small mammal populations	10	corridor	L	L	L	VL	
34.	Increase fragmentation of forested tracts	create a corridor	watershed	L	L	L	L	35, 41
35.	Decrease species deversity of forested tracts	34 41	watershed & adj.to corr.	L L	M M	L L	VL VL	
36.	Increase collision hazard to waterfowl	powerline	corridor	L	VL	L	L	
37.	Cause avoidance of wetlands by waterfowl	powerline	corridor	L	M	L	VL	
38.	Create(in wetlands) small islands useful to some wildlife	construction	corridor	L	L	-	L	
39.	Direct wildlife movements into the path of highway traffic	create a corridor	corridor	L	L	L	VL	
40.	Increase damage to timber	8 11	adjacent to corridor adjacent to corridor	L L	M L	- -	M L	
41.	Increase cowbird parasitism of songbird nests	34	corridor & adj.to corr.	L	M	-	VL	35
42.	Reduce site fertility	2 7 13 16	corridor corridor corridor watershed	L L S L	L L L L	M L H -	H M M L	19
43.	Invasion of remote areas by adventive or weedy plants	create a corridor	corridor & adj.to corr.	L	M	L	L	19
44.	Relieve big game of nuisance insects during summer	8	corridor	L	L	L	M	
45.	Enhance mixing of genetically isolated populations	create a corridor	corridor & adj.to corr.	L	M	-	L	

[1]Reference: Ecological Resources Impact Study, Appendix E

H = high (mitigation is technically and financially feasible and effective to a high degree)
M = medium (mitigation is technically and financially feasible and effective to a partial degree)
L = low (mitigation is normally not feasible or effective either technically or financially)

Confidence - A measure of the confidence or degree of uncertainty in the estimation that the cause in column 2 will induce the impact in column 1. Uncertainty is caused by:

(a) inadequate scientific data;
(b) inadequate data on location, or design;
(c) uncertainty about probability of the cause actually occuring; or
(d) insufficient knowledge/experience with analogous situations.

The index numbers under the heading "What Impacts Might Result" show possible secondary impacts. The probability and magnitude of these may be low, as indicated along with the impact that is numbered. The user of the table is encouraged to follow each impact to its final outcome. Data in this column does not necessarily correspond with data elsewhere in the same row.

3.02 Geology

Construction of the proposed transmission facilities will have little impact on the geologic structure of the region. Some geologic features, on the other hand, are of considerable importance in planning, constructing, and operating transmission systems. For example, unstable areas, landslides, and other natural hazards can damage facilities and affect the reliability of the system. These natural hazards can be minimized through careful siting and special designs. Similarly, shallow bedrock, steep slopes, and wet soils also require special designs.

Transmission facilities may be subjected to seismic activity. Transmission lines are designed to withstand a considerable amount of bending or twisting, as compared to bridges or buildings. In the event of an earthquake, repairs to the structures may be required. However, earthquakes of low or medium intensity would have little or no effect on the line.

Substations are also designed to withstand earth movements. Projections of earthquake magnitudes and their probable effects are calculated and provisions to withstand such forces are incorporated into substation designs.

The transmission lines, the substations, the right-of-way clearings, and the access roads do not influence the frequency or intensity of earthquakes.

3.03 Soils and Topography

Soils develop slowly from the weathering of bedrock and of materials deposited by water, wind, or ice. Soils form under the influence of climate, vegetation, parent material, and time. In northern New England, the natural production of 1 inch of topsoil required 500 to 700 years.

3.03.1 Soil Disturbance

Soils are most likely to be disturbed during the construction phase of the proposed project. The degree of impact and its duration will depend on construction activities and soil characteristics. For example, maximum impacts could be expected to occur where towers or substations are built on steep slopes with highly erodable soils. Minimum impacts would probably occur on cleared farmland where soil erodability is low and no towers are to be built. The temporary impacts that might arise during construction would result from slopes and soil instability, mass soil movement, increased erosion, and sedimentation. Accelerated erosion and changes in a soil's physical characteristics would alter its productivity.

Some permanent changes are anticipated along the proposed right-of-way, at tower, microwave and substation sites, and on access roads. These impacts would vary in intensity.

Soil structure, density, moisture content, grain size, cohesiveness, and chemical makeup are characteristics of soils that could be impacted by construction and maintenance activities.

One of the principal impacts on soils is caused by the movement of heavy machinery. This movement compacts surface soils or removes the upper horizons. It can reduce infiltrations rates, restrict root penetration, hamper lateral and vertical movement of water through the soil, inhibit chemical exchanges, and increase runoff. Under some conditions, ground water may form surface ponds or seepage. Compaction reduces soil productivity. Mitigation measures described in section 4 should alleviate such impacts and confine them to the right-of-way during and immediately after construction. Measures to restore sites will assure that long range impacts are confined primarily to access roads and tower sites.

Earth work--excavation and backfill--can change soil characterstics. This work can mix the soil profile and be either detrimental or beneficial to productivity, depending on the conditon of the soil and the quality of its lower horizons. Rock fragments or boulders may be brought to the surface. Infiltration and drainage may be interupted, increasing erosion. Vegetation may be removed and the humus disturbed. However, if the impacts are effectively mitigated, the impacts will be minimal in extent and duration. In the absence of mitigation, years may pass before the fertility of the topsoil is restored.

3.03.2 Soil Erosion and Sedimentation

Erosion is a natural process. It wears down the earth's surface through the action of water, wind, ice, or gravity. The factors associated with soil erosion are shown in figure 3.03-1. When man interfers with this process by removing plants, disturbing the soil, or otherwise altering the environment, erosion may accelerate. Studies show that sediment eroded from building and road construction sites is about 10 times greater than sediment yields from an equivalent amount of land in cultivated row crops, 200 times greater than sediment yields from pasture, and 2,000 times greater than sediment yields from forest land (USDA Soil Conservation Service, 1970).

Thus, when vegetation is removed, erosion rates increase especially on slopes, and when the soil is unstable and the top soil is lost, revegetation may be delayed, prolonging the erosion. Roots tend to hold soil in place. Also, foliage breaks the force of falling rain, which detaches individual particles of soil when it falls on bare ground. This in turn breaks down solid aggregates, placing the surface soil in suspension. Surface porosity is decreased, and surface runoff is increased. The combined effect can measurably accelerate erosion.

Short-term increases in erosion are likely to appear when the soil is exposed or disturbed. This erosion is likely to disappear if plants revegetate the land. The presence of roads can, however, bring about long-term changes that affect erosion rates and runoff patterns.

The potential for erosion is greatest where the rainfall is heavy and the slopes are cleared for rights-of-way and access roads. The subsequent runoff can cause sheet, rill, or gully erosion. Sheet erosion removes an almost uniform level of soil. The runoff is not concentrated in flow channels. As the runoff increases, the water begins to run in rills. If left uncontrolled the rills will continue to erode, forming ditches and then gullies.

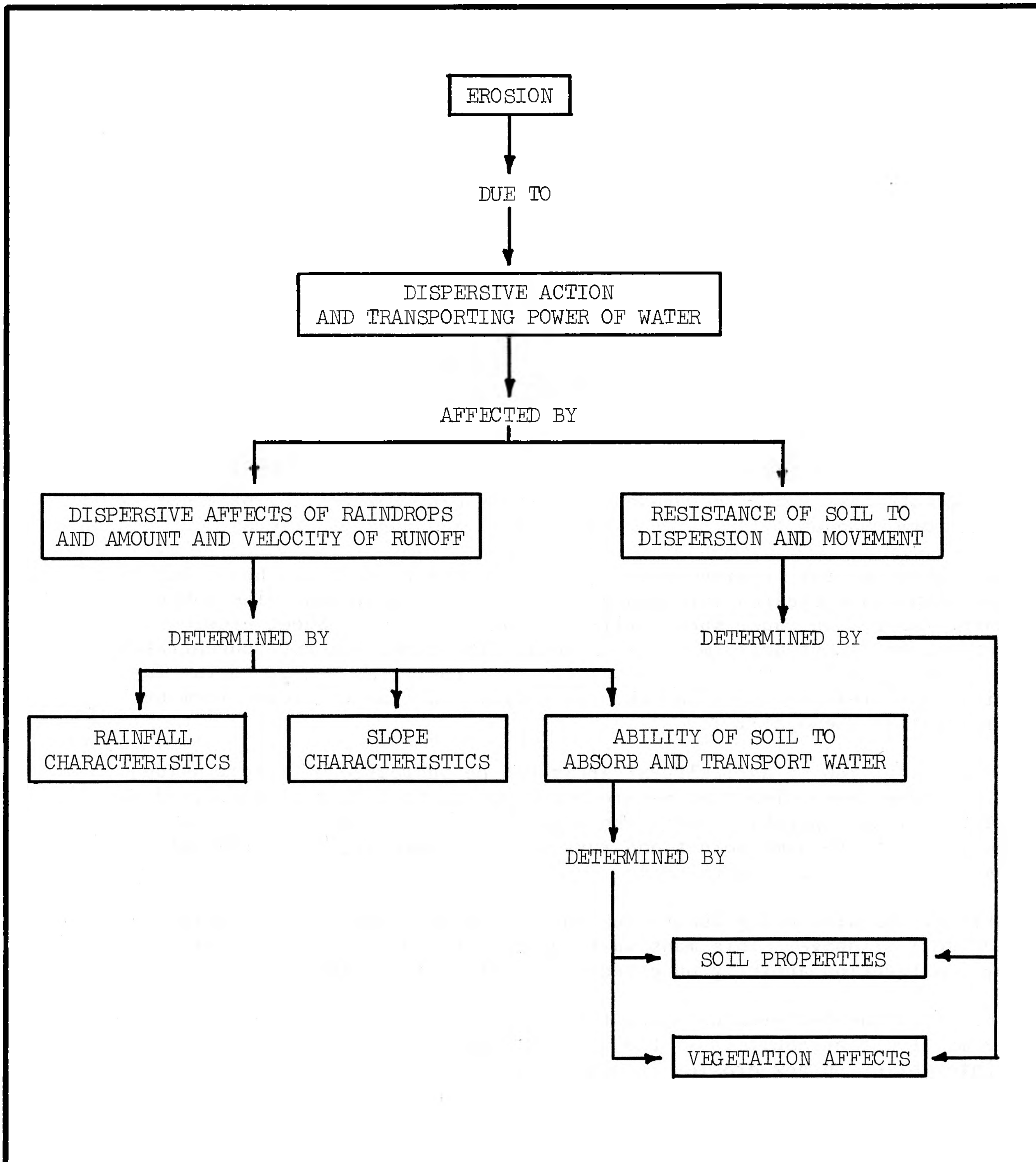
Natural erosion in agricultural areas can be increased by transmission line towers and poles that become obstructions to tillage. They tend to force tillage operations into the same pattern year after year. Water collects at the same points and runs off in a more or less permanent pattern, deepening its channels.

Gravity can also bring about erosion by causing landslides, rock falls, and soil slippage. This mass wasting of rock and soil may be accelerated by construction activity on excessively steep or unstable slopes.

The potential for erosion along the proposed route has been evaluated in terms of the erodability of the soil and the degree of the slope. (Information on how erosion is measured is contained in appendix F.) Table 3.03-1 shows the miles of slight, moderate, and high erosion potentials on the route.

FIGURE 3.03-1

FACTORS OF SOIL EROSION[1]



[1]Reference: Geotechnical Impact Study, Appendix F

TABLE 3.03-1

EROSION POTENTIALS [1]

Proposed Route Segments	Slight Miles	Slight Percent	Moderate Miles	Moderate Percent	High Miles	High Percent
Dickey-Lincoln School-Fish River	19.5 mi.	67%	7.2 mi.	24%	2.7 mi.	9%
Dickey-Moose River	86.7 mi.	72%	31.5 mi.	27%	0.4 mi.	1%
Moose River-Moore	70.7 mi.	52%	60.8 mi.	45%	4.6 mi.	3%
Moore-Granite	23.6 mi.	63%	14.0 mi.	36%	0.5 mi.	1%
Granite-Essex	21.4 mi.	49%	15.5 mi.	36%	6.4 mi.	15%

[1] Reference: Geotechnical Impact Study, Appendix F

Most line segments have only slight to moderate erosion potential. Four percent of the total route (all segments) has a high erosion potential.

If during construction an area is stripped and the soil left bare, erosion will undoubtedly occur, especially on alluvial and lacustrian soils. Even soils rated as having only a slight erosion potential will erode if disturbed and left exposed for long periods of time. Thus, construction practices will largely determine how much erosion will actually occur. The erosion potential classification serves as an indication of a soil's rate of erosion in respect to its slope.

3.03.3 Slope Stability

The stability of slopes was evaluated based on slope data and soil descriptions. Generally, only excessively steep and steep slopes will have stability problems. The most severe problems will occur where the degree of slope exceeds 50 percent. Slopes of less than 15 percent should be stable for all soil types evaluated. (See appendix F for a discussion of slope stability.)

3.03.4 Site Specific Impacts

3.03.4.1 Dickey-Lincoln School-Fish River

Soil related impacts on this segment include 2.7 miles of high erosion potential and 7.2 miles of moderate erosion potential. This mileage accounts for about 33 percent of the length of the segment. Two areas--an area along Bossy Mountain and an area of steep slopes just south of where the route crosses McLean Brook southwest of the Lincoln School Substation--are considered to have high erosion potential. The greatest potential for erosion exists between Lincoln School and Fish River substations.

3.03.4.2 Dickey - Moose River

Four-tenths of a mile of high erosion potential occurs on this segment where the line crosses Blue Brook near Blue Pond some 30 miles southwest of Dickey Substation. Seventy-three percent of the route is believed to have low potential for erosion.

Slope and stability problems are generally low for this segment.

3.03.4.3 Moose River - Moore

About 4.6 miles of this segment are on lands with high erosion potential. Some 60.8 miles of the route lie on lands with moderate erosion potential. This mileage accounts for 48 percent of the segment. Areas where the potential is high occur near Round Mountain, about 4 miles southwest of Highway 27 near Chain of Ponds, northwest of Alder Stream in the town of Seven Ponds, and where the route goes over and between mountain areas. Other areas of concern are: an extensive area just east of the Kennebago divide in the town of Seven Ponds where the line crosses the Kennebago River near Sable Ridge; an area between Stratford Mountain and Whitcomb Mountain along Nash Stream where topography is excessive, an area where the line passes between Halibut Mountain and Sheridan Mountain about 4 miles southwest of Guildhall, VT.; and an area southwest of Alden Mountain in the town of Lunenburg, VT.

The soil is least stable at Cape Horn near Groveton, NH. Other than at Cape Horn, soil stability is low to moderate.

3.03.4.4 Moore - Granite

This segment contains half a mile where the erosion potential is high and 14 miles where it is moderate. This 14.5 miles accounts for 37 percent of the segment. The areas where erosion is most likely are on excessive slopes on both sides of the Connecticut River near Barnet, VT. Other areas with high erosion potential lie at the base of a slope directly west of Barnet, just south of Vermont Highway 302 near Haden Hill, and along Vermont Highway 302 south of Riddle Pond.

Impacts related to slope and soil stability are low on this segment.

3.03.4.5 Granite - Essex

On about half of this segment, the potential for erosion is either moderate or high. The area of greatest erosion potential lies about 5 miles west of Montpelier between two steep mountains. Other areas where the potential is high lie west of Middlesex where the route traverses steep topography, near Essex Substation, on part of the segment parallel to Highway 117 near the Vermont Research Forest Agriculture Experiment Station, and on the west side of the Winooski River Valley just west of where the transmission route crosses an existing railroad track.

This segment possesses the greatest potential for soil and slope stability. Problems are most likely to occur near Waterbury in the Winooski Valley.

3.03.5 Summary of Soil Impacts

Erosion potentials along the proposed route (all segments) is summarized in table 3.03-2.

TABLE 3.03-2

SUMMARY OF EROSION POTENTIAL 1/

PROPOSED ROUTE - ALL SEGMENTS

Potential	Miles Crossed	Percent
Slight	221.9 mi.	62.9%
Moderate	129.0 mi.	35.3%
High	14.6 mi.	1.8%

1/ Reference: Geotechnical Impact Study, appendix F

3.04 Mineral and Aggregate Resources

No direct impacts upon areas presently utilized for extraction of minerals or aggregate would occur as a result of the action.

Areas in which such deposits exist but as yet are not mined would not be adversely affected. In most circumstances, the facility may remain in place while mining activities occur around it. In other cases, the capital investment required to mine such resources under most circumstances so overwhelms the cost of moving a transmission line, that the value of the underlying resource is not considered to be altered.

3.05 Atmosphere

The following sections on impacts to the atmosphere are directed toward the environmental conditions of air quality and climate. The extent of impacts is determined by the type and extent of construction.

Air quality is typically divided into three categories based on the types of pollutants encountered: gaseous composition, particulate matter (either solid or liquid), and fumes and odors (either gaseous or particulate).

Climate is discussed in terms of the microclimate, which refers to the meterological conditions at specific locations and includes air temperature, orientation, wind, humidity, solar radiation, and other factors.

Many activities associated with constructing, operating, and maintaining a transmission system have impacts on the atmosphere. Most of these, however, are short-term nuisances or inconveniences of construction and have no long-term effect on the atmosphere as a resource. Minor, long-term microclimatic changes may occur in areas where the vegetation has been changed by clearing and right-of-way maintenance. For example, wind patterns and soil temperatures may be altered when the vegetation has been removed.

3.05.1 Climatological

The removal of vegetation from the right-of-way during construction will cause microclimatic changes in air temperature, solar radiation, and wind velocities. Periodic vegetative management activities will insure that these microclimatic changes will be perpetuated. The changes will be confined mainly to the immediate right-of-way in forested lands and may be adverse or beneficial depending on site conditions. Cleared right-of-way will increase the amount of solar radiation which reaches the ground depending on the orientation of the right-of-way and the width of the clearing. Reflection and back-radiation will also be changed. The width and the orientation of the right-of-way relative to the prevailing winds will change wind patterns. Since air temperature depends in part on solar radiation and wind, changes in air temperatures will occur also.

Although each microclimatic impact may be relatively insignificant by itself, the cummulative effect of vegetation removal and the subsequent microclimatic changes that result can substantially alter the environment within the right-of-way. As a result, the composition of wildlife species that would normally inhabit this zone may change as will the use patterns of other animal species. The infiltration and runoff rates for moisture will be altered as well as the soil temperatures and erosion rates.

3.05.2 Air Quality

Air quality is impacted by activities which change the gaseous composition or levels of particulate matter, fumes, or odors in the atmosphere. Operation of power transmission systems does not result in the discharge of air pollutants, except very minor and barely detectable amounts of oxidants. (See section 3.18 for a more detailed discussion of oxidants).

Activities during the construction period will result in some adverse air quality impacts that include combustion by-products from burning, dust from disturbed soil, vehicle and equipment exhaust emissions, and fumes and odors from miscellaneous operations. The impacts of these construction activities on ambient air quality are normally localized and short-lived.

Open burning introduces a number of combustion by-products into the atmosphere. Emission rates and quantities vary with the type of material being burned, the method of burning employed, and weather conditions. Generally speaking, approximately 90 percent of the mass of the resultant air emissions are CO_2 and water vapor. Neither of these two emissions pose any problem with respect to the maintenance of air quality. The remaining 10 percent includes particulates, carbon monoxide, oxides of nitrogen, and various hydrocarbons. The relatively high concentrations of these emissions near the sites of the fire decrease rapidly to ambient levels in all directions (McMahon, 1976). In studies involving forest fires it was found that particulates in smoke may reduce visibility in the immediate vicinity of the fire; however, visibility again increases to normal short distances downwind. Smoke impacts are normally localized and short-lived.

In vegetated areas, slash and unmerchantable timber are an inevitable by-product resulting from right-of-way clearing and construction operations for transmission facilities. Contractors may use controlled open burning in stacks, pits, or tubs to dispose of these materials where and when permitted by local, State, and Federal air pollution regulations.

New substations and maintenance buildings constructed as part of the proposed program will be heated and cooled with electricity. They are not expected to contribute directly to air pollution. However, certain key substations, communication facilities, and control stations have emergency power capability fueled by propane or diesel. Except for emergencies, these generators are operated for very short periods of time (McLean, H. R., and Ward, F. R., 1976).

Odors and drifting particulate matter result from the application of herbicides during right-of-way vegetation management activities. Herbicides sprayed by aerial or ground blower techniques are prone to drift beyond the right-of-way. (For a more detailed discussion of herbicides, see section 1.03.6.)

3.05.3 Noise

Noise can be defined precisely by its intensity, duration, and character of sound from any and all sources. In lay terms, it is generally defined as undesirable sound. Noise becomes important when it impacts such things as public comfort, wildlife, or land use.

The intensity of sound is usually measured by a unit called the decibel (dB). Several frequency patterns are used to measure sound. The most common frequency is the A scale (A). It corresponds closely with characteristics of the human ear. Decibel levels progress logarithmically; i.e., a difference of 10 dB(A) represents a doubling of sound intensity.

Two Federal agencies regulate noise. The Environmental Protection Agency (EPA) coordinates all Federal noise control activity under the Noise Control Act of 1972 (42 U.S.C. Sec. 4901 et seq.). The Occupational Safety and Health Administration (OSHA) regulates noise at employment locations under the Occupations Safety and Health Act of 1970 (29 U.S.C. Sec. 553).

Changes in sound quality depend on a number of factors. These include loudness, type, duration, number of sources, the environment between the source of the sound and the receiver, and ambient noise levels at the receiver's location.

Scientific opinion holds that frequent and regular exposure to noise levels of 80 dB(A) can contribute to inner ear damage (Central Institute for the Deaf, 1971). Table 3.05-1 lists the sound levels of various noise sources. Individuals, vary as to response. Annoyance can occur at levels much lower than 85 dB(A).

The three primary effects of noise exposure on people are the risk of hearing damage, speech interference, and sleep interference (Glorig, 1958). Long exposure to loud noise can increase body tension and affect blood pressure, as well as functions of the heart and nervous system. Noise alone would not ordinarily unbalance a well-adjusted person. But combined with other stress factors such as financial problems, domestic crises, illness, or fatigue, it can evoke a strong emotional response. Noise, even at lower levels, can produce arousal reactions during sleep, and thus prevent the sleeper from reaching the deep sleep stage so necessary for physical stability. Under most circumstances, however, humans will adapt to continuous low to moderate level noises while awake and sleeping.

When exposed to chronic noise stress, animals develop much of the same disorders that people do. However, like humans, animals will adapt to continuous low to moderate noise levels.

Noise associated with transmission facilities fall into three categories--noise from construction and maintenance activities, operational noise from transmission lines, and operational noise from substation facilities. Construction and maintenance sources are short-term. Noise from stationary substation equipment is long-term.

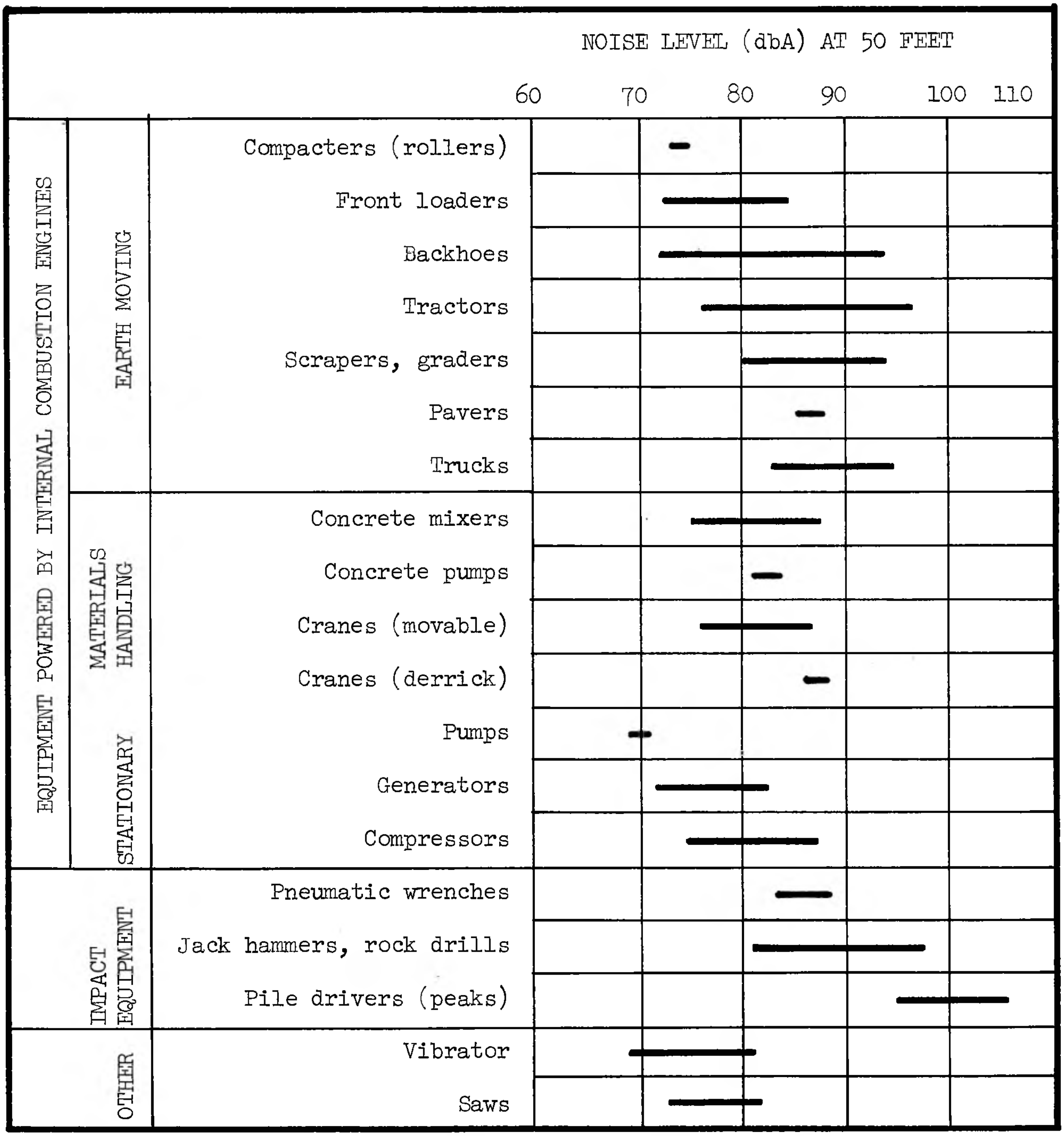
3.05.3.1 Construction

Construction equipment, although it varies widely, creates two kinds of noise--that produced by the internal combustion engine and that made by impact tools such as hammers and drills. Noise levels measured 50 feet from construction equipment range from 72 to 96 dB(A) for earthmoving equipment and from 75 to 88 dB(A) for materials handling compressors. The tracks on earthmoving equipment can also contribute significantly to noise at a construction site. Also, a machine and a material sometimes interact to make noise. Pile drivers and pneumatic hammers create noise levels ranging from 82 dB(A) to 106 dB(A).

Noise from construction comes from many sources and varies widely. Activities such as pole driving, pavement breaking, grading, excavation, rock blasting, and logging are significant sources. Noise from these activities is determined by the type and amount of equipment in use and the distance from the site to the people exposed to the sound. Peak noise from a construction site is usually somewhat above the levels for individual pieces of equipment, but adding noise from different equipment can produce deceptive results. For example, two identical pieces of equipment producing 70 dB(A) each will produce only 73 dB(A) when combined. In most cases, the distances from noise sources at construction sites are sufficiently great to avoid hearing damage. Construction

TABLE 3.05-1

CONSTRUCTION EQUIPMENT
NOISE RANGES



Note: Based on limited available data samples.

usually takes place during the day. Thus, usually the sleep of only the very young, the sick, or people who have worked night hours, is affected.

Blasting noise is not dependent on equipment type except for the type of drills used to prepare the holes in which charges are placed. Noise levels from blasting vary with the type and size of charge and with the use and effectiveness of noise suppression devices such as blast mats. The low-frequency subaudible vibrations from blasting are usually as significant as the audible noise. Noise from blasting is significant, not so much because of its loudness, but because its occurrence is intermittent.

In clearing operations, skidders and chain saws used for logging make the most noise. In an average situation, a chain saw can be heard from as far away as 1.5 miles. Factors which affect this distance include wind, temperature, humidity, topography, and ambient sound levels.

3.05.3.2 Maintenance

Noise from maintenance activities may include any of those previously described for construction, as well as helicopter noise. Helicopters may be used to visually inspect the line or to spray the right-of-way to control vegetation. As a result, residences adjacent to the line may experience brief noise impacts when a helicopter passes overhead. The noise is a distinct low frequency sound. It can be distinguished at a greater distance than other sounds of equal level because low frequency sound penetrates the atmosphere more effectively than higher frequency sounds.

3.05.3.3 Operation

Transmission Lines

Transmission lines sometimes emit a crackling or hissing sound which is audible. This sound is caused by corona, which occurs when air is ionized near the conductor. It may intensify during rain or snow. (See section 3.18 for a more detailed discussion of corona and audible noise.)

Substations

Substations can create noise which is heard beyond the station boundaries for periods of long duration. This noise may include:

A constant low frequency hum from transformers and shunt reactors caused by changing magnetic fields inside the equipment;

Reciprocating engine exhaust from occasional operation of emergency engine-generators;

Noise impulse from operation of automatic power circuit breakers, load interruptors, and disconnect switches. At some installations this impulse noise may occur once or twice a day.

Corona noise from incoming transmission lines.

Noise from work activities caused by operation of such equipment as trucks, automobiles, etc.

The loudness of noise from all of these sources will vary with equipment rating, type of installation, distance from noise source, and some lesser factors such as weather, terrain, and vegetation.

Transformer and shunt reactor noise outside the substations on the proposed lines would generally be low enough to cause little annoyance.

Power circuit breaker noise is an impulse of short duration and high level. If air blast breakers were used, this noise could approach 100 dB(A) at the substation property line. Many State and local noise regulations in various parts of the nation permit higher noise levels than continuous sounds. As a result, residents living near a substation site may experience some degree of discomfort or annoyance.

3.06 Impacts on Aquatic Ecosystem Resources

3.06.1 Water Quality and Fisheries

Right-of-way clearing, construction of access roads and transmission facilities will result in short-term impacts on aquatic ecosystems. Of particular concern is erosion and the consequent sediment impact to the streams, wetlands, and lakes.

3.06.1.1 Sedimentation

Sedimentation within water bodies is a significant problem. It has been well documented (e.g., Cordone and Kelley 1961-62). Briefly, the detrimental effects include:

1. Smothering of fish eggs and fry;
2. Smothering of aquatic insects, which are food organisms for fish;
3. Irritation and clogging of fish and aquatic insect gills;
4. Accelerated euthrophication;
5. Decreased photosynthesis caused by increased turbidity;
6. Habitat alteration, i.e. filling of pools;
7. Poor fishing due to poor visibility; and
8. Decreased esthetic quality.

The loss of nutrients, gullying, and decreased water holding capacity are important terrestrial events related to erosion. Cleared forests can lose to aquatic systems 3 to 20 times the amount of cations lost from undisturbed terrestrial systems (Borman, et al. 1968). Increased nutrient loss from the watershed increases aquatic plant growth, but reduces terrestrial revegetation rates. As successional vegetation develops on the right-of-way, the nutrient losses are reduced because waters from runoff are channeled into evapotranspiration and the available nutrients are incorporated into new growth (Kitchings, Shugart, and Story, 1974). Extensive clearing for access roads on steep slopes or in stream channels can increase erosion, which may affect water quality in the receiving streams for long periods.

The effects of sedimentation may be present but not always obvious. While dramatic fish kills seldom occur, lowered reproductive success and increased incidence of diseases and parasites may act insidiously on fish populations.

Access roads for wood harvesting operations, a construction activity similar to right-of-way construction, impact wetlands, ponds, and streams. Particularly sensitive are streams supporting cold-water fish species. The magnitude of the impacts depends on the volume and frequency of the sediment source.

Several methods have been developed for estimating the amount of sediment that will move from a given area over a given period of time. The method that is simplest and most appropriate for evaluating the sedimentation of a construction project, such as the proposed transmission system, is the universal soil loss equation (USLE). The USLE was originally developed for use on agricultural lands. Since most of the proposed transmission route is through forested areas, the products derived from the equation are accurate only for purposes of comparison. The values obtained from this method are quasi-quantitative and can be used as a comparative tool in evaluating alternate routes. Appendix F contains a more complete discussion of the USLE.

Sedimentation potentials for all water features along the route have been calculated for existing conditions, conditions without mitigation, and conditions with mitigation. Table 3.06-1 shows the three conditions for which sediment yields have been estimated.

TABLE 3.06-1

TONS OF SEDIMENT DEPOSITED INTO WATER SYSTEMS/YEAR[1]
PROPOSED ROUTE

	Existing Conditions	Conditions with no Mitigation	Conditions with Mitigation
Dickey-Lincoln School-Fish River	41 tons	214 tons	63 tons
Dickey-Moose River	13 tons	635 tons	113 tons
Moose River-Moore	205 tons	3938 tons	695 tons
Moore-Granite	90 tons	944 tons	194 tons
Granite-Essex	602 tons	2783 tons	794 tons

[1]Reference: Geotechnical Impact Study, Appendix F

3.06.1.2 Water Temperature

Heating of the water will take place where rights-of-way parallel streams for any distance. Cold-water game fishes are generally displaced by warm-water species in streams whose shorelines have been devegetated because the increase in water temperature causes decreases in dissolved oxygen and increases in metabolism of the fishes.

Higher temperatures result from a greater radiant energy budget on the stream surface (Brown, 1969) or heating of the watershed (Fischner and Larmoyeux, 1963). Greater seasonal and daily fluctuations (5-7° F; 3-4° C) will also occur in deforested New England watersheds (Likens, et al., 1970) from devegetation activities. Table 3.06-2 shows typical changes in stream temperatures, which can be estimated by the empirical formula $T = \frac{A \times H}{D} (0.000267)$, where T is the stream temperature in ° F, A is the surface area of the stream exposed, H is the maximum heat input (B.T.U./ft/2/minute) and D is discharge of the stream in cubic feet per second (Brown, et al., 1971).

TABLE 3.06-2

Changes in Stream Temperatures (after Brown 1969)[1]

Length of stream exposed	Rate of flow	Temperature change
1,100 ft. (344 m)	1-1.9 cfs (28 - 54 l/sec)	4° F (2° C)
150 ft. (47 m)	0.04-0.05 cfs (1.1 - 1.4 l/sec)	13° F (7° C)
60 ft. (19 m)	0.05-0.10 cfs (1.4 - 2.8 l/sec)	4° F (2° C)
30 ft. (9 m)	0.05-0.10 cfs (1.4 - 2.8 l/sec)	2° F (1° C)

[1]Reference: Ecological Resources Impact Study, Appendix E

3.06.1.3 Vegetation Control

Controlling vegetation with chemicals, particularly by foliar treatment, is a common method on utility rights-of-way. Spraying can be accomplished by backspray, high pressure hose, or aircraft. Pellet and granule forms are also broadcast by hand or aircraft. Selective (as opposed to blanket) application, and hand-cutting have less severe impacts. Resulting biological impacts are not only related to the particular herbicide formulation, but the addition of more active ingredients such as emulsifiers, surfactants, and oils. Because treatment is more effective if the plants are thoroughly wetted, large volumes of solution are generally applied.

Drifting during application, or erosion of sprays attached to soil particles into aquatic systems, could occur. Aquatic ecosystems along the route depend on terrestrial energy input, making them highly susceptible to herbicides. Aquatic organisms take up herbicides either directly from the water or by ingestion of contaminated foodstuffs. As with most chemicals, the amount of herbicides accumulated within an organism varies considerably from species to species. Some aquatic species concentrate certain herbicides, while other species do not; and one species may not accumulate all herbicide compounds.

The methods of application, types of herbicides, auxiliary spraying compounds, etc., have not been determined to date. Because the impacts are highly dependent on the type of herbicide, method of application, etc., only a general outline of impacts can be given:

1. Direct toxicity to fish and wildlife;
2. Indirect impact by toxicity to food species, i.e. aquatic insects;
3. Decreased water quality;
4. Loss of primary productivity by herbicidal effects on aquatic plants;
5. Loss of shade and accelerated erosion due to removal of bank vegetation by herbicides; and
6. Increase in biological oxygen demand by increased runoff of terrestrial organic materials.

Furthermore, the Environmental Protection Agency, has recently instituted a review of herbicides containing "nitrosamine impurities", as possible cancer-producing agents. Of particular concern have been Trysben and Banzac, which are used as herbicides on right-of-way (EPA Environmental News Bulletin 1977).

The most common herbicides used for foliar spray are waterborne amines of 2,4,5,-T and 2,4,D-2,4,5-T mixtures containing picloram or dicamba and ammate (Cody, 1975). In comparison to other herbicides these are relatively mobile (Harris 1967; Harris 1968). Decomposition generally occurs within three months (Kitchings, Shugart and Story 1974).

A number of studies have been conducted to trace herbicide residue movement from treated forested watersheds into the aquatic ecosystems. The data are insufficient to draw general conclusions on how herbicide application to the forest will affect herbicide residues and aquatic life in the receiving water bodies. However, the following important observations were made from these studies:

1. The most important mechanism of entry of herbicides to the aquatic environment is direct application or drift of spray materials to the water surface; and
2. Surface runoff during intense precipitation is the second most important mode of transport to the aquatic environment (EPA 1973).

Field studies using the indigenous species in the proposed area of application will be needed to fully assess the impact of terrestrial herbicides on aquatic ecosystems in the proposed route. In the interim, groups of particular concern are the crustaceans and aquatic insects, significant links in the aquatic food chain (Wilson and Bond, 1969), and the fry (larvae) of fish.

3.06.2 Water Quantity and Ground Water

3.06.2.1 Drainage Patterns

The nature of transmission lines is such that natural drainage patterns usually will not be altered. Vegetation cover will be changed within the right-of-way but tower and microwave construction will not affect existing drainage patterns to a significant degree.

3.06.2.2 Surface Runoff

Once the clearing of vegetation along the transmission right-of-way is completed, there will be a change in surface runoff conditions. Surface runoff for a given rainfall event will be greater along the right-of-way due to the loss of vegetation cover that previously intercepted precipitation and slowed runoff. However, the area occupied by this right-of-way will be extremely small in relation to the remaining watershed area except in the smallest of first order stream watersheds. The overall impact on surface runoff will, therefore, be insignificant in almost all cases.

3.06.2.3 Streamflow

Because the surface runoff conditions will not be significantly altered as a result of the transmission corridor and related facilities, streamflow will usually not be affected. Significant streamflow alteration will only occur when there are major changes in land cover in a watershed. This will not be the case as a result of transmission line construction.

Access roads, however, can impact runoff and streamflow. Inadequately designed stream crossings can impede the natural flow characteristics of a stream by creating a retaining structure with undersized culverts and extensive fill. This can easily be mitigated by proper design and installation of drainage facilities.

3.06.2.4 Ground Water

The only possible source of impact could result from excessive applications of herbicides along the right-of-way. Water-soluable, persistent herbicides could be transported through the upper soil horizons to the water table below causing some amount of local contamination. Because of the relatively small size of the right-of-way as compared to the size of major aquifers, this is not expected to cause a significant problem with existing groundwater quality.

3.06.3 Site-Specific Impacts

The major impacts of the transmission line on the aquatic ecosystems are:

1. Sediment runoff from line construction activities;
2. Sediment runoff from access road construction;
3. Herbicide runoff from line maintenance activities; and
4. Increased water temperatures from removal of streamside vegetation.

Each of these impacts were assessed for each stream, wetland, and lake along the route on a 1 to 5 scale, with 1 being the least impact and 5 being the most severe impact. Stream flow is an important factor that balances these potential impacts and is not taken into account here. Larger lakes and streams with large flows throughout most of the year (e.g., most third-order and higher streams) may cause significant dilution of the nutrient, sediment, herbicide, and temperature alterations.

The final impact quality ranking for each stream, wetland and lake was calculated by adding the four impact values to the existing quality ranking for each stream, wetland, and lake and dividing by 5 to obtain an average. Streams which are paralleled within 300 feet would be severely impacted and thus receive an impact quality ranking of 5.

3.06.3.1 Dickey - Lincoln School - Fish River

Table 3.06-3 shows the summary of impacts on the aquatic ecosystem resources in this segment.

TABLE 3.06-3

AQUATIC ECOSYSTEM IMPACT SUMMARY[1]
DICKEY - LINCOLN SCHOOL - FISH RIVER

		Streams		Lakes		Wetlands	
Impact Levels		Number Impacted	Percent	Number Impacted	Percent	Number Impacted	Percent
Slight	1	-	-	-	-	-	-
Low	2	3	13%	-	-	2	50%
Moderate	3	18	79%	-	-	1	25%
High	4	1	4%	-	-	1	25%
Severe	5	1	4%	-	-	-	-

[1]Reference: Ecological Resources Impact Study, appendix E

The majority of the rivers and streams along this route segment are crossed perpendicularly by the route and would be moderately impacted by sediment and herbicide runoff. This would include both Fish River and the Allagash River.

Petite Brook, a high quality trout stream is paralleled by the route and is within the proposed right-of-way. The stream would be severely impacted by the disturbance or removal of streamside vegetation during construction.

3.06.3.2 Dickey - Moose River

Table 3.06-4 shows the summary of impacts to the aquatic ecosystem resources in this segment of the line.

TABLE 3.06-4

AQUATIC ECOSYSTEM IMPACT SUMMARY[1]
DICKEY TO MOOSE RIVER

		Streams		Lakes		Wetlands	
Impact Levels		Number Impacted	Percent	Number Impacted	Percent	Number Impacted	Percent
Slight	1	-	-	-	-	-	-
Low	2	5	9%	2	22%	9	20%
Moderate	3	44	78%	1	11%	25	56%
High	4	6	11%	5	56%	11	24%
Severe	5	1	2%	1	11%	-	-

[1]Reference: Ecological Resources Impact Study, appendix E

The majority of the streams in this segment are crossed perpendicularly or obliquely by the route and could be moderately impacted.

Impacts by sedimentation and herbicide runoff is of particular concern to: the south branch of West Twin Brook where the route parallels the stream for about one-eighth mile to Blue Pond; a medium size wetland on Little Penobscot Brook; and to Long Pond, and an associated wetland complex along Long Pond's northeast shore.

The right-of-way is one-fourth mile from the northwest shore of Baker Lake which is a high quality brook trout and salmon lake. The route also crosses a number of small tributaries and Baker Lake's outlet, the Baker Branch of the St. John River. The tributaries and outlet are important spawning areas for the salmon and brook trout in Baker Lake, and would be particularly sensitive to sedimentation impacts during the fall spawning season.

Also of concern are Canada Falls Lake, Trickey Pond, Alden Ponds and an associated wetland, Alden Brook, and Alden Stream. They could also experience impacts from sedimentation and runoff.

3.06.3.4 Moose River - Moore

Table 3.06-5 shows the summary of impacts to the aquatic ecosystem in this segment of line.

TABLE 3.06-5

AQUATIC ECOSYSTEM IMPACT SUMMARY[1]
MOOSE RIVER - MOORE

Impact Levels		Streams Number Impacted	Streams Percent	Lakes Number Impacted	Lakes Percent	Wetlands Number Impacted	Wetlands Percent
Slight	1	-	-	-	-	-	-
Low	2	3	4	-	-	5	10
Moderate	3	47	61	3	38	16	31
High	4	21	27	2	24	28	55
Severe	5	6	8	3	38	2	4

[1]Reference: Ecological Resources Impact Study, appendix E

Most impacts to the aquatic ecosystem in this segment of the route would be caused by sedimentation and herbicide runoff. Almost all of the streams in this segment were judged to have impacts considered moderate or greater. There are several high quality trout streams that are impacted especially in the western Maine area. Included in these streams is the Kennebago River, a high quality trout stream, which is especially vulnerable to impact during the fall spawning season.

The right-of-way parallels the Cupsuptic, Magalloway, and Nash rivers all of which could be impacted by sediment and herbicide runoff as well as removal of streamside and wetland vegetation during the construction activities.

The impact on the aquatic ecosystem would be greatest in the portion of the route between Moose River Substation and Groveton, N.H., although a tributary to the Connecticut River between Groveton and Moore Reservoir is parallel for about one-half mile and could be severely impacted by the removal of streamside vegetation during construction. Also of concern between Groveton and Moore Substation is Catbow Brook and Miles Stream both of which could be highly impacted.

3.06.3.4 Moore - Granite

Table 3.06-6 shows the summary of impacts to the aquatic ecosystem in this segment of route.

TABLE 3.06-6

AQUATIC ECOSYSTEM IMPACT SUMMARY[1]
MOORE - GRANITE

		Streams		Lakes		Wetlands	
Impact Levels		Number Impacted	Percent	Number Impacted	Percent	Number Impacted	Percent
Slight	1	-	-	-	-	-	-
Low	2	19	56%	1	50%	4	80%
Moderate	3	13	38%	-	-	1	20%
High	4	1	3%	1	50%	-	-
Severe	5	1	3%	-	-	-	-

[1] Reference: Ecological Resources Impact Study, appendix E

The majority of the aquatic ecosystem resources in this segment would receive low to moderate impacts. The exception to this is where the right-of-way parallels Manchester Brook, Keenan Brook, Waits River, and a tributary to Waits River all of which could be impacted by the removal of streamside vegetation during construction and by sedimentation and herbicide runoff. Also, the impact to Coburn Lake near the Connecticut River across from Monroe, N.H., could be high.

3.06.3.6 Granite - Essex

Table 3.06-7 shows a summary of impacts to the aquatic ecosystem in this segment of the route.

TABLE 3.06-7

AQUATIC ECOSYSTEM IMPACT SUMMARY[1]
GRANITE - ESSEX

		Streams		Lakes		Wetlands	
Impact Levels		Number Impacted	Percent	Number Impacted	Percent	Number Impacted	Percent
Slight	1	-	-	-	-	-	-
Low	2	13	27%	-	-	2	50%
Moderate	3	25	52%	-	-	1	25%
High	4	8	17%	-	-	1	25%
Severe	5	2	4%	-	-	-	-

[1]Reference: Ecological Resources Impact Study, appendix E

The streams in the first part of this route between Granite Substation and a location just north of the Montpelier-Barre Regional Airport would have moderate impacts. A mile of route along the stream bed of the Dog River could be severly impacted by sediment and herbicide runoff.

Also, where Kelley Brook is paralleled and crossed, this Brook could be highly impacted by sediment and herbicide runoff. The impact on parts of the Winooski River, where the transmission line is quite close and parallel, could be highly but locally significant.

3.06.3.6 Summary of Aquatic Ecosystem Impacts

Aquatic Ecosystem impacts along the entire proposed route are summarized in table 3.06-7.

TABLE 3.06-8

SUMMARY OF AQUATIC ECOSYSTEM IMPACTS[1]
Proposed Route (All Segments)

		Streams		Lakes		Wetlands	
Impact Levels		Number Impacted	Percent	Number Impacted	Percent	Number Impacted	Percent
Slight	1	-	-	-	-	-	-
Low	2	43	18.0	3	15.8	22	20.2
Moderate	3	147	61.8	4	21.1	44	40.4
High	4	37	15.5	8	42.0	41	37.6
Severe	5	11	4.7	4	21.1	2	1.8

[1]Reference: Ecological Resources Impact Study, appendix E

3.07 Vegetation

3.07.1 General Impacts

Vegetation is of fundamental importance. It furnishes stored energy upon which other life depends, and it maintains and renews the oxygen content of the atmosphere. Vegetation is probably of most concern to people because of its economic and ecological importance (i.e., timber production, wildlife habitat, etc.) and for its influences on hydrology, erosion control, and microclimates.

Various activities involved in the construction and maintenance of transmission systems have an effect on vegetation. Direct impacts on the form, composition, and density of vegetation communities are made through displacement, removal, or damage during construction. In heavily wooded areas, the clearing of lines of sight for surveys involves cutting brush, branches, and trees. Right-of-way clearing removes all trees and brush on and next to the right-of-way that could interfere with the safe operation of the transmission line. Vegetation is also removed for access roads and other improvements.

Further impacts to vegetation result from excavating for tower sites and substations where the vegetative cover is completely removed.

3.07.2 Impact on Microclimate

Apart from the short-term removal of vegetation and the possible alteration of drainage as a result of construction, the long-term effects of transmission lines on existing vegetation are related primarily to site microclimates. The removal of vegetation or its suppression by construction and maintenance cause changes in solar radiation, wind, and temperature regimes that affect plant growth.

In a forest community, the primary energy exchange or "active" surface is the overhead canopy. That is to say, most of the net transfer of energy in the environment takes place in the canopy. Solar radiation is absorbed. The canopy's temperature is elevated. Energy is reemitted to the sky above and to the ground below as heat. At night, if there is no cloud cover to reflect the outgoing radiation, much of this energy is lost. Cooling near the top of the canopy is significant. Pronounced temperature fluctuations take place between daytime heating and nocturnal cooling. Under the canopy, however, there is a continual exchange of heat from the canopy to the ground and back. Losses and gains nearly balance in the understory, and there is considerably less diurnal temperature fluctuation. These relationships are affected by differences in cover type and canopy closure.

The convective transfer of heat also takes place, primarily at the canopy surface where wind speeds are greater than in the understory. A high rate of transpiration in the canopy is driven by the vapor concentration gradient between the leaves and atmosphere. Approximately 580 calories of heat energy are needed to evaporate 1 gram of water. The rate of energy transfer depends on the rate with which the wind removes water vapor from the layers of air in the canopy. Likewise, the transfer of warmer or colder air from the surrounding areas is a function of wind. Beneath the forest canopy, air movement is greatly reduced. Hence, the rate of energy transfer is lower.

Removal of the forest canopy in clearing the right-of-way lowers the active surface and, consequently, greatly alters the microclimate near the ground. The net effects are influenced by the orientation and width of the corridor.

Surface temperatures at ground level in the clearing will be raised significantly. This means that more heat will be conducted into the ground at a rate that depends to some extent on the soil's properties. The removal of the poorly conducting litter layer would, for example, lessen the increase in surface temperature but would increase heat conduction to lower depths. Increased soil temperatures affect soil microbial activity, soil-water and nutrient mobility, root growth and absorption capacity, and seed germination.

At night, the loss of heat from the soil or vegetation to the atmosphere will result in diurnal fluctuations in air temperature. Air temperatures near the ground will tend to show greater diurnal fluctuations in the right-of-way than in nearby woods. Similarly, the increase in wind speed near the ground as a result of clearing will vary with the width of the corridor and the direction of the wind. Winds blowing parallel to the corridor will be reduced only slightly in the clearing. But where the height/width ratio of the clearing is high, winds blowing across the corridor will pass over the opening without affecting air movement at the ground level appreciably. (A detailed discussion of the influence of wind on microclimates appears in appendix E.)

The net effect will be a decided change in the site microclimate after clearing the right-of-way and a shift in competitive balance which with time, will bring about a shift in species composition, and possibly a change in cover type.

3.07.3 Impacts on Vegetation Adjacent to or Under the Powerline

According to Herrington and Heisler (1973) changes in the soil-air temperature profile do not extend into or greatly influence the forest, nor does the reverse occur. Raynor (1971), however, showed that with winds directed into a forest edge, the air movement near the ground was nearly as great as that at the top of the canopy for a distance of up to 20 meters. Given in addition even a slight increase in solar radiation at ground level inside the forest edge (a function of solar angle and orientation of the corridor), it is not unreasonable to assume that under some conditions the microclimate of the undisturbed forest will be affected for a distance of up to 10 or 20 meters from the edge. The net effect on the vegetation, however, would probably vary with cover type.

It follows that a right-of-way through nonforested vegetation will usually have little effect on the community outside of the actual construction areas--tower sites and access roads. Since all plant communities are not affected equally, they were rated according to their general susceptibility to disturbance. This rating scheme (table 3.07-1) anticipates the maximum potential impact of the right-of-way clearing. It takes into account not only the projected effects of microclimatic changes, but also the possible effects of soil compaction and drainage alteration as they relate to residual soil-moisture levels and the trophic status of the site. This is especially important for wetland communities. The probable direction of change, i.e. succeeding community, is also given. While actual changes in the vegetation adjacent to the maintained right-of-way may be minimal and confined to a narrow border area, these changes may in special cases pose a threat to rare plant species or uncommon habitat types.

It may be assumed that all vegetation within the cleared and maintained right-of-way will undergo significant change. Where grass cover is established on access roads and tower sites, it may persist for a considerable length of time, successfully resisting invasion by trees and shrubs (cf. Richards, 1973). Where the right-of-way is maintained by broadcast spraying, a totally different community may succeed, noticeably devoid of perennial herbs and composed mostly of herbicide resistant grasses, sedges, and woody shrubs (Carvell, 1973; Bramble and Byrnes, 1973). As those species increase and spread to unsprayed areas,

TABLE 3.07-1

MAXIMUM POTENTIAL IMPACT OF CONSTRUCTION AND MAINTENANCE ON VEGETATION ADJACENT TO RIGHT-OF-WAY.[1] (Numbers 1 to 3 indicate low to high susceptibility to disturbance, respectively, with 0 indicating no effect).

Cover Types[2]	Alteration of Microclimate[2]	Susceptibility to Soil Compaction and Drainage Alteration[2]	Probable Direction of Change
SWM	3	2	SHM or SWR
SWR	1	2	MR
PNM	3	2	HSM
PNR	1	2	MR
CS	3	3	SWM (swamp)
SHM	2	1	incr. in less tolerent spp.
HSM	2	1	incr. in less tolerant spp.
MR	1	1	incr. in less tolerant spp.
PB	1	1	MR
HWM	2	2	incr. in less tolerant spp. or HS
HWR	1	1	incr. in less tolerant spp. or HS
RAF	0	1	no change
BG	0	3	M or SP
M	0	3	SP
SP	3	3	B or SWM

[1]Reference: Ecological Resources Impact Study, appendix E

[2]For cover type definitions see section 2.07.

they may threaten rare or more sensitive plants. Species that spread most rapidly on broadcast-sprayed rights-of-way are those which proliferate vegetatively by rhizomes or root sprouts. These may include a number of perrennial grasses, several sedges ferns such as hayseed fern, New York fern, and braken fern, the shrub meadowsweet, and fireweed. Spring wildflowers which complete their life cycle before the spraying season may also be abundant, except where the persistant chemical picloram is used (Carvell, 1973).

Selective or basal spraying, has only a limited impact on species composition. Its primary effect is to hold the vegetation in a continuously regenerating or early successional stage. In New England this means, even for the spruce-fir cover type, a preponderance of relatively intolerant early successional hardwoods.

Rare species may also be threatened by herbicide spray drifting away from designated spray areas during maintenance operations.

3.07.4 Vegetation Impacts from Ozone Generation

The production of ozone is associated with high-voltage transmission lines. However, the levels of ozone and nitrous oxides produced by the proposed transmission line would be so low they would be indistinguishable from ambient levels. Studies indicate that the ozone produced would have no adverse impact on plants.

3.07.5 Vegetation Impacts from Increased Snowmobile Traffic

If the transmission right-of-way serves as a new trail for snowmobile users, as is expected to happen, many delicate plants could be adversely impacted. Impacts will be greatest near those miles which presently are crossed by snowmobiles. In northern Minnesota, Wanek (1973) found that the impact varies with the severity of the winter, the depth of snow accumulation, the intensity of snowmobile traffic, and the susceptibility of the organism to injury due to cold temperatures or physical contact.

Wanek's 3 years of data, much of it collected on transmission rights-of-way, established that temperatures beneath snow compacted by snowmobiles are significantly colder than those under undisturbed snow cover. Colder soil temperatures retarded soil microbe activity in the spring. Wanek noted that this is probably not biologically significant because these decay organisms rebound quickly once the soil warms. The growth of early spring flowers was retarded, and their reproductive success was reduced where snowmobiles traveled. Many herbs with massive underground storage organs were winter-killed in the modified environment under snowmobile tracks.

Woody plants were vulnerable to physical damage by snowmobiles. Deciduous trees and shrubs and young conifers were readily damaged or broken when the snow cover was not deep enough to protect them. Some, however, managed to maintain the population or increase through vegetative propagation or possibly increased seed germination. The author concludes that snowmobile traffic can be beneficial by reducing the stature of woody vegetation in areas where it needs to be controlled. But traffic is unwise in places where forest regeneration is being encouraged, or where the esthetic or economic value of fragile communities necessitate their preservation.

3.07.6 Site Specific Impacts

This section summarizes impacts on potential rare plant habitat and the possible alteration of plant communities. These impacts were evaluated for each mile of the proposed right-of-way and its borders. A complete discussion of the evaluation appears in appendix E. (See also map volume appendix E.)

Part of the discussion of impacts on vegetation is included in other sections. The discussion of impacts on forest resources appears in section 3.14. The relationship of wildlife and vegetation is discussed in section 3.08, and the relationship of vegetation and soils in section 3.03. The visual impacts that result when vegetation is removed are discussed in section 3.13.

3.07.6.1 Dickey - Lincoln School - Fish River

The adverse impact on potential rare plant habitat is slight to moderate in this segment. The most important area for potential rare plant habitat between Dickey and Lincoln School Substation is near where the route crosses McLean Brook. Other important areas on this segment would be near St. Francis, St. John, and along the base of Bossy Mountain.

The alteration of adjacent plant communities is likely to be greatest near the confluence of the Allagash and St. John rivers, near McLean Brook, and near where the route crosses Wheelock Brook.

3.07.6.2 Dickey - Moose River

The adverse impact on potential rare plant habitat is slight to moderate for most of this segment. However, there is one part of this segment where the adverse impact is probably quite high. It extends from near Canada Falls Lake southwest towards Moose River. That part of the route where it crosses Alder Brook has the highest potential for rare plant habitat. Also of concern is that area on the route just east of Boundry Bald Mountain.

The alteration of the adjacent plant communities would be greatest at certain locations on the first 35 miles of the segment. Most of these locations are in the area between Baker Lake and Dickey Substation.

Several cedar swamps on this segment are cause for concern. They range in size from 5 to 74 acres and are discussed in detail in appendix E.

3.07.6.3 Moose River - Moore

From Moose River Substation to State Route 16 in New Hampshire, the segment will in general have slight to moderate impacts on potential rare plant habitat except for an area of calcareous metisedimentary rock north of Little Big Wood Pond in the town of Dennistown, Maine. A severe impact rating is also assigned to an area near Boil Mountain about 6 miles southwest of Maine State Highway 27. This is the area where the route crosses the North and Middle Branch of Alder Stream.

That part of the segment between New Hampshire State Highway 16 and a point a few miles north of Moore Substation could cause a highly adverse impact on potential rare plant habitat. The most critical areas are near Cranberry Bog Notch, Nash Stream, and Groveton, NH. A 2-acre wetland in the Connecticut River floodplain near the Vermont side of the river and a stand of naturally growing red pine along the western slope of Cape Horn Mountain are also of special concern.

Concern has also been expressed for Catbow Brook swamp, a classic spruce-fir swamp just southeast of Alden Mountain in the town of Guildhall, VT.

High adverse impacts on potential rare plant habitat may occur in the area between Halibut Mountain and Sheraton Mountain and along the route through Catbow swamp as well as just west of Baldwin Hill in the town of Lunenburg, VT.

The area of the route near the Moore Substation may receive moderate adverse impacts on rare plant habitat. The Littleton Dam Wildflower Area near Moore Reservoir is also an area of concern.

Alterations of adjacent plant communities may occur along 52 miles of the segment.

3.07.6.4 Moore - Granite

The portion of this segment that parallels the Connecticut River is expected to have moderate adverse impacts on potential rare plant habitat. That part of the segment from Barnet, VT, to Granite Substation has high adverse impact. Ledges near Barnet, and an unusual stand of burled hemlocks near Haden Hill on Vermont Highway 302 are of special concern.

There are many areas along this segment where alterations of the adjacent plant communities could be substantial. Twenty-one miles of the route have locations where significant alterations might occur.

3.07.6.5 Granite - Essex

Special concern has been expressed for pockets of cedar between Granite Substation and an area north of the Montpelier-Barre Regional Airport.

Moderate impacts are expected to occur on the portion of route starting just north of Berlin, VT, west for about 6 miles parallel to the Winooski River Valley. Ledges occur at several places on this portion of the route. Severe adverse impacts may occur on potential rare plant habitat near Middlesex, VT, in the Winooski Valley. Calcareous soils occur on the north side of a ridge on the south side of Winooski River. West from Middlesex, VT, until the line crosses the Winooski River, adverse impacts on the potential rare plant habitat are judged to be moderate. Ledges near Middlesex are of special concern. Part of the segment on the north side of the Winooski River may have a high impact potential on potential plant habitat. Several ledges near the segment could harbor rare plants. The rest of the route--after it crosses the Winooski River near the Vermont Research Forest Agriculture Experiment Station--was judged to have moderate impact. Areas where adjacent plant communities are most likely to be altered occur along 28 miles of the segment.

3.08 Wildlife

3.08.1 Introduction

Impacts of the construction and operation of the proposed action upon the terrestrial fauna of Maine, New Hampshire, and Vermont were examined. Adverse impacts would be caused by destroying or altering portions of habitat that a particular species requires for feeding, hiding, resting, sleeping, or raising young. Impacts upon individual species will vary according to the particular species' requirements, and upon the degree to which the area surrounding the proposed route is meeting these needs.

Impacts may be beneficial to a species if opportunities for feeding, hiding, resting, sleeping, or raising young are created by the proposed action.

A species may not be affected if needed habitat is neither created nor destroyed, or if some other factor, not altered by the proposed action, is controlling the size of the wildlife population.

Activities associated with transmission lines that can impact wildlife and impacts specific to particular species or groups of species are discussed below.

3.08.2 Direct Impacts of Construction

Wildlife species whose principal habitat consists of forested areas, including some with populations presently declining because of loss of this habitat, will be the species most adversely impacted by the clearing of forested land (Thomas 1975). In many cases, the impact may be slight, though long-term, due to the abundance of forest land along the route. For other species, the right-of-way may cross areas that serve as critical concentration areas or reproductive sites, in which case a more severe, long-term impact may result. Moreover, the clearing of right-of-way areas may serve to aid in creating discontinous habitat types, or habitat islands, detrimental to certain species of wildlife (Whitcomb 1977). These impacts could be cumulative.

Forested areas subjected to cutting may exhibit a natural succession that may be beneficial to specific wildlife species. Although the length of time needed by sites for successional phases is related to specific sites, researchers have compiled data that can be used as general guidelines. Bramble and Brynes (1955, 1972, 1974, 1976) found that, for a transmission line constructed in central Pennsylvania through oak forested region, woody shrub, mixed herbacious plants, sedge-grass, and bracken fern cover began developing within the right-of-way within one year of clearing. Wildlife use--deer were the indicator species--began to increase in the fourth year following construction. Byrd (1956), in a study of plant and animal succession in Virginia, found herbacious plants that produce wildlife food developing within the first 5 years after abandonment. Shrubby growth began to develop in the sixth year, producting significant cover and food for some wildlife. Other studies, more applicable to northern New England, have shown that clear-cutting strips 132 feet wide increased the amount of forage for some wildlife species (Rinaldi 1970). Thomas (1975) postulated generally that herbacious wildlife habitat develops within 1 to 5 years after a site is disturbed, while shrubby wildlife habitat develops in 6 to 10 years.

The number and diversity of wildlife species have been used to examine impacts of transmission lines and other developments on wildlife populations. In New Hampshire, Cavanagh, Olson, and Macrigeanis (1976) found the total number of wildlife species using a new right-of-way was greater than the number of wildlife species using adjacent forested areas. In northern Maine, a Shannon species diversity index calculated for small mammals using disturbed areas next to highways was greater than species diversity values of small mammals in adjacent, altered areas (Palman 1977). Bird populations in Tennessee, however, showed a reverse trend with respect to a line, in that species diversity was greater in forest communities than on the right-of-way (Anderson, Mann, and Shugart 1977). The highest species diversity was noted in a right of way 100 feet wide, as compared to both narrower and wider rights-of-way.

Other potential terrestrial wildlife habitats, including fields, abandoned fields, and regenerating forests will be impacted to a lesser degree by clearing and construction operations. Since natural succession in these areas is in its earlier stages, impacts from construction may consist of fewer long-term effects when compared to forested regions. In the short-term, however, wildlife populations may be adversely impacted until vegetation is restored. Leopold (1933) commented on the importance of these types of vegetation by stating that a majority of game species are associated with an interspersion of the early and intermediate stages of plant succession. Earlier successional stages are also used by a wide variety of nongame wildlife (Thomas 1975).

Biologists in Maine noted that alteration of wetland habitat by powerlines may be caused by filling or other earth work to provide bases for towers and poles or by constructing roadbeds for equipment. These operations, as well as the use of heavy equipment, may contribute to permanent destruction of communities through erosion, drainage alternation, or compaction. Also, an unknown behavioral impact on waterfowl may cause wetland areas under powerlines to become unaccept-able for waterfowl use. In addition to these impacts upon wildlife populations, the generation of noise and dust may cause some wildlife to abandon habitats or restrict movements on or adjacent to construction activities. For the most part, impacts will be short-term but if repro-ductive habitat is temporarily abandoned, local impact upon following seasons' wildlife populations may result.

3.08.3 Impacts from Operations

By creating a continuous 150-foot wide strip of predominantly regenerating habitat over a three-state area, the proposed right-of-way would provide a corridor that might enhance the dispersal of a few species.

Increased dispersal of some species will allow slightly increased genetic mixing of their populations. This will benefit some species while others may suffer. Predators such as the fox and the coyote will probably follow the edge in the course of their daily hunting. Several kinds of hawks may find favorable perches and plentiful food supplies. However, where the line crosses roads, it might possibly conduct some species, especially birds, into the path of highway traffic.

In areas that now have few clearings amid the forest, the route will serve to connect a few such clearings with larger open areas. By creating this corridor, the northward range of several wildlife species adapted to early successional stages might be expanded. These species include indigo buntings, field sparrows, and brown thrashers.

Of special concern is the possibility of encouraging the spread of the brown-headed cowbird, an open land species that parasitizes the nests of many woodland species. In many cases where a nearly continuous path of open land has connected existing agricultural lands with remote clearings, the cowbird has moved in and may have caused a decline in forest bird species (Mayfield 1977). The cowbird presently is not common in the interior forests of Maine, and the chances of the corridor causing it to increase in this area is not great so long as vegetation remains at shrub height or higher. But if the cowbird does gain a hold in the region, impacts upon songbird populations could be serious. The region is probably the most important one in the United States for nesting warblers and vireos, and these groups are the most vulnerable to cowbird parasitism.

The dispersal of starlings into the region might also be encouraged by the presence of an open corridor. Although starlings would compete with native woodpeckers, bluebirds, and other hole-nesting birds, the chances of a significant dispersal occurring as a result of the powerline habitat are slight, so long as the right-of-way is maintained at shrub height or higher.

Table 3.08-1 shows the status of all terrestrial vertebrates inhabiting the region, and the impact of the transmission line upon them.

Explanation of Table

Scarcity of each species is rated as follows: R = rare, U = uncommon, FC = fairly common, C = common, A = abundant. No numerical value is assigned to these terms. They are meant only to be relative, i.e. "common" for a species of hawk means common relative only to other hawks; actual numbers may be only one-tenth those of a "common" songbird. Since abundance varies greatly in the region, only maximum abundance is indicated, e.g., although the ruby-crowned kinglet is listed as fairly common, this is true only in northern Maine --elsewhere it is uncommon or rare.

Geographic Trends - Species designated "N" increase in a northerly or easterly direction along the route. "S" species increase in a southwesterly direction. Species designated "-" show no marked geographic trend.

Seasonal Occurrence - An "X" indicates presence at that season. A circled "X" indicates substantially higher numbers at that season. Although most songbirds increase during spring and fall migration, this was not indicated. A parenthesized "X" indicates substantially lower numbers at that season.

Impact Categories - Impacts are rated as follows:

O = no identifiable impact on habitat
L = low or slight impact
M = moderate impact on habitat
H = high impact on habitat
S = severe or very high impact on habitat
+ = positive impact on habitat
- = adverse impact on habitat

The table presents only the most extreme level of impact, such as by crossing the most critical habitats at the most critical seasons. Under the heading "Uncertainty" confidence in the estimate is elucidated: L = low uncertainty/high confidence, M = moderately uncertain, H = highly uncertain/low confidence). Uncertainty was evaluated in terms of adequacy of biological data, design or location data, or insufficient knowledge/ experience with analogous situations. Uncertainty was especially high for herptiles and small mammals.

Impacts on food and impacts on cover are usually crucial to a species. Changes indicated can mean a change in the amount, availability, or suitability of the food or cover. "Cover" is used in a broad sense to include suitable nesting sites, perches, den sites, etc. All impacts assumed the current presence of a mature forest. Short-term impacts

TABLE 3.08-1 POTENTIAL MAGNITUDE OF IMPACTS ON TERRESTRIAL VERTEBRATES IN THE REGION [1]

	Scarcity (overall)	Geographic Trends	Seasonal Occurrence: Spring	Seasonal Occurrence: Summer	Seasonal Occurrence: Fall	Seasonal Occurrence: Winter	Impact of Vegetation Removal: Within R.O.W., Short-term: Food	Within R.O.W., Short-term: Cover	Within R.O.W., Long-term: Food	Within R.O.W., Long-term: Cover	Adjacent to R.O.W., Long-term: Food	Adjacent to R.O.W., Long-term: Cover	During Construc. Disturbance	Post-Construc. Impact	Collision Hazard	Probable Net Change	Uncertainty
Common Loon	FC	N	X	X	X	(X)	-L	O	O	+L	O	O	L	M	M	O	M
Pied-billed Grebe	U	S	X	X	X		-L	O	O	+L	O	O	L	L	L	O	L
Great Blue Heron	FC	-	X	X	X	(X)	-L	-L	O	+L	O	O	L	L	H	O	L
Green Heron	FC	S	X	X	X		-L	O	O	+L	O	O	L	L	M	+L	M
American Bittern	U	-	X	X	X		O	O	O	+L	O	O	L	L	M	O	L
Canada Goose	R	-	⊗	X	X		O	O	O	O	O	O	L	L	M	O	L
Black Duck	C	N	X	X	X	(X)	O	+L	O	+L	O	O	L	L	M	O	L
Green-winged Teal	R	-	X	X	⊗		O	+L	O	+L	O	O	L	L	M	O	L
Blue-winged Teal	R	-	X	X	⊗		O	+L	O	+L	O	O	L	L	M	O	L
Wood Duck	U	S	X	X	X		O	-L	O	-L	O	+L	L	L	M	O	L
Ring-necked Duck	FC	N	X	X	X		O	O	O	+L	O	O	L	L	M	O	L
Common Goldeneye	FC	N	X	X	X	(X)	O	-L	O	-L	O	+L	L	L	M	O	L
Hooded Merganser	U	-	X	X	X		-L	-L	O	-L	O	+L	L	L	M	O	L
Common Merganser	FC	N	X	X	X	(X)	-L	O	O	O	O	O	L	L	M	O	L
Turkey Vulture	R	S	X	X	X		+L	O	+L	O	O	O	M	L	L	O	M
Goshawk	U	-	X	X	X	⊗	+M	-L	+L	-L	+L	O	H	H	L	+L	M
Sharp-shinned Hawk	R	-	X	(X)	X	(X)	+M	-L	+L	-L	+L	O	H	H	L	+L	M
Cooper's Hawk	R	-	X	(X)	X	(X)	+M	-L	+L	-L	+L	O	H	H	L	+L	M
Red-tailed Hawk	FC	-	X	X	X	(X)	+H	-L	+M	-L	+L	O	H	M	M	+L	L
Red-shouldered Hawk	U	S	X	X	X		+H	-L	+M	-L	+L	O	H	M	M	+L	M
Broad-winged Hawk	C	-	X	X	X		+H	-L	+M	-L	+L	O	H	M	M	+L	M
Golden Eagle	R	N	X	(X)	X		+M	O	+L	O	+L	O	S	H	M	O	H
Bald Eagle	R	N	X	X	X	(X)	+L	-L	O	-L	O	O	S	H	H	O	L
Osprey	U	N	X	X	X		-L	-L	O	+L	O	O	S	H	M	+L	H
Marsh Hawk	R	-	X	(X)	X		+M	+L	O	O	O	O	M	H	M	+L	M
Peregrine Falcon	R	-	X	(X)	X		+L	O	+L	O	+L	O	M	H	L	+L	M
Merlin	R	N	X	X	X		+M	-L	+L	-L	+L	O	L	L	L	+L	H
Kestrel	FC	S	X	X	X		+H	-L	+M	-L	+L	O	L	L	L	+M	L
Spruce Grouse	U	N	X	X	X	X	-H	-	+M	+M	+L	+L	O	L	O	+M	M
Ruffed Grouse	C	-	X	X	X	X	-H	-	+H	+H	+L	+L	O	L	O	+M	L
Pheasant	U	S	X	X	X	X	+M	+L	+L	+M	+L	+L	L	L	O	+M	M
Virginia Rail	U	S	X	X	X		O	+L	O	+L	O	O	L	L	O	O	L

[1] Reference: Ecological Resources Impact Study, Appendix E

(continued)

TABLE 3.08-1 (Cont'd)

Species	Scarcity (overall)	Geographic Trends	Seasonal Occurrence: Spring	Summer	Fall	Winter	Impact of Vegetation Removal: Within R.O.W., Short-term: Food	Cover	Within R.O.W., Long-term: Food	Cover	Adjacent to R.O.W.: Food	Cover	During Construc. Disturbance	Post-Construc. Impact	Collision Hazard	Probable Net Change	Uncertainty
Sora Rail	U	–	X	X	X		O	+L	O	+L	O	O	L	L	O	O	L
Common Gallinule	R	S	X	X			O	+L	O	+L	O	O	L	L	O	O	L
Killdeer	C	S	X	X	X		+M	+M	+L	O	O	O	M	M	L	O	M
Woodcock	C	–	X	X	X		+M	–L	+L	+H	+L	+M	M	M	M	+H	L
Common Snipe	C	–	X	X	X		+L	+L	O	+L	O	O	M	M	M	+L	M
Spotted Sandpiper	C	–	X	X	X		+L	+L	O	+L	O	O	M	M	L	+L	M
Herring Gull	U	S	X	X	X	(X)	+L	O	O	O	O	O	L	L	M	O	L
Black Tern	R	S	X	X	X		+L	O	O	+L	O	O	L	L	M	O	L
Mourning Dove	C	S	X	X	X	(X)	+M	O	+L	+M	O	O	O	O	L	+L	M
Yellow-billed Cuckoo	R	S	X	X	X		–L	–L	+M	+M	+L	O	L	L	O	+L	M
Black-billed Cuckoo	U	S	X	X	X		–L	–L	+M	+M	+L	O	L	L	O	+L	M
Screech Owl	R	S	X	X	X	X	+M	–L	+M	–M	+L	+L	M	M	L	O	M
Great Horned Owl	FC	–	X	X	X	X	+M	–M	+M	–M	+L	O	H	M	L	O	M
Barred Owl	FC	–	X	X	X	X	+M	–M	+M	–M	+L	+L	H	L	L	O	M
Long-eared Owl	U	–	X	X	X	X	+M	–M	+M	–M	+L	O	M	L	L	O	M
Saw-whet Owl	U	N	X	X	X	ⓧ	+M	–M	+M	–M	+L	+L	M	L	L	O	M
Whip-poor-will	U	S	X	X	X		–L	–L	+L	–M	O	+L	M	M	L	O	L
Common Nighthawk	U	S	X	X	X		+L	+H	O	+L	O	O	M	M	M	O	L
Chimney Swift	C	–	X	X	X		+L	O	O	O	O	O	O	O	L	O	L
Ruby-throated Hummingbird	FC	–	X	X	X		+M	–L	+M	O	O	O	O	O	O	+L	L
Belted Kingfisher	FC	–	X	X	X		–L	+L	O	O	O	+L	M	M	M	O	L
Yellow-shafted Flicker	C	–	X	X	X		+M	–L	+L	–L	+L	+L	O	O	L	+L	L
Pileated Woodpecker	U	–	X	X	X	X	O	–L	+L	–L	+L	+L	O	O	M	O	L
Yellow-bellied Sapsucker	FC	N	X	X	X		+L	+L	+L	–L	+L	+L	O	O	L	O	M
Hairy Woodpecker	C	–	X	X	X	X	+L	–L	+L	–L	+L	+L	O	O	O	O	M
Downy Woodpecker	C	–	X	X	X	X	+L	–L	+L	–L	+L	+M	O	O	O	+L	M
Black-backed three-toed Woodpecker	U	N	X	X	X	⊗	+L	–L	+L	–L	+L	+L	O	O	O	+L	L
Northern three-toed Woodpecker	R	N	X	X	X	⊗	+L	–L	+L	–L	+L	+L	O	O	O	O	M

(continued)

TABLE 3.08-1 (Cont'd)

	Scarcity (overall)	Geographic Trends	Seasonal Occurrence				Impact of Vegetation Removal						During Construc. Disturbance	Post-Construc. Impact	Collision Hazard	Probable Net Change	Uncertainty
							Within R.O.W.				Adjacent to R.O.W.						
							Short-term		Long-term								
			Spring	Summer	Fall	Winter	Food	Cover	Food	Cover	Food	Cover					
Eastern Kingbird	C	–	X	X	X		+M	+M	+L	+M	O	+L	O	O	O	+M	L
Great Crested Flycatcher	FC	S	X	X	X		+L	–L	+L	–L	O	+L	O	O	O	O	M
Eastern Phoebe	FC	–	X	X	X		+L	–L	+L	+L	O	O	O	O	O	+L	M
Yellow-bellied Flycatcher	FC	N	X	X	X		+L	–L	+L	O	O	O	O	O	O	O	L
Alder Flycatcher	FC	–	X	X	X		+L	–L	+L	+M	O	+L	O	O	O	+L	L
Least Flycatcher	FC	–	X	X	X		+L	O	+L	+H	O	+L	O	O	O	+L	L
Wood Pewee	C	S	X	X	X		+L	–L	+L	–L	O	O	O	O	O	O	M
Olive-sided Flycatcher	FC	N	X	X	X		+L	–L	+L	–L	O	+M	L	L	O	+L	M
Horned Lark	R	–	X	X	X	(X)	+M	+L	O	O	O	O	L	L	O	O	L
Tree Swallow	A	–	X	X	X		+L	–L	+L	O	O	+L	O	O	O	+L	M
Bank Swallow	C	–	X	X	X		+L	+M	+L	O	O	O	O	O	O	O	M
Barn Swallow	FC	–	X	X	X		+L	O	+L	O	O	O	O	O	O	O	L
Cliff Swallow	C	–	X	X	X		+L	O	+L	O	O	O	O	O	O	O	L
Purple Martin	R	S	X	X	X		+L	O	+L	O	O	O	O	O	O	O	L
Gray Jay	U	N	X	X	X	(X)	–L	–M	O	–L	O	O	O	O	O	O	L
Blue Jay	C	–	X	X	X	(X)	+L	–L	+L	–L	O	O	O	O	O	+L	L
Common Raven	U	N	X	X	X	(X)	+L	O	O	O	O	O	L	L	L	O	L
Common Crow	A	S	X	X	X	(X)	O	–L	+L	–L	O	O	L	L	L	+L	M
Black-capped Chickadee	C	–	X	X	X	X	+L	–L	+M	–L	+L	+L	O	O	O	O	M
Boreal Chickadee	FC	N	X	X	X	X	+L	–L	+L	–L	+L	+L	O	O	O	O	L
White-breasted Nuthatch	FC	–	X	X	X	X	+L	–L	O	–L	+L	+L	O	O	O	O	L
Red-breasted Nuthatch	C	–	X	X	X	X	+L	–L	O	–L	+L	+L	O	O	O	O	L
Brown Creeper	C	–	X	X	X	X	+L	–L	O	–L	+L	+L	O	O	O	O	L
House Wren	FL	S	X	X	X		+L	+M	+M	+M	+L	+L	O	O	O	+M	M
Winter Wren	C	N	X	X	X		+L	+L	+M	+M	+L	+M	O	O	O	D	L
Long-billed Marsh Wren	U	–	X	X	X		O	+L	O	+L	O	O	O	O	O	O	L
Short-billed Marsh Wren	R	N	X	X	X		O	+L	O	+L	O	O	O	O	O	O	L
Mockingbird	U	S	X	X	X	X	O	+L	+L	+L	O	O	O	O	O	O	L
Catbird	C	–	X	X	X		O	+M	+M	+M	O	+L	O	O	O	+L	L
Brown Thrasher	FC	S	X	X	X		O	+L	+M	+M	O	+L	O	O	O	+L	L

(continued)

TABLE 3.08-1 (Cont'd)

	Scarcity (overall)	Geographic Trends	Seasonal Occurrence: Spring	Summer	Fall	Winter	Impact of Vegetation Removal: Within R.O.W. Short-term: Food	Cover	Within R.O.W. Long-term: Food	Cover	Adjacent to R.O.W. (Long-term): Food	Cover	During Construc. Disturbance	Post-Construc. Impact	Collision Hazard	Probable Net Change	Uncertainty
Robin	A	-	X	X	X	(X)	+M	+L	+L	-L	O	O	O	O	O	+L	L
Wood Thrush	FC	S	X	X	X		+L	-L	O	-L	O	+L	O	O	O	-L	M
Hermit Thrush	C	-	X	X	X	(X)	+L	-L	O	-L	O	+L	O	O	O	O	L
Swainson's Thrush	C	N	X	X	X		+L	-L	O	-L	O	+M	O	O	O	+L	M
Veery	C	-	X	X	X		+L	-L	O	-L	O	+L	O	O	O	+L	M
Bluebird	R	S	X	X	X		+L	-L	O	-L	O	+L	O	O	O	O	L
Golden-Crowned Kinglet	FC	N	X	X	X	X	O	-L	O	-L	O	O	O	O	O	O	L
Ruby-Crowned Kinglet	FC	N	X	X	X	X	O	-L	O	-L	O	O	O	O	O	O	L
Cedar Waxwing	FC	-	X	X	X	(X)	+L	-L	+M	-L	O	O	O	O	O	+L	L
Loggerhead Shrike	R	-	X	X	X		+M	-L	+L	+L	O	O	M	M	O	O	L
Starling	A	S	X	X	X	(X)	+M	O	+L	O	O	+L	O	O	O	O	L
Yellow-throated Vireo	R	S	X	X	X		O	-L	O	-L	O	O	O	O	O	O	L
Solitary Vireo	C	-	X	X	X		O	-L	O	-L	O	O	O	O	O	O	L
Red-eyed Vireo	A	-	X	X	X		O	-L	O	-L	O	O	O	O	O	O	L
Philadelphia Vireo	U	N	X	X	X		O	-L	O	+L	O	O	O	O	O	O	L
Warbling Vireo	U	S	X	X	X		+L	-L	O	-L	O	O	O	O	O	O	L
Black & White Warbler	C	-	X	X	X		+L	-L	O	-L	+L	+L	O	O	O	+L	M
Tennessee Warbler	FC	N	X	X	X		-L	-L	O	-L	+L	O	O	O	O	O	L
Nashville Warbler	C	-	X	X	X		-L	-L	+L	+M	+L	+L	O	O	O	+L	L
Parula Warbler	C	-	X	X	X		-L	-L	O	-L	O	O	O	O	O	O	M
Yellow Warbler	FC	S	X	X	X		-L	-L	+L	+M	O	O	O	O	O	+L	M
Magnolia Warbler	A	N	X	X	X		-L	-L	+L	+M	+L	+M	O	O	O	+L	L
Cape May Warbler	FC	N	X	X	X		-L	-L	O	-L	O	O	O	O	O	O	L
Black-throated Blue Warbler	C	-	X	X	X		-L	-L	O	-L	O	O	O	O	O	O	M
Myrtle Warbler	C	N	X	X	X		-L	-L	O	-L	O	O	O	O	O	O	L
Black-throated Green Warbler	C	N	X	X	X		-L	-L	O	-L	O	O	O	O	O	-L	M
Blackburnian Warbler	C	N	X	X	X		-L	-L	O	-L	O	O	O	O	O	-L	M
Chestnut-sided Warbler	A	S	X	X	X		-L	-L	+L	+M	O	+L	O	O	O	+L	L
Bay-breasted Warbler	FC	N	X	X	X		-L	-L	O	-L	+L	O	O	O	O	O	L
Blackpoll Warbler	U	N	X	X	X		-L	-L	+L	-L	+L	+L	O	O	O	O	L
Pine Warbler	R	S	X	X	X		+L	+L	O	+L	O	O	O	O	O	+L	L

(continued)

TABLE 3.08-1 (Cont'd)

	Scarcity	Geographic Trends	Seasonal Occurrence: Spring	Seasonal Occurrence: Summer	Seasonal Occurrence: Fall	Seasonal Occurrence: Winter	Impact of Vegetation Removal: Within R.O.W., Short-term: Food	Within R.O.W., Short-term: Cover	Within R.O.W., Long-term: Food	Within R.O.W., Long-term: Cover	Adjacent to R.O.W., Long-term: Food	Adjacent to R.O.W., Long-term: Cover	During Construc. Disturbance	Post-Construc. Impact	Collision Hazard	Probable Net Change	Uncertainty
Palm Warbler	R	N	X	X	X		-L	-L	O	O	O	O	O	O	O	O	L
Ovenbird	A	–	X	X	X		-L	-L	-L	-L	-L	+L	O	O	O	-L	M
N. Waterthrush	FC	–	X	X	X		+L	-L	O	-L	O	O	O	O	O	O	L
Mourning Warbler	FC	N	X	X	X		-L	-L	+L	+M	+L	+L	O	O	O	+L	L
Yellowthroat	A	–	X	X	X		+L	+L	+M	+H	+L	+L	O	O	O	+H	L
Wilson's Warbler	U	N	X	X	X		-L	-L	+L	+L	O	O	O	O	O	O	M
Canada Warbler	FC	N	X	X	X		-L	-L	O	+L	O	+L	O	O	O	+L	M
American Redstart	A	–	X	X	X		-L	-L	O	-L	O	O	O	O	O	+L	M
House Sparrow	C	S	X	X	X	(X)	+L	O	O	O	O	O	O	O	O	O	L
Bobolink	FC	S	X	X	X		-L	+L	O	O	O	O	O	O	O	O	L
Eastern Meadowlark	C	–	X	X	X		-L	+L	+L	O	O	O	O	O	O	O	L
Red-Winged Blackbird	C	–	X	X	X		+L	+L	+L	+L	O	O	O	O	O	O	M
Northern Oriole	FC	S	X	X	X		+L	-L	O	-L	+L	O	O	O	O	+L	L
Rusty Blackbird	FC	N	X	X	X		+L	+L	O	+L	O	O	O	O	O	O	L
Common Grackle	C	–	X	X	X		+L	-L	O	O	+L	O	O	O	O	O	L
Brown-Headed Cowbird	C	S	X	X	X		-L	+L	O	+L	O	+L	O	O	O	+L	M
Scarlet Tanager	FC	S	X	X	X		-L	-L	O	-L	O	O	O	O	O	O	L
Cardinal	R	S	X	X	X	X	-L	-L	+L	+L	O	+L	O	O	O	O	L
Rose-breasted Grosbeak	C	–	X	X	X		-L	-L	+L	+L	O	+M	O	O	O	+L	L
Indigo Bunting	FC	S	X	X	X		-L	-L	+L	+M	O	O	O	O	O	+L	L
Evening Grosbeak	C	N	X	X	X	(X)	+L	-L	+L	-L	O	O	O	O	O	O	L
Purple Finch	FC	N	X	X	X	(X)	+L	-L	O	-L	O	O	O	O	O	O	L
Pine Grosbeak	U	N	X	X	X	(X)	+L	-L	O	-L	O	O	O	O	O	O	L
Pine Siskin	C	N	X	X	X	(X)	+L	-L	O	-L	O	O	O	O	O	O	L
American Goldfinch	C	–	X	X	X	(X)	+L	+L	+M	+M	O	O	O	O	O	+L	L
Red Crossbill	U	N	X	X	X	(X)	+L	-L	O	-L	O	O	O	O	O	O	L
White-Winged Crossbill	U	N	X	X	X	(X)	+L	-L	O	-L	O	O	O	O	O	O	L
Rufous-Sided Towhee	C	S	X	X	X		O	+L	+M	+M	O	+L	O	O	O	+L	M
Savannah Sparrow	FC	–	X	X	X		O	+L	+L	+L	O	O	O	O	O	O	L
Vesper Sparrow	U	S	X	X	X		O	+L	+L	+L	O	O	O	O	O	O	M

(continued)

TABLE 3.08-1 (Cont'd)

	Scarcity (overall)	Geographic Trends	Seasonal Occurrence: Spring	Summer	Fall	Winter	Impact of Vegetation Removal: Within R.O.W.: Short-term: Food	Cover	Long-term: Food	Cover	Adjacent to R.O.W: Food	Cover	During Construc. Disturbance	Post-Construc. Impact	Collision Hazard	Probable Net Change	Uncertainty
Dark-Eyed Junco	FC	N	X	X	X	X	0	-L	+M	+M	+L	+M	0	0	0	+L	L
Chipping Sparrow	FC	S	X	X	X		0	-L	+L	+L	0	0	0	0	0	+L	M
Field Sparrow	FC	S	X	X	X		+L	+L	+L	+M	0	0	0	0	0	0	M
White-Throated Sparrow	A	N	X	X	X	(X)	+L	+L	+M	+H	+M	+M	0	0	0	+H	L
Lincoln's Sparrow	U	N	X	X	X		0	+L	+L	+M	+L	+L	0	0	0	+L	M
Swamp Sparrow	FC	-	X	X	X		0	+L	+L	+L	0	0	0	0	0	0	M
Song Sparrow	C	-	X	X	X	(X)	0	+L	+L	+M	0	0	0	0	0	+L	L
Rough-Legged Hawk	U	S				X	+M	-L	+L	0	0	0	0	M	M	0	M
Snowy Owl	R	N				X	+M	-L	+L	0	0	0	0	M	L	0	L
Common Redpoll	U	N				X	+L	+L	+L	+L	+L	0	0	L	0	+L	M
Tree Sparrow	C	N				X	+L	+L	+M	+M	+L	+L	0	L	0	+L	L
Snow Bunting	U	N				X	+L	+L	+L	+L	0	0	0	L	0	0	L
Snowshoe Hare	data inadequate	N				Resident Species	+L	+L	+M	+L	+M	+M	0	0		+M	L
Cottontail		S					+L	-L	+M	+M	+M	+M	0	0		+M	M
Deer		S					+L	-M	+M	-L	+M	0	L	L		+L	L
Moose		N					-L	-L	+M	-L	+M	0	L	L		+M	L
E. Cougar		N					+L	-L	+L	-L	+L	0	H	H		0	H
Parascalops breweri		-					-L	0	0	0	0	0	L	0		0	H
Condylura cristata		-					-L	0	0	0	0	0	L	0		0	H
Sorex cinereus		-					0	0	0	+L	0	0	L	0		0	H
Sorex fumeus		-					-L	-L	-L	-L	0	0	L	0		-L	H
Sorex palustris		-					0	-L	0	0	0	0	L	0		0	M
Microsorex hoyi		N					0	0	0	0	0	0	L	0		0	H
Blarina brevicauda		-					0	0	0	0	0	0	L	0		0	H
Myotis lucifugus		-					+L	-L	+L	-L	+L	+L	0	0		0	H
M. Keeni		-					+L	-L	+L	-L	+L	+L	0	0		0	H

(continued)

	Scarcity	Geographic Trends	Seasonal Occurrence: Spring	Summer	Fall	Winter	Impact of Vegetation Removal: Within R.O.W.: Short-term Food	Short-term Cover	Long-term Food	Long-term Cover	Adjacent to R.O.W.: Long-term Food	Long-term Cover	During Construc. Disturbance	Post-Construc. Impact	Collision Hazard	Probable Net Change	Uncertainty
<u>Lasionycteris noctivagens</u>		-					+L	-L	+L	-L	+L	+L	0	0		0	H
<u>Pipistrellus subflavus</u>		S					+L	-L	+L	-L	+L	+L	0	0		0	H
<u>Eptesicus fuscus</u>		-					+L	-L	+L	-L	+L	+L	0	0		0	H
<u>Lasiurus borealis</u>		-					+L	-L	+L	-L	+L	+L	0	0		0	H
<u>L. cinereus</u>		-					+L	-L	+L	-L	+L	+L	0	0		0	H
<u>Myotis subulatus</u>		S					+L	-L	+L	-L	+L	+L	0	0		0	H
Black Bear		N					-L	-L	+H	-L	+L	0	L	L		+L	L
Racoon		-					0	-L	+L	-L	0	+L	0	0		0	M
Marten		N					+L	-L	+L	0	+M	+L	M	L		0	M
Fisher		N					+L	-L	+L	0	+M	+L	L	0		0	M
<u>Mustela ermina</u>	data inadequate	-			Resident		+L	+L	+M	+L	+M	+L	L	0		+M	L
<u>M. frenata</u>		S					+L	+L	+M	+L	+M	+L	L	0		+M	M
Mink		-					0	+L	0	+L	0	0	L	0		0	M
Otter		-					-L	0	0	0	0	0	L	0		0	L
Skunk		-					+L	+L	+M	+L	+L	+L	0	0		+M	L
Red Fox		-					+M	+L	+L	0	+L	0	L	0		+L	L
E. Coyote		S					+M	+L	+L	0	+L	0	L	0		+L	L
Canada Lynx		N					+L	-L	+L	0	+M	+L	M	L		+L	M
Bobcat		N					+L	-L	+L	0	+M	+L	M	L		+L	M
Woodchuck		S					+L	0	+L	0	+L	0	0	0		0	L
Chipmunk		-					+L	0	+L	+L	+L	+L	0	0		+L	M
Red Squirrel		-					-L	+L	-L	-L	0	+L	0	0		0	M
Gray Squirrel		S					-L	-L	-L	-L	0	+L	0	0		0	L
N. Flying Squirrel		-					0	-L	0	-L	0	+L	0	0		0	M
S. Flying Squirrel		S					0	-L	0	-L	0	+L	0	0		0	L
Beaver		-					+L	0	+M	0	+L	0	L	L		+L	M
Muskrat		S					+L	0	+L	0	0	0	L	L		0	M

(continued)

TABLE 3.08-1 (Cont'd)

	Scarcity	Geographic Trends	Seasonal Occurrence: Spring	Summer	Fall	Winter	Impact of Vegetation Removal: Within R.O.W.: Short-term: Food	Cover	Long-term: Food	Cover	Adjacent to R.O.W.: Food	Cover	During Construc. Disturbance	Post-Construc. Impact	Collision Hazard	Probable Net Change	Uncertainty
Peromyscus maniculatus		-					+M	+L	+L	+L	0	+L	0	0		+L	H
P. leucopus		S					+M	+L	+L	+L	0	+L	0	0		+L	H
Synaptomys cooperi		-					+M	+L	+L	+L	0	+L	0	0		+L	H
Clethrionomys gapperi		-					+M	+L	+L	+L	0	+L	0	0		+L	H
Microtus pennsylvanicus		-					+M	+L	+L	+L	0	+L	0	0		+L	H
Pitymys pinetorum		S					+M	+L	+L	+L	+L	+L	0	0		+L	H
Mus musculus		S					+M	+L	+L	+L	+L	+L	0	0		+L	H
Zapus hudsonicus		-					+M	+L	+L	+L	+L	+L	0	0		+L	H
Napeozapus insignis		-					+M	+L	+L	+L	+L	+L	0	0		+L	H
Rattus norvegicus		S					+M	+L	+L	+L	+L	+L	0	0		+L	H
Porcupine		N					-L	-L	-L	+L	0	+L	0	0		0	M
Common Snapping Turtle	data inadequate	S		Resident			0	0	0	0	0	0	0	0		0	L
Wood Turtle		S					+L	+L	+L	+L	0	0	0	0		0	M
E. Painted Turtle		S					0	0	0	0	0	0	0	0		0	L
Blanding's Turtle		S					0	0	0	0	0	0	0	0		0	L
Box Turtle		S					+L	+L	+L	+L	0	0	0	0		0	M
Musk Turtle		S					0	0	0	0	0	0	0	0		0	L
Spotted Turtle		S					0	0	0	0	0	0	0	0		0	L
N. Water Snake		S					0	0	0	0	0	0	0	0		0	L
E. Garter Snake		S					+M	+M	+L	+M	+L	+L	0	0		+L	L
N. Ribbon Snake		S					+M	+M	+L	+M	+L	+L	0	0		+L	L
Red-bellied Snake		S					+M	+M	+L	+M	+L	+L	0	0		+L	L
Green Snake		S					+M	+M	+L	+M	+L	+L	0	0		+L	L
Milk Snake		S					+M	+M	+L	+M	+L	+L	0	0		+L	L
Black Racer		S					+M	+M	+L	+M	+L	+L	0	0		+L	L
Red-Spotted Newt		-					0	-L	0	-L	0	+L	0	0		0	H
Blue-Spotted/Jefferson Salamander		-					0	-L	0	-L	0	+L	0	0		0	H
Spotted Salamander		-					0	-L	0	-L	0	+L	0	0		0	H
Dusky Salamander		S					0	-L	0	-L	0	+L	0	0		0	H

(continued)

TABLE 3.08-1 (Cont'd)

	Scarcity	Geographic Trends	Seasonal Occurrence: Spring	Seasonal Occurrence: Summer	Seasonal Occurrence: Fall	Seasonal Occurrence: Winter	Impact of Vegetation Removal: Within R.O.W., Short-term: Food	Within R.O.W., Short-term: Cover	Within R.O.W., Long-term: Food	Within R.O.W., Long-term: Cover	Adjacent to R.O.W., Long-term: Food	Adjacent to R.O.W., Long-term: Cover	During Construc. Disturbance	Post-Construc. Impact	Collision Hazard	Probable Net Change	Uncertainty
Spring Salamander		S					0	-L	0	-L	0	+L	0	0		0	H
Red-backed Salamander		-					0	-L	0	-L	0	+L	0	0		0	H
Two-lined Salamander		-					0	-L	0	-L	0	+L	0	0		0	H
4-toed Salamander		S					0	-L	0	-L	0	+L	0	0		0	H
Marbled Salamander		S					0	-L	0	-L	0	+L	0	0		0	H
American Toad	data inadequate	-		Resident			0	-L	0	-L	0	+L	0	0		0	M
Spring Peeper		-					0	-L	0	-L	0	+L	0	0		0	M
Gray Tree Frog		S					0	-L	0	-L	0	+L	0	0		0	M
Green Frog		-					0	-L	0	-L	0	+L	0	0		0	M
Bullfrog		S					0	-L	0	-L	0	+L	0	0		0	M
N. Leopard Frog		-					0	-L	0	-L	0	+L	0	0		0	M
Pickerel Frog		-					0	-L	0	-L	0	+L	0	0		0	M
Mink Frog		N					0	-L	0	-L	0	+L	0	0		0	M
Wood Frog		-					0	-L	0	-L	0	+L	0	0		0	M
Fowler's Toad		S					0	-L	0	-L	0	+L	0	0		0	M

within the right-of-way assumed a condition of increased barren ground, piled slash, and grasses--somewhat resembling the "other fields" cover type. Long-term impacts within the right-of-way assumed that vegetation could grow to the greatest height allowable, thus resembling typical forest regeneration stages, but with few snags. Long-term impacts adjacent to the right-of-way assumed an increased layer of herbaceous and shrubby vegetation in the adjacent forest within 20 feet of the edge, and increased wind damage to trees along the edge.

Disturbance impact during construction was assumed to be of higher intensity but shorter duration than disturbance impact after constru-tion. Collision hazard was assumed to be greatest among large birds, birds that concentrate along narrow migration routes (e.g., many water-birds), and breeding birds having nocturnal aerial display. It was assumed to be least among relatively sedentary, ground dwelling, nonmigratory species (e.g., grouse).

"Probable Net Change" weighs all the impacts on food and cover, and comes up with an overall impact prediction.

3.08.4 Impacts from Increased Interspersion

The frequent interspersion of varying cover is widely believed to enhance the area's value to wildlife (Leopold 1933). This interspersion creates ecotones or "edges," and these act synergistically to enhance both the value of the forest and the value of the open land (defined for purposes of this discussion as vegetative cover less than 30 feet tall).

Edges provide many species with food and dense cover in close association. Forest species may visit the edge because it can provide a source of food not available in the forest, including insects, herbacious vegetation, some species of woody browse, berries, etc. Open land species may visit the edge because it can provide escape or shelter. Therefore, edges are usually diverse and productive habitats (Leopold 1933). Where edges form a wavy, irregular pattern, both horizontally and vertically, the area of the edge is maximized. However, the effect of any increase in the amount of edge will ultimately depend on the existing balance between food and cover in a specific local area, and data are lacking in this regard.

The regeneration habitat created by the right-of-way, the edge associated with it, and the edge associated with access roads, will usually benefit wildlife diversity and productivity. This effect will be most noticeable in regions which are mostly forested, but it is very species-specific. Analysis of edge effects is presented on a species basis in table 3.08-1.

Recent discussion in theoretical ecology have focused on the possibility that some kinds of edges, in some situations, are not as beneficial as was once thought. Many ecologists (e.g. Whitcomb 1977) feel that serious fragmentation of large blocks of habitat by clearing surrounding land can lead to a long-term loss of species in these blocks.

Fragmentation creates "habitat islands," and bird species which breed on these forest islands tend to be plagued with more egg predators, brood parasites, and non-native nest-hole competitors (Whitcomb et al. 1976). Most vulnerable are ground-nesting and hole-nesting species, and neo-tropical migrants (e.g., warblers and flycatchers).

Little is known about how small an "island" may become before it begins to lose species, or, similarly, how wide the "ocean" of cleared land around it must become to effectively isolate it. Some preliminary evidence suggests that forest "islands" of less than 400 acres (and certainly those less than 50 acres) are rather poorly populated unless they are connected to larger tracts of forest by a corridor of forest habitat (MacClintock et al., 1976).

Few implications for Dickey-Lincoln School transmission facilities can be drawn from such "island biogeographic" studies, because experimental evidence of these effects is still inadequate. Still, there is the slight possibility that the 150-foot right-of-way and access roads might be sufficiently wide to isolate some forest tracts into "islands." The cummulative effect of this impact could be great. It would be most likely to occur in landscapes already highly fragmented, such as in western Vermont.

3.08.5 Vegetation Control Impacts

Vegetation control will alter wildlife habitat, but this impact will depend on which control practices are chosen. These include broadcast spraying of herbicides, selective spraying of herbicides to basal or foliar areas of plants, hand or mechanical cutting of vegetation, planting other vegetation, and combinations of practices.

Broadcast spraying causes the most severe impact on wildlife, when compared to other control methods. (Egler 1953, 1957). In New Hampshire, a right-of-way subjected to herbicide treatment for more than 30 years proved to be less productive for wildlife (using tabulated counts of total observations of wildlife as well as the number of species observed) than adjacent forested areas. (Cavanagh, Olson, and Macriganis 1976). Bramble and Byrnes (1972, 1974) have also concluded that the broadcast spraying of 2, 4-D and 2,4,5-T on a right-of-way in central Pennsylvania produced the least amount of wildlife habitat when compared to several other procedures for right-of-way vegetation management and resulted in greatly reduced use of these areas by game species. Carvell (1976) concluded that broadcast spraying of 2,4-D and 2,4,5-T, when used regularly, results in the elimination or reduction of abundance of many woody plants, some of which are of high value as wildlife food and cover.

In contrast, maintenance operations that involve the selective control of vegetation that could interfere with operations can have a positive effect on some kinds of wildlife (Egler 1953, 1957; Arner 1977). Bramble and Byrnes (1972, 1974, 1976) found that use by deer and small game of right-of-way areas selectively sprayed with herbicides was greater than with other treatments. Gysel (1962) also concluded that food and cover not available on adjacent lands in Michigan were present on a selectively sprayed right-of-way. Mayer (1976) found that browse within a right-of-way was more heavily used than browse in adjacent, unimpacted woods, and habitat for upland game birds was better on the right-of-way than on nearby abandoned fields. Vegetation maintenance by hand or mechanical means would eliminate the risks of toxic herbicides, but would, subject wildlife to more disturbances.

3.08.6 Other Operation-related Impacts

The proposed action may impact wildlife populations through disturbances caused by increased human activity and off-road vehicle traffic. The area may be avoided by some species of wildlife. Game species and furbearers may be subjected to increased harvest pressure.

Electrical effects from the proposed lines are not expected to have any impact on wildlife (see section 3.18).

Powerline structures could serve as barriers to movement for a few mammals that are very sensitive to disturbance by man (Palman 1977). Powerlines may also cause wetland habitat to be avoided by nesting waterfowl.

It is possible that a small number of birds may collide with the wires or towers of the powerline. This potential varies among species and is treated on a specific basis in table 3.08-1.

Powerlines have been used by birds of prey for perching. Electrocution of birds sometimes occurs. Electrocution, however, has only been a problem on lower voltage lines where clearances between conductors are less. It is mainly a problem when only one pole is used for a tower (Hannum, Anderson, and Nelson 1974). The steel tower or H-frame wood pole design proposed for use would greatly reduce this possibility.

3.08.7 Specific Impacts on Species

White-tailed deer (Odiocoirleus virginianus)

Deer may both gain and lose habitat as a result of the proposed action through the alteration of deer wintering areas and a gain in food resources and non-wintering habitat. Dickenson and Garland (1974) said the quality and quantity of winter range are limiting factors that affect the Vermont deer herd. They said that in certain areas, less than 10 percent of the overall range serves as winter range and that this winter range is necessary for the survival of deer populations. Finally, they said that wintering areas could be destroyed or carrying capacities severly reduced by man's activities.

About 138 acres of known deer wintering areas are crossed by the proposed rights-of-way. An unknown number and acreage of deer wintering areas will be crossed by access roads.

The areas used by deer for wintering vary from year to year (Stevens, pers. comm.). Deer wintering areas shown as adjacent to the route may actually be on the route at the time of construction while some areas now shown as being on the route will be off it. Since deer wintering areas (at least in Maine) are usually situated in low-lying areas, and in proximity to brooks or streams, deer wintering areas lying along brooks crossed by the proposed route in the vicinity of these areas may be more likely to be impacted than those areas separated from the route by rises in elevation.

Other, unknown deer wintering areas may exist along the proposed route in areas not familiar to state biologists.

Impacts upon deer wintering areas may vary depending on how they are crossed. Maine officials oppose permanent openings through deer wintering areas that would reduce or destroy the value of the shelter. Under worst-case condition, wide permanent rights-of-way openings through central portions of deer wintering areas, containing only herbacious vegetation, could have long-term, severe impacts on deer populations over large areas. Under best-case analysis, narrow, shrubby openings adjacent to deer wintering areas may have a moderately beneficial impact upon deer populations because of the food value of these shrubs. In areas of deep snow, however, such as in Maine portions of the proposed route, these shrubs might not be available to deer due to deep snows. About as many deer wintering areas are expected to be harmed by right-of-way clearing as would be benefitted.

A second source of impact upon deer populations in wintering areas may be caused by increased human access with snowmobiles. In Maine, Hugie (1973) and Lavigne (1976) found that deer use snowmobile paths to get better access to winter food sources. Lavigne (1976) noted that deer adjust to snowmobile traffic. Dorrance, Savage, and Huff (1975) hypothesized that the displacement of does by snowmobile traffic from even small segments of their home range is detrimental, where the home range is of poor quality and when the winter is severe. However, they also concluded that during less severe winters, in average or good deer habitat, the effect of snowmobiles may be negligible. Snowmobile trails are shown in appendix I, map volume.

Transmission line construction and operations may impact deer habitat other than wintering areas. Short-term impacts from construction will destroy vegetation and slightly alter local drainage patterns. Access roads will cause permanent loss of food and shelter. Long-term impacts of the right-of-way upon non-wintering habitat will be generally beneficial, depending upon the kind of vegetation that develops on the right-of-way.

White-tailed deer have responded favorably to certain practices of transmission line vegetation management (Bramble and Byrnes 1955, 1972, 1974, 1976; Gysel 1962). These practices develop a stable shrub cover on rights-of-way. Deer have also responded favorably in Maine to shrubby growth following strip clearcuts (Rinaldi 1970).

In summary, a potential exists for moderate to severe long-term adverse impacts on deer populations of regions surrounding the proposed route. However, with only selective removal of vegetation, moderately beneficial impacts to deer populations may result.

Moose (*Alces alces*)

Potential impacts on moose have not been well documented, however, the Canadian Wildlife Service believes that the food supply is the major factor limiting moose in Canada. The supply of winter browse, mainly small trees and tall woody shrubs such as willow is most important. Wetlands impacts may either create or destroy aquatic vegetation that moose feed on in summer. This impact will depend upon the existing characteristics of each wetland, as well as the amount of sedimentation created by right-of-way construction. The loss of food supply may be locally significant. Sources of food will be permanently lost if site-specific characteristics and vegetation management of the right-of-way prohibit the natural re-establishment of woody vegetation. If, however, a growth of tall shrubs and young trees is fostered, moose populations may be benefited.

Impacts upon other species of wildlife may result in secondary impacts upon moose. Any beneficial impacts causing increase in populations of white-tailed deer or, to a much lesser degree, snowshoe hares (*Lepus americanus*) may result in increased competition between these species and moose. However, this competition may not be significant because moose can reach higher for food than either deer or hares. In addition, moose are more mobile in winter than deer.

Moose habitat may be slightly benefited by the transmission line, while populations may suffer adverse impacts from removal of vegetation by access roads, increased populations of other animals, and increased illegal harvest resulting from increased access.

Black bear (*Ursus americanus*)

Black bear may suffer local, adverse impacts from the loss or disturbance of potential denning sites directly on the proposed route. However, the increased windthrow of timber, especially in rocky areas, may create new denning sites next to the route. The short-term loss of secondary vegetation may temporarily reduce the amount of food on the right-of-way and permanently reduce the food supply where ground is crossed by access roads.

The presence of humans during construction and the potential for increased disturbance and greater accessibility may initially cause bear to avoid certain areas. However, bear may soon become accustomed to human disturbance.

If the right-of-way becomes vegetated with herbicide-tolerant grasses and herbacious vegetation, this vegetation may replace preferred foods. If, however, vegetation providing food for bear is fostered by maintenance techniques (such as blackberry, raspberry and blueberry), bear will be benefited.

Therefore, assuming that the right-of-way will support beneficial food plants, a slightly beneficial long-term impact will result.

Canid Predators

This group includes the red fox (Vulpes fulva), coyote (Canis latrans), and some gray fox (Urocyon cinereoagentues) and perhaps eastern timber wolf (Canis lupus). Richens and Hugie (1974) say that coyotes have frequently responded to habitat changes and to animal control programs by extending their range. Palman (1977) found that coyotes were attracted to disturbed sites along Interstate Highway 95 in northern Maine. Foxes also were attracted to disturbed areas next to the highway.

Although some denning sites may be destroyed on the proposed route, the preliminary data indicate that coyote and fox populations may be benefited by the proposed action. The extent of this impact may be partially determined by the impacts upon prey species such as small mammals. However, past impacts to other wildlife species due to increased population of canid predators, especially coyotes, have been a matter of considerable debate (Senecal 1977).

The wolf, which requires areas remote from human disturbance, may be adversely impacted by the proposed action.

Felid predators

Species in this category include the bobcat (Lynx rufus) and the Canada lynx (Lynx canadensis). The eastern cougar (Felis concolor cougari) is listed by the Federal government as endangered (DOI 1976).

In the past, wild cats have suffered from overexploitation by man (Keith 1977). Increased human accessibility may result in further harassment of these species. If unmolested, however, the Canada lynx is surprisingly tolerant of human settlement (Keith 1977).

Any impacts upon prey species may limit populations of wild cats. The bobcat feeds on a variety of prey. The Canada lynx, however, likes to feed mostly on snowshoe hares.

Construction disturbances may temporarily impact wild cat populations. Increased access may provide for increased harvesting. However, it is more probable that long-term beneficial impacts upon prey species will benefit these wild cats.

Research on transmission line impacts to lynx and bobcat, however, is lacking.

Mustelid furbearers

Species included within this category are fisher (Martes pennanti), marten (M. americanus), long-tailed weasel (Mustela frenata), short-tailed weasel (M. ermina), mink (M. vison), river otter (Lutra canadensis) and striped skunk (Mephitis mephitis). Since these species are wide-ranging, any impacts may be significant over a wide area.

Some of these species may be sensitive to disturbance from construction operations, as well as any increased accessibility. For example, although Coulter (1960) stated that fisher may not be as shy as formerly believed, Palman (1977) found that fisher did tend to avoid areas next to I-95 in northern Maine. Reactions to increased human presence may differ between species of mustlids. Marten, also, show preferance for remote areas (Burt and Grossehleider 1964).

Both fisher and marten may be adversely impacted by loss of wooded habitat, though marten may be more susceptable to habitat loss than fisher (Coulter 1959). Since fisher and marten den in dead trees or logs (Burt and Grossenheider 1964), the removal of dead trees along the right-of-way may adversely impact fisher populations. Additional denning sites may be created, however, by inceased windthrow of old trees in rocky soils.

Short-tailed and long-tailed weasels may not be as adversely impacted by the proposed action. Palman (1977) found weasels are attracted to disturbed sites along I-95 in Maine. In New Hampshire, more weasels were observed using line rights-of-way than adjacent habitats (Cavanagh, Olson, and Macrigeanis 1976). In the short-term, habitat may be altered adversely by the proposed action. If, however, the habitat under the line fosters small mammal populations, beneficial impacts to weasels may result. Any adverse wetland impacts may adversely impact long-tailed weasel populations.

Mink and otter may also be impacted through the loss, gain, or alteration of wetland habitats. Skunks may be benefited by the addition of early successional stages of vegetation.

Rodent furbearers

Species in this category include the muskrat (Ondatra zibethica) and beaver (Castor canadensis). They may be adversely impacted by the alteration of wetlands and increased exploitation due to increased accessibility. Aleksink (1974) said that human activity has not significantly affected the distribution of muskrats, except for the draining of marshes or swamps for agriculture or other purposes. The drainage of wetland areas is not expected with this project. The destruction of large areas of aspen, however, may impact beaver food supply. Impacts due to increased accessibility and exploitation may be insignificant. Controls are placed on harvesting these species by state agencies.

If adverse impacts occur upon these species, secondary adverse impacts will fall on other species of wildlife, including waterfowl, shorebirds, mink, and long-tailed weasels.

Rodent furbearers probably will not be impacted by increased disturbance during construction. Beaver, for example, have been known to construct dams adjacent to highways.

Food for rodent furbearers would be created by the growth of sapling sized aspen and willow, which supply food for beaver, or by a diversity of herbacious growth, which supplies food for muskrats. Therefore, impacts upon the rodent furbearers can be expected to be insignificant to mildy beneficial.

Snowshoe hare (Lepus americanus)

Snowshoe hare habitat may be created or destroyed by the proposed action. In the short-term, destruction of regenerating softwood-hardwood habitat may cause locally adverse impacts upon snowshoe hare populations. If the present vegetation along the right-of-way is replaced with herbicide tolerant grass and herbacious vegetation, a locally significant and adverse long-term impact may result. If, however, the development of woody and diverse herbacious vegetation is fostered, snowshoe hare habitat may be benefitted. Rinaldi (1970) found snowshoe hare forage increased in strip clearcuts in central Maine.

Racoon (Procyon lotor)

The raccoon is well adapted to human disturbance and may benefit from the proposed action. Gilbert (1975) postulated that the raccoon may continue to thrive even in the midst of suburbia due to its ability to adjust so effectively to changes.

Although dead trees used by raccoons for denning may be destroyed, other trees may be windthrown and otherwise killed along the right-of-way, increasing denning sites. While some forms of herbicide management on the right-of-way would produce vegetation not valuable to raccoons, the fostering of shrubby, berry-producing vegetation on the right-of-way may benefit raccoon populations.

Other mammals

For small mammals, Palman (1977) found no difference in total numbers between disturbed sites next to I-95 and forested control sites. However, differences in species composition were noticed. For example, redbacked voles (Clethrionomys gapperi) were found more frequently in control sites. Species diversity of small mammals also varied between disturbed sites and mature forest, being higher in disturbed sites. Schreiber in 1976 found small mammal communities along powerlines tended to exhibit a reasonable degree of habitat specificity, showing distributions within forest, edge, and right-of-way habitats (Schreiber et. al., 1976). The authors were, however, concerned that continuous linking of communities through powerlines may foster additional disease problems, as well as induce additional changes in the species composition of an area. The authors were especially concerned that the abruptness of change due to powerline construction may not allow enough time for stable change of natural ecosystems through natural processes, including evolution and natural succession.

Small mammals in black spruce forests subjected to clearcuts have shown similar trends. Total numbers did not change, but species composition did (Martell and Radvangi 1977).

Impacts upon mammal populations will vary, depending upon the vegetation management techniques. Under favorable circumstances, a diverse layer of herbacious vegetation or woody shrubs may benefit species adapted to fields and earlier successional stages (e.g., deer mouse, meadow vole) and adversely impact forest species, like the redbacked vole. The development of herbicide tolerant grasses will benefit neither group. Felling of large seedbearing trees during construction could provide small mammals with a temporarily large amount of food and shelter, and cause large but short-term population increases. In any event, impacts will be mostly local.

Although the concern has been voiced that rights-of-way serve as barriers to movement of small mammals, Schreiber and Graves (1977) found that powerlines did not serve as barriers to the movements of deer mice. Palman (1977) found that, in general, I-95 did not restrict small mammals. However, in winter, movement of the small mammals could be restricted where snow has been heavily compacted by snowmobiles (especially in areas of minimal snow depths in Vermont and western New Hampshire). Small mammals are believed to be stressed by snow compaction (Schmid 1971, Jarvinen and Schmid 1971). Also, small mammals which travel on top of the snow in winter may be reluctant to cross the right-of-way if the vegetative cover is short and covered by deep snows, thereby offering no protection from predators.

Waterfowl

Waterfowl, including Canada geese, mallards, black ducks, greenwinged teal, bluewinged teal, wood ducks, ringnecked ducks, goldeneyes, hooded mergansers, and common mergansers, will be predominatly affected through wetland impacts. Alterations in upland sites may impact feeding or nesting habitat for a few species in a minor way.

Sedimentation in wetlands due to construction may cause water quality changes in wetlands, impacting the vegetational structure. This could cause adverse impacts due to a loss of food. The availability of food, however, could increase depending upon existing cover and water quality in individual wetlands and the amount of sedimentation.

The alteration of adjacent terrestrial habitat may affect waterfowl populations adversely by impacting forested areas producing mast used by black ducks, wood ducks, and greenwinged teal; causing a loss of suitable cover for nesting of ground-nesting waterfowl; or by destroying mature trees containing cavities suitable for wood ducks or merganser nests. However, the clearing of forests next to streams and wetlands could improve shrubby cover for waterfowl. Increased wind damage to trees could create more nesting cavities. Also, if small areas of wetlands must be filled to support towers, these "islands" may be preferred by nesting waterfowl and calving deer (Thorsell 1976). Disturbance due to construction, maintenance, or increased accessibility may cause nesting habitat for waterfowl to become unproductive.

Instances of waterfowl and other large birds colliding with wires, especially during courtship rituals, have been recorded (Cornwall 1971), and could present an additional unmitigatable source of long-term mortality to waterfowl populations.

Thus, although the extent of impacts to waterfowl populations is unknown, impacts could adversely effect waterfowl populations slightly. Due to a general reduction in waterfowl habitat, any adverse impacts upon waterfowl populations would be significant.

Upland and shore game birds

Species in this category include ruffed grouse (Bonasa umbellus), woodcock (Philohela minor = Scolopax minor of Edwards 1974), pheasant (Phasianus colchicus), Virginia rail (Rallus limicola), sora rail (Porzana carolina), and common snipe (Capella gallinago delicata = Gallinago gallinago of Edwards 1974).

Ruffed grouse may suffer adverse, short-term impacts due to loss of early-successional habitat during and immediately following construction. However, areas underneath the powerline may regenerate to vegetation beneficial to ruffed grouse. Some of these plants serve as food for grouse, including hazelnut (Corylus sp.), clover (Vibernum sp.), wild strawberry (Fragaria sp.), serviceberry (Amelanchier sp.), wintergreen (Gauthuria procumbons), sumac (Rhus typhina), and others (Brown 1946). Other food plants beneficial to grouse which may have to be controlled at some point due to their height include aspen (Populus sp.), willow (Salix sp.), and birch (Betula sp.). If this vegetation is fostered along the powerline, the spring, summer, and autumn food of ruffed grouse and ground cover may be increased. If vegetation management does not foster favorable plant species for grouse, areas within or adjacent to impacted areas may be adversely impacted.

Other adverse impacts upon ruffed grouse include the destruction of mature aspen used for winter food and sites used for courtship and territorial displays by male grouse. New sites may be created if timber felled during construction is left lying in adjacent wooded areas.

Habitat for woodcock may be lost initially because of construction of the powerline, but increased in the long-run. Since alders (Alnus sp.) and young aspen (Populus sp.) are used during the day by woodcock in New England (Sheldon 1967, Owen 1977), the removal of these may constitute a loss of habitat. However, since these plants are common in early successional stages, areas disturbed by construction will probably regenerate into usable woodcock habitat.

Woodcock populations will also benefit from the creation of sparsely vegetated, areas on the right-of-way, since woodcock use these areas for courtship displays in the spring and roosting in the summer (Sheldon 1967). Pheasant populations, already low in this region, will not be impacted by the proposed action.

The impacts upon the Virginia rail, sora rail, and common snipe are related to their habitats, primarily wetlands. The Virginia rail nests in the sedge and cattail borders of freshwater marshes (Zimmerman 1977). The sora rail's habitat, includes wet, soggy marshes (Odom 1977). The common snipe's nesting habitat includes peat lands of the northern boreal forest. It also uses the edges of lakes and rivers, ditches, periodically inundated fields, and wet cattle pastures (Fogarty and Arnold 1977).

Birds of prey

This group includes hawks and owls. Impacts on these species will be related to changes in the availability of prey, destruction of nesting habitat, provision of perches, disturbance, and potential for electrocution, or collision with, electric wires.

The bald eagle (Haliaeetus leucocephalus) and osprey (Pandion haliaeetus) rely heavily on many kinds of fish for food. If some fisheries are impacted, these birds may adjust and take other kinds of fish. The eagle is currently being considered for listing as an endangered species by the Department of the Interior (DOI 1977). The osprey is listed as a species of concern by the National Audubon Society (Arbib 1976). Harmful impacts on these species would be significant.

Most species of hawks and owls rely heavily on small mammals for food. The creation of an earlier successional stage on the right-of-way may increase the food availabile to hawks and owls. In West Virginia, red-tailed hawks and kestrels were found to prefer transmission rights-of-way for hunting. Nest sites on or next to the right-of-way, however, may be destroyed or disturbed through construction operations. Maine officials consider construction operations within 330 feet to be detrimental to osprey and eagle nests. Disturbances near nest sites will be most critical in April-May for owls and bald eagles, and June-early July for ospreys, golden eagles, and most other hawks. Raptors nesting in remote areas are perhaps less accustomed to disturbance and, therefore, may suffer slightly more from disturbing activities near their nests.

Songbirds

The impact of the proposed line and access roads on forest dwelling songbirds may be seen essentially as a tradeoff. Population productivity will be lost due to destruction of nest-trees, the normal inhabitants of which will be displaced into adjacent forest habitat. If this adjacent habitat is similar to that studied by Stewart and Aldrich (1952), a direct loss in the breeding population may result, since adjacent habitat in the boreal forest frequently harbors a surplus of breeding males.

Balancing this postulated loss will be a possible tendency of forest edge-nesting individuals to have a larger, or more available food supply and, thus larger broods. Experimental evidence is presently insufficient to indicate the true impact of the right-of-way on most populations of forest songbirds.

Some groups of song birds stand to gain greatly by the right-of-way, depending on what maintenance practices are used. An abundant supply of berries, especially of the genus Rubus, will grow in many places on the right-of-way, providing food and cover for waxwings, catbirds, mourning warblers, yellowthroats, and other species. If brush is cut by hand during maintenance and is left piled on the right-of-way, it will provide nest sites for some wrens and sparrows. (It may also host some insects destructive to commercial timber). Moreover, a slight increase in the incidence of wind damage to mature trees will cause an increase in feeding and nesting habitat for snag-nesting species, such as woodpeckers, some owls, and chickadees. By increasing the sunlight reaching the floor of the adjacent forest, the understory there will grow thicker, and species such as Swainson's thrush and magnolia warbler will prosper. Still other species, such as the pine grosbeak and the black-backed three-toed woodpecker, seem to benefit from small clearings for reasons that are not apparent (Palmer 1948). And finally, even the towers may serve as nest sites for birds such as eastern kingbirds (Van Velzen 1971) and blackbirds.

Reptiles and amphibians (herptiles)

Due to the small home ranges of reptiles and amphibians, most adverse impacts will be local in extent. For those species (e.g., most salamanders) which require moist, shaded forest, removal of overstory or disturbance of the forest duff layer may cause initial adverse impacts. Removal of bank cover, siltation of temporal pools, and scouring from slight increases in runoff will also have a negative affect, especially in the headwaters of streams. However, as the fallen slash and logs begin to rot, they may provide a habitat for many salamanders, if ground temperatures have not been altered above specific species' tolerance limits by removal of the canopy. For those herptiles which prefer warm, exposed brushy and rocky areas (e.g., most snakes), the substitution of regeneration habitat for dense forest will have a positive affect. However, experimental evidence suggests that at least one herbicide (Atrazene) causes some herptile larvae to become less fertile (Beebe 1973) and more hyperactive. The latter effect causes the larvae to become selectively preyed upon (Cooke 1972).

Rare, Threatened, or Endangered Species

A recovery plan for the peregrine falcon, an endangered species, calls for its reintroduction into selected regions of the eastern United States. The proposed route would pass through the Connecticut River Valley-White Mountain region, which is given fourth priority within designation of 11 regions for restocking efforts. The recovery team considered this priority preliminary. It may be changed once more data is available on restocking efforts. (Bollengier, et al. 1976).

The eastern cougar, a federally defined endangered species that prefers mountainous, wilderness areas (Burt and Grossenheider 1964), may be impacted by the proposed action. Since the cougar does tend to avoid man, adverse impacts resulting from increased human disturbance may affect this species. Data are limited concerning the distribution and life history of this species in New England, so accurate predictions cannot be made.

Members of a recovery team for the Indiana bat, one other species listed by the Federal Government as endangered, considered the presence of caves suitable for hibernation as an important concern to the management of this species (Engel, et al. 1975). No caves are known to exist along the proposed route which is on the periphery of the bat's range. Impact upon this species is expected to be minimal. However, little knowledge exists on the summer habitat of the Indiana bat (Engel et al. 1975).

3.08.8 Site-specific Impacts

This section describes the site-specific habitat and disturbance impacts that were developed for each segment of the proposed route. These measures consist of a summary of the habitat change for (1) all wildlife species and (2) habitat value for species of special concern, and (3) game species. Species of special concern are those that are rare, threatened, endangered, decreasing, or otherwise highly significant and vulnerable according to state or federal agencies, National Audubon Society or the Center for Natural Areas. These species are shown in table 3-11 of appendix E. Species legally harvested (shot or trapped) in one or more of the three states, are also shown in table 3-11 of appendix E.

The habitat changes mentioned above are presented on a scale of highly positive (+5) to highly negative (-5). A measure of disturbance probability is included. This is a qualitative assessment of slight, low, moderate, high, or severe impacts on the remoteness qualities and needs of many species of wildlife. The number and size of deer wintering areas impacted are discussed, as are rare fish species.

Section 2 of appendix E contains information on methods employed to measure and assess the site-specific wildlife related impacts.

3.08.8.1 Dickey - Lincoln School - Fish River

Table 3.08-2 summarizes the relative impact the transmission route would have on the habitat of species of special concern, game species, and all wildlife species.

TABLE 3.08-2

WILDLIFE HABITAT IMPACTS[1]
DICKEY - LINCOLN SCHOOL - FISH RIVER

Impact Levels	Species SP. Concern: Miles Impacted	Species SP. Concern: Percent	Game Species: Miles Impacted	Game Species: Percent	All Wildlife: Miles Impacted	All Wildlife: Percent
Highly Positive +5	-	-	-	-	-	-
+4	-	-	-	-	-	-
+3	-	-	1.0 mi.	3%	-	-
+2	4.3 mi.	16%	6.7 mi.	23%	2.7 mi.	11%
+1	25.1 mi.	84%	18.9 mi.	64%	24.8 mi.	87%
0	-	-	-	-	-	-
-1	-	-	2.8 mi.	10%	1.9 mi.	2%
-2	-	-	-	-	-	-
-3	-	-	-	-	-	-
-4	-	-	-	-	-	-
Highly Negative -5	-	-	-	-	-	-

[1]Reference: Ecological Resources Impact Study, appendix E

The impact on the habitat of species of special concern, game species, and all wildlife species will be moderately positive. Ten percent of the route is considered to be of slight negative impact for both game species and two percent for all wildlife. This impact would occur primarily between Dickey Substation and Lincoln School Substation.

The magnitude and direction of all these impacts on habitat will strongly depend on the vegetation control methods used, and the specific ecological factors now limiting the wildlife population along this segment.

Five deer wintering areas which include 16.3 impacted acres are located between Dickey and Lincoln School Substations. These deer yards are near where the route crosses Casey Brook, Wiggins Brook, and Negro Brook. These yards will be impacted either positively or negatively depending on how the deer yard is crossed at the time of construction.

(For information on deer yard impacts see section 4.3.5 of appendix E.)

Table 3.08-3 shows the summary of disturbance impact for this segment of route.

TABLE 3.083

DISTURBANCE PROBABILITY[1]
DICKEY - LINCOLN SCHOOL - FISH RIVER

Impact Levels		Miles of Impact	Percent
Slight	1	-	-
Low	2	-	-
Moderate	3	-	-
High	4	8.6 mi.	28%
Severe	5	20.8 mi.	72%

[1]Reference: Ecological Resources Impact Study, appendix E

About 75 percent of the route was considered to have a high disturbance impact.

3.08.8.2 Dickey - Moose River

Table 3.08-4 summarizes the relative impact the route segment would have on species of special concern, game species, and all wildlife species.

TABLE 3.08-4

WILDLIFE HABITAT IMPACTS[1]
DICKEY - MOOSE RIVER

Impact Levels		Species Sp. Concern Miles Impacted	Species Sp. Concern Percent	Game Species Miles Impacted	Game Species Percent	All Wildlife Miles Impacted	All Wildlife Percent
Highly Positive	+5	-	-	-	-	-	-
	+4	-	-	-	-	-	-
	+3	-	-	3.0 mi.	3%	-	-
	+2	23.6 mi.	20%	34.9 mi.	29%	9.6 mi.	8%
	+1	54.8 mi.	46%	79.7 mi.	67%	105.2 mi.	89%
	0	-	-	-	-	-	-
	-1	39.2 mi.	33%	1.0 mi.	1%	3.8 mi.	3%
	-2	1.0 mi.	1%	-	-	-	-
	-3	-	-	-	-	-	-
	-4	-	-	-	-	-	-
Highly Negative	-5	-	-	-	-	-	-

[1]Reference: Ecological Resources Impact Study, appendix E

Impact on the preferred habitats of harvested species, on the habitat of species of special concern, and habitat of all species will be moderately positive. About 35 percent of the segment would have slightly negative impacts for species of special concern. These impacts would be most prevalent between Baker Lake and Dickey Substation.

Snags standing in a regenerating burn north of Cunliffe Brook, and the Big Bog, Little Bog, Sweeney Bog complex are of special concern.

Sixteen deer wintering areas (a total of 71 acres) are impacted on this segment. These yards will be impacted either positively or negatively depending on how the deer yard is crossed at the time of construction.

Table 3.08-5 summarizes disturbance impacts for this segment.

TABLE 3.08-5

DISTURBANCE PROBABILITY[1]
DICKEY - MOOSE RIVER

Impact Levels		Miles of Impact	Percent
Slight	1	-	-
Low	2	42.3 mi.	36%
Moderate	3	66.6 mi.	56%
High	4	9.7 mi.	8%
Severe	5	-	-

[1]Reference: Ecological Resources Impact Study, appendix E

Disturbances would be high near the Moose River because of impacts from snowmobiles.

3.08.8.3 Moose River - Moore

Table 3.08-6 summarizes the relative impact the segment will have on species of special concern, harvested species, and all wildlife species.

TABLE 3.08-6

WILDLIFE HABITAT IMPACTS[1]
MOOSE RIVER - MOORE

		Species Sp. Concern		Game Species		All Species	
Impact Levels		Miles Impacted	Percent	Miles Impacted	Percent	Miles Impacted	Percent
Highly Positive	+5	-	-	-	-	-	-
	+4	12.9 mi.	9%	1.6 mi.	1%	-	-
	+3	15.7 mi.	12%	13.0 mi.	10%	0.3 mi.	1%
	+2	33.3 mi.	24%	62.6 mi.	46%	41.9 mi.	31%
	+1	54.7 mi.	41%	51.8 mi.	38%	83.7 mi.	61%
	0	2.0 mi.	1%	2.0 mi.	1%	2.0 mi.	1%
	-1	17.5 mi.	13%	5.1 mi.	4%	8.2 mi.	6%
	-2	-	-	-	-	-	-
	-3	-	-	-	-	-	-
	-4	-	-	-	-	-	-
Highly Negative	-5	-	-	-	-	-	-

[1]Reference: Ecological Resources Impact Study, appendix E

The projected impacts on species of special concern for this segment is moderately to highly positive or beneficial. The area south of Groveton, N. H., where the route crosses the Connecticut River is considered to have very highly positive impacts due to significant gains in habitat value. The area near Moore Substation will have a slightly negative impact on habitat for species of special concern. The impact on harvested and all species will be highly to very highly positive. A heron rookery on Parmachenee Lake (two miles from the route) is of special concern.

The magnitude and direction of all these impacts on habitat will strongly depend on the vegetation control methods and the specific ecological factors now limiting wildlife populations in this area.

Sixteen deer wintering yards are crossed on 16 acres of the segment. The most important yards are: north of Beach Hill in the Upper Ammonoosuc River valley; one-fourth mile west of Cape Horn Mountain near Northumberland, N. H.; just south of Adden Hill; and along the Moore Reservoir. These deer wintering yards will be impacted either positively or negatively depending on the final route orientation with respect to the wintering areas at the time of construction.

Table 3.08-7 shows the summary of disturbance impacts for this segment of the route.

TABLE 3.08-7

DISTURBANCE PROBABILITY[1]
MOOSE RIVER - MOORE

Impact Levels		Miles of Impact	Percent
Slight	1	7.3 mi.	6%
Low	2	48.7 mi.	36%
Moderate	3	65.9 mi.	47%
High	4	14.2 mi.	11%
Severe	5	-	-

[1]Reference: Ecological Resources Impact Study, appendix E

3.08.8.4 Moore - Granite

Table 3.08-8 summarizes the relative impact on the habitat of species of special concern, game species, and all wildlife species.

TABLE 3.08-8

WILDLIFE HABITAT IMPACTS[1]
MOORE - GRANITE

		Species Sp. Concern		Game Species		All Species	
Impact Levels		Miles Impacted	Percent	Miles Impacted	Percent	Miles Impacted	Percent
Highly Positive	+5	-	-	-	-	-	-
	+4	-	-	-	-	-	-
	+3	1.0 mi.	3%	-	-	-	-
	+2	6.5 mi.	17%	4.0 mi.	11%	-	-
	+1	25.2 mi.	66%	31.0 mi.	81%	35.0 mi.	92%
	0	-	-	-	-	-	-
	-1	5.4 mi.	14%	3.1 mi.	8%	3.1 mi.	8%
	-2	-	-	-	-	-	-
	-3	-	-	-	-	-	-
	-4	-	-	-	-	-	-
Highly Negative	-5	-	-	-	-	-	-

[1]Reference: Ecological Resources Impact Study, appendix E

The impacts on species of special concern will be slight to moderately positive except for the area adjacent to Moore Substation. It will have a slightly negative impact on habitat. The impact on habitat of harvested species and all species will be slightly positive. The magnitude and direction of all these impacts on habitat will strongly depend on the vegetation control methods used and the specific ecological factors now limiting wildlife populations in this area.

Of special concern is the Pine Mountain Wildlife Management Area near where the route crosses the Montpelier River and the Blue Mountain area where red shouldered hawks and a pair of uncommon mourning warblers are believed to nest.

There are deer wintering areas south of Blue Mountain in the town of Ryegate, Vt., and near where the route crosses the Keenan Brook in the town of Groton, Vt.

Table 3.08-9 shows the summary of disturbance impact for this segment.

TABLE 3.08-9

DISTURBANCE PROBABILITY[1]
MOORE - GRANITE

Impact Levels		Miles of Impact	Percent
Slight	1	-	-
Low	2	-	-
Moderate	3	-	-
High	4	31.5 mi.	83%
Severe	5	6.6 mi.	17%

[1]Reference: Ecologocial Resources Impact Study, appendix E

The potential for increased disturbance on this segment is generally high. A severe rating has been given to that part of the route near and east of the Granite Substation.

3.08.8.5 Granite - Essex

Table 3.08-10 summarizes the relative impact on the habitat of species of concern, game species, and all wildlife species.

TABLE 3.08-10

WILDLIFE HABITAT IMPACTS[1]
GRANITE - ESSEX

		Species Sp. Concern		Game Species		All Species	
Impact Levels		Miles Impacted	Percent	Miles Impacted	Percent	Miles Impacted	Percent
Highly Positive	+5	-	-	-	-	-	-
	+4	3.0 mi.	7%	-	-	-	-
	+3	1.0 mi.	2%	-	-	-	-
	+2	10.9 mi.	25%	17.1 mi.	40%	4.9 mi.	11%
	+1	21.2 mi.	49%	21.7 mi.	50%	31.2 mi.	71%
	0	-	-	-	-	-	-
	-1	7.2 mi.	17%	4.5 mi.	10%	7.2 mi.	18%
	-2	-	-	-	-	-	-
	-3	-	-	-	-	-	-
	-4	-	-	-	-	-	-
Highly Negative	-5	-	-	-	-	-	-

[1]Reference: Ecological Resources Impact Study, appendix E

The impacts on the habitats of game species and species of special concern generally are positive for more than 80 percent of this segment. The impacts on the habitat of all species is moderately positive.

The magnitude and direction of these impacts on habitat will strongly depend on the vegetation control methods used and the specific ecological factors now limiting the wildlife population in this segment.

Twelve deer wintering yards covering 12.8 acres are crossed by the route. Some of these yards are just west of Barre, Vt., and near the Dog River between Barre and Mountpelier. A major deer wintering area covers several acres near Richmond, Vt.

Table 3.08-11 shows the summary of disturbance impact for this segment of route.

TABLE 3.08-11

DISTURBANCE PROBABILITY[1]
GRANITE - ESSEX

Impact Levels		Miles of Impact	Percent
Slight	1	-	-
Low	2	0.5 mi.	1%
Moderate	3	8.2 mi.	19%
High	4	27.1 mi.	63%
Severe	5	7.5 mi.	17%

[1]Reference: Ecological Resources Impact Summary, appendix E

About 80 percent of the route would have a significant high disturbance impact.

3.08.10 Summary of Wildlife Impact

The proposed action is expected to cause the following regionally significant impacts:

1. A continuous edge habitat would be created over a three-state region that includes some of the more remote forests in the northeastern United States. This edge habitat will benefit most terrestrial vertebrates, but a few will suffer irretrievable loss of habitat.

2. Some sensitive and important wildlife species in remote areas will be significantly stressed as a result of increased access afforded to off-road vehicles and commercial logging operations.

3. Habitats with a significant potential for harboring rare plants will be irretrievably altered by construction activity and long-term changes in microclimate on and very near the right-of-way.

4. Ecosystems of many streams will be subjected to possible, significant, local and long-term increases in sediment load. Unless mitigative measures are implemented fully, the value of several excellent coldwater fisheries will suffer.

Tables 3.08-12 and 3.08-13 show the total impact of wildlife disturbance impact for the proposed route.

TABLE 3.08-12

WILDLIFE HABITAT IMPACT SUMMARY[1]
PROPOSED ROUTE - ALL SEGMENTS

Impact Levels		Species Sp. Concern: Miles Impacted	Species Sp. Concern: Percent	Game Species: Miles Impacted	Game Species: Percent	All Species: Miles Impacted	All Species: Percent
Highly Positive	+5	-	-	-	-	-	-
	+4	15.9 mi.	4.4%	1.0 mi.	0.3%	-	-
	+3	17.7 mi.	4.8%	17.6 mi.	4.8%	0.3 mi.	.1%
	+2	78.6 mi.	21.5%	125.3 mi.	34.3%	59.1 mi.	16.2%
	+1	181.0 mi.	49.5%	203.1 mi.	55.6%	279.9 mi.	76.6%
	0	2.0 mi.	0.5%	2.0 mi.	0.5%	2.0 mi.	0.5%
	-1	69.3 mi.	19.0%	16.5 mi.	4.5%	24.2 mi.	6.6%
	-2	1.0 mi.	0.3%	-	-	-	-
	-3	-	-	-	-	-	-
	-4	-	-	-	-	-	-
Highly Negative	-5	-	-	-	-	-	-

[1]Reference: Ecological Resources Impact Study, appendix E

TABLE 3.08-13

DISTURBANCE PROBABILITY SUMMARY[1]
PROPOSED ROUTE - ALL SEGMENTS

Impact Levels		Miles of Impact	Percent
Very Low	1	7.3 mi.	2.0%
	2	91.5 mi.	25.0%
	3	140.7 mi.	38.5%
	4	91.1 mi.	25.0%
Very High	5	34.9 mi.	9.5%

[1]Reference: Ecological Resources Impact Study, appendix E

3.09 Socioeconomic Impacts

Social and economic impacts are of two types; general and site specific. General impacts refer to those impacts that can be measured but cannot be specifically located. In most cases, such impacts can be discussed only on a regional or state basis. Site-specific impacts refer to impacts that affect a designated landowner. In some cases, it is also possible to identify the location of impacts to a specific community.

3.09.1 General Impacts

3.09.1.1 Employment

Employment opportunities in the construction and maintenance of the proposed transmission line will occur during preconstruction, construction, operation, and maintenance. Due to the total length of the line and the time frame for construction, several simultaneous contracts will be let for the construction work. This will create a greater number of short-term employment opportunities.

Table 3.09-1 indicates the type of line to be constructed in each region, the approximate length of a section, and the estimated number of months required to complete that section. A month assumes a full working schedule of 20 days at 8 hours per day. Construction falls into two phases. Phase I includes the construction of access roads, surveying, and right-of-way clearing. Phase II includes construction of transmission structures and stringing. All of phase I work will be completed before phase II begins. Therefore, the total labor force at any one time will depend only on the phase in progress.

TABLE 3.09-1
ESTIMATED WORKING MONTHS FOR CONSTRUCTION BY SEGMENT[1]

Segment	Type of Line	Length Miles (avg.)	Phase I[2] Surveying, Clearing (months)	Phase II Tower, Line Construction (months)
Region I				
Subregion I-A	138 kV single wood[3]	40	6	6
Subregion I-B(a)	345 kV double circuit steel[4]	63	10	13
I-C(b)		63	10	13
(c)		63	10	13
Subregion I-D	345 kV double circuit steel	70	11	14
Region II				
Region III	345 kV single wood	40	6	6
Region IV	345 kV single wood	40	6	6
Region V				

[1]Reference: Socioeconomic Impact Study, appendix H

[2]Assumes preconstruction crews move at rate of 10 miles per month Based on estimates from case study as cited in Appendix H.

[3]Assumes construction crews move at rate of 10 miles per month. Based on estimate from case study as cited in Appendix H.

[4]Assumes construction crews move at rate of 5 miles per month. Based on estimates provided by the Department of the Interior.

(a)(b)(c) Represents three separate and simultaneous contracts for this section of line.

Because the majority of the proposed route traverses heavily forested lands, phase I labor requirements for surveying and clearing the right-of-way will represent about 50 percent of total direct labor used in the project.

The average size for a phase I clearing crew is estimated at about 40 workers per section. Individual crews may have 2 to 10 workers. The size of any crew on phase II will average about 60 workers per work segment. Any decision to accelerate the work schedule will increase the size of a crew and the total number of workers.

A combination of labor requirements and working conditions in isolated woods areas indicates that experience will be an important factor in initial hiring practices. The present timber industry labor force in northern New England includes about 70 to 80 percent local labor and 20 to 30 percent imported labor. Local labor refers to any workers who are residents of the State where construction would take place.

The labor pool for the proposed line will probably be 70 to 80 percent local and 20 to 30 percent imported for phase I. The largest percentage of imported labor is expected in Maine. It will come from Canada. Less impacted labor is expected in Vermont where numerous small landowners who may elect to remove their timber prior to the sale of easement are more likely to use local labor.

Based on discussions with local contractors, labor unions, and power companies it is estimated that about 50 percent of phase II labor force will be imported. This estimate reflects the high level of skills required and the mobility of the specialty labor at a national level.

Because the majority of the proposed route traverses heavily forested lands, it is estimated that about as many laborers will be required for phase I work as for phase II, although for a shorter period of time.

The estimated required labor force per segment by source is indicated in table 3.09-2. The total transmission lines construction is based on a time table of 5½ years. Table 3.09-3 indicates the estimated size of the labor force during this period.

Based on the type of line to be constructed, the type of terrain, and the length of any one segment, the longest construction time will occur in subregions I-B, I-C, and I-D, and region II. All construction work may be subject to seasonal stoppages, thus all phase II work is spread over a 2-year period.

As indicated in table 3.09-2, the maximum number of jobs available in a single state is 485 jobs in Maine. The number of jobs likely to be supplied from the labor force in Maine is 266 for a maximum of 13 working months per job spread over a 2-year period. The wage scale will be competitive with existing wages, thus it may be expected that some shift in the labor force will occur.

In the tri-state area, there will be some competition with private industry for workers needed for road construction and right-of-way clearing. Weather conditions may cause layoff periods. The longer the layoff, the more likely workers will be to disperse from the work site.

Secondary employment refers to the increased labor requirements needed to supply goods and services during phases I and II. Because of the construction schedule and the mobility of the crews, secondary employment opportunities are generally expected to be few to none. In most cases due to the short duration of increased demand, an increase in manhours worked by existing employees will suffice.

TABLE 3.09-2

ESTIMATED SIZE OF TOTAL LABOR FORCE PER SEGMENT[1]

Segments[2]	Local Labor	Imported Labor	Total Labor Force
MAINE			
Region I:			
Subregion I-A	60	57	117
Subregion I-B			
Subregion I-C	206	162	368
NEW HAMPSHIRE			
Subregion I-D			
Region II	65	50	115
VERMONT			
Region III	64	52	116
Region IV			
Region V	39	27	66
	434	348	782

[1]Reference: Socioeconomic Impact Study, appendix H

[2]For locations of regions and subregions see figure 2.09-1.

Source: Total labor force estimates are based on data provided by the Department of the Interior. They includes preconstruction and construction crews for transmission line plus construction crews for substation sites.

TABLE 3.09-3

PROJECTED ANNUAL
SIZE OF THE CONSTRUCTION
LABOR FORCE

Year 1	Surveys	Clearing	Construction	Totals
1st Quarter	75	0	0	75
2nd Quarter	75	0	0	75
3rd Quarter	105	0	0	105
4th Quarter	30	0	0	30
Year 2				
1st Quarter	0	0	0	0
2nd Quarter	0	0	0	0
3rd Quarter	0	0	0	0
4th Quarter	0	0	0	0
Year 3				
1st Quarter	0	0	0	0
2nd Quarter	0	0	0	0
3rd Quarter	0	156	0	156
4th Quarter	0	156	0	156
Year 4				
1st Quarter	0	156	0	156
2nd Quarter	0	0	0	0
3rd Quarter	0	50	263	313
4th Quarter	0	50	263	313
Year 5				
1st Quarter	0	0	271	271
2nd Quarter	0	0	311	311
3rd Quarter	0	0	387	387
4th Quarter	0	0	387	387
Year 6				
1st Quarter	0	0	420	420
2nd Quarter	0	0	450	450

3.09.1.2 Income

For purposes of income estimates an average hourly wage of $10 has been utilized. This wage reflects the requirements of the Davis-Bacon Act to meet the prevailing wage of other local federal projects and generally high skill requirements of transmission line work and the competitive going was for class I woodcutter as of 1977.

Table 3.09-4 shows an anticipated cumulative monthly gross income for an average size crew of 60 workers and a maximum crew of 100 workers. The schedule related the total gross income against time, indicating increased impacts should the schedule change. Table 3.09-5 indicates estimated gross income by State.

Table 3.09-6 shows the estimated total direct net income to be paid in each state. Under the 5½-year schedule for the project, an estimated annual direct net income in Maine will be $1 million, in New Hampshire $300,000, and in Vermont $200,000.

The income impact will be more significant in regions I and II based on both absolute and relative levels of existing income in western Maine and Coos County, N. H. It will be moderate at State levels.

TABLE 3.09-4
TRANSMISSION LINE CONSTRUCTION
ESTIMATED GROSS INCOME PER CREW[1]
$10.00 PER HOUR

	60 Man Crew[2] Construction only	100 Man Crew[3] Preconstruction and Construction
Month 1	$ 96,000[4]	$ 160,000
Month 2	192,000	320,000
Month 3	288,000	480,000
Month 4	384,000	640,000
Month 5	480,000	800,000
Month 6	576,000	960,000
Month 7	672,000	1,120,000
Month 8	768,000	1,280,000
Month 9	864,000	1,440,000
Month 10	960,000	1,600,000
Month 11	1,056,000	1,760,000
Month 12	1,152,000	1,920,000
Month 13	1,248,000	2,080,000
Month 14	1,344,000	2,240,000
Month 15	1,440,000	2,400,000

1 Reference: Socioeconomic Impact Study, appendix H
2 Construction crew includes work on tower and stringing operations only
3 Includes construction tower and line crew plus preconstruction survey and clearing operations and substation construction crews
4 Monthly income based on 8-hour working day, 5 day week

TABLE 3.09-5

ESTIMATED GROSS INCOME[1]

State	Total Estimated Gross Income
Maine	$8,000,000
New Hampshire	2,400,000
Vermont	1,700,000

[1] Reference: Socioeconomic Impact Study, appendix H

TABLE 3.09-6

ESTIMATED DIRECT NET INCOME[1]
PER STATE BY LABOR SOURCE

State	Local Labor[2]	Imported Labor[2]	Total Direct Net Income[2]
Maine	$3,100,000	$2,500,000	$5,600,000
New Hampshire	900,000	800,000	1,700,000
Vermont	750,000	450,000	1,200,000

[1] Reference: Socioeconomic Impact Study, appendix H
[2] Net income is derived from gross income less 30 percent for all Federal and State taxes plus personal benefit contributions
[3] All figures rounded

Attempts to estimate secondary income impacts are hampered by the varying sources of the labor supply, insufficient knowledge as to spending habits of each group, the mobility of the crew along the line, and the degree to which contractors will have to supply goods and services in more remote areas.

The anticipated retail spending has been estimated as 35 percent of net wages. This was based on calculations in the Edward C. Jordan Company, report "Social and Economic Impact Assessment - Dickey-Lincoln School Lakes Project, Maine."

The retail spending estimates listed in table 3.09-7 must be viewed as absolute maximums and used with caution.

TABLE 3.09-7

ESTIMATED DIRECT RETAIL SALES BY STATE[1]

State	Net Income	Total Anticipated Retail Sales	Per Annum Retail Sales
Maine	$5,600,000	$1,960,000	$356,000
New Hampshire	1,700,000	595,000	108,000
Vermont	1,200,000	420,000	76,000

[1] Reference: Socioeconomic Impact Study, appendix H

Because the route is rather isolated in western Maine, secondary income benefits will be concentrated in the towns of Fort Kent, Jackman, and Eustis. In Fort Kent, where significant income will be associated with the impoundment work, income impacts from the transmission line will account for about one percent of the total direct income.

In New Hampshire, most of the anticipated secondary impact is expected to stay in Coos County. Colebrook and Groveton would receive the most impacts.

There may be some mobility to the St. Johnsbury area of Vermont during construction within region II. In regions III, IV and V secondary income benefits will be dispersed throughout the populated centers along the route.

Statewide, secondary income cannot be viewed as significant for any segment of the line. However, for specific towns such as Jackman, Eustis, and Clarksville, the impact may be significant.

3.09.1.3 Supply of Goods and Services

The primary materials required for the proposed transmission line are not available in Maine, New Hampshire, or Vermont, and in most cases are not available in New England. Respondents in a Central Maine Power (CMP) case study indicated that all primary materials were purchased on a bid basis and all came from outside the New England area (appendix H).

The Vermont Agency of Development and Community Affairs indicated that the major suppliers of wooden tower poles to the State were in Canada.

The two principal purchases that will affect the local area will be the purchase of gravel for access road construction and the purchase of gasoline and parts for construction equipment. Most of these purchases will be made in Maine because most of the line is in that State, more access road will be required and hauls from delivery sites will be longer. Materials may be delivered by rail. Jackman is on the only railroad near the line between Fort Kent and Berlin, N. H. Nearly two-thirds of the transmission line, all with steel tower construction, will be constructed in this area.

It is difficult to estimate the dollar amount that may be generated by local purchases of construction needs, especially for gasoline, repairs, and services.

The value of gravel required for access roads is estimated at about $152,000 in Maine, $50,000 in New Hampshire, and $28,000 in Vermont. This estimate is based on an average price of $5 per cubic yard and 100 cubic yards of gravel per mile of road. This assumes that 10 percent of the access mileage will require gravel. Since the transportation of gravel is a considerable portion of its the cost, it is reasonable to expect purchases will be made from the sources near the route whenever possible.

The construction schedule and seasonal nature of the work will not warrant the introduction of new businesses in any area of the route. Communities will become suppliers of goods and services for construction and for workers and should experience a temporary increase in sales volume. In the cases of communities such as Jackman and Eustis, Maine, and Pittsburg and Colebrook, N. H., the short-term impact to local businesses such as machine parts and repair, gasoline, and sand and gravel may be substantial.

3.09.1.4 Temporary Population Increase

As the right-of-way is cleared and the line is constructed, work crews will be recruited. Workers will hold jobs for different periods of time. Some will be from specific towns along the right-of-way and will work clearing their own or their neighbor's land. Others will work on several segments while living at home. Still others will work on many segments, moving as the line progresses. These workers will temporarily increase the population in areas. Assuming no workers are hired who will be residing at home (the conservative approach), a maximum of 40 workers would move into an area during clearing work, and a maximum of 60 during construction. They would stay in an area from 2 to 6 months.

It is possible that two 60-man crews would work out of the Jackman area at one time. The survey of contractors showed that few workers bring families. Those that do will bring them only for the summer months where construction is in a desirable area and where rental facilities are available.

3.09.1.5 Housing

The impacts of housing workers in local communities during the right-of-way clearing, tower construction, and substation construction would be slight. The small size of the work crews and the short duration of their stay in any one community would create a demand for temporary housing but little demand for more permanent housing. Interviews with contractors familiar with this type of work indicate that few construction workers would bring their families and rent homes. If local labor were hired, this would further reduce the demand for housing.

The availability of temporary housing, such as motels, tourist homes, or boarding houses, varies throughout the region. In New Hampshire, along the Connecticut River, and in Vermont, there are enough hotels, motels, and inns to provide housing for workers. Workers may also use campers in campgrounds or trailer parks which have electric hookups and waste disposal facilities.

In Fort Kent, however, where the construction of the hydroelectric dam, the substation, and transmission lines would be going on at about the same time, a severe housing shortage may occur unless the transmission schedule for that section is timed to avoid the peak construction period at the dams.

In the Jackman-Moose River area, the work crew size could be 60 workers. There are nine motels in the area, but it is probable that local labor would be hired and no housing shortage would occur. If two such crews work in the same vicinity at one time, a temporary housing shortage could occur during the summer and winter tourist seasons. The recreation users would encounter a shortage of rooms.

Discussions with area contractors suggest that about 25 percent of the workers are likely to bring mobile homes to the more remote areas of western Maine. However, access roads are few, and campground space is scarce.

Contractors have indicated that in remote areas similar to western Maine and northern New Hampshire, they have used existing lumber and sporting camps when and where they were available. There are areas that are so far from camps or towns with motels that the contractors may bring in mobile camps and set them up along the right-of-way.

3.09.1.6 Public and Private Services

The impact of the transmission facilities on public and municipal services is likely to be slight. As part of the research for the assessment of socioeconomic impacts, contractors who had worked on a similar transmission line in eastern Maine, as well as the officials of municipalities along its route were interviewed. Responses indicated that there is no noticeable increase in demand for services or increased burden of work on town government, town planning boards, fire departments, conservation commissions, highway departments, police departments, public schools, hospitals, solid waste and sewage treatment facilities, water, private services, or private recreational facilities.

More of an impact on public and private services would probably be felt on the Fort Kent and Jackman areas. In the Fort Kent region, the impacts of the crews working on transmission facilites will be overshadowed by the construction crews working on the impoundment and hydroelectric facilities. The impacts, then, would add to those impacts, and depend to some degree on the actual timing of the transmission facilities construction.

Since Jackman, Maine, and Pittsburg, N. H., are relatively isolated, all service needs of workers in those areas would need to be met. The possibility of two work crews in the Jackman area would place further demands on services. Workers not commuting home on weekends would remain in the immediate area seeking entertainment. There is a possibility of the work crews having a slight to moderate impact on grocery stores, restaurants, and private recreation establishments. It is also possible that increased police services would be required in the evenings or on weekends when workers staying in the area will be seeking recreation. It is unlikely that other public or private services or facilities would be more than slightly impacted.

Emergency medical treatment facilities would be needed when transmission facilities construction was in progress. The remote areas of western Maine and northern New Hampshire would require special emergency transportation via helicopters because of the distances to hospitals and a lack of landing areas for airplanes. Hospitals closest to the remote areas, such as at Fort Kent and Jackman in Maine, and at Berlin, N. H. would be involved.

3.09.1.7 Community Character and Values

The amount of impact on town residents because of the lines will vary. The strength of the feelings of residents may reflect their concern toward the planning and construction of the lines. The reactions obtained from a survey of residents included concern for post growth rates, projected growth, length of settlement in their area, and emphasis on local planning.

If past growth has led to rapid development with few controls, local resentment against change could result in opposition to a transmission line. This could occur in the central Vermont regions IV and V. They have experienced substantial growth in recent years. Also, if a town has slow growth and still retained a rural character, it might desire to maintain that character. In either case, the existence of the transmission line would be inconsistent with community goals and could be considered a detriment for years to come. Conversely, if a community welcomes development and associates it with a positive image, the line might be seen as an asset.

Transmission lines, when routed around existing residences, often use land valued for its development potential. Several residents interviewed on the Central Maine Power line felt the loss of the development value of their land was a negative impact.

According to town and regional plans, all the towns within the proposed corridor have been settled for a long period of time. Those in Vermont were settled the earliest (in the 1700's) while those in the more isolated areas were settled somewhat later (early to mid-1800's). Most of these towns expressed a desire to preserve their communities' historic quality. The destruction of any old buildings on the right-of-way in these communities could be perceived as a negative long-term impact.

Finally, emphasis on local planning, particularly high in regions IA-IC, III, and V, indicates a desire for local control of future development in town. This could have an impact on long-term reaction to the line's existence, but it is not clear if it might be perceived positively or negatively.

3.09.1.8 Public Health and Safety

The construction of high voltage power transmission facilities have negative health impacts which include impacts from the use of heavy equipment during construction and the open burning of slash during right-of-way clearing.

During construction, accidents could result from the movement of construction equipment on town streets. Air pollution caused by construction vehicles burning of the cleared vegetation is potentially a slight impact on the health of nearby residents. During dry seasons, dust can be created by construction vehicles traveling on unpaved access roads. This, also, could have a slight impact on health of nearby residents and will depend on the proximity of residences.

It is unlikely that the burning of slash would cause health problems except in special cases where burning occurs close to a residence where a health problem already exists. Some concern has been expressed about the electrical fields around transmission lines. Questions have been raised about the impact of long-term exposure to electric fields on nearby flora and fauna and human beings. Electrical effects of the proposed transmission line is expected to be negligible (see section 3.18).

Another concern of residents along the CMP line was the use of herbicides sprayed on the right-of-way to lessen plant growth. Some residents stopped picking berries on the right-of-way. Still others were concerned about effects on health. These concerns seemed to be somewhat alleviated when spraying by air was replaced by ground spraying. (See section 1.03.6 for a discussion of herbicides and vegetation control.)

3.09.1.9 Auditory and Communication Impact

When a transmission line is operating, it sometimes produces noise. This is called the corona effect. It may occur in wet weather when there is rain or snow on the conductors. Transmission lines can also interfere with television and radio reception near the line, particularly in wet weather in areas with a low station strength. Neither of these were mentioned as problems by residents living near the Central Maine Power line. And neither is expected to be a problem along the proposed line (see section 3.18).

Noise during right-of-way clearing and construction from heavy equipment operation was shown in the resident questionnaire to be a slight problem when indicated as a problem at all. In many cases, residents were unaware of these impacts.

3.09.1.10 Transportation Impacts

Heavy equipment can create damage, to road surfaces. The extent of this damage depends on the design of the road, its surface, and weather conditions. On secondary paved roads continued passage of heavy transports during the spring "frost heave" season can result in severe road damage requiring unscheduled expenditure for road repairs. Many roads are posted as being closed to heavy traffic during certain spring months.

A few traffic problems are likely to result from competing demands of project traffic and that of other users of the highways and secondary and tote roads.

3.09.1.11 Loss of Economic Production

The impacts associated with temporary loss of economic production are very site specific and cannot be determined until individual landowners are identified, the final right-of-way located, and the number and location of access roads are known.

Short-term impacts on agricultural land will occur during construction. Access roads will disturb an area 20 feet wide along the right-of-way. Tower construction will disturb an area 150 by 200 feet at double circuit tower sites and 60 by 100 feet at wood pole structure sites.

Long-term impacts on agriculture will also occur at tower sites. Double circuit towers will remove an area measuring 50 by 50 feet from production. Each wood pole structure will remove 10 square feet from production.

Table 3.09-8 shows the estimated area of agricultural land that will be impacted both during construction and on a long-term basis.

TABLE 3.09-8

ACRES OF AGRICULTURAL DISTURBANCE

	Construction Disturbance		Permanent Disturbance
Segments	Tower Sites	Access Roads	Tower Sites[1]
Dickey-Lincoln School-Fish River	0.4 acres	6.3 acres	0.1 acres
Dickey-Moose River	-	-	-
Moose River-Moore	8.0 acres	5.6 acres	0.7 acres
Moore-Granite	0.5 acres	8.7 acres	0.2 acres
Granite-Essex	0.7 acres	11.6 acres	0.2 acres
Totals	9.6 acres	32.2 acres	1.2 acres

[1]No permanent access will be developed in agricultural areas.

3.09.1.12 Construction Crews Working in Remote Areas

According to the survey taken of major construction companies (see appendix H), work crews experience social and psychological impacts when working in remote areas. There are remote areas between Dickey and Moore substations. Workers from nearby areas in northern New England and Canada could drive home on weekends, lessening their feelings of isolation. Workers who spend the entire week at the campsite are the most likely to be impacted by the isolation. The experiences of contractors working in similar remote areas indicate that the social isolation, lack of recreational outlets, and close group quarters, result in a buildup of tension and anxiety. Contractors have said that winter work conditions in these areas are considered adverse, and, consequently, worker turnover may become a problem during the cold months.

3.09.1.13 Canadian Labor

The use of Canadian workers to clear the right-of-way and construct transmission facilities could raise a social and political issue. The wages paid workers on this project may be higher than local wages for comparable work. Consequently, it is likely the U.S. workers who would normally not be seeking work in this remote region could be looking for employment on the project. According to the survey of contractors in this region, it is common to have some 30 percent of woods workers from Canada. When the right-of-way was cleared for the CMP 345-kV line a much higher percentage of the clearing crew was Canadian. U.S. workers may resent a high proportion of Canadian Labor, depending on how the situation is handled by labor contractors.

3.09.1.14 Land Values

The question as to whether property values are affected by the presence of a transmission line right-of-way has not yet been resolved satisfactorily. Studies have found little empirical evidence to suggest that property values are adversely affected. One of the most extensive studies of the issue (Clark and Treadway) fails to establish a clear case of adverse impact on property values after considering a variety of different land uses. At the same time, nearly 40 percent of respondents to a residential survey cited a decrease in property values as a major impact of the right-of-way. Without further study of the affected properties, it is difficult to determine if this is an actual or a percieved loss. All of those respondents who identified this impact had been at their present residence prior to the construction of the line. No new residents identified a reduction in property value as an impact. At the present time there is not enough evidence to predict that property values will be impacted by a transmission line right-of-way. These impacts may interfere with a planned future use, such as a subdivision development or ski trails. Without information regarding long-term land use plans, it is not possible to indicate specific impact sites.

In the purchase of easements for the right-of-way, the Department of Interior has traditionally used a method of payment based on the difference between the present appraised value of the property and the appraised future value. On this basis, if a loss in property value is identified the landowner would be compensated at the time the easement is purchased. This compensation does not extend to property owners in the viewshed who may experience an esthetic impact and potential property value decrease. The Department of Energy is expected to follow this same policy.

3.09.1.15 Visual

The transmission facilities could affect the views of residents adjacent to the right-of-way. In the survey of residents of the 345-kV Central Maine Power line (appendix H), one-half of the residents within view of the transmission line and towers considered the line to be a negative impact on area esthetics. This impact is dealt with in depth in section 3.13. It is worth noting that esthetic impacts can have social and economic implications.

Table 3.09-9 shows the number of residential units or clusters that are within the viewshed of the proposed route. The table shows that the portion of the line in New Hampshire and Vermont is much more visible to greater numbers of people.

TABLE 3.09-9

RESIDENTIAL CLUSTERS WITHIN VIEWSHED[1]

Route Segments	Clusters: 1-5 Units	Clusters: 6-25 Units	Clusters: 26+ Units
Dickey-Lincoln School-Fish River	78	13	-
Dickey-Moose River	6	-	-
Moose River-Moore	325	7	3
Moore-Granite	224	3	5
Granite-Essex	290	21	10

Source: Visual-Rescreational Resources Impact Study, appendix I
[1] Reference: Socioeconomic Impact Study, appendix H

3.09.1.16 Wildland Character

The proposed transmission route will have an impact on the wildland character of the western Maine region and, on those who use it because of its qualities. The users include two main groups, the "active users" and the "passive users." The active users are the recreationists and guides who engage in various forms of "primitive recreation" activities in the wilderness area. According to the Maine Land Use Regulation Commission (LURC), these activities include climbing, hiking, canoeing, fishing, hunting, trapping, cross country skiing, snow sledding, snow shoeing, wildlife viewing, and camping. The second group, the "passive users", consists of such people as students of ecology, naturalists, members of conservation and recreation groups, and others who place a high value on the wildland character of this region. These individuals derive satisfaction through direct or indirect knowledge of the area, whether or not they have visited it in the past or plan to in the future.

The area is significant to the user groups discussed above not only because it provides an expanse of undeveloped land ideal for primitive and natural environment related recreation activities but additionally as an important cultural symbol. These wildlands serve as a symbol of wilderness values and, consequently, have a social function which transcends the economic functions which occur on them.

3.09.2 Region-Specific Impacts

Table 3.09-10 gives a general summary of impacts specific to the socioeconomic regions that were studied.

TABLE 3.09-10

REGIONAL SUMMARY OF SOCIOECONOMIC IMPACTS SPECIFIC TO REGIONS[1]

Region	Types of Impacts	Comments
I-Western Maine and Northern New Hampshire	- Employment	- Total employment in subregions I-A, I-B, I-C estimated 485 people.
	- Canadian Labor Issues	- For region near Canadian border 20-30 percent of crew may be Canadian, with possible labor conflicts.
	- Income	- Total gross income $8,000,000 subregion I-A, I-B, I-C.
	- Tax Increase	- $2,651 to $5,302 increase subregion I-A, I-B, I-C.
	- Construction Crews	- Adverse working conditions.
	- Wilderness	- Loss of wilderness quality for at least the lines viewshed.
	- Housing for work crews	- Lack of adequate temporary housing in remote areas requiring use of portable facilities.
II-Connecticut River Valley, New Hampshire	- Employment	- Total employment (including subregion I-D) 115 people.
	- Income	- Total gross income $2,400,000 subregion I-D, II-A, II-B
	- Loss of agricultural productivity	- Agricultural lands taken out of use during construction.

[1]Reference: Socioeconomic Impact Study, appendix H

Region	Types of Impacts	Comments
II-Connecticut River Valley (continued)	- Tax loss	- $433 due to timber loss.
	- Road damage	- Heavy equipment on secondary roads
Subregion II-B	- Community concern	- Northumberland (Groveton) view transmission line as incompatible with town goals.
Region III-Northeastern Vermont	- Employment	- Total employment 116 people.
	- Income	- Total gross income $1,700,000
	- Loss of agricultural productivity	- Land taken out of use during construction
	- Road damage	- Heavy equipment on secondary roads.
	- Auditory	- Construction near populated areas, noise impact on nearby residences
Subregion III-A		
Subregion III-B	- Community concerns	- Peacham-opposed to presence of line in community
		- Barnet-concerned with transmission line in community.
Region IV-Central Vermont	- Employment	- Total employment for Regions IV and V.
	- Auditory	- Construction near populated areas, noise impact on nearby residences.
	- Income	- Total gross income for regions IV and V - $1,000,000.

REGIONAL SUMMARY OF IMPACTS (Continued)

Region	Types of Impacts	Comments
IV-Central Vermont (cont.)	- Forest production	- Loss
	- Road damage	- Heavy equipment on secondary roads.
Subregion IV-A	- Community concern	- All towns potentially concerned with incompatibility of transmission line and community goals.

3.10 Existing Land Use Impacts

The transmission line would directly affect land use. Land occupied by a tower would usually be unavailable for other uses. The proposed line also would place certain limitations on land use underneath the conductors.

If possible, existing roads would be used for construction and maintenance. Where existing roads could not be used, temporary or permanent access roads would be built. In many cases these roads would be located within the cleared right-of-way, effectively reducing their impact on neighboring land uses. After a line was constructed, temporary access roads would be restored as nearly as possible to their original condition. Permanent roads would be constructed and maintained to prevent soil erosion and deterioration of the roads. Land occupied by permanent access roads could not be used for other purposes. Occasionally, access roads would lend themselves to land use patterns of adjacent property such as providing access to farm fields, timber, or to public lands for recreation.

Table 3.10-1 shows the different categories of land use included in this section. Associated with each land use is the anticipated impact level that could occur to the land use if a transmission line were on or immediately adjacent to the property. The table indicates whether the impact can be mitigated, what the impact level would be after full mitigation, and whether the impact is temporary or permanent.

The following impact categories were used in land use assessment:

Severe -- This level is used to describe conditions where the land use could not function if it were located on the transmission line right-of-way. The land use either could not function or would be relocated. This compatibility measure was based on public safety and operation characteristics of the land use.

High -- This defines conditions where most of the activity could not function and most of the facility would be relocated for reasons of safety or operation.

Moderate -- The transmission line would cause inconvenience or part of the land use could not function or could function but with reduced effeciency.

Slight -- This is the lowest impact level and is used to define potential conditions where small inconveniences or inefficiencies might occur. However, the land use could remain and would be functional.

None -- The existing land use would not be impacted in any way by the transmission line.

The following discussion presents general information associated with each land use category.

TABLE 3.10-1

LAND USE IMPACT[1]

LAND USE CATEGORY	LAND USE TYPES	SEVERE (S)	HIGH (H)	MODERATE (M)	SLIGHT (SL)	NONE (N)	MITIGATION POSSIBLE	IMPACT AFTER MITIGATION	DURATION OF IMPACT
Residential									
	Single family 0 -5		X				yes	SL	P
	5 - 25	X					yes	M	P
	25+	X					yes	M	P
	Multi-family	X					yes	N	P
	Group quarters	X					yes	N	P
	Mobile homes			X			yes	SL	P
	Seasonal homes	X					yes	M	P
Manufacturing									
	Light		X				yes	N	-
	Heavy	X					yes	N	-
Transportation									
	Railroads								
	Abandoned					X	No	N	-
	Passenger				X		No	S	T
	Freight					X	No	N	P
	Aircraft	X					yes	N	-
	Roads								
	Limited access				X		No	S	T
	Paved				X		No	S	T
	Unpaved				X		No	S	T
	Organized logging pattern				X		No	S	T
Utilities						X	No	N	-
Trade									
	Commercial	X					yes	N	-
	Institutional		X				yes	S	T/P
Resource Extraction									
	Crops								
	Hay field				X		yes	N	-
	Row			X			yes	S	T
	Abandoned field					X	No	N	-
	Pasture					X	No	N	-
	Dairy/livestock					X	No	N	-
	Potato house/barns					X	No	N	-
	Poultry					X	No	N	-
	Nurseries/plantations					X	No	N	-
	Mining					X	No	N	-
	Active			X			yes	N	-
	Abandoned					X	No	N	-
	Maple sap extraction	X					No	S	P

[1] Reference: Land Use Impact Study, Appendix G

3.10.1 Residential

In order to meet National Electric Safety Code standards, Occupational Safety and Health Act Regulations, and to provide ready access to transmission lines for maintenance, residences and other tall structures would not usually be allowed on rights-of-way. Where single family residential structures are now located within the proposed right-of-way, the line might be moved slightly to avoid the structure. Noise and dust from construction would be temporary. Electrical interference with TV and radio reception is unlikely (see section 3.18).

If it is necessary to relocate a residence an impact rating of high is assigned. If the transmission line can be routed around the structure, the impact would be slight.

Impacts associated with residences also apply to mobile homes, although mobile units can be moved to a new site.

Like residences, seasonal homes would not be allowed on transmission rights-of-way. Because the site is often the principal attribute to a seasonal home, relocating to a new site is not an effective mitigating action. Full mitigation is almost impossible.

The six to twenty-five and twenty-six or more unit clusters of housing in multifamily categories were evaluated separately because of the greater number of families impacted. Relocation to comparable sites is usually not feasible. Impacts would be severe to these structures.

3.10.2 Manufacturing

This category includes buildings and associated land uses. Relocating a manufacturing facility to a site of equal value and convenience would create severe impacts. These impacts would include the difficulty of finding a new location and the disruption of production.

3.10.3 Transportation

Railroads are compatible with transmission lines. Slight visual impacts would be associated with railroads that carry passengers. At railroad crossings, impact is low.

Impacts at airport facilities are severe. Transmission lines and aircraft and associated facilities are usually incompatible. Even with markers on the conductors to show their position, the conductors present a threat to air traffic.

Transmission lines typically cross and parallel roads. Transmission lines do not affect the safety or operation of roads. During construction, slight temporary impact may occur because of equipment noise, dust from construction, and equipment movement.

3.10.4 Utilities

These land uses are compatible with the transmission line. Their functions would not be affected by the line.

3.10.5 Businesses and Institutions

Because the location of a retail business is a major factor in its success, relocation of the business can not always fully mitigate the loss for prime site.

The impact of transmission lines on institutions is high. Institutional facilities, such as schools, hospitals, and military installations, may result in high impacts. Institutional buildings would not be permitted under transmission lines. However, the use of open space next to the buildings for such activities as parking and storage is compatible with transmission lines.

3.10.6 Resource Extraction

Crops - The production of all row and field crops could continue under the transmission lines. Access roads to sites are kept to a width of 20 feet and restored after construction. During construction, a double circuit tower site disturbs an area of about 150 by 200 feet and when completed occupies an area of 50 by 50 feet. Thus, some production may be lost temporarily during construction and a lesser area of production may be lost permanently after construction (see table 3.09-8). A tower site may also cause some permanent inconvenience in maintaining the tillage patterns. Periodic inspections and maintenance of the tower can be scheduled at times convenient for the farmer and his crop cycle. Emergency repairs may damage portions of the crop and affect soil conditions.

Transmission line towers could also interfere with certain types of irrigation equipment and aerial spraying. Neither of these activities are widely used in the region.

Pasture/Livestock - Since pasture requires little maintenance the placement of a transmission tower would have almost no impact. Cattle will continue to graze undisturbed under transmission lines. Access roads for maintenance should not interfere with the pasture. However, construction of the line may temporarily disrupt the use of pasture.

Mining - Active mining along the route is limited to the surface extraction of gravel, sand, and quarried rock. The location of a transmission line could limit the potential for expansion of such an operation and thus cause the land use to cease. Lines adjacent to surface mining activities would not affect the mining operation or its effeciency if no expansion were to take place.

3.10.2 Sites Specific Impacts

Tables 3.10-2 through 3.10-6 show the potential impacts on existing land use along the route. By cross referencing these tables with table 3.10-1, land use impacts and severity can be determined - with and without mitigation. Table 3.10-7 presents data for the entire (all segments) proposed route.

3.11 Proposed Land Use

Table 3.11-1 shows the estimated number of miles along the route for different categories of planned land use. The table also shows the estimated degree of compatibility of the transmission line route with the planned land use categories which are rated as high, moderate, or low.

Table 3.11-2 shows the relative degree of compatibility - high, moderate or low - for the planned land use along the proposed transmission line. Those lands that were recorded on the proposed land use maps as being unclassified were not given a compatibility rating.

3.12 Recreation

3.12.1 General Impacts

Because of the diverse scenic character of the study area and the variety of recreational resources that exist, it is inevitable that transmission facilities will pass near or through existing and potential recreation areas. The adverse impacts primarily affect visual quality and recreational use. Positive impacts occur where transmission right-of-way can be used for recreation.

In scenic areas viewers are impacted by structures that dominate views and affect the scenic values of the recreation sites. Such a distraction or contrast can detract from one's enjoyment of natural esthetic features. Visual impacts are most noticeable where there is a contrast between the manmade form of the tower or cleared right-of-way and a natural land element such as a lake, waterfall, or mountain.

Because of their linear nature, transmission lines may pass near or cross scenic highways, rivers, lakes, and trails which are heavily used for recreation. Tower size, design, and color influence the degree of visual impact.

The commitment of land for a transmission right-of-way may limit the present and future of a recreation facility. A transmission facility could reduce an area's potential recreation designation or classification. The visual impacts created may be sufficiently adverse to prevent an area's development for a specific recreational purpose. An existing recreational area's potential for expansion also could be reduced by lines adjacent to, or paralleling, its boundaries.

TABLE 3.10-2
POTENTIAL IMPACT ON EXISTING LAND USES
DICKEY-LINCOLN SCHOOL-FISH RIVER

	Units Within R-O-W[2]	Units Within 1/8 mi.
Residential		
Single Family	0	10
Multi-Family	0	0
Group Quarters	0	0
Mobile Homes	0	1
Seasonal Homes	0	1
Manufacturing		
Light	0	1
Heavy	0	0
Trade		
Commercial	0	0
Institutional	0	0
Airports	0	0

	Acres in R-O-W[2]
Resource Extration	
Hay Field	13.3
Row Crops	16.4

	Acres in R-O-W[2]
Resource Extraction	
Abandoned Agricultural	5.5
Pasture	1.2
Dairy/Livestock	0.0
Sap Extraction	0.0
Nurseries/Plantations	0.0
Mining	3.6

	Units in R-O-W[2]
Potato House/Barn	0
Poultry	0

	Miles Parallel within 1/8 mi.	Number of Crossings
Transportation		
Abandoned Railroads	0	0
Passenger Railroads	0	0
Freight Railroads	4.5	0
Limited Access Highway	0	0
Paved Roads	0	2
Utilities	0	0

[1] Reference: Land Use Impact Study, appendix G

[2] Right-of-way = a 100 foot wide area located along the center of the one-half mile wide route.

TABLE 3.10-3
POTENTIAL IMPACT ON EXISTING LAND USES[1]
DICKEY-MOOSE RIVER

	Units Within R-O-W[2]	Units Within 1/8 mi.
Residential		
Single Family	0	1
Multi-Family	0	0
Group Quarters	0	0
Mobile Homes	0	0
Seasonal Homes	0	0
Manufacturing		
Light	0	0
Heavy	0	0
Trade		
Commercial	0	0
Institutional	0	0
Airports	0	0

	Acres in R-O-W[2]
Resource Extration	
Hay Field	0.0
Row Crops	0.0
Resource Extraction	
Abandoned Agricultural	0.0
Pasture	0.0
Dairy/Livestock	0.0
Sap Extraction	0.0
Nurseries/Plantations	0.0
Mining	3.6

	Units in R-O-W[2]
Potato House/Barn	0
Poultry	0

	Miles Parallel within 1/8 mi.	Number of Crossings
Transportation		
Abandoned Railroads	0	1
Passenger Railroads	0	0
Freight Railroads	0	0
Limited Access Highway	0	0
Paved Roads	0	1
Utilities	0	0

[1]Reference: Land Use Impact Study, appendix G

[2]Right-of-way = a 150 foot wide area located along the center of the one-half mile wide route.

TABLE 3.10-4
POTENTIAL IMPACT ON EXISTING LAND USES[1]
MOOSE RIVER-MOORE

	Units Within R-O-W[2]	Units Within 1/8 mi.
Residential		
Single Family	0	13
Multi-Family	0	0
Group Quarters	0	0
Mobile Homes	0	1
Seasonal Homes	0	4
Manufacturing		
Light	0	1
Heavy	0	4
Trade		
Commercial	0	0
Institutional	0	0
Airports	0	0

	Acres in R-O-W[2]
Resource Extraction	
Hay Field	26.1
Row Crops	3.6

	Acres in R-O-W[2]
Resource Extraction	
Abandoned Agricultural	26.1
Pasture	12.6
Dairy/Livestock	0.0
Sap Extraction	0.0
Nurseries/Plantations	7.2
Mining	7.2

	Units in R-O-W[2]
Potato House/Barn	0
Poultry	0

	Miles Parallel within 1/8 mi.	Number of Crossings
Transportation		
Abandoned Railroads	0	0
Passenger Railroads	0	1
Freight Railroads	0	2
Limited Access Highway	0	0
Paved Roads	0	3
Utilities	4.1	0

[1]Reference: Land Use Impact Study, appendix G

[2]Right-of-way = a 150 foot wide area located along the center of the one-half mile wide route.

TABLE 3.10-5
POTENTIAL IMPACT ON EXISTING LAND USES[1]
MOORE-GRANITE

	Units Within R-O-W[2]	Units Within 1/8 mi.
Residential		
Single Family	0	34
Multi-Family	0	0
Group Quarters	0	0
Mobile Homes	0	0
Seasonal Homes	0	0
Manufacturing		
Light	0	0
Heavy	0	0
Trade		
Commercial	0	0
Institutional	0	0
Airports	0	0

	Acres in R-O-W[2]
Resource Extraction	
Hay Field	38.8
Row Crops	15.2
Abandoned Agricultural	21.8
Pasture	11.5
Dairy/Livestock	0.0
Sap Extraction	25.5
Nurseries/Plantations	3.6
Mining	0.0

	Units in R-O-W[2]
Potato House/Barn	0
Poultry	0

	Miles Parallel within 1/8 mi.	Number of Crossings
Transportation		
Abandoned Railroads	0	1
Passenger Railroads	0	0
Freight Railroads	0	1
Limited Access Highway	0	1
Paved Roads	0	14
Utilities	38.1	3

[1]Reference: Land Use Impact Study, appendix G

[2]Right-of-way = a 150 foot wide area located along the center of the one-half mile wide route.

TABLE 3.10-6
POTENTIAL IMPACT ON EXISTING LAND USES[1]
GRANITE-ESSEX

	Units Within R-O-W[2]	Units Within 1/8 mi.
Residential		
Single Family	5	66
Multi-Family	0	0
Group Quarters	0	0
Mobile Homes	0	60
Seasonal Homes	0	5
Manufacturing		
Light	0	0
Heavy	0	0
Trade		
Commercial	1	0
Institutional	0	0
Airports	0	0

	Acres in R-O-W[2]
Resource Extraction	
Hay Field	40.6
Row Crops	32.9

	Acres in R-O-W[2]
Resource Extraction	
Abandoned Agricultural	37.8
Pasture	8.4
Dairy/Livestock	4.2
Sap Extraction	0.0
Nurseries/Plantations	1.4
Mining	2.8

	Units in R-O-W[2]
Potato House/Barn	1
Poultry	0

	Miles Parallel within 1/8 mi.	Number of Crossings
Transportation		
Abandoned Railroads	0	0
Passenger Railroads	0	2
Freight Railroads	0	1
Limited Access Highway	0	2
Paved Roads	0	14
Utilities	30.1	6

[1]Reference: Land Use Impact Study, appendix G

[2]Right-of-way = a 150 foot wide area located along the center of the one-half mile wide route.

TABLE 3.10-7
POTENTIAL IMPACT ON EXISTING LAND USES[1]
ALL SEGMENTS

	Units Within R-O-W[2]	Units Within 1/8 mi.
Residential		
Single Family	5	124
Multi-Family		
Group Quarters		
Mobile Homes		60
Seasonal Homes		10
Manufacturing		
Light		1
Heavy		
Trade		
Commercial	1	
Institutional		
Airports		

	Acres in R-O-W[2]
Resource Extraction	
Hay Field	118.8
Row Crops	68.1

	Acres in R-O-W[2]
Resource Extraction	
Abandoned Agricultural	91.2
Pasture	33.7
Dairy/Livestock	4.2
Sap Extraction	25.5
Nurseries/Plantations	12.0
Mining	17.2

	Units in R-O-W[2]
Potato House/Barn	1
Poultry	

	Miles Parallel within 1/8 mi.	Number of Crossings
Transportation		
Abandoned Railroads		2
Passenger Railroads		4
Freight Railroads	4.5	4
Limited Access Highway		3
Paved Roads		34
Utilities	72.3	10

[1] Reference: Land Use Impact Study, appendix G

[2] Right-of-way = a 150 foot wide area located along the center of the one-half mile wide route.

TABLE 3.11-1

PLANNED LAND USE COMPATIBILITIES[1]

PROPOSED ROUTE

Categories	Degree of Compatibility	Dickey-Lincoln School-Fish River (miles crossed)	Dickey-Moose River (miles crossed)	Moose River-Moore (miles crossed)	Moore-Granite (miles crossed)	Granite-Essex (miles crossed)	TOTALS
Village/Commercial	LOW	-	-	-	-	1.5 mi.	1.5 mi.
Urban Residential	LOW	-	-	.2 mi.	-	2.2 mi.	2.4 mi.
Rural Residential/AG	MOD	-	-	3.0 mi.	6.3 mi.	23.1 mi.	32.4 mi.
Public/Semi-Public	MOD	-	-	0.1 mi.	-	0.3 mi.	0.4 mi.
Industrial	HIGH	-	-	-	-	3.2 mi.	3.2 mi.
Management District	MOD	9.7 mi.	107.7 mi.	54.5 mi.	-	-	171.9 mi.
Development District	MOD	-	-	-	-	-	-
Conservation/Resource	LOW	1.0 mi.	5.9 mi.	23.7 mi.	8.8 mi.	13.0 mi.	52.4 mi.
Unclassified		18.7 mi.	5.0 mi.	54.6 mi.	23.0 mi.	-	101.3 mi.

[1]Reference: Land Use Impact Study, appendix G

TABLE 3.11-2

PLANNED USE COMPATIBILITY RATINGS[1]

Compatibilities	Dickey-Lincoln School-Fish River (miles crossed)	Dickey-Moose River (miles crossed)	Moose River-Moore (miles crossed)	Moore-Granite (miles crossed)	Granite-Essex (miles crossed)	TOTALS
High	-	-	-	-	3.2 mi.	3.2 mi.
Moderate	9.7 mi.	107.7 mi.	57.6 mi.	6.3 mi.	23.4 mi.	204.7 mi.
Low	1.0 mi.	5.9 mi.	23.9 mi.	8.8 mi.	16.7 mi.	56.3 mi.
Unclassified	18.7 mi.	5.0 mi.	54.6 mi.	23.0 mi.	-	101.3 mi.

[1]Reference: Land Use Impact Study, appendix G.

Unauthorized or uncontrolled use of transmission line rights-of-way by recreational vehicles can cause detrimental effects such as erosion, disturbance to wildlife, fire hazards, and annoyances to landowners.

Analysis Methods

The analysis of the recreational resources encompassed the review of literature concerning recreation on the regional, statewide, county, municipal, and site levels to obtain an appreciation for the value of certain activities. Since the study area is quite diversified from a recreational standpoint, ranging from semi-wilderness to suburban and urban, it was necessary to understand the characteristics of the potential users. This review provided a basis for the creation of the recreational resource classification system (appendix I) and the understanding of relationship of recreational resources to transmission line rights-of-way and towers. The relationships which were analyzed included compatibility, enjoyment of scenery, and relative numbers of viewers. The compatibility relationship which was analyzed related to the positive and negative interactions which take place when recreational activity participants experience the transmission facilities. The enjoyment of scenery relationship was analyzed to determine the degree to which a recreational activity was dependent on the viewing and appreciation of the natural landscape to obtain satisfaction. An analysis of a relative number of viewers was performed to identify how many people may be engaged in an activity at a particular location and the general character of visits.

The compatibility, enjoyment of scenery, and number of viewers for a specific activity could vary depending on access and population in proximity to the area or as a function of its scarcity or abundance.

Another form of analysis which was conducted relates to the spatial relationship of a recreational resource as a point, line or area feature to the actual configuration of the transmission facilities. The degree to which the proposed transmission facilities covered, crossed, bisected, or ran parallel to recreational resources, influences the overall effect one would experience from them.

Impact values assigned to the transmission facilities were severe, high, medium, and low. These values represent relative judgments of the effect of the facilities on recreation users.

Preemptive impact or actual interference with land use for recreational sites was also assessed. The preemptive impacts on land use would be experienced within the one-half-mile-wide route at the centerline, or at a tower site, and a substation or microwave facility site. The impact on recreational viewers would be experienced both within the route and the viewshed, of the transmission facilities. Through this distinction of impact types, the total impact of the proposal through the direct and indirect effects as well as the constant long-term or short-term effects was addressed.

3.12.2 Site-Specific Impacts

3.12.2.1 Dickey-Lincoln School-Fish River

Table 3.12-1 shows the number of preemptive impacts and the number of miles where impacts would be experienced by recreational viewers.

Preemptive Impacts

The majority of these impacts are low and reflect snowmobile trail crossings. The two severe impacts relate to activities on public lands. The high impacts are assigned to crossings of fall foliage, sightseeing and canoe routes along the Allagash River and Bossy Mountain a high elevation of local significance.

Recreational Viewer Impacts

High viewer impacts occur where the line crosses the Allagash River, sightseeing, and fall foliage routes.

TABLE 3.12-1

RECREATION IMPACTS[1]
DICKEY - LINCOLN SCHOOL - FISH RIVER

	Preemptive Impacts		Recreation Viewer Impacts	
Impact Levels	Number of Occurances	Percent	Miles With Impacts	Percent
None	-	-	-	-
Low	17	56.7%	2.0 mi.	6.8%
Moderate	6	20.0%	16.1 mi.	54.8%
High	5	16.7%	10.4 mi.	35.4%
Severe	2	6.6%	.9 mi.	3.0%

1 Reference: Visual-Recreation Resources Impact Study, appendix I.

3.12.2.2 Dickey - Moose River

Table 3.12-2 shows the number of preemptive impacts and number of miles with viewer impacts along the route from Dickey to Moose River Substation.

Preemptive Impacts

The impacts are primarily low and moderate and are basically caused by crossings of snowmobile trails. The one severe impact is recorded for the length of route that crosses the North Branch of the Penobscot River which is a national wild and scenic river candidate. High impacts are primarily due to the crossing of canoe routes in the semi-wilderness area between Dickey and Jackman, and for crossings of fall foliage and sightseeing routes near Moose River. There is also a high impact where the line crosses Baker Branch of the St. John River.

Recreational Viewer Impacts

No severe impacts were recorded. The high impacts relate primarily to views of the proposed transmission lines from wild and scenic river candidates or a wild and scenic river study candidate, or large surface water bodies noted for their recreational use.

The proposed route could also be viewed from Chemquasabamticook (Ross) Lake and Baker Branch above Baker Lake. In areas with a lesser number of viewers the nature of high impact would relate to the perception of the contrast between the transmission facilities and the surrounding natural setting. This would be the case in the area around Baker Lake and in the North Branch of the Penobscot River.

TABLE 3.12-2

RECREATION IMPACTS
DICKEY - MOOSE RIVER[1]

	Preemptive Impacts		Recreation Viewer Impacts	
Impact Levels	Number of Occurances	Percent	Miles With Impacts	Percent
None	-	-	77.2 mi.	65.1%
Low	12	50.0%	16.5 mi.	13.9%
Moderate	6	25.0%	15.9 mi.	13.4%
High	5	20.8%	9.0 mi.	7.6%
Severe	1	4.2%	-	-

1 Reference: Visual-Recreation resources Impact Study, appendix I.

3.12.2.3. Moose River - Moore

Table 3.12-3 shows the number of preemptive impacts and miles of recreational viewer impacts, occuring along this segment.

Preemptive Impacts

The severe impacts are associated with the disruption of public lands between the Moose River Substation and the Chain-of-Ponds area. The 30 high impacts which occur in this segment relate primarily to crossings of sightseeing, fall foliage, and canoe routes as well as wild and scenic river candidates, and scenic Maine Highway 27. The route crosses the Moose River and Kibby Stream which are national wild and scenic river study candidates. There are several stream crossings that are designated by the State of New Hampshire as wild and scenic river candidates. The moderate potential impacts relate primarily to the recreational streams and rivers which are crossed. Other recreational features moderately impacted include bicycle trails and routes and proposed recreational and conservation lands in the area between Groveton, NH and Moore Dam.

Recreational Viewer Impacts

About 30 percent of the route was judged to have severe or high impacts. Severe viewer impacts would occur at the crossing of the Connecticut River south of Groveton. The features affected include sightseeing and fall foliage routes such as Route 3 in New Hampshire and Route 102 in Vermont; and conservation areas and the Connecticut River, a canoe route and national wild and scenic river study candidate. Just north of the Moore Substation impacts are assigned because of the visibility from Routes 18 and 131, a bicycle route, and a fall foliage route; the Connecticut River; a canoe route; recreation streams; and Route 93, a scenic road.

A number of high impacts were recorded where the route crosses or is visible from State wild and scenic river candidates in New Hampshire. Near Groveton the route would be visible from portions of the White Mountain National Forest. A high impact is assigned to the crossing of the Arnold Trail in Maine.

TABLE 3.12-3

RECREATION IMPACTS[1]
MOOSE RIVER - MOORE

	Preemptive Impacts		Recreation Viewer Impacts	
Impact Levels	Number of Occurances	Percent	Miles with Impacts	Percent
None	-	-	32.7 mi.	24.3%
Low	27	32.1%	43.9 mi.	31.6%
Moderate	24	28.6%	32.1 mi.	23.7%
High	30	35.7%	23.4 mi.	17.4%
Severe	3	3.6%	4.0 mi.	3.0%

1 Reference: Visual-Recreation Resources Impact Study, appendix I.

3.12.2.4 Moore - Granite

Table 3.12-4 shows the number of preemptive impacts and number of miles with recreational viewer impacts occurring along the route segment.

Preemptive Impacts

The predominate impacts along this segment are moderate. The impacts relate to the crossing of recreational streams and rivers, bicycle routes, proposed scenic routes, and crossings of proposed recreation and conservation areas. The severe impacts in this segment occur where the proposed route crosses Groton State Forest and the Pine Mountain wildlife management area. The high impacts recorded occur primarily at crossings of fall foliage route and where historic sites are in the viewshed. Other high impacts occur to a scenic road and hiking trails.

Recreational Viewer Impacts

Severe impacts occur where the line would be visible from the Connecticut River and proposed recreation and conservation lands. A severe impact is assigned where the line crosses the Pine Mountain Wildlife Management Area and the Groton State Forest.

TABLE 3.12-4

RECREATION IMPACTS[1]
MOORE - GRANITE

Impact Levels	Preemptive Impacts: Number of Occurances	Preemptive Impacts: Percent	Recreation Viewer Impacts: Miles with Impacts	Recreation Viewer Impacts: Percent
None	-	-	5.0 mi.	13.1%
Low	-	-	6.0 mi.	15.7%
Moderate	19	57.6%	5.6 mi.	14.8%
High	11	33.3%	13.5 mi.	35.4%
Severe	3	9.1%	8.0 mi.	21.0%

[1] Reference: Visual-Recreation Resources Impact Study, appendix I.

3.12.2.5 Granite - Essex

Table 3.12-5 shows the number of preemptive impacts and miles of recreational viewer impacts occurring along this segment.

Preemptive Impacts
Over one-half the impacts recorded for this segment were moderate. Many occur at crossings of recreational and fishing streams. Other recreational resources which may experience a moderate impact include canoe routes and bicycle routes. Four severe impacts were recorded along the route. Features include the Barre City Forest, and a natural area along the route, Bolton Falls, and a skiing area near the Essex Substation. High impacts were assigned to crossings of fall foliage routes, scenic roads, and the Long Trail, and to views from historic sites.

Recreational Viewer Impacts
Slightly less than half of the recreational viewer impacts in this segment are high. The severe impacts represent slightly more than 6 percent of the total impacts for this segment. Collectively, the severe and high impacts were primarily recorded where the proposed facilities can be seen from the recreational sites and areas along the Winooski River Valley. At many locations the line is visible from the river which is a canoe route and a fishing stream. It is also visible from routes 100 and I-89, which are fall foliage and scenic routes; Bolton Falls natural area; historic sites, and Camels Hump State Park. Severe impacts would occur where the line would be visible from Barre City Forest and a natural area.

High impacts were assigned to views from recreational resources of the Winooski River Valley. Such features as the Long Trail, several fall foliage routes, Mad and Huntington rivers, other smaller recreational stream tributaries to the Winooski River, and a ski jump would view of the facilities.

TABLE 3.12-5

RECREATION IMPACTS[1]
GRANITE - ESSEX

	Preemptive Impacts		Recreation Viewer Impacts	
Impact Levels	Number of Occurances	Percent	Miles with Impacts	Percent
None	-	-	4.2 mi.	9.7%
Low	8	16.0	4.4 mi.	10.2%
Moderate	27	54.0	12.7 mi.	29.3%
High	11	22.0	19.3 mi.	44.6%
Severe	4	8.0	2.7 mi.	6.2%

[1] Reference: Visual-Recreation Resources Impact Study, appendix I.

3.12.3 Summary of Recreation Impacts

Recreational impacts for the entire proposed route are summarized in Table 3.12-6.

TABLE 3.12-6

SUMMARY OF RECREATIONAL RESOURCE IMPACTS[1]
ALL SEGMENTS

Impact Levels	Preemptive Impacts: Number of Occurances	Preemptive Impacts: Percent	Recreation Viewer Impacts: Miles with Impacts	Recreation Viewer Impacts: Percent
None	-	-	122.1 mi.	33.3%
Low	64	28.4%	85.9 mi.	23.5%
Moderate	82	36.4%	76.7 mi.	21.1%
High	66	29.3%	66.1 mi.	18.1%
Severe	13	5.9%	14.7 mi.	4.0%

[1] Reference: Visual-Recreation Resources Impact Study, appendix I.

3.13 Visual

3.13.1 General Impacts

The location, construction, and maintenance of the proposed transmission lines, substations, and control facilities will have varying degrees of visual impact. These impacts will depend on each facility's compatibility with its surroundings, the scenic quality of the area, the screening provided by terrain and vegetative cover, the design of the structures, control buildings, access roads, and rights-of-way. They will also depend on the number of viewers at any given point, their distance from the line, their activity at the time of viewing, and their subjective reaction to the scene. Adverse visual impacts usually occur when:

- The facilities are visible in areas recognized for visual quality.
- Lines cross transportation (i.e., highways, rivers, trails, railroads, etc.) or other areas used by sightseers, recreationists, or naturalists.
- A major portion of a view is occupied by transmission lines.
- Several transmission corridors are visible from any one point.
- Residences are exposed to immediate views of transmission towers.

-Lines are incompatible or out of scale with major visual patterns.

-Parallel lines are dissimilar in configuration, location and materials, or when the lines become visually dominant.

-Facilities are located in areas subject to long-term scarring from grading, clearing, and maintenance activities.

-Towers are silhouetted, especially on ridges.

-Several transmission corridors converge or are parallel in one area, or in areas where corridors intersect, as around substations.

Esthetic impacts of a transmission facility last through the life of a project. Mitigating measures are discussed in chapter 4.

A vegetation management program often results in dead vegetation within controlled corridors. When aerial spraying is used, the visual impact can be extensive. A brown path will be visible until vegetation is reestablished--in a few months or a full growing season.

Some visual impacts are temporary. Visual starkness may be characteristic of new construction sites, new corridors, and temporary access roads before these areas are covered with vegetation that grows naturally or is produced by reseeding.

Present clearing criteria call for the removal of vegetation on or adjacent to the right-of-way where it may jeopardize the safe, reliable operation of the line.

Minimum conductor clearance criteria are established for initial clearing of a transmission line right-of-way and long-term vegetation management. The criteria call for the control of vegetation that will exceed minimum clearances within 15 years of growth.

These standard criteria based on tree growth can be reduced in visually sensitive areas. However, if this is done, the frequency of maintenance is increased.

3.13.2 Site Specific Impacts

Three categories of impact have been identified - impact on viewers, impact on visual landscape quality, and impact on site attractiveness. (see appendix I.)

3.13.2.1 Dickey-Lincoln School-Fish River

Table 3.13-1 shows the viewer impacts, landscape quality impacts, and site attractiveness impacts for this segment.

Viewer Impacts
Viewer impacts are generally moderate. Only 13.2 percent of the segment has high impacts. Most of the high impacts occur in the vicinity of Fort Kent Mills and near St. Francis. Some moderate and high viewer impacts would occur at other locations in the St. John River Valley. Table 3.13-1 shows the miles of impacts on viewers for this line segment.

Landscape Quality Impacts
Impacts on visual landscape quality for this segment are moderate. The only area which may have a high impact is near Fort Kent Mills where the line may cross part of Stevens Hill and some adjacent smaller peaks. About 95 percent of the proposed alinement will result in moderate impacts.

Site Attractiveness Impacts
Impacts on site attractiveness in this segment are largely moderate. Severe impacts are identified at the Fish River and Allagash River crossings. High impacts would occur in two State owned public lands for which the timber and grass rights have been retained. For the rest of the segment, impacts reflect the attractiveness of land cover types along the route. The western part of the segment has a greater concentration of mature woodlands which are rated as having moderate impact. The eastern half passes through farm land and abandoned fields. It would receive high impacts.

TABLE 3.13-1

VISUAL IMPACTS[1]
DICKEY - LINCOLN SCHOOL - FISH RIVER

	Landscape Quality Impacts		Site Attractiveness Impacts		Viewer Impacts	
Impact Levels	Miles	Percent	Miles	Percent	Miles	Percent
None	-	-	-	-	-	-
Low	1.2 mi.	4.1%	8.0 mi.	27.2%	2.0 mi.	6.8%
Moderate	27.9 mi.	94.0%	16.2 mi.	55.0%	8.4 mi.	28.6%
High	0.3 mi.	1.9%	5.1 mi.	17.3%	15.1 mi.	51.4%
Severe	-	-	0.1 mi.	0.5%	3.9%	13.2%

1 Reference: Visual-Recreation Resources Impact Study, appendix I

3.13.2.2. Dickey - Moose River

Table 3.13-2 shows the viewer impacts, landscape quality impacts, and site attractiveness impacts for this segment.

Viewer Impacts

The impacts on viewers are extremely low because the line would pass through the unpopulated wildlands in northwestern Maine. Thirty-nine percent of the segment miles will have impacts on viewers. These are predominantly on recreation viewers. High impacts are predicted where recreation and transportation viewers are encountered. Impacts would be moderate for urban land use viewers and where the proposed route crosses Maine Highway 201. Impacts would be severe on recreation viewers in the vicinity of Baker Lake.

Landscape Quality Impacts

Landscape quality impacts along the Dickey to Moose River segment are the lowest of all segments. The terrain is not highly scenic. Impacts are low on the first half of the segment. High impacts occur where the line crosses ridges or hills. Some high impacts would occur on the South Branch of the Penobscot River and near Long Pond.

Site Attractiveness Impacts

Moderate impacts are predicted for most of this segment. Severe impacts occur where streams or rivers are crossed. High impacts occur where the line would pass near wetlands such as swamps, marshes and beaver dam impoundments. The dominant cover type along the route is mature woodlands. They would receive moderate impacts.

TABLE 3.13-2

VISUAL IMPACTS[1]
DICKEY - MOOSE RIVER

	Landscape Quality Impacts		Site Attractiveness Impacts		Viewer Impacts	
Impact Levels	Miles	Percent	Miles	Percent	Miles	Percent
None	-	-	0.3 mi.	0.5%	72.4 mi.	61.0%
Low	80.6 mi.	68.0%	45.2 mi.	38.0%	32.6 mi.	27.5%
Moderate	14.8 mi.	12.5%	70.2 mi.	59.0%	12.6 mi.	10.6%
High	23.2 mi.	19.5%	2.6 mi.	2.0%	1.0 mi.	0.9%
Severe	-	-	0.3 mi.	0.5%	-	-

[1] Reference: Visual-Recreation Resources Impact Study, appendix I

3.13.2.3 Moose River - Moore

Table 3.13-3 shows the viewer impacts, landscape quality impacts, and site attractiveness impacts for the Moose River-Moore segment.

Viewer Impacts

The impacts in western Maine will fall primarily on recreational viewers. Within New Hampshire, the route will encounter residential and highway viewers as well. Views from historic sites along the Connecticut River are impacted. Severe impacts are forecast for 4 miles of the route along the Connecticut River Valley southwest of Groveton, NH. High impacts will occur near Kidderville, NH; in the Black Hill area northeast of Groveton, NH; Mills Pond; and along Moore Reservoir.

Landscape Quality Impacts

Impacts on landscape quality in this segment are greater than for any other segment in the entire route. Landscape quality is high in western Maine. Severe impacts occur near Burnt Jacket Mountain, west of Jackman, Maine, on several hilltops; in the Connecticut Lakes Region; near Kidderville, NH: southwest of Groveton, NH; near Cape Horn; and through the Connecticut River Valley.

TABLE 3.13-3

VISUAL IMPACTS[1]
MOOSE RIVER - MOORE

	Landscape Quality Impacts		Site Attractiveness Impacts		Viewer Impacts	
Impact Levels	Miles	Percent	Miles	Percent	Miles	Percent
None	-	-	0.7 mi.	0.5%	28.7 mi.	21.3%
Low	-	-	23.5 mi.	17.4%	59.8 mi.	43.4%
Moderate	3.8 mi.	2.8%	103.8 mi.	76.0%	33.9 mi.	25.2%
High	116.2 mi.	85.2%	7.6 mi.	5.6%	10.4 mi.	7.7%
Severe	16.1 mi.	12.0%	0.5 mi.	0.5%	3.3 mi.	2.4%

[1] Reference: Visual-Recreation Resources Impact Study, appendix I

Site Attractiveness Impacts

Impacts on site attractiveness along most of this segment are moderate. High impacts occur to wetlands. Moderate impacts fall on mature woodlands which dominate the segment. Regenerating forests would receive high impacts. Agricultural land would receive high impacts in the Colebrook area of New Hampshire. Severe impacts occur at the Connecticut River crossing and near Cape Horn.

3.13.2.4 Moore - Granite

Table 3.13-4 illustrates impacts to viewers, landscape quality, and site attractiveness on this segment.

Viewer Impacts
This segment contains sections that will have severe impacts on viewers. The average impacts for the entire segment is high because of the number of persons who live in or visit northeast Vermont. Recreation viewer impacts are severe on more than one-fourth of the segment. Severe impacts on viewers will occur near Barnet, VT, and near East Barre.

Landscape Quality Impacts
The average landscape quality rating for this segment ranges from moderate to high. From Barnet, high impacts dominate the first half of the route. Moderate impacts dominate the latter half. This is because the route leaves the mountainous area next to the Connecticut River Valley and enters a more hilly area southeast and east of Barre City. The impact is lower for this segment because the right-of-way is shared with another line.

Site Attractiveness Impacts
The low impacts in this segment are generally related to the sharing of an existing right-of-way.

TABLE 313-4

VISUAL IMPACTS[1]
MOORE - GRANITE

	Landscape Quality Impacts		Site Attractiveness Impacts		Viewer Impacts	
Impact Levels	Miles	Percent	Miles	Percent	Miles	Percent
None	-	-	2.1 mi.	5.5%	2.0 mi.	5.2%
Low	-	-	25.4 mi.	66.6%	1.0 mi.	2.6%
Moderate	22.9 mi.	60.0%	9.3 mi.	24.4%	11.0 mi.	28.9%
High	15.2 mi.	40.0%	0.8 mi.	2.0%	20.0 mi.	52.5%
Severe	-	-	0.5 mi.	1.5%	4.1 mi.	10.8%

[1] Reference: Visual-Recreation resources Impact Study, appendix I

3.13.2.5. Granite - Essex

Table 3.13-5 shows impacts to viewers, landscape quality and site attractiveness on this segment.

Viewer Impacts
Because this segment passes through the most populated area on the proposed route, it will cause the most severe impacts on viewers. The average viewer impact is high. Severe impacts occur on almost one-fourth of the segment. Severe impacts will occur on viewers traveling Route I-89. Impacts occur all along the segment.

Landscape Quality Impacts
Right-of-way sharing is proposed for much of this segment. The overall impact is moderate. Much of the land along this segment is developed and is rated lower in scenic quality. Severe impacts will occur on some ridges. High and moderate impacts are uniformly distributed.

Site Attractiveness Impacts
Because most of this segment would share a right-of-way, the average impact is low to moderate. Moderate impacts dominate where the proposed route passes through mature woodlands or abandoned agricultural fields. The most severe impact occurs near Montpelier-Barre Regional Airport where the line would infringe on a designated "unique geological area." Another severe impact occurs nearby on hilltops. Others occur near river crossings.

TABLE 3.13-5

VISUAL IMPACTS[1]
GRANITE - ESSEX

	Landscape Quality Impacts		Site Attractiveness Impacts		Viewer Impacts	
Impact Level	Miles	Percent	Miles	Percent	Miles	Percent
None	-	-	1.7 mi	3.9%	1.0 mi.	2.3%
Low	10.7 mi.	24.7%	16.6 mi.	38.3%	3.0 mi.	6.9%
Moderate	18.8 mi.	43.4%	21.3 mi.	49.2%	9.1 mi.	21.1%
High	13.5 mi.	31.2%	2.7 mi.	6.2%	20.5 mi.	47.3%
Severe	0.3 mi.	0.7%	1.0 mi.	2.4%	9.7 mi.	22.4%

[1] Reference: Visual-Recreation resources Impact Study, appendix I

3.13.2.6 Summary of Visual Impacts

Visual impacts contained in the impact tables for individual route segments are summarized in Table 3.13-6.

TABLE 3.13-6

SUMMARY OF VISUAL IMPACTS[1]
ALL SEGMENTS

	Landscape Quality Impacts		Site Attractiveness Impacts		Viewer Impacts	
Impact Levels	Miles	Percent	Miles	Percent	Miles	Percent
None	-	-	4.8 mi.	1.3%	106.1 mi.	29.0%
Low	92.5 mi.	25.3%	118.7 mi.	32.5%	104.8 mi.	28.7%
Moderate	88.2 mi.	24.1%	220.8 mi.	60.4%	81.7 mi.	22.4%
High	168.4 mi.	46.1%	18.8 mi.	5.1%	55.8 mi.	15.3%
Severe	16.4 mi.	4.5%	2.4 mi.	0.7%	17.1 mi.	4.6%

[1] Reference: Visual-Recreation Resources Impact Study, appendix I

3.14 Forest Resources

3.14.1 Volume Impacts

Table 3.14-1 shows the acres of forest land, by timber type and political subdivision, that would be removed from production. Table 3.14-2 shows the volumes and values of timber that would be lost from production each year. These volumes were calculated using average state stumpage values, under the assumption that 7 percent of Maine's sawtimber production is veneer logs and bolts.

3.14.2 Impacts During Construction

The impact of the route during construction would clearly be minimal. The logging forces and mill capacities in the three-state region should be able to absorb the products from clearing operations with no disruption of the existing market structure.

3.14.3 Impacts During Operation

Whether or not the "losses" portrayed in table 3.14-2 would actually occur depends upon future demands for timber in the route area. The

TABLE 3.14-1

ACRES OF FOREST LAND BY TIMBER TYPE, COUNTY AND STATE[1]

Political Subdivision	Timber Type[2/]								
	S	H	SH	HS	CS	PN	PB	W	Total[2/]
Aroostook	478	253	223	201	46	0	6	7	1214
Piscataquis	55	5	3	12	7	0	0	2	84
Somerset	875	404	59	85	6	0	10	51	1490
Franklin	183	162	55	121	0	0	0	6	527
Oxford	129	100	0	0	0	0	0	8	237
Coos	113	315	253	160	0	6	0	0	847
Grafton	5	0	0	68	0	21	0	0	94
Essex	96	80	121	33	0	0	0	1	331
Caledonia	85	65	39	113	0	9	0	0	311
Washington	38	98	137	54	0	1	0	0	328
Orange	26	96	39	111	0	6	0	0	278
Chittenden	3	66	111	51	0	0	0	0	231
Maine	1720	924	340	419	59	0	16	74	3552
New Hampshire	118	315	253	228	0	27	0	0	941
Vermont	248	405	447	362	0	16	0	1	1479
Total	2086	1644	1040	1009	59	43	16	75	5972

1 Reference: Socioeconomic Impact Study, appendix H

2/ S=softwood, H=hardwood, SH=softwood/hardwood mix, HS=hardwood/softwood mix, CS=cedar swamp, PN=pine/hemlock, PB=poplar/birch, W=wetlands.

loss values are dominated by sawlog-quality hardwood and spruce-fir sawtimber and pulpwood. These are the product categories most likely to be in high demand indefinitely, and the highest quality sawtimber is already in short supply.

The following estimates of opportunity costs due to the proposed route assume a discount rate of 10 per cent, deflated by an estimated average annual rate of inflation of 3 per cent. The adjusted rate was used to capitalize the volumes listed in table 3.14-2, multiplied by the values of shipments per cord. The maximum economic impacts, using conservative growth rates are:

Maine	$4,495,214
New Hampshire	3,082,790
Vermont	2,316,176
Total	9,894,180

3.14.4. Tax Impacts

3.14.4.1. Maine

Under current assessment practice, conversion of forest lands to a cleared right-of-way will actually increase, rather than decrease, the tax yields from those lands. The land, once cleared, no longer qualifies for Tree Growth Tax Law treatment. State assessors regard a right-of-way as a "higher and better use" of the land, even if the powerline is in tax-exempt public ownership and the landowner is unable to grow timber on it. For lack of empirical evidence as to the actual market value in this use, the rule of thumb currently used is to assess the property as before the change but on double the acreage, thus doubling the tax yield. The effect of the tax shift, then, will appear as a project cost to the extent that the landowner is able to include the capitalized value of expected tax levies in the compensation negotiated for the easement.

Table 3.14-3 shows current tax yields along the route. Under current assessment practice, assuming assessment of the rights-of-way in the organized towns comparable to the guidelines used for the unorganized, the total annual tax yield would be $2,463 (capitalized present value net gain of $36,241).

3.14.4.2 New Hampshire

The impact of the transmission line on tax revenues from New Hampshire forest lands would probably be limited to yield tax losses. A number of powerline and pipeline rights-of-way through the state's forest lands exist where no distinction has been made between these rights-of-way and adjacent forested lands in assessing bare land value. Accordingly, the total tax loss in New Hampshire would be $322 per year (capitalized loss of $4885).

TABLE 3.14-2

ANNUAL ROUNDWOOD PRODUCT VOLUME AND VALUE LOSSES[1]

Product	Volumes			Values ($)		
	ME	NH	VT	ME	NH	VT
Sawlogs (BF)						
White pine	7417	11914	4852	304	447	182
Spruce-fir	191673	39233	40873	6613	1275	1327
Hemlock	14338	10377	9887	344	192	183
Cedar	21131	4905	4960	448	147	146
Yellow birch	462	315	187	20	19	11
White birch	3558	1389	1219	153	80	69
Hard maple	10831	7529	8140	444	377	406
Soft maple	11989	2983	6630	276	60	132
Beech	8847	2359	3504	230	47	70
Pulpwood (cords)						
Pine	8	0	29	28	0	522
Spruce-fir	434	79	84	3146	513	546
Hemlock	43	2	6	183	6	18
Hardwood	149	44	16	633	154	56
Veneer (BF)						
Yellow birch	37	31	23	2	0	0
White birch	239	0	579	61	0	0
Hard maple	815	0	117	33	0	0
Totals (cords and $'s)	1175	287	297	12918	3317	3668

1 Reference: Socioeconomic Impact Study, appendix H

TABLE 3.14-3

CURRENT TREE GROWTH TAX LAW VALUES AND TAX YIELDS OF TRANSMISSION ROUTE THROUGH MAINE[1]

Jurisdiction	Valuation ($) by Timber Type[2/] S	M	H	W	Total Valuation	Tax ($)	% of total
Fort Kent	869	876	265	0	2010	49	.0076
St. John Plt.	553	1826	405	0	2784	57	.1545
St. Francis	1217	2209	389	11	3826	96	.2116
Allagash	2449	2803	627	57	5936	370	.2471
Moose River	1028	2015	511	267	3821	47	.0309
Dennistown Plt.	975	778	469	262	2410	54	.2655
Unorganized Towns							
Aroostook County	15192	4243	1551	70	21055	423	.0271
Piscataquis "	3057	474	97	20	3648	73	.0045
Somerset "	37994	922	5230	157	44303	889	.0553
Franklin "	7320	4418	2155	60	13953	280	.1023
Oxford "	4812	0	1330	80	6222	125	.0509
Totals	75465	20564	13029	984	109968	2463	

1 Reference: Socioeconomic Impact Study, appendix H

2/ S - softwood (including cedar and pine types)
M - mixed wood
H - hardwood (including poplar-birch type)
W - wetland

3.14.4.3 Vermont

The transmission route would probably have little effect on tax yields from Vermont forest lands. Except perhaps for highly-valued sugarbushes, market prices for these lands appear to reflect values other than for timber production. There might be some decrease in valuation in towns such as Jericho and Barre, where there is now considerable pressure for development, but remote forest lands in towns such as Guildhall and Lunenberg would probably not change in valuation under the route easement.

3.15 Cultural Resources

Impacts on historic and archaeologic resources could be caused by construction, operation, or maintenance of transmission lines. Direct impact refers to actual physical alteration of the site during construction of access roads and transmission towers or during the stringing of the line. Indirect impact refers to visual intrusions on cultural settings.

3.15.1 Direct Impact

Most if not all of the standing structures and cemeteries have been identified and will be avoided. Further work will be done during subsequent phases of the project to locate additional historic sites. Major concern has been expressed over impacts to archaeological resources that may lie below the surface of the ground. An intensive right-of-way survey by professional archeologists is also planned to locate prehistoric sites. Potential direct impact on these resources can be minimized by avoidance.

However, some sites may be buried too deep to be revealed by the intensive survey. Footings for transmission towers may extend as deep as 10 feet, or deeper than test pits usually extend. If an archaeological site is discovered during construction, the contractor or construction inspector will be required to report the site and suspend activity in the area until the site can be investigated by an archaeologist. Artifacts which have been disturbed will be retained by the construcion inspector for an archaeologist. Objects still in place will be protected from vandalism and will not be moved.

Decisions concerning appropriate mitigative action will be made in each instance in cooperation with the State historic preservation officers. These decisions might entail minor redesign of the line.

3.15.2 Indirect Impact

Indirect impact results from visual intrusion by the transmission line on the integrity of a cultural setting. This type of impact affects only those cultural resources referred to as historic and even here there are varying degrees of impact severity depending upon the status of the particular resource. The esthetic integrity of cemeteries and archaeological sites is of relatively minor concern.

For a standing structure to be considered of historical value it must (a) have some antiquity (usually in excess of 50 years) (b) bear a direct relation to an historical person or event, or (c) reflect early construction methods or architecture.

Historic structures within view of the line are subject to indirect impact if the line dominates the landscape to the extent that it detracts from the site. Factors considered include distance from the transmission facility, number of viewers, the nature of the landscape, the nature of the view, and how much line is seen.

Appendix I contains a more complete discussion of visual impacts.

A final assessment of the degree of impact on standing structures and cementeries will be made in each state by the State Historic Preservation Officer during the intensive review.

3.15.3 Site Specific Impacts

The more significant direct and indirect impacts on the cultural resources along each segment of route are discussed below. Section 2.15 contains tables which list cultural resources occuring along the proposed route.

3.15.3.1 Dickey - Lincoln School - Fish River

One historical site on this segment is within view of the line. It is the Villa d'Aigle house in St. Francis township. Two potential archaeological sites in St. Francis township also are in the viewshed. They are the Xavier-Cyr Mill and an Indian burial ground in Jonesmill. The potential for finding archaeological sites on the route is medium to high.

3.15.3.2 Dickey - Moose River

One significant historical area on this segment is where the line crosses the abandoned Bald Mountain Railroad in Somerset County.

An archaeologic site known as the Gorge-on-waterline, is listed on the State register and is within view of the line. A predicted analysis of archaeologic resources suggested that the probability of finding archaeological sites on this segment is medium.

3.15.3.3 Moose River - Moore

There are 11 historical sites within the viewshed of this segment. Six are within the viewshed but are outside the route. Four sites are on the State register: the Guildhall, VT Common Area, the Guildhall Central School, and the Old Crawford home in Guildhall, and the Arnold Trail, The Trail is also on the National register. Also of significance are an 1820 house near Littleton, NH and two 19th century frame houses in the township of Guildhall. Three archaeological sites were identified: Fort Wentworth, 1775, which is listed on the State register; the remains of an 18th century fort north of Guildhall; and cellar holes north of Lunenburg, VT. The general archaeological assessment said the probability of finding additional archaeological sites on this segment is medium.

3.14.3.4 Moore - Granite

There are 16 historical sites on this segment. Seven are within the one-half-mile-wide route. Nine of the sites are identified on the State register. Significant sites within the route include the crossing of the Bailey Hazen Military Road in Ryegate, VT; the Bouville route in Groton, VT; the Downing Lot Cemetery; the Joseph Calef Place two 19th century frame houses in Groton, VT; and a 19th century cemetery in Concord, VT.

Three archaeological sites are listed on the State register, two on the route, and one in the viewshed. The general archaeological assessment indicated the probability of finding additional archaeological sites on the route is medium.

3.15.3.5 Granite - Essex

There are 37 historic sites along this segment, five which are on the one-half-mile-wide route. Twenty-nine of these historical sites are listed on the Vermont State register. Four sites were determined from other sources. The line would cross two Indian trails, the Winooski River Trail and the First Branch River Trail, both in Washington County, VT. A complete listing of the specific resources is shown in table 2.15-5, section 2.15. One archaeological site was listed on the State register. This is the Bolton Falls site, a rock shelter in Washington County. The probability of finding additional archaeological sites is medium.

3.16 Substation Impacts

As discussed in Section 2.16, three of the substations in the system are additions to the existing substations. These are Fish River, Moore, and Granite. Essex Substation is to be built by Vermont Electric Power Company and the proposed transmission will tie into the existing facility.

No specific impact discussions are presented for the additions to the existing substations because little or no additional impact or modification is anticipated. Section 1.04 discusses the amount of additional land area that will be required at each of the substation sites. It is assumed that this amount of land and associated resources will be permanently impacted by the additions. Impact discussions for the new substations follows:

3.16.1 Dickey Substation

The impact on the ecological resources of the site will be minor since no ecological resources of significant regional or local importance are known to be present at this site.

The impact on the visual landscape quality of the area will be moderate to low. The dams and related generating facilities will drastically alter the visual environment surrounding the site. The substation will be visible from portions of the Michaud Tote Road.

The substation would be visible from the Allagash River. The status of the Allagash as a State Wilderness Waterway and a notable canoe route is the basis for high impact. There could be views of the substation from an existing picnic area and proposed hiking trails, depending on their actual location.

3.16.2 Lincoln School Substation

The impact on the ecological resources of the site will be minor as no ecological resources of significant regional or local importance are known to be present.

The impact of the substation on the visual landscape quality is high due primarily to the high visual quality of the site. The impact on the visual site attractiveness of the site will also be high. This is primarily due to the location of the substation on cultivated agricultural fields with adjacent hedge rows and wood lots. The substation will be visible from Highway 161 which is located adjacent to the proposed site. There are several residences and two medium density residential clusters on the highway in the vicinity of the site.

Recreation resources near this site are: Highway 161, a fall foliage route; the St. John River; and maintained and unmaintained snowmobile trails. Users of the fall foliage route would pass directly in front of the proposed site.

The substation would permanently impact about 0.7 acre of agriculture land which currently is used to grow potatoes.

3.16.3 Moose River Substation

The impact on the ecological resources of the site will be minor as no ecological resources of significant regional or local importance are known to be present. A moderate impact is expected on the visual quality of the area near and adjacent to the substation site. The site would be visible from U.S. Highway 201 which is located near the proposed site.

Approximately 5 acres of forest land would be permanently removed by this facility.

3.17 Microwave Station Impacts

The most significant impacts from these facilities will result from access road construction, because of rugged locations. These roads, even when well constructed, can raise the silt load in streams until it becomes harmful to fish, especially during construction.

The facilities and access roads will cause long-term destruction of vegetation and the habitat for wildlife and will preclude its future use. Microwave stations will destroy one-fourth acre of habitat for each site. These figures do not include habitat removal from access roads. The microwave sites will probably be limited in wildlife and most plants.

The most significant impacts of these facilities are the visual and recreation impact associated with each microwave site.

Four sites will be developed in conjunction with existing microwave facilities. These are Hot Brook, Ferry, Bagley and Black Cap, all of which facilities would be constructed next to exisitng facilities. Changes would be minimal. Viewer impacts would not increase significantly. The potential for preemptive impacts on recreational resources is low since recreational sites could easily be avoided.

At Black Cap, the facilities are in an area proposed as open space by the town of Eddington. Recreational viewer impacts would be low due to the presence of the existing towers.

The seven new microwave installations are: Lincoln School, McLean Mountain, Pennington Mountain, Ashland, Oakfield, Oak Ridge and Parlin.

3.17.1 Lincoln School Passive Repeater

The impact to recreational viewers would be high due to the direct visibility of the facility. Motorists on Highway 161, snowmobilers, or users of the Rankin Rapids Park or other sites along the St. John could directly observe the proposed facility.

The predicted level of impact on visual landscape quality for this facility is moderate owing to a high existing quality and moderate absorption rating. The land clearing will be minimal and the greatest impact will result from the presence of the reflector.

Impacts on residential and transportation viewers are low; primarily as the number of incidents of impact will be low. Woodlands along the edge of the St. John River and Highway 161 will occasionally screen the facility from view. No historic site viewer impacts are predicted.

3.17.2 McLean Mountain

Due to the direct visibility of the proposed tower from McLean Lake and Third Lake as well as the fishing streams and snowmobile trails in the area, the overall impact of the installation would be high. This would be the case especially because of the visual change introduced into this fairly remote portion of St. Francis.

A high existing landscape quality rating coupled with very low absorption conditions result in a severe impact on visual landscape quality. The facility will be an obvious intrusion on the landscape situated atop

McLean Mountain.

Impact on visually sensitive land uses is low (to very low) owing to the fact that almost no uses are present within a 2-mile radius of the proposed installation site.

3.17.3 Pennington Mountain

Since there would only be a potential for a low number of recreational viewers from the existing Maine Forest Service fire tower, the overall impact at this proposed site would be low. Any other recreational resource in the vicinity of the proposed site would probably not notice the facility.

Very low absorbtion at the site results in a high impact on visual landscape quality. Due to the extremely rural and remote character of the area around Pennington Mountain, few if any land uses will be visually affected.

3.17.4 Ashland

The overall recreation viewer impact at the Ashland site would be high. This is due primarily to viewers along the Machias and Aroostook rivers, which would include canoeists, fishermen, swimmers and boating enthusiasts. In addition, hunters using the American Realty Tote Road, snowmobilers using Lynch's Tote Road, and motorists traveling along Highway 11 could see the facility.

Similar to most of the microwave site alternatives, the very low absorbability is the prime impact determinant. The impact on visual landscape quality will be high.

Visual impact on land uses is moderate. A farmhouse is located adjacent to the proposed site. A moderate impact rating has been assigned because an existing radio antenna is next to the house. Other impacts within a 2-mile radius will be low.

3.17.5 Oakfield

The recreational viewer impact at this site would be moderate. Snowmobilers are the only known close viewers of the facility. Other viewers may be near Pleasant Lake about 2 miles to the southwest.

The impact on the visual landscape quality will be severe. The highest existing landscape quality at any of of the sites occurs at Oakfield. Absorption is very low.

As only scattered residences and farmsteads are located in the vicinity of the proposed site visual impacts on land use will be low. The settlements at Oakfield and Red Bridge will be unaffected and are beyond a 2-mile radius. No views from historic sites are affected.

3.17.6 Oak Ridge

The recreational viewer impact at Oak Ridge would be high. This is due to the visibility of the proposed site from Routes 6 and 15 and the Appalachian Trail. Motorists on Routes 6 and 15 would not have a direct line of sight to the facility, and, the users of the Appalachian Trail may only notice the facility when traveling north.

A high impact on existing visual landscape quality is predicted for this site. This is primarily the result of a very low absorption rating. Land use viewer impacts will be low.

3.17.7 Parlin

Visual impacts at the Parlin site would be moderate. Moderate impact was assigned since most of the recreational viewers would be located a distance from the facility and may not notice it and the motorists using Highway 201 would not have the tower in a direct line of sight. The site would, however, be visible from an unmaintained snowmobile trail and possibly to trout fishermen at the Horseshoe Pond.

Due to the very low absorbability of the mountaintop location, proposed for this facility and a very high existing quality rating, impact on visual landscape quality will be severe.

Only scattered land use development is present within the vicinity of the proposed facility. Thus, impacts on residential viewers is low. Highway 201 also passes near the site; transportation viewer impacts rated low.

3.18 Electrical Effects

3.18.1 Audible Noise

Corona creates audible noise along transmission lines. Corona occurs in regions of high electric field strength on conductors and other hardware. Sufficient energy is imparted to charged particles to cause ionization of the air. During all weather, air ionizes near irregularities (e.g., nicks, scrapes, or concentrations of insects) on the conductor surface.

During foul weather, raindrops, snowflakes and condensation add to the isolated corona sources that exist in fair weather and cause an increase in corona activity. Audible noise is mostly caused when drops of water form of the surface of the conductor. The noise has a hissing or crackling sound with a 110 Hz hum occasionally superimposed. The sound level near a transmission line depends on the electric field strength at the conductor surface, the size and number of conductors, and the weather. Engineers can and do produce line designs which limit corona generation so that corona effects have no appreciable significance.

The proposed design for the double circuit line for twin rail conductors spaced 18 inches apart for each phase. This configuration would result in audible noise levels of 43 dBA at the edge of the right-of-way, during rain. No appreciable noise will result from operation of the line, even in rare and unusual weather conditions. Thus, the line would have little or no noise impact on the surrounding environment.

3.18.2 Electromagnetic Interference

Electromagnetic interference (EMI) is defined as the disruption of electromagnetic waves or the entire frequency spectrum from 10 Hz to 100 Hz. (Hz or Hertz is a unit of frequency measured in cycles per second.) AM radio, television reception, and wire communications circuits operate in a portion of this frequency range and can be susceptible to EMI from some high voltage lines depending upon signal strength and level of interference. The proposed EHV lines, however, are designed to operate at 345 kV with a conductor configuration which is almost interference free. Television reception would not be affected. Interference with radio reception might be noticed when a weak station is being received on the right-of-way.

Power transmission lines produce electromagnetic and electrostatic fields which can, under certain conditions, cause voltages to appear on wire communications circuits. These systems are usually operated by telephone and railroad utilities. This electrical effect, under certain conditions, can cause electrical noise on voice and data transmission circuits. As a general guidelines, interference with wire-type communication lines is not expected if the power transmission line and the communication lines parallel each other for less than a mile and are separated by more than one-fourth to one-half mile.

3.18.3 Field Effects

In recent years, some members of the public have voiced concern about possible adverse biological effects from transmission lines. It has been suggested that adverse effects result to living organisms from exposure to electric and magnetic fields surrounding substations and transmission lines. Much research into the effects of these fields is underway, and a lot of it is directed at obtaining information that will clarify findings that are as yet incomplete or contradictory. A listing of current and recent research activities on the biological effects is contained in a summary published by the Bonneville Power Administration (BPA), an agency of the Department of Energy.

DOE is not aware of any conclusive evidence or research findings indicating that exposure to electric and magnetic fields near 345-kV transmission lines causes any harmful effects to humans, animals, or plants.

Field effects from transmission lines stem from electric and magnetic fields at the power frequency of 60 Hz in the proximity of high-voltage conductors carrying electric current. The high voltage creates the electric field. Currents flowing in the conductors are the source of the magnetic field.

A useful parameter to quantify the electrostatic and magnetic effects associated with these respective fields is the magnitude of the unperturbed field, that is, the magnitude or strength of the field where no large objects are present to interact with the field. In general, electric fields associated with transmission lines are expressed in units of kilovolts/meter (kV/m) and magnetic fields of gauss (G). The earth's average d.c. electric field at ground level is 0.13 kV/m. Beneath thunder clouds, the field may reach 3 kV/m, even in the absence of lightning (Polk, 1974). The d.c. magnetic field of the earth is about 0.6G.

Electric Fields. The electric field (voltage gradient) which surrounds a high-voltage conductor is measured or calculated at standard heights above the ground. This permits comparisons to be made between different lines. The electric field strength 1 meter above the ground has been demonstrated to be a valid parameter for the prediction of electrostatic effects (Deno, 1974; Bracken, 1975). (For a given conductor-to-ground height, the strength of the electric field does not vary more than 10 to 15 percent for heights up to 3 meters.) Maximum electric field levels of 4.9 kV/m would be present on the right-of-way under the proposed 345-kV line. Fifty feet from the center of the right-of-way, the level would be about 1.8 kV/m (see figure 3.18-1).

The presence of an electric field under a transmission line is sometimes demonstrated with a hand-held fluorescent tube. The tube may light up. This phenomenon has been associated with transmission lines and distribution lines. It is also possible to light fluorescent tubes in other ways, such as by holding a tube near a television set (Morgan, 1975). In all these instances, the illumination would be much less than that produced by normal use.

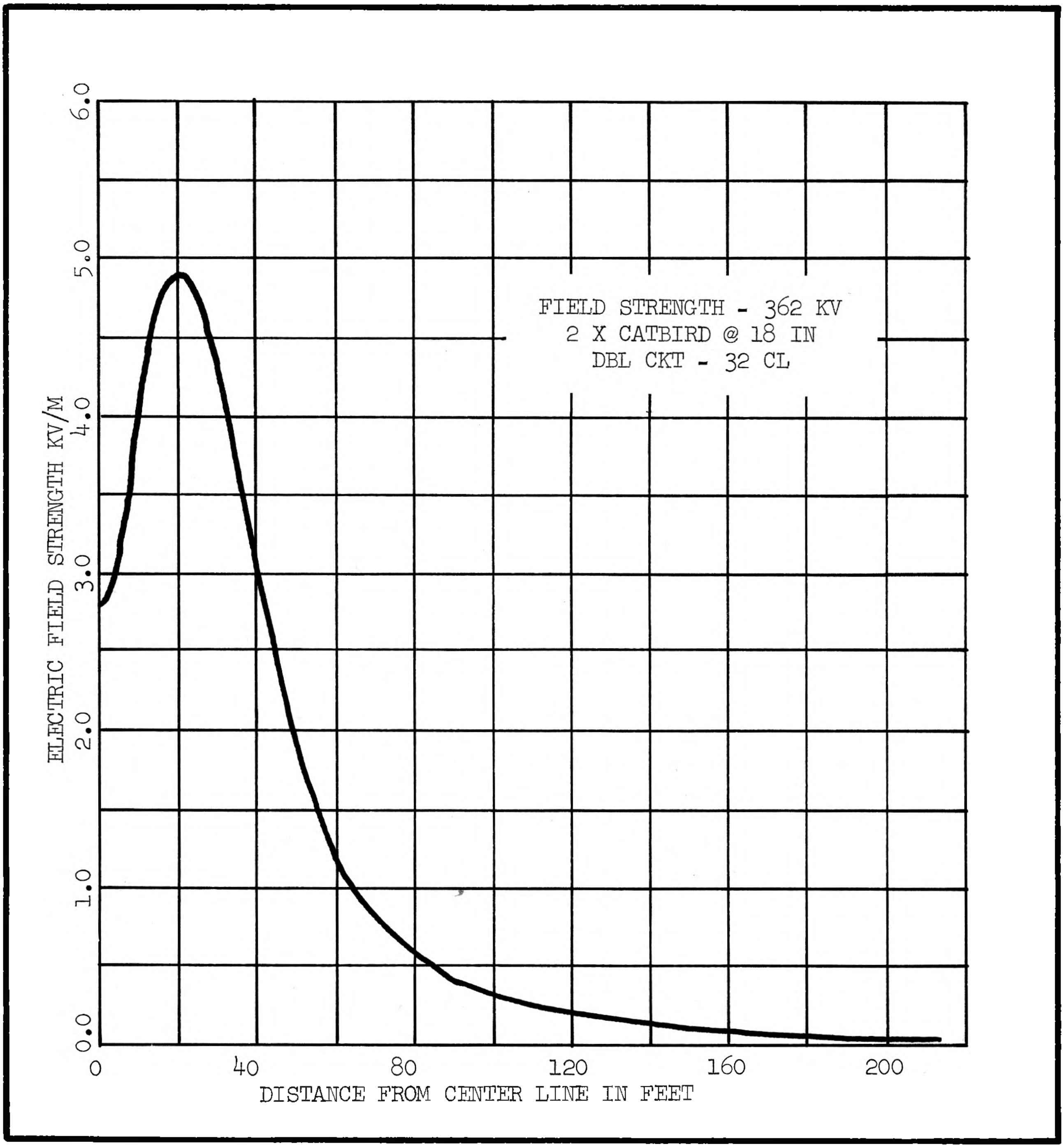
Induced Currents and Voltages. The electric fields associated with high-voltage lines can induce voltages and currents in metallic fences, structures, equipment, persons, or other conducting objects. This includes wire communications facilities of utility systems which may be in proximity to the powerline. The magnitide of the induced voltage and induced current due to the electrostatic field depend on the line voltage, the size of the object being charged, and the object's distance from the line conductors. The magnitude of induced current due to the magnetic field depends on the load current in the conductors, the orientation and length of the objects, and its distance from the conductors. Where the lines are less than 500 kV, conducting objects usually are grounded only after the receipt of complaint and an investigation indicates the need.

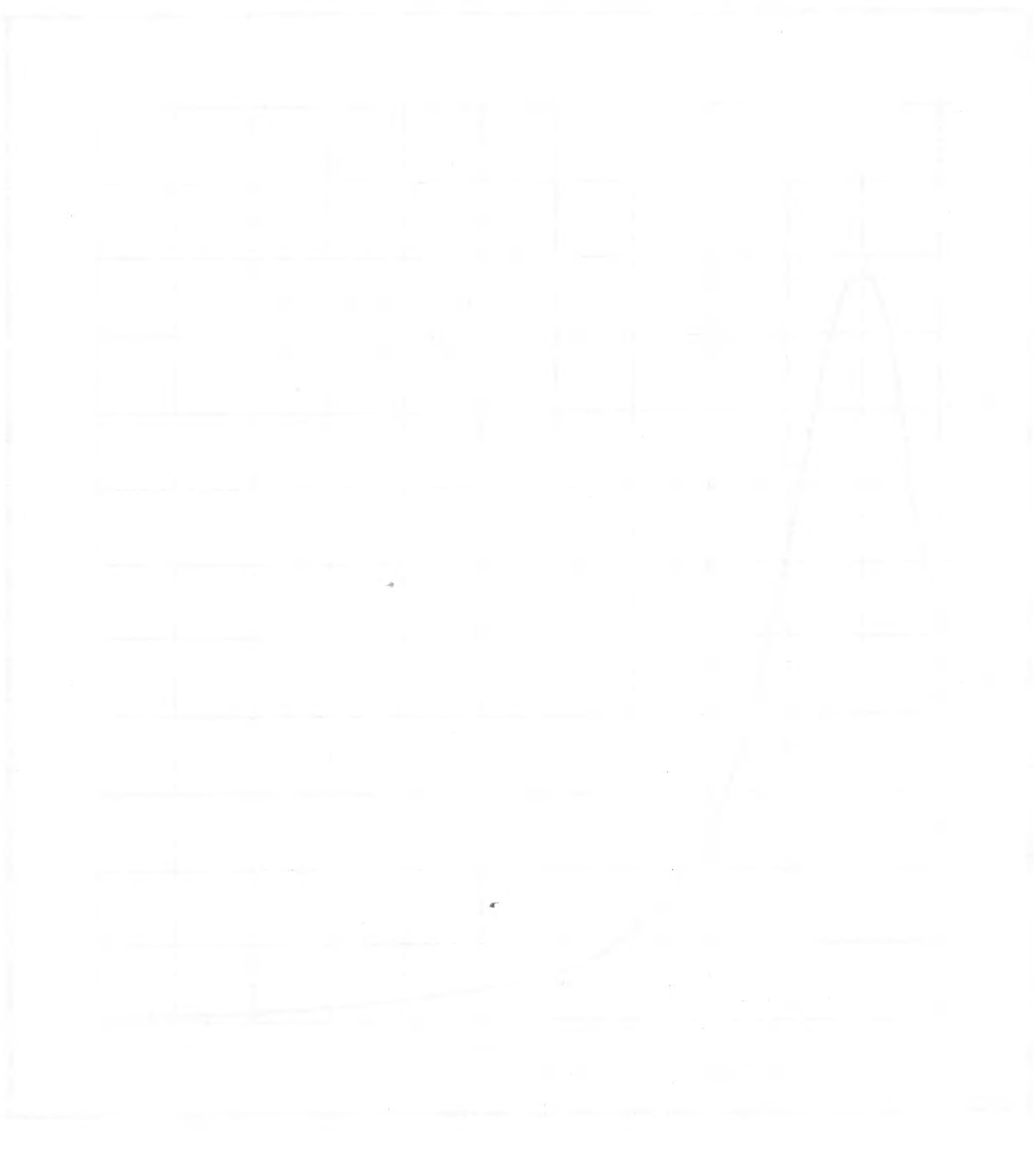
When conducting objects are grounded, the induced current flows to the ground and is called the short-circuit of the object. Measured short-circuit current for some objects in a 60 Hz electric field of 1 kV/m are tabulated below in miliamperes (mA):

Person (1.75 m height)	0.016 mA
Sedan	0.110 mA
Camper truck	0.280 mA
Large trailer truck	0.600 mA

FIGURE 3.18-1

ELECTRIC FIELD STRENGTH
AT 1 METER HEIGHT





The total short-circuit current for the above objects in any other field is found by multiplying the field strength in kV/m times the value given above.

Induced current effects fall into two classes: (1) perceptible short-term shocks, and (2) possible effects due to long-term exposure to electric fields.

Exposure to electric fields of the magnitude found under transmission lines results in currents flowing in an organism which are below the perception level. The significance of such currents is the subject of much research today.

Short-Term Biological Effects. When a person becomes a path to ground for short-circuit current from an insulated object, steady state current shocks may occur. The amount of current that will flow through a person contacting such an object is determined by how well both the object and the person are insulated from ground. The short-circuit current tabulated above is the maximum current an individual could experience in this situation. The values represent worst case conditions. Conditions conducive to maximum current flow are extremely rare.

Shock cases can be classified as below perception, above perception, secondary, and primary.

The mean perception level for an 82-kg (180-pound) man is about 1.0 mA. It is about two-thirds of that value for a 55-kG (120-pound) woman (Keesey and Letcher, 1970).

Secondary shocks cause no direct physiological harm, but they may annoy a person and cause his muscles to react involuntarily. Though difficult to determine precisely, the lower mean shock level for men is approximately 1.9 mA (General Electric, 1973).

Primary shocks can produce direct physiological harm. Their lower level is described as the current at which 99.5 percent of subjects can voluntarily let go of the shocking electrode. Keesey and Letcher, mentioned above, fixed the mean "let-go" level for 82 kg men at 9 mA and for 55-kG women at 6 mA. Their estimate for children was 5 mA. They recommended the children's level be used as a safety standard for the general public, and it was proposed as a limiting value for electrostatically induced currents under transmission lines for the National Electric Safety Code (7th Edition). In the list of objects tabulated above, only the larger trailer trucks, well insulated from ground, exceed the 5-mA limit under lines if the field strength is greater than 8 kV/m.

Problems associated with electric shocks from induced currents under transmission lines have been recognized for years (IEEE Working Group, 1973). Stationary objects such as fences, metal roofs, and antennas are grounded to prevent shocks.

If a person is insulated from ground in an electric field and he touches a grounded object, his body discharges a spark and he may be conscious of a shock. The effect is similar to the discharge one sometimes encounters after walking across a carpet. If the person is grounded and the object is not, he may also experience a shock. Spark discharges are a function of both voltage and energy. Energy is measured in joules and is dependent on the size of the object which is discharged and the voltage on the object. Spark discharges reach the perception level when they measure about 0.1 mJ (millijoule); shocks are classed as secondary when they reach a level of 0.5-1.5 mJ; the minimum primary shock level is estimated at 25 J (General Electric, 1973). The magnitude of spark discharges beneath transmission lines depends greatly on ground conditions and even under worst case conditions for large vehicles do not approach the 25 J limit. As in the case of steady state current shocks, proper grounding mitigates transient voltage shocks from stationary objects.

An extra high voltage line imparts little energy to an insulated person standing on the ground under the line. The amount of energy stored on the person is so low that under the worst possible conditions he would receive only a minor secondary shock. In tests simulating the spark discharge from an umbrella to a grounded person in a field strength of 2.63 kV/m, Takagi and Matu found an increase in blood pressure (6-7 mm Hg), following shock. This was about half the increase in blood pressure brought on by a cold day (14 mm Hg). They also compared the increase in blood pressure with that obtained after 1 of 1½ minutes of going up and down steps (13-14 mm Hg). They concluded that "if the field intensity is less than 3.0 kV/m, the influence the discharge stimulation may have upon people remains, physically as well as mentally, within the range of physiological changes occurring daily around us and are of fugitive phenomena" (Takagi and Matu, 1971).

Long-Term Biological Effects. The advent of extensive transmission systems of 500 kV and higher has raised the question: Will long-term exposure to electric fields and induced currents below the perception level cause biological changes? The DOE is not aware of any substantive information that indicates electric fields in the range of those which would exist beneath the proposed transmission lines pose a biological hazard.

No standards or regulations exist in the United States for exposure to electric fields at 60 Hz. Transmission line designers have relied on responsible judgment and operating experience. The U.S. Environmental Protection Agency is gathering information to determine if there is a need to provide guidance for radiation standards for transmission lines above 700 kV (Environmental Protection Agency, 1975).

The experience of the electric utilities indicated that long-term exposure is not a hazard. A survey of several electric utilities throughout the United States found no reports of long-term effects (Hawaiian Electric Co., Inc., 1973).

In the early 1960's the American Electric Power Company sponsored studies of safety practices, field intensities, body currents, and working environments related to high-voltage transmission lines. In one of these studies, a group of 11 linemen who performed hot line maintenance on 345-kV lines were given complete physical examinations at Johns Hopkins Hospital over a period of 42 months (Knickerbocker, Kouwenhoven, and Barnes, 1967; Barnes, McElroy, and Charkow, 1967). The study concluded there were no significant changes of any kind in the general physical examinations and the men remained essentially healthy.

To hasten the process of obtaining information on long-term effects, tests also were made at Johns Hopkins with mice (Knickerbocker, Kouwenhoven, and Barnes, 1967). Twenty-two male mice were exposed to a 60-Hz electric field of 160 kV/m (approximately 20 times the maximum ground level value for a 500-kV line) for 6.5 hours a day for a 10.5-month period. A parallel control group was identically handled, but received no exposure to the electric field. The exposed males were bred with nonexposed females. The male offspring did not grow to be quite as heavy as offspring of control animals. The researchers suggested that further studies may clarify this finding. For the exposed males, there was no sign of a detrimental or beneficial effect from the electric field. Research on animals and electric fields is continuing at Johns Hopkins and has been started elsewhere to obtain further data.

Soviet studies on EHV substation workers report physiological effects attributable to exposure to high electric fields (Asanova and Rakov, 1966; Korobkova, Morozov, Stolyarov, and Yakub, 1972). The workers were exposed to 50-Hz fields with intensities from 2 to 26 kV/m. The reported effects included greater variability of pulse and arterial blood pressure, reduced sexual potency, and a number of other changes among a high exposure class as compared with a low exposure class. As a result, regulations for Soviet substation workers now allow unlimited exposure to fields less than 5 kV/m and limit exposure times in fields higher than 5 kV/m.

A recent Soviet paper discussed during a U.S./USSR symposium on UHV transmission in February 1975 reiterated that EHV substation workers had experienced problems (Lyskov, Emma, and Solyarov, 1975). During the oral discussion on the paper, the Soviets added that they attribute the effects reported to long-term exposure. They said the effects disappear in a month when workers are assigned to jobs outside a high electric field environment. The second paper also said that presently in the USSR there are no limits governing similar exposures for the general public living or working near powerlines. Russian 500-kV lines have a minimum clearance to ground of 8 m with a maximum field strength of 12 kV/m. In comparison, 500-kV lines of the Bonneville Power Administration in the Pacific Northwest have a minimum clearance to ground of 10.7 m and a maximum electric field strength of 8-9 kV/m. BPA operates one of the largest networks of 500-kV lines in the world. The Soviets are conducting further research on which transmission line standards may be based. They feel standards for nonelectrical workers should be different because they are exposed infrequently to electric fields from transmission lines.

The complaints of Soviet workers have not been substantiated by reports from other sources. The effects remain speculative because of the difficulty of showing a direct relationship in a complex work environment.

A Swedish study measured the influence of a 50 Hz field of the intensity that exists in high-voltage substations on the reaction time, attention, memory, and motor preparedness of man (Johannson, Lundquist, Lundquist, and Scuka, 1973). The study reported no significant differences in the performance or the subjective well-being of the test group compared to a control group.

Other studies are frequently cited in papers dealing with this topic. Most were made for purposes other than to provide data that could be related specifically to transmission lines. Several of the more relevant studies are discussed below.

A number of studies connected with the U.S. Navy's Project Sanguine (now known as Project Seafarer) investigated biologic effects of low-level electric and magnetic fields. Some laboratory studies in the late 1960's using 2.0 G at a frequency of 45 Hz (approximately four times the maximum ground level value beneath 500-kV lines) showed limited effects; others were inconclusive (Coate et al., 1970). The studies involved a variety of organisms ranging from bacteria to water and land animals. Studies on rat fertility and behavior, canine physiology, bacteria mutagenesis, and plant cytogenetics showed no significant effects. Other studies indicated a possible inhibition of growth in sunflower seedlings, and a possible increase in the percentage of fruit flies that are born with a fatal defect. More recent studies on the behavior of pigeons and rats using field strength levels up to 7 V/m again found no adverse genetic effects (Rozzell, 1974). These same studies did not find the adverse genetic effects to fruit flies which had been suggested by the earlier studies.

In another Sanguine study, snap beans grown in a controlled environment and exposed to a 45-Hz, 10-V/m field produced more dry matter than unexposed control beans (Gardner, Harris, and Tanner, 1975). The authors offered no explanation. Research is underway at Pennsylvania State University using 60-Hz electric fields and is expected to provide more conclusive data.

Studies have been done on personnel working near the Project Sanguine test facility (Krumpe and Tockman, 1974). Twenty-four persons exposed to radiations below 100 Hz during a 1-year period did not appear to suffer any ill effects attributable to the exposure. The Navy's assessment is that available data suggests no acute effects from weak, low frequency fields on microorganisms, populations of plants or animals, or humans (Rozzell, 1974). Studies are continuing.

Scientists are studying the effects of the frequency as well as the strength of the electric field. Adey in 1974 reports on unpublished work with monkeys where their perception of time was influenced. The threshold of influence was about 100 V/m at frequencies of 45, 60, and

75 Hz, and 1 V/m at frequencies below 10 Hz. The research is continuing (Adey, 1974). Krueger reported a slight change in young chickens. They were continuously exposed until 28 days old to a 60-Hz, 3.4-kV/m electric field and a 45-Hz, 3.6-kV/m field. The study concluded the growth rate was consistently depressed, but not significantly so (Krueger, Giarola, Bradley, and Daruvalla, 1972).

As yet, experimental investigations are inconclusive as to the possible existence and the significance of effects on organisms exposed to electric fields under transmission lines. Currently, much research is underway on the biological effects of electric fields. More information is being sought to clarify contradictory or inconclusive findings reported by various researchers.

Magnetic Fields. Figure 3.18-2 shows the calculated magnetic profile at 1.5 meters above the ground under various transmission lines. The maximum magnetic field intensity shown is about 0.6 G (gauss). For comparison, measured 60-Hz magnetic fields found in the vicinity of small appliances are also indicated (Kaufman and Michealson, 1974).

The maximum magnetic field intensity under the proposed 345-kV lines for the Dickey-Lincoln School Project would be about 0.3 G, or half that of the earth's magnetic field.

Two types of possible effects can be identified with the magnetic fields: (1) shocks due to contact with objects where a magnetically induced voltage is present, and (2) long-term biological effects due to magnetically induced voltages and currents.

Short-Term Biological Effects. Magnetically induced voltages appear at the open ends of partly grounded loops on conductors--such as fences, irrigation pipes, and distribution lines--parallel to high-voltage circuits. Normally, one end of the conductor is grounded, and the earth serves as the remainder of the loop. A person who completes the loop will be subject to either a steady state or spark discharge shock.

Threshold and let-go levels are the same as for electrostatically coupled currents, although magnetically induced voltage usually is lower and the current higher than in the electrostatic case. Here again, proper grounding of objects under transmission lines will prevent shocks. Mitigative measures are very effective because objects that are long enough to create a hazard usually are permanent. A complete calculation appears in an IEEE paper (IEEE Working Group, 1973).

Long-Term Biological Effects. Safety standards for whole body exposure to magnetic fields for long periods have been recommended in the United States at 200 G and in the Soviet Union at 300 G (Kaufman and Michealson, 1974). No harmful biological effects are expected from exposure to magnetic fields under transmission lines. This is because the magnetic field levels at which effects occur are generally much higher than levels under powerlines.

A two-volume collection of papers edited by M. F. Barnothy contains descriptions of most of the experiments prior to 1964 that demonstrated biological effects from magnetic fields (Barnothy, 1964). With few exceptions, the investigators used magnetic field strengths up to hundreds of times greater than those found beneath transmission lines. However, some studies described possible effects from magnetic fields closer to the maximum associated with transmission lines. Three are referred to below.

The study with young chickens mentioned above also tested exposure to low-frequency magnetic fields of 1.2 G at 60 Hz and 1.4 G at 45 Hz (Krueger, et al, 1972). The study concluded that continuous exposure to the low-frequency magnetic field resulted in a significantly reduced growth rate to 28 days of age.

The Naval Aerospace Medical Research Laboratory exposed 10 men to a low-intensity magnetic field of 1 G at 45 Hz for periods to 24 hours (Beischer, Grissett, and Mitchell, 1973). No effects were noted that could be definitely linked with the magnetic field. However, the researchers found that a delayed increase in serum triglycerides occurred in the men exposed. The authors concluded that, because the number of persons tested was small, a final assessment will depend on establishing a threshold for the biological effect and identifying the relationship between the field strength and the effect.

In a set of experiments, the same laboratory exposed monkeys to a 3 G field at 45 Hz. The magnetic field did not significantly affect any of the known, measured parameters associated with response to stimuli, including reaction time (deLorge, 1972).

A new program is underway at the Naval Laboratory in which a large number of monkeys will be exposed to a 2 G, 45-Hz magnetic field for 1 year. An equal number of monkeys in a control group will be matched on a pair basis with the test animals for such things as age, sex, weight, and medical history.

3.18.4 Oxidants

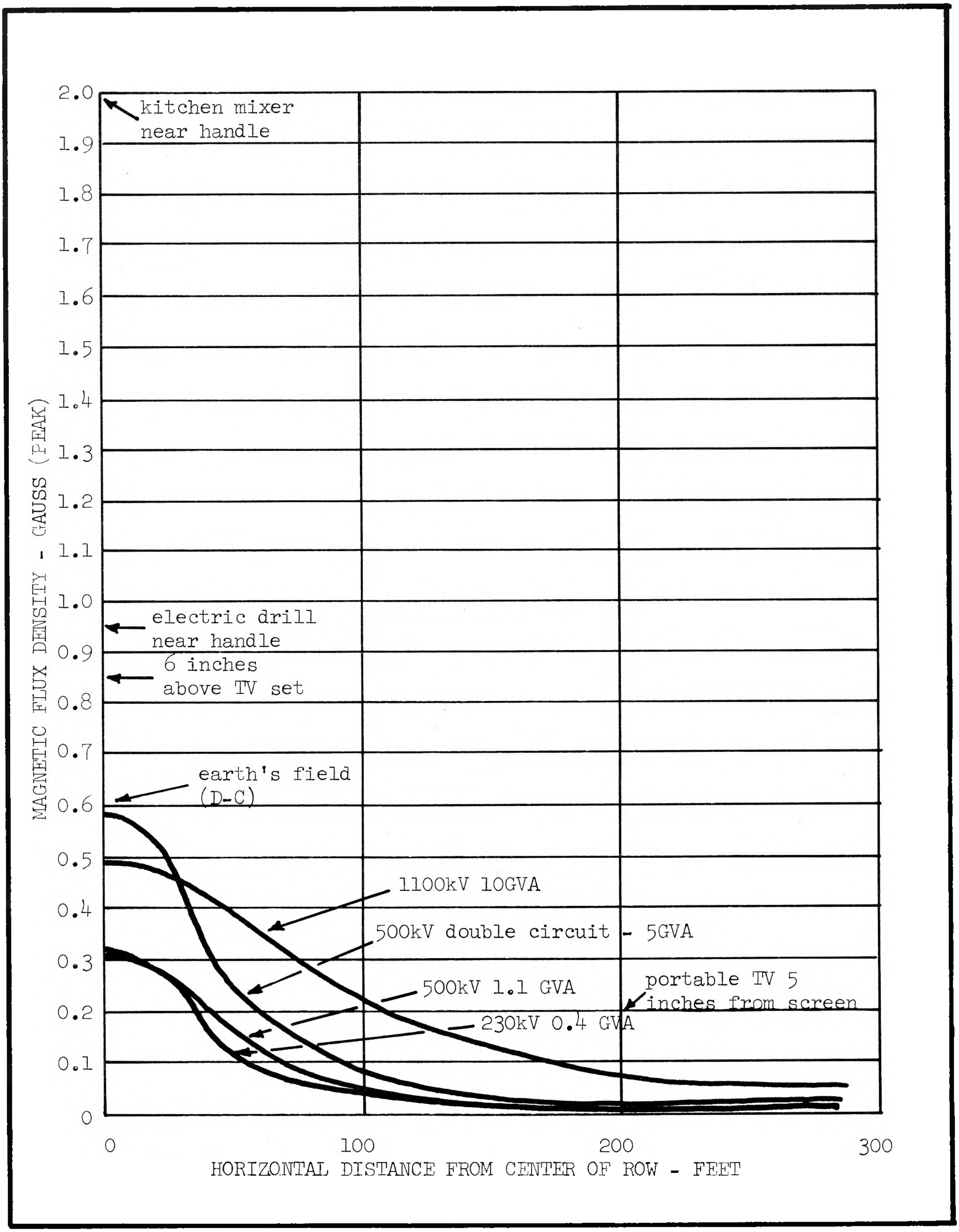
The production of ozone and nitrous oxides are also associated with corona. However, experience and studies to date indicate that the amounts of the oxidants produced by transmission lines are minimal and have no adverse effects on humans, animals, or plants. The levels of ozone and nitrous oxides created by the proposed transmission facilities would be so low that they would be indistinguishable from ambient levels.

3.18.5 Electrical Hazards

Certain transmission line failures, such as an energized conductor falling to the ground, while uncommon, are unavoidable. They may occur as the results of acts of nature, or of man. When a line drops to earth or is faulted for any other reason, it is automatically switched off in less than one-half of a second. Fire may result from these accidents.

FIGURE 3.18-2

PROFILE OF CALCULATED MAGNETIC FLUX DENSITY (60 Hz) AT 1.5m ABOVE GROUND FOR TRANSMISSION LINES COMPARED WITH LOCALIZED FIELDS FROM TYPICAL HOUSEHOLD APPLIANCES



For a short interval during such failures, current may flow through the earth. Because of the earth's resistance, a voltage appears in the vicinity of the nearest tower. This voltage may present a local hazard.

All transmission lines pose a hazard if long objects, such as lengths of pipe, construction booms, or other conducting materials are brought close to or into contact with the line. Since any transmission line can pose a hazard, people must observe basic safety precautions when near a line. Great care should be exercised when handling lengths of metallic pipes near any overhead conductors.

In designing an electric transmission system, one concern is the possibility that a spark discharge could ignite a flammable mixture such as gasoline vapor. Such an incident might occur under a transmission line where a vehicle was being refueled. The conditions necessary for such an incident could not be achieved under the proposed 345-kV lines.

It is very dangerous to fly kites or model planes in the vicinity of transmission lines or to climb transmission towers. Shooting at powerlines and insulators, whether accidental or intentional, can result in powerlines dropping to the ground, posing a severe hazard in the immediate area. Standing near towers during severe electrical storms is also hazardous. Similar potential hazards exist near substations.

Transmission lines pose a potential obstruction to low-flying aircraft. In general, the transmission lines would be below the minimum flight altitudes allowed by the Federal Aviation Administration (FAA), except for special operations such as crop dusting. FAA standards would be followed in marking lines and structures. These include precautions for large river crossings, such as the painting of towers with airway marker colors, and the placing of airway beacon lights on towers and colored spherical markers on the conductors.

Section 4

Mitigation Measures Included in the Proposed Action

4.0 MITIGATION MEASURES INCLUDED IN THE PROPOSED ACTION

This chapter lists certain measures to mitigate environmental impacts if the proposed transmission facilities are constructed. They form an "umbrella" under which specific mitigating measures will be developed.

Environmental impacts of the proposed action would be reduced significantly if the following proposed mitigating measures are implemented.

It is assumed for purposes of this draft environmental impact statement that the mitigation measures for the proposed transmission facilities would be achieved through provisions in contracts between the U.S. Government and the entities that would build, operate, and maintain the facilities, or through the performance of government employees who might do all or part of the work. These provisions would cover such things as fire prevention; vegetation protection; rehabilitation; clearing, grading, timber harvesting practices; and the use of access roads. Where applicable, the proposed transmission line would be constructed in accordance with guidelines outlined in the Department of Interior/Department of Agriculture joint publication titled, "Environmental Criteria for Electric Transmission Systems." These guidelines cover location, design, construction, operation, and maintenance activities (USDA/DOI 1970).

An environmental protection and management plan would be developed for construction of the transmission facilities. It would be incorporated into contract specifications and enforced by qualified inspectors to insure contractor compliance. Among other things, this plan would address construction, pre and post construction conferences, and rehabilitation of the environment. Effective mitigation measures under this plan would fall into three time phases. First, there would be those measures that are incorporated into the planning, location, and design of a transmission facility prior to construction. Second, there would be those measures undertaken while the facilities are being built. Third, there would be those that are applied during maintenance and operation acitivites.

Work in the planning phase has been directed at selecting areas of least potential impact for location of the proposed facilities. The Alternative Power Transmission Corridor Study (appendix B) and each of the detailed impact studies contributed to the identification of the proposed route.

During the design phase, further mitigating actions would be taken to reduce impacts along the proposed route. Based upon the impacts identified, centerline adjustments would be made. Detailed investigations would be conducted in areas of high impact to identify design solutions that would reduce impacts. Major road, highway, and river crossings would be designed for minimum impacts. Where applicable, high conductor clearance would be used at highway and river crossings.

Specific substation sites would be further defined through a detailed site analysis. Considerations in this process would include: Proximity to the transmission lines and distribution systems and load centers, drainage, visibility, type of soil, access grading requirements, terrain, suitability of land for future development, and vegetative features such as those that could be used to shield the substation from view or reduce its contrast with the landscape.

Conceptual designs would be prepared to study impacts as they vary for different plans. Substation design engineers, architects, and landscape architects would prepare drawings to take advantage of natural surroundings and adapt the substation to its environment. The natural surroundings might then be supplemented by planting trees and shrubs. Low profile structures may be used to further reduce visual impacts.

4.01 Mitigation of Soil and Mineral Impacts

The following measures would be implemented to mitigate impacts to soils:

1. Clearing, grading or other soil and vegetative disturbance would be held to a minimum.

2. Soil disturbance would be held to a minimum when installing tower footings.

3. During construction, maximum use of existing roads would be made. Construction of new roads would be held to a minimum. This measure will assure the least disturbance to soil, vegetation, and water.

4. Physically sensitive soils would be avoided if possible. Where this is not possible, special provisions would be included in plans, specifications and schedules to minimize impacts.

5. To restrict access disturbance there would be not more than one road to each site requiring access. This measure would minimize erosion and facilitate rehabilitation.

6. All construction and vehicular traffic would be confined to the right-of-way or designated roads. Any roads used for construction would be adequately rehabilitated after construction.

7. Every effort would be made to avoid road locations on steep slopes. If this is not possible, excavated soils would be end-hauled to a suitable disposal site. This measure would help reduce the potential for mass soil movement.

8. Topsoil at tower sites would be stockpiled and redistributed over the surface after the area is reshaped to conform to the original topography. Topsoil is defined as the surface 6 inches of the undisturbed soil. This requirement would not apply to areas where the topsoil is less than 6 inches deep over bedrock.

9. When practical, the transmission facilities would be located to avoid known economic deposits of sand, gravel, and stone, as well as any high value minerals which can be extracted economically by

surface mining. (High value minerals currently are being extracted on or near a number of transmission line corridors in the United States. Little if any conflicts exist between deep mining of mineral deposits and high voltage transmission lines.)

10. Staging areas and tower sites would be located to make maximum use of existing roads.

11. Access roads would be built to follow the contour of the land and "fit" the terrain so that excessive cutting and filling is avoided.

12. Temporary roads would be restored to the original contour of the land, drained, revegetated, and closed to vehicle use.

13. Compacted soil would be loosened where appropriate.

14. Construction vehicles and equipment would not be operated when inclement weather or other factors would cause unacceptable environmental damage.

15. Seasonal closure of access roads would be provided when necessary to protect the soil during spring runoff.

16. Helicopter construction techniques would be used if necessary to prevent the impact of conventional construction methods on fragile soils. Track mounted vehicles would also be considered for some areas in lieu of roads. This measure would be implemented on an as-needed basis.

17. Erosion control measures would include reducing soil exposure, controlling runoff, shielding the soils, and binding the soil.

18. Ground cover, brush, and small trees would be left to stabilize the soil whenever possible.

19. Vegetation would be planted or replanted where appropriate in areas that have been disturbed.

20. When soil stabilization is required and erosive or climatic conditions preclude the use of vegetation, then gravel, crushed stone, or a mulch would be applied to the surface area. Areas commonly requiring this treatment would include excessively steep slopes, graded areas containing ground water seepage, and areas with unfavorable soil conditions.

21. Where a slope is excessively steep, the design may call for concrete, wood, or metal retaining structures to keep soils in place.

22. The access roads would be designed to have drainage facilities, including roadside ditches and water bars. Such facilities would be required to be maintained during the construction period. During construction, the existing roads would be maintained to

minimize erosion from construction activities. Upon completion of construction, many of the access roads would be seeded to grass or some other accepted vegetation.

4.02 Mitigation of Atmospheric Impacts

Atmospheric impacts are of two general types--air quality impacts and noise impacts. Impacts on air quality result from burning of cleared debris, exhaust emissions from construction machinery, or the creation of dust by construction activities. The noise impacts come mostly from construction. The following mitigation measures would be taken to reduce these impacts.

1. Burning would be conducted in accordance with State or local smoke abatement programs and in accordance with approved practices of the region.

2. The amount of waste products would be reduced by clearing only that vegetation hazardous to the facility and through the requirement that all merchantable wood products be marketed.

3. Burning methods that aid combustion would be used as required. These methods include high stacking and high temperature air curtain incineration devices.

4. A nonburning disposal method, such as chipping, would be used if necessary in extreme circumstances.

5. Burning near populated areas and roadways would be restricted.

6. The burning of tires and plastic materials would be prohibited.

7. Applicable Federal, State, and local laws would be complied with to control vehicle emissions and noise. The contractors would be required to maintain engines and equipment in proper adjustment to avoid excessive exhaust emissions.

8. Dust caused by construction would be reduced by imposing controls on the type of equipment used and the number of vehicles allowed on the access roads. Water, wood chips, oil, gravel, or a combination of these materials, may be used to control dust on unpaved roads if necessary.

9. Noise regulations established under the Occupational Health and Safety Act would be complied with.

10. Noise abatement procedures would be used to help minimize annoyance near residential or recreation areas.

4.03 Mitigation of Water Impacts

The soil erosion control measures listed above will help to control sedimentation. Many impacts upon water resources would be mitigated through careful design. Other measures to mitigate impacts on water resources would include:

1. The location of transmission lines parallel to streams would be avoided where possible.

2. Stream crossings would be made as close to perpendicular as possible.

3. Stream crossings would be located to take advantage of terrain so that maximum ground clearance is provided. This reduces the amount of vegetation that has to be removed which, in turn, reduces the potential for sedimentation.

4. Culverts, bridges, or other facilities would be designed and installed at important stream crossings.

5. Care would be taken in removing culverts and bridges from temporary access roads.

6. A buffer strip of understory vegetation not less than 100 feet wide would be left along stream banks to trap sediment in runoff before it reaches the stream.

7. Stream crossings by heavy equipment would be carefully controlled.

8. Gravel would not be removed from a stream.

9. The refueling of construction vehicles, storage of construction materials, and the disposal of waste materials would be prohibited near water features.

10. Special sanitation toilets and land stabilization measures would be employed to assure water quality.

11. Maintenance activities would be conducted to minimize water resource impacts.

12. Herbicide applications would not be made until the right-of-way has begun to revegetate and thus reduce runoff rates. The spraying of herbicides into streams, wetlands, rivers, lakes, or other bodies of water would be prohibited. Herbicides would not be applied aerially within 100 feet of shore lines of bodies of water. The application of herbicides from the ground would not be allowed within 10 feet of any body of water, except in cases where the chemicals are known to be safe.

13. Debris resulting from periodic vegetation management activities would not be placed within the high water mark of any watercourse, pond, lake, or reservoir.

14. Handcutting would be used to clear vegetation where herbicide use would create significant adverse impacts.

15. Contractors would comply with all applicable Federal, State, and local laws and regulations concerning the use of herbicides.

4.04 Mitigation of Fish and Wildlife Impacts

The primary impact of transmission lines and substation sites on wildlife is caused by the removal or disturbance of habitat. Habitat would be protected or disturbance minimized by adjusting the season, area, or method of construction. Some of the measures listed under such topics as soils, water, and vegetation will also serve to mitigate impacts on wildlife. Other mitigation measures would include the following:

1. Whenever possible, critical game areas, such as breeding, nesting, or wintering grounds, would be avoided. Access roads in areas of high existing remoteness would be managed to restrict public access to the extent possible in cooperation with the landowners. The possiblity of helicopter construction in such areas would be considered as an alternative to constructing access roads.

2. In clearing rights-of-way, only the vegetation determined to be dangerous to the facility would be removed. Low growing species would be preserved to the extent possible.

3. The contractors would be required to use brush blades on tractors when gathering debris for disposal.

4. Vehicle movement would be confined to the access roads to the extent possible. This would prevent soil disturbance and compaction in the habitat.

5. Disturbed areas would be reseeded with grasses and legumes. State wildlife authorities would be consulted to identify areas in which special seed mixtures are recommended.

6. If agreeable to the landowner, brush piles would be left within the right-of-way where it is determined these piles would benefit wildlife.

7. Platforms can be designed and placed on towers for use by raptors if it is determined this is desirable.

8. Raptor nests on the right-of-way would be protected from damage.

9. Wildlife biologists would inventory for threatened and endangered wildlife species along the route to assure protection and compliance with the Endangered Species Act of 1973.

   A mid-winter survey of deer wintering areas was initiated during the period in which this EIS was prepared. This survey is being conducted by the Fish and Game Departments of the three states. Information revealed through the survey will be used to finalize the transmission line location so that impacts are minimized.

10. The fish habitat will be protected by the prevention of unnecessary siltation and erosion.

11. Short snags and dead or dying trees used by cavity dwelling wildlife will be left within the right-of-way wherever possible. This will help to avoid the displacement of cavity dwelling wildlife into areas already occupied or unsuitable to them.

12. Towers could be built taller in some areas, such as at deer wintering areas, so that less vegetation would have to be removed.

13. If a proposed facility could adversely affect a threatened or endangered species, Federal and State wildlife authorities would be consulted to identify actions required to eliminate the possibility of impacts on such species.

14. The disturbance of riparian vegetation will be held to a minimum so as to avoid impacts caused by temperature and sedimentation increases.

4.05 Mitigation of Impacts on Vegetation

A transmission line by its nature requires separation from encroachment by tall objects, such as trees. Vegetation removal is thus required. Clearing requirements would be determined using such variables as: the location, height, and growth rate of existing trees; the position and height of the electrical conductors; and the minimum distance required between the energized transmission line and adjacent objects. Areas to be cleared on the right-of-way would encompass only those trees determined to be hazardous to the facility. This program would significantly reduce the amount of clearing required as compared with older transmission line rights-of-way clearing methods. Clearing boundaries resulting from this method are typically irregular. The maximum clearing width occurs midway between towers. The minimum clearing width occurs at the towers where conductor swing is constrained.

Measures to reduce impacts on vegetation would include the following:

1. The removal of timber in forested rights-of-way would be performed by conventional methods. However, where excessive soil disturbance or other damage to the physical environment would occur, other methods, such as winter clearing or helicopter logging, would be considered.

2. The landowner would be compensated for the value of the timber removed from the right-of-way. The clearing contractor would be required to market the maximum amount of forest products so as to secure the greatest possible use of the material.

3. Under the environmental management plan for construction, contractors would comply with provision designed to prevent fires on or near lands to be occupied by the right-of-way.

4. If rare, threatened or endangered plant species are found along the route, the contractors would construct roads, towers, substations, staging areas, etc., in a manner that would avoid or minimize disturbance of such species.

5. The rehabilitation planning under the environmental management plan for construction would include, but not be limited to, site preparation, plant species to be seeded, rate of seeding, type of fertilizer and mulching to be used, and time of seeding of temporary access roads and disturbed areas. After the first growing season, steps would be taken to assure that revegetation is successful.

6. Vegetation with a growth potential of less than 20 feet in height will not be removed from the right-of-way, except as necessary for surveying purposes. The survey centerline would be confined to as narrow a clearing as possible.

7. Right-of-way clearing in valleys and depressions spanned by the line will be minimal--limited to that required to maintain clearance to the conductor. Topping may be considered.

8. Trees and shrubs will be cleared by hand on steep slopes.

9. Protective vegetative ground cover would be established on temporary access roads.

10. A clearing plan would be prepared. It would restrict clearing to that necessary for safe operation of the line, construction areas, and roads. Trees outside the right-of-way which are hazardous to the operation of the line would be removed and the owner compensated. Clearing on the right-of-way would provide an undulating edge effect.

11. Riparian vegetation would be disturbed only if unavoidable.

12. Grading would be held to a minimum necessary for construction.

4.06 Mitigation of Land Use Impacts

Mitigation measures would be applied to areas of developed land use. Landowners would be compensated for the rights granted in the right-of-way easement. Owners would be compensated for homes and other structures which must be removed from the right-of-way. Property improvements, such as water supply facilities, fences, driveways, and landscaping not interfering with the transmission facilities would be protected from damage. If damage to such facilities should occur, repairs would be made or the owner compensated for the loss. Construction forces using either existing or new access roads would make provisions to assure that access to residential properties is maintained. Attention would be directed toward maintaining the right-of-way in an acceptable manner during the construction period. All litter would be removed from the right-of-way. Other mitigating measures for land use would include:

1. The use of existing roads by contractors would be scheduled so as not to interfere with logging activities. Access roads developed to construct transmission facilities would be left for use after construction by landowners if so requested. Gates and fencing to prevent unauthorized entry to the right-of-way would be installed at the request of landowners.

2. The cultivation of Christmas trees, nursery stock, or other low growing species within the cleared right-of-way would be encouraged. Maintenance of the right-of-way would be designed to be compatible with the owner's plans.

3. Care would be taken to minimize the number of towers in cropped areas.

4. Permanent access roads would not be constructed in croplands. When possible or necessary, construction would be restricted to periods of least impact to standing crops or to soils. Cropland disturbed by construction or maintenance activities would be restored to as near its original condition as is possible. Compacted soils would be loosened. Topsoil would be stockpiled and replaced in areas of excavation.

5. Ruts and other disturbed surfaces would be filled or smoothed.

6. Noxious weeds would be controlled around the towers in cooperation with the landowner.

7. Fences and gates would be repaired or installed to prevent escape of livestock and control unauthorized entry or damage to agricultural lands.

4.07 Mitigation of Socioeconomic Impacts

Opportunities to mitigate the economic and social impacts discussed in section III appear to be limited. Advance notice of construction would encourage individual entrepreneurs to plan, expand, or develop facilities to supply basic needs of the construction crews, thus mitigating adverse impacts.

State and local governments also could be expected to take some action to mitigate socioeconomic impacts. Examples include land use planning, social services, police protection, laws and ordinances, etc.

The Department of Energy will continue to respond to public input through public meetings, correspondence, and other channels of communication. To reduce conflicts with communities and community planning goals, the DOE will continue to meet with regional planning agencies and towns. Alternate designs and minor alinement changes may successfully resolve potential conflicts. Other mitigating measures for socioeconomic impacts include the following:

1. The facilities would be located to obtain the benefits of compatibility with adjacent utilities, make the maximum use of available space, and fit into the patterns of community development.

2. The most significant social impact would occur where residences or other property improvements are displaced by the transmission line. This impact would occur infrequently because route location activities are designed to avoid it. When structures must be removed from a proposed right-of-way, owners would be compensated as set forth in the Uniform Relocation Assistance and Real Property Acquisition Act of 1970 (42 U.S.C.A., sec. 4601), and in accordance with the Uniform Appraisal Standards for Federal Land Acquisition (Interagency Land Acquisition Conference, 1973). Where desirable, homes may be moved away from the right-of-way to an adjacent site.

3. The proposed transmission facilities would be designed to meet or exceed requirements of the National Electric Safety Code which establishes safety criteria for electrical facilities. The proposed facilities would be marked for air traffic safety in accordance with Federal Aviation Administration Standards. The public would be informed by means of brochures, news releases, and notices on the hazards of such activities as flying kites, model airplanes, or climbing the towers.

4. During construction, residents living near the right-of-way might be impacted by dust and noise created by construction machinery. Also, in areas where unmerchantable timber and slash are being disposed of by open burning, some increases in the level of air pollutants would probably be experienced. Mitigative actions designed to reduce the effects of atmospheric impacts are described in section 4.02.

5. The loss of productive croplands would be minimized by limiting the number of towers on croplands; the use of self-standing structures would limit the areas lost to production by guy wires. When new line in parallels an existing right-of-way, new towers would be located opposite existing towers, where possible, to reduce inconvenience to farming.

6. The disruption to standing crops would be mitigated by scheduling construction during non-growing seasons. Disturbances to livestock would be prevented through temporary fencing on the right-of-way or through the provision of alternate pasture lands.

7. The economic impact of road damage by heavy construction equipment would be mitigated by limiting the use of roads during early spring when they are easily damaged and by maintaining the roads properly.

8. The impact of property division would be reduced by locating the facility along property lines to the extent possible.

9. Efforts would be made to inform contractors, their employees, and members of the public on laws which govern conduct and prohibit the

destruction of natural features, objects of historic or scientific interest, signs, markers or other public property, and damage to private property. Where appropriate, monetary compensation would be sought.

4.08 Mitigation of Recreational and Visual Impacts

Line routings, access road locations, and substation sites, where possible, would be selected which would avoid areas known for their scenic or recreational value or which are readily visible to the public. Where this could not be done, the line would be designed to reduce its conflict with the recreation area or designed to be least disruptive to recreation activities. For example, a line could be located on the perimeter of a park, away from recreation centers. Procedures recommended in the Department of the Interior/Department of Agriculture publication, "Environmental Criteria for Electric Transmission Systems," would be used as a guide in selecting line routes and substation sites and in the design of facilities. Other measures to reduce impacts on recreation and visual features would include the following:

1. In all forested areas, right-of-way clearing would be limited to the width necessary to prevent vegetative interference with the line. The clearing would be "feathered" or would have undulating boundaries. In locations where the right-of-way enters timber from a meadow or other open area, clearing edges would be "feathered" into the timber to approximate natural vegetative patterns.

2. Nonspecular conductor and treated steel towers would be used if necessary in sensitive scenic areas to reduce reflection.

3. Towers would be located as far as possible from the banks of rivers and edges of primary and secondary roads. An effort would be made to retain all but the tallest trees at high crossings and to screen the towers from the view of motorists with vegetation.

4. Towers would be located to minimize skyline effects.

5. Centerline selection will take advantage of topographic features to screen towers from view (behind ridges).

6. Roads will be designed to "fit" the terrain.

7. Access roads can be located to accommodate the access needs of recreation areas and parks.

8. Additional visual studies would be conducted during the design phase to reduce impacts.

9. Occasionally, the right-of-way alinement and access roads can be deflected to avoid long views down the right-of-way.

4.09 Mitigation of Cultural Resource Impacts

The Department of Energy would comply with both the Historic Preservation Act of 1966 (16 U.S.C., Sec. 470, et. seq.) and Executive Order 11593 (36 F.R. 8921). Prior to construction or ground disturbance a "survey" of the right-of-way including towers sites and access roads would be conducted. The State historic preservation officers would be consulted and kept informed of findings or activities.

4.09.1 Mitigation of Historic Impacts

The physical alteration of historic sites would be largely avoided through the selection of the route. Those standing structures identified through impact studies would be avoided. Other measures to mitigate impacts to historic features would include:

1. Indirect impacts on an historic setting could result from visual intrusion. The measures presented in section 4.08 would help to mitigate visual intrusion. Sites of particular importance would be investigated in cooperation with the appropriate State historic preservation office.

2. In some instances, a transmission line right-of-way would have to cross lineal features of historic importance. Examples of such areas are Indian trails, old railroads, or historic trails. In such instances, the primary impact of the transmission line would be visual intrusion upon the setting. Those special mitigative measures described in section 4.08 to reduce visual impacts upon a scenic or recreation area would be followed to reduce visual impacts on historic settings.

3. The physical remains of known historic features on the right-of-way would be protected from damage by construction activities through the construction of barriers, such as fencing, and appropriate instructions would be included in the construction contract to assure the protection of these features.

4.09.2 Mitigation of Impacts to Archaeologic Sites

The general approach to mitigating impacts on archaeological sites is much like that for historic sites. The primary way to mitigate impacts on archaeological sites would be to identify such sites when locating the right-of-way and towers. An archaeological survey will be conducted along the proposed right-of-way if the project is approved for construction. Professional archaeologists would investigate tower sites, access road locations, and other areas which might be disturbed. If it is found that a facility is to be located on an archaeological site, the facility would be relocated or other mitigating action would be initiated. Other mitigating measures would include:

1. If an archaeological site is discovered in the course of construction, the contractor or the construction inspectors would be required to report the site. The contractor would be required to suspend

activities in the area until the site could be investigated by an archaeologist. Artifacts which have been disturbed would be retained by the construction inspector for the archaeologist. Objects still in place on the site would be protected from vandalism and would not be moved.

2. Sites that cannot be avoided would be moved from the impact if portable, or the data which contribute to the significance of the resource recovered through an archaeological excavation. These measures would be initiated upon the advice of the State Historic Preservation Offices.

4.10 Mitigation of Electrical Effects

No electrical effects from the proposed transmission facilities are expected to occur that will require special mitigation effects beyond the following measures which are routinely implemented:

1. The transmission line will be designed to minimize audible noise and electromagnetic interference.

2. If radio or TV interference problems occur, appropriate measures to mitigate this impact will be taken. For example, a radio antenna or TV antenna may be moved or installed.

3. Conducting objects under the transmission line will be grounded as needed. For example, fences, metallic structures or communication lines will be grounded upon complaint.

4.11 Mitigation of Substation and Microwave Installation Impacts

The impacts which result from the construction and operation of substations and microwave facilities are largely mitigated during the design and planning phase for these facilities. The sites would be purchased in fee from the present landowners.

Existing substation or microwave installations would be utilized or expanded where possible. This results in less total disturbed area. Where new substations are to be developed, the site would be located in an area of least total impact.

These facilities would be designed to be compact and thereby reduce the amount of land disturbed. They would be made as compatible as possible with their surroundings.

The same general construction methods used to reduce the impact of transmission lines would be followed to reduce impacts at substations and microwave installations.

Section 5

Any Adverse Effects Which Cannot be Avoided Should the Proposal be Implemented

5.0 ANY ADVERSE EFFECTS WHICH CANNOT BE AVOIDED SHOULD THE PROPOSAL BE IMPLEMENTED

5.01 Geotechnical Resources

An unavoidable short-term increase in runoff and erosion will result from vegetation removal and surface compaction. Soils will be permanently displaced. Subsoil disturbance will occur at tower locations and where footing excavations and access road cuts and fills are required. This will result in the disruption of soil profiles. The rate of erosion will decrease as revegetation progresses.

5.02 Atmospheric Resources

During construction some unavoidable adverse impacts on air quality will be caused by dust from disturbed soils, combustion by-products from the burning of unmerchantable wood products, vehicle and equipment exhaust emissions and fumes and odors from various operations. These impacts are expected to be localized and short-lived.

Small amounts of ozone will be introduced into the atmosphere during line operation. Levels will vary, depending on climatic conditions, but are considered to be insignificant.

In some areas, adverse microclimatic changes may occur along the rights-of-way where forest vegetation has been altered. Removal of this vegetation will cause minor, long-term microclimatic changes in air temperature, solar radiation and wind velocities.

Local noise levels will increase during line construction. Though unavoidable, these impacts are expected to be intermittent and of short duration. Line and substation operation will result in minor, long-term increases in local noise levels. Overall, such noise levels are considered annoyances with no adverse health effects.

5.03 Ecological Resources

Adverse impacts on hydrological resources include increased surface runoff and erosion, increased turbidity and sedimentation, the possible introduction of small amounts of herbicides, and possible channel alteration by vehicular traffic. Slight increases in water temperature could have secondary impacts on other ecological resources where vegetation has been removed from stream and pond banks. Most of the impacts will occur during construction and will disappear shortly after the line is completed.

Existing vegetation will be disturbed or removed along the entire route. The primary impacts that will result from this loss of vegetation include the alteration of growth patterns and forms, disruption of successionary stages, changes in community composition both within and outside the rights-of-way, and possible disturbance of rare or sensitive plants. Secondary impacts from snowmobile and other recreational vehicle use of rights-of-way and access roads are largely unavoidable.

Removal of vegetation will alter wildlife habitat. The quantity of habitat will be reduced for some forest species, directly reducing their numbers and, in turn, their overall productivity. Increased disturbance of certain species during construction will result in significant stress and the possible temporary abandonment of preferred habitat. Disturbance will continue after construction, owing to human activity along new access roads. Possible increase in animal hunting mortalities could result from easier accessibility.

Changes in vegetation will benefit some wildlife in the area. Birds may occasionally collide with the transmission lines. The most likely birds to do so are waterfowl.

Impacts on aquatic wildlife from changes in stream temperature would be long term and potentially quite adverse. The effect of herbicides introduced into the food chain will depend on the type used and the methods used to control vegetation. Herbicides used will be on the "approved" list of the Environmental Protection Agency. Aquatic wildlife could experience intense, though short-term and localized, impacts from increased turbidity, sedimentation and disturbance of streambeds.

5.04 Land Use Resources

The proposed project would preempt use of the land at substation and tower sites and along permanent access roads. Small areas of agricultural land would be taken out of production for tower footings. Timber production and sap extraction would be eliminated along cleared rights-of-way and permanent access roads. Up to five residences may have to be moved from their present locations.

The proposed plan would restrict land use within the right-of-way to types compatible with high voltage transmission lines. Indirect effects on the future development of adjacent lands are possible.

5.05 Socioeconomic

Five residences are within the proposed route and may have to be removed. Occupants of the houses will be adversely impacted. Slight, yet unavoidable, impacts on housing, employment, income, tax receipts, public and private services, or the supply of goods and services are expected from the proposal plan.

Socioeconomic effects may incur from impacts of the proposed line on community values associated with town character, town planning goals and the general esthetic quality of the environment. The presence of a transmission line may have unavoidable effects, whether real or perceived, on the "wilderness character" of remote wildlands and on the quality of the recreational experience.

Loss of economic production on cultivated lands will occur at tower sites. The long-term, unavoidable loss of economic production on forest lands within the rights-of-way will be more severe. Economic impacts in the form of opportunity losses could approch $10 million over the life of the facility.

5.06 Visual

Towers, lines and rights-of-way, together with the visual consequences of certain necessary construction practices, will result in unavoidable visual impacts. Varying degrees of impact are expected on the quality of the visual landscape, the visual attractiveness of individual sites, and on recreation, residential, and transporation-related viewers. The introduction of visual elements out of character with historic properties could possibly alter their settings. Adverse visual impacts are not entirely unavoidable.

5.07 Recreational Resources

The transmission lines will be built through areas looked upon as having "wilderness character." Many recreational activities in these areas along the proposed route focus on natural visual amenities. Thus, views of the lines will conflict with these activities and detract from the recreation experience. Some visual impact is unavoidable. The line will be visible from several scenic highways, a small portion of the Allagash wilderness waterway, and from several other rivers which are candidates for inclusion in the national wild and scenic river system.

5.08 Historic and Archeological

No historic properties or archeologic resources will experience direct impacts from the construction or operation of the line as a "survey" would be conducted to locate and thus avoid sites. Increased accessibility to some areas, however, could contribute to site vandalism. Disturbance or destruction of undiscovered archeological sites is possible due to construction activities. Such impacts are not totally avoidable.

Section 6

The Relationship Between Local Short-Term Uses of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity

6.0 THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

For this discussion, "short-term" will refer to the life of the line. It is reasonable to assume that some of the impacts related to the transmission lines would last beyond this period. Existing rights-of-way will probably continue to provide one of the best routes for new transmission facilities. For these reasons electric transmission facilities will probably continue to exist in established corridors.

6.01 Resource Relationships

6.01.1 Geotechnical Resources

Soil disturbed and eroded by the short-term use of the powerline corridor will result in minor long-term losses in productivity, but most of the impacts will diminish shortly after the project is completed.

6.01.2 Atmospheric Resources

Effects of short-term air quality impacts will result in no appreciable reduction in long-term air quality. Microclimatic changes along cleared rights-of-way would gradually diminish in the unlikely event that the facilities should be decommissioned and removed.

6.01.3 Ecological Resources

The effect on long-term water productivity and water quality should be minimal. Most impacts on water resources would abate soon after construction of the line is completed. Adherence to proper mitigation measures would insure against any significant reduction in water quality.

Some effects of vegetation removal and disturbance could persist longer than the projected life of the line. Certain resistant weedy species are inevitably introduced. These plants often proliferate and can supplant existing species. This can lead to long-term, perhaps permanent alterations in community composition. Even if the facilities are eventually removed, a return to former conditions would take decades.

Although many adverse impacts on wildlife would abate after construction of the line, several changes in wildlife productivity would persist beyond the life of the line. Ecological relationships between predators and prey and those between competing species can be thrown out of balance. Disrupting such a fragile balance can set into motion a synergistic cycle of effects, making the return to original conditions a time-consuming and perhaps impossible process. Continued human access disturbs most wildlife. Increased hunting pressures would compound the cycle.

6.01.4 Land Use

When a powerline is built, the rignt-of-way is committed to use for electric power transmission. The land can no longer be used for commercial forestry, nor can structures be built on it. Land areas limited by their use for electrical facilities could be restored to former uses, or used for some new purpose, should the line be decommissioned and removed. Some land uses, such as agriculture, can co-exist with the facility during its operational life.

Long-term indirect effects on adjacent land uses may occur through short-term use of the land for powerline rights-of-way. Future transmission lines will likely involve using existing substations, upgrading existing lines, or paralleling existing rights-of-way. This could tend to discourage the development of residences, commercial establishments, scenic areas, and public parks which may be incompatible with transmission lines. Thus, the corridor could limit opportunities for short-term use and long-term productivity of adjacent lands.

Because of the absence of additional power generation sites in the vicinity of the Dickey-Lincoln School Lakes Project, it is unlikely that additional transmission capacity will be required in the future between the project and Moore Substation. Long-term impacts, such as those discussed above would, therefore, be minimal.

6.01.5 Socioeconomic

Over the life of the transmission line, such noncompatible uses as forestry and development of structures, would not be permitted. However, the availability of the right-of-way for such uses could be restored, if desired, by removal of the line. Thus, the use of the land for right-of-way does not in a permanent sense influence its economic productivity or the availability of its resources.

Long-term effects on productivity attributable to the Dickey-Lincoln School Lakes Project are addressed in section 7 of the draft EIS, Dickey-Lincoln School Lakes, U.S. Army Corps of Engineers, New England Division, Waltham, Ma., August 1977.

6.01.6 Visual

Short-term effects on esthetic resources would result from the visual presence of the line itself. These visual impacts could be felt over the long term. Should the line be removed later, the scarring effects of constructing, operating, and removing the line would continue to affect visual resources for an extended period.

6.01.7 Recreation

Recreational resources will incur both short and long-term adverse and beneficial effects from the short-term use of the transmission line corridor. Recreational activities requiring remote or natural landscapes could suffer. Improved access associated with the proposal could accomodate recreational use of previously inaccessible areas. Increased hunting and snowmobiling within the rights-of-way could have long-term positive and negative effects.

6.01.8 Historic-Archaeological

Short-term use of a transmission line right-of-way could result in permanent loss of part of the archaeologic record in the region should undiscovered sites be accidentally disturbed during construction. Long-term increases in accessibility to potential archaeological sites could further jeopardize this resource.

6.02 Trends Affecting Ecological Interrelationships

Ecological interrelationships on or adjacent to construction sites would be irreversibly altered by construction activities. These changes would last until the effects of vegetation removal and soil disturbances stabilize and a new ecosystem begins to function. In many instances, the new ecosystem may be more productive.

6.03 Long-term Risks to Health and Safety

Transmission lines impose a threat to public safety because they carry electric power at high voltages. There is a remote danger of human contact with electricity in the line during the life of the facility, despite stringent design precautions. The results of contact accidents are usually very serious.

Any of numerous catastrophes, such as earthquakes, floods and lightning, and accidents, including aircraft collisions with the line, though of remote potential, could damage the line and pose a risk to public safety.

Section 7

Any Irreversible and Irretrievable Resources Which Would be Involved if the Project Should be Implemented

7.0 ANY IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES WHICH COULD BE INVOLVED IN THE PROPOSED ACTION SHOULD IT BE IMPLEMENTED.

Irreversible committments of resources include resource commitments that, once initiated, would continue after the life of the project. Irretrievable resources are those that are expended or permanently lost through the proposed action.

7.01 Geotechnical Resources

The sites occupied by transmission towers, microwave sites and substations commit underlying resources, such as agriculturally productive soil and mineral or aggregate deposits to alternative use throughout the life of the project. The erosion or displacement of topsoil is considered an irretrievable resource loss. In humid climates, such as the study area, natural production requires 500-700 years to redevelop 1 inch of topsoil. Similarly, the use of aggregated materials for road, microwave and substation sites essentially renders the aggregate resource irretrievable.

7.02 Atmospheric Resources

The proposed action will have no irreversible or irretrievable impacts on air quality or the atmosphere as a resource.

7.03 Ecological Resources

Certain terrestrial vertebrates would experience an irretrievable loss of habitat. Habitats with significant potential for harboring rare or sensitive plants could be irretrievably altered by construction activities and consequent microclimatic changes. The loss of any such plant species could be considered irretrievable.

7.04 Land Use

Land used for tower footings and permanent access roads are considered irreversibly committed for the life of the facility, or longer if a new transmission system should ever be constructed in its place. Some long-term indirect impacts on land uses adjacent to the facilities could result. Removal of the system would not necessarily allow return of the land to its former uses.

7.05 Socioeconomic

Material used in the construction of the towers and line including steel, aluminum, copper, and wood will be irretrievably committed to transmission use, although most such retired equipment is either reclaimed for use on other transmission facilities or recycled. Estimates of these resources have been made based on the mileage of the preferred route. (See section 1.03.2.)

It is estimated that a total of 17,071 tons of tower steel, 1,691 tons of conductor steel, and 6,776 tons of conductor aluminum will be used in the proposed transmission line. These materials will be irretrievably committed for the life of the project.

Approximately 45,000 cubic yards of sand and gravel materials used in the construction of access roads will be irretrievably committed.

Fuel consumption for equipment during construction will be irretrievably committed to the project.

7.06 Visual Resources

Visual resources would be irreversibly altered by the proposed action. Construction of the facilities would physically alter the landscape. If the lines were to be removed at the end of the project's life, features of the landscape would still be modified somewhat. Also, utility rights-of-way are sometimes upgraded or expanded to meet future needs. Thus, in this sense the intrusion of a manmade form on natural settings can be considered to be irreversible.

7.07 Recreational Resources

Most recreational activities would continue despite the presence of the lines. Those types of recreation oriented towards scenery would be modified to some extent. Since the rights-of-way would be committed to utility use over a long term, the impacts may be considered irreversible. The lines would cross several rivers. Each crossing may conflict with the river's possible inclusion in the national wild and scenic river system.

7.08 Historic and Archaeological

Undiscovered archaeological resources could be accidentally disturbed during construction, and perhaps suffer irreversible damage due to the disruption of stratigraphy. Similarly, access into previously inaccessible areas could lead to pothunting and vandalism of both known and undiscovered archaeological sites, rendering them irretrievable.

Section 8

Alternatives to the Proposed Action

8.0 ALTERNATIVES TO THE PROPOSED ACTION

8.01 Introduction

This Section of the EIS presents alternatives to the proposal. It is organized under the headings:

- 8.02 - Alternative of Not Building Transmission Lines
- 8.03 - Plan of Service Alternatives
- 8.04 - Transmission Line Route Alternatives
- 8.05 - Design Alternatives

Figure 8.01.1 is a diagram of the DOE study methodology. The headings above reflect options that were analyzed at progressive phases of the study. The extent to which they differ from the proposal is greatest under the headings, "Alternative of Not Building Transmission Lines and Plan of Service Alternatives." The alternatives discussed under the other two headings constitute different design and location solutions within a proposed plan of service.

Diagrams or maps that illustrate each alternative are enclosed or referenced within the discussions that follow. The illustrations that are referenced provide context for the discussions and therefore it is helpful to review them first.

8.02 Alternative of Not Building Transmission Lines

This alternative relates to alternatives to the Dickey-Lincoln School Lakes Project which are addressed in section 6 of the Draft EIS prepared by the U.S. Army Corps of Engineers. If the project were not built, the proposed transmission system would not be required. If the project is built, there is no way other than by conventional transmission facilities that the power can be transmitted to load centers.

8.02.1 Use of the Existing Transmission System

Dickey and Allagash, Me. are presently served by a 7.2 kV single phase line (approximately 1 megawatt capacity) from St. Francis, Me. St. Francis is served by a 34.5 kV line from Fort Kent which has approximately a 5 megawatt capacity. Similar capacity lines serve Fort Kent from Presque Isle, and Houlton, Me. Present loading on these facilities leaves little excess capacity. Considering the 954 megawatt output of the project, these lines would not begin to be of any practical use from the standpoint of power transmission. Additional facilities are thus required.

8.03 Plan of Service Alternatives

Plan of service alternatives were established and analyzed in phases I, and II of the study. The Dickey-Lincoln School Lakes Project presently is proposed for development at what is termed the authorized level. However, if additional pumped storage facilities were installed at Dickey Dam, the project would generate power at its ultimate level. Studies during phase I and II considered project development at both of these levels.

During phases I and II, the DOI studies focused on identifying the most suitable plan of service at both development levels.

Five plans of service were identified through the phase I system planning study.

The phase II study focused on studying alternative transmission corridors for each plan of service.

Study area boundaries for phase II of the study were drawn to include all areas that could be considered as locations for any of the system plans under study. Figure 8.03-1 shows the study area. Its outline follows jurisdictional boundaries, including the International Boundary between the United States and Canada, as well as county and town boundaries. The area includes the northern parts of Maine, New Hampshire and Vermont. It encompasses about 32,000 square miles.

The study methodology focused on environmental concerns and resources most threatened by the construction, maintenance, and operation of transmission facilities. The method would provide for consideration of and reaction to the concerns of a multidisciplinary team working on the project for the contractor as well as those of a number of people and organizations contacted by the contractor's representatives and by members of the DOI team at Bangor.

Two reports - the March 1976 Comitta Frederick Associates report entitled "Environmental Data Reconnaissance Report - Dickey-Lincoln School Lakes Transmission Project" and a September 1975 META System, Inc., report entitled "Scope of Work-Environmental Impact Statement for the Dickey-Lincoln School Lakes Project," - provided much useful information about the availability of data and environmental concerns in the region.

Information obtained during public meetings held by the DOI in July and December 1976 throughout the study region was also very useful.

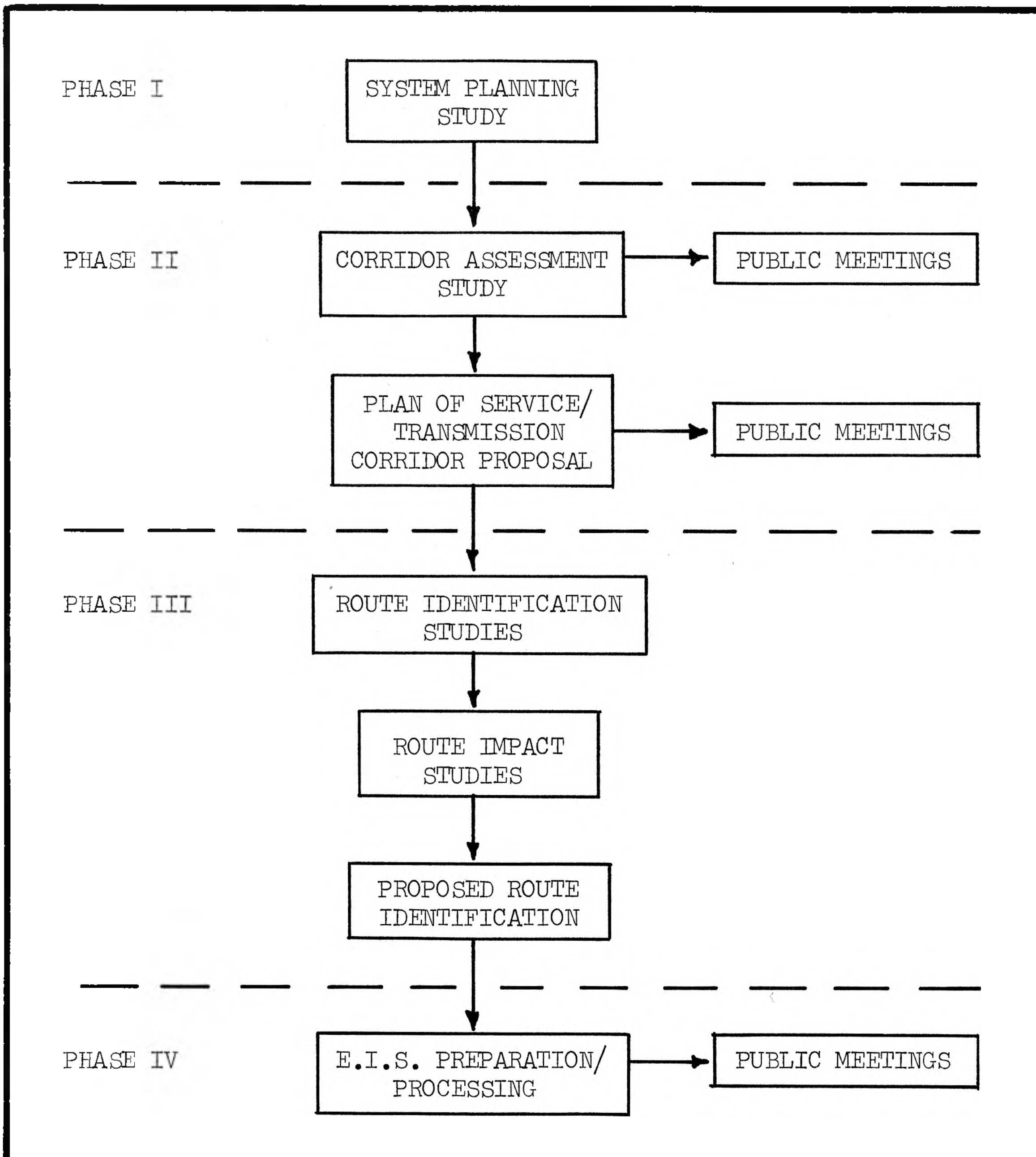
Major concerns identified were: Social, economic, natural systems, esthetic/cultural, legal, and site development costs.

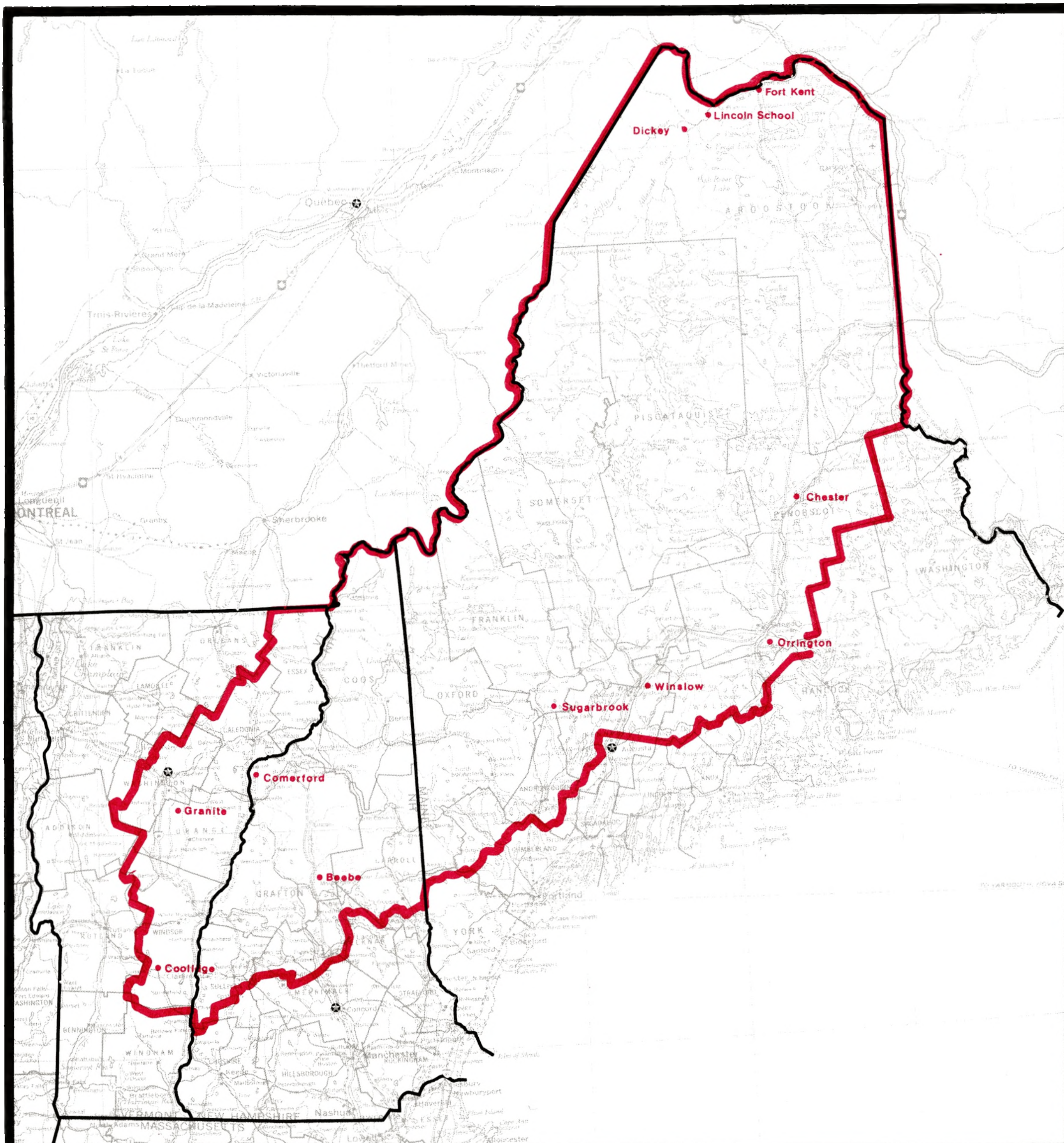
The methodology developed and used in the environmental study can possibly be understood best by referring to figure 8.03-2. Seventy-three data elements are listed across the top of this matrix. These items are the kinds of resources that exist in the study area for which data was collected and mapped and which would be impacted by the construction, maintenance, and operation of transmission facilities. Seventy-three separate data map overlays were made, one for each data element. (See appendix B , map volume).

A list of the six major concerns that would affect the location acceptability of transmission circuits was developed. They are designated as A-level, major - concerns in figure 8.03-2. The A-level, major concerns were then separated into subsets - C-level concerns called "Location Factors". Twenty-eight location factors are listed on figure 8.03-2.

FIGURE 8.01-1

STUDY METHODOLOGY





STUDY AREA

DICKEY-LINCOLN SCHOOL LAKES PROJECT

U.S. Department of Energy March, 1978

FIGURE 8.03-1

The matrix shows the relationship between the location factors (C-1 through C-28), and the 73 data elements. For example, location factor C-1, Land Ownership includes data items: Indian Lands/Reservations (1.6); Parcel Density/Town - high (5.5); Parcel Density/Town - medium (5.6); and Parcel Density/Town - low (5.7). A map was then made in the form of a shaded overlay based upon the relationships established in the matrix. That is, the location factor, Land Ownership is related to or dependent upon data elements 1.6, 5.5, 5.6, and 5.7. Similar overlays were made for each of the 28, C-level location factors.

A location factor, impact number was then assigned to each of the 28 location factors (see table 8.03-1). This number indicates the relative impact the transmission facilities could have on the environment. The degree of impact is either severe, moderate, or slight.

Six composite maps corresponding to each of the major concerns (A-level) were then produced by overlaying appropriate location factor (C-level) maps.

Two things remained to be done to accomplish the desired results of this effort. They were:

1. Corridors of least impact needed to be located for each plan of service.

2. The different corridors for each plan needed to be ranked to identify the best location for the facilities.

The first requirement was achieved by overlaying the six A-level, shaded maps. The corridors of least impact were identified via the lighter shaded areas on the resulting composite.

The DOI Bangor staff shared knowledge of study area conditions and transmission construction and location requirements with the contractors multidisciplinary team. This collaboration helped assure that feasible routes could be located within the designated corridors.

Corridors identified through these procedures are shown on the corridor map (see figure 8.03-3).

The second requirement - the ranking of the corridors - was accomplished using two methods. A numerical system was developed. A qualitative method was also developed to double check the results of the numerical system.

The numerical system for ranking corridors was developed by first developing an "impact-index" number for each of the major A-level concerns. The impact-index number was determined by calculating the average of the "Location Factor Impact Numbers" for each of the A-level concerns. For example, in table 8.03-1 the location factor impact numbers for the three location factors under A-1 Social are 2,3, and 2. The average of this (the A-Level, impact-index) is 2.3. The resultant A-level, impact-index numbers for the six major concerns are tabulated in table 8.03-2

TABLE 8.03-1

LOCATION FACTOR IMPACT NUMBERS [1]

LOCATION FACTORS:	IMPACT NUMBER:
1. SOCIAL	
Land Ownership	two (2)
Human Populations	three (3)
REcreation Land Use	two (2)
2. ECONOMIC	
Recreation Land Value	one (1)
Open/Agricultural Land	one (1)
Existng Forest Industry	three (3)
3. NATURAL SYSTEMS	
Vegetative Cover	three (3)
Surface Water Systems	two (2)
Groundwater Systems	one (1)
Deer Habitat	three (3)
Waterfowl Areas	two (2)
Fish Habitat	three (3)
Significant Wildlife Areas	three (3)
Soils: Increased Erosion	two (2)
4. ESTHETIC/CULTURAL	
Historic Resources	three (3)
Archaeological Resources	two (2)
Unique Resources	three (3)
Existing Visual Quality	three (3)
Visual Quality Due to Visibility/Absorption Parameters	three (3)
Visual Quality Due to Exposure to Land Uses	three (3)
5. LEGAL	
6. SITE DEVELOPMENT COSTS	
Value of Developed Lands	three (3)
Value of Recreation Lands	two (2)
Value of Forest Industry Lands	one (1)
Cost Due to Decreased Accessibility	two (2)
Cost Due to Unstable Soils	three (3)
Cost Due to Steep Slopes	one (1)
Cost Due to Severe Microclimatic Conditions	one (1)
Cost Due to Presence of Unique Rare and/or Endangered Plant Species	two (2)

[1] Reference: Alternative Power Transmission Corridors Study, Appendix B Volume 1

DEGREES OF IMPACT POSSIBLE

1 = slight
2 = moderate
3 = severe

following. A formula was then used to calculate the total impact score. Inputs to this calculation were: the impact index, miles of transmission line, and a factor that representated the level of shading on the overlays for the A-Level concerns map.

TABLE 8.03-2

"A" LEVEL CONCERNS

Social	2.3
Economic	1.7
Natural Systems	2.4
Esthetic/Cultural	2.8
Legal	*
Site Development Costs	1.9

*Items identified as legal concerns tend to be site specific and not particularly difficult to avoid through corridor location. Airports, historic sites, and areas known to be inhabited by endangered or threatened wildlife or plant species are examples of what are termed legal concerns. Impacts on these areas by transmission facilities are not anticipated.

The qualitative evaluation was made by overlaying the corridor map over selected data maps and recording the number and proximity of resources.

Some corridors represent opportunities for sharing existing transmission line rights-of-way. The impact of paralleling an existing right-of-way is often considerably less than that of a new one. A formula for calculating the decreased impact of sharing right-of-way was developed based on the additional right-of-way width required (100 feet as compared with 150 feet for new right-of-way). When a shared right-of-way was used, the impact score was reduced by 33 percent to reflect a lower environmental impact.

A similar procedure was used to calculate the impact score when the new right-of-way would have two single circuit 345-kV lines adjacent to one another. Two hundred-fifty feet would be required to accommodate the two lines. A factor of 1.66 was applied to the impact score to reflect the additional environmental impact caused by the additional 100 feet of required right-of-way.

These evaluation procedures were used to rank corridors as to environmental impacts. (See table 8.03-3). Best corridors for each system plan were then compared and used to select the system plan which would have the least environmental impact. Rankings were made at both the authorized and ultimate level of generation, as well as for plans calling for wood pole or steel towers. (See table 8.03-4).

Prior to making final corridor and plan of service rankings and recommendations to the DOI, the consultant reviewed the results of their evaluation in the field. This was done using aircraft. It was found that field observations and ground review generally confirmed the findings. Final rankings and recommendations were then made to the DOI.

Plan E was determined to have least environmental impact at both the authorized and ultimate level. It is the plan of service described as the proposed action.

After completion of the Alternative Power Transmission Corridors study, additional lines were identified as being required due to the delay or possible elimination of planned generation in southeastern Maine and western Vermont.

All plans at the authorized level would require a 345-kV line between Granite Substation and a new substation to be constructed near Essex Junction, Vt. This line has been studied by DOI in detail and has been included as part of the proposal.

At the authorized level, there would be a 345-kV line from Winslow to Maxcy's to Maine Yankee for Plans A and B. This additional line would be approximately 48 miles long. At the ultimate level for plan A, there would be an additional 30-mile 345-kV line from Beebe to Webster. For Plan B at the ultimate level, there would be an additional 139-mile 345-kV line from Sugarbrook to Webster.

A discussion follows for each of the alternative plans of service, describing the key environmental advantages and disadvangates for each plan at the authorized and ultimate levels of transmission.

Table 8.03-5 indicates the miles of impact along the best corridors for each plan of service. These mileages reflect measurements from analysis maps; A1, A2, A3, A4, and A6 (appendix B, volume 1). Qualitative values of miles of none, low, moderate, and high impact were calculated for each plan of service. Further comparisons of alternative plans are shown in table 8.03-4.

For Plans C, D, and E, at the ultimate level, an additional 345-kV line is required between Beebe and Webster Substations. The distance is about 45 miles in length.

The additional lines which were identified after completion of the corridor study are not shown on these tables. Due to the greater length of additions for Plans A and B, these plans would undoubtedly become still less desirable than the proposed plan.

The mileages discussed in the following, include those additional lines that were included after the Alternative Power Transmission Corridor Study.

8.03.1 Plan A

Authorized Level

Plan A, at the authorized level would require about 548 miles of 345-kV transmission lines. It also requires about 30 miles of 138-kV transmission line (see figure 8.03-4).

TABLE 8.03-5

MILEAGE IMPACT COMPARISON OF ALTERNATIVE PLANS

IMPACT CONCERNS	IMPACT CATEGORIES	AUTHORIZED LEVEL[1]					ULTIMATE LEVEL[1]				
		Plan A	Plan B	Plan C	Plan D	Plan E	Plan A	Plan B	Plan C	Plan D	Plan E
Social	None	0	0	0	0	0	40	0	0	0	0
	Low	341	341	250	250	250	151	161	19	19	19
	Moderate	96	96	29	29	29	83	55	25	25	25
	High	13	13	1	1	1	12	7	0	0	0
Economic	None	0	0	0	0	0	13	0	0	0	0
	Low	106	106	38	38	38	75	66	6	6	6
	Moderate	342	342	242	242	242	196	157	17	17	17
	High	2	2	0	0	0	2	0	21	21	21
Natural Systems	None	0	0	0	0	0	5	0	0	0	0
	Low	79	79	29	29	29	37	48	3	3	3
	Moderate	319	319	221	221	221	227	157	35	35	35
	High	52	52	30	30	30	17	18	6	6	6
Cultural Visual	None	191	191	125	125	125	60	76	1	1	1
	Low	16	16	4	4	4	66	2	1	1	1
	Moderate	156	156	94	94	94	110	89	16	16	16
	High	87	87	57	57	57	50	56	26	26	26
Site Devel. Costs	None	0	0	0	0	0	0	0	0	0	0
	Low	349	349	188	188	188	247	186	20	20	20
	Moderate	78	78	89	89	89	34	31	16	16	16
	High	23	23	3	3	3	5	6	8	8	8

[1] The values shown in the table reflect miles of impact along the 'best' corridor for each plan.

New substations would be required at Dickey and Lincoln School and a switching station would be needed between Dickey and Chester substations. Substation expansion would be required at Fish River, Chester, Orrington, Winslow, Sugarbrook, Granite, Maxcy's and Maine Yankee substations.

Plan A, at the authorized level, requires about 213 more miles of 345-kV transmission than the proposed action (Plan E).

Ultimate Level

At the ultimate level, Plan A requires an additional 317 miles of 345-kV transmission lines. These lines are required between Chester and Sugarbrook; Sugarbrook and Beebe; Beebe and Coolidge and Beebe and Webster substations.

At the ultimate level, Plan A requires a total of 865 miles of 345-kV transmission as contrasted with 409 miles for the proposed plan (Plan E).

8.03.1.1 Environmental Impacts - Plan A (Authorized Level)

The Alternative Power Transmission Corridors Study (appendix B) found Plan A to have greater impact than the proposal. This was true in terms of both a quantitative and qualitative comparison of impacts (see table 8.03-4). Plan A was shown to have more environmental impact at both levels of development (see table 8.03-5).

Plan A (Authorized) - Social Impacts

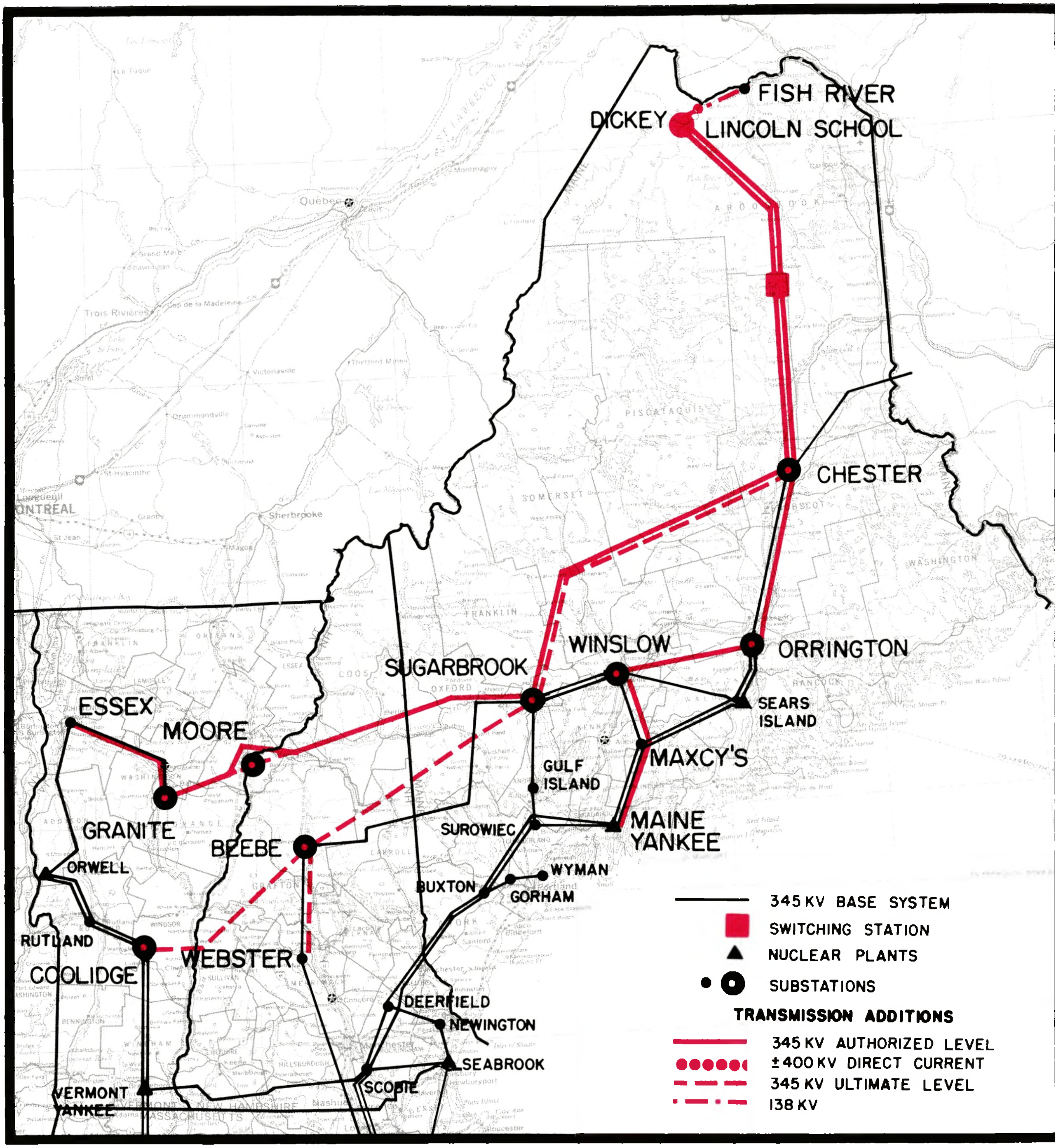
Social impacts were analyzed in terms of land ownership, human population, and recreation land use.

This plan would have greater impact on people-oriented activities than the proposed plan and is located within some of the more populated areas of Maine, New Hampshire, and Vermont. Population centers along the route include Dover-Foxcroft, Milo, Bangor, Waterville, Madison, and Skowhegan, Maine; Gorham, and Littleton, N.H. as well as settled areas near Barre and Waterbury, Vt. For example, Plan A facilities would be in close proximity to 64 town centers and would cross 269 roads.

Plan A (Authorized) - Economic Impacts

Economic impact assessments express the economic value of recreation areas, agricultural production and forest lands along the corridors.

Plan A facilities would cause moderate or high impacts along more than 340 miles of its corridors. Impacts to the regional economy would fall primarily on the forest products industry, agriculture, and recreation. The greatest economic impacts would occur to commercially managed forests between the project site and Bangor, Maine. Agriculture would be impacted at locations along the route from Bangor to Vermont. The line would pass within 1.5 miles of 13 intensively used recreation areas. The White Mountain National Forest, which is valued for its recreational resources, is along corridors for this plan.



SYSTEM PLAN A

Eastern AC Plan

DICKEY-LINCOLN SCHOOL LAKES PROJECT

U.S. Department of Energy March, 1978

FIGURE 8.03-4

Plan A would have the least impact of any of the plans on commercially managed forests. This plan generally avoids impacts on the wildland aspects of the north Maine woods, the mountainous areas of western Maine and New Hampshire, and on some of the more remote recreation lands within the study area.

Plan A (Authorized) - Impacts to Natural Systems

Assessments of impact upon the natural system includes: impacts upon the surface and ground water systems; impacts on vegetation and wildlife systems; and impacts on soils and the sedimentation of streams, rivers and water bodies.

This plan would have considerably greater impact on natural systems than would the proposed plan. Plan A would have 371 miles of moderate or high impact.

This plan crosses a number of streams that are used by anadromous fisheries. These occur primarily in Aroostook County on the segment of line between the project and Chester Substation. The plan in total would cross about 200 streams compared with about 130 for the proposed plan.

Plan A would impact deer wintering yards, especially between Dickey and Chester Substations. The number of identified deer wintering areas are fewer for this plan than the proposed plan.

The facilities would be built within 1.5 miles of 28 wildlife restoration areas and 4 natural research wilderness areas. Plan A would also be located in close proximity to 11 areas that have been identified as having unique resources.

Most of the high impacts on natural systems would occur between the project and the Dover-Foxcroft areas and in select areas of New Hampshire and Vermont. Greatest adverse impacts on wildlife, waterfowl and fishing areas, occur on that portion of the plan from Dickey to Orrington Substation near Bangor. The line would pass through the Aroostook River drainage basin which is classified as a high quality watershed.

Plan A avoids the remote areas of western Maine and northeast New Hampshire where the natural systems are relatively untouched by man. Although Plan A impacts many of the area's natural resources, it is located in areas where development and prior disturbance is also considerable. The proposed plan in contrast crosses areas of very sparse development and remoteness.

The potential for soil erosion would be considerably less with this plan than the proposed plan. Much of the area that would be crossed by Plan A is not very steep and thus areas of particularly high erosion potential are infrequent.

Plan A (Authorized) - Cultural/Visual Impacts

This category assesses the impact of Plan A on historic and archaeological resources, unique resources, and its impact on the scenic resources of the region. At the authorized level, 156 miles of the route would have moderate impact and about 87 miles high impact.

Plan A would cross two designated scenic roads and two scenic trails, including the Appalachian trail in western Maine. The line would be in proximity to 22 scenic wayside areas. At the authorized level, it would pass near 13 National Register historic sites. Although the archaeological data at the regional scale is quite limited, it was determined that this plan would be close to six archaeological sites and a rather large number of existing or potential sites of state significance.

The facility would be close to Baxter State Park and might be visible from Mount Katahdin. In the vicinity of Baxter Park, the line would be located near the East Branch of the Penobscot River. Other highly scenic areas impacted would be a portion of the White Mountain National Forest along the Androscoggin Valley and the Connecticut River Valley near Barnet, Vt.

Plan A would often be located in a landscape setting which has previously been altered by development and agricultural activities. Thus, this plan would avoid impacting mountainous areas of western Maine and northeast New Hampshire, which are presently unaltered except for logging activities.

Plan A impacts more highly scenic land than the proposed plan but fewer scenic rivers.

Plan A (Authorized) - Site Development Cost

This factor considers the various relative costs of developing sites for transmission facilities. Included in this analysis are costs of development within recreation and forested lands, unstable soils, steep slopes, and other related factors.

This plan is considerably longer than the proposed plan. Thus, site development costs in general are greater. As developed lands are frequently encountered, land values could be considerably higher than the proposed plan. More individual landowners would be impacted. Accessibility is greater and thus construction of the facilities would require fewer new roads than the proposed plan. Steep slopes and areas of high erodibility are less frequently encountered.

8.03.1.2 Additional Environmental Impacts - Plan A (Ultimate Level)

An additional 317 miles of 345-kV transmission line would be required at the ultimate level under Plan A, requiring an additional 6,300 acres of right-of-way. Table 8.03-5, projects impact levels within the corridors defined to accomodate these lines. At the ultimtate level, Plan A requires more transmission lines than any of the alternatives. Its impacts are higher than for the proposal and other alternate plans.

The following discussion provides an indication of the additional environmental impacts which are attributed to Plan A at the ultimate level.

This information is not directly comparable with the proposal as the ultimate level of development is not proposed. If the plan were to be developed at the authorized level, this information provides a measure of the additional impact that could occur if the ultimate level was achieved in the future.

Plan A (Ultimate) - Additional Social Impacts

This addition would have 95 miles of moderate or high impacts on the social resources of the area. Much of this additional impact would occur between Sugarbrook and Coolidge. Especially high impacts would occur in the area between Fryburg, Maine, and Plymouth, N.H. The line between Beebe and Coolidge substations would probably parallel an existing line. The line would pass close to 26 town centers and cross 126 roads.

Plan A (Ultimate) - Additional Economic Impacts

The additional 345-kV line would result in 198 miles more of moderate or high impacts on the agricultural, forest, and recreation lands. The higher impacts would be rather uniformly distributed along the corridor from Sugarbrook to Coolidge Substation. The line would be located in close proximity to three state parks and eight intensive recreation areas.

Plan A (Ultimate) - Additional Natural System Impacts

Moderate impacts on natural systems would occur on an additional 227 miles along this route. Impacts on about 17 miles of the corridor would be high.

These impacts would affect vegetation, a large deer wintering area east of the Beebe Substation, and a number of significant wildlife areas. The line would cross 110 streams and pass near six natural landmarks of national significance. The line would also be built near one wildlife research area and near two areas that may be inhabited by threatened or endangered species.

Plan A (Ultimate) - Additional Cultural/Visual Impacts

Moderate impacts would occur on 110 miles and high impacts on 50 miles of the additional line. Most of the increase in adverse impacts would occur in New Hampshire near the White Mountain National Forest and also between between Beebe and Coolidge substations. Impacts on the area between Sugarbrook and the Maine-New Hampshire line would not be significant. The line might be seen from Highway 26 near the town of Norway, Maine. The corridors would cross three additional scenic roads and pass close to nine more scenic waysides. There are seven National Register historic sites, 22 State Register historic sties, and 13 potential State Register historic sites within 1.5 miles of the line.

Plan A (Ultimate) - Additional Site Development Cost Impacts

The additional line will cause few adverse impacts. Moderate to high impacts will, however, occur between Sugarbrook and State Highway 16 in eastern New Hampshire and also between Beebe and Coolidge near the White Mountain National Forest.

Most of the line would be easily accessible for construction, maintenance, and operation activities.

8.03.2 Plan B

8.03.2.1 Environmental Impacts - Plan B (Authorized Level)

At the authorized level of project development, Plans A and B are identical. Impact discussions are presented under Plan A, section 8.03.1.1.

8.03.2.2 Additional Environmental Impacts - Plan B (Ultimate Level)

At the level, additional 345-kV lines are required from Chester to Sugarbrook Substation, from Sugarbrook to Moore Substation, and from Beebe to Webster Substations (see figure 8.03-5).

At the ultimate level, Plan B differs from both Plan A and the proposal. Plan B requires fewer additional miles of transmission line than Plan A (317 vs. 237). However, in comparison with the proposed Plan E, it still requires more additional transmission mileage (237 vs. 74).

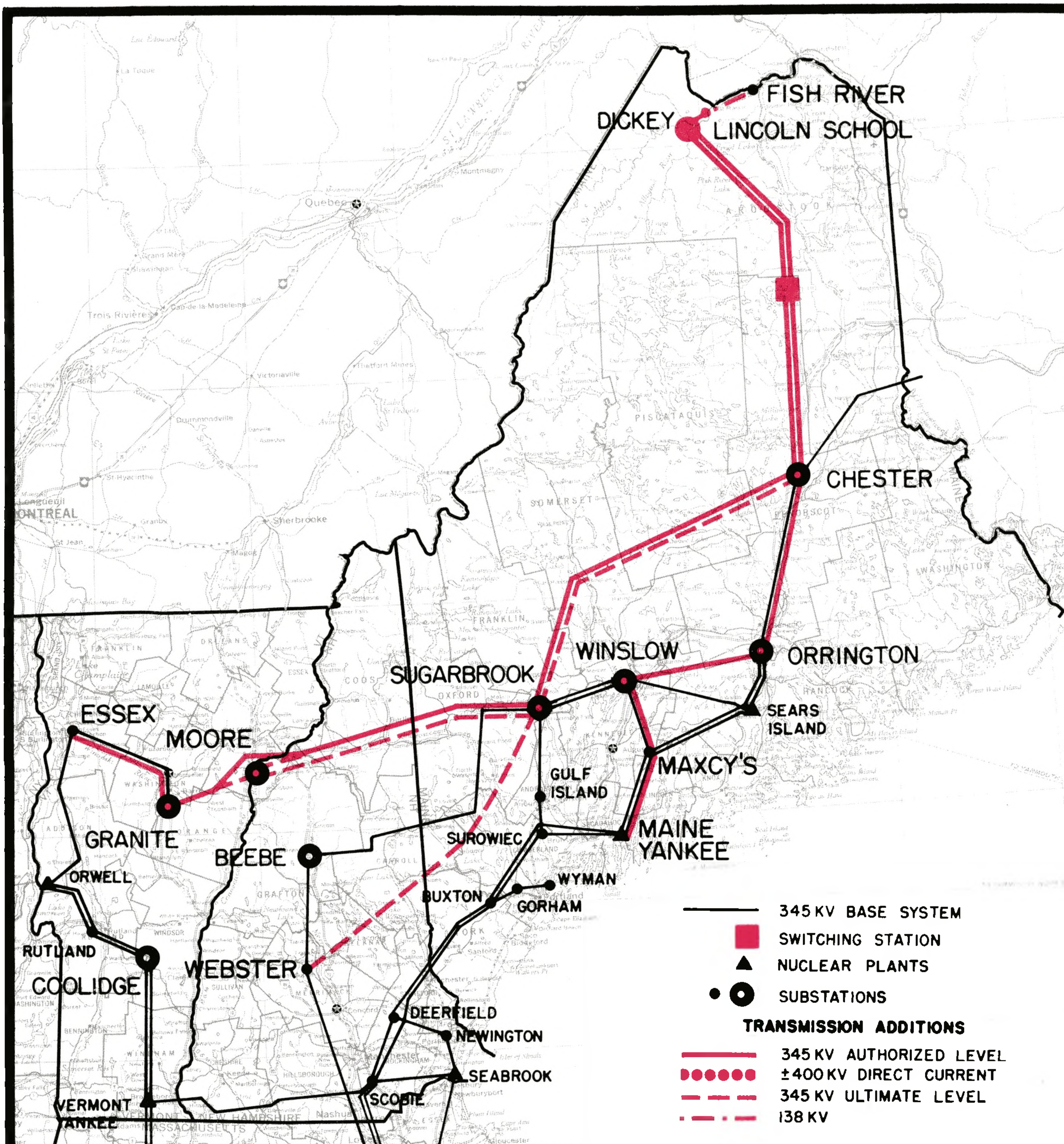
In terms of its environmental suitability, Plan B at the ultimate level ranks higher than Plan A, but is less desirable than the proposal.

The additional transmission lines which would be needed for Plan B-Ultimate could all be constructed parallel to what will then be existing facilities. Most of the additional lines would parallel those developed at the authorized level (see figure 8.03-5). Approximately 2,900 acres of additional right-of-way would be required.

Table 8.03-5 projects the additional impacts which would result from the added facilities. The additional impacts associated with this plan could be reduced considerably if the lines from Chester to Sugarbrook and west to Moore Substation were initially built as a double circuit line, and additional conductors added later to carry the additional generation. From an economic standpoint, however, this would not be desirable unless the ultimate level was a certainty and scheduled to occur fairly soon after the intial development. Therefore, the impact assessments reflect the construction of wood pole lines adjacent to those which would be then existing.

Plan B (Ultimate) - Additional Social Impacts

It is assumed that the additional lines would be built parallel to those constructed at the authorized level. Thus, social impacts would be fewer than if the line were to be built on a new corridor. However,



SYSTEM PLAN B

Eastern AC Plan

DICKEY-LINCOLN SCHOOL LAKES PROJECT

U.S. Department of Energy **March, 1978**

FIGURE 8.03-5

some 62 miles of this line would pass through areas of moderate to high impacts. These impacts reflect close proximity to town centers and other populated areas.

Plan B (Ultimate) - Additional Economic Impacts

This plan would have moderate impact along 157 miles of line. Most of this moderate impact can be attributed to impacts on open agricultural land and, to some extent, on small forest woodlots.

Plan B (Ultimate) - Additional Natural System Impacts

More than 175 miles of this additional line would cause moderate or high impacts on natural systems. Of concern is the possibility of increased erosion.

Plan B (Ultimate) - Additional Cultural/Visual Impacts

An additional 56 miles of high cultural/visual impact would occur. Most of this impact would occur in New Hampshire and Vermont in areas near the White Mountain National Forest and along the Connecticut River.

Plan B (Ultimate) - Additional Site Development Cost Impacts

There would be few site development associated impacts with this plan. Most of these impacts would be attributed to obtaining additional rights-of-way required to parallel the existing facilities. Access will be provided by the initial construction of Plan A/B.

8.03.3 Plan C

Authorized Level

Plan C would be a direct current (d.c.) transmission line from Dickey to Moore Substation through the western portion of the study region (see figure 8.03-6). 345-kV alternating current (a.c.) lines are required from Moore to Granite and from Granite to Essex Substations. Plan C is similar to the proposed plan, except that d.c. transmission is used and a midpoint substation at Jackman or Moose River would not be needed. Impacts are not discussed for Plan C Authorized. They are essentially the same as those for the proposed plan.

Ultimate Level

Plan C - Ultimate would require an additional 74-mile 345-kV a.c. line from Moore to Webster Substation, impacting about 900 additional acres. Plan C and the proposed Plan E are identical in terms of the additional facilities at the ultimate level.

8.03.3.1 Additional Environmental Impacts - Plan C (Ultimate)

Table 8.03-5 indicates the miles of impact associated with this additional transmission.

Plan C (Ultimate) - Additional Social Impacts

Most of this line would parallel an existing 115-kV facility. This would reduce the severity of social impacts. The line would be considerably shorter than those associated with Plans A or B.

Moderate impacts occur on approximately 25 miles of the line to Webster. Most of this impact would occur near settled areas. There would be no high impact. The line would be located close to Lincoln, N.H. It would cross 24 roads and pass close to four town centers. The line would be close to state parks and forests at 18 locations and to intensive recreation sites at two locations.

Plan C (Ultimate) - Additional Economic Impacts

This plan would require use of corridors located either adjacent to or within the White Mountain National Forest, thus economical impacts are high.

Plan C (Ultimate) - Additional Natural System Impacts

Few adverse impacts would be associated with this line. Only six miles of line have been judged to have high impacts. This high impact is mainly due to a potential for increased soil erosion during construction.

Twenty-four streams and rivers would be crossed. This could result in sedimentation problems and other water associated impacts. Three areas along this line would pass close to unique resource areas. The line would be in close proximity to a natural landmark and six wildlife restoration areas.

The impact of this line on cultural and visual resources is generally high. These high impacts are associated primarily with resources on or near the White Mountain National Forest and nearby recreation areas. Especially high impacts would occur near Lincoln, N.H. The line would cross 24 roads, three of which are classed as scenic. One scenic trail, the Appalachian, is crossed. Four scenic waysides, one state historic site, and three potential state historic sites are within 1.5 miles of this line.

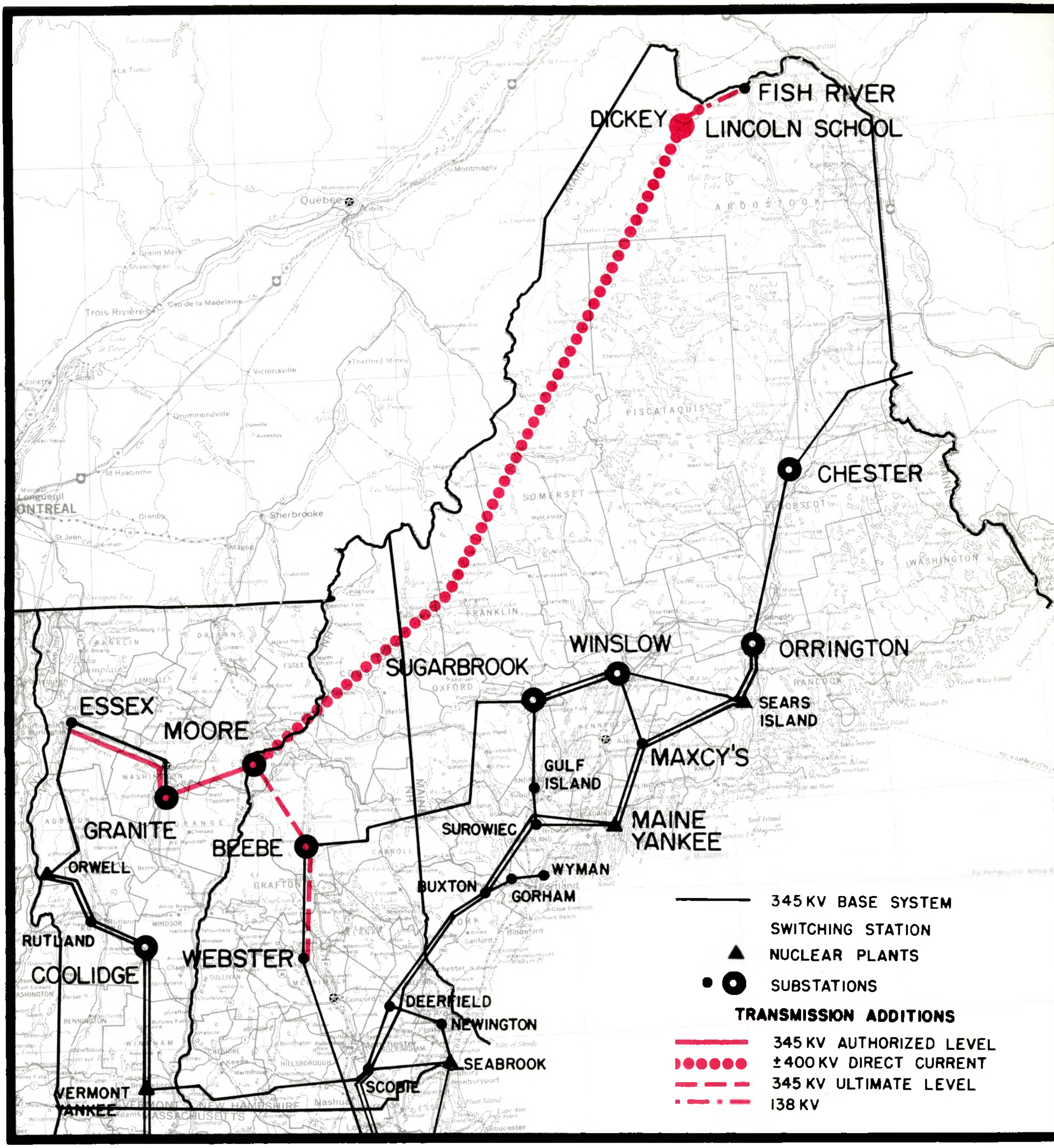
Plan C (Ultimate) - Additional Site Development Cost Impacts

More than 20 miles of this alternative were judged to have moderate to high impacts on site development costs. This can be attributed in part to the value of land, difficult access and steep slopes.

8.03.4 Plan D

Authorized Level

As in the proposal, Plan D (figure 8.03-7) would require two 345-kV a.c. circuits from Dickey to Moore Substation via Moose River Switching Station. The only difference between this plan and the proposal is that



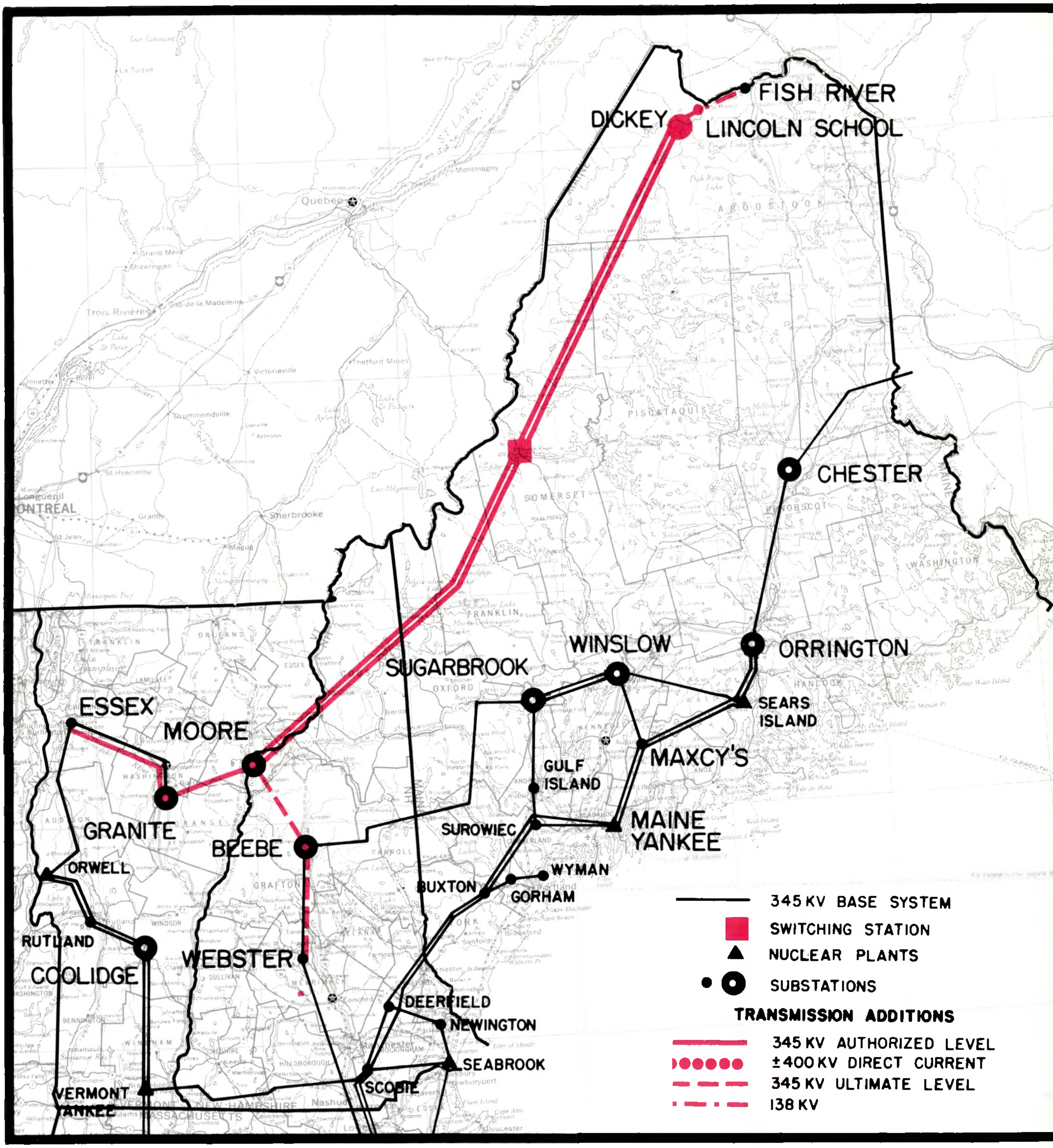
SYSTEM PLAN C

Western DC Plan-Direct Current

DICKEY-LINCOLN SCHOOL LAKES PROJECT

U.S. Department of Energy **March, 1978**

FIGURE 8.03-6



SYSTEM PLAN D

Western AC Plan-Two Single Circuits

DICKEY-LINCOLN SCHOOL LAKES PROJECT

U.S. Department of Energy March, 1978

FIGURE 8.03-7

in Plan D, the two 345-kV a.c. circuits from Dickey to Moore would be constructed on single circuit wood pole structures rather than the double circuit steel structures. The remainder of the plan is identical in that a 345-kV circuit is needed from Moore to Granite and from Granite to Essex.

Ultimate Level

At the ultimate level, Plans C and D and the proposal are identical. An additional 345-kV circuit is required from Moore to Webster Substation. This circuit is about 74 miles long, and thus constitutes a fraction of the additional transmission needed under Plans A and B - Ultimate.

Environmental Impacts - Plan D

The only significant difference between the proposal and Plan D is the amount of right-of-way that is required for these alternatives. The two single circuit lines from Dickey to Moore would require a 250-foot right-of-way as compared with the 150 feet required for the proposal. Plan D would require 40 percent more acres of right-of-way than the proposal. The lines would be located largely within areas used for commercial forestry so this additional impact is significant. Some of the taller structures required under the proposal would, however, be viewed from greater distances.

Additional information on the quantitative and qualitative differences between Plans D and E are provided on table 8.03-4. Plan D ranks third in comparison with the proposal at the authorized level and second at the ultimate level.

Impacts related to the additional transmission at the ultimate level was discussed under Plan C - Ultimate, section 8.03.3.1.

8.03.5 Plan E

Plan E is the proposed plan. (See figure 8.03-8). Facilities required for this plan and their impacts are discussed in sections 1-7.

The Alternative Power Transmission Corridors Study (appendix B), found Plan E to have least impact at both the authorized and ultimate development levels. Impacts related to the additional transmission at the ultimate level has been discussed under Plan C - Ultimate, section 8.03.3.1.

8.03.6 Plans Involving Canada

During the planning phases of the Dickey Lincoln School Lakes Project, electrical alternatives involving the location of facilities in Canadian provinces were considered. One alternate involves the Province of Quebec, the other New Brunswick as described below.

8.03.6.1. Quebec Route

Consideration was given to locating a route from the Dickey-Lincoln School Lakes Project site to Moore Substation via a corridor through the Canadian Province of Quebec. This alternative route would probably enter Quebec, near Daaquam, and cross the primarily agricultural lands of eastern Quebec. The line would probably be located west of Lac Megantic and east of Megantic Mountain. It would enter the United States near Norton, Vt. and continue through Vermont to Moore Substation in New Hampshire.

A preliminary review of this alternative revealed that it would encounter more extensively developed lands than the routes through western Maine. Detailed analysis of a Canadian route would require an agreement between the United States and Canada. The time frame for the investigations was not sufficient to allow for such an agreement. Thus, no detailed investigations were conducted.

8.03.6.2 New Brunswick Route

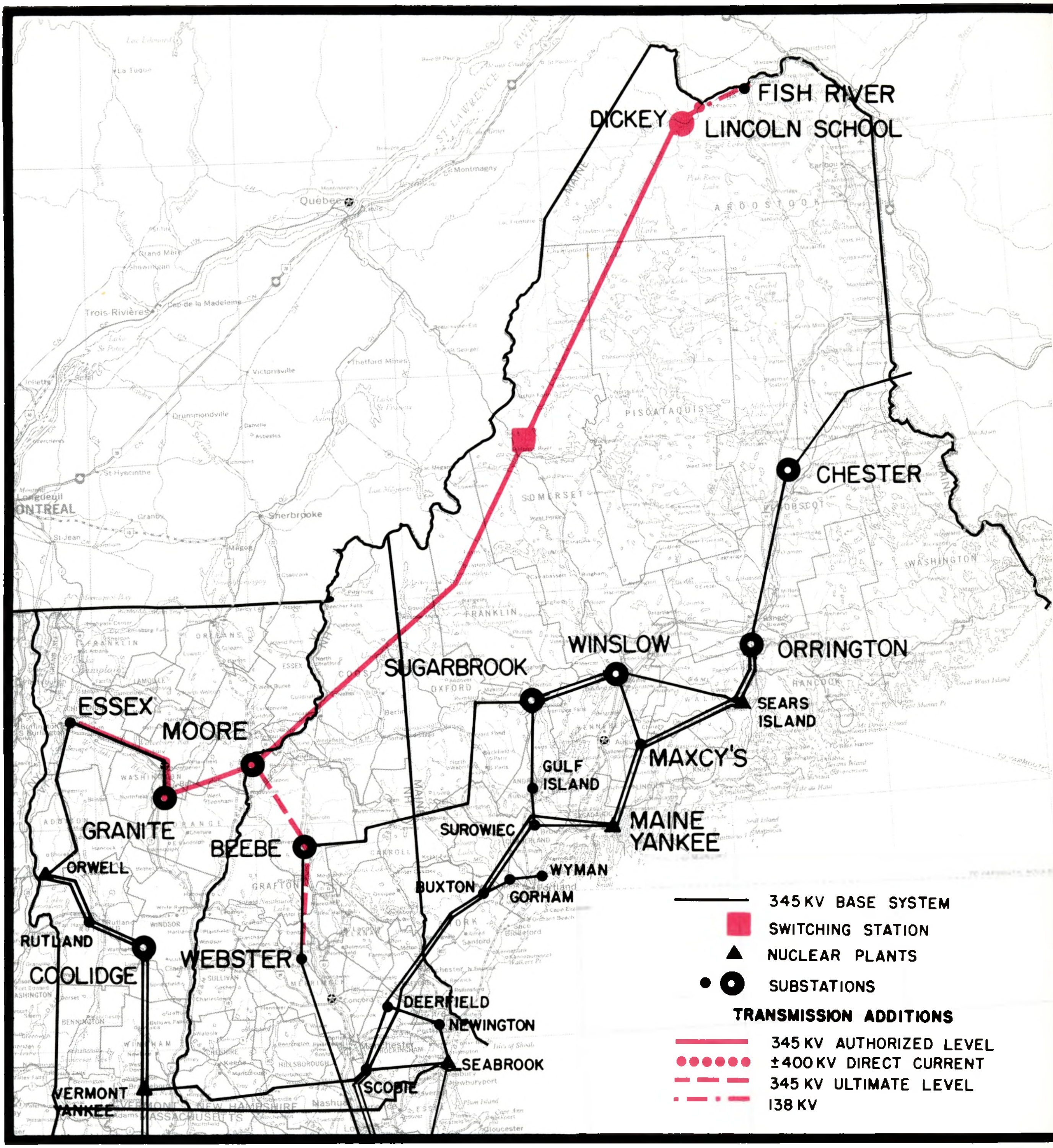
Preliminary discussions were held with the New Brunswick Electric Power Commission on the possibility of developing a tie with a 345-kV transmission system existing and being planned in the Canadian Province of New Brunswick.

This plan was a variation of Plan A in which power from the Dickey-Lincoln School Lakes Project would be transmitted from the project to New England load centers via two 345-kV lines routed through Chester, Maine (eastern route). One of these lines would instead be routed to Grand Falls, New Brunswick. There it would interconnect with a planned 345-kV line to be constructed from Keswick, New Brunswick by the Commission. Another 345-kV line would then be constructed from Keswick to Chester, paralleling an existing 345-kV tie between the New Brunswick and New England systems. The plan seemed promising in that it would take advantage of existing and planned system additions as well as the benefits of combining opposing power schedules (Dickey power south and New Brunswick power north between Keswick and Grand Falls).

The plan was discussed with New Brunswick representatives, but electrical studies were not performed. A preliminary analysis indicated that the line through New Brunswick would not load as well as one route through Maine because of its greater length. Its cost would be of the same order as Plan A. A treaty would be required before construction of the line could begin. Consideration of these factors and the time required to negotiate and approve a treaty made it inadvisable to include this plan of service in current environmental impact studies.

8.04 Transmission Line Route Alternatives

Alternative transmission line routes for Plan E were identified in the Transmission Reconnaissance Study (appendix D). These routes were analyzed by a multidisciplinary environmental team.



SYSTEM PLAN E

Western AC Plan-Double Circuit

DICKEY-LINCOLN SCHOOL LAKES PROJECT

U.S. Department of Energy March, 1978

FIGURE 8.03-8

Detailed environmental impact studies were conducted on the network of alternative routes shown on figure 1, Facility Locations. These studies were largely conducted by New England consulting firms and addressed the following topics: geotechnical resources, ecological resources, socio-economic resources, visual and recreational resources, land use and historic/archeologic resources. Study reports for these investigations are enclosed as appendices E through J.

Upon completion of their studies, the multidisciplinary environmental consulting team at a joint meeting ranked the alternative routes based on environmental impact. These rankings were key in the decision-making process that the DOE used in formulating the proposed route. The consultants recommendations on the alternative routes are provided in the subsequent discussions.

Route Designation System

Alternative routes discussed within the following pages are numerous, therefore a route designation structure was devised. The foundation of the route designation system is the link, which is a term used to depict a section of transmission line route which is different in location from any other route section. Each link has a number designation. The complex of links together (72) form what is termed the alternative route network. The route network is illustrated on figure 1, which is enclosed at the back of this statement. Reference to this map is essential to the following discussion.

A transmission line route is formed by combining a series of links. To aid the comparison of environmental impacts routesegments were established between the substations and referred to as route segments. Five segments were defined:

- Segment A - Dickey Substation to Lincoln School Substation to Fish River Substation.
- Segment B_1 - Dickey Substation to Jackman Substation
- Segment B_2 - Dickey Substation To Moose River Substation
- Segment C_1 - Jackman Substation to Moore Substation
- Segment C_2 - Moose River Substation to Moore Substation
- Segment D - Moore Substation to Granite Substation
- Segment E - Granite Substation to Essex Substation

Routes are first designated by segment (A-E) and secondly by route number (A-1). The links which are used to form routes are indicated in tables (matrices) which correlate route numbers with links which are used.

A final aspect of the route designation system is the identification of what are termed "localized routing alternatives." In the Transmission Reconnaissance Study (appendix D), locations occassionally were encountered where a single best location was not apparent. Thus, two or more route variations were brought forward for environmental evaluation. These alternatives serve as alternatives within a rather localized area, and thus the devivation of this term. Environmental comparisons were made of these alternatives and the most acceptable solution was used in the formation of segment routes. For example, in segment B Links 6 and 7 form what is termed LRA-I. Link 7 was preferred by the environmental team and thus, this link is included in routes which involve this localized routing alternative (LRA). There are eight LRA's in the route network.

8.04.1 Dickey-Lincoln School-Fish River (Segment A)

8.04.1.1 General Description

There is one alternative to the proposed route from Dickey Substation to Fish River Substation. It consists of substituting link 2 for link 1. Link 2 is 17.7 miles long and proceeds southeast from the eastern end of link 1B generally following Petite Brook to Bran Lake. The link continues northeast and parallels the St. John River Valley about 4 miles south of the river. The route crosses largely forested areas and passes close to Hunnewell and Wheelock lakes.

Table 8.04-1 shows which links comprise the alternative route for Segment A.

TABLE 8.04-1

ALTERNATIVE ROUTES - SEGMENT A

	ROUTES	
LINKS	A-1*	A-2
1	X	
1A	X	X
1B	X	X
1C	X	X
2		X
3	X	X

* Proposed Route

Table 8.04-2 shows the environmental ranking assigned to both the proposed and alternative routes for this segment.

TABLE 8.04-2

ALTERNATIVE ROUTE IMPACT RANKINGS - SEGMENT A

Impact Topics	ROUTES	
	A1*	A2
Geotechnical	2	1
Ecological	1	2
Land Use	1	2
Forestry	1.5	1.5
Recreation	1	2
Socio-economic	1	2
Historic/Archeologic	1.5	1.5
Visual	2	1
Site Engineering	1	2

* Proposed route
(Lower Values = Lower Impacts)

8.04.1.2 Significant Impacts of the Alternative Route

Geotechnical

Alternative route A-2 was ranked as having less impact due to soils with less erosion potential.

Ecological

Ecological studies ranked the proposed route as having least impact. The alternative route could result in high sedimentation impacts on Petite Brook, Wheelock Brook, and Paradise Brook. Route A-2 would also impact more deer wintering yards.

Land Use

The preferred route would have fewer impacts on land use than route A-2. This is primarily because it contains a greater percentage of agricultural land which would be only marginally affected. The alternative route is mostly forested; which would cease within the right-of-way due to restrictions on vegetation height.

Forestry

The alternative would result in greater impacts on forestry than would the proposed route.

Recreation

The preferred route would have the fewest recreation impacts. Route A-2 would impact a great pond, a public land parcel, and would be located near an area designated as an elevation of significance.

Socioeconomic

This study ranked the alternative route as having greater impact. This was due to a greater loss of timber resources.

Historic-Archaeologic

No significant difference was noted between the two route alternatives.

Visual

The preferred route was ranked as having more visual impact than the alternative. Both alternatives were the same in impact on landscape quality and site attractiveness. There is a significant difference, however in impact on viewers. The alternative would have much less viewer impact.

Site Engineering

The preferred route would have less impact. The alternative route would be more expensive to build, the right-of-way would have to be totally cleared because the route is largely within forest lands.

8.04.2 Dickey - Moose River/Jackman (Segment B)

8.04.2.1 General Description

There are three alternative routes between Dickey Substation and a substaton located at either Jackman or Moose River. Routes terminating at Jackman are designated B-1. Routes terminating at Moose River, B-2.

Table 8.04-3 shows which links form the alternative routes for Segment B.

TABLE 8.04-3

ALTERNATIVE ROUTES - SEGMENT B

LINKS	ROUTES			
	B1-1	B1-2	B2-1*	B2-2
4	X	X	X	X
5	X		X	
Best LRA I	X		X	
8	X		X	
9		X		X
9A		X		
10	X			
10A				X
11 (1st 7.2 mi)			X	X
11A			X	
12 (1st 1.0 mi)	X	X		

*Proposed route

The major difference between the alternative routes within segment B, is that the line follows a westerly route about 10 miles east and parallel to the United States - Canadian border rather than a more easterly location. This eastern route extends nearly due south from an area west of Clayton Lake to a point north of Moosehead Lake where it turns southwest of Jackman (see figure 1).

In an area northeast of the alternative substation sites, these routes intersect this allows them to be routed to either the Jackman or the Moose River substation sites.

There is one localized routing alternative (LRA) associated with this segment. Table 8.04-4 shows the links in each LRA.

TABLE 8.04-4

LOCALIZED ROUTING ALTERNATIVES - SEGMENT B

LINKS	LRA I	
	I-1	I-2
6	X	
7		X

The LRA was studied in the same level of detail as all of the alternatives. Table 8.04-5 shows the relative ranking that was assigned to each LRA alternative.

TABLE 8.04-5

LOCALIZED ROUTING ALTERNATIVE RANKINGS - SEGMENT B

Impact Topics	LRA I: I-1	LRA I: I-2*
Geotechnical	2	1
Ecological	2	1
Land Use	1	2
Forestry	1.5	1.5
Recreation	2	1
Socioeconomic	2	1
Historic/ Archaeologic	1.5	1.5
Visual	2	1
Site Engineering	2	1

* selected LRA
(Lower Values = Lower Impact)

Table 8.04-6 presents the impact rankings assigned by the interdisciplinary team to both the proposed and alternative routes.

TABLE 8.04-6

ALTERNATIVE ROUTE IMPACT RANKINGS - SEGMENT B

Impact Topics	Alternative Routes: B1-1	B1-2	B2-1*	B2-2
Geotechnical	1.5	2.5	1.5	2.5
Ecological	1	3	2	4
Land Use	2	4	1	3
Forestry	2.5	2.5	2.5	2.5
Recreation	4	3	2	1
Socioeconomic	3	4	1	2
Historic/Archaeologic	2.5	2.5	2.5	2.5
Visual	1	3	2	4
Site Engineering	2	3	1	4

* Proposed route
(Lower Values = Lower Impacts)

8.04.2.2 Significant Impacts of the Alternative Routes

Geotechnical

Proposed route B2-1 and route B1-1 were ranked as having the least impact. Alternative routes B2-2 and B1-2 would have the greater impacts, although not significantly. They would encounter steep slopes and potential sedimentation problems near Caucomgomoc Mountain.

Ecological

Proposed route B2-1 and B1-1 were ranked second and first, respectively, in terms of least impact. Alternative route B2-2 was judged to have the greatest impact on ecological resources. Both routes B1-2 and B2-2 would cross greater amounts of deer wintering yards and pass very close to Wadleigh Pond, a habitat for Blue Back Trout. This species is listed as rare and endangered. They would also cross bogs and shady rock cliffs that are a potential habitat for rare plants. These two routes also cross the west branch of the Penobscot River near Seboomook Lake.

Land Use

The proposed route was ranked as having the least impact, as it would cause least land use change. Alternative routes B2-2 and B1-2 would have the greatest potential impact. Route B2-2 would impact a seasonal camp near Luther Pond.

Forestry

No significant difference was noted between the route alternatives.

Recreation

The proposed route was ranked as having the least impact on recreation resources. All routes are considered to have fairly low impacts. The proposed route would have a significant impact near Baker Lake as would route B1-1. A second area of concern occurs where routes B1-2 and B2-2 cross the west branch of the Penobscot River near Moosehead Lake. Route B1-2 would impact public lands northeast of Long Pond near Jackman.

Socioeconomic

The proposed route was ranked as having the least impact. This was followed by route B2-2 which also terminates at Moose River switching station. Route B1-2 was ranked as having the greatest impact because of a residential structure close to the line near Tomhegan stream and because the route is located in an area with very little access. Routes B1-1 and B1-2 would terminate at a switching station located in the town of Jackman. Both the town of Jackman and the North Kennebec Regional Planning Commission have voiced concerns about the towers and the Jackman switching station site.

Historic/Archaeologic

Both the proposed route and alternatives are considered to have low potentials for impact on the cultural resources. It had been noted, however, that the passage between Seboomook and Moosehead lakes is a likely area in which to find archaeological artifacts. A slight preference was indicated for route B2-1, the proposed route.

Visual

The proposed route was ranked as having the least visual impact. Routes B1-2 and B2-2 would have significant impacts on viewers. Also of concern is the potential impact on visual quality near the narrow section of land that separates Seboomook and Moosehead lakes.

Site Engineering

The proposed route was judged as having the least site engineering problems. The route with greatest impact would be B2-2 because of its additional length and because the route winds through a series of small lakes and ponds near Boundary Bald Mountain.

8.04.3 Jackman/Moose River - Moore (Segment C)

8.04.3.1 General Description

Route alternatives within segment C are numerous. Several localized routing alternatives are involved and in several instances portions of one route are combined with portions of a second to form an alternative. Reference to figure 1, is recommended while reviewing the following discussion.

The use of either the Jackman or Moose River switching station as the route origin is indicated by the designations C1 or C2, respectively. The Transmission Reconnaissance Study (appendix D), provides detailed geographical descriptions of each link should a more detailed description be desired.

As in previous segments localized route alternatives (LRA) were compared as to environmental impacts. That LRA shown to have least overall impact was used in the formation of segment routes. Table 8.03-7 shows the links which were compared in each of six LRA's (II-VII). Table 8.04-8 shows the relative impact rankings assigned by the multidisciplinary team.

Table 8.04-9 indicates the links use to form the alternative routes in segment C. Table 8.04-10 shows the impact rankings assigned to the alternative routes by the environmental team.

TABLE 8.04-7

LOCALIZED ROUTING ALTERNATIVES - SEGMENT C

	LRA II		LRA III			LRA IV		LRA V		LRA VI			LRA VII	
LINKS	2-1	2-2	3-1	3-2	3-3	4-1	4-2	5-1	5-2	6-1	6-2	6-3	7-1	7-2
15	X													
16		X												
17A			X	X										
17B					X									
18			X											
18A			X		X									
19				X										
21										X				
22											X			
23											X	X		
24												X		
32												X		
33											X	X		
26						X								
27							X							
29								X						
30									X					
36													X	
37														X
39														X

TABLE 8.04-8

LOCALIZED ROUTING ALTERNATIVE RANKINGS - SEGMENT C

Impact Topics	LRA II		LRA III			LRA IV		LRA V		LRA VI			LRA V
	2-1*	2-2	3-1	3-2	3-3*	4-1	4-2*	5-1*	5-2	6-1	6-2*	6-3	7-1*
Geotechnical	1	2	2	3	1	2	1	2	1	1	3	2	1
Ecological	1	2	1	3	2	1	2	1	2	3	1	2	1
Land Use	1.5	1.5	2	2	2	1	2	1.5	1.5	2	2	2	2
Forestry	1.5	1.5	2	2	2	1.5	1.5	1.5	1.5	2	2	2	1.5
Recreation	1	2	2	3	1	2	1	1	2	3	1	2	1
Socioeconomic	1.5	1.5	3	2	1	1.5	1.5	1.5	1.5	2.5	2.5	1	1.5
Historic/ Archeologic	1.5	1.5	2	2	2	1.5	1.5	1.5	1.5	2	2	2	1
Visual	1.5	1.5	2	3	1	2	1	1.5	1.5	1	2	3	1
Site Engineering	1	2	2	3	1	1	2	1	2	3	1	2	2

*Selected LRA
(Lower Rank = Lower Impact)

TABLE 8.04-9

ALTERNATIVE ROUTES - SEGMENT C

LINKS	ROUTES							
	C1-1	C1-2	C1-3	C1-4	C2-1*	C2-2	C2-3	C2-4
11(last 37.5 mi)					X	X	X	X
12(last 36.8 mi)	X	X	X	X				
12A		X		X				
13						X		X
13A		X		X				
14		X		X	X		X	
14A					X		X	
Best LRA II		X		X	X		X	
Best LRA III		X		X	X		X	
17		X		X	X		X	
20		X		X	X		X	
Best LRA IV	X		X		X	X		X
25	X		X			X		X
Best LRA V	X		X			X		X
28	X		X			X		X
Best LRA VI		X		X		X	X	
31	X		X			X		X
32	X		X			X		X
33	X		X			X		X
34	X	X	X	X	X	X	X	X
35	X	X			X	X		
Best LRA VII	X	X			X			
38			X	X			X	X
39			X	X			X	X
40	X	X	X	X	X	X	X	X

*Preferred Route

TABLE 8.04-10

ALTERNATIVE ROUTE IMPACT RANKINGS - SEGMENT C

Impact Topics	Alternative Routes							
	C1-1	C1-2	C1-3	C1-4	C2-1*	C2-2	C2-3	C2-4
Geotechnical	1	3.5	2	6	7	3.5	8	5
Ecological	7	3	8	4	1	5	2	6
Land Use	1	3	3	6.5	6.5	3	8	5
Forestry	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Recreation	7	3	8	4	1	6	2	5
Socioeconomic	3	5	7	8	1	2	6	4
Historic/ Archeologic	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Visual	7	8	4	6	2	5	1	3
Site Engineering	4	2	8	6	1	3	5	7

*Proposed route
(Lower Rank = Lower Impact)

8.04.3.2 Significant Impacts of the Alternative Routes

Geotechnical

The proposed route was ranked seventh in terms of least geotechnical impact. Route C1-1 and C2-3 were the least impact routes followed by routes C1-2 and C2-2. Route C2-3 was judged to have the highest impact potential because of several areas with steep slopes and potential sedimentation problems. Of particular concern are areas near Moose Mountain, Boyle Mountain and potential sedimentation of the Kennebago River. The Stratford Mountain and Cape Horn Mountain areas near Groveton also pose potential slope and sedimentation problems.

Ecological

The preferred route was ranked as having least impact on ecological resources. Routes C1-1, C1-3, C2-2, and C2-4 were considered to have the greatest impact. A factor in this ranking was the Second College Grant, a forested area owned by Dartmouth College and managed by Seven Islands Land Company. The Grant encompasses one of the best natural areas in northern New Hampshire, has an important deer wintering yard, and has high potential for rare plant occurrence. Routes C1-1, C1-2, Cl-3, and Cl-4 encounter several rare plant localities around Baker Pond; a bog, and three limestone areas. These four routes also are expected to have higher impacts on deer wintering yards, especially in Maine. Considerably fewer deer wintering yards are encountered along the proposed route as compared with the alternatives.

Land Use

Land use impacts are infrequent within this segment. The proposed route was ranked as sixth of eight relative to its impact. The least impact route for land use was route Cl-l; it would have no significant impacts on developed land use. Three routes Cl-2, Cl-3, and C2-2 tied for second least impacts; they would have slight impact on land use. Routes Cl-4, C2-l, and C2-3 all were ranked as having the greatest impact. The few land use impacts which occur in this segment reflect residences along the routes.

Forestry

No significant difference was noted between the route alternatives.

Recreation

The proposed route was ranked as having the least impact on recreational resources. The goal was to select an alternative that avoided the eastern most links, where impacts were substantially higher. High impacts were associated with such developed recreation areas as Weeks State Park, the White Mountains, several public land parcels, and rivers that may be designated wild and scenic. The eastern links are also near the Kennebago Lake area.

Socioeconomic

The preferred route was ranked as best. There is not much difference in the impacts of the top four routes. Routes Cl-4 would have the greatest impact because it utilizes the Jackman substation site near Jackman and would impact the people living in the vicinity. Also, this route would impact residences near Kidderville, Whitefield, and Groveton, N.H.

Historic/Archaelogic

Another problem common to routes (Cl-3, Cl-4, C2-3, and C2-4) is their proximity to the Connecticut River along the Moore Reservoir. This area was identified as being of high sensitivity for cultural resources and has a high potential for impact. Differences between the routes are nearly equal, thus no route preference was indicated.

Visual

The proposed route was ranked second best. The difference between the least impact route which is C2-3, and the proposed route is not great. One area of significant differences relates to the use of Jackman Substation site. The alternates which use this site (Cl-l, Cl-2, Cl-3, and C1-4) would have severe impacts on visual landscape quality from that point where the route crosses Maine Highway 201 south of Jackman to the Spencer Lake area. Also, routes C1-2 and C1-4 would also impact viewers on Prospect Mountain south of Lancaster, N.H. and again near the town of Whitefield, N.H. Visually the least impact route is C2-3. This route parallels an existing transmission line from the Groveton area past Whitefield. Although this route is longer, the existing views are not judged to be as scenic as those along the other routes.

Site Engineering

The preferred route was ranked as having the least impact. The routes with the greatest impact are C1-4, C2-4, and C1-3. Routes C1-3 and C2-4 cross the north end of Kennebago Lake which would result in several impacts. Route C1-3 would result in paralleling a much smaller line than the proposed line. This would result in several engineering location problems. Generally, the route of the smaller line has more angles which would make it quite difficult to parallel with a 345-kV steel tower line.

8.04.4 Moore - Granite (Segment D)

8.04.4.1 General Description

Two alternatives that would connect Moore Substation with Granite Substation were studied. Table 8.04-11 shows the links that are joined to make up the alternative routes for this segment.

TABLE 8.04-11

ALTERNATIVE ROUTES - SEGMENT D

	ROUTES	
LINKS	D1*	D-2
41	X	X
42	X	X
43		X
44	X	
45	X	X

*Proposed route

The alternative to the proposed route is a new right-of-way that would be located about 10 miles north of the proposed route. This route would leave the proposed route near Barnet, Vt. on the Connecticut River and go between Peacham and East Peacham, Vt. The route crosses a corner of the Groton State Forest and then turns south to Granite Substation. Appendix D contains a detailed description of the route. There are no localized routing alternatives in this segment.

Table 8.04-12 presents the impact ranking summaries for both the proposed and alternative route.

TABLE 8.04-12

ALTERNATIVE ROUTE IMPACT RANKINGS - SEGMENT D

Impact Topics	ALTERNATIVE ROUTES D-1*	D-2
Geotechnical	1	2
Ecological	1	2
Land Use	1	2
Forestry	1.5	1.5
Recreation	1	2
Socioeconomic	1	2
Historic/Archeologic	1	2
Visual	1	2
Site Engineering	1	2

*Proposed route
(Lower Rank = Lower Impact)

8.04.4.2 Significant Impacts of the Alternative Route

Geotechnical

Geotechnical impacts are generally high for both the alternative and the proposed route. Sedimentation potential is the most significant concern. One area of high sedimentation potential along route D-2 is where is crosses Stevens Stream. The proposed route is considered to have least impact.

Ecological

The alternate route (D-2) would pass through an almost virgin forest. The alternate encounters more lakes and wetlands than the proposed route and is more remote. Route D-2 also contains 10 acres of cedar swamp, two deer yards, Peacham Bog which is a recognized botanical area, and a state game refuge in Groton State Forest.

Land Use

The alternative route would have significantly greater impact on single family residences. The alternate route would also pass through a sugar-bush which would have high impact.

Forestry

The alternative and proposed routes would impact similar acreages of forest resources. No signficant differences exist between the alterna-tives.

Recreation

There are 10 recreation areas along the alternative route that would receive high or severe impacts. They include Groton State Forest, a municipal forest, a state park, and scenic roads. The proposed route is ranked as having less impact.

Socioeconomic

The impacts on residences and communities along this route are significant. Three residences would potentially require relocation. Peacham, Plainfield, and Marshfield, Vt., all have registered opposition to the alternative. These considerations resulted in a preference for the proposed route which is the alternative with least social impact.

Historic/Archeologic

A town on this alternative route, Peacham, Vt., is of utmost concern. It is an historic community and could be of national significance. The concern involves potential impacts to standing historical structures.

Visual

Sixteen areas along this alternative were judged to have high visual impacts. Most of these impacts are views from towns along the alternative. The proposed route is preferred because it follows an existing line.

Site Engineering

Although terrain poses difficulties, the alternative route could be a difficult line to design and build because of existing land use along its location. Easements could be difficult to acquire there are several small communities occur along the route, and a lot of individual land holdings.

8.04.5 Granite-Essex (Segment E)

8.04.5.1 General Description

There is one localized routing alternative in this segment. Table 8.04-13 shows the links which comprise LRA VIII.

TABLE 8.04-13

LRA VIII

LINKS	8-1	8-2
45B	X	
45C		X

Table 8.04-14 shows the environmental rankings assigned to each LRA by the interdisciplinary team.

TABLE 8.04-14

IMPACT RANKINGS
LOCALIZED ROUTING ALTERNATIVE VIII

Impact Topics	LRA 8-1*	LRA 8-2
Geotechnical	1	2
Ecological	1	2
Land Use	1	2
Forestry	1.5	1.5
Recreation	1	2
Socioeconomic	1	2
Historic/Archeologic	1	2
Visual	1	2
Site Engineering	1	2

*Preferred LRA

Eight alternatives have been identified and studied between Granite Substation and a new substation to be built near Essex Junction, Vt. Table 8.04-15 shows the links that are joined to make up the alternative routes.

TABLE 8.04-15

ALTERNATIVE ROUTES - SEGMENT E

	ALTERNATIVE ROUTES							
LINKS	E-1A	E-1B	E-2A	E-2B*	E-3A	E-3B	E-4A	E-4B
45A	X	X	X	X	X	X	X	X
Best LRA VIII	X	X	X	X	X	X	X	X
46	X	X	X	X	X	X	X	X
47	X	X			X	X	X	X
47A	X	X					X	X
48	X	X						
49	X	X	X	X	X	X	X	X
50			X	X				
51					X	X		
52			X	X	X	X		
53							X	X
54			X	X	X	X	X	X
55	X		X		X		X	
56		X		X		X		X

*Proposed Route

These substation sites are separated by the Green Mountains, a north-south range broken only by the Winooski River Valley. All alternative routes pass through this valley which contains two highways, a railroad, and two transmission lines. Most alternatives would parallel existing facilities.

Table 8.03-16 shows the impact ranking summaries for both the proposed and alternative routes for this segment.

TABLE 8.03-16

ALTERNATIVE ROUTE IMPACT RANKINGS - SEGMENT E

	ALTERNATIVE ROUTES							
Impact Topics	E-1A	E-1B	E-2A	E-2B*	E-3A	E-3B	E-4A	E-4B
Geotechnical	7	8	3	4	1	2	5	6
Ecological	1	5	3	7	4	8	2	6
Land Use	3	3	6	3	6	6	6	3
Forestry	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Recreation	7	7	3	1	4	4	5	5
Socioeconomic	7	7	4	2	3	3	5	5
Historic/ Archeologic	5	5	1	2	6.5	6.5	5	5
Visual	7	8	3	6	1	4	2	5
Site Engineering	6	5	2	1	4	3	8	7

*Proposed Route
(lower Values = Lower Impact)

8.04.5.2 Significant Impacts of the Alternative Routes

Geotechnical

Alternative routes have sedimentation potential, severe slopes, and soil stability problems.

Ecological

Deer wintering yards on alternative routes E-1A, E-1B, E-3A, E-4A, and E-4B are important. They are in the saddle of the mountains. In winter the deer come to the yards from the higher elevations. Sedimentation was slightly higher for the proposed route than for the alternatives routes.

Land Use

Significant impacts would occur to some residences and commercial developments along the alternatives. The proposed route was ranked as having the least impact. The alternative routes would create greater impacts on land use. Routes E-4A and E-4B had the greatest impacts because of their effect on residences. Routes E-1A and E-1B would have impacts near the town of Waterbury in the Winooski Valley.

Forestry

Forests are not as important commercially on this segment as they are on the other segments. Significant differences between the alternatives which would result in a preference were absent.

Recreation

The proposed route would have least impact. Alternative routes E-1A and E-1B were ranked as having the greatest impact. Of major concern was the fact that the alternatives cross a municipal forest. Impacts are high on recreation viewers where the line crosses the Winooski River.

Socioeconomic

The proposed route was ranked as the least socioeconomic impact route. The alternative routes would have similar impacts, however, they contain more residential structures which might require relocation. Impacts upon residences are much more severe in this segment than others and are the more significant socioeconomic impacts.

Historic/Archeologic

The proposed route has the second least impact on historic and archeologic resources. All routes contain sites that have been identified by the State historical survey in Chittenden County, Vt.

Visual

The proposed route was ranked sixth in terms of visual impact. The differences between rankings are attributed to landscape quality and impacts on viewers.

Site Engineering

The proposed route was ranked as having the least impact. All of the alternatives are thought to be quite difficult to construct. They are probably most difficult of all the routes considered. They have steep slopes, erosion potential, and would be visible from the valley.

8.05 Alternative Types of Towers

Two alternative transmission tower designs could be used instead of the proposed double circuit steel structures from Dickey Substation to Moore Substation.

8.05.1 Wood Poles

Two parallel rows of wood pole structures would be needed between Dickey and Moore substations to carry the two circuits. Wood pole towers for 345-kV lines stand about 75 feet tall. Their height depends largely on the structural limitations of wood poles. About 10 wood pole structures would be required for each mile of transmission line. If two wood pole circuits were located parallel to one another, on one right-of-way, the combined right-of-way would be about 250 feet wide. Figure 8.05-1 is a diagram of a typical wood pole tower.

8.05.2 Single Circuit Steel

The second alternative type of tower is a single circuit steel tower. These towers average about 100 feet in height for 345-kV lines. Their added strength and height enables them to support longer conductor spans. About five towers are needed per mile. The right-of-way required for each circuit is about 150 feet wide. When two steel circuits are located parallel to one another, the combined right-of-way is about 250 feet wide. Figure 8.05-1 is a diagram of a typical single circuit steel tower.

Section 9

Consultation and Coordination With Others

345 KV
TRANSMISSION STRUCTURES

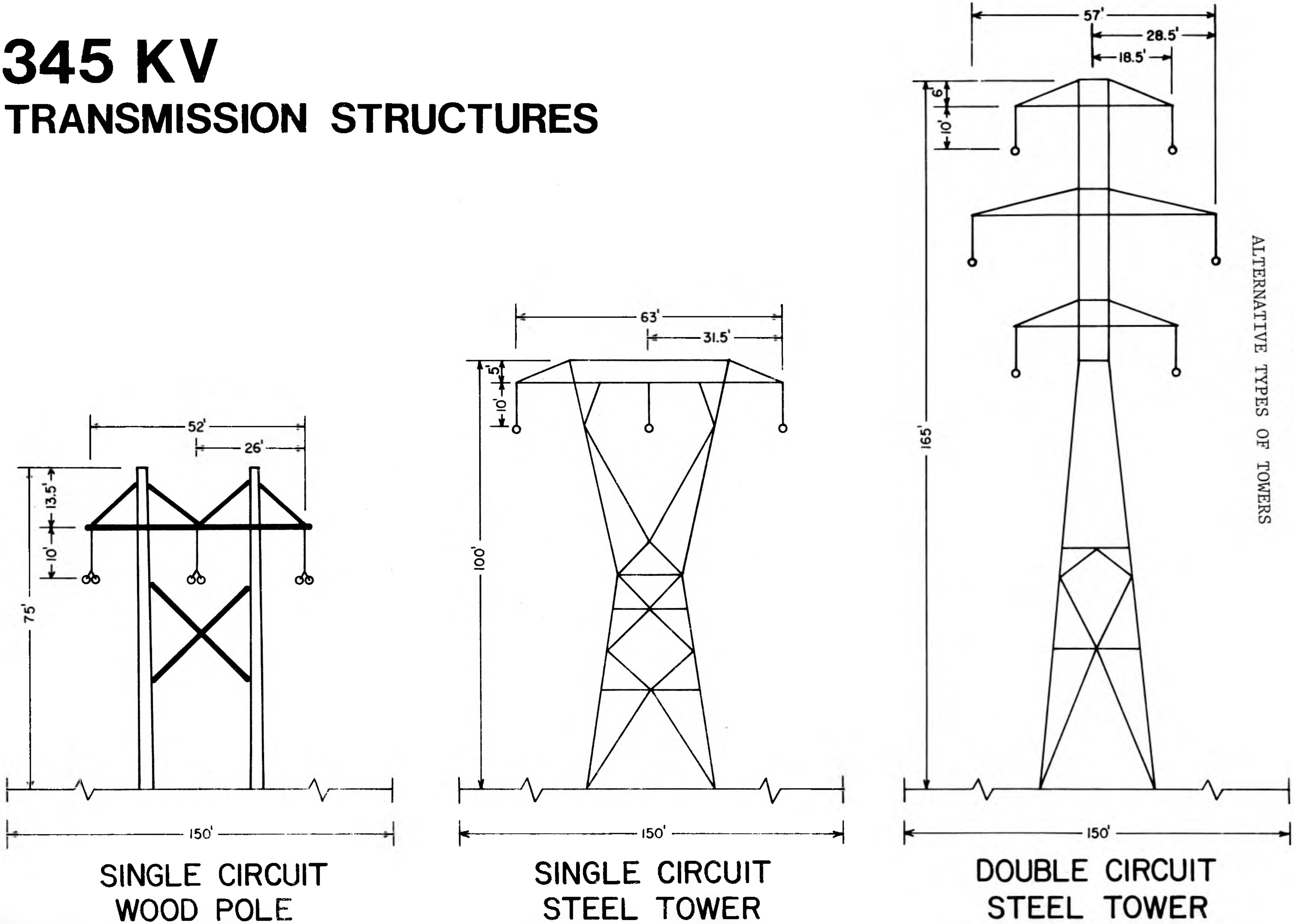


FIGURE 8.05-1
ALTERNATIVE TYPES OF TOWERS

9.0 CONSULTATION AND COORDINATION

The Department of the Interior, in developing the scope of work for the Dickey-Lincoln School Lakes transmission study, recognized the need for a great deal of consultation and coordination. Consultation, coordination, and public involvement was an integral part of the study design. Furthermore, in choosing consultants for various portions of the study, the firm's location and experience in northern New England was an important selection factor.

The System Planning Study (appendix A), the Department's first project effort, was accomplished in coordination with the electric utilities of the region, specifically NEPLAN, the planning arm of the New England Power Pool.

During the regional corridor study phase, the emphasis for coordination was with agencies and groups with regional responsibility. Contacts were established with federal and state agencies and regional planning commissions early in this phase, and also utilities, major paper and land management companies, and environmental groups. A large number of meetings and discussions were held with representatives of these agencies and groups.

In the spirit of 'open planning' and to solicit additional input directly from the people of the region, public informational meetings were held in June 1976, at Presque Isle, Bangor, and Augusta, Maine; Concord, and Berlin, New Hampshire; and Montpelier, Vermont. In December 1976, with the corridor study complete, another series of public meetings were held, this time at Presque Isle, Jackman, Bangor, and Augusta, Maine; Concord and Groveton, New Hampshire; and Montpelier, Vermont. These meetings were to present and receive comments on the proposal to proceed with detailed route studies on System Plan E, a system of corridors through western Maine, northern New Hampshire, and Vermont.

At the point the study effort shifted its focus from broad corridor evaluations to route studies, the coordination requirements changed in emphasis. Discussions became more technical, and, for the first time all towns along the alternative routes were contacted directly. Working with the Regional Planning Commissions, meetings involving town planners and selectmen, were arranged. Usually several towns were represented at each meeting. These meetings were held in Montpelier, Essex Junction, and St. Johnsbury, Vermont; Groveton, New Hampshire, and Jackman, Maine, during the fall and winter of 1977-78.

Individual property owners were not contacted during this study. If the project is approved and funded for construction, land owners along the proposed route will be consulted during actual right-of-way location.

Throughout the project a great deal of coordination took place between the Department's study team and the U.S. Army Corps of Engineers, responsible for studies relating to the dam and reservoir. It was also necessary to coordinate closely with the U.S. Fish and Wildlife Service who has project responsibilities under the Fish and Wildlife Coordination

Act. Staff members also briefed the Citizen's Review Committee for the Governor of Maine on several occasions, and provided relevant material on various aspects of the transmission studies.

The following pages list agencies, groups and individuals who were in contact with Department's study team, and with whom some degree of consultation or coordination took place. In addition to the following, contacts by the various environmental contractors are shown in the technical reports published as appendices to this statement.

CONTACTS

ENVIRONMENTAL GROUPS

Natural Resources Council	Augusta, ME
Sunkhaze Chapter of Trout Unlimited	Bangor, ME
National Wildlife Federation	Bar Harbor, ME
Sportman's Alliance	Gardiner, ME
The Maine Association of Conservation Commissions	Kennebunkport, ME
Maine Audubon Society	Portland, ME
Land Use Foundation of New Hampshire	Concord, NH
New Hampshire Association of Conservation Commissions	Concord, NH
Society for Protection of New Hampshire Forests	Concord, NH
Statewide Program to Conserve Our Environment	Concord, NH
Nature Conservancy	Durham, NH
New Hampshire Wildlife Federation	Manchester, NH
Vermont Natural Resources Council	Montpelier, VT
Conservation Society of Vermont	Townsend, VT
Appalachian Mt. Club	Boston, MA
Friends of the St. John	Boston, MA

PLANNING COMMISSIONS

Androscoggin Valley Regional Planning Commission	Auburn, ME
South Kennebec Valley Regional Planning Commission	Augusta, ME
Penobscot Valley Regional Planning Commission	Bangor, ME
Northern Maine Regional Planning Commission	Caribou, ME
Eastern Mid-Coast Regional Planning Commission	Rockland, ME
Southern Maine Regional Planning Commission	Sanford, ME
North Kennebec Regional Planning Commission	Winslow, ME
North Country Council	Franconia, NH
Upper Valley Lake Sunapee Council	Lebanon, NH
Lakes Region Planning Commission	Meredith, NH
Chittenden County Regional Planning Commission	Essex Junction, VT
Central Vermont Regional Planning Commission	Montpelier, VT
Southern Windsor Regional Planning Commission	Springfield, VT
Northeastern Vermont Development Association	St. Johnsbury, VT

STATE AGENCIES

Maine

Department of Inland Fisheries and Wildlife	Augusta, ME
Department of Forestry	Augusta, ME
Department of Inland Fisheries and Wildlife	Bangor, ME
Land Use Regulation Commission (LURC)	Augusta, ME
Department of Conservation	Augusta, ME
Maine Bureau of Geology	Augusta, ME
Department of Parks and Recreation	Augusta, ME
Department of Agriculture, Soil and Water Conservation Commission	Augusta, ME
State Geologist	Augusta, ME
State Planning Office	Augusta, ME
State Historic Preservation Office	Augusta, ME

New Hampshire

Department of Resources and Economics	Concord, NH
Department of Inland Fisheries - Fish and Game	Concord, NH
Office of Comprehensive Planning	Concord, NH
Water Resources Board	Concord, NH
Bureau of Outdoor Recreation Planning	Concord, NH
Coordinator of Federal Funds	Concord, NH
Department of New Hampshire Energy	Concord, NH
Department of Resources and Economics	Concord, NH
State Planning Office	Concord, NH

Vermont

Division of Historic Preservation	Montpelier, VT
Department of Forest and Parks	Montpelier, VT
Environmental Conservation Agency	Montpelier, VT
Department of Fish and Game	Montpelier, VT
Planning Board	Stowe, VT
Public Service Board	Montpelier, VT
State Planning Office	Montpelier, VT
Vermont Water Resources Department	Montpelier, VT

FEDERAL AGENCIES

Department of Justice

U.S. Attorney's Office	Bangor, ME

Department of the Interior

U.S. Fish and Wildlife Service	Concord, NH
U.S. Department of the Interior Office of Environmental Project Review	Washington, D.C.
U.S. Geological Survey	Concord, NH
Inter-agency Archeological Service National Park Service	Atlanta, GA

Department of Agriculture

Forest Experiment Station University of Maine	Orono, ME
White Mountain National Forest	New Hampshire

UTILITIES

Carrabasst Light & Power	North Anson, ME
Central Maine Power Co.	Augusta, ME
Union River Electric Corp.	Aurora, ME
Bangor Hydroelectric Co.	Bangor, ME
Eastern Maine Electric Corp.	Calais, ME
Maine Public Service	Presque Isle, ME
Granite State Electric Co.	Lebanon, NH
Littleton Water & Light	Littleton, NH
Public Service Co. of New Hampshire	Manchester, NH
New Hampshire Electric Corp.	Plymouth, NH
Village, Inc.	Barton, VT
Green Mountain Power Corp.	Burlington, VT
Light Commission	Hardwick, VT
Village of Hyde Park, Inc.	Hyde Park, VT
Vermont Electric Corp.	Johnson, VT
Electric Light Department	Ludlow, VT
Electric Plant	Lyndonville, VT
Washington Electric Corp., Inc.	E. Montpelier, VT
Municipal Electric Association, Morrisville Water & Light	Morrisville, VT
Citizens Utilities Co.	Newport, VT
Light Commission	Northfield, VT
Allied Power & Light Co.	Pittsford, VT
Vermont Marble Co.	Proctor, VT
Rochester Electric Light & Power	Rochester, VT
Conn. Valley Electric Co.	Rutland, VT
Vermont Electric Power Co.	Rutland, VT
Light Commission	Stowe, VT
Northeast Utilities Service Company	Berlin, CT
Northeast Public Power Association	Littleton, MA
Massachusetts Municipal Wholesale Electric Co.	Ludlow, MA
NEPLAN	West Springfield, MA
Northeast Utilities	W. Springfield, MA
Planning & Power Supply	Westborough, MA
Stony Brook Energy Center	Westover, MA

UNIVERSITIES

Cooperative Extension Service, University of Maine	Bangor, ME
Department of Anthropology, University of Maine	Orono, ME
Dartmouth College	Hanover, NH

TIMBER COMPANIES

Boise Cascade Corp.	Rumford, ME
Brown Paper Company	Berlin, NH
Dead River Company	Bangor, ME
Diamond International Corp.	Old Town, ME
Dunn Heirs	Ashland, ME
Georgia Pacific Corp.	Woodland, ME
Great Northern Paper Co.	Millinocket, ME
James W. Sewall Co.	Old Town, ME
J. M. Huber Corp.	Old Town, ME
Maine Woodlands International Paper Co.	Jay, ME
North Maine Woods	Presque Isle, ME
St. Regis Paper Co.	Bucksport, ME
Scott Paper Company	Winslow, ME
Seven Islands Land Company	Bangor, ME

OTHER CONTACTS

Citizens Advisory Committee for the Governor of Maine	Farmington, ME
Jackman Planning Board	Jackman, ME
Kennebago Camp Owners Association	Oguossoc, ME
League of Women Voters of Maine	Winthrop, ME
Berlin, Town of (Community Development Director)	Berlin, NH
International Generation and Transmission Company Inc.	Berlin, NH
Walkers Pond Water Conservation Society	Conway Center, NH
Barnet, Town of	Barnet, VT
Plainfield, Town of	Plainfield, VT
Peacham, Town of	Peacham, VT
Tenneco, Inc.	Hopkinton, MA
Social Assessment Services	Sudbury, MA

Section 10

Bibliography

BIBLIOGRAPHY

Adey, Ross, 1974. Letter from Dr. Ross Adey, UCLA School of Medicine, to Dean Perry, Bonneville Power Administration. July 8, 1974.

Aleksink, M. 1974. Hinterland Who's Who: Muskrat. Minister of the Environment, Information Canada, Ottawa. 4 p.

Anderson, S. H., Mann, K. and Shugart, H. H., Jr. 1977. The effect of Transmission Line Corridors on Bird Populations. Amer. Midl. Nat. 97(1): 216-221.

Anon. 1976. Power Line Rights-of-Way and Wildlife Management--A Working Paper. 7 p. In: Wildlife resources management opportunities in the unorganized townships of Maine. Maine Land Use Regulation Commission, Unpubl. Rept. Augusta, Maine.

Arbib, R. 1976. The Blue List of 1977. American Birds. 30:1031-1039.

Arner, D. H. 1977. Transmission Line Rights-of-Way Management. U.S. Fish and Wildlife Service Office of Biological Services Publ. FWS/OBS-76/20.2 12 p.

Asanova, T. P., and Rakov, A. I. 1966. The State and Health of Persons Working in Electric Field of Outdoor 400-kV and 500-kV Switchyards: in Hygiene of Labor and Professional Diseases, 5.

Barnard, J. E., and Bowers, T. M. 1974. A Preview of New Hampshire's Forest Resource, U.S. Forest Service Res., Note NE-197.

Barnes, H. C., McElroy, A. H., and Charkow, J. H. 1967. Rational Analysis of Electric Fields in Live Line Working. In: IEEE Transactions on Power Apparatus and Systems. PAD-86(4).

Barnothy, M. F. (ed.). 1964. Biological Effects of Magnetic Fields: 2 Volume. Plenum Press, New York.

Beebe, T. J. C. 1973. Observations Concerning the Decline of British Amphibia. Biol. Conserv. 5(1):20-24.

Beischer, D. E., Grissett, J. D., and Mitchell, R. E. 1973. Exposure of Man to Magnetic Fields Alternating at Extremely Low Frequency. Naval Aerospace Medical Research Laboratory. Pensacola, Florida.

Bollengier, R. M., Baird, J., Brown, L. P., Cade, T. J., Edwards, M. G., Hagar, D. C., and Halla, B. 1976. Eastern Peregrine Falcon Recovery Plan: Preliminary Draft. Eastern Peregrine Falcon Recovery Team. 130 p.

Bones, J. T., Engalichev, N., and Gove, W. G. 1974. The Timber Industries of New Hampshire and Vermont. U.S. Forest Service Resources Bulletin, NE-35.

Bormann, F. H., Likens, G. E., Fischer, D. W. and Pierce, R. S. 1968. Nutrient Loss Accelerated by Clear-Cutting of a Forest Ecosystem. Science 159:882-884.

Bracken, T. D. 1975. Field Measurements and Calculations of Electrostatic Effects of Overhead Transmission Lines: paper presented at the IEEE Summer Power Meeting, 1975.

Bramble, W. C. and Byrnes, W. R. 1955. Progress Report on the Effect of Certain Brush Control Techniques and Materials on Game Food and Cover on a Power Line Right-of-Way. No. 11. Proceedings, 9th annual meeting, N.W. Weed Control Conference. p. 417-427, mimeo.

________________________________, 1972. A Long-Term Ecological Study of Game Food and Cover on a Sprayed Utility Right-of-Way. Purdue U. Ag. Exper. Sta. Res. Bull. No. 885. 20 p.

________________________________, 1974. Impact of Herbicides Upon Game Food and Cover on a Utility Right-of-Way. Purdue University Ag. Exper. Sta. Res. Bull. No. 918. 16 p.

________________________________, 1976. Development of a Stable, Low Plant Cover on a Utility Right-of-Way. p. 167-176 In: Tillman, R. (Ed.) Proceedings of the first national symposium on environmental concerns in rights-of-way management. Mississippi State University, Mississippi State, Mississippi. 335 p.

Braun, E. L. 1972. The Deciduous Forests of Eastern United States.

Brown, C. P. 1946. Food of Maine Ruffed Grouse by Seasons and Cover Types. J. Wildl. Mgmt. 10(1):17-28.

Brown, G. W. 1969. Predicting Temperatures of Small Streams. Water Resour. Res. 5:68-75.

Bureau of Taxation, 1976. Maine Tree Growth Tax Law 100% Valuation Per Acre by County by Forest Type to Apply for Tax Years 1977 and 1978. Augusta, Maine. June 1976.

Burt, W. H. and Grossenheider. 1964. A Field Guide to the Mammals. Houghton Mifflin Co., Boston, Massachusetts. 284 p.

Byrd, M. W. 1956. Relation of Ecological Succession to Farm Game in Cumberland County in Virginia Piedmont. J. Wildl. Manage. 20:188-195.

Carvell, K. L. 1976. Effects of Herbicidal Management of Electric Transmission Line Rights-of-Way on Plant Communities. p. 177-182. In: Tillman, R. (Ed.). Proceedings of the first national symposium on environmental concerns in rights-of-way management. Mississippi State University, Mississippi. 335 p.

Cavanaugh, J., Olson, D. P., and Macrigeanis, S. N. 1976. Wildlife use and Management of Powerline Rights-of-Way in New Hampshire. p. 276-285. In: Tillman, R. (Ed.). Proceedings of the first national symposium on environmental concerns in rights-of-way management. Mississippi State University, Mississippi. 335 p.

Center for Natural Areas. September 1977. Ecological Resources Impact Study. A study report for U.S. Department of the Interior/Energy, Dickey-Lincoln School Lakes Transmission Project. South Gardiner, Maine. 913 p.

Central Vermont Regional Planning Commission, 1974. Regional Plan, Park 1, Land Use and Background Information. Montpelier, Vermont.

Chittenden County Regional Planning Commission, 1976. We are Not the Last Generation, (Regional Plan). Essex Junction, Vermont.

Clark, Louis E., and Treadway, F. H., Jr. Impact of Electrical Power Transmission Line Easements of Real Estate Values. Chicago: American Institute of Real Estate Appraisers, 1972.

Coate, W. B., et al., 1970. Project Sanguine Biological Effects Test Program Pilot Studies Final Report: Prepared for Naval Electronics Systems Command Headquarters, Washington, D.C.

Cody, J. B. 1975. Vegetation Management on Powerline Rights-of-Way. AFRI Research Report No. 28, Syracuse Univ. Syracuse, New York. 17 p.

Comitta Frederick Associates. March 1976. Environmental Data Reconnaissance Report. West Chester, Pennsylvania. 482 p.

Cooke, A. S. 1972. Indications of Recent Changes in Status in the British Isles of the Frog Rama Temporaria and the Toad Bufo Bufo. J. Zool. London 167:158-161.

Cordone, A. J., and Kelley, D. W. 1961-62. The Influences of Inorganic Sediment on the Aquatic Life of Streams. Calif. Fish and Game 47-48: 189-228.

Cornwell, G. 1971. Collisions with Wires: A Source of Anatid Mortality. Wilson Bull. 83:305-306.

deLorge, J. 1972. Operant Behavior of Rhesus Monkeys in the Presence of Extremely Low Frequency - Low Intensity Magnetic and Electric Fields: Experiment 1. Naval Aerospace Medical Research Laboratory, Pensacola, Florida.

Deno, D. W. 1974. Calculating Electrostatic Effects of Overhead Transmission Lines. IEEE Paper No. T74086-5.

Dickinson, N. R., and Garland, L. E. 1974. Deer Project. In: Vermont's 1974 Game Annual. Vermont Fish & Game Department, Montpelier, Vt. p. 5-10.

Dorrance, M. J., Savage, P. J., and Huff, F. E. 1975. Effects of Snowmobiles on White-Tailed Deer. J. Wildl. Manage. 39(3):563-569.

Dunn, F. 1976. Moose Census. Maine Dept. of Inland Fisheries and Wildlife, Augusta, Maine.

Edwards, E. P. 1974. A coded List of Birds of the World. Sweet Briar, Va. 174 p.

Egler, F. E. 1953. Our Disregarded Rights-of-Way -- Ten Million Unused Wildlife Acres. Trans. 18th N. Amer. Wildl. Conf. 147-158.

____________, 1957. Rights-of-Way and Wildlife Habitat: A Progress Report. Trans. 22nd N. Amer. Wildl. Conf., p. 133-144.

Engalichev, N., and Sloan, R. P. 1977. New Hampshire Forest Market Report. Univ. of New Hampshire Coop. Extension Service Publication 11.

Engel, J. M., Courtsal, F. R., Martin, R. L., Messerli, J. R., Hooper, T. M., Munford, R. E., and Terry, L. E. 1975. Recovery Plan for the Indiana Bat: Preliminary Draft. Indiana Bat Recovery Team. 33 p.

Environmental Protection Agency. 1977. Environmental news bulletin (August 3.)

Ferguson, R. J., and Kingsley, N. P. 1972. The Timber Resources of Maine. U.S. Forest Service Resources Bulletin, NE-26.

Fischner, A. R., and Larmoyeux, J. 1963. Logging and Trout: Four Experimental Forest Practices and Their Effect on Water Quality. The Prog. Fish Culturist. 25:59-67.

Fogarty, M. J. and Arnold, K. A. 1977. Common Snipe. p. 189-209. In: Sanderson, G. E. (Ed.). Management of migratory shore and upland game birds of North American International Association of Fish and Wildl. Agencies. Washington, D.C. 358 p.

Gardner, W. R., Harris, R. F., and Tanner, C. B. 1975. Response of Plants and Soil Microorganisms to Extremely Low Frequency Electric Fields: Final Report. Submitted to Office of Naval Research, Department of Soil Science, University of Wisconsin, Madison, Wisconsin.

General Electric, 1973. Transmission Line Reference - 345-kV and Above: Unpublished report for the Electric Power Research Institute.

Gilbert, F. F. 1975. Hinterland Who's Who: Racoon. Minister of the Environment, Information Canada, Ottawa. 3 p.

Glorig, A. 1958. Noise and Your Ear. Grune and Stralton, New York, N. Y.

Gysel, L. W. 1962. Vegetation and Animal Use of a Powerline Right-of-Way in Southern Michigan. Michigan Agr. Exp. Sta. Quart. Bull. 44(4):697-713.

Halperin, R. L. Summary 1977 State Valuation as Filed with the Secretary of State, January 28, 1977. Bureau of Taxation, State Office Building, Augusta, Maine.

Hannum, G., Anderson, W., and Nelson, M. 1974. Powerlines and Birds of Prey. Northwest Electric Light and Power Association Engineering and Operating Conference. Yakima, Washington. 12 p. + 9 fig. l.

Harris, C. I. 1967. Movement of Herbicides in Soils. Weeds 15:214-216.

_____________, 1968. Movement of Pesticides in Soil. J. Agr. Food and Chem. 17:80-82.

Hawaiian Electric Co., Inc. 1973. Ecological Influence of Electric Fields: Memo dated May 18, 1973.

Herrick, O. W. 1977. Impact of Alternative Timber Management Policies on Availability of Forest Land in the Northeast. U.S. Forest Service Resource Paper, NE-(Pre-publication Author Copy).

Herrington, L. P. and Heisler, G. M. 1973. Microclimate Modification Due to Power Transmission Rights-of-Way. In: R. Goodland (Ed.), Powerlines and the Environment. Cary Arboretum, N. Y. Bot. Gardens. p. 37-57.

Hugie, R. D. 1973. A Winter Study of Deer Mobility in West-Central Maine, M.S. thesis, U. Maine, Orono. 78 p.

IEEE Working Group on Electromagnetic and Electrostatic Effects of Overhead Transmission Lines, 1973, Electromagnetic Effects of Overhead Transmission Lines: Practical Problems, Safeguards, and Methods of Calculation: IEEE Transactions Paper T73-441-3.

Jarvinen, J. A., and Schmid, W. D. 1971. Snowmobile Use and Winter Mortality of Small Mammals. p. 131-141, In: M. Chubb (Ed.). Proceedings of the 1971 snowmobile and off-the-road vehicle research symposium. Rec. Research and Plan. Unit, Dept. Park and Rec. Resources, Michigan State Univ. Tech. Rep. No. 8, 196 p.

Johansson, R., Lundquist, A. G., Lindquist, S., and Scuka, V. 1973. Is There a Connection Between the Electricity in the Atmosphere and the Function of Man? Part 3, 50-Hz Field Variations: Translation of FOA Report dated September 1973.

Jordon Co., Inc., E.C. January 1978. Socioeconomic Impact Study, Dickey-Lincoln School Lakes Transmission Project. A study report for U.S. Department of the Interior/Energy. Portland, Maine. 186 p.

______________________, February 1978. Land Use Impact Study, Dickey-Lincoln School Lakes Transmission Project. A study report for U.S. Department of the Interior/Energy. Portland, Maine. 87 p.

______________________, Jordon Gorrill Associates. December 1977. Geotechnical Impact Study, Dickey-Lincoln School Lakes Transmission Project. A study report for U.S. Department of the Interior/Energy. Portland, Maine. 85 p.

Kaufman, B. E., and Michaelson, S. M. 1974. Critical Review of the Biological Effects of Electric and Magnetic Fields: In: Llaurado, J. G., et al. (Ed.): Biological and Clinical Effects of Low-Frequency Magnetic and Electric Fields. Charles C. Thomas, Springfield, Ill.

Keesey, J. C., and Letcher, F. S. 1970. Human Thresholds of Electric Shock at Power Transmission Frequencies. Archives of Environmental Health, 21.

Keith, L. B. 1977. Hinterland Who's Who: Canada Lynx. Minister of Fisheries and the Environment, Ottawa. 3 p.

Kingsley, N. P. 1977. The Forest Resources of Vermont. U.S. Forest Service Resource Bulletin, NE-46.

_______________, 1973. The Volume of Elected Hardwood Species Suitable for Turnery Bolts in Maine, 1970. U.S. Forest Service Resource, Note NE-165.

Kitchings, J. T., Shugart, H. H., and Story, J. D. 1974. Environmental Impacts Associates with Electric Transmission Lines. Oak Ridge National Laboratory. Report TM-4498. 100 p.

Knickerbocker, G. G., Barnes, H. C., and Kouwhenhoven, W. B. 1967. Exposure of Mice to a Strong a.c. Electric Field - An Experimental Study: IEEE Transactions on Power Apparatus and Systems, PAD-86.

Korobkova, V. P., Morozov, Yu. A., Stolyarov, M. D., and Yakub, Yu. A., 1972. Influence of the Electric Field in 500- and 750-kV Switchyards on Maintenance Staff and Means for Its Protection. International Conference on Large High-Tension Electric Systems: CIGRE Paper 23-06.

Krueger, W. F., Giarola, A. J., Bradley, J. W., and Daruvalla, S. R., 1972. Influence of Low-Level Electric and Magnetic Fields on the Growth of Young Chickens. Biomedical Sciences Instrumentation. (9).

Krumpe, P. E., and Tockman. 1974. Evaluation of the Health of Personnel Working Near Project Sanguine Beta Test Facility from 1971 to 1972: In: Llaurado, J. G., et al. (Ed.): Biological and Clinical Effects of Low-Frequency Magnetic and Electric Fields. Charles C. Thomas, Springfield, Ill.

Land Use Regulation Commission (LURC). 1976. Comprehensive Land Use Plan for the Unorganized Townships of the State of Maine. Maine Department of Conservation, Augusta, Maine.

Lavigne, G. R. 1976. Winter Response of Deer to Snowmobiles and Selected Natural Features. M.S. thesis. Univ. Maine, Orono. 68 p.

Leopold, A. 1933. Game Management. Charles Scribners Sons, New York. 481 p.

Lorimer, C. G. 1977. The Presettlement Forest and Natural Disturbance Cycle of Northeastern Maine. Ecology 58:139-148.

Lyskov, Yu. I., Emma, Yu. S., and Stolyarov, M. D. 1975. Electrical Field as a Parameter Considered in Designing Electric Power Transmission of 750-1150-kV: The Measuring Methods, the Design Practices, and Direction of Further Research. Soviet paper discussed at the US/USSR Symposium on UHV Transmission. Washington, D.C. Feb. 1975.

MacClintock, L., Whitcomb, R. F., and Whitcomb, B. L. 1976. Evidence for the Value of Corridors and Minimization of Isolation in Preservation of Biotic Diversity. Am. Birds 31(1).

Maine Bureau of Taxation. 1974. Determination of the Average Annual Net Wood Production Rates for 1975-1984. Augusta, Maine. Mimeo.

Maine Department of Inland Fisheries and Game. 1971. Maine Lakes, Index of Lake Surveys Completed through 1971. Maine Dept. of Inland Fisheries and G., Misc. Public.

Maine Forest Service. Maine Timber Cut Report for 1976. Augusta, Maine. Miemo 1977.

____________________, 1977b. Mill Delivered Prices, Fall 1977. Augusta, Maine. Mimeo 1977.

____________________. Stumpage Prices, Fall 1977. Augusta, Maine. Mimeo 1977.

____________________. Maine Primary Forest Products Manufacturers. Mimeo list of 4-9-76. Augusta, Maine. 1976.

____________________, Maine Logging Firms. Mimeo list of 12-22-75. Augusta, Maine. 1975.

Maine Municipal Association. 1976 Full Value Tax Rates. Maine Townsman. 39(2):9-13. 1977.

Martell, A. M., and Radvanyi. 1977. Changes in Small Mammal Populations After Clearcutting of Northern Ontario Black Spruce Forest. Canad. Field Nat. 91:41-46.

Mayer, T. D. 1976. An Evaluation of Chemically-Sprayed Electric Transmission Line Rights-of-Way for Actual and Potential Wildlife Use. p. 287-294. In: Tillman, R. (Ed.). Proceedings of the first national symposium on environmental concerns in rights-of-way management. MIssissippi State Univ., Mississippi. 335 p.

Mayfield, H. 1977. Brown-Headed Cowbird: Agent of Extermination? Am. Birds 31(2):1-7.

McLean, H. R., and Ward, F. R. 1976. Is Smoke-Free Burning Possible? Fire Management. Winter 1976.

McMahon, C. K., and Ryan, P. W., USDA, Forest Service, Macon, Georgia. 1976. Some Chemical and Physical Characteristics of Emissions from Forest Fires. Presented at 69th Annual Meeting of the Air Pollution Control Assn., Portland, Oregon, June 27-July 1, 1976. #76-2.3.

Morgan, M. 1975. EHV Electric Fields: The New Radiation Scare. Electric Light and Power. March 24, 1975.

National Electric Safety Code, 6th Edition. 1973. American National Standards Institute, (ANSI-C2): IEEE, and National Bureau of Standards. New York, New York.

National Electric Safety Code, 7th Edition (unapproved draft). 1976. American National Standards Institute (ANSI-C2), IEEE, and National Bureau of Standards. New York, New York.

New Hampshire Department of Resources and Economic Development. Coos County New Hampshire Comprehensive Plan. Concord, New Hampshire (no date).

New Hampshire Water Supply and Pollution Control Commission and Environmental Protection Agency. 1971. Water Quality Standards Summary. New Hampshire Water Supply and Pollution Control Commission. Misc. Public.

Noise Control Act of 1972. Pub. L. 92-574, 86 Stat. 1234, 42 U.S.C., Sec. 4901 - 4918.

Northeast Vermont Development Association. 1972. Regional Sketch Plan. St. Johnsbury, Vermont.

Occupational Safety and Health Act of 1970. Pub. L. 91-596, 84 Stat. 1590, 29 U.S.C.A., Secs. 553, 651-678.

Odom, R. R. 1977. Sora Rail. p. 57-65. In: Sanderson, G. E. (Ed.). Management of Migratory Shore and Upland Game Birds in North America. International Assoc. of Fish and Wildl. Agencies, Washington, D.C. 358 p.

Owen, R. B., Jr. 1977. American Woodcock. p. 149-186. In: Sanderson, C. E. (Ed.) Management of Migratory Shore and Upland Game Birds in North America. International Assoc. of Fish and Wildl. Agencies. Washington, D.C.

Palman, D. S. 1977. Ecological Impact of Interstate 95 on Srall- and Medium-Sized Mammals in Northern Maine. M.S. thesis, U. Maine, Orono. 34 p.

Palmer, R. S. No date. Notes on Birds of the Upper Allagash Drainage and Vicinity in Maine, 1948. Bull. of the Maine Audubon Society.

Pease, A. S. 1969. A Flora of Vermont. Univ. of Vermont, Burlington.

Polk, C. 1974. Sources, Propagation, Amplitude, and Temporal Variation of Extremely Low Frequency (0-100 Hz) Electromagnetic Fields. In: Llaurado, J. G., et al. (Ed.): Biological and Clinical Effects of Low-Frequency Magnetic and Electric Fields. Charles C. Thomas, Springfield, Ill.

Public Archaeology Facility, Department of Anthropology, State University of New York. February 1978. Historic, Archaeological and Related Cultural Resources Study, Dickey-Lincoln School Lakes Transmission Project. A study report for the U.S. Department of the Interior/ Energy. Binghamton, New York. 97 p.

Raynor, G. S. 1971. Wind and Temperature Structure in a Coniferous Forest and in a Contiguous Field. Forest Sci. 17:351-363.

Richards, N. A. 1973. Old Field Vegetation as an Inhibitor of Tree Vegetation. p. 79-88. In: R. Goodland (Ed.) Powerlines and the Environment. Cary Arboretum, New York Botanical Gardens.

Rinaldi, A. M. 1970. Deer and Hare Forage Following Strip Clearcutting and Slash Disposal on the Penobscot Experimental Forest, Maine. M.S. thesis, Univ. of Maine, Orono. 81 p.

Rozzell, T. C. 1974. Biological Research for Extremely Low-Frequency Communications Systems. In: Llaurado, J. C. et al. (Ed.): Biological and Clinical Effects of Low-Frequency Magnetic and Electric Fields, Charles C. Thomas Springfield, Ill.

Safford, L. O. 1968. 10-Year Average Growth Rates in the Spruce-Fir Region of Northern New England. U.S. Forest Service Resource Paper NE-93, 1968.

Salber, L. 1974. Hard to Find Natives. New Hampshire Natural Resources, Spring/Summer. p. 25-28.

Schmid, W. D. 1971. Modification of the Subnivean Microclimate by Snowmobiles p. 251-257. In: A. O. Haugen (Ed.). Proceedings of the Snow and Ice Symposium. Iowa Coop. Wildl. Research Unit, Iowa State Univ., Ames. 280 p.

Schreiber, R. K., and Graves, J. H. 1977. Powerline Corridors as Possible Barriers to the Movements of Small Mammals. Amer. Midl. Nat. 97(2):504-508.

________________, Johnson, W. C., Story, J. D., Wenzel, C., and Kitchings, J. T. 1976. Effects of Powerline Rights-of-Way on Small, Nongame Mammal Community Structure. p. 263-273. In: Tillman, R. (Ed.). Proceedings of the first national symposium on environmental concerns in rights-of-way management. Mississippi State Univ. 335 p.

Senecal, D. 1977. Hinterland Who's Who: Coyote. Minister of Fisheries and the Environment, Information Canada, Ottawa. 2 p.

Sheldon, W. B. 1967. The Book of the American Woodcock. Univ. of Massachusetts Press, Amherst. 227 p.

Steward, R. E. and Aldrich, J. W. 1951. Removal and Repopulation of Breeding Birds in a Spruce-Fir Forest Community. Auk 68:471-482.

Takagi, T., and Muto, T. 1971. Influences Upon Human Bodies and Animals of Electrostatic Induction Caused by 500-kV Transmission Lines. Tokyo Electric Power Co., Inc. Tokyo, Japan.

Thomas, J. W. 1975. Sivicultural Options and Habitat Values in Coniferous Forest. p. 272-287. In: Proceedings of the symposium on management of forest and range habitats for nongame birds. U.S. Forest Service. Washington, D.C.

Thorsell, R. S. 1976. Environmental Concerns in Right-of-Way Management: An Electric Utility Viewpoint. In: Tillman, R. (Ed.). Proceedings of the first national symposium on environmental concerns in right-of-way management. Mississippi State Univ.

U.S. Dept. of Agriculture, Soil Conservation Service. January 1970. K and T Factors of Soil Series Mapper in the Northeast Region. Upper Darby, Pennsylvania.

U.S. Dept. of Army, New England Division, Corps of Engineers. August 1977. Draft Environmental Impact Statement, Dickey-Lincoln School Lakes, Maine, U.S.A., and Quebec, Canada. Waltham, Mass. 195 p.

U.S. Environmental Protection Agency. 1975. Extremely High-Voltage Transmission Lines: Health and Environmental Effects; Request for Submission of Data. Federal Register, Vol. 40, Nox. 53, Tuesday, March 18, 1975.

U.S. Dept. of the Interior. November 1976. Transmission Planning Summary, Dickey-Lincoln School Lakes Project Transmission Studies. Bangor, Maine. 39 p.

__________________________. July 1977. Transmission Reconnaissance Study, Dickey-Lincoln School Lakes Project Transmission Studies. Bangor, Maine. 58 p.

__________________________. February 1977. Transmission System Planning Study, Dickey-Lincoln School Lakes Project. Bangor, Maine. 41 pp.

U.S. Departments of the Interior/Energy, Comitta-Frederick Associates. March 1978. Visual-Recreation Resources Impact Study, Dickey-Lincoln School Lakes Transmission Project. Bangor, Maine.

U.S. Dept. of the Interior, Fish and Wildlife Service. 1976. Endangered and Threatened Wildlife and Plants. Federal Register, October 27: 47180-47198.

U.S. Dept. of the Interior, Fish and Wildlife Service. 1977. Pending Rulemakings. Endangered Species Technical Bulletin 2(4):6.

Van Velzen, W. T. 1971. Breeding Bird Counts on Powerline Rights-of-Way. Am. Birds 25(6):997-999.

Vermont Department of Water Resources. 1971. Vermont Lakes and Ponds 20 Acres or Larger - An Inventory by Counties. Vermont Dept. of Water Resources, 1968. Inventory of Small Ponds in Vermont - By Counties - Less than 20 Acres.

VTN Consolidated, Inc., Comitta Frederick Associates. 1976. Volume 1, Assessment of Alternative Power Transmission Corridors for the Dickey-Lincoln School Lakes Hydroelectric Project. A study report for the U.S. Department of the Interior. Cambridge, Ma. 173 p.

______________________________. 1976. Volume 2, Assessment of Alternative of Alternative Power Transmission Corridors for the Dickey-Lincoln School Lakes Hydroelectric Project, Qualification of Environmental Resource Data and Study References. Cambridge, Ma. 146 p.

______________________________. 1976. Volume 3, Assessment Alternative Power Transmission Corridors for the Dickey-Lincoln School Lakes Hydroelectric Project, Environmental Resources. Cambridge, Ma. 187 p.

Wanek, W. J. 1973. The Ecological Impact of Snowmobiling in Northern Minnesota. In: Proc. of the 1973 Snowmobile and ORV Research Symposium. Tech. Rept. of Dept. of Park and Recreation Resources, Mich. State Univ.

Whitcomb, R. F. 1977. Inland Biogeography and "Habitat Islands" of Estern Forest. Amer. Birds 31(1):

Wilson, D. C., and Bond, C. E. 1969. The Effects of Herbicides Diquat and Dichlobenil on Pond Invertebrates, Part I. Acute Toxicity. Trans. Amer. Fish. Soc. 98:438-443.

Zimmerman, J. L. 1977. Virginia Rail. p. 46-56. In: Sanderson, G. E. (Ed.). Management of migratory shore and upland game birds in North America. International Assoc. of Fish and Wildl. Agencies, Washington, D.C. 358 p.

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TABLE 2.08-13

HABITAT PREFERENCES & STATUS[1]
SPECIES OF SPECIAL CONCERN

	RECOGNITION						PROBABILITY			COVER TYPES														
	N.H.	Vt.	Me.	U.S.	CNA	NAS	S	T	N	SWM	PNM	DNR	CS	SHM	HSM	PFM	HWM	RGN	RAF	F	AF	W	OW	MM
Atlantic Salmon (anadromous)	X						4																	5
Blue-backed Trout			X						5															5
Round Whitefish	X			X				1	5															5
Finescale Dace	X						1	5	5															5
Blacknose Shiner	X						5	5	5															5
Musk Turtle					X		2	2															3	5
Spotted Turtle					X		1	1															3	5
Wood Turtle			X		X		4	3	2		1	1	1	1	1	1	1	2	1	1		1	3	2
Box Turtle					X		1	1			1	1	1	1	1	1	1	2	1	1		1	3	2
Blanding's Turtle	X				X		1	1			1	1	1	2	1	1	1	1	1	1			3	5
Black Racer					X		2	1			2	2	2	2	2	2	2	2	4	4	1	3	4	
Smooth Green Snake	X				X		4	4	3										2	2	1	3	2	
Marbled Salamander	X				X		1	1			2	2	2	2	2	2	2	2	2	2			3	
Four Toed Salamander					X		2	3	3		2												5	
Purple Salamander	X				X		4	4	3		1	1	1	2	2	2	1	2	1	1			5	
*Common Loon	X						3	5	5														3	5
*Great Blue Heron			X		X		3	4	4														5	3
Black-cr. Night Heron						X	2	1	1														5	3
*Am. Bittern						X	4	5	5														5	1
*Turkey Vulture					X		4	2												1	5	5		
Sharp-shinned Hawk	X					X	3	3	4		4	2	1	1	4	4	4	3	5	5	1	3	2	
Cooper's Hawk	X		X			X	3	3	4		3	2	1	2	4	4	3	3	5	5	1	3	2	
*Red-shouldered Hawk	X					X	4	4	2		2	2	2	1	2	3	3	3	4	4	3	4	5	
Golden Eagle	X		X				1	2	2		1				1				2			1	5	3
Southern Bald Eagle	X	X	X	(X)		X	1	2	2													1	3	5
Marsh Hawk	X					X	2	2	2													1	5	
*Osprey	X	X				X	1-2		5														3	5
Peregrine Falcon	X	X	X	(X)		X	2	1	1										1			1	3	5
Merlin						X		1	1		5			4	4	2			3	1	1	1	2	
Spruce Grouse	X							3	5		5			3	1				4	1		1	4	
Common Gallinule					X		2	1															5	3
Upland Sandpiper					X	X	3	3	1													5		
Black Tern			X			X	1	1	2														5	2
Yellow-billed Cuckoo						X	4	3	1									1	5	5			3	
Screech Owl					X		4	3	1							1		3	4	4		2	5	
Boreal Owl					X			1	3		5			1	5	3	2						2	
Red-headed Woodpecker						X	2	1											1	1		5	2	
*Black-back 3-toed Woodp.					X			2	5		5			2	1				1				2	
No. 3-toed Woodpecker	X						1	1	4		5			2	1				1				2	
*Bank Swallow					X		5	5	4		1										1	2	3	5 2
Rough-winged Swallow					X		4	3	1														3	5
Purple Martin	X					X	4	4	2												1	5	3	2 1
Carolina Wren					X		2	1										1	5	5			3	
Short-billed Marsh Wren					X	X	1	1	3													1	5	
Grey-cheeked Thrush					X				1		5				1									
E. Bluebird	X		X				4	4	2										3	4	1	5	1	
Loggerhead Shrike					X	X	1	1	1											3		2		
*Blackpoll Warbler					X		1	3	5	5								2				1		
Prairie Warbler					X		3	1				3						5	5		1			
Palm Warbler					X			1	5										2			5		
Pine Grosbeak				X	X				5	5				3	1			3	1			1		
*White-winged Crossbill					X			1	5	5	1			3	2									
Grasshopper Sparrow						X	1														5			
Opossum					X		3	1		1	2	2	2	3	3	1	4	5	5	4	4	3		
Arctic Shrew					X				2	5												3		
Long-tailed Shrew							4	4	4	3	1	1	3	5	5	4	5	3	3	1	1	4		
N. Water Shrew (S. pa lstris)			X		X				5	1	1	1	1	1	1	1	1	2	2	1	2	5	3	
Myotis keeni			X		X		3	3	3	3	3	3	3	3	3	3	3	4	3	2	3	5	3	4
Indiana Bat		X		(X)			2	1		4	4	3	3	4	4	4	4	3	3	1	1	5	3	4
Myotis subulatus			X		X		4	3	1	4	4	3	3	4	4	4	4	3	3	1	1	5	2	4
Pipistrellus subflavus			X		X		3	3	2	4	4	3	3	4	4	4	3	4	3	1	1	5	4	4
Hoary Bat	X						3	3	3	4	4	3	3	4	4	4	4	3	3	1	1	5	3	4
Marten	X	X					1	3	5	5	3	1	5	2	2	1	1	3	2		1	4		
Timber Wolf	X			(X)			1	2	3	3	1	1	4	4	4	2	2	5	2			4		
E. Grey Fox					X		3	2	1	2	2	3	2	2	2	2	2	5	5	4	5	3		
Mountain Lion	X	X		(X)				1	2	3	1	1	4	4	4	2	2	5	2			4		
Canada Lynx	X	X	X	X			1	2	5	3	1	1	4	4	4	2	1	5	5		1	4		
S. Flying Squirrel					X		3	2	1	2	2	1	2	4	4	4	5	4	2			4		
N. Bog Lemming					X			1	2	2												5		
Microsorex hoyi thompsoni	X							1	3	3	2	1	3	3	3	2	3	4	5	2	3	4		
Clethrionomys gapperi gapperi	X							1	3	4	1		5	4	4	1	3	3	3		1	4		
Yellow Nosed Vole	X		X					1	5	5			1	1							1	1		
Pine Vole					X		3	1		2	2	2	1	4	4	2	5	4	5			3		
E. Cottontail	X						1			1	1	2	2	2	2	1	1	4	5	3	3	4		
N. England Cottontail	X		X				3	2		1	1	2	2	2	2	1	1	4	5	3	3	4		
*Moose	X						2	5	5	1		1	4	4	4	2	5	4		1	5	4		

The species listed in this table have been officially or unofficially considered as rare, threatened, or endangered in the study region. The first six columns under the heading "Recognition" indicate the agency or institution which officially or unofficially has designated the species to be of some concern, either because of its rarity, its declining population, or its tendency to breed in colonies or in very localized situations. Authority (unofficial) for New Hampshire species was considered to be Salber (1974). Authority (official) for Vermont species was considered to be Title 13, Section 3651(3)(A), Vermont Statutes. Authority (very unofficial) for Maine species was considered to be a mimeographed, very preliminary, in-house, list of the Maine Department of Inland Fisheries and Wildlife (1974) entitled "Species of Concern." Additional authority (unofficial) for Maine listings were a recent series of planning reports issued by the State Planning Office as part of their Critical Areas Program. The column "U.S." indicates species either officially declared threatened or endangered by U.S.D.I. (circled X's) or recommended for special consideration in a letter from U.S. Fish and Wildlife Service to the Army Corps of Engineers dated 7 July, 1976 (uncircled X's). The column "CNA" refers to species selected from the Center's report to the Maine State Planning Office (Adamus and Clough 1976). The column "NAS" refers to species we selected from National Audubon Society's 1977 "Blue List", a listing of birds which are believed to be declining in numbers.

The columns entitled "PROBABILITY" give our estimate of how probable it is that the named species might actually breed in parts of the northern, transitional, and southern ecoregions (as defined on pages) that are crossed by the route network. This evaluation was based on our familiarity gained in the field with what microhabitats are present for these species directly on the proposed route. A rating of "5" indicates the species is known to inhabit the proposed route corridor, or almost certainly can be expected. A rating of "1" indicates a very low probability of occurrence. These numbers, we emphasize, reflect probability, not abundance. The remaining columns indicate the species' habitat preferences, as explained on pages A key to the cover types abbreviations is given in table

* seen on right of way during field investigations

TERRESTRIAL VERTEBRA OCCURRING IN THE REGION

Species	Scarcity (Overall)	Geographic Trends	Seasonal Occurrence (Spring Summer Fall Winter)
Common Loon	FC	N	X X X(X)
Pied-billed Grebe	U	S	X X X
Great Blue Heron	FC	-	X X X(X)
Green Heron	FC	S	X X X
American Bittern	U	-	X X X
Canada Goose	R	-	Ⓧ X X
Black Duck	C	N	X X X(X)
Green-winged Teal	R	-	X X Ⓧ
Blue-winged Teal	R	-	X X Ⓧ
Wood Duck	U	S	X X X
Ring-necked Duck	FC	N	X X X
Common Goldeneye	FC	N	X X X(X)
Hooded Merganser	U	-	X X X
Common Merganser	FC	N	X X X(X)
Turkey Vulture	R	S	X X X
Goshawk	U	-	X X X Ⓧ
Sharp-shinned Hawk	R	-	X(X)X(X)
Cooper's Hawk	R	-	X(X)X(X)
Red-tailed Hawk	FC	-	X X X(X)
Red-shouldered Hawk	U	S	X X X
Broad-winged Hawk	C	-	X X X
Golden Eagle	R	N	X(X)X
Bald Eagle	R	N	X X X(X)
Osprey	U	N	X X X
Marsh Hawk	R	-	X(X)X
Peregrine Falcon	R	-	X(X)X
Merlin	R	N	X X X
Kestrel	FC	S	X X X
Spruce Grouse	U	N	X X X X
Ruffed Grouse	C	-	X X X X
Pheasant	U	S	X X X X
Virginia Rail	U	S	X X X
Sora Rail	U	-	X X X
Common Gallinule	R	S	X X
Killdeer	C	S	X X X
Woodcock	C	-	X X X
Common Snipe	C	-	X X X
Spotted Sandpiper	C	-	X X X
Herring Gull	U	S	X X X(X)
Black Tern	R	S	X X X
Mourning Dove	C	S	X X X(X)
Yellow-billed Cuckoo	R	S	X X X
Black-billed Cuckoo	U	S	X X X
Great Horned Owl	FC	-	X X X X
Barred Owl	FC	-	X X X X
Long-eared Owl	U	-	X X X X
Saw-whet Owl	U	N	X X X Ⓧ
Whip-poor-will	U	S	X X X
Common Nighthawk	U	S	X X X
Chimney Swift	C	-	X X X
Ruby-throated Hummingbird	FC	-	X X X
Belted Kingfisher	FC	-	X X X
Yellow-shafted Flicker	C	-	X X X
Pileated Woodpecker	U	-	X X X X
Yellow-bellied Sapsucker	FC	N	X X X
Hairy Woodpecker	C	-	X X X X
Downy Woodpecker	C	-	X X X X
Black-backed 3-toed Woodpecker	U	N	X X X Ⓧ
Northern 3-toed Woodpecker	R	N	X X X Ⓧ
Eastern Kingbird	C	-	X X X
Great Crested Flycatcher	FC	S	X X X
Screech Owl	R	S	X X X X

Species	Scarcity (Overall)	Geographic Trends	Seasonal Occurrence (Spring Summer Fall Winter)
Eastern Phoebe	FC	-	X X X
Yellow-bellied Flycatcher	FC	N	X X X
Alder Flycatcher	FC	-	X X X
Least Flycatcher	FC	-	X X X
Wood Pewee	C	S	X X X
Olive-sided Flycatcher	FC	N	X X X
Horned Lark	R	-	X X X(X)
Tree Swallow	A	-	X X X
Bank Swallow	C	-	X X X
Barn Swallow	FC	-	X X X
Cliff Swallow	C	-	X X X
Purple Martin	R	S	X X X
Grey Jay	U	N	X X X Ⓧ
Blue Jay	C	-	X X X(X)
Common Raven	U	N	X X X Ⓧ
Common Crow	A	S	X X X(X)
Black-capped Chickadee	C	-	X X X X
Boreal Chickadee	FC	N	X X X X
White-breasted Nuthatch	FC	-	X X X X
Red-breasted Nuthatch	C	-	X X X X
Brown Creeper	C	-	X X X X
House Wren	FC	S	X X X
Winter Wren	C	N	X X X
Long-billed Marsh Wren	U	-	X X X
Short-billed Marsh Wren	R	N	X X X
Mockingbird	U	S	X X X X
Catbird	C	-	X X X
Brown Thrasher	FC	S	X X X
Robin	A	-	X X X(X)
Wood Thrush	FC	S	X X X
Hermit Thrush	C	-	X X X(X)
Swainson's Thrush	C	N	X X X
Veery	C	-	X X X
Bluebird	R	S	X X X
Golden-crowned Kinglet	FC	N	X X X X
Ruby-crowned Kinglet	FC	N	X X X X
Cedar Waxwing	FC	-	X X X(X)
Loggerhead Shrike	R	-	X X X
Starling	A	S	X X X(X)
Yellow-throated Vireo	R	S	X X X
Solitary Vireo	C	-	X X X
Red-eyed Vireo	A	-	X X X
Philadelphia Vireo	U	N	X X X
Warbling Vireo	U	S	X X X
Tennessee Warbler	FC	N	X X X
Nashville Warbler	C	-	X X X
Parula Warbler	C	-	X X X
Yellow Warbler	FC	S	X X X
Magnolia Warbler	A	N	X X X
Cape May Warbler	FC	N	X X X
Black-throated Blue Warbler	C	-	X X X
Myrtle Warbler	C	N	X X X
Black-throated Green Warbler	C	N	X X X
Blackburnian Warbler	C	N	X X X
Chestnut-sided Warbler	A	S	X X X
Bay-breasted Warbler	FC	N	X X X
Blackpoll Warbler	U	N	X X X
Pine Warbler	R	S	X X X
Palm Warbler	R	N	X X X
Ovenbird	A	-	X X X
N. Waterthrush	FC	-	X X X
Mourning Warbler	FC	N	X X X
Black and White Warbler	C	-	X X X

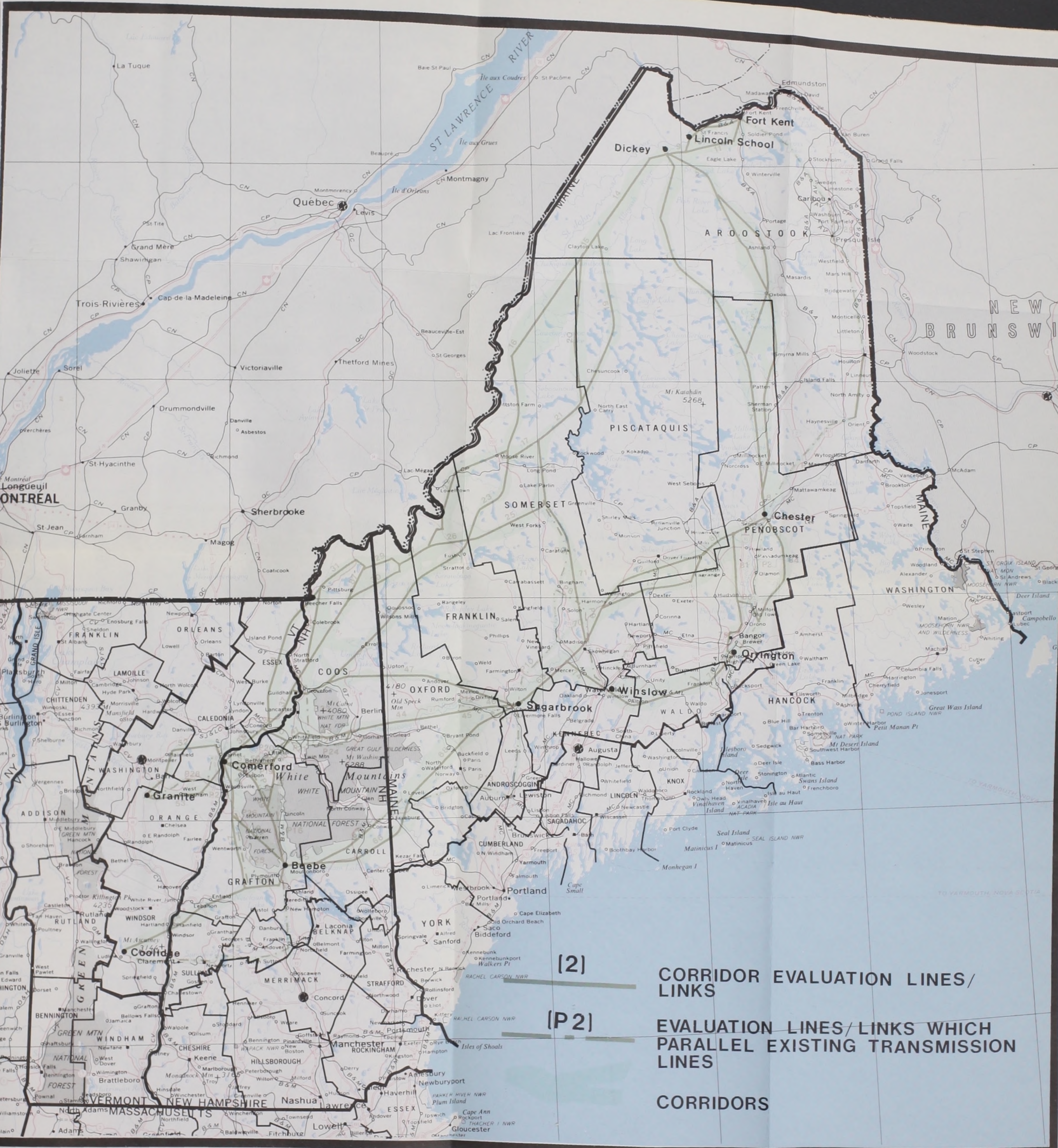
Species	Scarcity (Overall)	Geographic Trends	Seasonal Occurrence (Spring Summer Fall Winter)
Yellowthroat	A	-	X X X
Wilsons Warbler	U	N	X X X
Canada Warbler	FC	N	X X X
American Redstart	A	-	X X X
House Sparrow	C	S	X X X(X)
Bobolink	FC	S	X X X
Eastern Meadowlark	C	-	X X X
Red-winged Blackbird	C	-	X X X
Northern Oriole	FC	S	X X X
Rusty Blackbird	FC	N	X X X
Common grackle	C	-	X X X
Brown-headed Cowbird	C	S	X X X
Scarlet Tanager	FC	S	X X X
Cardinal	R	S	X X X X
Rose-br. Grosbeak	C	-	X X X
Indigo Bunting	FC	S	X X X
Evening Grosbeak	C	N	X X X Ⓧ
Purple Finch	FC	N	X X X Ⓧ
Pine Grosbeak	U	N	X X X Ⓧ
Pine Siskin	C	N	X X X Ⓧ
American Goldfinch	C	-	X X X Ⓧ
Red Crossbill	U	N	X X X Ⓧ
White-winged Crossbill	U	N	X X X Ⓧ
Rufous-sided Towhee	C	S	X X X
Savannah Sparrow	FC	-	X X X
Vesper Sparrow	U	S	X X X
Dark-eyed Junco	FC	N	X X X X
Chipping Sparrow	FC	S	X X X
Field Sparrow	FC	S	X X X
White-throated Sparrow	A	N	X X X(X)
Lincoln's Sparrow	U	N	X X X
Swamp Sparrow	FC	-	X X X
Song Sparrow	C	-	X X X(X)
Rough-legged Hawk	U	S	X
Snowy Owl	R	N	X
Common Redpoll	U	N	X
Tree Sparrow	C	N	X
Snow Bunting	U	N	X
Snowshoe Hare		N	
Cottontail		S	
Deer		S	
Moose		N	
E. Cougar		N	
Parascalops breweri		-	
Condylura cristata		-	
Sorex cinereus		-	
Sorex fumeus		-	
Sorex palustris		-	
Microsorex hoyi		N	
Blarina brevicauda		-	
Myotis lucifugus		-	
M. keeni		-	
Lasionycteris noctivagens		-	
Pipistrellus subflavus		S	
Eptesicus fuscus		-	
Lasiurus borealis		-	
L. cinereus		-	
Myotis subulatus		S	
Black Bear		N	
Raccoon		-	

Species	Scarcity (Overall)	Geographic Trends	Seasonal Occurrence (Spring Summer Fall Winter)
Marten		N	
Fisher		N	
Mustela ermina		-	
M. frenata		S	
Mink		-	
Otter		-	
Skunk		-	
Red Fox		-	
E. Coyote		S	
Canada Lynx		N	
Bobcat		N	
Woodchuck		S	
Chipmunk		-	
Red Squirrel		-	
Gray Squirrel		S	
N. Flying Squirrel		-	
S. Flying Squirrel		S	
Beaver		-	
Muskrat		S	
Peromyscus maniculatus		-	
P. leucopus		S	
Synaptomys cooperi		-	
Clethrionomys gapperi		-	
Microtus pennsylvanicus		-	
Pitymys pinetorum		S	
Mus musculus		S	
Zapus hudsonicus		-	
Napeozapus insignis		-	
Rattus norvegicus		S	
Porcupine		N	
Common Snapping Turtle		S	
Wood Turtle		S	
E. Painted Turtle		S	
Blandings Turtle		S	
Box Turtle		S	
Musk Turtle		S	
Spotted Turtle		S	
N. Water Snake		S	
E. Garter Snake		S	
N. Ribbon Snake		S	
Red-bellied Snake		S	
Green Snake		S	
Milk Snake		S	
Black Racer		S	
Red-spotted Newt		-	
Blue-spotted/Jefferson salamander		-	
Spotted Salamander		-	
Dusky Salamander		S	
Spring Salamander		S	
Red-backed Salamander		-	
Two-lined Salamander		-	
4-toed Salamander		S	
Marbeled Salamander		S	
American Toad		-	
Spring Peeper		-	
Gray Tree Frog		S	
Green Frog		-	
Bullfrog		S	
N. Leopard Frog		-	
Pickerel Frog		-	
Mink Frog		N	
Wood Frog		-	
Fowler's Toad		S	

SCARCITY of each species is rated as follows: R = rare, U = uncommon, FC = fairly common, C = common, A = abundant. We assigned no numerical value to these terms. They are meant only to be relative, i.e. "common" for a species of hawk means common relative only to other hawks; actual numbers may be only one-tenth those of a "common" songbird. Since abundance varies greatly in the region, we gave only the maximum abundance, e.g., although the ruby-crowned kinglet is listed as fairly common, this is true only in northern Maine -- elsewhere it is uncommon or rare.

GEOGRAPHIC TRENDS. Species designated "N" increase in a northerly and/or easterly direction along the route. "S" species increase in a southwesterly direction. Species designated "-" show no marked geographic trend.

SEASONAL OCCURRENCE. An "X" indicates presence at that season. A circled "X" indicates substantially higher numbers at that season. Although most songbirds increase during spring and fall migration, we did not indicate this. A parenthesized "X" indicates substantially lower numbers at that season.



TRANSMISSION CORRIDORS

DICKEY-LINCOLN SCHOOL LAKES TRANSMISSION PROJECT
MAINE, NEW HAMPSHIRE AND VERMONT

U.S. Department of Energy
Federal Building
Bangor, Maine 04401
March, 1978

FIGURE 8.03-3

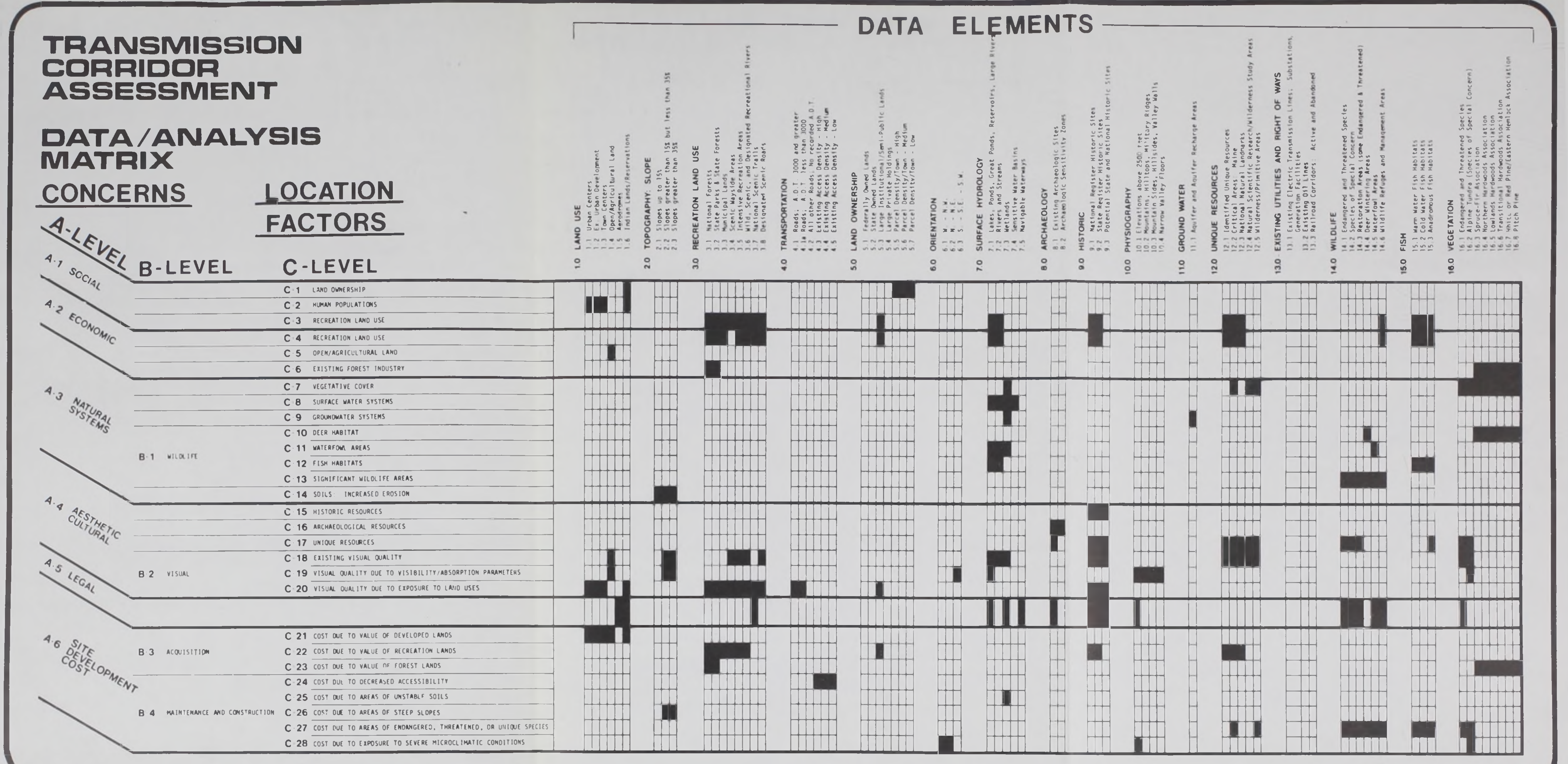

TRANSMISSION CORRIDOR ASSESSMENT
DATA/ANALYSIS MATRIX
CONCERNS
LOCATION FACTORS
DATA ELEMENTS
A-LEVEL
B-LEVEL
C-LEVEL
A·1 SOCIAL
A·2 ECONOMIC
A·3 NATURAL SYSTEMS
A·4 AESTHETIC CULTURAL
A·5 LEGAL
A·6 SITE DEVELOPMENT COST
B·1 WILDLIFE
B 2 VISUAL
B 3 ACQUISITION
B 4 MAINTENANCE AND CONSTRUCTION
C·1 LAND OWNERSHIP
C·2 HUMAN POPULATIONS
C·3 RECREATION LAND USE
C·4 RECREATION LAND USE
C·5 OPEN/AGRICULTURAL LAND
C·6 EXISTING FOREST INDUSTRY
C·7 VEGETATIVE COVER
C·8 SURFACE WATER SYSTEMS
C·9 GROUNDWATER SYSTEMS
C·10 DEER HABITAT
C·11 WATERFOWL AREAS
C·12 FISH HABITATS
C·13 SIGNIFICANT WILDLIFE AREAS
C·14 SOILS INCREASED EROSION
C·15 HISTORIC RESOURCES
C·16 ARCHAEOLOGICAL RESOURCES
C·17 UNIQUE RESOURCES
C·18 EXISTING VISUAL QUALITY
C·19 VISUAL QUALITY DUE TO VISIBILITY/ABSORPTION PARAMETERS
C·20 VISUAL QUALITY DUE TO EXPOSURE TO LAND USES
C 21 COST DUE TO VALUE OF DEVELOPED LANDS
C 22 COST DUE TO VALUE OF RECREATION LANDS
C 23 COST DUE TO VALUE OF FOREST LANDS
C 24 COST DUE TO DECREASED ACCESSIBILITY
C 25 COST DUE TO AREAS OF UNSTABLE SOILS
C 26 COST DUE TO AREAS OF STEEP SLOPES
C 27 COST DUE TO AREAS OF ENDANGERED, THREATENED, OR UNIQUE SPECIES
C 28 COST DUE TO EXPOSURE TO SEVERE MICROCLIMATIC CONDITIONS
1.0 LAND USE
1.1 Urban Centers
1.2 Ex. Urban Development
1.3 Town Centers
1.4 Open/Agricultural Land
1.5 Aerodromes
1.6 Indian Lands/Reservations
2.0 TOPOGRAPHY: SLOPE
2.1 Slopes up to 15%
2.2 Slopes greater than 15% but less than 35%
2.3 Slopes greater than 35%
3.0 RECREATION LAND USE
3.1 National Forests
3.2 State Parks & State Forests
3.3 Municipal Lands
3.4 Scenic Wayside Areas
3.5 Intensive Recreation Areas
3.6 Wild, Scenic, and Designated Recreational Rivers
3.7 National Scenic Trails
3.8 Designated Scenic Roads
4.0 TRANSPORTATION
4.1 Roads; A.D.T. 3000 and greater
4.1a Roads; A.D.T. less than 3000
4.2 All other Roads; No recorded A.D.T.
4.3 Existing Access Density - High
4.4 Existing Access Density - Medium
4.5 Existing Access Density - Low
5.0 LAND OWNERSHIP
5.1 Federally Owned Lands
5.2 State Owned Lands
5.3 Large Institutional/Semi-Public Lands
5.4 Large Private Holdings
5.5 Parcel Density/Town - High
5.6 Parcel Density/Town - Medium
5.7 Parcel Density/Town - Low
6.0 ORIENTATION
6.1 W. - N.W.
6.2 N. - N.E.
6.3 S. - S.E. - S.W.
7.0 SURFACE HYDROLOGY
7.1 Lakes, Ponds, Great Ponds, Reservoirs, Large Rivers
7.2 Rivers and Streams
7.3 Wetlands
7.4 Sensitive Water Basins
7.5 Navigable Waterways
8.0 ARCHAEOLOGY
8.1 Existing Archaeologic Sites
8.2 Archaeologic Sensitivity Zones
9.0 HISTORIC
9.1 National Register Historic Sites
9.2 State Register Historic Sites
9.3 Potential State and National Historic Sites
10.0 PHYSIOGRAPHY
10.1 Elevations above 2500 feet
10.2 Mountains, Hilltops, Military Ridges
10.3 Mountain Sides, Hillsides, Valley Walls
10.4 Narrow Valley Floors
11.0 GROUND WATER
11.1 Aquifer and Aquifer Recharge Areas
12.0 UNIQUE RESOURCES
12.1 Identified Unique Resources
12.2 Critical Areas: Maine
12.3 National Natural Landmarks
12.4 Natural Scientific Research/Wilderness Study Areas
12.5 Wilderness/Primitive Areas
13.0 EXISTING UTILITIES AND RIGHT OF WAYS
13.1 Existing Electric Transmission Lines; Substations, Generation Facilities
13.2 Existing Oil Lines
13.3 Railroad Corridors: Active and Abandoned
14.0 WILDLIFE
14.1 Endangered and Threatened Species
14.2 Species of Special Concern
14.3 Restoration Areas (some Endangered & Threatened)
14.4 Deer Wintering Areas
14.5 Waterfowl Areas
14.6 Wildlife Refuges and Management Areas
15.0 FISH
15.1 Warm Water Fish Habitats
15.2 Cold Water Fish Habitats
15.3 Anadromous Fish Habitats
16.0 VEGETATION
16.1 Endangered and Threatened Species
16.2 Alpine Tundra (Species of Special Concern)
16.3 Spruce-Fir Association
16.4 Northern Hardwoods Association
16.5 Lowlands Hardwoods Association
16.6 Transitional Hardwoods Association
16.7 White or Red Pine/Eastern Hemlock Association
16.8 Pitch Pine

FIGURE 8.03-2

SYSTEM PLAN RANKINGS

RANKING BY NUMERIC METHOD | QUALITATIVE CONSIDERATIONS

Level	System Plans	Type of Construction (by Corridor)	Corridors Evaluated	Total Plan Length (Miles)	Total Plan Impact Score	Plan Rank by Impact Score	Average Impact Score by Mile	Plan Rank by Impact per Mile	Acres of Right-of-Way	Number of Streams and Rivers Crossed	Projected Accessibility: Low	Projected Accessibility: Moderate	Projected Accessibility: High	Number of Wild and Scenic Rivers Crossed	Number of Anadromous Fisheries Crossed	Number of Road Crossings	Number of Scenic Road Crossings	Number of Scenic Trails Crossed	Proximit to Town Centers	Proximity to National and State Parks and Forests (Miles)	Proximity to Scenic Wayside Areas	Proximity to Intensive Recreation Areas	Proximity to Archaeological Sites	Proximity to National Register Historic Sites	Proximity to State Register Historic Sites	Proximity to Potential State Historic Sites	Proximity to Unique Resources	Proximity to Critical Areas: Maine	Proximity to National Natural Landmarks	Proximity to National Research/Wilderness Areas	Proximity to Wilderness Study Areas	Proximity to Threatened/Endangered Wildlife Species	Proximity to Wildlife Species of Special Concern	Proximity to Wildlife Restoration Areas	Proximity to Threatened/Endangered Vegetation Species	FINAL RANKING
AUTHORIZED LEVEL	**A-B	STEEL TOWER	*A,G,J,U, X,a	450.0	7,338	2	16.3	1	7,500	200	46	94	313		26	269	2	2	64	25	22	13	6	13	6	11	11		5	4		3	6	28	13	2
AUTHORIZED LEVEL	**A-B	WOOD POLE	A,G,J,U, X,a	450.0	8,724	4	19.4	3	11,570	200	46	94	313		26	269	2	2	64	25	22	13	6	13	6	11	11		5	4		3	6	28	13	4
AUTHORIZED LEVEL	D	WOOD POLE	D,G	280.5	7,651	3	27.3	4	7,970	130	82	74	127	1		114	7		10		7	11	6	2	1	1	8		2	2			2	8	1	3
AUTHORIZED LEVEL	E	STEEL TOWER	*D,G	280.5	4,750	1	17.0	2	4,920	130	82	74	127	1		114	7		10		7	11	6	2	1	1	8		2	2			2	8	1	1
ULTIMATE LEVEL	A	STEEL TOWER	*A,G,J,P, R,U,X,a	639.0	10,952	4	17.13	2	9,800	310	50	99	493		26	395	5	2	90	28	31	21	7	20	28	24	24		11	5		5	10	40	22	4
ULTIMATE LEVEL	A	WOOD POLE	A,G,J,P, R,U,X,a	639.0	12,338	6	19.3	3	14,260	310	50	99	493		26	395	5	2	90	28	31	21	7	20	28	24	24		11	5		5	10	40	22	6
ULTIMATE LEVEL	B	STEEL TOWER	*A,G,J,U, X,a ***	450.0	9,836	3	21.8	4	7,500	200	46	94	313		26	269	2	2	64	25	22	13	6	13	6	11	11		5	4		3	6	28	13	3
ULTIMATE LEVEL	B	WOOD POLE	A,G,J,U, X,a ***	450.0	11,222	5	24.9	5	11,560	200	46	94	313		26	269	2	2	64	25	22	13	6	13	6	11	11		5	4		3	6	28	13	5
ULTIMATE LEVEL	D	WOOD POLE	D,G,M	324.5	8,453	2	26.0	6	8,590	154	86	83	158	1		138	10	1	14	18	11	13	6	2	2	4	11		3	2			2	14	2	2
ULTIMATE LEVEL	E	STEEL TOWER	*D,G,M	324.5	5,552	1	17.11	1	5,290	154	86	83	158	1		138	10	1	14	18	11	13	6	2	2	4	11		3	2			2	14	2	1

LEGEND:

NUMERIC METHOD: High impact scores indicate greater environmental impact.
QUANTITATIVE CONSIDERATIONS: "Number of" - a measure of the number of times the corridor crosses a resource.
PROJECTED ACCESSIBILITY: A measure indicating miles of corridor crossing areas of low, medium or high accessibility.
PROXIMITY TO: A measure indicating the number of times these resources are located within 1 1/2 miles of the "evaluation line" in the corridor.

* Indicates corridors in which steel tower or wood pole construction is an option.
** Authorized System Plans A and B are treated in the same manner for purposes of this assessment.
*** Requires (2) parallel wood pole circuits.

TABLE 8.03-4

CORRIDOR RANKINGS

SEGMENTS	Corridor Designations	Links Evaluated	Total Corridor Length (Miles)	Total Corridor Impact Score	Corridor Rank by Impact Score	Average Impact Score by Mile	Corridor Rank by Impact per Mile	Number of Streams and Rivers Crossed	Projected Accessibility: Low	Projected Accessibility: Moderate	Projected Accessibility: High	Number of Wild and Scenic Rivers Crossed	Number of Anadromous Fisheries Crossed	Number of Road Crossings	Number of Scenic Road Crossings	Number of Scenic Trails Crossed	Proximity to Town Centers	Proximity (Miles) to National and State Parks and Forests	Proximity to Scenic Wayside Areas	Proximity to Intensive Recreation Areas	Proximity to Archaeological Sites	Proximity to National Register Historic Sites	Proximity to State Register Historic Sites	Proximity to Potential State Historic Sites	Proximity to Unique Resources	Proximity to Critical Areas: Maine	Proximity to National Natural Landmarks	Proximity to National Research/Wilderness Areas	Proximity to Wilderness Study Areas	Proximity to Threatened/Endangered Wildlife Species	Proximity to Wildlife Species of Special Concern	Proximity to Wildlife Restoration Areas	Proximity to Threatened/Endangered Vegetation Species	FINAL RANKING
DICKEY to CHESTER (PLANS A & B)	A	2,3,5,7,8	130.5	2,078	1	15.9	1	33	32	51	48		6	41			7		2	6					2					2	1	16	3	1
	B	1,7,8	126.0	2,112	2	16.8	3	42	47	38	42		7	33			3		1	7					5		1				1	2	3	2
	C	2,3,6,8	130.5	2,126	3	16.3	2	50	33	40	58	2	4	43			14		2	2					3		3			2	1	16	3	3
DICKEY to COMERFORD (PLANS C, D & E)	D	14,15,16,22, 27,30,32,36, 37,38,39	250.5	4,349	1	17.4	1	117	82	74	97	1		92	6		5		2	9			1	1	7		1				2	5		1
	E	14,15,20,21, 17,23,28,35, 42,37,38,39	254.5	4,445	2	17.5	2	115	60	87	111	2		88	8		10	1	8	11			2	2	12		3			1	3	6		2
	F	14,15,16,18, [illegible]	257.5	4,588	3	17.8	3	142	58	86	116	1		93	5		8	1	4	9	1		3	1	14		5			2	2	7	1	3
COMERFORD to GRANITE (PLANS A, B, C, D & E)	G	P 28	30.0	401	1	13.4	1	13			30			22	1		5		5	2	6	2			1		1	2				3	1	1
	H	52	31.0	622	2	20.1	2	9		6	25			21	2		5	6	1	6	6		3		1		1				1	2	3	2
	I	53	31.5	641	3	20.3	3	14			32			28	1		5		4	3	2	2	1		1			1			1	3	2	3
SUGARBROOK to COMERFORD (PLANS A & B)	J	P11,P12,44 86,P24,P21 P20,50,51	95.5	2,020	1	21.2	2	73	11	28	58		5	44	6	1	12	10	11	1		2	4	3	2		1	1			2	4	2	1
	K	47,35,P23 P22,P21,P20, 50,51	108.0	2,100	2	19.4	1	72	20	21	69	1	4	50	8	1	14	3	9	3		3	4	5	5		1	3			1	8	1	2
	L	47,35,42,37, 38,39	99.0	2,171	3	21.9	3	63	20	21	60	1		26	7	1	15	3	7	6		2	2	3	4		1				1	6	1	3
COMERFORD to BEEBE (PLANS C, D & E)	M	51,P18,P17, P16	44.0	802	1	18.2	1	24	4	9	31			24	3	1	4	18	4	2			1	3	3		1					6	1	1
	N	P27,P26,58	41.0	883	2	21.5	2	25	2	12	27			22	2	1	5	15	2	1			1	4			3					7		2
	O	59,62	37.5	890	3	23.7	3	20		6	32			18	1	1	7	15	3					2			1					3		3
BEEBE to COOLIDGE (PLAN A)	P	P15	80.0	1,096	1	13.7	1	52			80			55	2		14			7		3	19	7	4					1	1	3	2	1
	Q	63,64	61.0	1,171	2	19.2	2	20	4	3	55			40	1		9	1	1	6		7	10	4	3		4	1		1	1	7		2
SUGARBROOK to BEEBE (PLAN A)	R	P13,P14,67, 65	109.0	1,612	1	14.8	1	58	4	5	100			71	1		12	3	9	1	1	4	3	6	9		6	1		1	3	9	7	1
	S	P13,66,65	110.0	1,649	2	15.0	2	61	4	11	95			74			14	3	4	3	1	2	2	4	8		2				1	5	2	2
	T	68,P14,67, 65	92.0	1,721	3	18.7	3	66	4	5	83			66	1		17	3	8	1	1	2	3	4	9		7	1		1	3	7	6	3
CHESTER to SUGARBROOK (PLANS A & B)	U	83,82,72,85, 69	98.0	1,359	1	13.9	1	37	1	11	87		5	89	1	1	14	15	3	1		3	2	2	2		1				3	5	4	1
	V	83,82,73,88, 85,69	97.0	1,494	2	15.4	3	50	1	21	76		6	73			9		2	1		4		3	1						3	3	3	2
	W	P4,75,P6,69	100.0	1,501	3	15.0	2	51			100		4	91			20		3	3		8		5	4					1	2	1	1	3
ORRINGTON to WINSLOW (PLANS A & B)	X	P4,75	50.0	783	1	15.7	2	23			50		4	50			11			2		4		3	4					1			1	1
	Y	78,76,75	46.0	846	2	18.4	3	21			46		2	48			15			1		2		3	3					1				2
	Z	78,76,P5	59.0	859	3	14.6	1	39			59		4	61			17			1		1		4	3					1	1			3
CHESTER to ORRINGTON (PLANS A & B)	a	P2,P3	46.0	697	1	15.2	2	21	2	4	40		6	23			15		1	1		2		3			2	1					2	1
	b	84,P3	50.0	725	2	14.5	1	25	1	15	35		10	24			8			1		2		2			1	1					4	2
	c	83,81,80,P3	54.0	834	3	15.4	3	21	12	6	36		12	29			11					3		3	1		2	1					4	3
DICKEY to LINCOLN (ALL PLANS)	d	9,10	11.5	230	1	20.0	1	5		8	4			6			1																	1
LINCOLN to FORT KENT (ALL PLANS)	e	12	16.5	356	1	21.6	1	5	8	4	5			15	1		4					1	1										2	1

TABLE 8.03-3

SYSTEM PLAN RANKINGS

RANKING BY NUMERIC METHOD | QUALITATIVE CONSIDERATIONS

Level	System Plans	Type of Construction (by Corridor)	Corridors Evaluated	Total Plan Length (Miles)	Total Plan Impact Score	Plan Rank by Impact Score	Average Impact Score by Mile	Plan Rank by Impact per Mile	Acres of Right-of-Way	Number of Streams and Rivers Crossed	Projected Accessibility: Low	Projected Accessibility: Moderate	Projected Accessibility: High	Number of Wild and Scenic Rivers Crossed	Number of Anadromous Fisheries Crossed	Number of Road Crossings	Number of Scenic Road Crossings	Number of Scenic Trails Crossed	Proximit to Town Centers	Proximity to National and State Parks and Forests (Miles)	Proximity to Scenic Wayside Areas	Proximity to Intensive Recreation Areas	Proximity to Archaeological Sites	Proximity to National Register Historic Sites	Proximity to State Register Historic Sites	Proximity to Potential State Historic Sites	Proximity to Unique Resources	Proximity to Critical Areas: Maine	Proximity to National Natural Landmarks	Proximity to National Research/Wilderness Areas	Proximity to Wilderness Study Areas	Proximity to Threatened/Endangered Wildlife Species	Proximity to Wildlife Species of Special Concern	Proximity to Wildlife Restoration Areas	Proximity to Threatened/Endangered Vegetation Species	FINAL RANKING
AUTHORIZED LEVEL	A-B**	STEEL TOWER	A*,G,J,U, X,a	450.0	7,338	2	16.3	1	7,500	200	46	94	313		26	269	2	2	64	25	22	13	6	13	6	11	11		5	4		3	6	28	13	2
AUTHORIZED LEVEL	A-B**	WOOD POLE	A,G,J,U, X,a	450.0	8,724	4	19.4	3	11,570	200	46	94	313		26	269	2	2	64	25	22	13	6	13	6	11	11		5	4		3	6	28	13	4
AUTHORIZED LEVEL	D	WOOD POLE	D,G	280.5	7,651	3	27.3	4	7,970	130	82	74	127	1		114	7		10		7	11	6	2	1	1	8		2	2			2	8	1	3
AUTHORIZED LEVEL	E	STEEL TOWER	D*,G	280.5	4,750	1	17.0	2	4,920	130	82	74	127	1		114	7		10		7	11	6	2	1	1	8		2	2			2	8	1	1
ULTIMATE LEVEL	A	STEEL TOWER	A*,G,J,P, R,U,X,a	639.0	10,952	4	17.13	2	9,800	310	50	99	493		26	395	5	2	90	28	31	21	7	20	28	24	24		11	5		5	10	40	22	4
ULTIMATE LEVEL	A	WOOD POLE	A,G,J,P, R,U,X,a	639.0	12,338	6	19.3	3	14,260	310	50	99	493		26	395	5	2	90	28	31	21	7	20	28	24	24		11	5		5	10	40	22	6
ULTIMATE LEVEL	B	STEEL TOWER	A*,G,J,U, X,a***	450.0	9,836	3	21.8	4	7,500	200	46	94	313		26	269	2	2	64	25	22	13	6	13	6	11	11		5	4		3	6	28	13	3
ULTIMATE LEVEL	B	WOOD POLE	A,G,J,U, X,a***	450.0	11,222	5	24.9	5	11,560	200	46	94	313		26	269	2	2	64	25	22	13	6	13	6	11	11		5	4		3	6	28	13	5
ULTIMATE LEVEL	D	WOOD POLE	D,G,M	324.5	8,453	2	26.0	6	8,590	154	86	83	158	1		138	10	1	14	18	11	13	6	2	2	4	11		3	2			2	14	2	2
ULTIMATE LEVEL	E	STEEL TOWER	D*,G,M	324.5	5,552	1	17.11	1	5,290	154	86	83	158	1		138	10	1	14	18	11	13	6	2	2	4	11		3	2			2	14	2	1

LEGEND:

NUMERIC METHOD: High impact scores indicate greater envirnmental impact.

QUANTITATIVE CONSIDERATIONS: "Number of" - a measure of the number of times the corridor crosses a resource.

PROJECTED ACCESSIBILITY: A measure indicating miles of corridor crossing areas of low, medium or high accessibility.

PROXIMITY TO: A measure indicating the number of times these resources are located within 1 1/2 miles of the "evaluation line" in the corridor.

* Indicates corridors in which steel tower or wood pole construction is an option.

** Authorized System Plans A and B are treated in the same manner for purposes of this assessment.

*** Requires (2) parallel wood pole circuits.

TABLE 8.03-4

CORRIDOR RANKINGS

SEGMENTS	Corridor Designations	Links Evaluated	Total Corridor Length (Miles)	Total Corridor Impact Score	Corridor Rank by Impact Score	Average Impact Score by Mile	Corridor Rank by Impact per Mile	Number of Streams and Rivers Crossed	Projected Accessibility: Low	Projected Accessibility: Moderate	Projected Accessibility: High	Number of Wild and Scenic Rivers Crossed	Number of Anadromous Fisheries Crossed	Number of Road Crossings	Number of Scenic Road Crossings	Number of Scenic Trails Crossed	Proximity to Town Centers	Proximity to National and State Parks and Forests (Miles)	Proximity to Scenic Wayside Areas	Proximity to Intensive Recreation Areas	Proximity to Archaeological Sites	Proximity to National Register Historic Sites	Proximity to State Register Historic Sites	Proximity to Potential State Historic Sites	Proximity to Unique Resources	Proximity to Critical Areas Maine	Proximity to National Natural Landmarks	Proximity to National Research/Wilderness Areas	Proximity to Wilderness Study Areas	Proximity to Threatened/Endangered Wildlife Species	Proximity to Wildlife Species of Special Concern	Proximity to Wildlife Restoration Areas	Proximity to Threatened/Endangered Vegetation Species	FINAL RANKING
DICKEY to CHESTER (PLANS A & B)	A	2,3,5,7,8	130.5	2,078	1	15.9	1	33	32	51	48		6	41			7		2	6					2					2	1	16	3	1
	B	1,7,8	126.0	2,112	2	16.8	3	42	47	38	42		7	33			3		1	7					5		1				1	2	3	2
	C	2,3,6,8	130.5	2,126	3	16.3	2	50	33	40	58	2	4	43			14		2	2					3		3			2	1	16	3	3
DICKEY to COMERFORD (PLANS C, D & E)	D	14,15,16,22, 27,30,32,36, 37,38,39	250.5	4,349	1	17.4	1	117	82	74	97	1		92	6		5		2	9			1	1	7		1				2	5		1
	E	14,15,20,21, 17,23,28,35, 42,37,38,39	254.5	4,445	2	17.5	2	115	60	87	111	2		88	8		10	1	8	11			2	2	12		3			1	3	6		2
	F	14,15,16,18, [illegible]	257.5	4,588	3	17.8	3	142	58	86	116	1		93	5		8	1	4	9	1		3	1	14		5			2	2	7	1	3
COMERFORD to GRANITE (PLANS A, B, C, D & E)	G	P 28	30.0	401	1	13.4	1	13			30			22	1		5		5	2	6	2			1		1	2				3	1	1
	H	52	31.0	622	2	20.1	2	9		6	25			21	2		5	6	1	6	6		3		1		1				1	2	3	2
	I	53	31.5	641	3	20.3	3	14			32			28	1		5		4	3	2	2	1		1			1			1	3	2	3
SUGARBROOK to COMERFORD (PLANS A & B)	J	P11,P12,44 86,P24,P21 P20,50,51	95.5	2,020	1	21.2	2	73	11	28	58		5	44	6	1	12	10	11	1		2	4	3	2		1	1			2	4	2	1
	K	47,35,P23 P22,P21,P20, 50,51	108.0	2,100	2	19.4	1	72	20	21	69	1	4	50	8	1	14	3	9	3		3	4	5	5		1	3			1	8	1	2
	L	47,35,42,37, 38,39	99.0	2,171	3	21.9	3	63	20	21	60	1		26	7	1	15	3	7	6		2	2	3	4		1				1	6	1	3
COMERFORD to BEEBE (PLANS C, D & E)	M	51,P18,P17, P16	44.0	802	1	18.2	1	24	4	9	31			24	3	1	4	18	4	2			1	3	3		1					6	1	1
	N	P27,P26,58	41.0	883	2	21.5	2	25	2	12	27			22	2	1	5	15	2	1			1	4			3					7		2
	O	59,62	37.5	890	3	23.7	3	20		6	32			18	1	1	7	15	3					2			1					3		3
BEEBE to COOLIDGE (PLAN A)	P	P15	80.0	1,096	1	13.7	1	52			80			55	2		14			7		3	19	7	4					1	1	3	2	1
	Q	63,64	61.0	1,171	2	19.2	2	20	4	3	55			40	1		9	1	1	6		7	10	4	3		4	1		1	1	7		2
SUGARBROOK to BEEBE (PLAN A)	R	P13,P14,67, 65	109.0	1,612	1	14.8	1	58	4	5	100			71	1		12	3	9	1	1	4	3	6	9		6	1		1	3	9	7	1
	S	P13,66,65	110.0	1,649	2	15.0	2	61	4	11	95			74			14	3	4	3	1	2	2	4	8		2				1	5	2	2
	T	68,P14,67, 65	92.0	1,721	3	18.7	3	66	4	5	83			66	1		17	3	8	1	1	2	3	4	9		7	1		1	3	7	6	3
CHESTER to SUGARBROOK (PLANS A & B)	U	83,82,72,85, 69	98.0	1,359	1	13.9	1	37	1	11	87		5	89	1	1	14	15	3	1		3	2	2	2		1				3	5	4	1
	V	83,82,73,88, 85,69	97.0	1,494	2	15.4	3	50	1	21	76		6	73			9		2	1		4		3	1						3	3	3	2
	W	P4,75,P6,69	100.0	1,501	3	15.0	2	51			100		4	91			20		3	3		8		5	4					1	2	1	1	3
ORRINGTON to WINSLOW (PLANS A & B)	X	P4,75	50.0	783	1	15.7	2	23			50		4	50			11			2		4		3	4					1			1	1
	Y	78,76,75	46.0	846	2	18.4	3	21			46		2	48			15			1		2		3	3					1				2
	Z	78,76,P5	59.0	859	3	14.6	1	39			59		4	61			17			1		1		4	3					1	1			3
CHESTER to ORRINGTON (PLANS A & B)	a	P2,P3	46.0	697	1	15.2	2	21	2	4	40		6	23			15		1	1		2		3			2	1					2	1
	b	84,P3	50.0	725	2	14.5	1	25	1	15	35		10	24			8			1		2		2			1	1					4	2
	c	83,81,80,P3	54.0	834	3	15.4	3	21	12	6	36		12	29			11					3		3	1		2	1					4	3
DICKEY to LINCOLN (ALL PLANS)	d	9,10	11.5	230	1	20.0	1	5		8	4			6			1																	1
LINCOLN to FORT KENT (ALL PLANS)	e	12	16.5	356	1	21.6	1	5	8	4	5			15	1		4					1	1										2	1

Column groups: RANKING BY NUMERIC METHOD (Total Corridor Length through Corridor Rank by Impact per Mile); QUALITATIVE CONSIDERATIONS (Number of Streams and Rivers Crossed through Proximity to Threatened/Endangered Vegetation Species).

TABLE 8.03-3