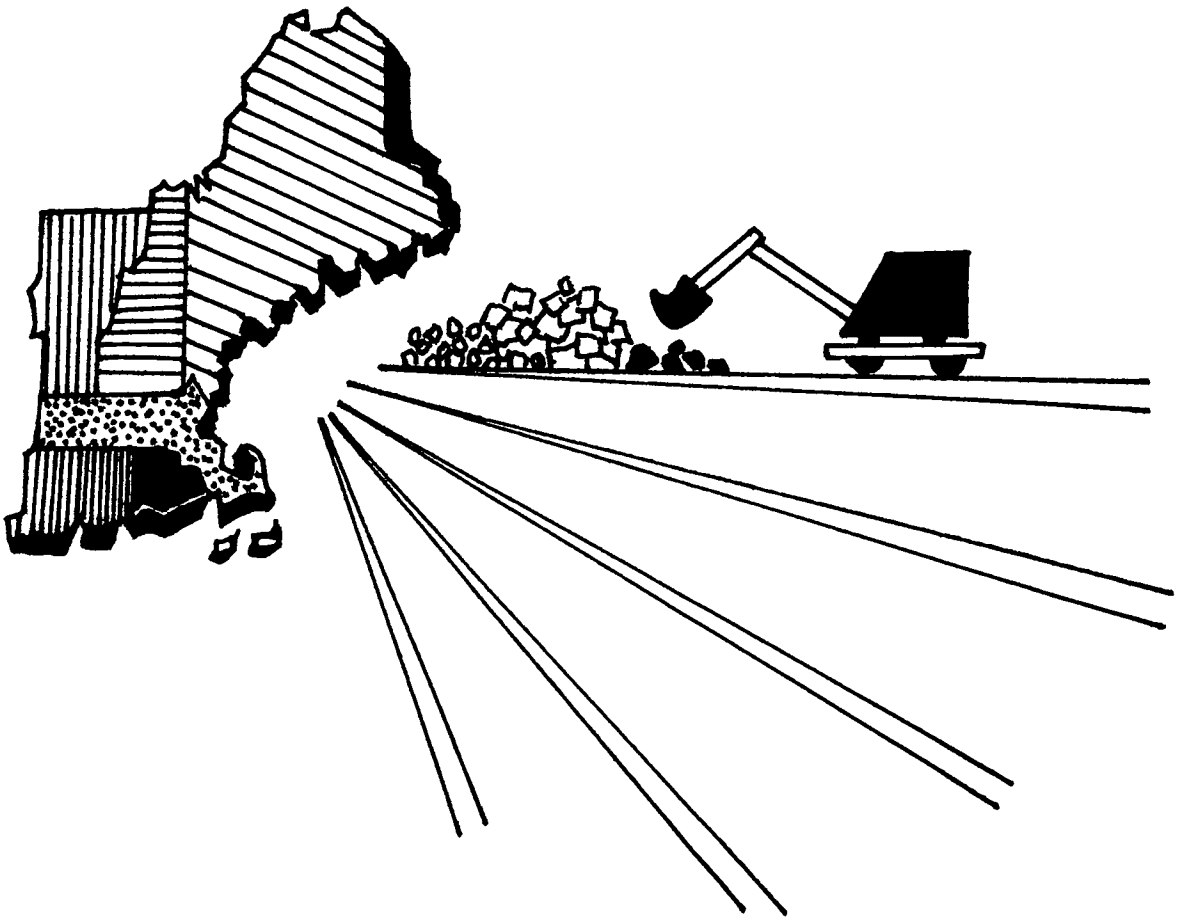
CONSTRUCTION AGGREGATES DEMAND IN THE NEW ENGLAND STATES



JANUARY 1992

The New England Governors' Conference, Inc.
in cooperation with
Minerals Management Service,
U.S. Department of the Interior

Cooperative Agreement #16-35-0001-30542

About the New England Governors' Conference, Inc.

The New England Governors' Conference, an informal alliance since colonial days, was formally established in 1937 by the governors of the six state region to promote New England's economic development. In 1981, the Conference incorporated as a non-partisan, non-profit, tax-exempt 501(c)3 corporation. The region's six governors serve as its Board of Directors.

The Conference's framework permits the governors to work together, to coordinate and implement policies and programs which are designed to respond to issues of regional concern.

The Conference addresses such issues as economic development, tourism, international trade, transportation, energy, and the environment. In addition, the Conference serves as the New England Secretariat for the Conference of New England Governors and Eastern Canadian Premiers, a unique, inter-regional, bi-national organization.

For further information, please call or write the New England Governors' Conference, Inc., 76 Summer Street, Boston, Massachusetts, 02110-1226, phone: 617/423-6900, fax: 617/423-7327.

FOREWORD

To achieve future economic growth a region needs to build a strong foundation. The future economic growth of New England is dependent upon a reliable and inexpensive supply of aggregates (sand, gravel, and crushed stone). This basic natural resource is vital to the construction industry, where it is essential for the production of concrete, as well as for fill.

For many reasons, the availability of aggregates over the long term is a matter of some concern. First, it is an extractive and non-renewable resource. Second, environmental regulations and land use controls often preclude development of the resource, especially in more urban areas where demand is also highest. Third, transportation costs quickly become prohibitive as the distance to available aggregates increases.

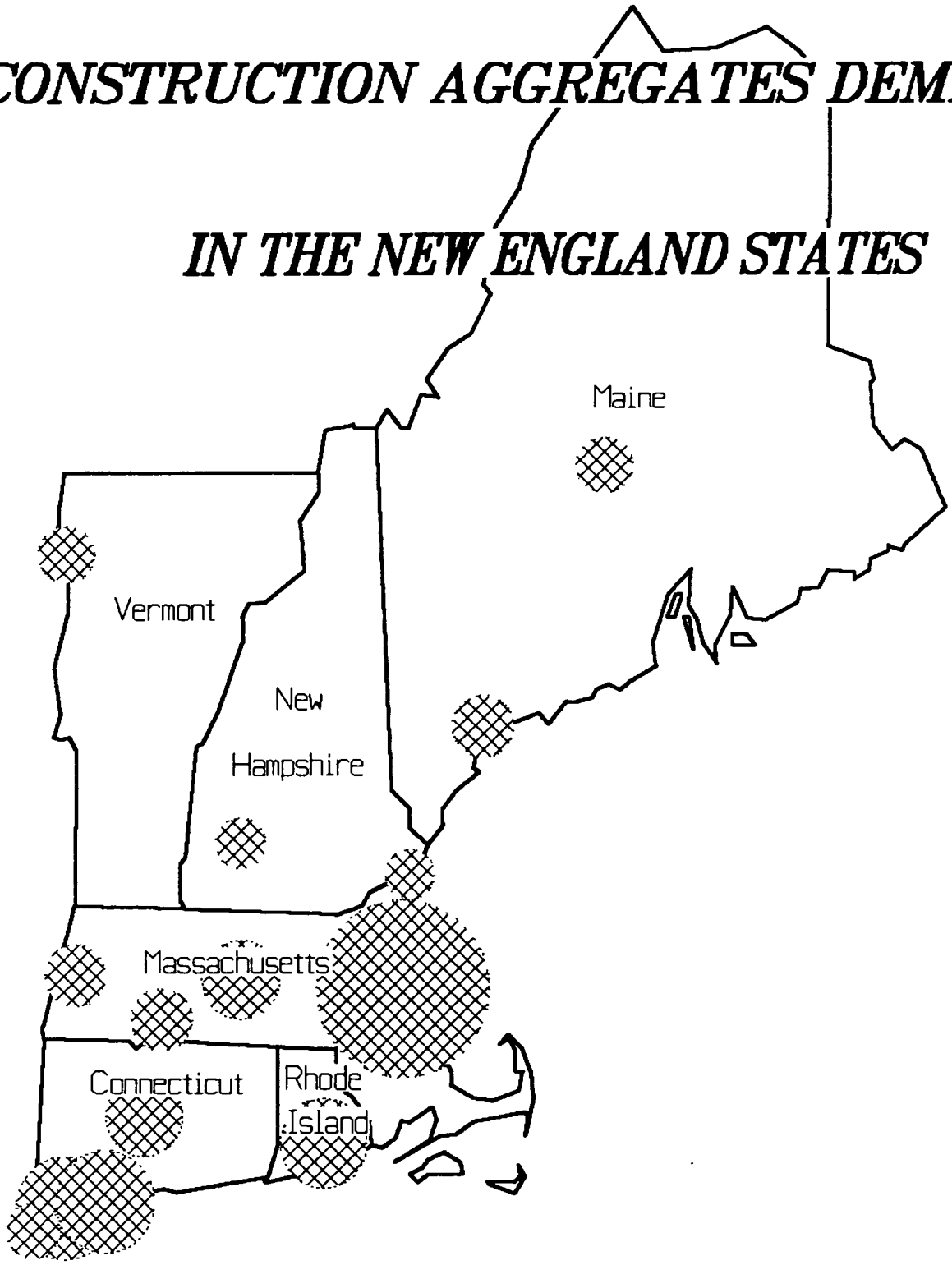
The demand for aggregate resources in New England continues at a high level. In Boston alone, the reconstruction of the Central Artery, the third harbor tunnel project, and the new Massachusetts Water Resources Authority secondary wastewater treatment plant will require vast quantities of aggregate supplies.

To assure that the region's future needs for aggregates will be met, it is essential that a detailed analysis be done of present and projected demand, existing and potential sources of supply, and factors that could hinder or promote development of the resource. With support from the United States Minerals Management Service, the New England Governors' Conference, Inc. has sponsored this analysis of aggregate demand in the New England region. A companion study of New England aggregate resources will follow.

- Arthur A. Socolow
Study Manager

CONSTRUCTION AGGREGATES DEMAND

IN THE NEW ENGLAND STATES



January, 1992

Prepared for the New England Governors' Conference, Inc by the Eastern Research Group, Inc.

TABLE OF CONTENTS

TABLE OF CONTENTS (cont.)

TABLE OF CONTENTS (cont.)

In addition to the continued, though modest, long-term growth trend for the region, short-term business cycles could produce more rapid increases in demand pressures in the aggregates markets. Actual changes in demand and supply at any time are affected by the more dramatic business cycles that can radically accentuate the changes in demand and supply. The forecasts developed for this report consider the possible influence of business cycles fluctuations on demand at any particular point in the next two decades. ERG estimates that, based on historical business cycle fluctuations, peak demand levels could be 5-15% higher than the trend-based projections would indicate in regional or state construction sectors.

ERG has also presented information on the effect of the current construction and business slump on the demand for aggregates in New England. Demand for sand and gravel and crushed stone fell sharply in 1989 and 1990. ERG's projections are based on an assumed recovery from the current business slump and a return to projected levels of demand.

Maps of future demand centers indicate that the greatest demand will continue to be found in the metropolitan statistical areas, with Boston the largest such area. The Boston MSA accounts for nearly one-quarter of all construction aggregates demanded in the region. The next largest MSAs are Hartford, CT and Providence, RI, although these combined are not as large as the Boston MSA in demand for aggregates.

The location of current supplies of these construction aggregates and the location of future demand centers are displayed in a series of maps prepared using mapping software. Separate regional and state maps are provided for current supply locations and for demand patterns for 1980 and 1990 (historical data), and for 2000 and 2010 (projected demand).

Locating new sand and gravel pits or crushed stone quarries has become extremely difficult primarily because of problems of local opposition to extraction activity and the truck traffic associated with mineral extraction. Producers have found it extremely difficult to overcome local opposition to the opening of new pits or quarries. The local permitting process is encumbered by difficult and inconsistent or unpredictable approval processes, and, most importantly, by acute political pressures. Producer attitudes and difficulties with permitting requirements were solicited in a survey distributed to aggregate producers throughout New England.

The difficulty of opening new pit and quarry sites is leading to increases in the distance over which construction aggregates must be transported to job sites. The survey of producers indicates that many producers are now transporting materials a longer distance than was true five years ago. Since transportation costs are a significant portion of the delivered cost of construction aggregates, continued increases in transportation distances will increase the cost of construction in New England.

Producers are also subject to a variety of state and federal permits that, while occasionally difficult, are relatively predictable. ERG compiled the permit requirements for new extraction operations in the New England states; they are summarized in the report. Many major Federal permit programs, such as those governing protection of wetlands, are relatively unimportant in New England because of the primacy of more restrictive state programs. State authorities generally, however, cede primacy to the local zoning boards. These local approvals for site development are usually considered the most difficult obstacle to development.

The net effect of rapid demand growth in the New England states in recent years was an increase in the pressure for aggregates producers to locate new pits and quarries. As noted above, most producers experienced considerable difficulty in locating new facilities. The potential for difficulties in meeting future consumption will be examined in the followup study on sand and gravel resources being planned by the New England Governors' Conference, Inc.

State by State Summary

Connecticut - Demand for sand and gravel and for crushed stone in Connecticut grew at the rapid pace of 11% per year from 1980 to 1988. In absolute terms this growth increased demand from approximately 6.0 million tons to over 14.2 million tons of sand and gravel and from 3.4 to 8.1 million tons of crushed stone per year. Approximately one-third of the demand in each product category derives from the Hartford metropolitan statistical area. Future economic growth is expected to add nearly 3 million tons of sand and gravel demand and 1.5 million tons of crushed stone demand per year through the year 2010.

Massachusetts - Massachusetts is the largest consumer of aggregates resources in New England. Both sand and gravel and crushed stone demand nearly doubled from 1980 to 1988. In absolute terms this growth represented at additional annual demand for 10.5 million tons of sand and gravel (to a total of 21.7 million tons) and an additional annual demand for 5.8 million tons (for a total of 11.9 million tons) of crushed stone. Even the modest future growth projected through 2010 will add a demand of 2.5 million tons per year of sand and gravel and 1.1 million tons per year of crushed stone.

Maine - Historical patterns of demand for aggregates in Maine were uniquely erratic among the New England states. Due to unusually high demand for aggregates from the public sector in Maine in 1980, overall demand actually declined since then despite the rapid economic growth during the 1980s. The slow economic growth projected for Maine during the next two decades will generate only a small increase over the 1988 annual demand for sand and gravel of 4.2 million tons per year and virtually no change in the crushed stone demand of 2.3 million tons per year.

New Hampshire - This state is among those that enjoyed extremely rapid economic and population growth during the 1980s, leading to a near doubling in the annual consumption of sand and gravel and nearly equivalent demand growth for crushed stone. Future projections show little growth in aggregates demand consumption from the current levels of 7 to 8 million tons per year of sand and gravel and 4 million tons yearly of crushed stone.

Rhode Island - Although the smallest state in absolute terms, Rhode Island experienced the most rapid aggregates demand growth among the New England states. The state's demand for sand gravel and crushed stone increased by 175% and 185%, respectively, from 1980 to 1988 (from 1.2 to 3.3 million tons per year for sand and gravel and 0.7 to 2.0 million tons per year of crushed stone). Further economic and demographic growth in the state will continue to push up demand. The next two decades are projected to increase annual demand by 0.7 million tons of sand and gravel and 0.1 million tons of crushed stone.

Vermont - This state saw a near doubling in the demand for sand and gravel and crushed stone during the 1980s. Modest to negative economic growth projections for the state is not expected to push consumption levels further upward, however, over the next two decades. The level

of demand in 1988 for the state was estimated at 4.2 million tons of sand and gravel and 2.6 million tons of crushed stone per year.

SECTION TWO

INTRODUCTION

Under contract to the New England Governors' Conference Inc., (NEGC) the Eastern Research Group, Inc. (ERG) investigated the future demand for construction aggregates -- sand and gravel and crushed stone -- in the region and the problems faced by aggregates producers in opening new production facilities. The ERG study was designed as the first of a two-part investigation into the potential for long-term difficulties in the availability of construction aggregates in New England. The second part of this investigation, which focuses on the location and quantities of sand and gravel deposits in New England that are available for eventual development, will be initiated in 1992.

The aggregates demand study was initiated by the NEGC with funds provided by the U.S. Department of the Interior, Minerals Management Service. Study direction was provided by Dr. Arthur Socolow of NEGC, and a committee of the State Geologists of each of the six New England states, the Minerals Management Service and the U.S. Bureau of Mines of the Department of the Interior.

2.1 The Origin of Interest in the Future Availability of Construction Aggregates

Construction aggregates are one of the essential components of most major construction projects and their ready availability is important to the cost effectiveness of construction activity. Sand and gravel is a basic component of concrete used in commercial and industrial buildings and public works projects. It also receives wide use as a base material in the construction and repair of highways, railways and airport runways. Other major uses include the building of dams, landscape applications, and use as fill in highway construction.

Crushed stone and gravel is used in road base or road surfacing material, railroad ballast, filter stone, and other purposes. It is also used in making concrete, in cement and lime manufacturing and in a variety of other industrial processes.

The availability of these resources became an issue during the 1980s partly due to the result of an unprecedented regional building boom during that period. Simultaneously, the pace of development in New England led to the closure or inaccessibility of many aggregates resource areas as developments were constructed near or on top of the aggregates resources. Additionally, many communities generated increased opposition to extraction and industrial activities in their vicinity. Their principal concerns were potential emissions of dust or noise and increases in truck traffic. Combined, these influences have created a business environment in which the continued availability of basic construction aggregates resources became uncertain.

This research is designed to develop a forecast and understanding of future conditions in construction aggregates, specifically the expected level of future demand. The research has also provided information on the other factors that may constrain future resource availability, such as the closure of communities to future development and the permitting difficulties presented.

2.2 Guide to the Sections of the Report

This investigation consists of several components. The description of these is provided below and in the introduction to each of the ensuing sections of the study.

In Section Three, ERG presents forecasts of the demand for construction aggregates in New England to the year 2010. The forecasts are based on projected trends in construction employment and estimates of the relationship between construction employment and demand for sand and gravel and crushed stone. Separate forecasts are presented for sand and gravel and crushed stone, with the forecasts defined for the region, states and metropolitan statistical areas.

In Section Four, ERG presents a series of maps depicting the present supply locations and past, present and future demand patterns for construction aggregates. Regional maps are provided in Section Four. A large number of additional maps were prepared, with separate maps for each state for each milestone year, i.e., 1980, 1990, 2000 and 2010. The state maps are presented in Section 3.

Section Five presents investigations of the problems faced by producers in locating new production sites for construction aggregates. ERG compiled information on the federal, state and local permits required for new sand and gravel pits and crushed stone quarries. Tables are presented summarizing the permitting requirements including the information requested for each permit, the potential need for public hearings and the amount of time necessary for a successful applicant to obtain a permit.

SECTION THREE

ESTIMATED AND PROJECTED DEMAND FOR CONSTRUCTION AGGREGATES FOR 1980-2010

3.1 Introduction

This section describes the methodology used for estimating and projecting demand for New England construction aggregates for the 1980-2010 period and presents the results of the analysis. Estimates are presented separately for sand and gravel and crushed stone for several levels of geographic detail, including the region, states, and metropolitan statistical areas (MSAs).

Section 3.2 discusses in detail the process by which construction activity is transformed into estimates of demand and projected to the year 2010. ERG then summarizes the modeling results in Section 3.3. A complete set of historical and projected demand estimates by region, state, and MSA for 1980-2010 are given in Appendix B. A set of historical estimates by town (or political jurisdiction, such as housing authorities) for 1980-1988 are available on diskette from the New England Governors' Conference (NEGC) in Boston, MA.

3.2 Overview of Demand Estimation and Projection Methodology

This section outlines the process used to: (1) estimate historical demand for construction aggregates and (2) project annual demand to 2010. The historical demand is estimated as a function of construction activity, following the procedure illustrated in Chart 3.1.

Table 3.1
Average Deviation from Trend:
Construction Employment, 1967 – 1988
(as a proportion of trend-value)

AREA	Trough	Peak
NEW ENGLAND	0.91	1.04
CONNECTICUT	0.90	1.10
Bridgeport MSA	0.91	1.12
Hartford MSA	0.85	1.09
New Haven MSA	0.87	1.11
New London MSA	0.77	1.13
Nonmetropolitan Counties	0.80	1.11
MAINE	0.93	1.05
Bangor MSA	0.92	1.14
Lewiston MSA	0.91	1.10
Portland MSA	0.93	1.04
Nonmetropolitan Counties	0.95	1.06
MASSACHUSETTS	0.78	1.09
Boston MSA	0.95	1.19
New Bedford MSA	0.75	1.11
Pittsfield MSA	0.70	1.18
Springfield MSA	0.85	1.05
Worcester MSA	0.89	1.14
Nonmetropolitan Counties	0.77	1.09
NEW HAMPSHIRE	0.90	1.14
Manchester MSA	0.84	1.17
Portsmouth MSA	0.98	1.11
Nonmetropolitan Counties	0.89	1.13
RHODE ISLAND	0.88	1.10
Providence MSA	0.93	1.08
Nonmetropolitan Counties	0.84	1.11
VERMONT	0.94	1.10
Burlington MSA	0.94	1.18
Nonmetropolitan Counties	0.97	1.13

Source: Eastern Research Group, Inc.

state, the highest average peak is found for New Hampshire at 1.14 times the trend value, and the lowest average trough is found in Massachusetts at 0.78 times the trend value.[2]

Used with the trend projections, these average deviations can yield an estimate of the potential peak and trough demand for the projection period. These are shown for the region as a whole in Figures 3.1 and 3.2. The potential range of demand values for the region, given the fluctuations attributable to the business cycle, is indicated by the bracketing of the forecasted demand levels.

The range in forecasted demand levels defines the minimum and maximum of the forecasted demand levels (assuming average business cycle variations) for each year considered. The bracketed demand values, however, should not be considered optimistic and pessimistic alternatives to the trend projections. The upper boundary of the business cycle values is not expected to be sustainable from year to year based on this analysis. Thus, the bracketing of demand levels describes the possible range of values around the trend-based forecast that might be observed in any given year.

For states and MSAs, the reader may calculate peak and trough values using the values shown in Table 3.1 and either the summary data presented in Tables 3.2 - 3.20 (discussed below) or the detailed data in Appendix B.

3.2.2 Data Sources and Data Preparations

The essential data sources used in the analysis include the use factors that relate construction expenditures to demand for aggregates; historical construction employment data; a price deflator series to define construction expenditures in a consistent, constant-dollar fashion; and projections of construction employment.

---

[2]The region average shown in Table 3.1 is not the arithmetic average of the states or MSAs. Rather, at each level of geography, the calculation is performed on the cycles for that area. In this way, proper weight is given to the contribution of each area in forming the cycle at an aggregate level.

Figure 3.1: Sand and Gravel Demand 1980 – 2010
New England Region

(The projections shown assume a recovery to pre-slump demand levels.)

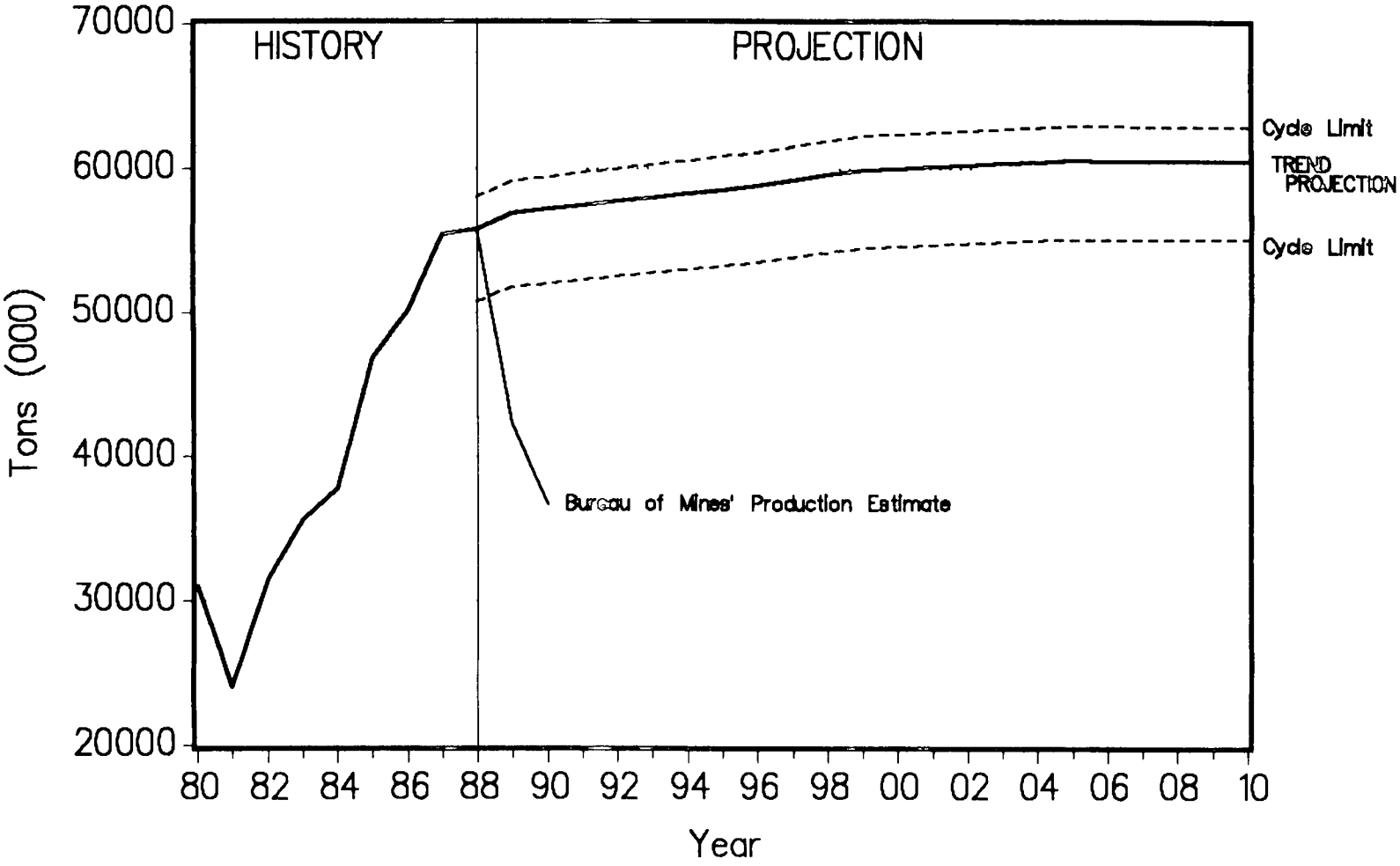
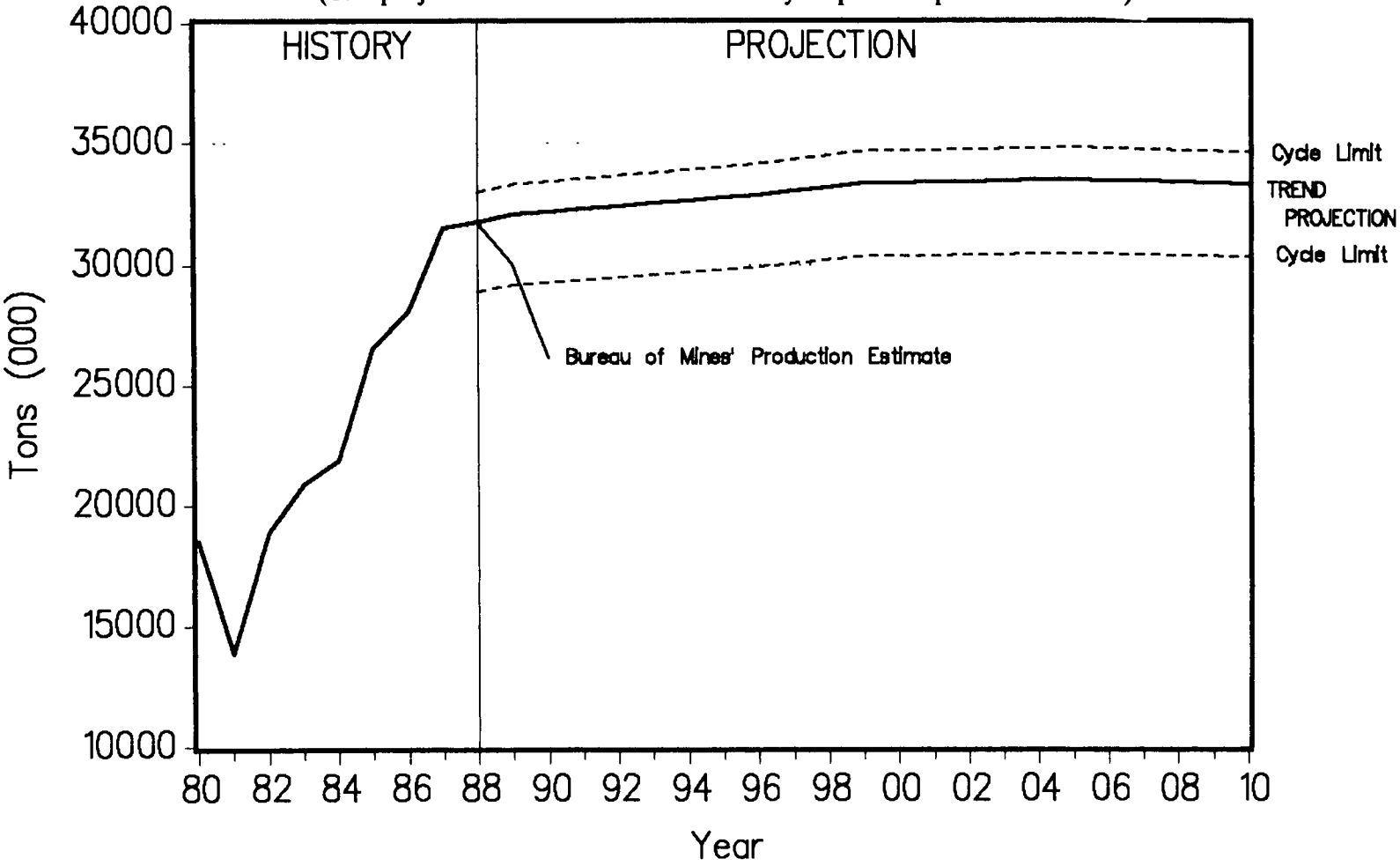


Figure 3.2: Crushed Stone Demand 1980 – 2010
New England Region

(The projections shown assume a recovery to pre-slump demand levels.)



The BLS use factors are derived from the 1987 input-output table of the U.S. economy for all types of construction except highway construction (BLS, 1991). ERG derived use factors for highway construction from the FHWA's "Federal-Aid Highway Construction Materials Usage Factors 1986-1987-1988" which provides state-level average aggregates demand per million dollars of construction expenditure (FHWA, 1989). All of the use factors are presented in Table A.1 in Appendix A.

To adjust for the effects of inflation, all construction expenditure data were converted to a 1987 base, using one of four price indices specific to different types of construction; indices for nonresidential, residential, nonhighway public works, and highways are given in Table A.2 in Appendix A.

The historical aggregates demand estimates are based on construction expenditures reported from actual private construction permits issued and reported government construction expenditures. In their most detailed form, the permit data cover "permit-places" and government-units (including quasi-governmental units such as special service districts and authorities), respectively. For estimating historical demand, these data were used at this most detailed level and then aggregated to the MSA level to develop projections.

ERG measured historical levels of public construction activity using reported expenditures from the Annual Survey of Governments for 1980, 1981, 1983-1986, 1988, and the Census of Governments for 1982 and 1987. The universe of respondents for these annual data is identical for both the Survey of Governments and the Census of Governments, i.e., all government and government-like authorities that ultimately expend public funds. Two potential sources of inaccuracy which arise from these data are: (1) nonresponse bias occurring with the annual survey, (i.e., 1981, 1983-1986, 1988) specifically for smaller jurisdictions; and (2) the lack of geographical detail for reported state-level construction expenditures. The nonresponse problem will tend to lower the estimates during the off-census years, while the state expenditure problem affects the geographic distribution of demand but not the state totals. In preparing the historical estimates, state-level aggregates demand was allocated to MSAs based on MSA shares of state population. To the extent that state governments depart from expending funds on a proportional basis according to population, however, the allocation may misrepresent the actual location of

expenditures. It is worth noting that the distribution of nonstate expenditures by MSA (i.e., private plus nonstate public construction expenditures) closely matches the distribution of population by MSA in New England.

ERG forecasted demand for construction aggregates as a function of projected state and MSA construction employment (see Section 3.1). For this, ERG used recent economic projections prepared by the Bureau of Economic Analysis (BEA) (U.S. Department of Commerce, 1990) as the source of projected construction employment. The BEA projections cover states and MSAs based on historical data through 1988 and, according to BEA, are premised on "continuance of past economic relationships and assume no major policy changes." These projections are long-run trend-based, and do not attempt to capture the inherent cyclical nature of the national, regional, and local economies. They are consistent with trends regarding population growth and the geographical distribution of population and economic activity, including the composition of employment by industry.

The demand projections for the United States, New England, and each of the MSAs in the region are shown in Appendix B. Estimates for *projection* years not given in the tables were made by linear interpolation. The graphs of the demand projections presented throughout this section include data from Bureau of Mines production estimates for 1989 and 1990. These are included to ensure that the reader could observe the significance of the current business slump in the context of the projections. These figures are preliminary estimates of state production figures and are subject to revision. Given their significance, however, they have been included on the graphs presented of projected aggregates demand.

3.2.3 Discussion of Modeling Limitations

The notable limitations in the methodology include (1) shortcomings inherent in use of permit data; (2) problems encountered in the application of national use factors to New England; and (3) the fact that the BEA data are not sufficiently current to capture the effect of the 1989-present business slump. Each of these limitations is addressed below.

Issues in the Use of Permit Data - By using construction data disaggregated by place and by type of construction, ERG is able to estimate aggregates demand at the place where it is used in a consistent manner for all areas of New England. Incomplete or inaccurately measured construction activity will adversely influence the quality of the results. For the private sector, where construction permits are used as the base measure, it is recognized that some construction permits are obtained for projects which subsequently either do not start or are not completed, either of which can bias the estimates, i.e., lead to overestimates of historical aggregate demand. This bias is offset by two factors. First, there is often an incentive to place a low value on the permitted project, owing to the use of value-based permit fees. Second, permit values fail to capture cost overruns. This is a not-infrequent occurrence on competitively bid contracts, but is not captured in the permit value figures. The net bias of these factors taken together is not known.

Issues Related to the Use Factors - While ERG regards its methodology as the best and most feasible for the study objective, the potential exists for inaccuracy owing to the use of national rather than regional use factors for nonhighway construction and incomplete coverage of activity via permit-reporting or government expenditure survey. To the extent that New England differs from the nation with respect to the amount or type of aggregates (or aggregates containing construction materials such as ready-mix concrete, asphalt, concrete block, concrete pipe, or other concrete products), estimates based on national use-factors will fail to reflect those region-specific differences.

A regional variation from the national norms may have influenced some of the preliminary estimates of sand and gravel demand, as is discussed below. ERG compared its estimates of historical demand with state-level estimates of production prepared by the U.S. Bureau of Mines (USBM). The ERG crushed stone estimates cumulatively accounted for exactly 100% of the figure estimated by the Bureau of Mines, and were thus left unadjusted. The sand and gravel estimates obtained from the initial application of the use factors, however, consistently underestimated regional production estimates from the USBM by 45%. (Typically ERG's estimation methodology produces figures that are slightly below the USBM figures in both the crushed stone and sand and gravel categories.)

A review of USBM figures noted a much higher relative proportion of sand and gravel production to crushed stone production in New England than in the United States as a whole. This suggests that the use factors for sand and gravel were below those appropriate for New England during the 1980s. One possible influence on the data is the effect of imports of aggregates (particularly crushed stone) from Canada to New England. ERG's investigation of international trade data indicate, however, that the international trade flows in aggregates are quite small, particularly imports arriving in New England ports. Thus no significant effects could be generated by imports of Canadian sand and gravel and crushed stone.

A more accurate set of use factors for New England might indicate a higher quantity of sand and gravel relative to crushed stone in various construction activities. Without a detailed study of regional use factors, however, ERG could not determine why the application of its methodology underestimated regional production of sand and gravel.

To ensure that the starting point in the demand estimation procedure was equivalent to that presented in the USBM figures, the sand and gravel estimates were scaled upward to reach the USBM estimates for the region.[3] The scaling was accomplished by multiplying each MSA demand total by a factor sufficient to correct for the 45% shortfall: this adjustment was made prior to the estimation of the relationship between construction employment and aggregates demand.[4] The adjustment ensured that the demand projections originated from the correct historical level. The USBM state production statistics for 1980-1990 are shown in Appendix A, Table A.3.

Issues Related to the Timing of the BEA Projections and the Recent Slump in Construction Activity - A key feature of the BEA projections is that they do not reflect the recent economic

---

[3]We note that the comparisons made with the USBM production estimates were done for the cumulative 9 year period for which historical construction data were available. Year-to-year departures from the production estimates are to be expected owing to changing inventory levels.

[4]The scaling of sand and gravel numbers to match the USBM figures was performed using 1987 as the base year. Thus 1987 historical construction employment estimates were used and the sand and gravel estimates were benchmarked to the 1987 USBM production data. This adjustment is equivalent to making an upward adjustment on the sand and gravel use factors. The scaling was performed separately for each of the MSAs. Once the scaling was performed, no other adjustments to the data were needed.

recession. At the time the projections were published (October, 1990), the latest available annual data were for 1988, a peak year for New England construction activity. Since that time, construction activity has declined considerably, with a corresponding decline in demand for aggregates. The USBM production data shown on the figures confirm this decline.

In light of the sharp downturn, ERG and NEGC sought alternatives to the BEA projections to explore differing perspectives on the future market conditions. One alternative is a set of projections of economic activity from the National Planning Associates (NPA), Inc., completed in June, 1991 (National Planning Associates, 1991). These projections reflect the sharp decline in construction activity and further incorporate an estimate of construction employment for the 1989-1991 period. This estimate shows a steep reduction in construction employment. Beyond 1991, the projections are purely trend-based.

ERG chose to rely primarily on the BEA projections, however, for this study based on a preference for the methodology used. The BEA projections are based on a modeling approach with a strong theoretical foundation. In contrast the NPA methodology is proprietary and was not fully defined in materials submitted to ERG. While a further analysis of the NPA modeling approach might prove useful, such an effort is beyond the present scope of this study. On balance, ERG believes the BEA projections represent a reasonable basis for projecting demand.

There remains the issue of projecting construction activity and, thus aggregates demand, amidst the very sharp business slump. The NPA projections, because they capture the downturn in activity, are approximately 25% lower than the BEA projections for the region as a whole through the year 2010. The actual USBM production estimates are lower still for 1989 and 1990. It is uncertain which estimates will prove most accurate over the long-term considering available evidence and depending upon one's view of the current slump in construction activity. If one expects that the current slump is simply a temporary, albeit acute, business slump, then the BEA projections remain viable. If one expects that the present cycle will ultimately lead to a significant long-run reduction in activity as posited by NPA, then the BEA projections will be too high. The USBM production estimates suggest even the NPA forecasts may be optimistic. None of the

projections or other data describe the path any eventual economic recovery will take. Because the present cycle is incomplete, the question will necessarily remain unresolved.[5]

Despite this uncertainty ERG retained the BEA-based trended projections and the business cycle bounds around the projections. While these trend-based projections are substantially too optimistic in the short-run, a return to normal economic growth may produce demand levels similar to those envisioned in the BEA projections. ERG's methodology cannot project the return to normal economic conditions in New England. All subsequent discussions rely primarily on ERG's future aggregates demand estimates as they were derived from the BEA projections.

3.3 New England Historical and Projected Demand for Construction Aggregates

This section presents estimates of historical demand for aggregates and a projection of demand for the region, states, MSAs, and non-metropolitan balance of each state. [Note: Detailed tables of historical and projected demand figures for states and MSAs are shown in Appendix B.]

[5]In view of the steep decline in construction activity which has occurred with the current recession, the question of whether it is reasonable to expect a return to the trend-based growth path depicted in Figures 3.1 and 3.2 is worth considering. We know that cycles are generally more severe and of longer duration for construction than for most all other industries, largely because of the durability of the product and the long production time required for projects to be designed, funded, and completed. As the current downturn has followed on the heels of tremendous overbuilding of many types of nonresidential and residential structures, renewed activity in these sectors of construction will likely not be seen for the rest of the decade. After that time, a moderately strong surge may again be experienced. Public works construction has not followed the private construction pattern and did not experience the boom during the mid-1980's to the same degree, with deferral of maintenance/repair construction and postponement of new project starts now a feature of state and local government spending plans. The net effect may be that stronger overall government expenditures on construction will partially offset the decline in commercial and residential building during the balance of the decade, followed by a slowing to the moderate rate implied by the trend-growth line.

3.3.1 Historical Activity

Demand for sand and gravel and crushed stone grew sharply during 1980-1988, with regional sand and gravel demand up by 80% over the 9 years, reaching 56 million tons (mt). Crushed stone demand grew by 70% during the same time, reaching 32 mt (see Tables 3.2 and 3.3, respectively). The steep increases evident during this period are bounded by the extraordinarily low level of demand experienced during the 1981-1982 national recession and the peak of the building boom in 1988. These movements are consistent with the region's overall economic growth during the same period in which total employment grew by 20% from 5.5 million persons to 6.6 million persons and where construction employment grew by 80% during the real estate boom, growing from 264,600 persons to 477,200 persons.

For both types of stone products, the geographic distribution of demand becomes more concentrated within metropolitan areas, with nearly 80% of total demand found in metropolitan areas by 1988, up from figures in the low 70%'s in 1980. This higher concentration represents a significant increase in the share of demand located at the production sites serving the presently defined MSAs.

Two states, Connecticut and Massachusetts, dominate the region in terms of demand volume: taken together, they account for nearly two-thirds of total regional demand for each product in 1988. This share increased from 1980 when the two states represented approximately one-half of the region total. Nearly all of the demand in these two states is located within MSAs, and not surprisingly, the four largest MSAs are found within these two states. The largest metropolitan area in the region is the Boston-Lawrence-Salem-Lowell-Brockton MSA, which accounted for nearly one-fourth of the 1988 *total regional demand*, followed by the Hartford-New Britain-Middletown-Bristol MSA, the Bridgeport-Stamford-Norwalk-Danbury MSA, and New Haven-Waterbury-Meriden MSA.[6] These are followed by the Providence MSA in Rhode Island

[6]In order to be consistent with the BEA regional projections, the geographical basis for the MSAs for this study is counties. All of the MSA definitions can be found under the special heading of New England County Metropolitan Areas (NECMAs) used by the Office of Management and Budget in defining the areas presently recognized by the federal government (see Office of Management and Budget, 1983). A more precise set of MSA definitions exists for New England based on cities and towns (because counties are not a major government unit in the region), but federal statistical agencies continue to rely on counties as the basic reporting unit for reporting most substate economic data.

Table 3.2–New England Sand and Gravel Demand. 1980–2010 (Tons, 000)

	History			Forecast					Growth Rates (Annual, %)					
AREA\YEAR	1980	1985	1988	1990	1995	2000	2005	2010	1980–1985	1985–1990	1990–1995	1995–2000	2000–2005	2005–2010
NEW ENGLAND TOTAL	30,910	46,700	55,736	57,085	58,467	59,923	60,500	60,426	8.6	4 1	0.5	0.5	0.2	–0.0
Metropolitan Areas	22,717	35,535	43,535	45,253	46,583	47,897	48,440	48,445	9 4	5.0	0.6	0.6	0.2	0.0
Nonmetropolitan Areas	8,193	11,165	12,201	11,832	11,883	12,026	12,061	11,981	6.4	1.2	0.1	0.2	0.1	–0.1
Connecticut	5,964	10,006	14,154	15,490	16,121	16,776	17,031	17,014	10 9	9.1	0 8	0.8	0 3	–0.0
Maine	6,271	6,666	4,239	4,272	4,516	4,668	4,827	4,974	1 2	–8.5	1.1	0 7	0.7	0.6
Massachusetts	11,123	17,399	21,652	22,405	23,098	23,770	24,093	24,134	9 4	5.2	0.6	0 6	0.3	0.0
New Hampshire	4,165	6,799	8,188	7,408	7,188	7,098	6,964	6,802	10 3	1 7	–0.6	–0.3	–0 4	–0 5
Rhode Island	1,208	2,485	3,321	3,461	3,683	3,873	3,986	4,027	15.5	6.8	1.2	1.0	0.6	0.2
Vermont	2,178	3,345	4,182	4,048	3,861	3,738	3,599	3,475	9.0	3.9	–0.9	–0.6	–0 8	–0 7

Source: Eastern Research Group, Inc.

Note: The 1990 forecast was calculated prior to the release of preliminary Bureau of Mines production estimates for 1990.

Table 3 3– New England Crushed Stone Demand 1980 – 2010 (Tons, 000)

AREA\YEAR	History			Forecast					Growth Rates (Annual, %)					
	1980	1985	1988	1990	1995	2000	2005	2010	1980–1985	1985–1990	1990–1995	1995–2000	2000–2005	2005–2010
NEW ENGLAND TOTAL	18,459	26,488	31,716	32,139	32,712	33,343	33,485	33,300	7 5	3 9	0 4	0.4	0.1	–0.1
Metropolitan Areas	13,287	19,855	24,751	25,320	25,897	26,473	26,620	26,479	8 4	5.0	0.5	0 4	0 1	–0 1
Nonmetropolitan Areas	5,172	6,633	6,965	6,819	6,816	6,871	6,864	6,821	5 1	0 6	–0 0	0 2	–0 0	–0.1
Connecticut	3,425	5,492	8,079	8,704	9,060	9,430	9,572	9,562	9 9	9 6	0 8	0 8	0 3	–0.0
Maine	4,176	4,200	2,331	2,387	2,406	2,391	2,386	2,383	0 1	–10 7	0 2	–0.1	–0.0	–0 0
Massachusetts	6,174	9,351	11,961	12,182	12,545	12,888	13,043	13,072	8 7	5 4	0.6	0.5	0.2	0 0
New Hampshire	2,607	3,909	4,810	4,347	4,217	4,163	4,085	3,989	8 4	2 1	–0 6	–0 3	–0 4	–0 5
Rhode Island	714	1,462	1,982	2,005	2,087	2,149	2,164	2,135	15 4	6 5	0 8	0.6	0.1	–0.3
Vermont	1,363	2,073	2,553	2,514	2,398	2,321	2,235	2,159	8.8	3.9	–0 9	–0 6	–0 8	–0 7

Source: Eastern Research Group, Inc.

Note: The 1990 forecast was calculated prior to the release of preliminary Bureau of Mines production estimates for 1990.

and the Manchester MSA in New Hampshire. Other large demand centers include the Portland MSA in Maine, the Worcester MSA in Massachusetts, the Portsmouth MSA in New Hampshire, and the Burlington MSA in Vermont.

During the 9-year historical period, Rhode Island was the fastest growing state in the region, with a 14% (compound) annual growth rate for both sand and gravel and crushed stone demand, followed by Connecticut with an 11% rate for both products. Of the remaining states, all had strong growth during the 1980-1988 period (at or above 8% per year) except for Maine which experienced a decline of 5% per year for sand and gravel and 7% per year for crushed stone, measuring between the two years. As discussed below, Maine exhibited highly volatile demand, originating from the wide swings in non-metropolitan county public construction expenditures.

3.3.2 Projection Overview

The BEA trend-based projection for future aggregates demand shows a return to much more moderate growth for the region: sand and gravel demand is seen in Table 3.2 to be rising from 56 mt to 60 mt by 2010, and crushed stone demand (shown in Table 3.3) grows from 32 mt to 33 mt by the end of the forecast period (see Figures 3.1 and 3.2). These small net increases are consistent with the BEA projection for slow population growth (less than 0.5% per year) and even slower growth in construction activity, with a total gain of only 5,000 jobs by 2010 to 483,400, up from 477,200.

As has been described, the BEA projections are not sufficiently current to capture the recent downturn in activity. As illustrated in Figures 3.1 and 3.2, USBM preliminary estimates show that actual demand fell approximately one-third in 1989 and 1990. The ensuing discussion of the ERG forecasts (based on the BEA projections) should be considered primarily applicable to the long-run forecasting issue and may not reflect demand levels in the early 1990s.

Returning to the ERG demand projections, the MSA share of total demand over the 1989-2010 period is expected to remain virtually unchanged from the 80% figure seen in 1988 (see Figures 3.3 and 3.4). The BEA projection calls for a stable growth distribution of non-metropolitan

Figure 3.3: Sand and Gravel Demand 1980 – 2010
New England Region, Metropolitan vs. Nonmetropolitan
(The projections shown assume a recovery to pre-slump demand levels.)

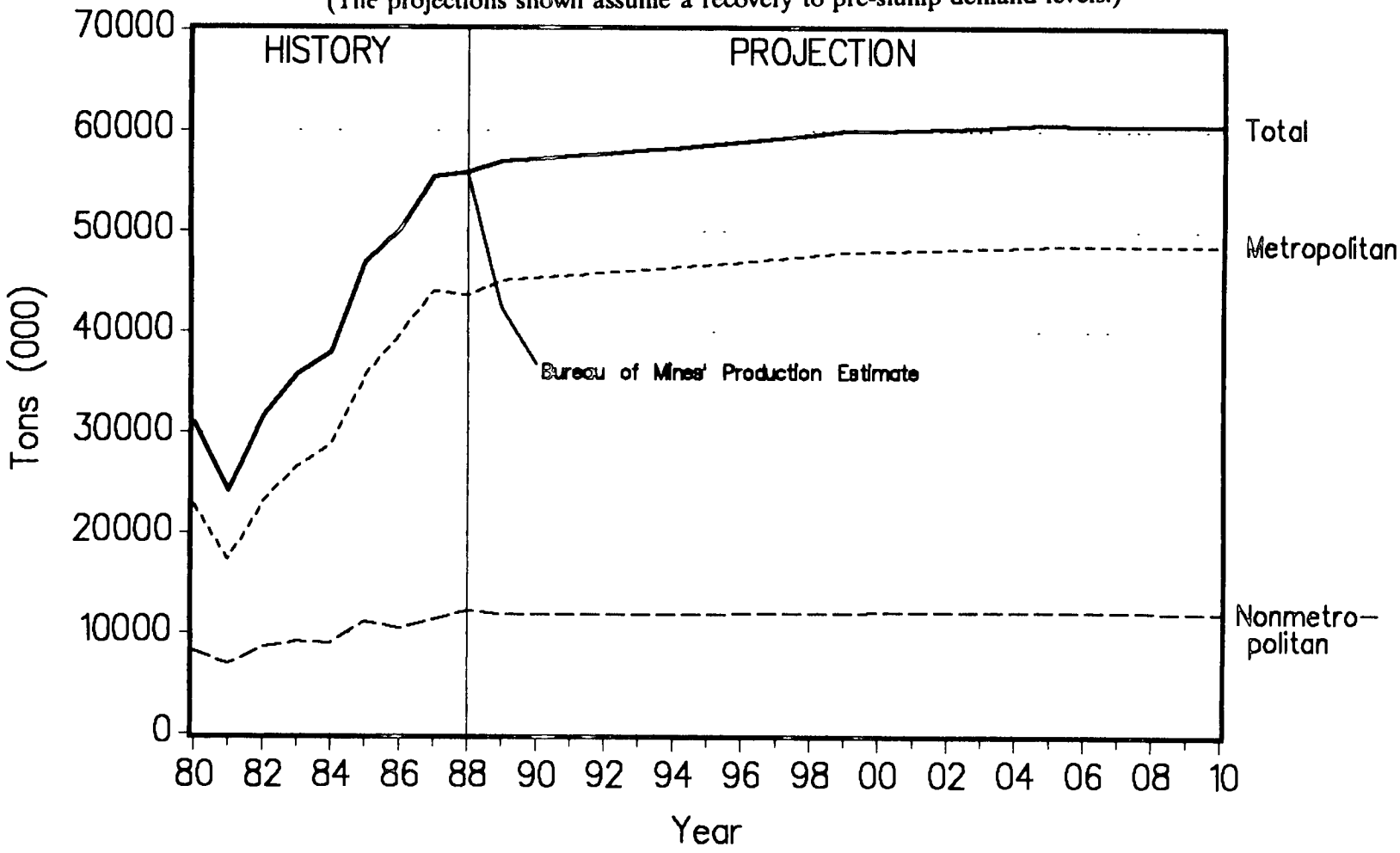
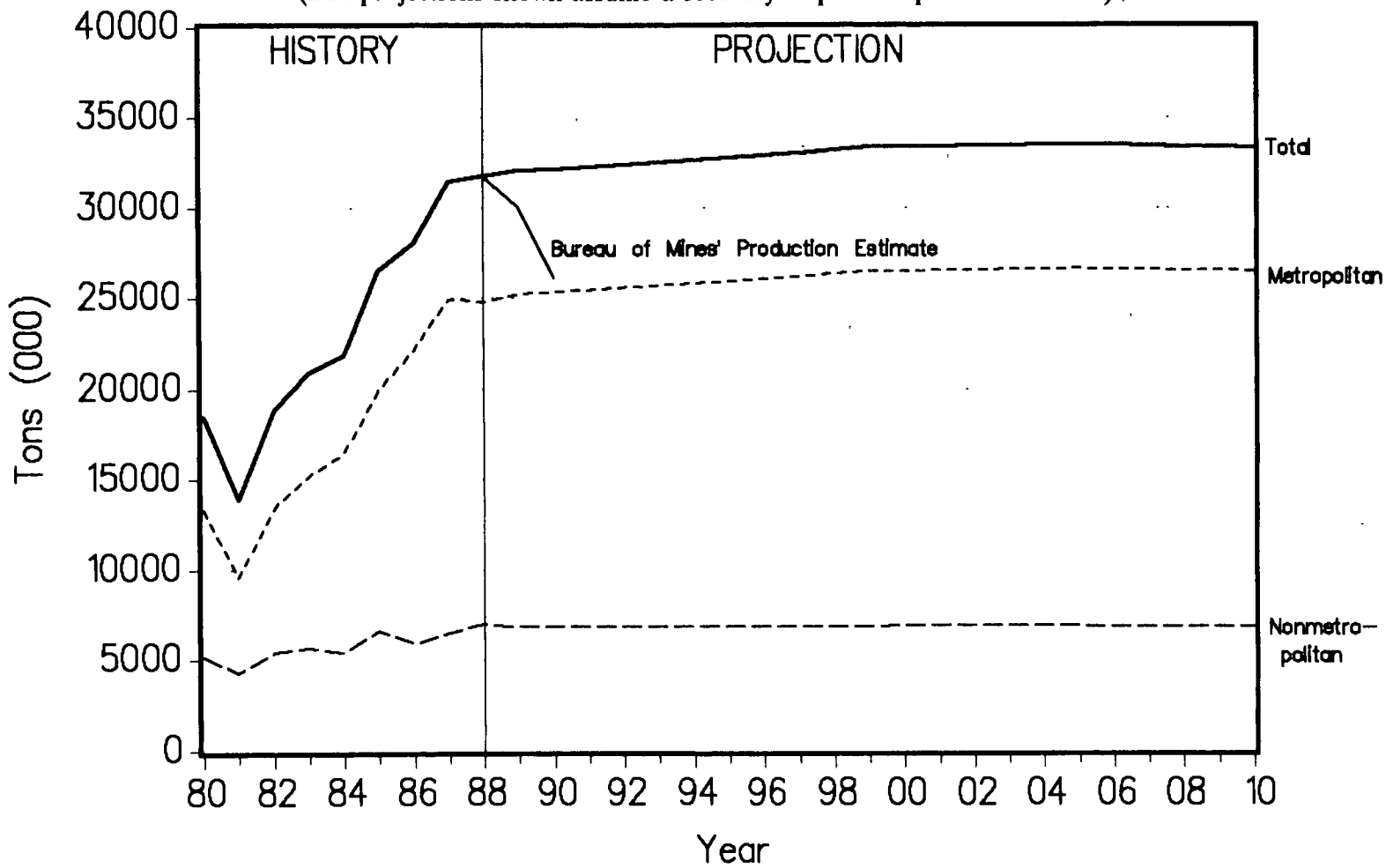


Figure 3.4: Crushed Stone Demand 1980 – 2010
New England Region, Metropolitan vs. Nonmetropolitan
(The projections shown assume a recovery to pre-slump demand levels.)



areas versus MSAs, ending the decades of the general migration of the population towards MSAs. The distribution of demand within MSAs however, is not static, with shifts to and from particular MSAs by as much as two percentage points. The specific shifts will be discussed below in the context of specific states.

Over the projection period, Connecticut, Massachusetts, and Rhode Island are expected to see increased shares of regional activity: Connecticut sand and gravel demand is expected to grow from 14 mt in 1988 to 17 mt in 2010, with its share of regional activity growing from 25% to 28% (see Figure 3.5). Similarly, crushed stone demand in Connecticut will grow from 8 mt in 1988 to nearly 10 mt in 2010, with its share of regional demand also growing from 25% to 28% (see Figure 3.6). Massachusetts sand and gravel demand is anticipated to grow from 22 mt in 1988 to 24 mt in 2010, with a share increase of 1 percentage point to reach 40%. Crushed stone demand will show a similar share increase, as the volume grows from 12 mt to 13 mt. Rhode Island sand and gravel will grow from 3 mt to 4 mt over the projection period with its share rising from 6% to 7%. Crushed stone demand will remain stable, however, with demand at approximately 2 mt.

Both New Hampshire and Vermont are expected to see demand declines during the projection period, but the change in volume is very small: neither will see a drop of more than 1.5 mt. The relatively static volumes do, however, translate to a loss in the regional share of activity, with New Hampshire's share of sand and gravel and crushed stone falling to 11% and 12% in 2010, respectively, from 15% shares for both products in 1988. Similarly, Vermont's share of the region will fall to 6% for both products by 2010 from 8% in 1988.

Figure 3.5: Sand and Gravel Demand 1980 – 2010
New England States

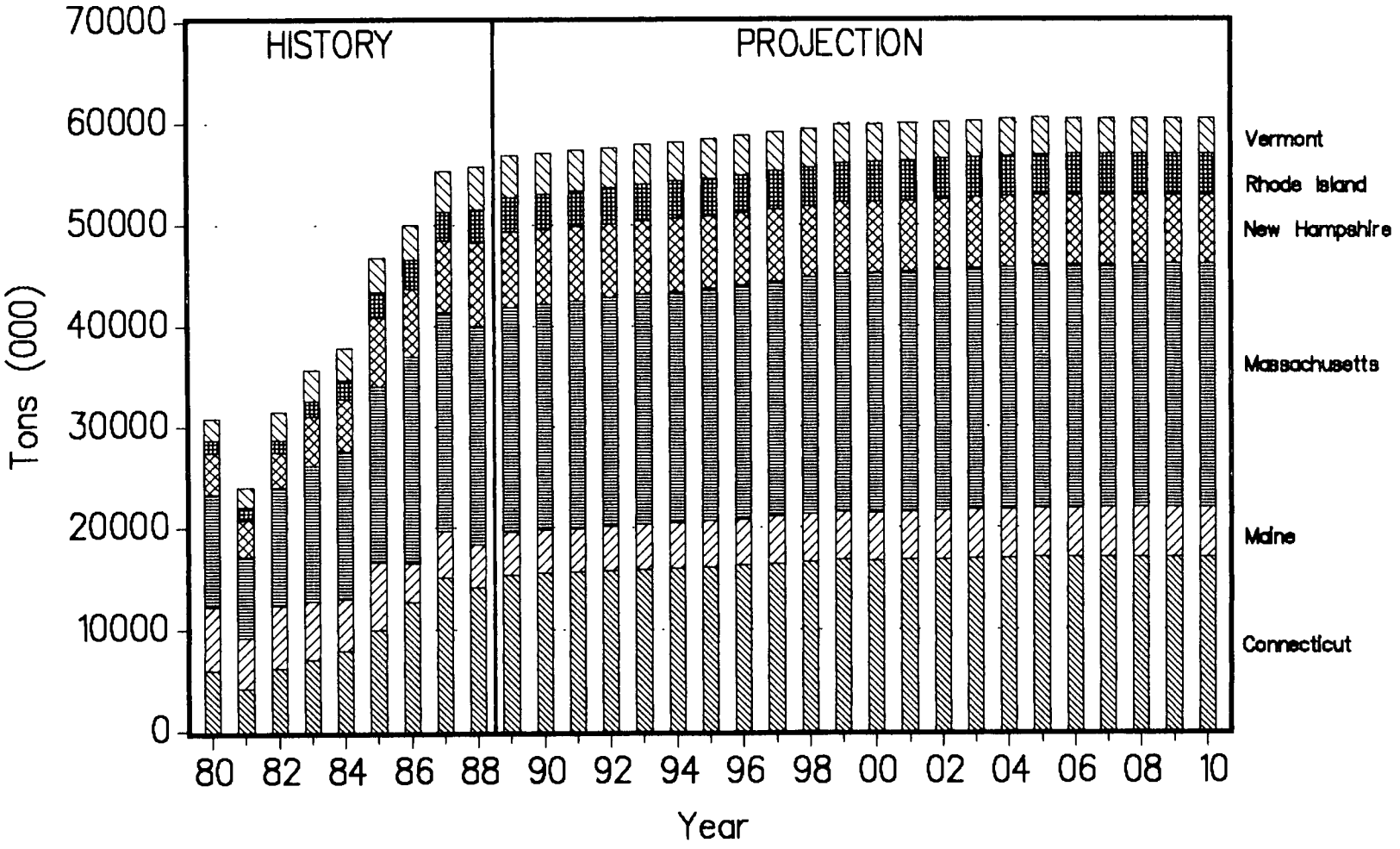
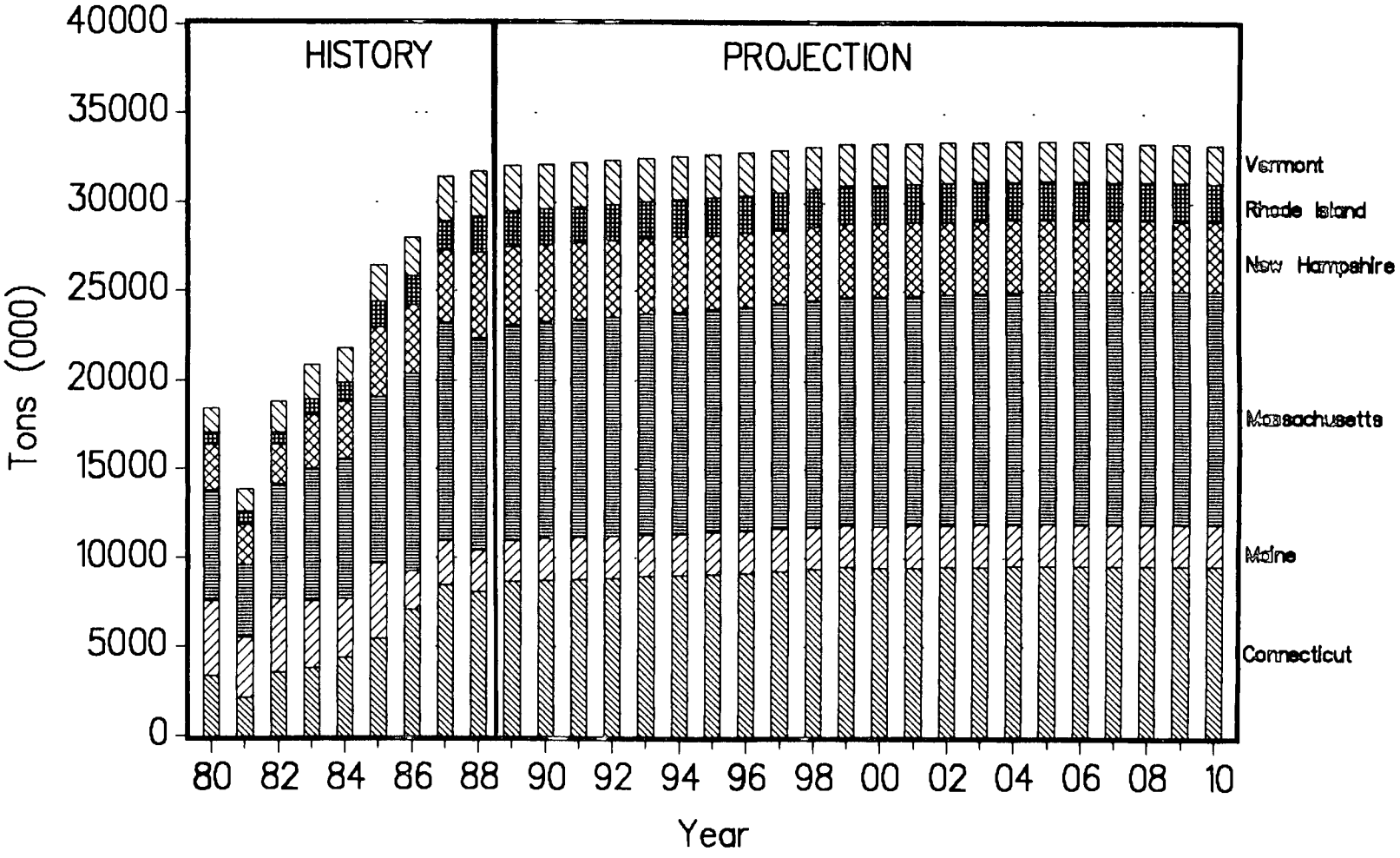


Figure 3.6: Crushed Stone Demand 1980 – 2010
New England States



3.4 State and MSA Histories and Projections: Sand and Gravel and Crushed Stone

This section discusses state-level historical and projected demand for sand and gravel and crushed stone. Each state-specific discussion highlights the significant occurrences with respect to MSA-level demand and shifts in the MSA shares of state totals.

In general, the pattern of the demand forecasts obtained for sand and gravel and crushed stone are quite similar. Because both products are used in similar applications, this is not surprising. Some slight variation between the two products will be apparent in the historical estimates, however, according to the changing mix of construction activity.

Graphs of the state demand projections include actual Bureau of Mines production estimates for 1989 and 1990. In most states these estimates have fallen sharply below the forecasted figures, although in a few cases they are above the forecasts. The discussion focuses primarily on the ERG demand forecasts, however, on the assumption of a return in the near future to the production levels suggested by the long-term forecasts.

Summary tables and graphs of historical and forecasted demand for each state are included. See Appendix B for the full annual history and projections.

Maps depicting the demand and supply locations and are provided for each state. The maps all reflect the ERG forecasts of aggregates demand, based on the BEA projections. For a full discussion of the method in which the maps were developed, see Section Four. A table follows each set of state maps summarizing the county-by-county projections displayed in the maps.

The supply maps include all locations producing or processing sand and gravel or crushed stone. Since the number of processing locations is significant, the number of supply locations should not be interpreted as evidence that actual excavation locations are as numerous as they appear on the map. These locations were identified from the Mine Safety and Health Administration data base of excavation establishments.

3.4.1 Connecticut
Aggregates History and Projections

Sand and Gravel

During the 1980s, demand for sand and gravel in Connecticut grew at an annual rate of 11% per year, a growth rate second in the region only to Rhode Island. By 1988 Connecticut demanded 14 mt, second only to Massachusetts in state tonnage. As shown in Table 3.4, high growth characterized all MSAs and non MSAs within the state. The non-MSA counties grew most rapidly (15% per year), with Hartford, New Haven, and New London all following at above 11% per year. In volume terms, Hartford's position as the largest market area strengthened during the period, followed by Bridgeport and the fast-growing New Haven MSA, as shown in Figure 3.7. The non-MSA counties grew quickly during the period, with share of the state growing from 6% to 9% over the nine year period. With volumes near 1 mt, however, the non-MSA counties are not comparatively large.

Based on the BEA projections, ERG projected that state demand in the near term (1988-2000) for sand and gravel will continue to grow, reaching nearly 17 mt, a growth rate of 0.8% per year over the period. This growth rate, which is in line with expected increases in population and employment, is lower than the rapid increases experienced during the 1980s. Beyond 2000, demand is expected to flatten at slightly more than 17 mt.

Similarly during the 1988-2000 period, all of the submarkets are expected to grow, although only the New London MSA will display a solid growth rate of 4% per year. Its share of the state will grow significantly, from 8% in 1988 to approximately 14% in 2000. Beyond 2000, New London is expected to be the only MSA with a positive growth in demand, growing to almost 2.5 mt by 2010. Modest declines characterize the remaining markets, with no significant shifts in market shares anticipated during the later period.

Table 3 4–Connecticut Sand and Gravel Demand 1980–2010 (Tons, 000)

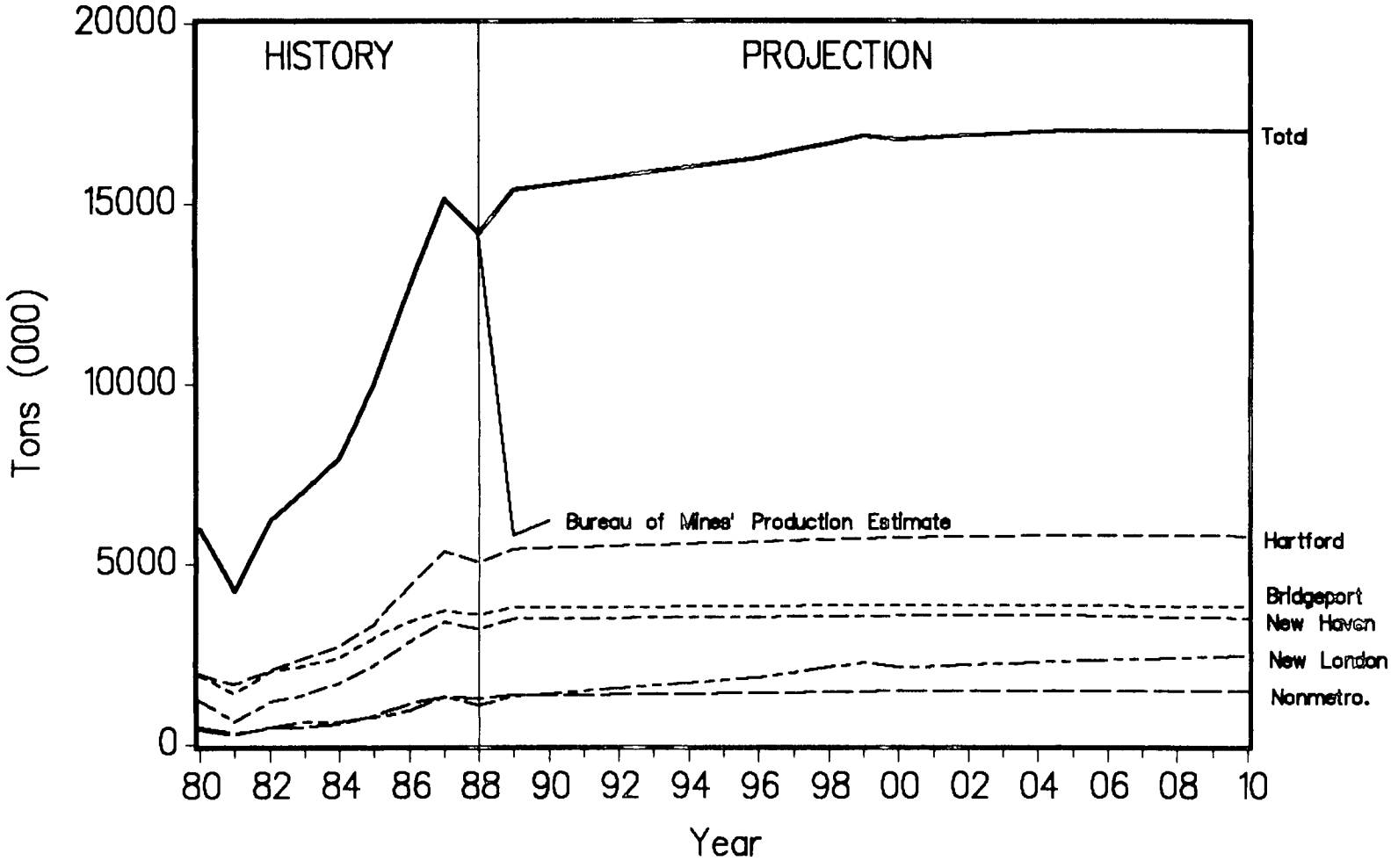
AREA\YEAR	History			Forecast					Growth Rates (Annual, %)					
	1980	1985	1988	1990	1995	2000	2005	2010	1980–1985	1985–1990	1990–1995	1995–2000	2000–2005	2005–2010
STATE TOTAL	5,964	10,006	14,154	15,490	16,121	16,776	17,031	17,014	10 9	9.1	0 8	0.8	0 3	–0 0
Bridgeport–Stamford–Norwalk–Danbury	1,932	2,946	3,577	3,787	3,812	3,864	3,847	3,812	8.8	5.2	0 1	0.3	–0.1	–0 2
Hartford–New Britain–Middletown–Bristol	1,945	3,318	5,047	5,450	5,592	5,750	5,810	5,790	11.3	10 4	0 5	0 6	0.2	–0.1
New Haven–Waterbury–Meriden	1,203	2,189	3,174	3,478	3,511	3,558	3,558	3,488	12.7	9.7	0 2	0 3	0.0	–0 4
New London–Norwich	469	757	1,081	1,408	1,792	2,125	2,315	2,445	10 0	13.2	4.9	3.5	1.7	1 1
Nonmetropolitan Counties	415	797	1,275	1,367	1,414	1,479	1,501	1,479	13.9	11.4	0.7	0 9	0 3	–0 3

Source: Eastern Research Group, Inc.

Note: The 1990 forecast was calculated prior to the release of preliminary Bureau of Mines production estimates for 1990.

Figure 3.7: Sand and Gravel Demand 1980 – 2010
Connecticut, State and Metropolitan Areas

(The projections shown assume a recovery to pre-slump demand levels.)



Crushed Stone

Over the 1980-1988 period, Connecticut also experienced a strong increase in the demand for crushed stone. Total demand rose from 3 mt to 8 mt, an 11% annual growth rate, again second only to Rhode Island (which has, however, only one-fourth the volume). All of the state's market areas showed very strong levels of growth during the period, as shown in Figure 3.8 and Table 3.5. As with sand and gravel, the largest markets were Hartford, followed by Bridgeport, New Haven, New London, and the non-MSA counties. The fastest growing markets were the non-MSA counties, followed by New Haven, Hartford, New London, and Bridgeport.

For the 1988-2000 period, all markets in Connecticut are projected to continue to grow, but at dramatically lower rates than previously seen. Only New London is likely to see any significant increase in volume, growing from 0.6 mt to 1.2 mt. The remaining markets will see increases of no more than 0.25 mt.

During the 2000-2010 period, projected demand falls off slightly, except for very slow (but positive) growth in New London. The largest decreases occur in New Haven, followed by the non-MSA counties, Bridgeport, and Hartford. The decreases are so slight, however, that they are nearly as imperceptible as the gains they saw in the 1989-2000 period.

Connecticut Maps - Maps 3-1 through 3-10 illustrate the demand and supply for sand and gravel and crushed stone in Connecticut. Table 3.6 presents the county-by-county projections that are displayed in the maps. Map 3-5 depicts the supply locations for sand and gravel facilities and shows a number of producing locations in Southeastern Connecticut. Much of the material produced, however, is transported to construction and other projects in New York, according to discussions with state geologists. Thus the mapping of supply locations overestimates the actual availability of aggregates resources in Connecticut.

Map 3-10 depicts the supply of crushed stone in Connecticut and includes a large facility in the northwestern corner of the state that produces crushed stone for industrial processes other than construction. Such facilities do not affect the overall availability of crushed stone for construction purposes.

Figure 3.8: Crushed Stone Demand 1980 – 2010
Connecticut, State and Metropolitan Areas

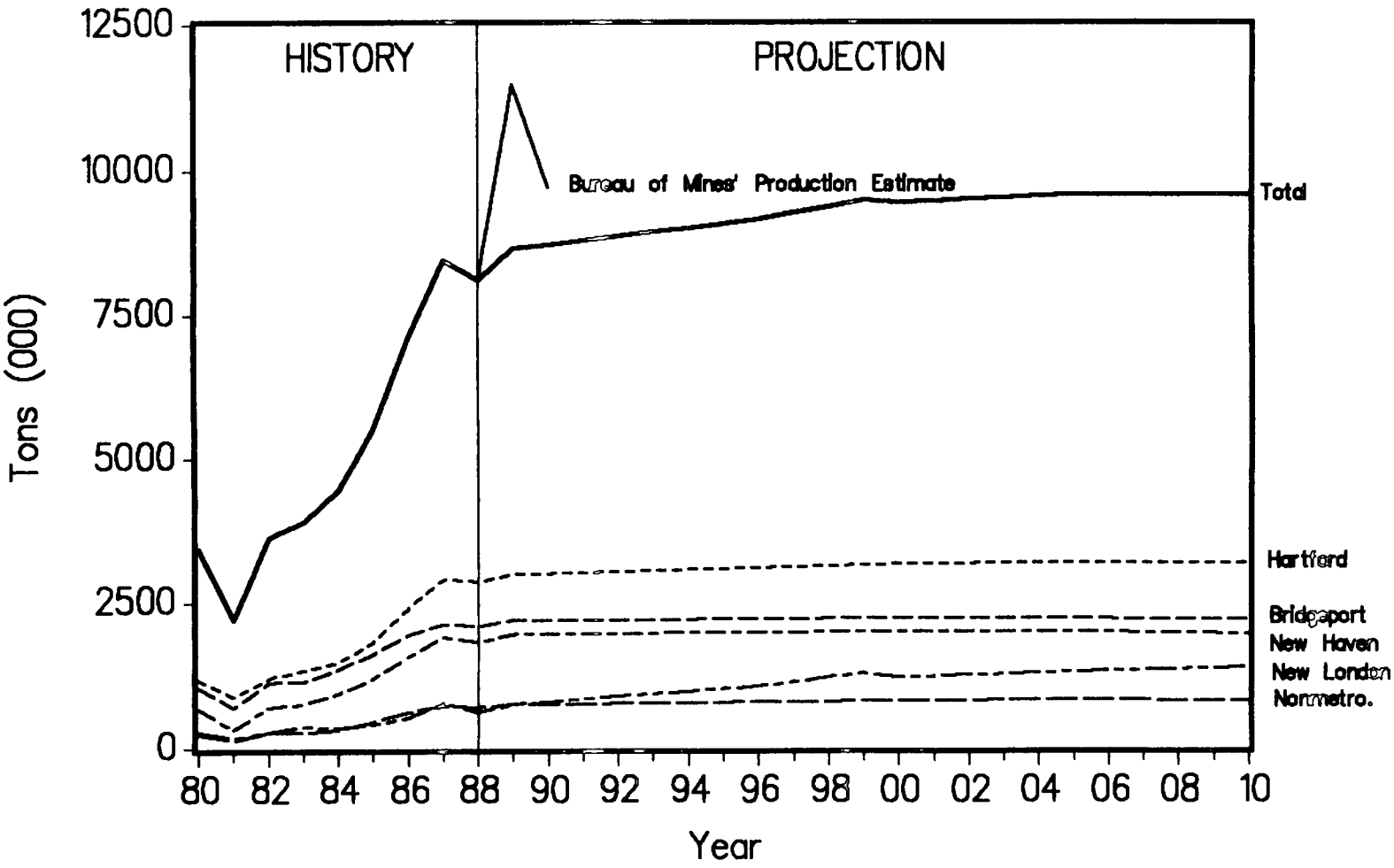


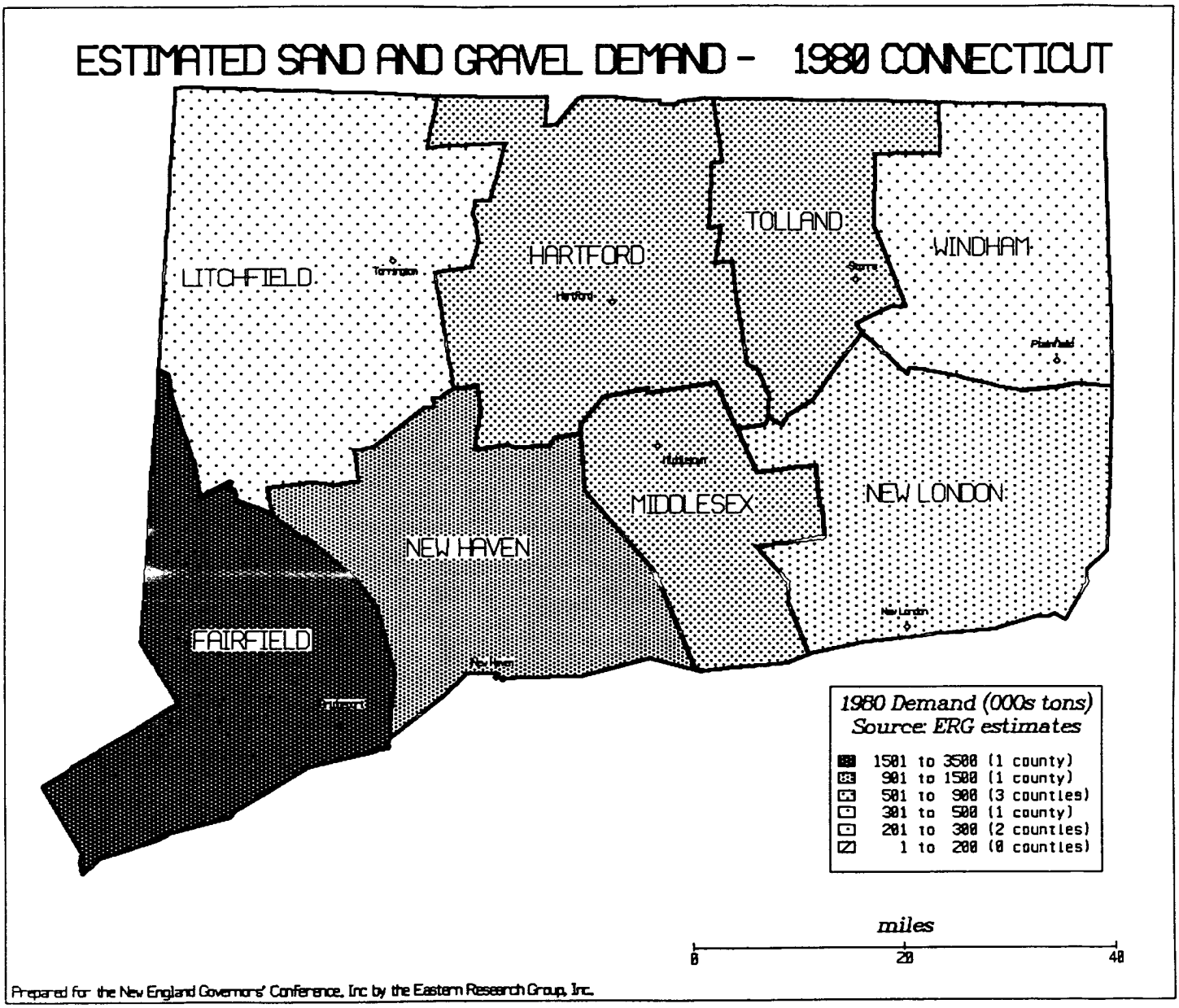
Table 3.5–Connecticut Crushed Stone Demand: 1980 – 2010 (Tons, 000)

	History			Forecast					Growth Rates (Annual, %)					
AREA\YEAR	1980	1985	1988	1990	1995	2000	2005	2010	1980–1985	1985–1990	1990–1995	1995–2000	2000–2005	2005–2010
STATE TOTAL	3,425	5,492	8,079	8,704	9,060	9,430	9,572	9,562	9.9	9.6	0.8	0.8	0.3	–0.0
Bridgeport–Stamford–Norwalk–Danbury	1,053	1,619	2,087	2,190	2,205	2,238	2,227	2,205	9.0	6.2	0.1	0.3	–0.1	–0.2
Hartford–New Britain–Middletown–Bristol	1,186	1,818	2,857	2,997	3,074	3,160	3,192	3,181	8.9	10.5	0.5	0.6	0.2	–0.1
New Haven–Waterbury–Meriden	677	1,198	1,815	1,958	1,977	2,003	2,003	1,963	12.1	10.3	0.2	0.3	0.0	–0.4
New London–Norwich	269	408	615	802	1,021	1,211	1,319	1,393	8.6	14.5	4.9	3.5	1.7	1.1
Nonmetropolitan Counties	239	449	706	757	783	819	831	819	13.4	11.0	0.7	0.9	0.3	–0.3

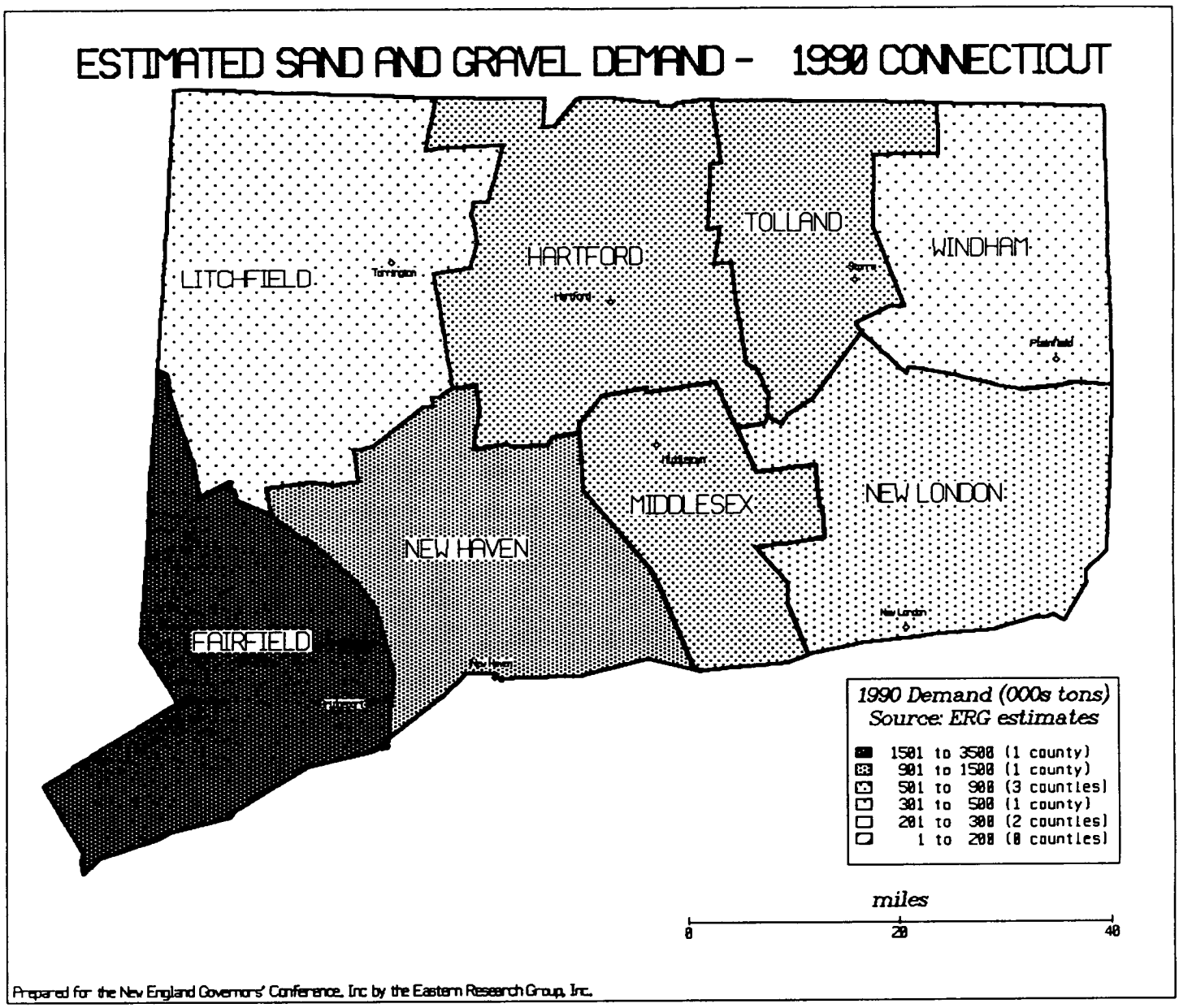
Source: Eastern Research Group, Inc.

Note: The 1990 forecast was calculated prior to the release of preliminary Bureau of Mines production estimates for 1990.

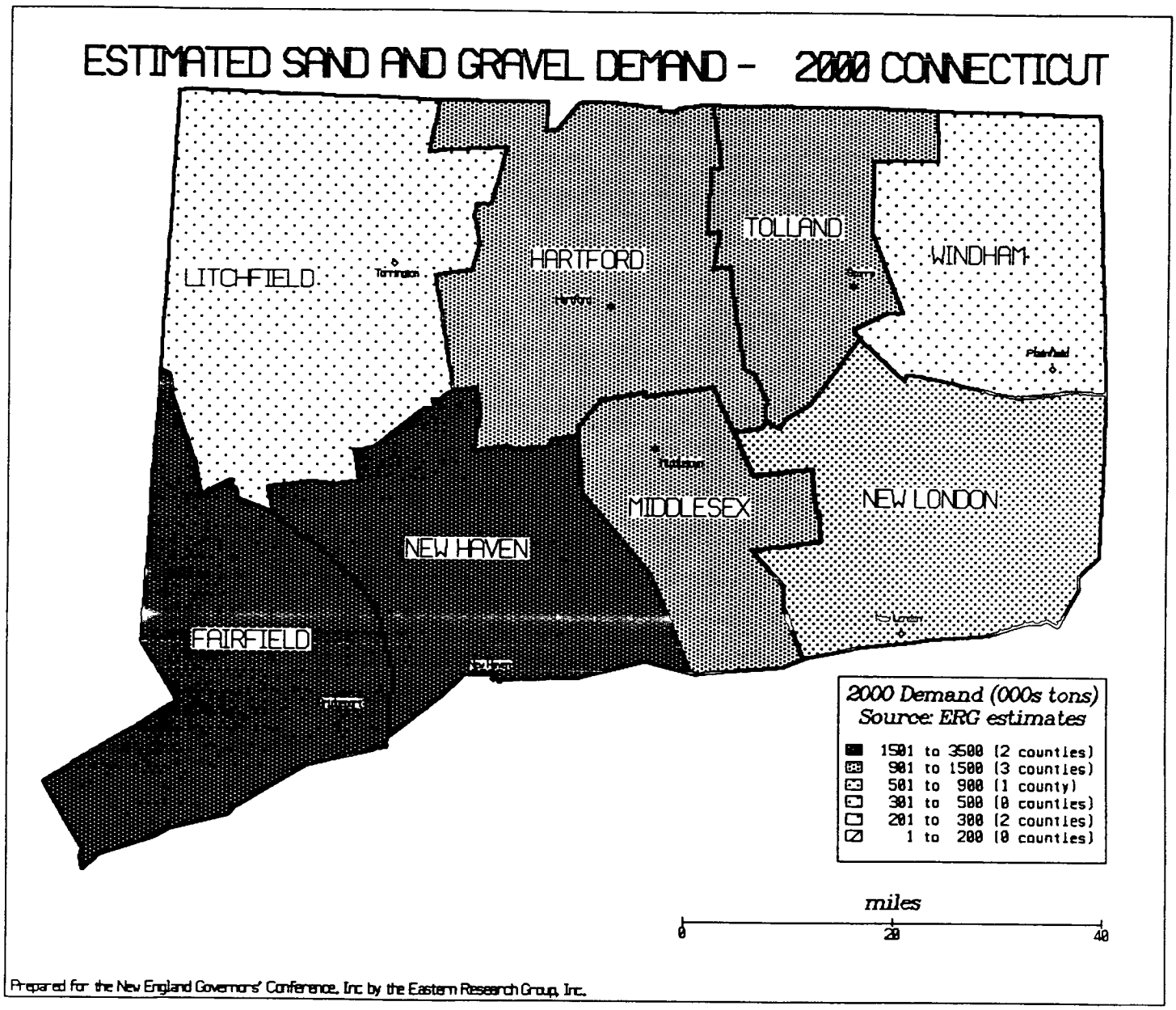
Map 3-1


ESTIMATED SAND AND GRAVEL DEMAND - 1980 CONNECTICUT
LITCHFIELD
HARTFORD
TOLLAND
WINDHAM
MIDDLESEX
NEW LONDON
NEW HAVEN
FAIRFIELD
1980 Demand (000s tons)
Source: ERG estimates
1501 to 3500 (1 county)
901 to 1500 (1 county)
501 to 900 (3 counties)
301 to 500 (1 county)
201 to 300 (2 counties)
1 to 200 (0 counties)
miles
0
20
40
Prepared for the New England Governors' Conference, Inc by the Eastern Research Group, Inc.

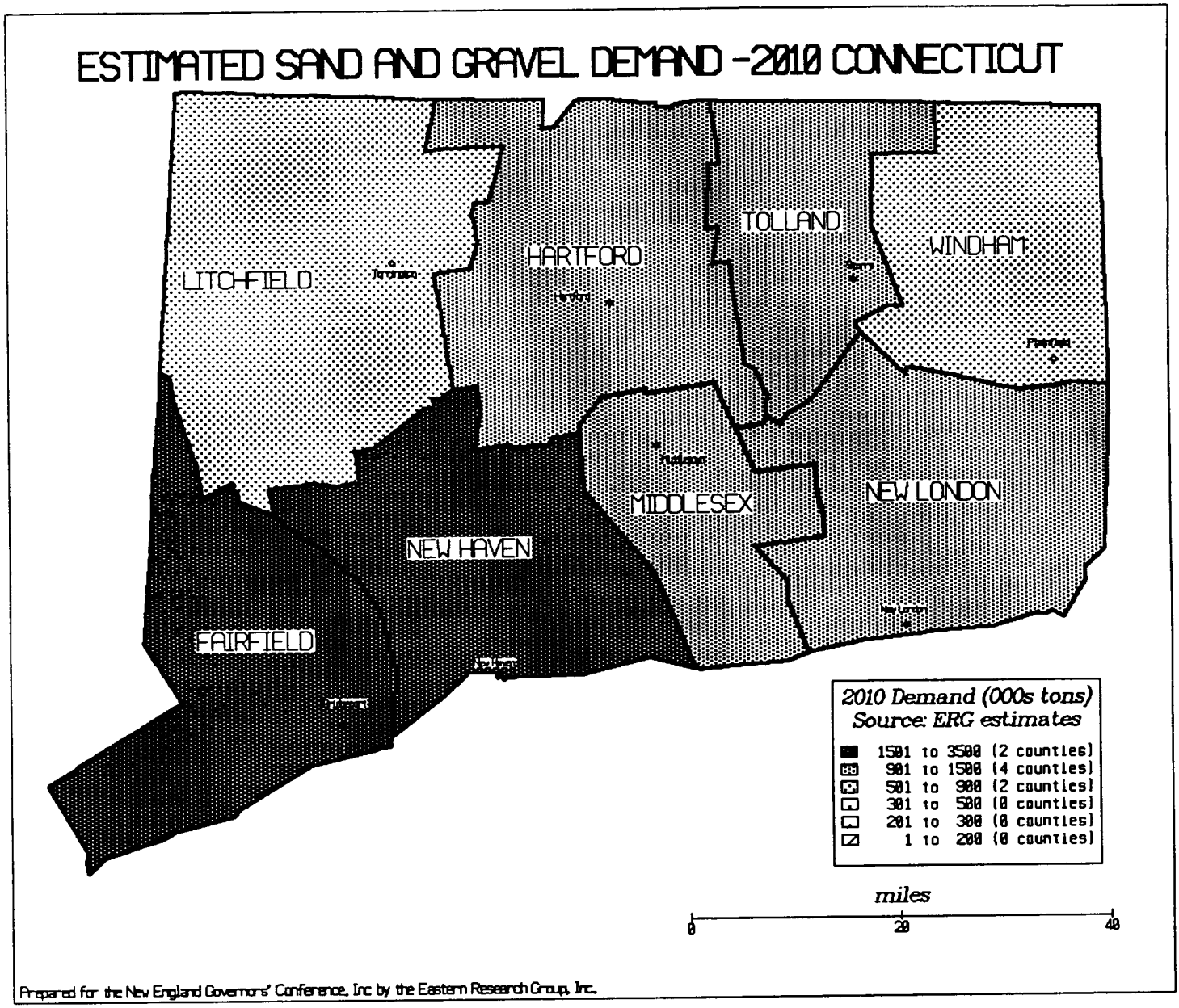
Map 3-2


ESTIMATED SAND AND GRAVEL DEMAND - 1990 CONNECTICUT
LITCHFIELD
HARTFORD
TOLLAND
WINDHAM
NEW HAVEN
MIDDLESEX
NEW LONDON
FAIRFIELD
1990 Demand (000s tons)
Source: ERG estimates
1501 to 3500 (1 county)
901 to 1500 (1 county)
501 to 900 (3 counties)
301 to 500 (1 county)
201 to 300 (2 counties)
1 to 200 (8 counties)
miles
0
20
40
Prepared for the New England Governors' Conference, Inc by the Eastern Research Group, Inc.

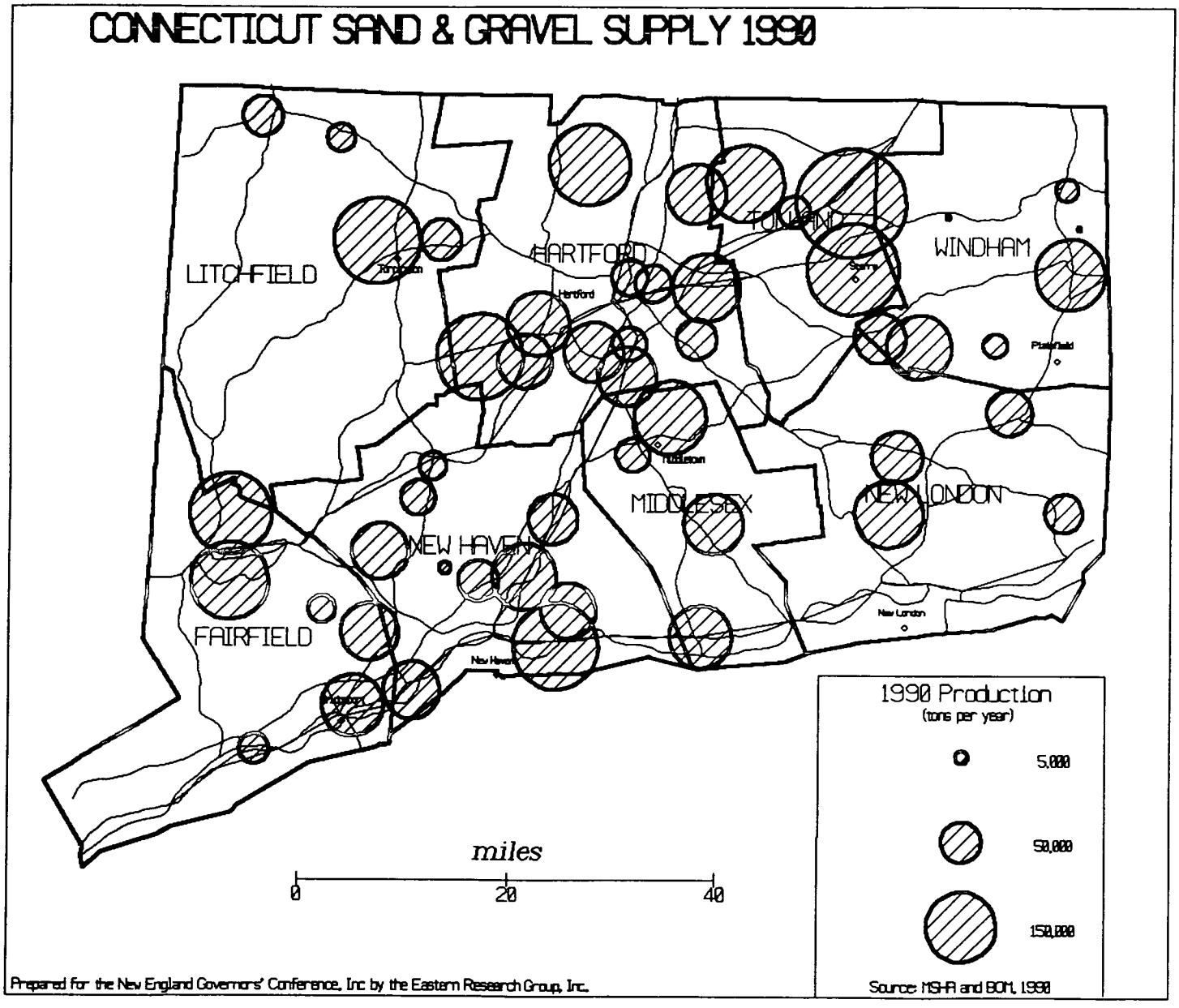
Map 3-3


ESTIMATED SAND AND GRAVEL DEMAND - 2000 CONNECTICUT
LITCHFIELD
HARTFORD
TOLLAND
WINDHAM
MIDDLESEX
NEW LONDON
NEW HAVEN
FAIRFIELD
2000 Demand (000s tons)
Source: ERG estimates
1501 to 3500 (2 counties)
901 to 1500 (3 counties)
501 to 900 (1 county)
301 to 500 (0 counties)
201 to 300 (2 counties)
1 to 200 (0 counties)
miles
0
20
40
Prepared for the New England Governors' Conference, Inc by the Eastern Research Group, Inc.

Map 3-4

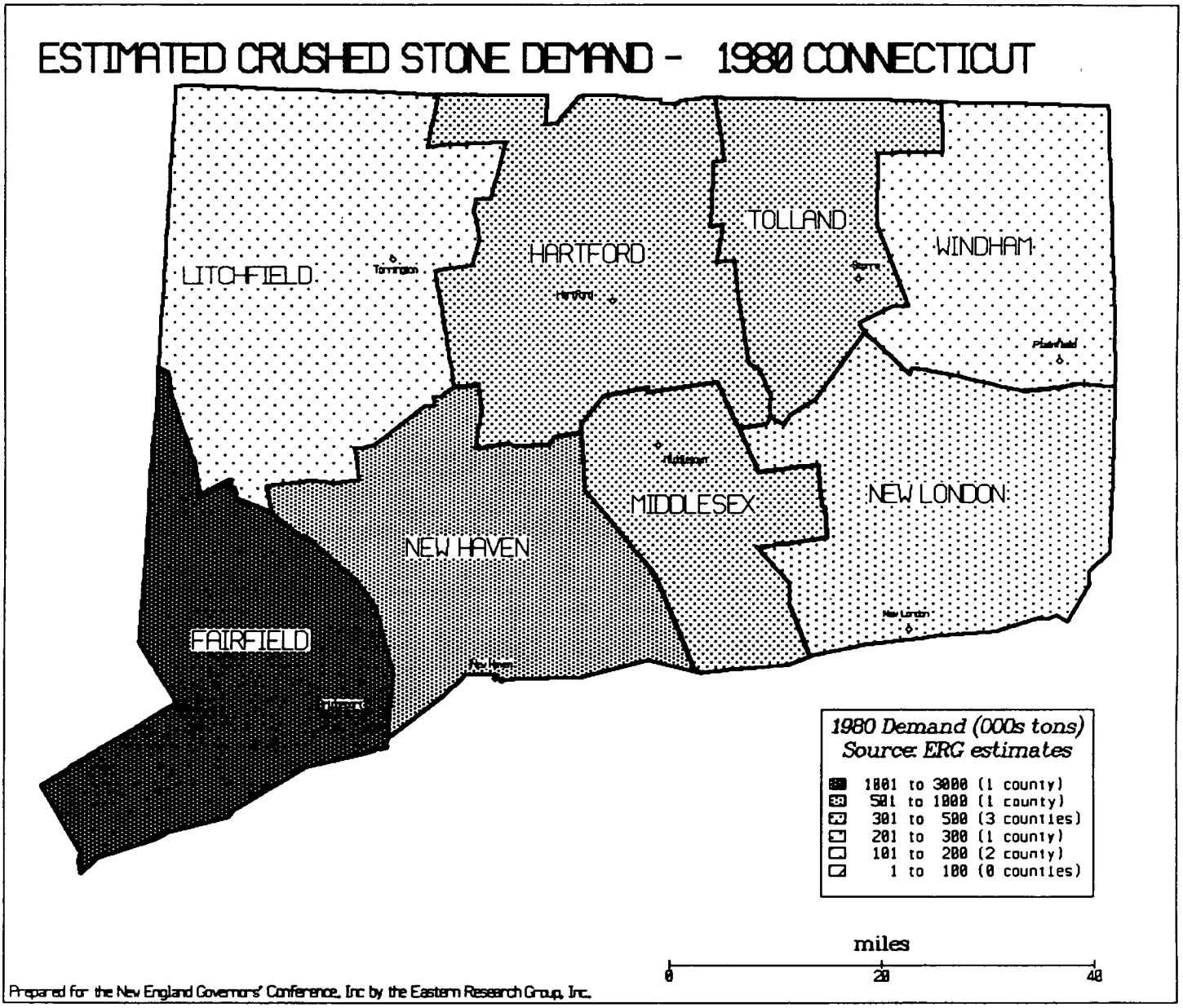

ESTIMATED SAND AND GRAVEL DEMAND -2010 CONNECTICUT
LITCHFIELD
HARTFORD
TOLLAND
WINDHAM
MIDDLESEX
NEW LONDON
NEW HAVEN
FAIRFIELD
2010 Demand (000s tons)
Source: ERG estimates
1501 to 3500 (2 counties)
901 to 1500 (4 counties)
501 to 900 (2 counties)
301 to 500 (0 counties)
201 to 300 (0 counties)
1 to 200 (0 counties)
miles
0
20
40
Prepared for the New England Governors' Conference, Inc by the Eastern Research Group, Inc.

Map 3-5

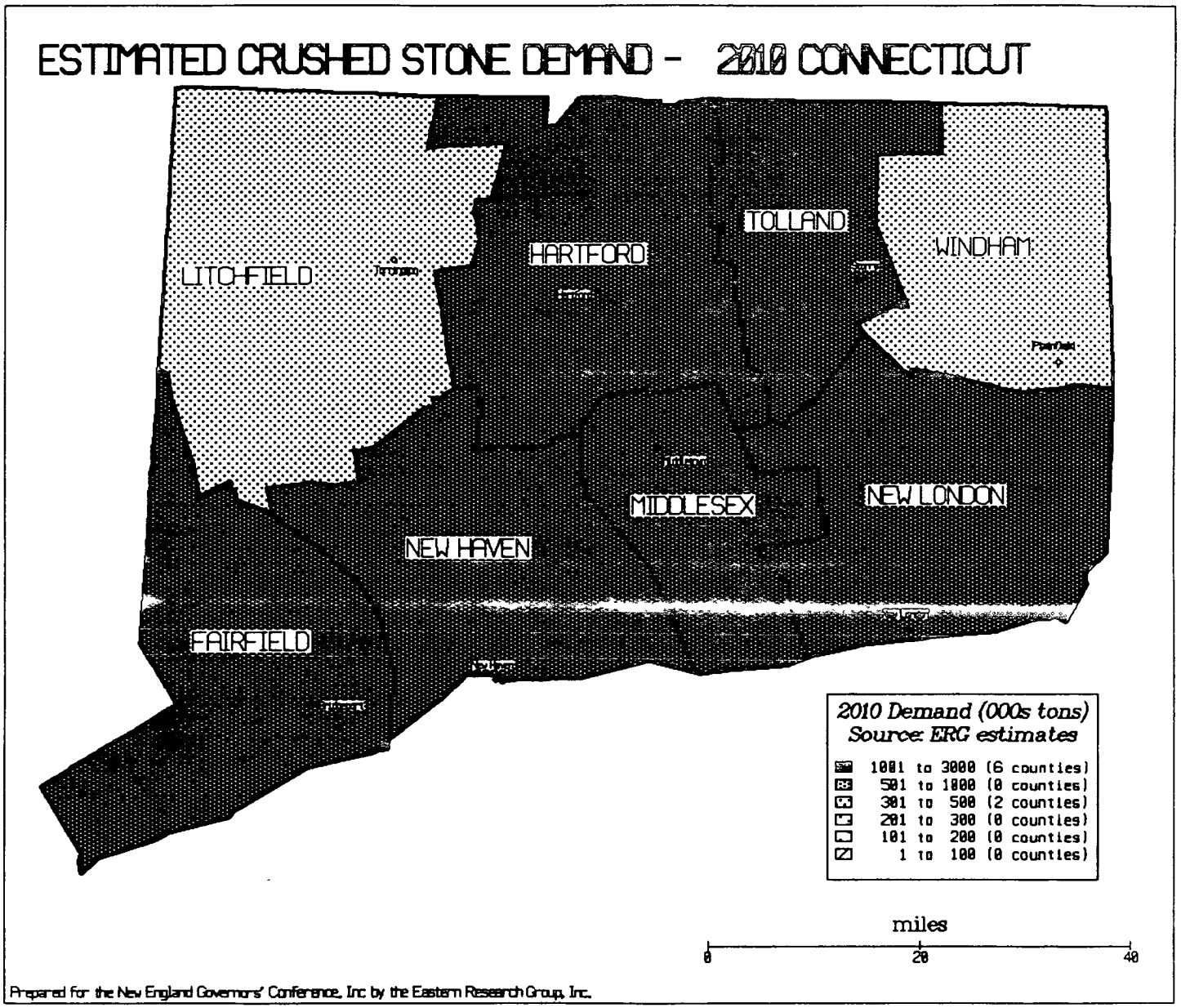


Production locations shown include aggregate producers and processors. Some producers of non-construction aggregates may also be included.

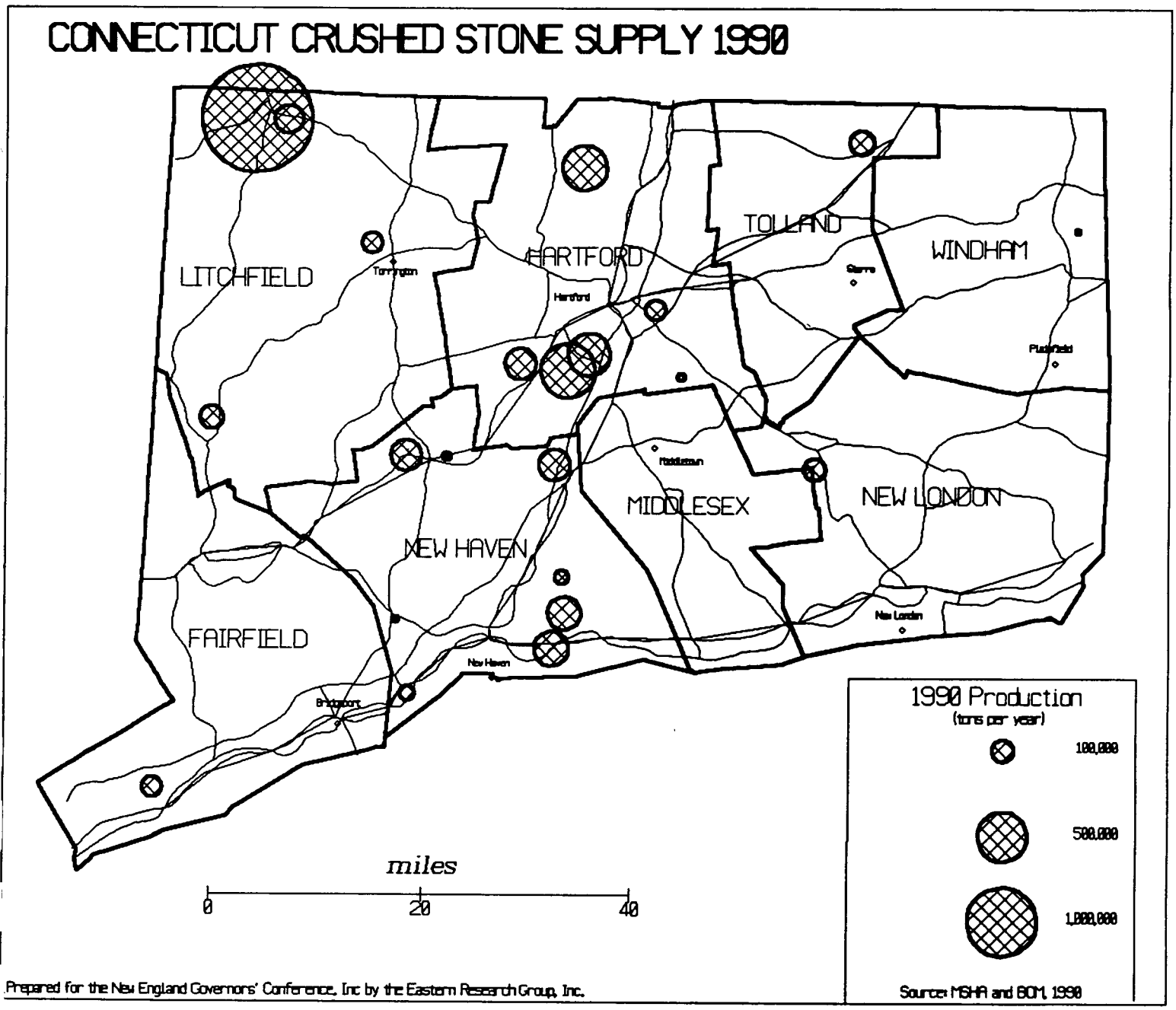
Map 3-6


ESTIMATED CRUSHED STONE DEMAND - 1980 CONNECTICUT
LITCHFIELD
HARTFORD
TOLLAND
WINDHAM
MIDDLESEX
NEW LONDON
NEW HAVEN
FAIRFIELD
1980 Demand (000s tons)
Source: ERG estimates
1001 to 3000 (1 county)
501 to 1000 (1 county)
301 to 500 (3 counties)
201 to 300 (1 county)
101 to 200 (2 county)
1 to 100 (0 counties)
miles
0
20
40
Prepared for the New England Governors' Conference, Inc by the Eastern Research Group, Inc.

Map 3-9


ESTIMATED CRUSHED STONE DEMAND - 2010 CONNECTICUT
LITCHFIELD
HARTFORD
TOLLAND
WINDHAM
MIDDLESEX
NEW LONDON
NEW HAVEN
FAIRFIELD
2010 Demand (000s tons)
Source: ERG estimates
1001 to 3000 (6 counties)
501 to 1000 (0 counties)
301 to 500 (2 counties)
201 to 300 (0 counties)
101 to 200 (0 counties)
1 to 100 (0 counties)
miles
0
20
40
Prepared for the New England Governors' Conference, Inc by the Eastern Research Group, Inc.

Map 3-10



Production locations shown include aggregate producers and processors. Some producers of non-construction aggregates may also be included.

TABLE 3.6
HISTORICAL AND PROJECTED DEMAND ESTIMATES
– CONNECTICUT, BY COUNTY (in 000s of tons)

County Name	Sand & Gravel				Crushed Stone			
	1980	1990	2000	2010	1980	1990	2000	2010
Fairfield	1,932	2,022	2,387	3,400	1,053	2,190	2,238	2,205
Hartford	648	687	901	1,461	395	999	1,053	1,060
Litchfield	208	231	277	562	120	379	409	409
Middlesex	648	687	901	1,461	395	999	1,053	1,060
New Haven	1,203	1,183	1,702	2,840	677	1,958	2,003	1,963
New London	469	472	616	926	269	802	1,211	1,393
Tolland	648	687	901	1,461	395	999	1,053	1,060
Windham	208	231	277	562	120	379	409	409
State Total	5,964	6,202	7,963	12,674	3,425	8,704	9,430	9,562

Source: ERG Estimates

3.4.2 Maine
Aggregates History and Projections

Sand and Gravel

As noted above in the regional overview, Maine's historical demand for sand and gravel (and crushed stone) is characterized by highly volatile movements in public construction expenditures (see Figure 3.9 and Table 3.7). During the 1980-1988 period, state demand fell from 6 mt to 4 mt. This decline appears to be more significant than it really is, however, since 1980 was a particularly strong year for expenditures and 1988 was the second worst year. Within the state, the market was dominated by the non-MSA market, which is spatially large, and the most erratic of the market areas. Portland, Bangor, and Lewiston follow in order of share. During the period, Portland was the only market which achieved positive overall growth, although only barely at 0.3% per year. The remaining markets, except for the erratic non-MSA counties, experienced moderate declines.

The outlook for sand and gravel demand in the state is for slow, steady growth: during the near-term, growth should approach 1% per year with annual tonnages rising from 4.2 mt to 4.6 mt. Later on, growth will slacken slightly to 0.6% per year, with tonnage reaching nearly 5.0 mt by 2010. All of the submarkets are expected to partake in the slow upward increase in volume, lead by Lewiston in the near-term and by the non-MSAs and Bangor in the 2000-2010 period. The largest market will continue to be the non-MSA counties, which are expected to do relatively well over the projection period.

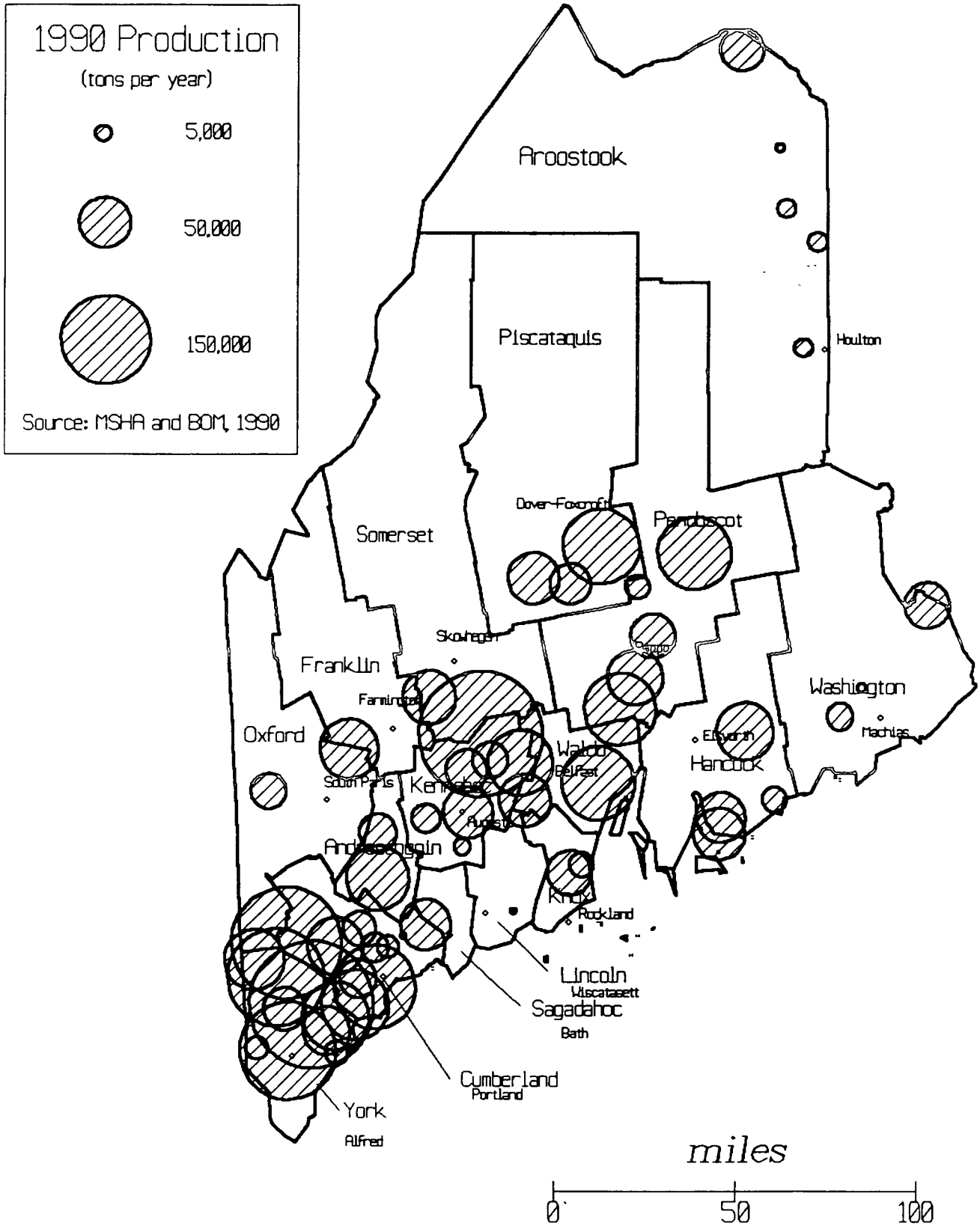
Crushed Stone

The volatility which was noted as a characteristic of Maine's sand and gravel demand is equally notable in the state's crushed stone demand (see Figure 3.10). Large swings in public expenditures in the non-MSA area account for much of the movement in the state totals, although all of the state's markets decline over the historical period (see Table 3.8). In volume terms, the non-MSA counties are the largest submarket, followed by Portland, Bangor, and Lewiston. The smallest historical decline was seen in the Portland MSA, but the projection has Portland as the

Map 3-15a

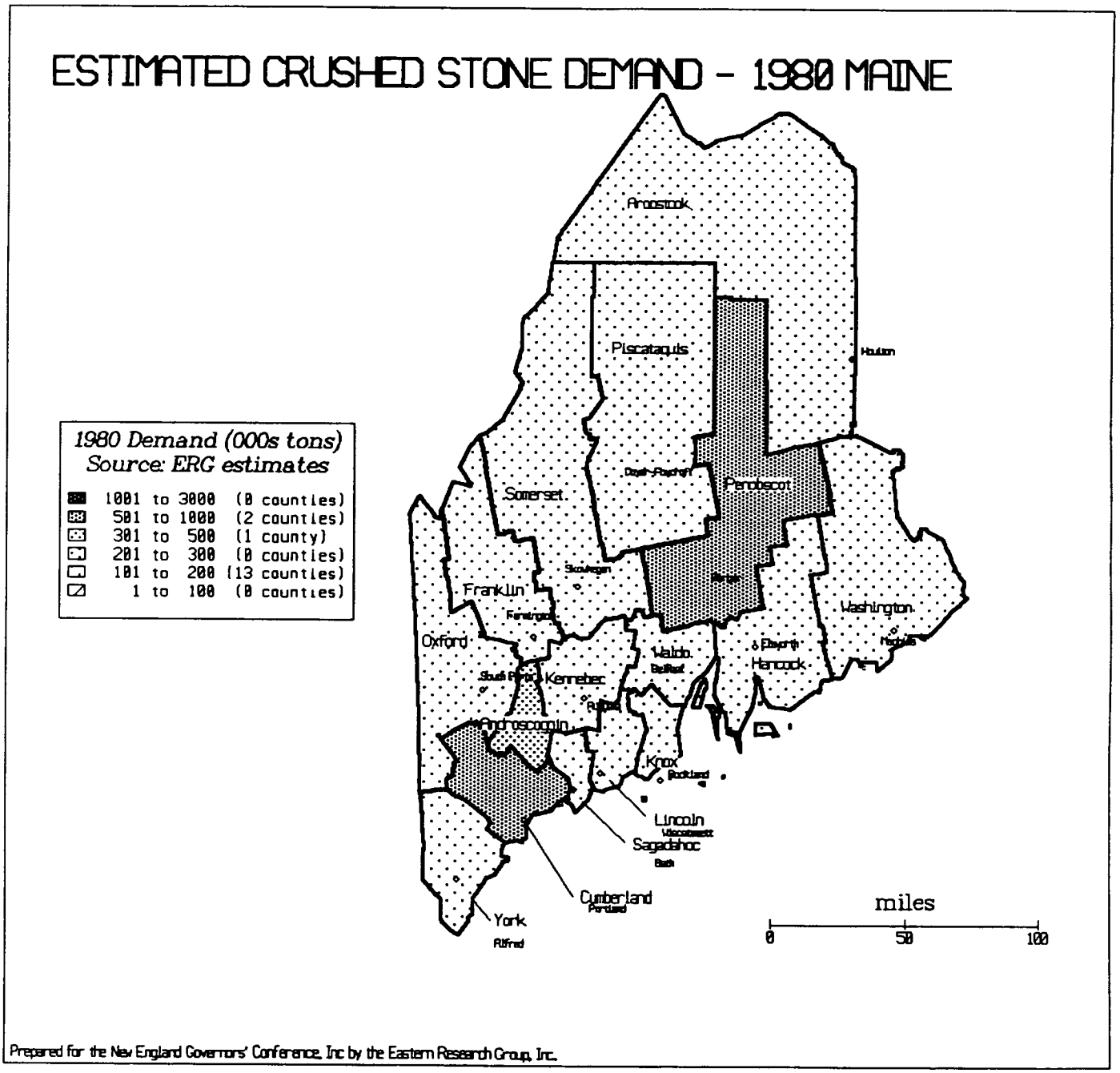
MAINE SAND & GRAVEL SUPPLY - 1990

(ENLARGED FORMAT)

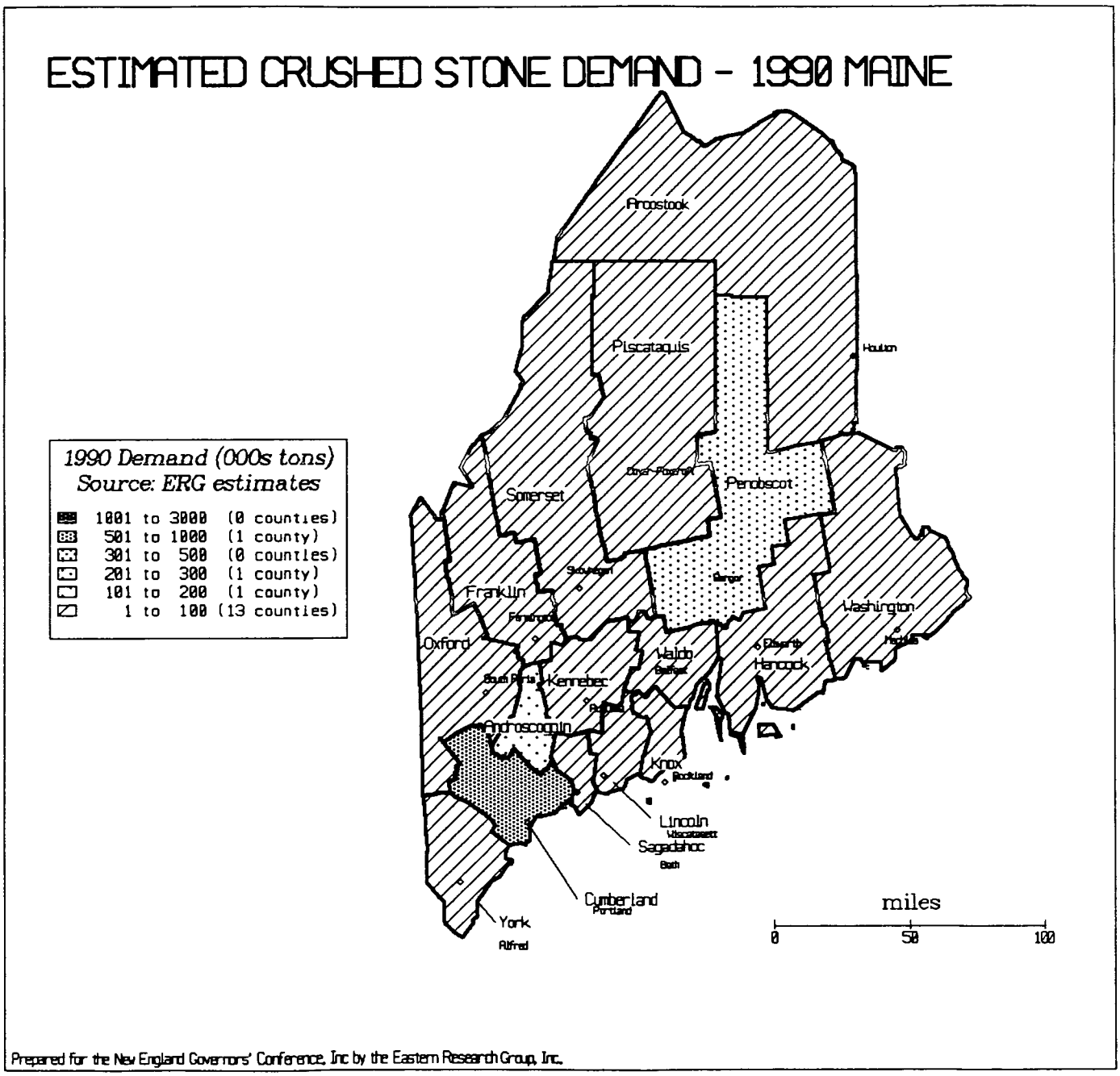


Prepared for the New England Governors' Conference, Inc by the Eastern Research Group, Inc.

Map 3-16

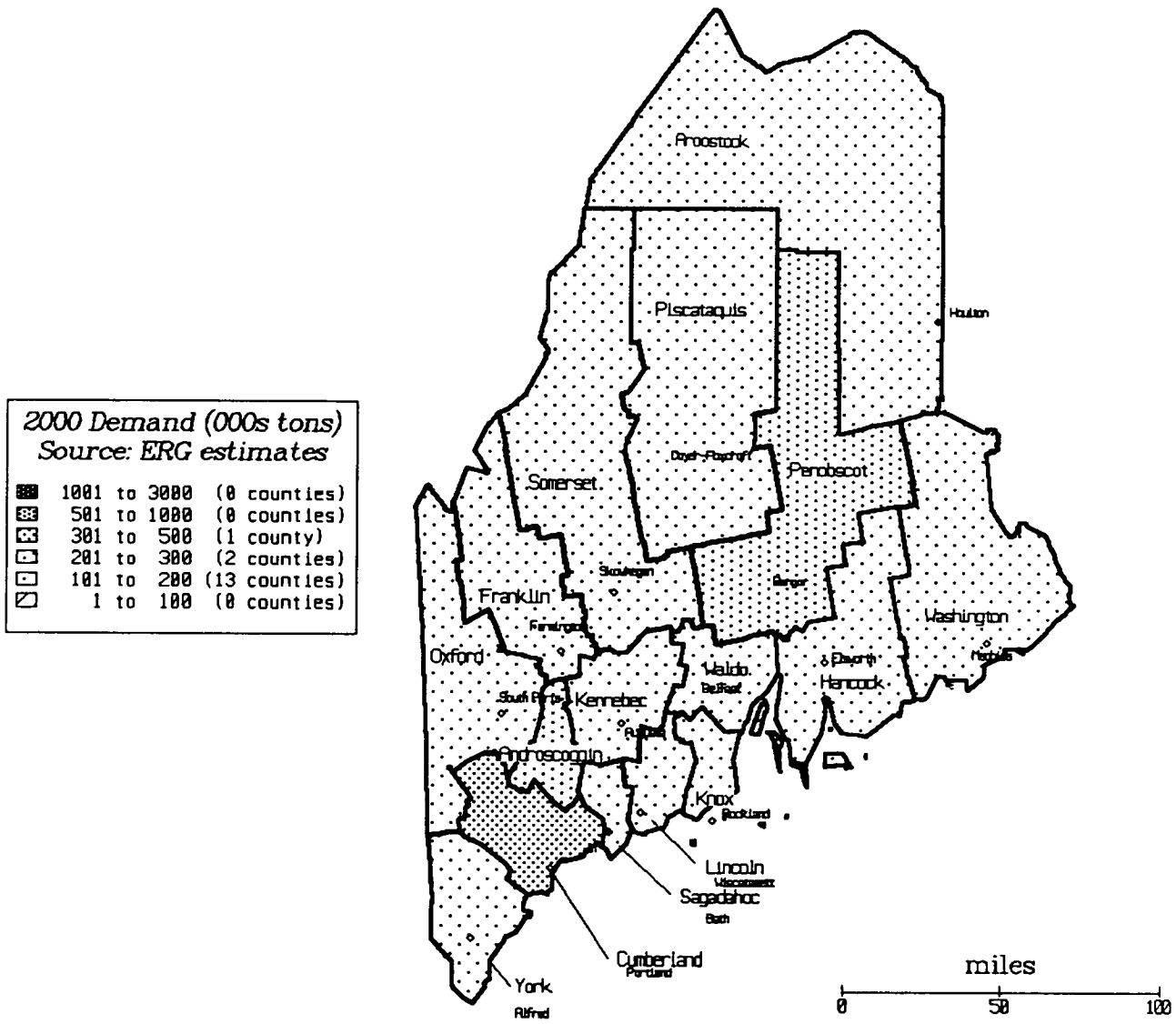

ESTIMATED CRUSHED STONE DEMAND - 1980 MAINE
1980 Demand (000s tons)
Source: ERG estimates
1001 to 3000 (0 counties)
501 to 1000 (2 counties)
301 to 500 (1 county)
201 to 300 (0 counties)
101 to 200 (13 counties)
1 to 100 (0 counties)
Aroostook
Piscataquis
Somerset
Penobscot
Franklin
Oxford
Androscoggin
Kennebec
Waldo
Hancock
Washington
Knox
Lincoln
Sagadahoc
Cumberland
York
miles
0
50
100
Prepared for the New England Governors' Conference, Inc by the Eastern Research Group, Inc.

Map 3-17


ESTIMATED CRUSHED STONE DEMAND - 1990 MAINE
1990 Demand (000s tons)
Source: ERG estimates
1001 to 3000 (0 counties)
501 to 1000 (1 county)
301 to 500 (0 counties)
201 to 300 (1 county)
101 to 200 (1 county)
1 to 100 (13 counties)
Aroostook
Piscataquis
Somerset
Penobscot
Franklin
Oxford
Kennebec
Androscoggin
Waldo
Hancock
Washington
Knox
Lincoln
Sagadahoc
Cumberland
York
miles
0
50
100
Prepared for the New England Governors' Conference, Inc by the Eastern Research Group, Inc.

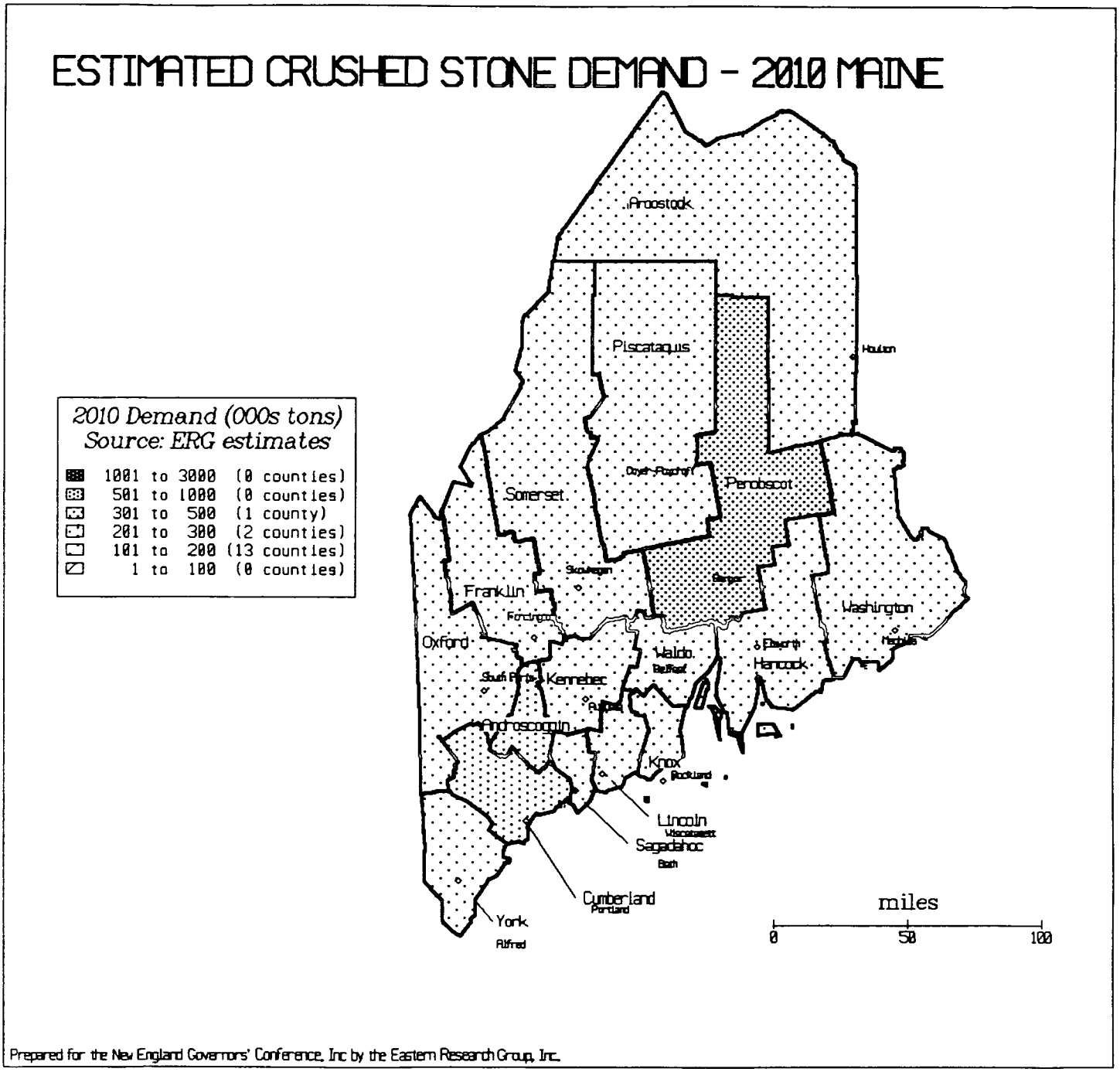
Map 3-18

ESTIMATED CRUSHED STONE DEMAND - 2000 MAINE

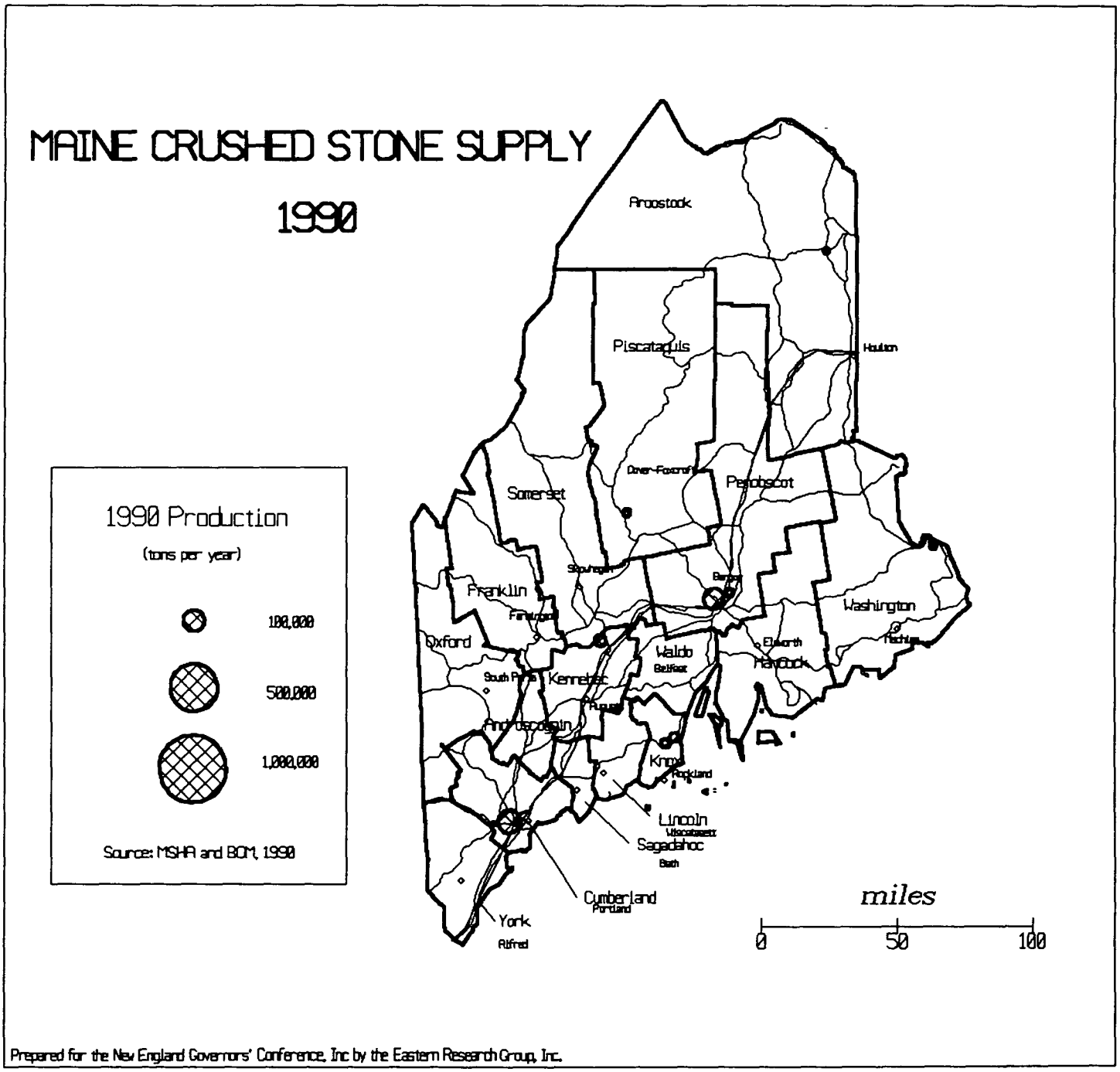


Prepared for the New England Governors' Conference, Inc by the Eastern Research Group, Inc.

Map 3-19


ESTIMATED CRUSHED STONE DEMAND - 2010 MAINE
2010 Demand (000s tons)
Source: ERG estimates
1001 to 3000 (0 counties)
501 to 1000 (0 counties)
301 to 500 (1 county)
201 to 300 (2 counties)
101 to 200 (13 counties)
1 to 100 (0 counties)
Aroostook
Piscataquis
Houlton
Somerset
Penobscot
Franklin
Washington
Oxford
Waldo
Hancock
Kennebec
Androscoggin
Knox
Lincoln
Sagadahoc
Cumberland
Portland
York
Alfred
miles
0
50
100
Prepared for the New England Governors' Conference, Inc by the Eastern Research Group, Inc.

Map 3-20



Prepared for the New England Governors' Conference, Inc by the Eastern Research Group, Inc.

Production locations shown include aggregate producers and processors. Some producers of non-construction aggregates may also be included.

TABLE 3.9
HISTORICAL AND PROJECTED DEMAND ESTIMATES
– MAINE, BY COUNTY (in 000s of tons)

County Name	Sand & Gravel				Crushed Stone			
	1980	1990	2000	2010	1980	1990	2000	2010
Androscoggin	567	499	459	306	379	193	212	230
Aroostook	277	284	219	162	185	99	109	118
Cumberland	1,277	1,325	1,271	1,095	841	639	470	300
Franklin	277	284	219	162	185	99	109	118
Hancock	277	284	219	162	185	99	109	118
Kennebec	277	284	219	162	185	99	109	118
Knox	277	284	219	162	185	99	109	118
Lincoln	277	284	219	162	185	99	109	118
Oxford	277	284	219	162	185	99	109	118
Penobscot	824	675	538	351	550	263	289	314
Piscataquis	277	284	219	162	185	99	109	118
Sagadahoc	277	284	219	162	185	99	109	118
Somerset	277	284	219	162	185	99	109	118
Waldo	277	284	219	162	185	99	109	118
Washington	277	284	219	162	185	99	109	118
York	277	284	219	162	185	99	109	118
State Total	6,271	6,196	5,114	3,859	4,176	2,387	2,391	2,383

Source: ERG Estimates

3.4.3 Massachusetts
Aggregates History and Projections

Sand and Gravel

Massachusetts is the largest single state market for sand and gravel in the New England region. Total volume reached nearly 22 mt tons by 1988, up from 11 mt in 1980. As shown in Table 3.10 and Figure 3.11, an overwhelming proportion of demand was concentrated in the Boston MSA, which represented more than a 60% share of the state total. Boston loomed large over the Worcester MSA, the next largest market area in 1988, where the share of the state total was 17%. Following in order of 1988 size were Springfield, the non-MSA counties, New Bedford, and Pittsfield.

All of the Massachusetts submarkets experienced strong growth during the 1980s, due largely to the area's building boom. The fastest growing markets over the 9 years were New Bedford (13% per year), Worcester (12% per year), the non-MSA area (12% per year), and Pittsfield (11% per year). Boston grew at an 8% rate per year, while Springfield saw 7% per year growth.

The outlook for Massachusetts shows a projected slowing of the state's growth through 2000, with stable demand volumes beyond that point through 2010. In view of the sharply negative effect which the present business cycle has had on Massachusetts construction, a return to the growth-trend might be considered optimistic by some who believe the state is undergoing a significant restructuring. In the absence of a revised trend projection, however, a slow-growth/no-growth projection, such as the one developed by BEA, is retained.

Within the state, there is little anticipated change of market shares. During the near-term, all of the market areas are expected to grow, ranging from the Boston's slow 0.5% per year to New Bedford's relatively fast 1% rate per year. In the later part of the projection period, even slower growth is anticipated, with rates of increase less than 0.3% in all MSAs except Boston and the non-MSA markets, which are expected to show a slight decline. In absolute volume of demand, these decreases will be virtually undetectable, however.

Table 3.11 Massachusetts Crushed Stone Demand. 1980 – 2010 (Tons, 000)

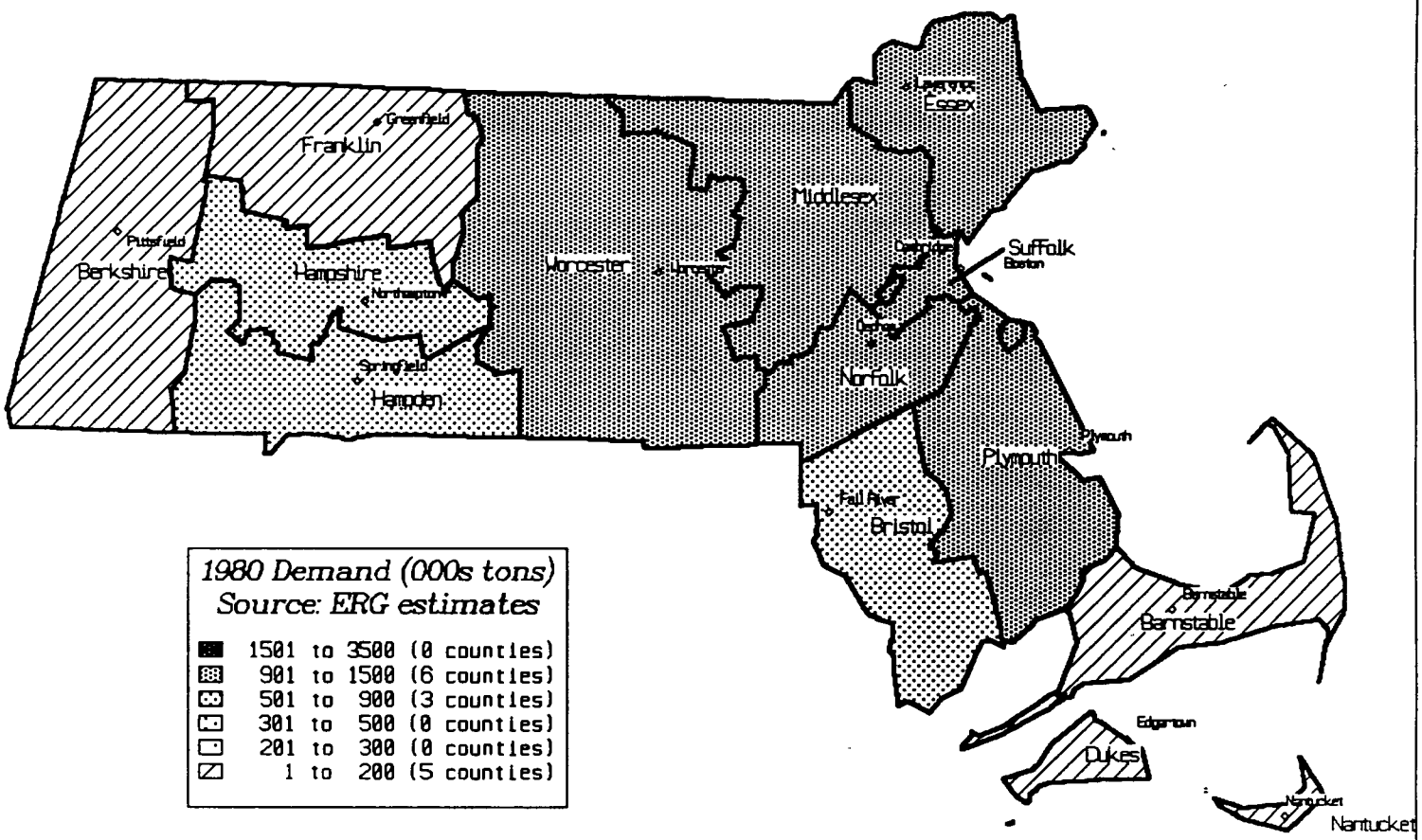
	History			Forecast					Growth Rates (Annual, %)					
AREA\YEAR	1980	1985	1988	1990	1995	2000	2005	2010	1980–1985	1985–1990	1990–1995	1995–2000	2000–2005	2005–2010
STATE TOTAL	6,174	9,351	11,961	12,182	12,545	12,888	13,043	13,072	8.7	5 4	0 6	0 5	0.2	0.0
Boston–Lawrence–Salem Lowell–Brockton	4,018	5,782	7,388	7,365	7,545	7,716	7,784	7,778	7.5	5.0	0.5	0.4	0 2	–0 0
New Bedford–Fall River–Attleboro	390	617	969	1,039	1,092	1,142	1,167	1,183	9 6	11 0	1.0	0 9	0 4	0.3
Pittsfield	108	188	253	261	274	283	288	293	11 7	6.8	1.0	0.7	0.3	0.3
Springfield	711	748	1,046	1,172	1,212	1,246	1,267	1,274	1 0	9.4	0.7	0.6	0.3	0.1
Worcester–Fitchburg–Leominster	544	1,169	1,316	1,359	1,408	1,460	1,483	1,488	16.6	3 1	0 7	0 7	0 3	0 1
Nonmetropolitan Counties	403	848	990	986	1,014	1,041	1,054	1,056	16.1	3.1	0.6	0.5	0 2	0 0

Source: Eastern Research Group, Inc.

Note: The 1990 forecast was calculated prior to the release of preliminary Bureau of Mines production estimates for 1990.

Map 3-21

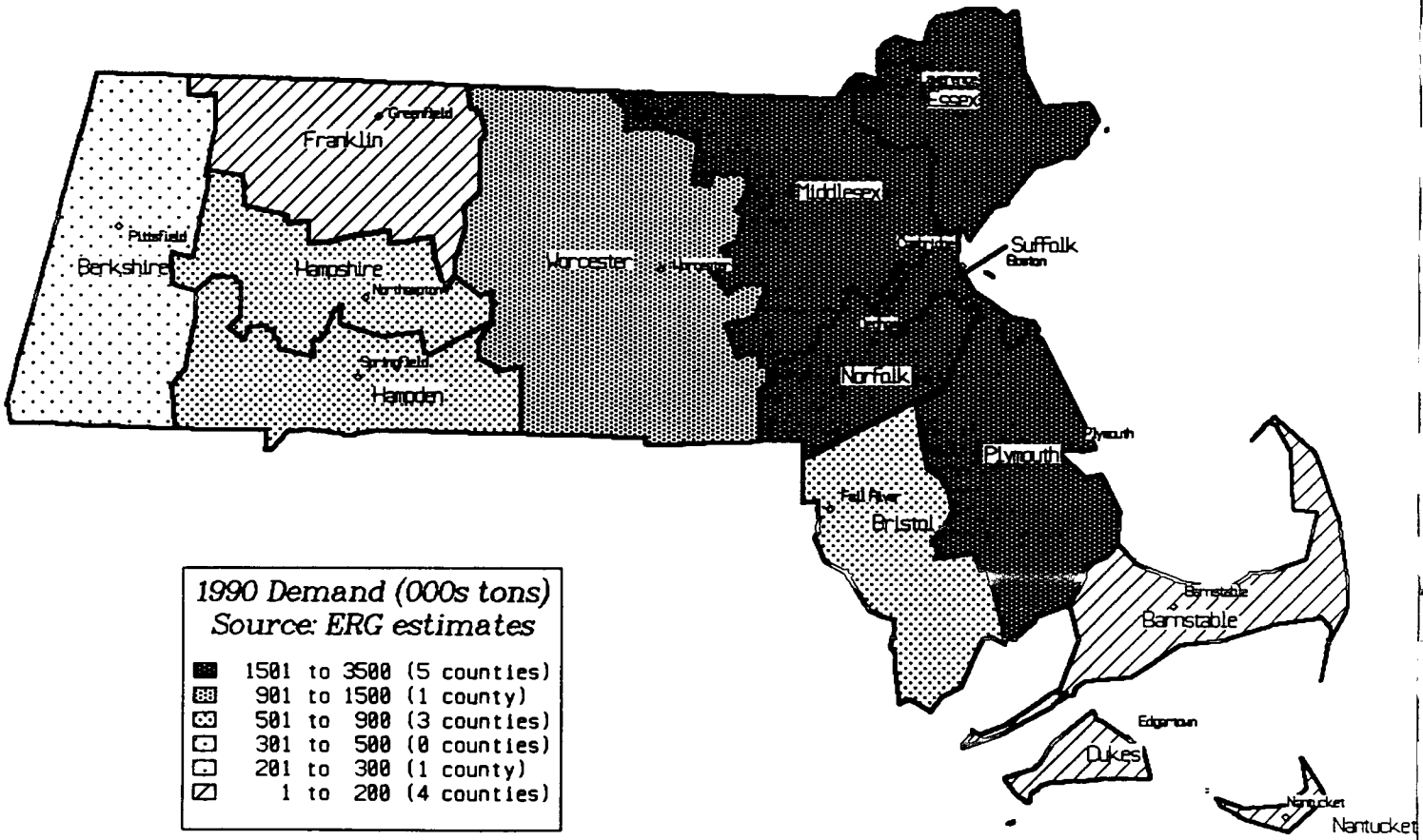
ESTIMATED SAND AND GRAVEL DEMAND - 1980 MASSACHUSETTS



Prepared for the New England Governors' Conference, Inc by the Eastern Research Group, Inc.

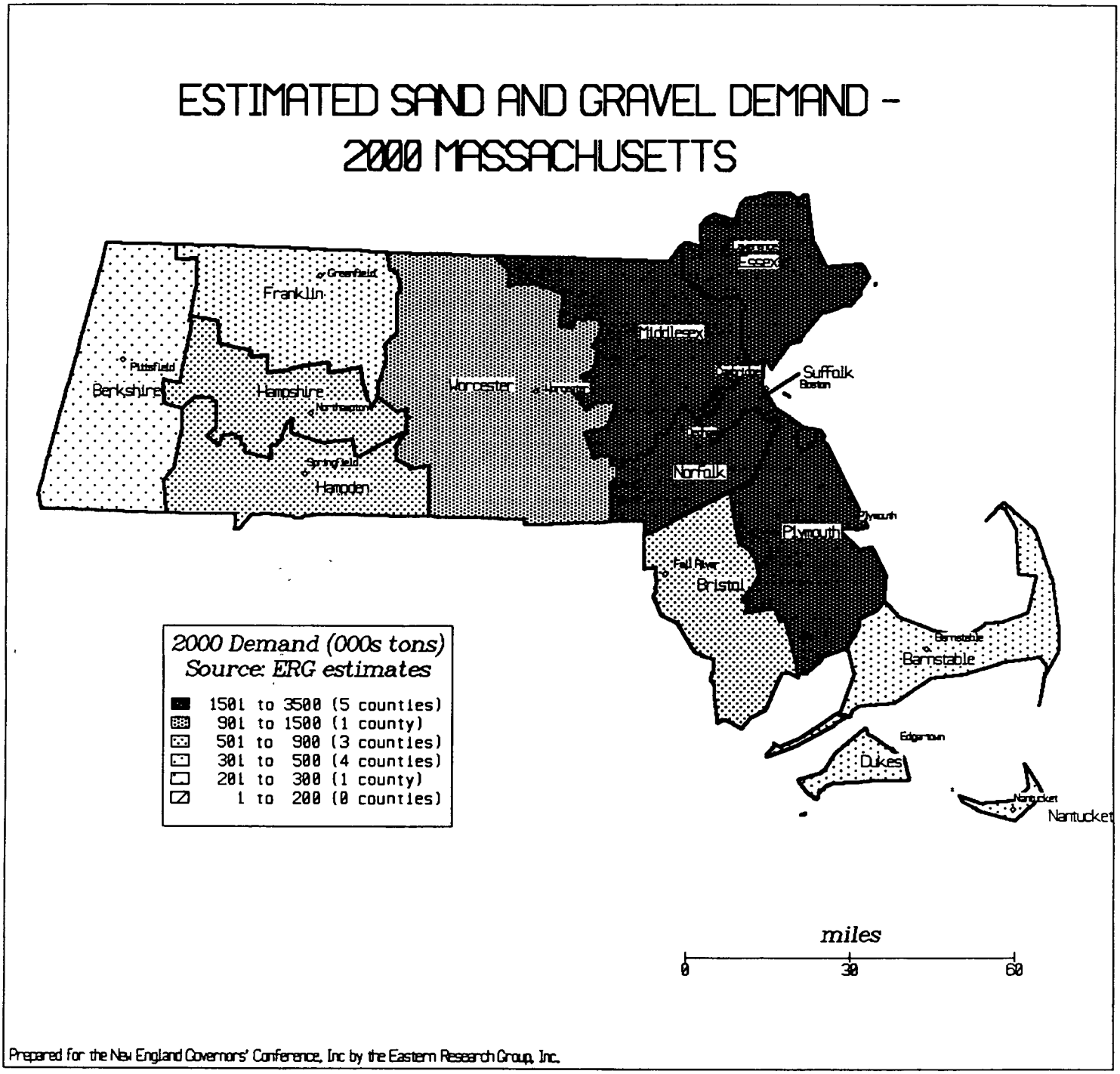
Map 3-22

ESTIMATED SAND AND GRAVEL DEMAND - 1990 MASSACHUSETTS

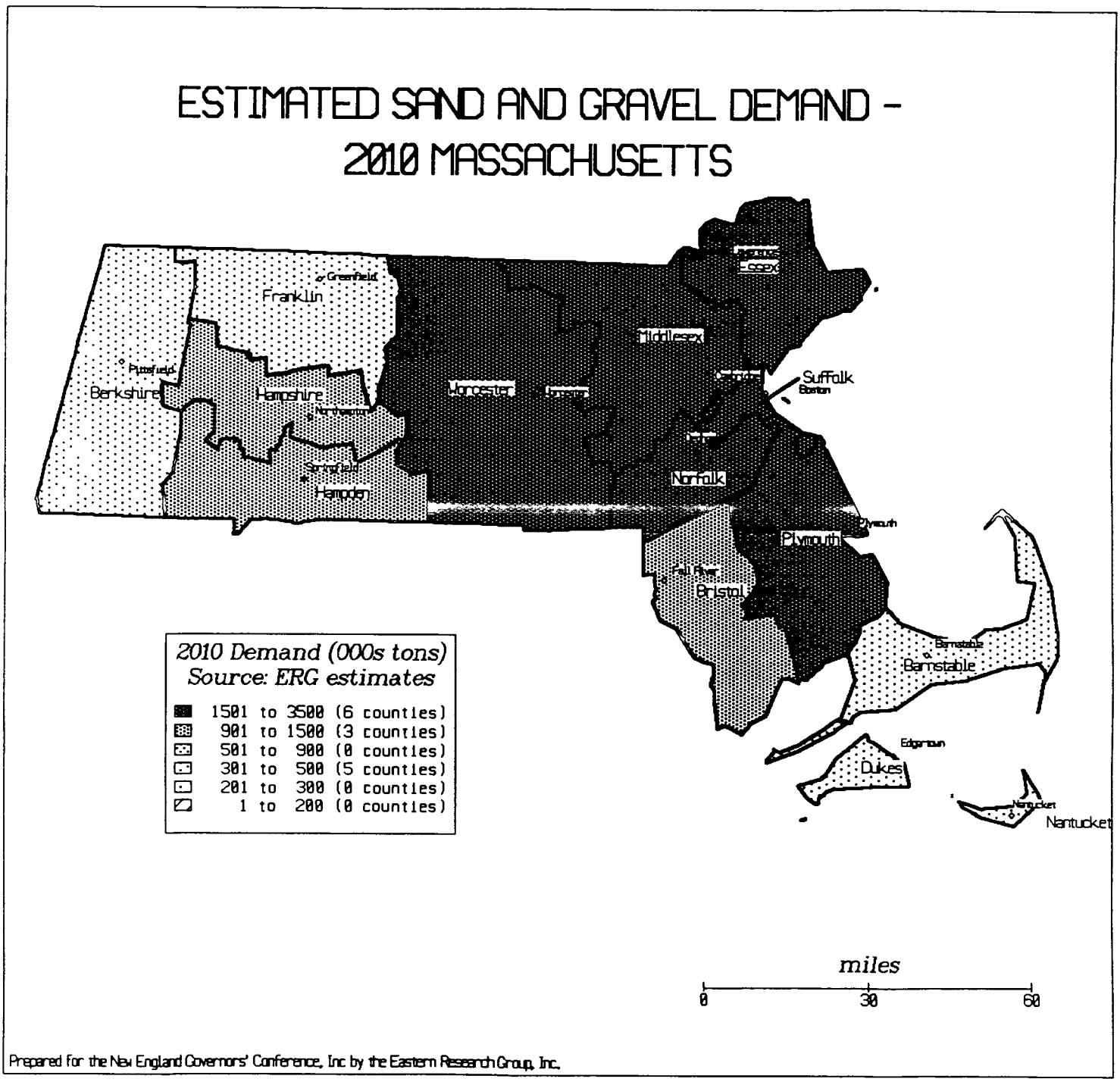


Prepared for the New England Governors' Conference, Inc by the Eastern Research Group, Inc.

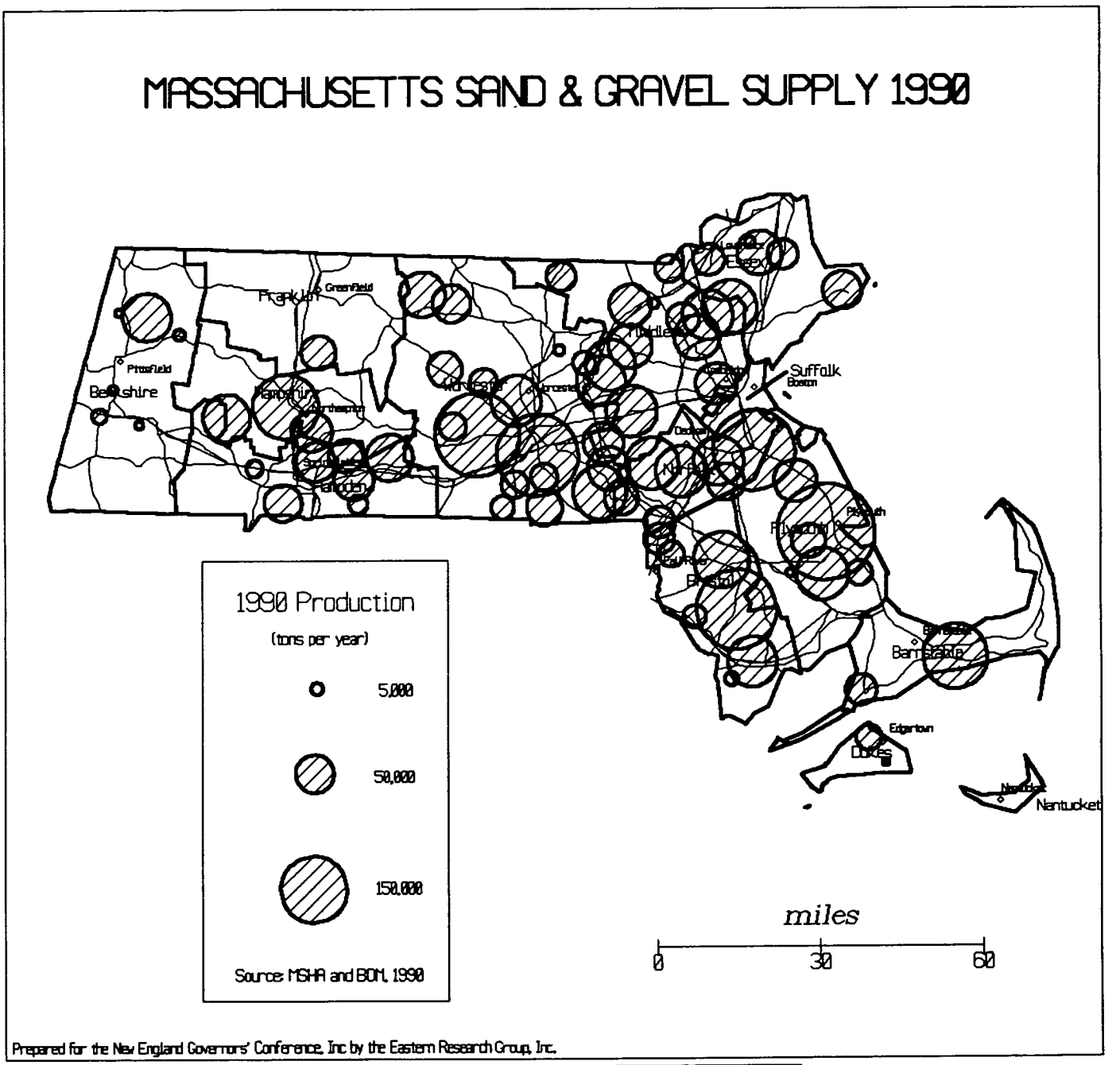
Map 3-23


ESTIMATED SAND AND GRAVEL DEMAND -
2000 MASSACHUSETTS
Franklin
Berkshire
Hampshire
Worcester
Middlesex
Essex
Suffolk
Norfolk
Plymouth
Bristol
Barnstable
Dukes
Nantucket
2000 Demand (000s tons)
Source: ERG estimates
1501 to 3500 (5 counties)
901 to 1500 (1 county)
501 to 900 (3 counties)
301 to 500 (4 counties)
201 to 300 (1 county)
1 to 200 (0 counties)
miles
0
30
60
Prepared for the New England Governors' Conference, Inc by the Eastern Research Group, Inc.

Map 3-24


ESTIMATED SAND AND GRAVEL DEMAND -
2010 MASSACHUSETTS
Franklin
Berkshire
Hampshire
Hampden
Worcester
Essex
Middlesex
Suffolk
Norfolk
Plymouth
Bristol
Barnstable
Dukes
Nantucket
2010 Demand (000s tons)
Source: ERG estimates
1501 to 3500 (6 counties)
901 to 1500 (3 counties)
501 to 900 (0 counties)
301 to 500 (5 counties)
201 to 300 (0 counties)
1 to 200 (0 counties)
miles
0
30
60
Prepared for the New England Governors' Conference, Inc by the Eastern Research Group, Inc.

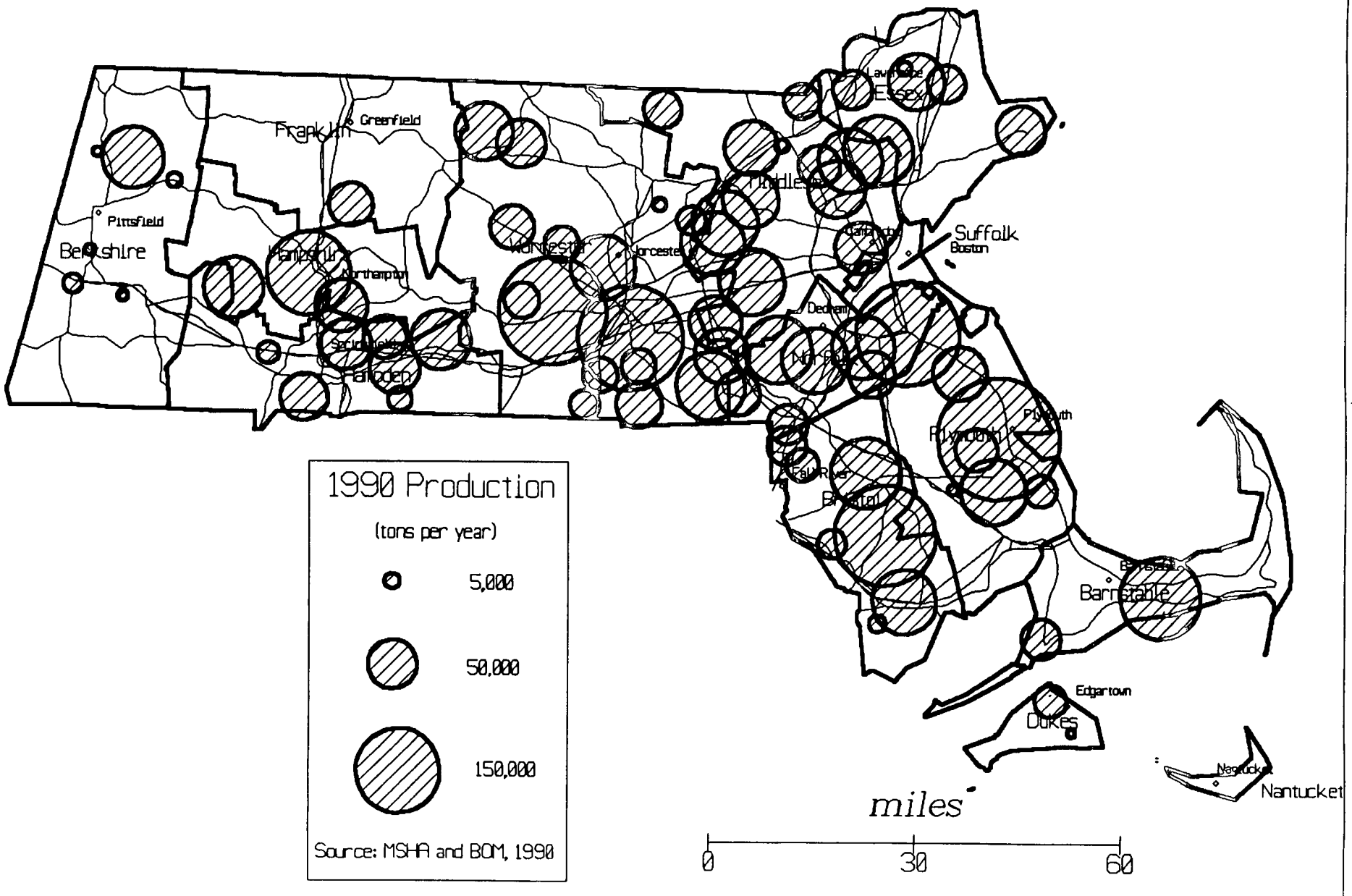
Map 3-25



Production locations shown include aggregate producers and processors. Some producers of non-construction aggregates may also be included.

MASSACHUSETTS SAND & GRAVEL SUPPLY 1990

(ENLARGED FORMAT)



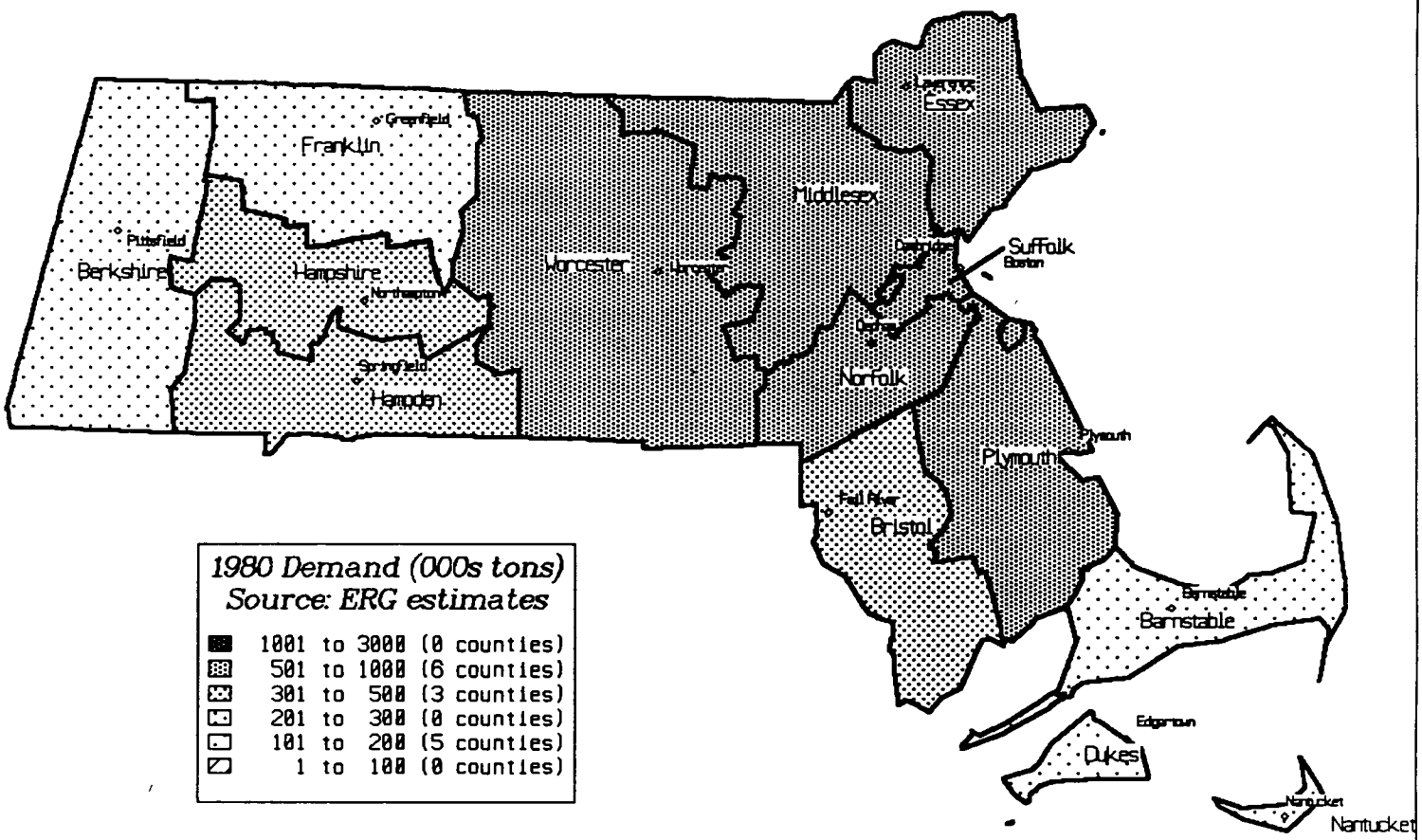
3-72

map 3-72a

Prepared for the New England Governors' Conference, Inc by the Eastern Research Group, Inc.

Map 3-26

ESTIMATED CRUSHED STONE DEMAND -1980 MASSACHUSETTS

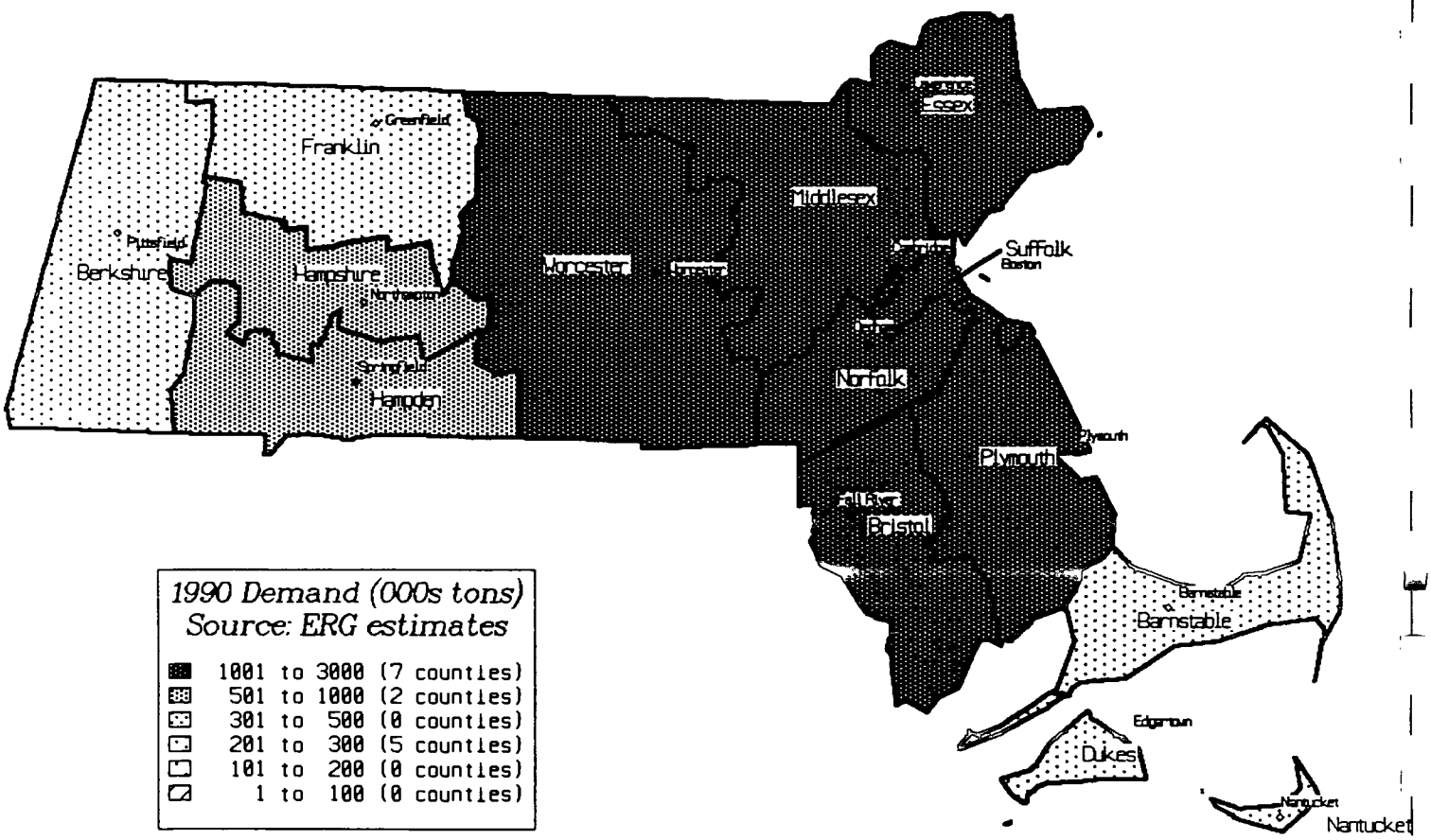


Prepared for the New England Governors' Conference, Inc by the Eastern Research Group, Inc.

Production locations shown include aggregate producers and processors. Some producers of non-construction aggregates may also be included.

Map 3-27

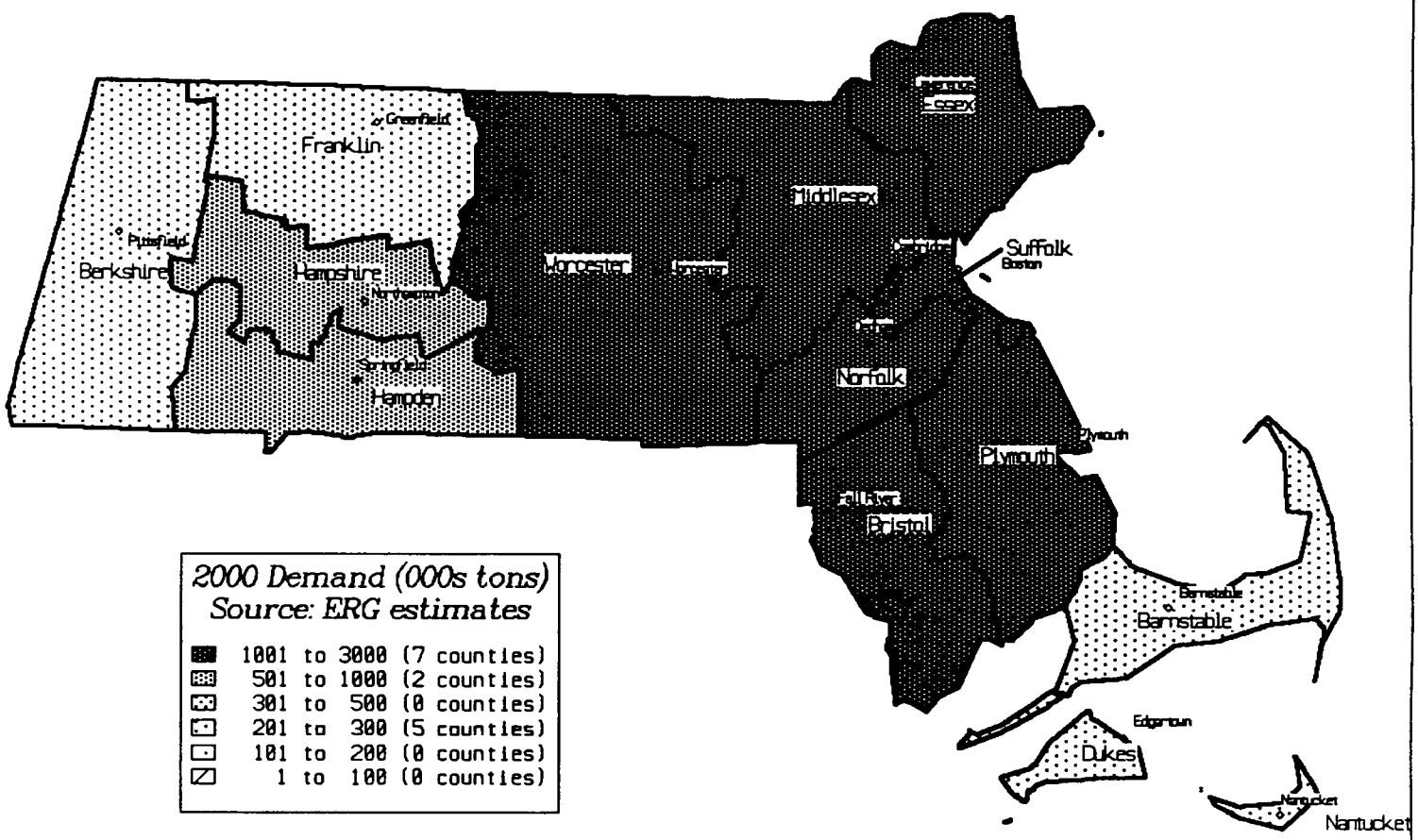
ESTIMATED CRUSHED STONE DEMAND -1990 MASSACHUSETTS



Prepared for the New England Governors' Conference, Inc by the Eastern Research Group, Inc.

Map 3-28

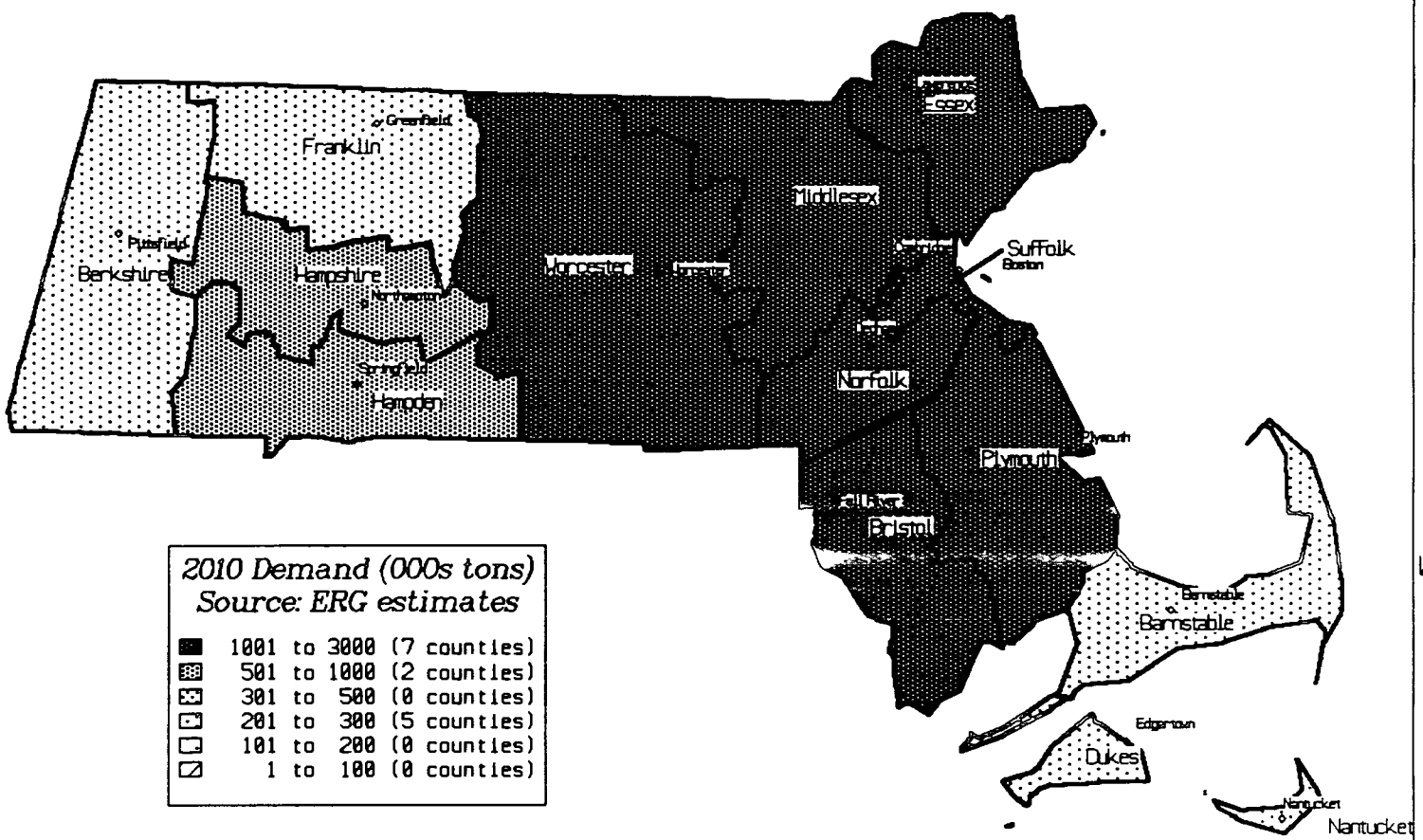
ESTIMATED CRUSHED STONE DEMAND - 2000 MASSACHUSETTS



Prepared for the New England Governors' Conference, Inc by the Eastern Research Group, Inc.

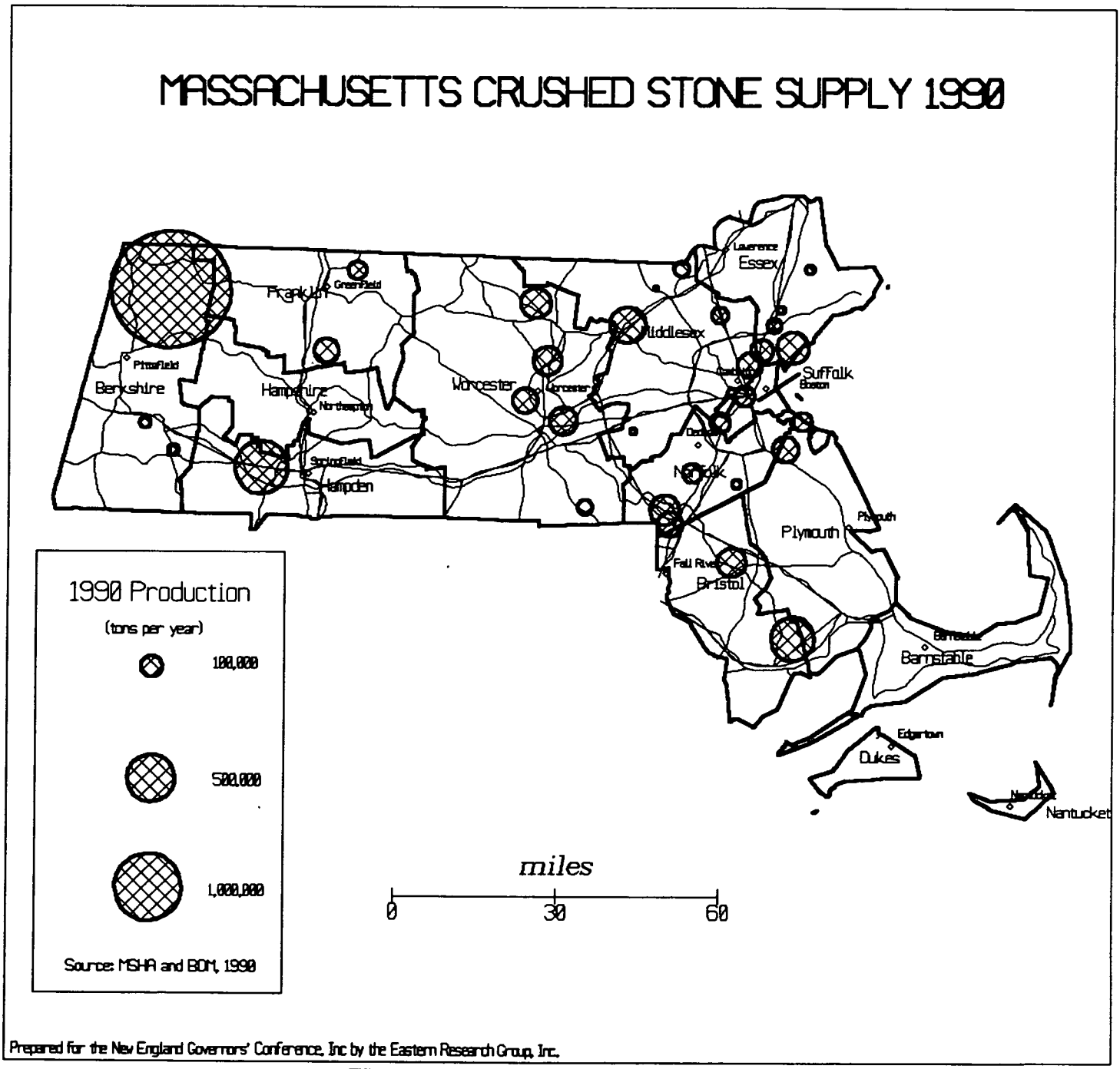
Map 3-29

ESTIMATED CRUSHED STONE DEMAND - 2010 MASSACHUSETTS



Prepared for the New England Governors' Conference, Inc by the Eastern Research Group, Inc.

Map 3-30



Production locations shown include aggregate producers and processors. Some producers of non-construction aggregates may also be included.

TABLE 3.12
HISTORICAL AND PROJECTED DEMAND ESTIMATES
– MASSACHUSETTS, BY COUNTY (in 000s of tons)

County Name	Sand & Gravel				Crushed Stone			
	1980	1990	2000	2010	1980	1990	2000	2010
Berkshire	192	202	258	430	108	261	283	293
Bristol	676	729	888	1,363	390	1,039	1,142	1,183
Dukes	188	200	345	446	101	246	260	264
Essex	1,487	1,566	1,891	2,494	804	1,473	1,543	1,556
Franklin	188	200	345	446	101	246	260	264
Hampden	557	510	605	989	355	586	623	637
Hampshire	557	510	605	989	355	586	623	637
Middlesex	1,487	1,566	1,891	2,494	804	1,473	1,543	1,556
Nantucket	188	200	345	446	101	246	260	264
Norfolk	1,487	1,566	1,891	2,494	804	1,473	1,543	1,556
Plymouth	1,487	1,566	1,891	2,494	804	1,473	1,543	1,556
Suffolk	1,487	1,566	1,891	2,494	804	1,473	1,543	1,556
Worcester	953	1,034	1,342	2,342	544	1,359	1,460	1,488
State Total	10,935	11,413	14,190	19,924	6,073	11,936	12,628	12,808

Source: ERG Estimates

3.4.4 New Hampshire
Aggregates History and Projections

Sand and Gravel

During the 1980s, New Hampshire enjoyed robust population and economic growth, pushed by the expanding regional economy. During this period, demand for sand and gravel rose at a 9% annual rate, rising from 4 mt in 1980 to 8 mt in 1988. The three major markets within the state experienced healthy growth during the period, as shown in Table 3.13 and illustrated in Figure 3.13. The largest market was the non-MSA counties, followed by the Manchester and Portsmouth MSAs.

The outlook for New Hampshire demand is for lower volumes over the entire projection period, falling in straight-line fashion. Overall, demand will fall to 7.1 mt in 2000 and 6.8 mt by 2010. Portsmouth is expected to see the sharpest declines, falling from 2.2 mt in 1988 to 1.6 mt by 2010. Both the non-MSA and Manchester markets will see more modest declines.

Crushed Stone

Historically, New Hampshire's share of regional crushed stone demand rose from fourth place in 1980 to third by 1988. Despite this increase in rank, the state had the slowest growth in crushed stone demand except for Maine. Total demand rose from 2.6 mt to 4.8 mt in 1988 (see Table 3.14 and Figure 3.14). Within the state, the largest submarket is the non-MSA counties, with balance evenly split between Manchester and Portsmouth.

In the near-term, the state will see modest declines from the 5 mt level in 1988 to the 4 mt level in 2000. The weakening will be evident within all submarkets, with demand in Portsmouth expected to decline at nearly twice the rate of the remainder of the state.

Beyond 2000, the same pattern of decline will continue. The overall drop in demand will be less than 0.2 mt per year for the state as a whole, with Portsmouth declining faster than the other markets.

Table 3.13–New Hampshire Sand and Gravel Demand: 1980–2010 (Tons, 000)

	History			Forecast					Growth Rates (Annual, %)					
AREA\YEAR	1980	1985	1988	1990	1995	2000	2005	2010	1980–1985	1985–1990	1990–1995	1995–2000	2000–2005	2005–2010
STATE TOTAL	4,165	6,799	8,188	7,408	7,188	7,098	6,964	6,802	10.3	1.7	−0.6	−0.3	−0.4	−0.5
Manchester–Nashua	1,358	2,514	2,433	2,603	2,542	2,525	2,490	2,439	13.1	0.7	−0.5	−0.1	−0.3	−0.4
Portsmouth–Dover–Rochester	1,157	2,081	2,207	1,821	1,745	1,699	1,652	1,593	12.5	−2.6	−0.8	−0.5	−0.6	−0.7
Nonmetropolitan Counties	1,651	2,204	3,548	2,984	2,900	2,874	2,822	2,770	6.0	6.2	−0.6	−0.2	−0.4	−0.4

Source: Eastern Research Group, Inc.

Note: The 1990 forecast was calculated prior to the release of preliminary Bureau of Mines production estimates for 1990.

Figure 3.13: Sand and Gravel Demand 1980 – 2010
New Hampshire, State and Metropolitan Areas

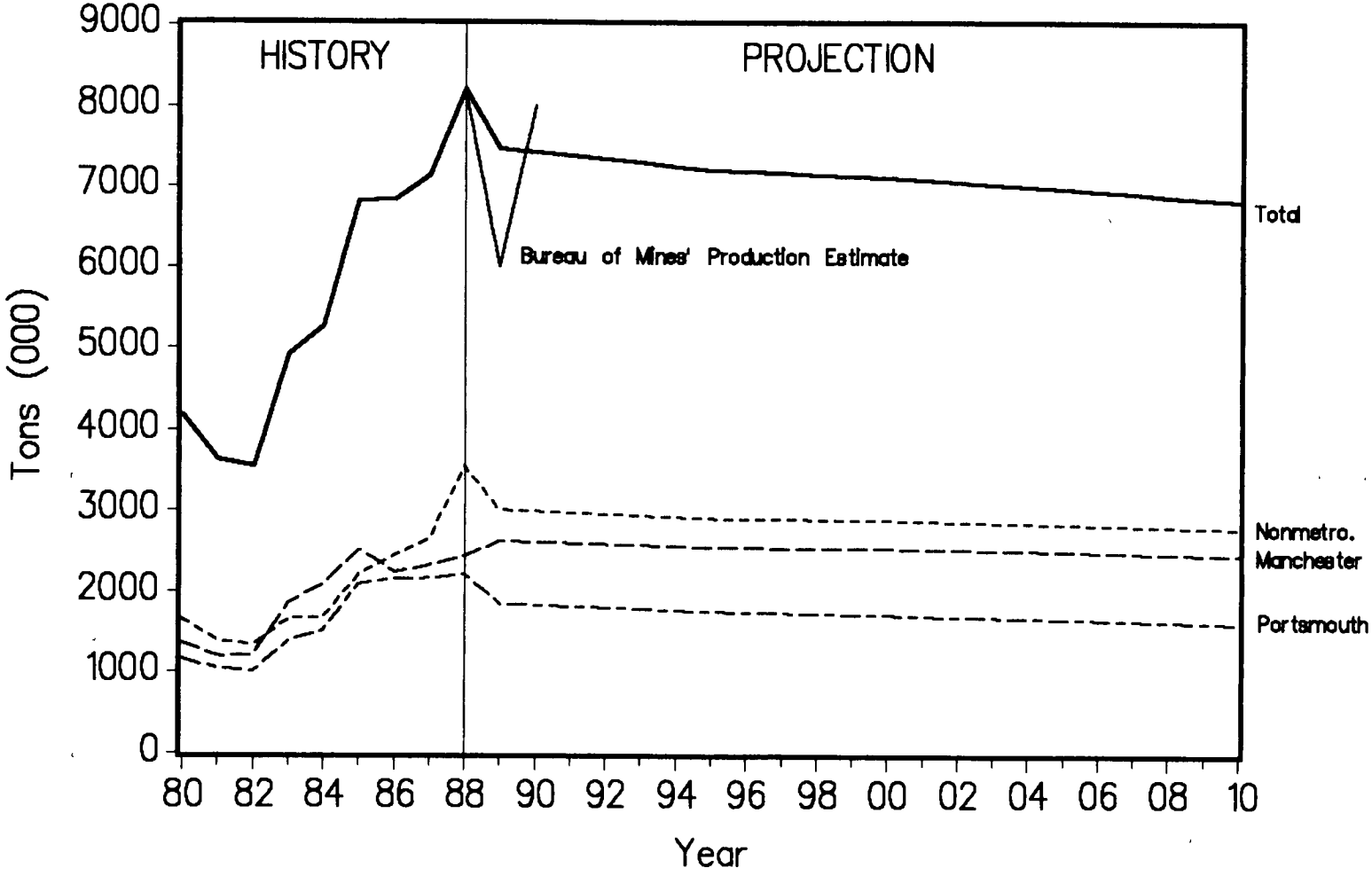


Table 3.14 – New Hampshire Crushed Stone Demand: 1980 – 2010 (Tons, 000)

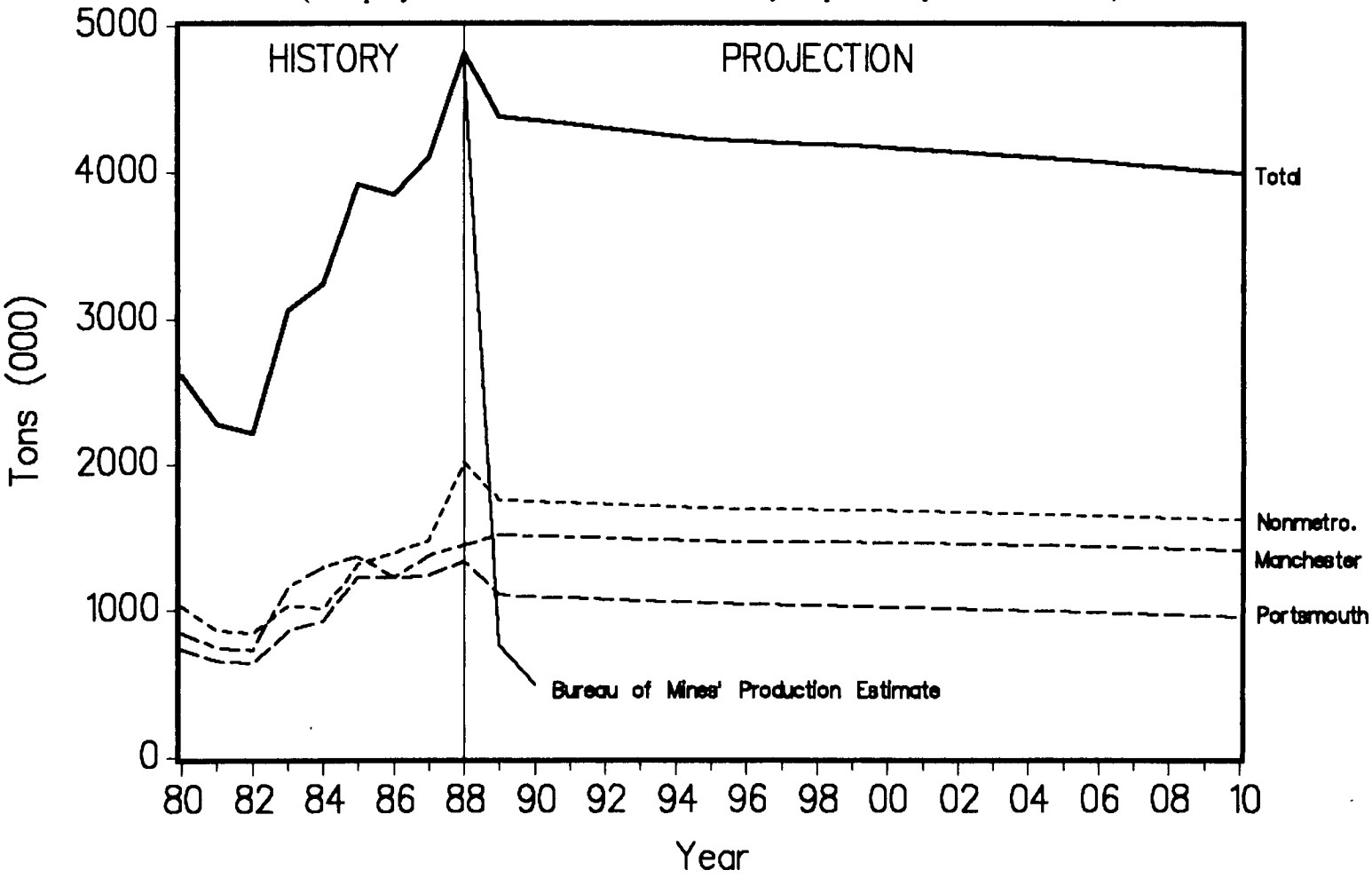
	History			Forecast					Growth Rates (Annual, %)					
AREA\YEAR	1980	1985	1988	1990	1995	2000	2005	2010	1980–1985	1985–1990	1990–1995	1995–2000	2000–2005	2005–2010
STATE TOTAL	2,607	3,909	4,810	4,347	4,217	4,163	4,085	3,989	8.4	2.1	–0.6	–0.3	–0.4	–0.5
Manchester–Nashua	844	1,371	1,446	1,507	1,472	1,462	1,442	1,412	10.2	1.9	–0.5	–0.1	–0.3	–0.4
Portsmouth–Dover–Rochester	740	1,226	1,342	1,093	1,047	1,019	991	956	10.6	–2.3	–0.8	–0.5	–0.6	–0.7
Nonmetropolitan Counties	1,023	1,312	2,022	1,747	1,697	1,682	1,652	1,621	5.1	5.9	–0.6	–0.2	–0.4	–0.4

Source: Eastern Research Group, Inc.

Note: The 1990 forecast was calculated prior to the release of preliminary Bureau of Mines production estimates for 1990.

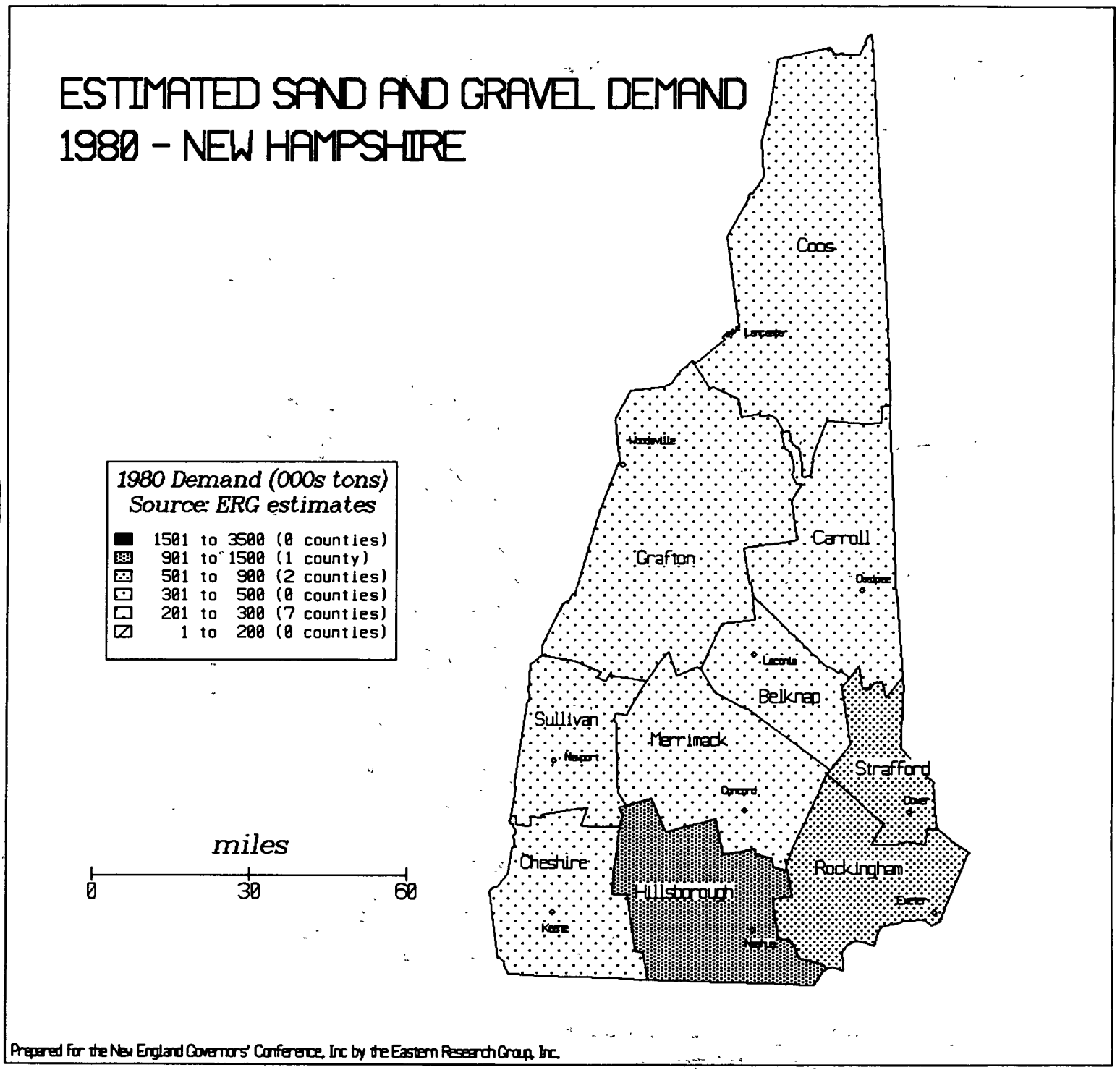
Figure 3.14: Crushed Stone Demand 1980 – 2010
New Hampshire, State and Metropolitan Areas

(The projections shown assume a recovery to pre-slump demand levels.)

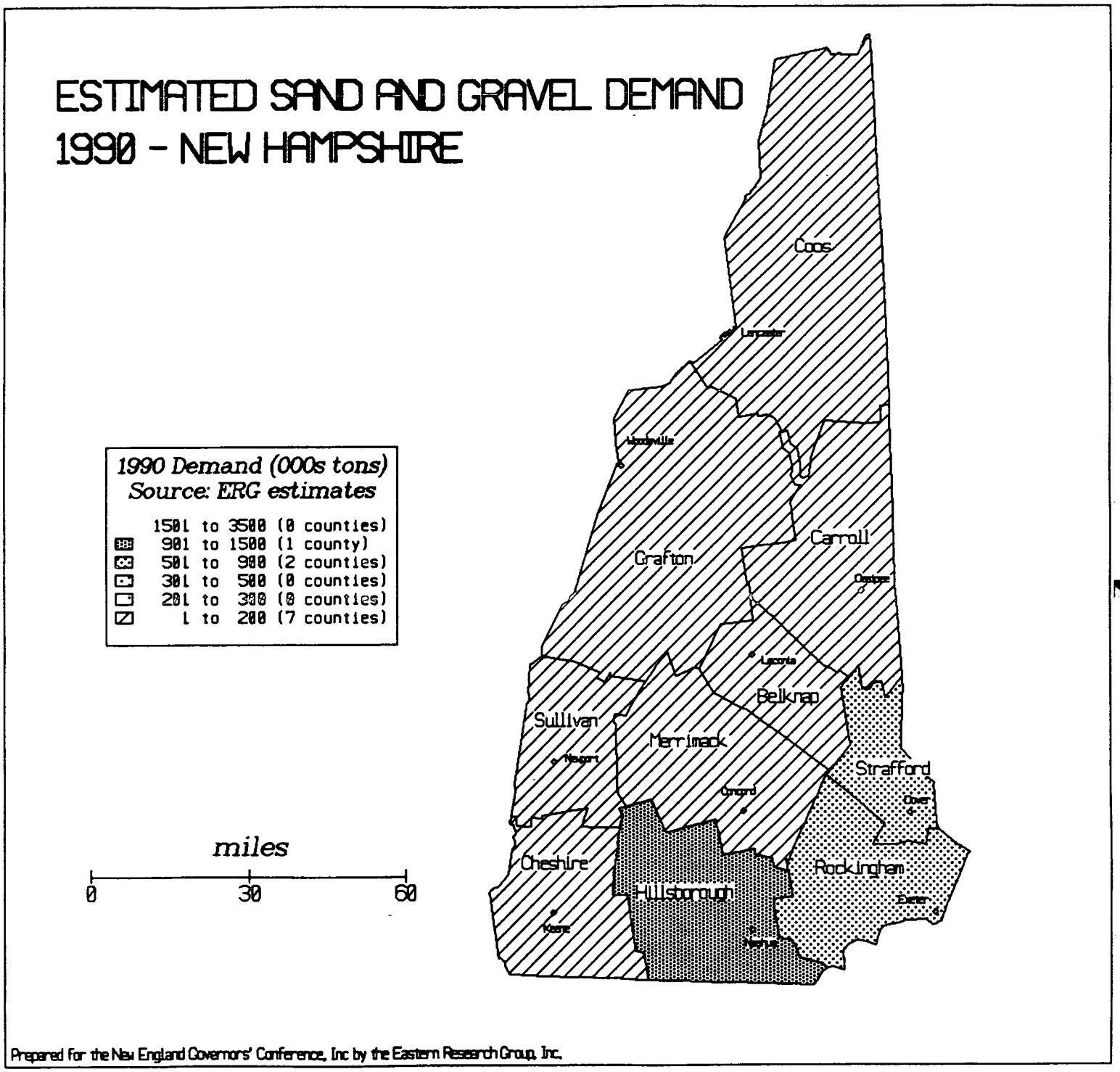


New Hampshire Maps - Maps 3-31 through 3-40 illustrate the demand and supply for sand and gravel and for crushed stone in New Hampshire. Table 3.15 summarizes the county-by-county projections displayed in the maps.

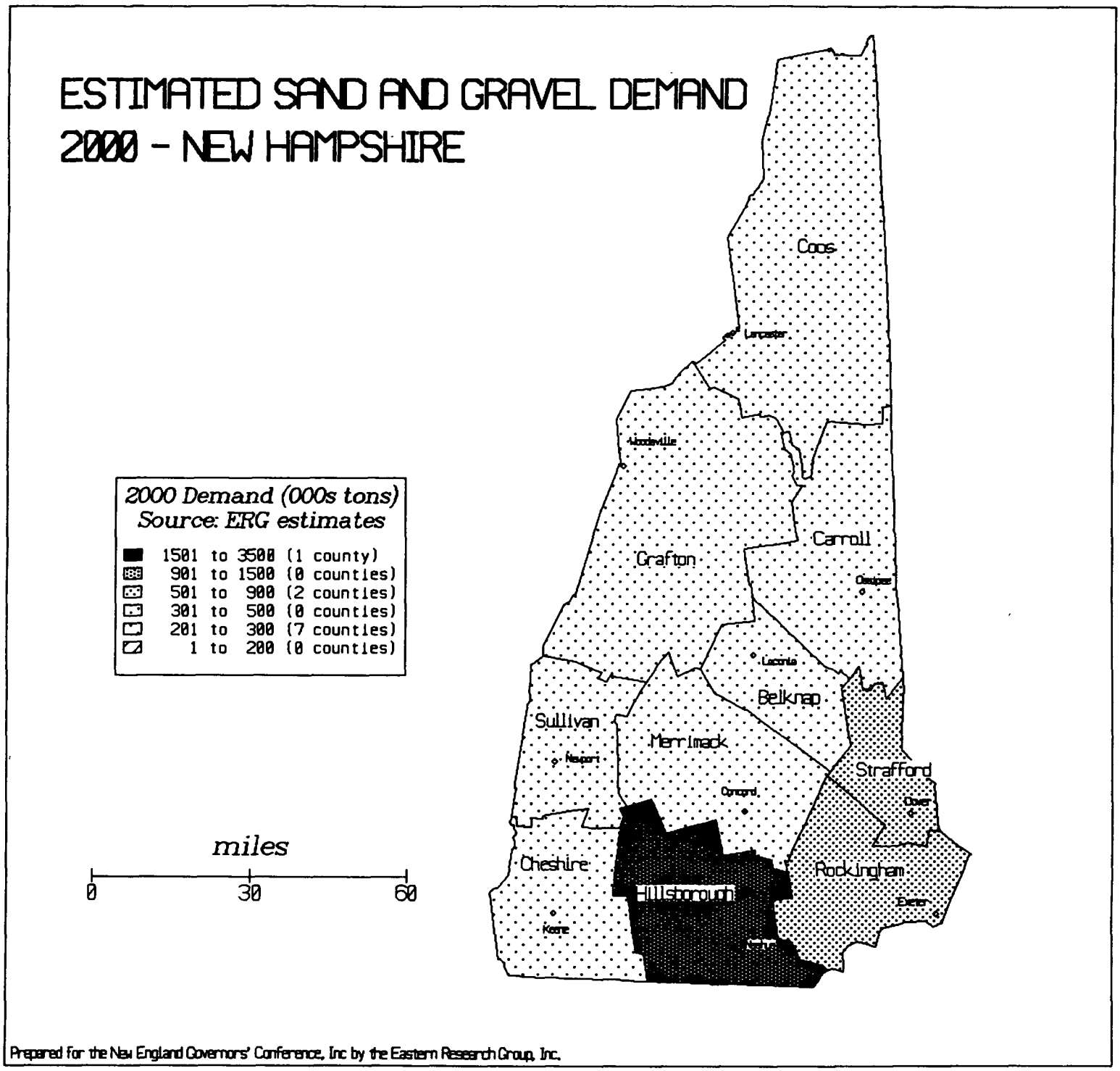
Map 3-31


ESTIMATED SAND AND GRAVEL DEMAND
1980 - NEW HAMPSHIRE
1980 Demand (000s tons)
Source: ERG estimates
1501 to 3500 (0 counties)
901 to 1500 (1 county)
501 to 900 (2 counties)
301 to 500 (0 counties)
201 to 300 (7 counties)
1 to 200 (0 counties)
miles
0
30
60
Coos
Carroll
Grafton
Belknap
Sullivan
Merrimack
Strafford
Cheshire
Hillsborough
Rockingham
Prepared for the New England Governors' Conference, Inc by the Eastern Research Group, Inc.

Map 3-32


ESTIMATED SAND AND GRAVEL DEMAND
1990 - NEW HAMPSHIRE
1990 Demand (000s tons)
Source: ERG estimates
1501 to 3500 (0 counties)
901 to 1500 (1 county)
501 to 900 (2 counties)
301 to 500 (0 counties)
201 to 300 (0 counties)
1 to 200 (7 counties)
miles
0
30
60
Coos
Carroll
Grafton
Belknap
Sullivan
Merrimack
Strafford
Cheshire
Hillsborough
Rockingham
Prepared for the New England Governors' Conference, Inc by the Eastern Research Group, Inc.

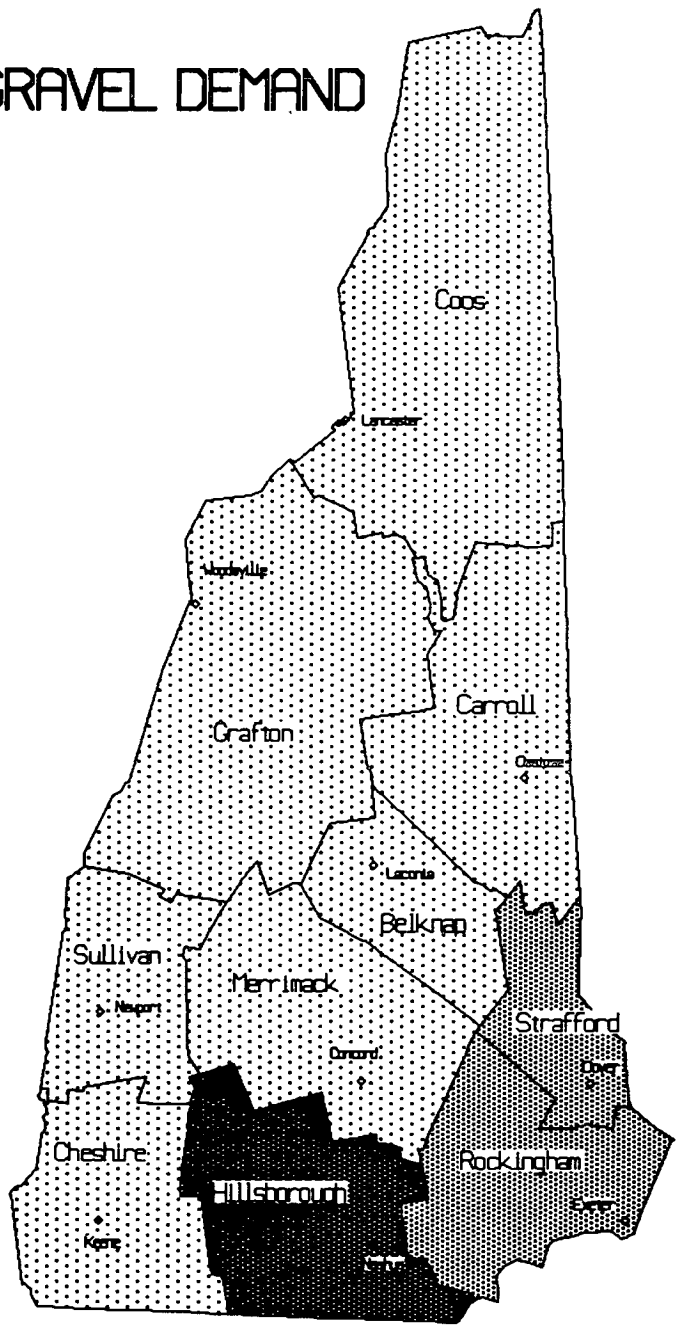
Map 3-33



Prepared for the New England Governors' Conference, Inc by the Eastern Research Group, Inc.

Map 3-34

ESTIMATED SAND AND GRAVEL DEMAND 2010 - NEW HAMPSHIRE



2010 Demand (000s tons)
Source: ERG estimates

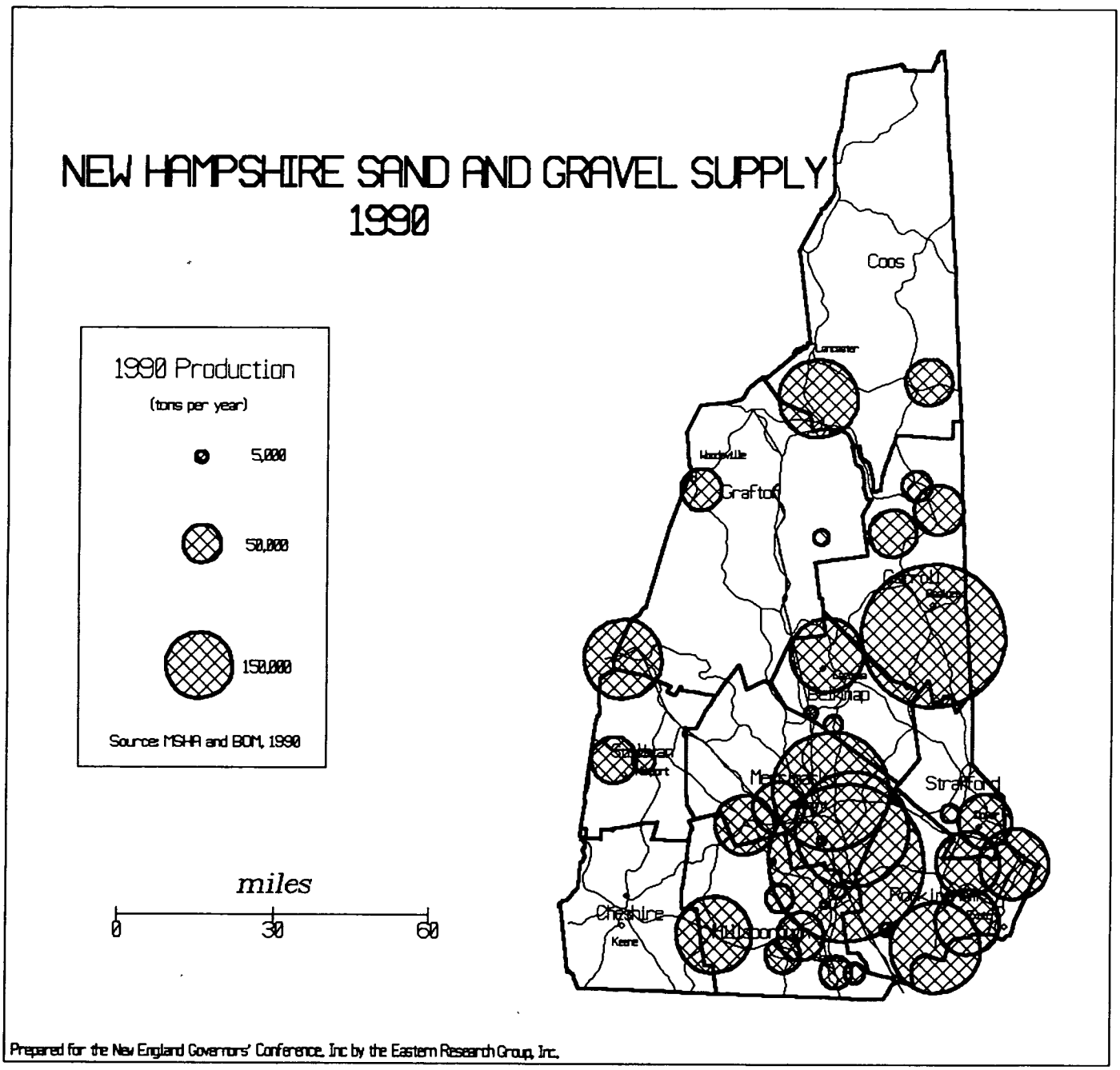
1501 to 3500	(1 county)
901 to 1500	(2 counties)
501 to 900	(0 counties)
301 to 500	(7 counties)
201 to 300	(0 counties)
1 to 200	(0 counties)

miles

0 30 60

Prepared for the New England Governors' Conference, Inc by the Eastern Research Group, Inc.

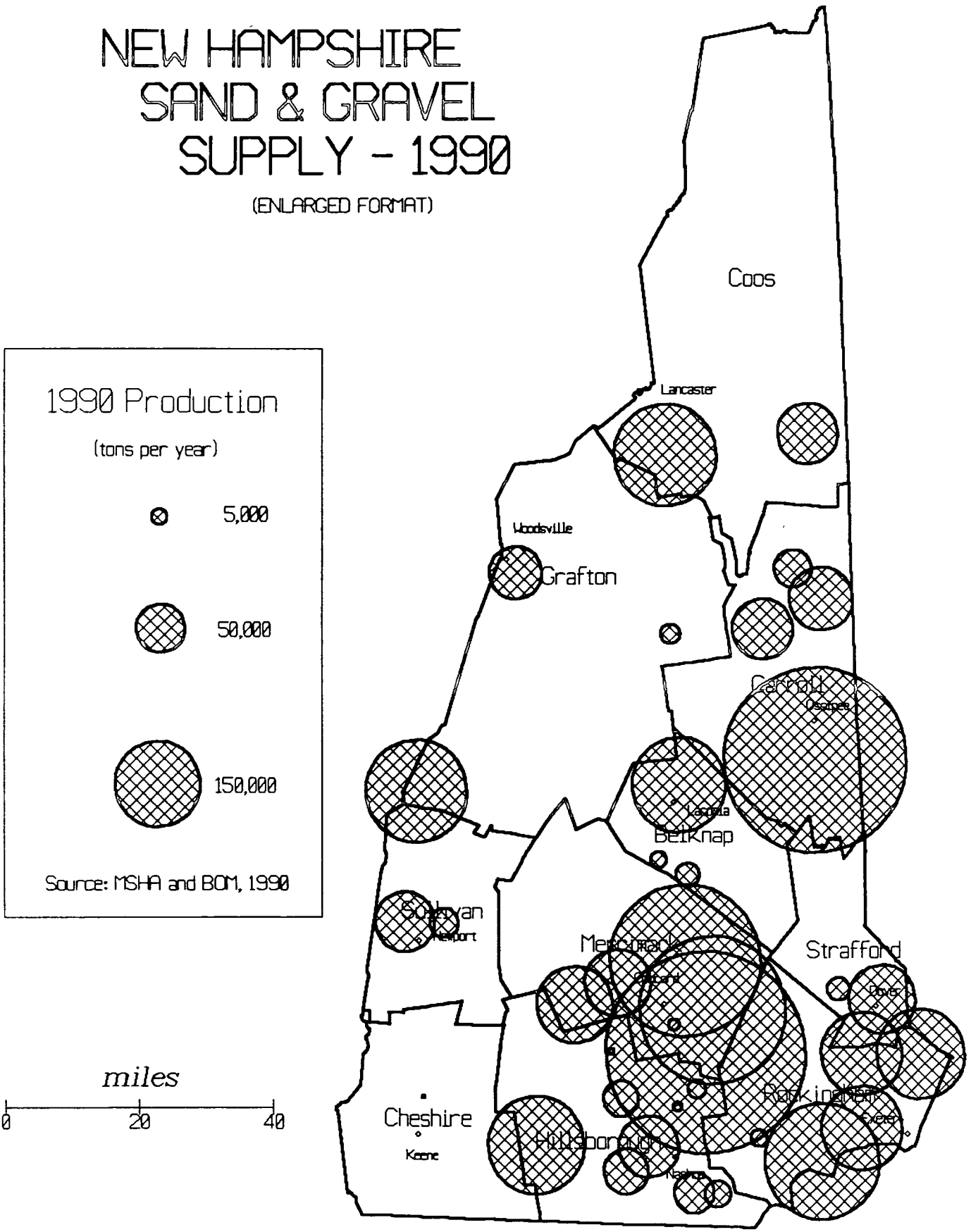
Map 3-35



Production locations shown include aggregate producers and processors. Some producers of non-construction aggregates may also be included.

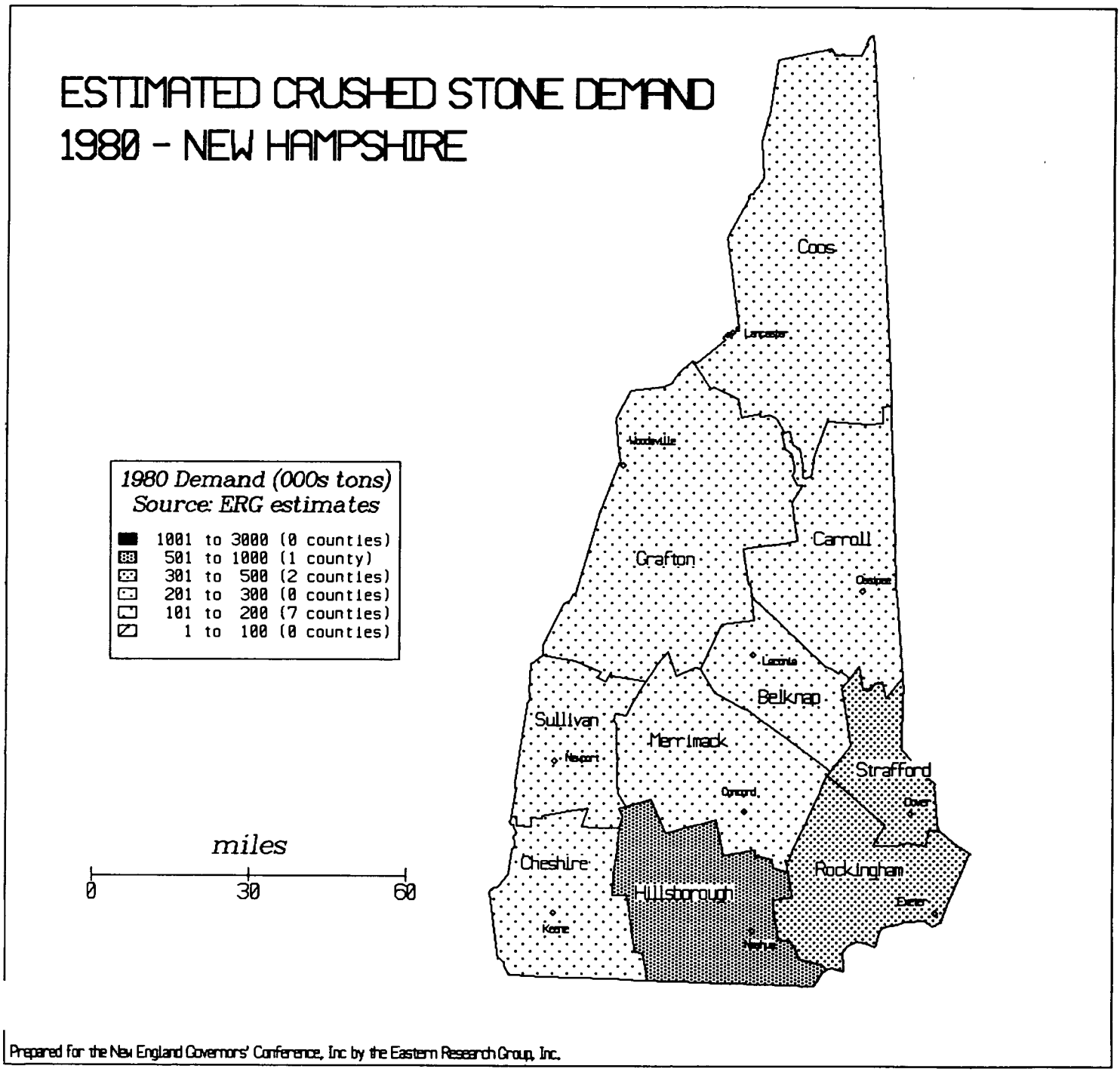
NEW HAMPSHIRE SAND & GRAVEL SUPPLY - 1990

(ENLARGED FORMAT)

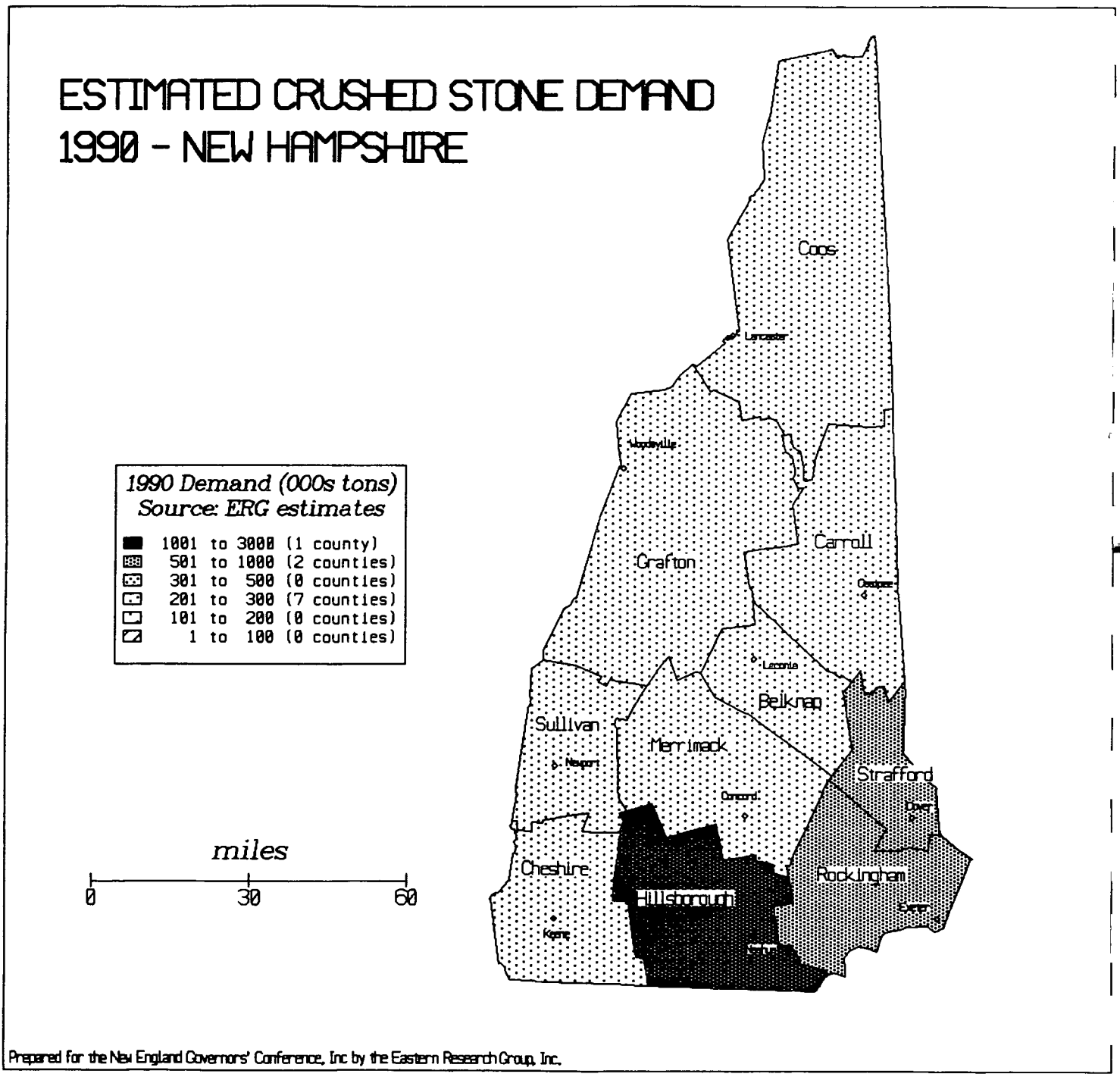


Prepared for the New England Governors' Conference, Inc by the Eastern Research Group, Inc.

Map 3-36

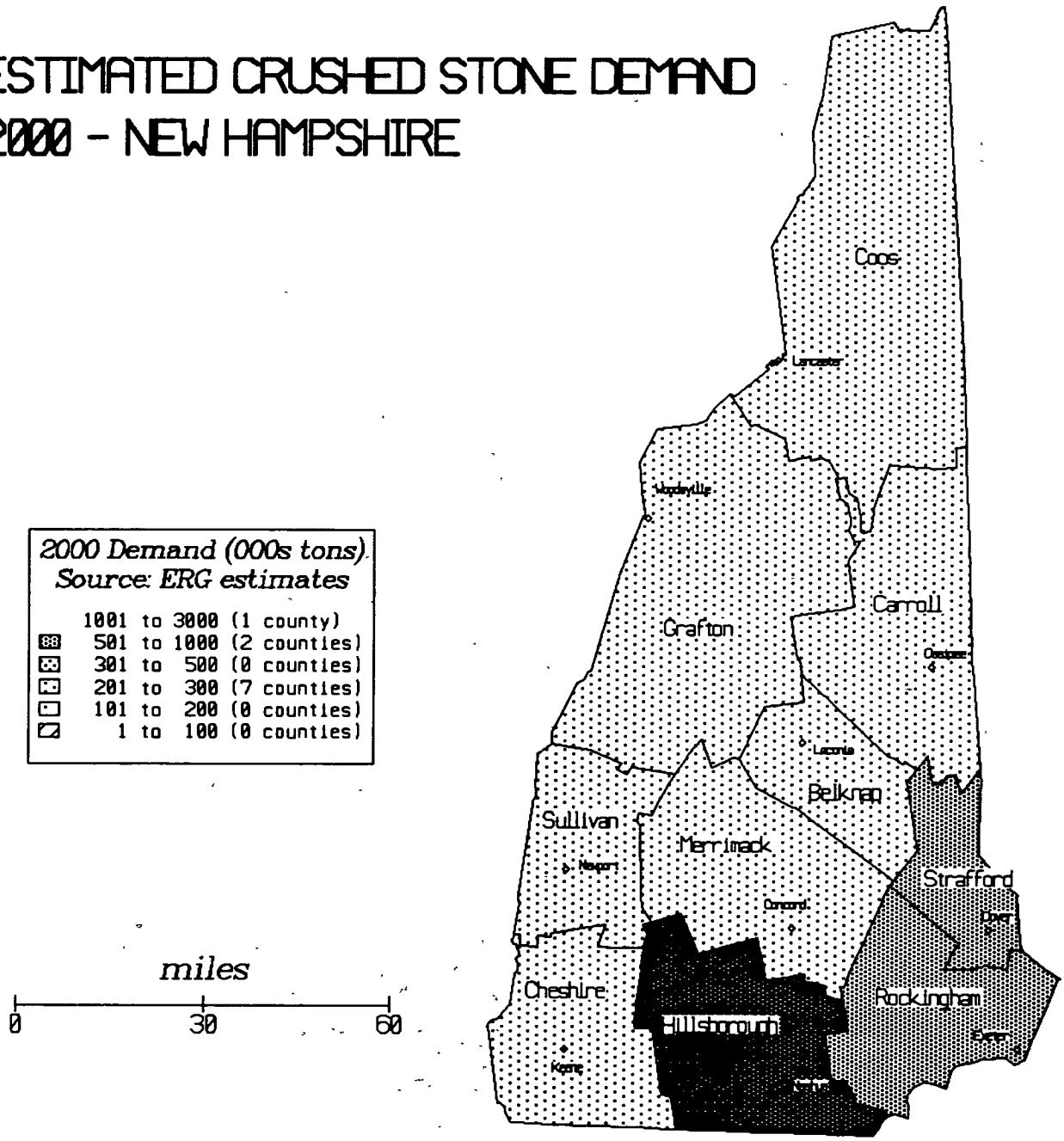

ESTIMATED CRUSHED STONE DEMAND
1980 - NEW HAMPSHIRE
1980 Demand (000s tons)
Source: ERG estimates
1001 to 3000 (0 counties)
501 to 1000 (1 county)
301 to 500 (2 counties)
201 to 300 (0 counties)
101 to 200 (7 counties)
1 to 100 (0 counties)
miles
0
30
60
Coos
Carroll
Grafton
Belknap
Sullivan
Merrimack
Strafford
Cheshire
Hillsborough
Rockingham
Prepared for the New England Governors' Conference, Inc by the Eastern Research Group, Inc.

Map 3-37


ESTIMATED CRUSHED STONE DEMAND
1990 - NEW HAMPSHIRE
1990 Demand (000s tons)
Source: ERG estimates
1001 to 3000 (1 county)
501 to 1000 (2 counties)
301 to 500 (0 counties)
201 to 300 (7 counties)
101 to 200 (0 counties)
1 to 100 (0 counties)
miles
0
30
60
Coos
Carroll
Grafton
Belknap
Sullivan
Merrimack
Strafford
Cheshire
Hillsborough
Rockingham
Prepared for the New England Governors' Conference, Inc by the Eastern Research Group, Inc.

Map 3-38

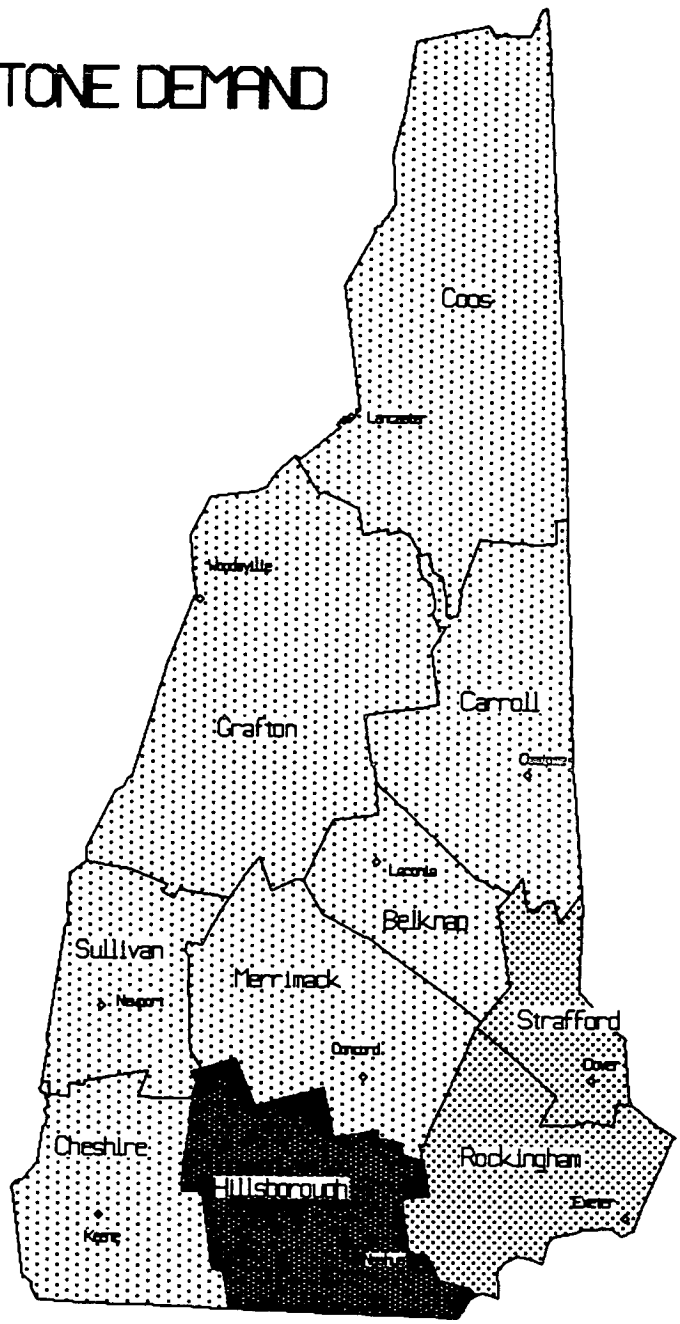
ESTIMATED CRUSHED STONE DEMAND 2000 - NEW HAMPSHIRE



Prepared for the New England Governors' Conference, Inc by the Eastern Research Group, Inc.

Map 3-39

ESTIMATED CRUSHED STONE DEMAND 2010 - NEW HAMPSHIRE



2010 Demand (000s tons)
Source: ERG estimates

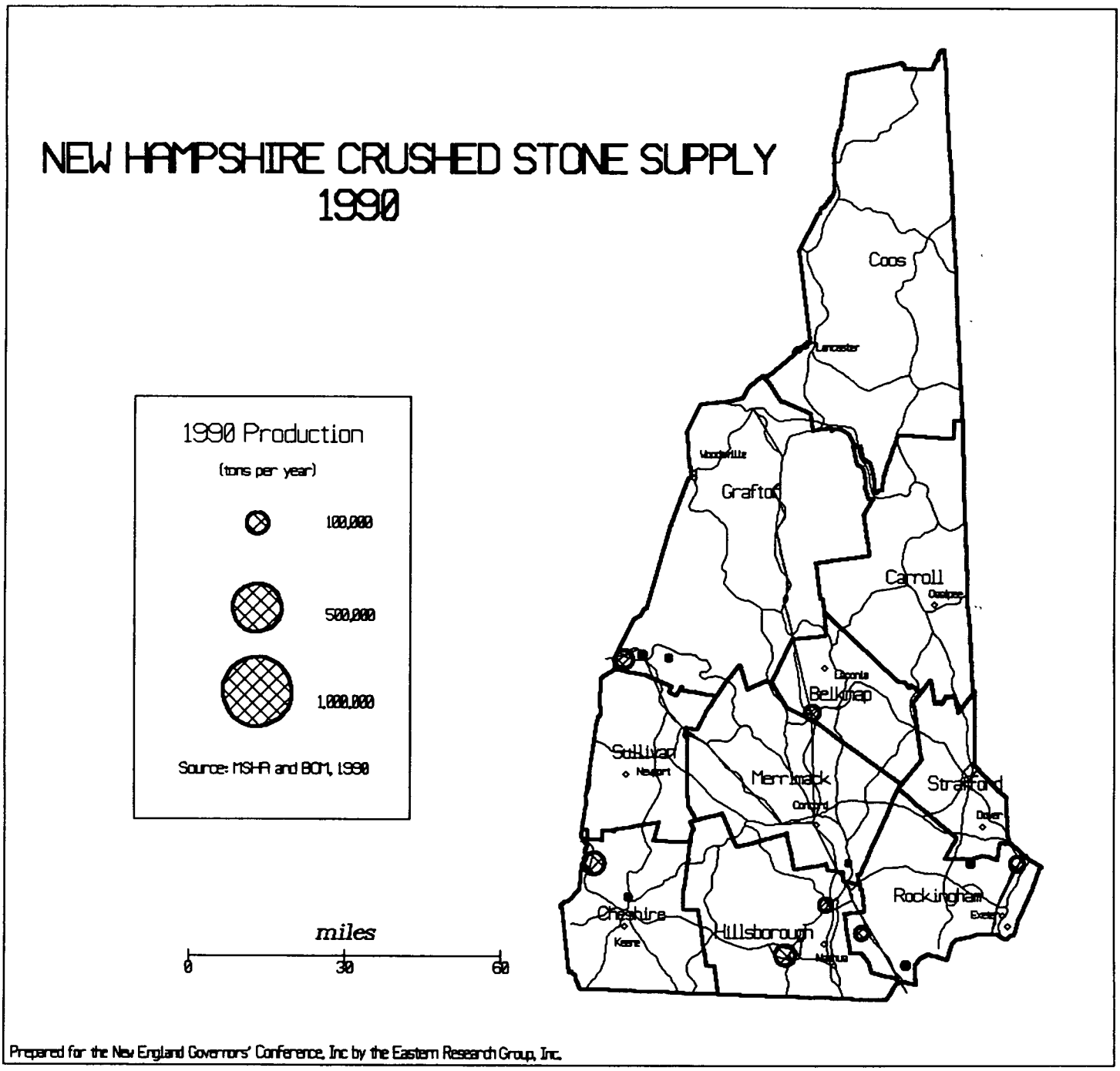
	1001 to 3000 (1 county)
	501 to 1000 (0 counties)
	301 to 500 (2 counties)
	201 to 300 (7 counties)
	101 to 200 (0 counties)
	1 to 100 (0 counties)

miles

0 30 60

Prepared for the New England Governors' Conference, Inc by the Eastern Research Group, Inc.

Map 3-40



Production locations shown include aggregate producers and processors. Some producers of non-construction aggregates may also be included.

TABLE 3.15
HISTORICAL AND PROJECTED DEMAND ESTIMATES
– NEW HAMPSHIRE, BY COUNTY (in 000s of tons)

County Name	Sand & Gravel				Crushed Stone			
	1980	1990	2000	2010	1980	1990	2000	2010
Belknap	236	191	237	349	146	250	240	232
Carroll	236	191	237	349	146	250	240	232
Cheshire	236	191	237	349	146	250	240	232
Coos	236	191	237	349	146	250	240	232
Grafton	236	191	237	349	146	250	240	232
Hillsborough	1,358	1,204	2,089	2,233	844	1,507	1,462	1,412
Merrimack	236	191	237	349	146	250	240	232
Rockingham	578	502	755	1,074	370	546	510	478
Strafford	578	502	755	1,074	370	546	510	478
Sullivan	236	191	237	349	146	250	240	232
State Total	4,165	3,542	5,255	6,826	2,607	4,347	4,163	3,989

Source: ERG Estimates

3.4.5 Rhode Island
Aggregates History and Projections

Sand and Gravel

Rhode Island demand is the smallest among the New England states. Nevertheless, over the 1980 to 1988 interval, Rhode Island's demand for sand and gravel was the fastest growing, with the total volume almost tripling from 1.2 to 3.3 mt, as shown in Table 3.16 and Figure 3.15. The state is divided into two submarkets, the Providence MSA and Newport County which is the state's only non-MSA county. Both markets saw strong growth during the 1980s, and both are expected to continue to grow at a more modest rate during the projection period. During the near-term, demand will rise from 3.3 mt to 3.9 mt, and from 2000 to 2010, an additional small increase to 4.0 mt is anticipated. During the later period, Newport County will see a period of relative stability, while slow growth will continue in Providence.

Crushed Stone

Rhode Island demand for crushed stone was also the fastest growing in the New England region during the 1980-1988 period. Total demand rose from 0.7 mt in 1980 to nearly 2 mt in 1988, an annual rate of increase of almost 14% per year, as shown in Table 3.17 and Figure 3.16. The Providence MSA dominates the state's activity, as the non-MSA portion consists entirely of Newport County.

Between 1989 and 2000, the state is projected to continue along a slow growth path, with total demand increasing to 2.1 mt by 2000. Beyond 2000, the state demand will remain slightly positive. No significant redistribution of activity within the two submarkets in anticipated.

Rhode Island Maps - Maps 3-41 through 3-50 illustrate aggregate demand and supply in Rhode Island. Table 3.18 summarizes the county-by-county projections that are displayed in the Rhode Island maps.

Table 3.16–Rhode Island Sand and Gravel Demand· 1980–2010 (Tons, 000)

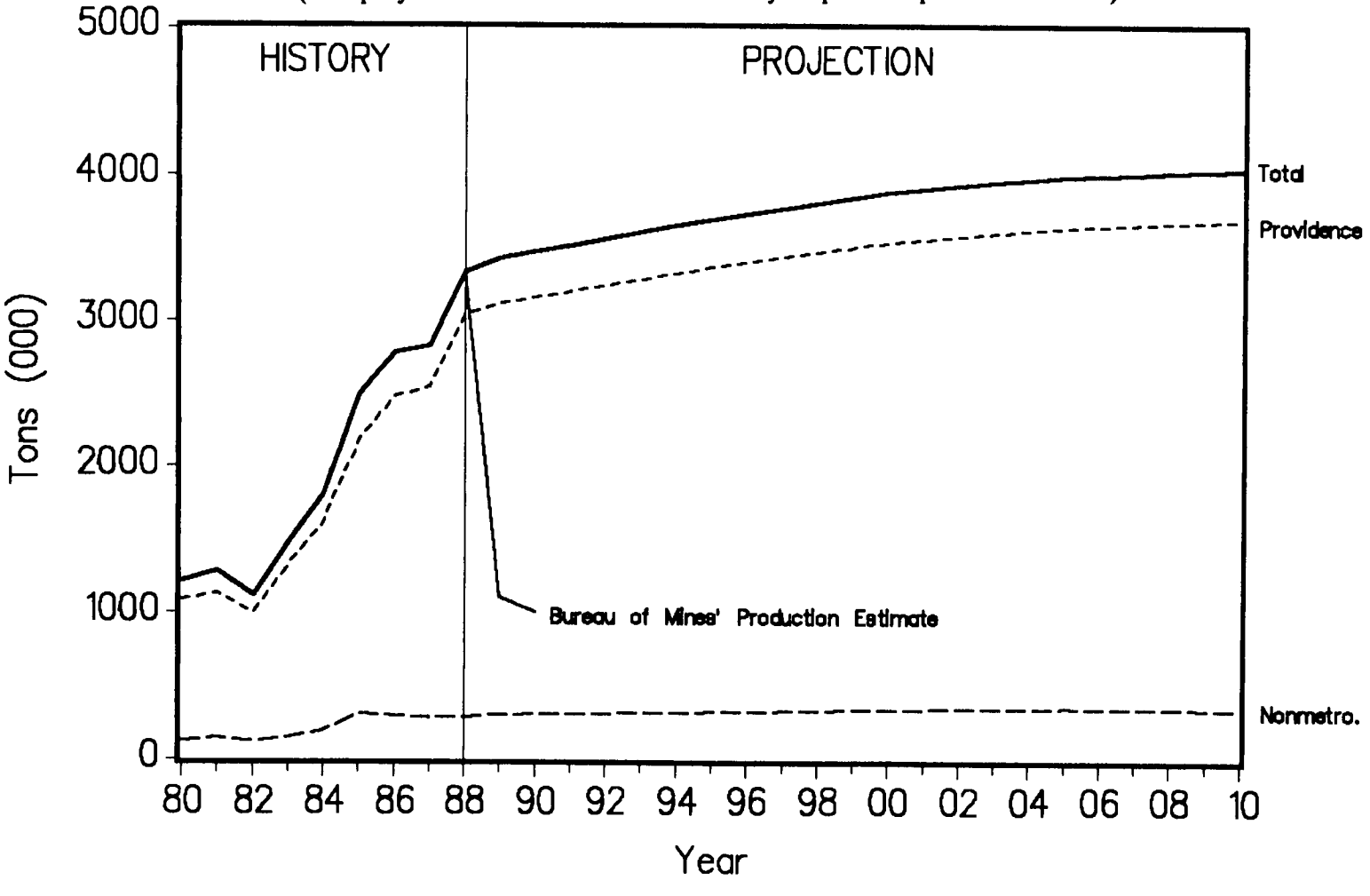
	History			Forecast					Growth Rates (Annual, %)					
AREA\YEAR	1980	1985	1988	1990	1995	2000	2005	2010	1980–1985	1985–1990	1990–1995	1995–2000	2000–2005	2005–2010
STATE TOTAL	1,208	2,485	3,321	3,461	3,683	3,873	3,986	4,027	15 5	6.8	1.2	1 0	0.6	0.2
Providence–Pawtucket–Woonsocket	1,083	2,175	3,033	3,154	3,360	3,530	3,632	3,683	15 0	7 7	1 3	1.0	0.6	0 3
Nonmetropolitan Counties	125	310	288	308	322	343	354	343	20.0	–0.2	0 9	1.3	0.6	–0 6

Source: Eastern Research Group, Inc.

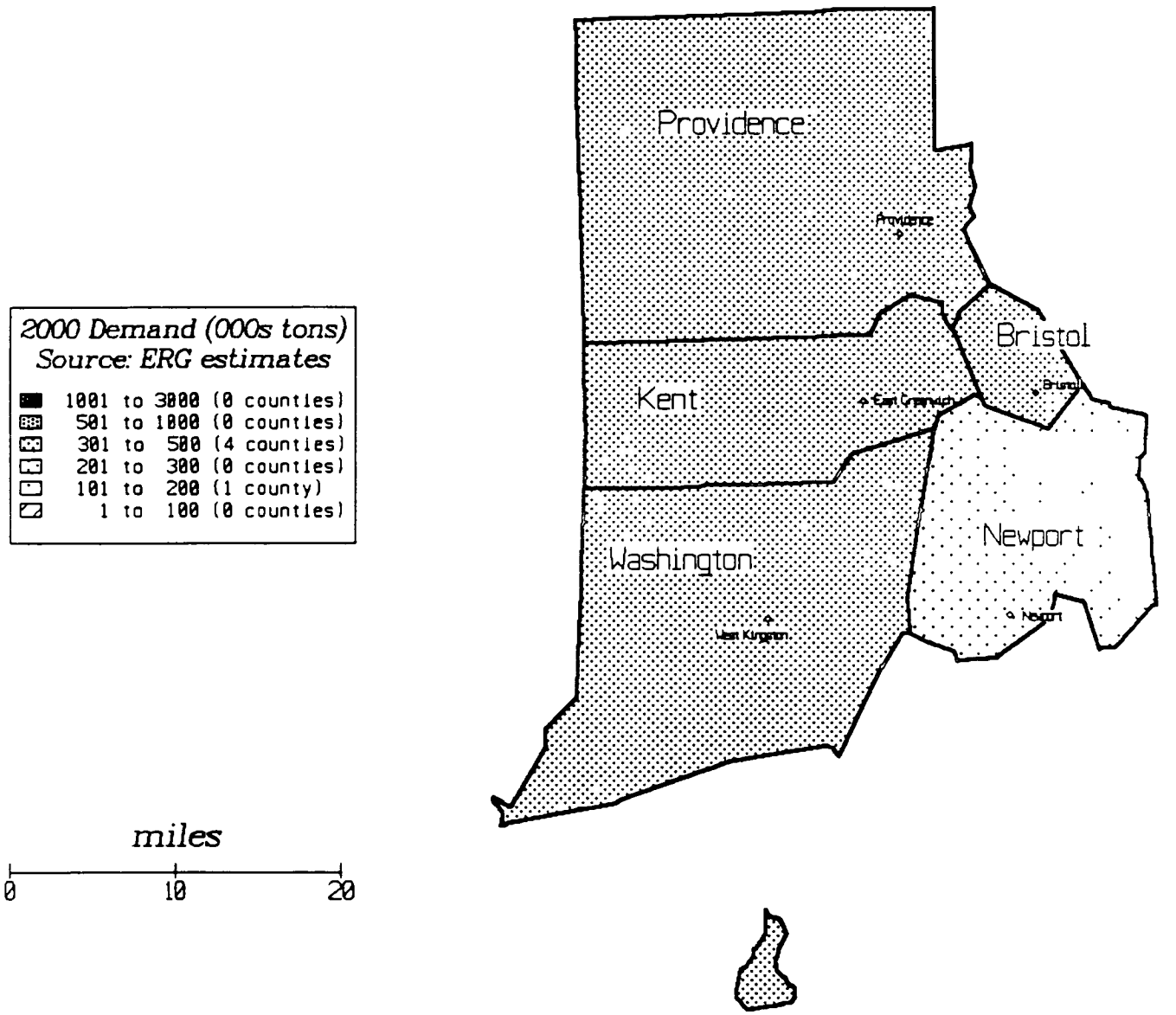
Note: The 1990 forecast was calculated prior to the release of preliminary Bureau of Mines production estimates for 1990.

Figure 3.15: Sand and Gravel Demand 1980 – 2010
Rhode Island, State and Metropolitan Areas

(The projections shown assume a recovery to pre-slump demand levels.)



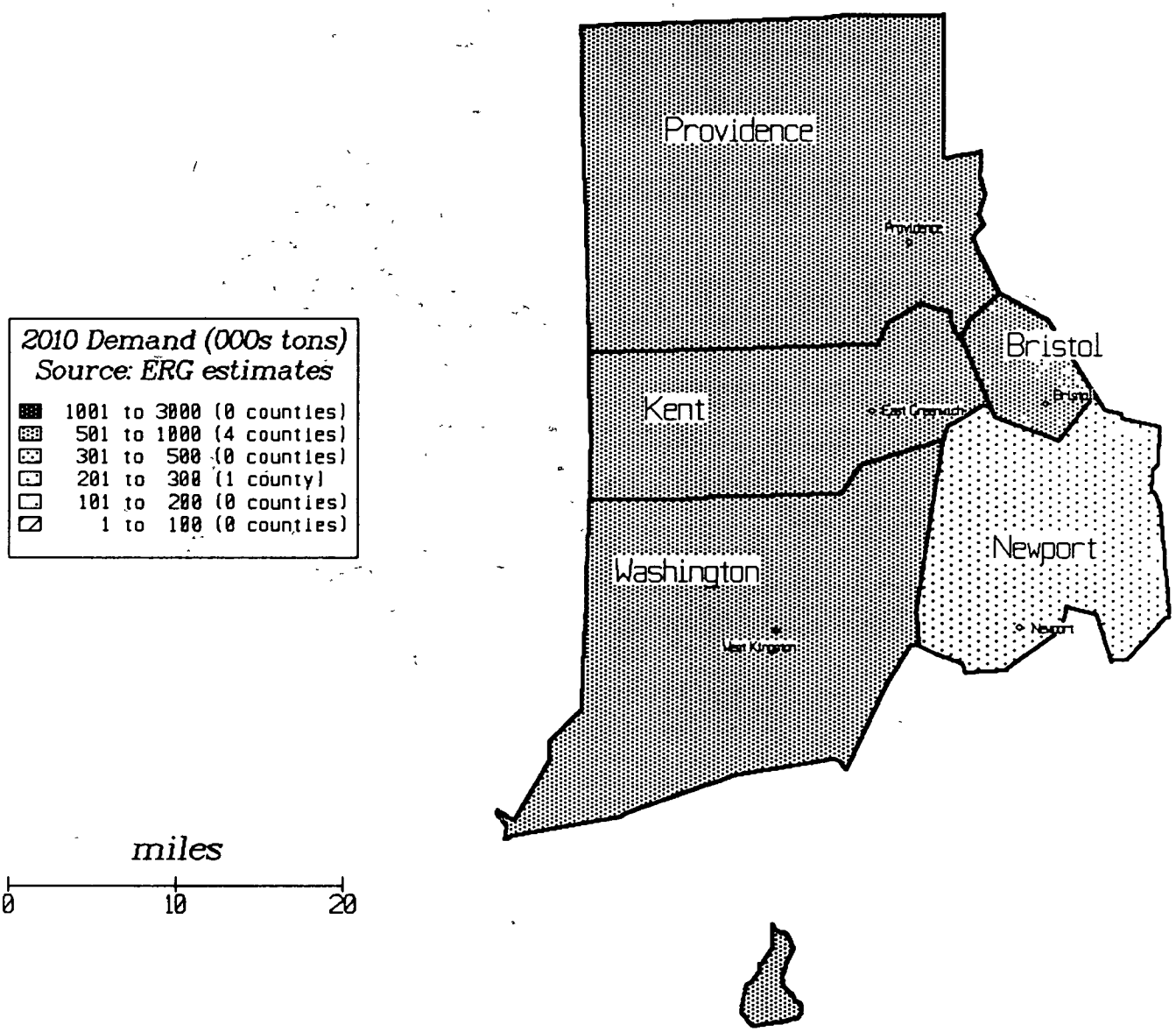
ESTIMATED SAND AND GRAVEL DEMAND 2000 - RHODE ISLAND



Prepared for the New England Governors' Conference, Inc by the Eastern Research Group, Inc.

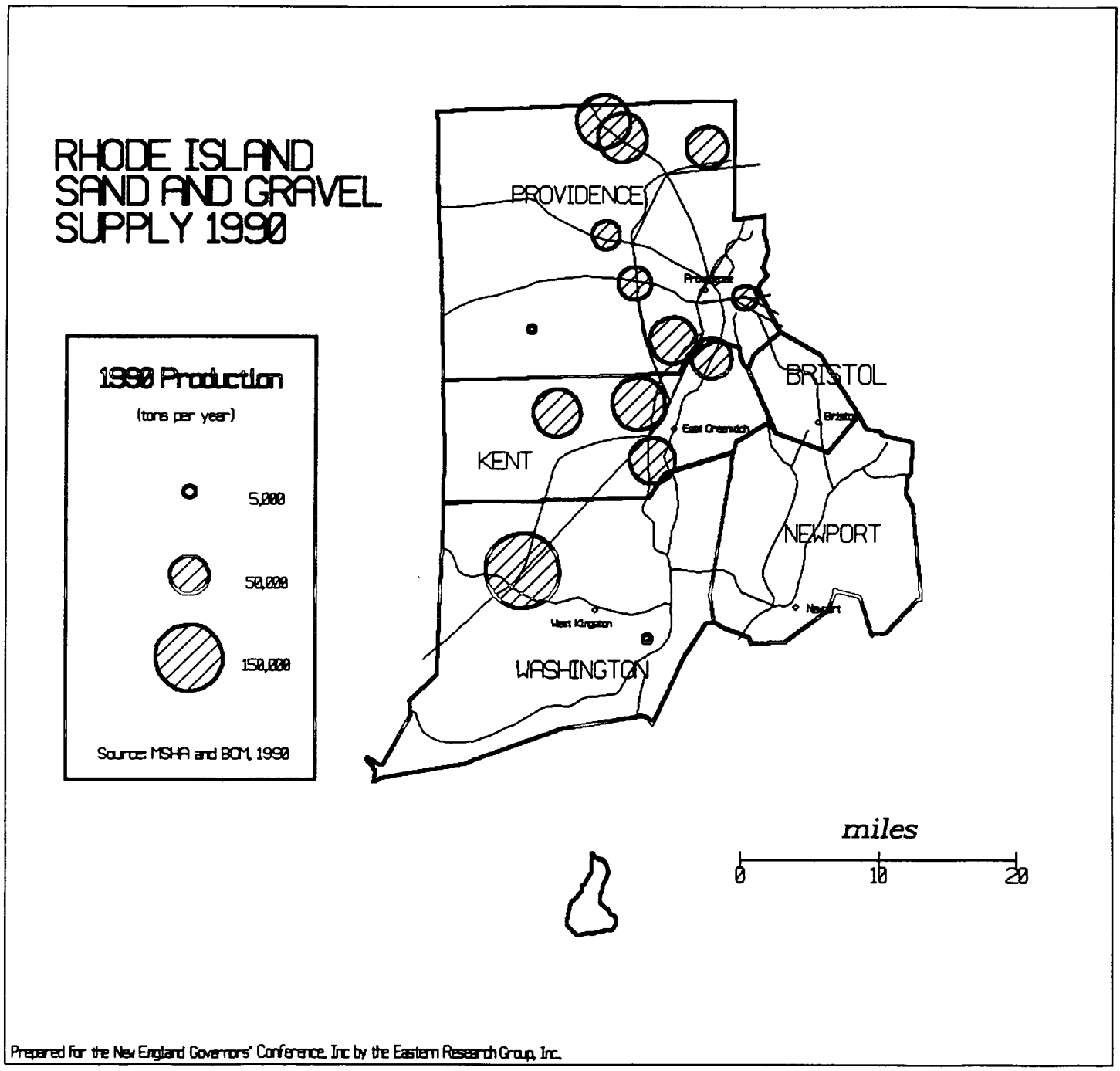
Map 3-44

ESTIMATED SAND AND GRAVEL DEMAND 2010 - RHODE ISLAND



Prepared for the New England Governors' Conference, Inc by the Eastern Research Group, Inc.

Map 3-45

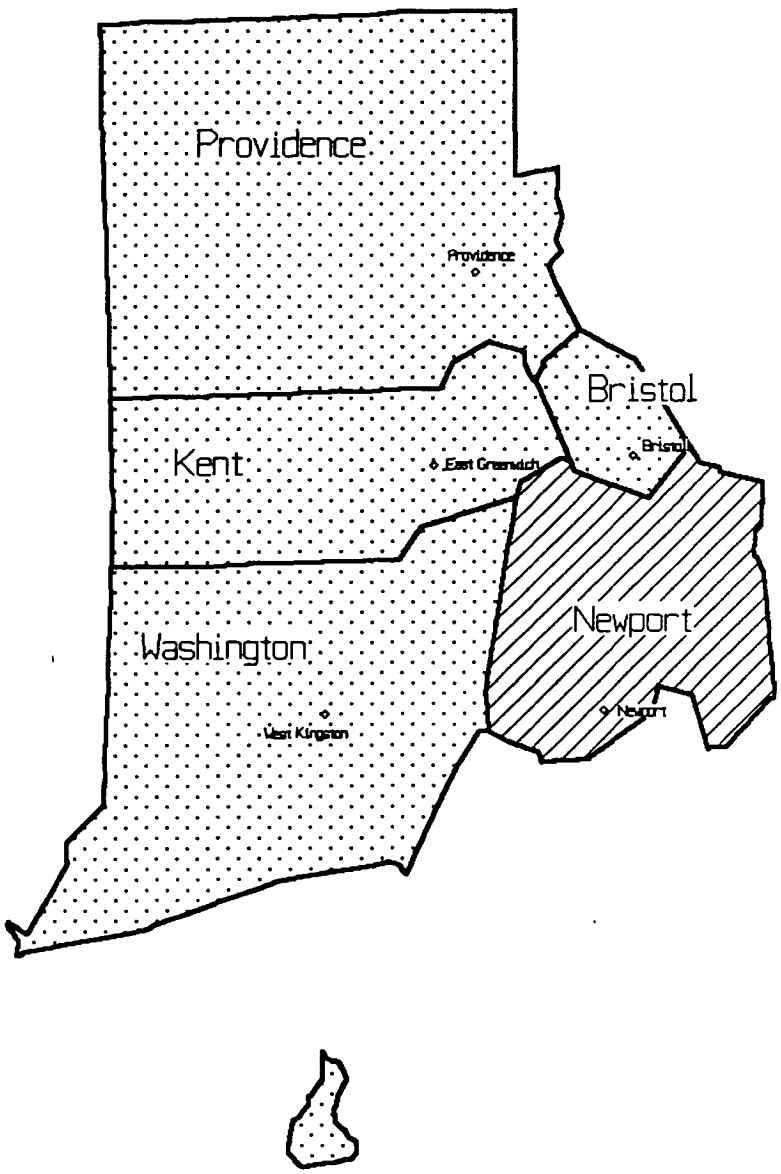


Prepared for the New England Governors' Conference, Inc by the Eastern Research Group, Inc.

Production locations shown include aggregate producers and processors. Some producers of non-construction aggregates may also be included.

Map 3-46

ESTIMATED CRUSHED STONE DEMAND 1980 - RHODE ISLAND



1980 Demand (000s tons)
Source: ERG estimates

1001 to 3000	(0 counties)
501 to 1000	(0 counties)
301 to 500	(0 counties)
201 to 300	(0 counties)
101 to 200	(4 counties)
1 to 100	(1 county)

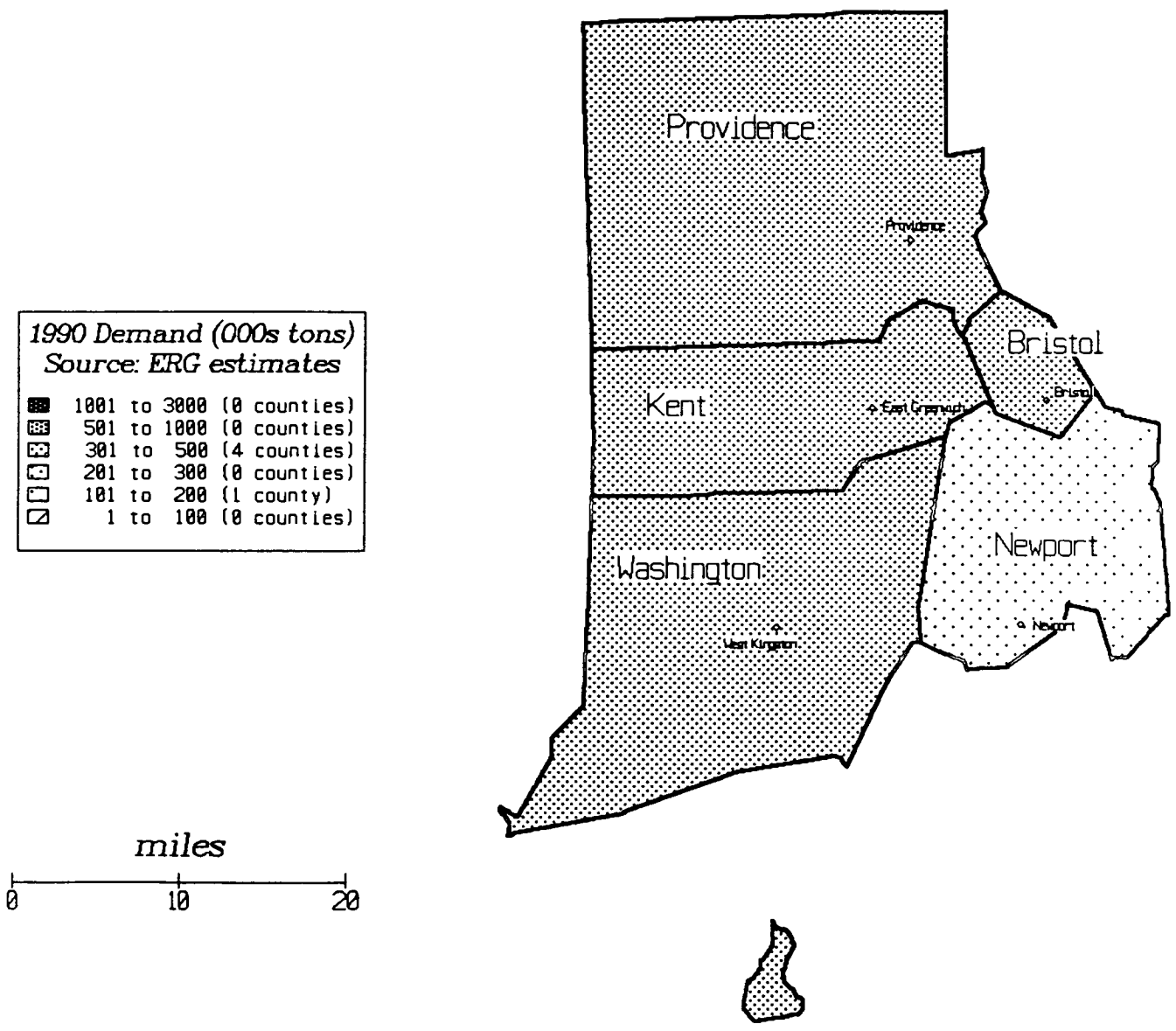
miles

0 10 20

Prepared for the New England Governors' Conference, Inc by the Eastern Research Group, Inc.

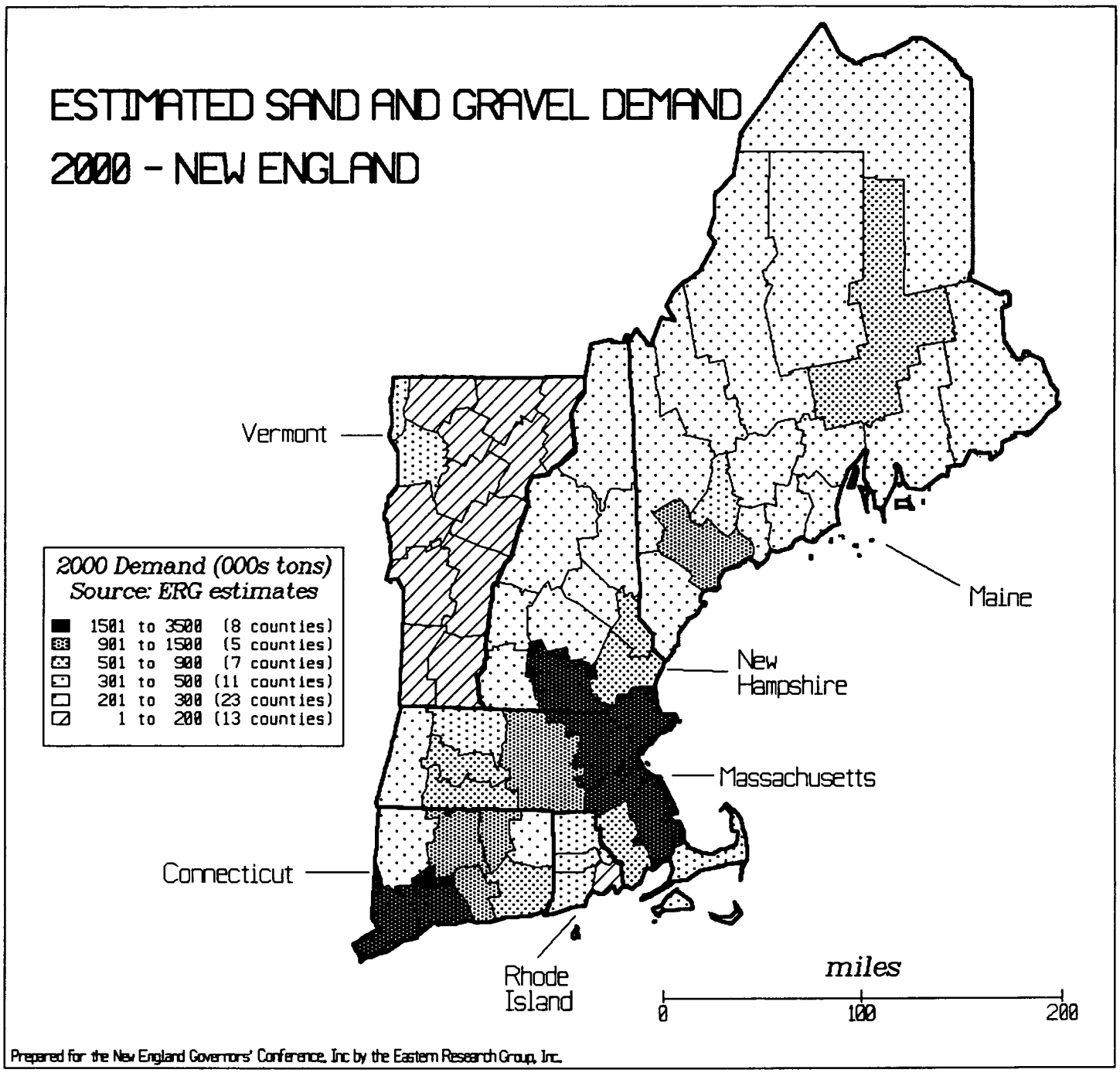
Map 3-47

ESTIMATED CRUSHED STONE DEMAND 1990 - RHODE ISLAND

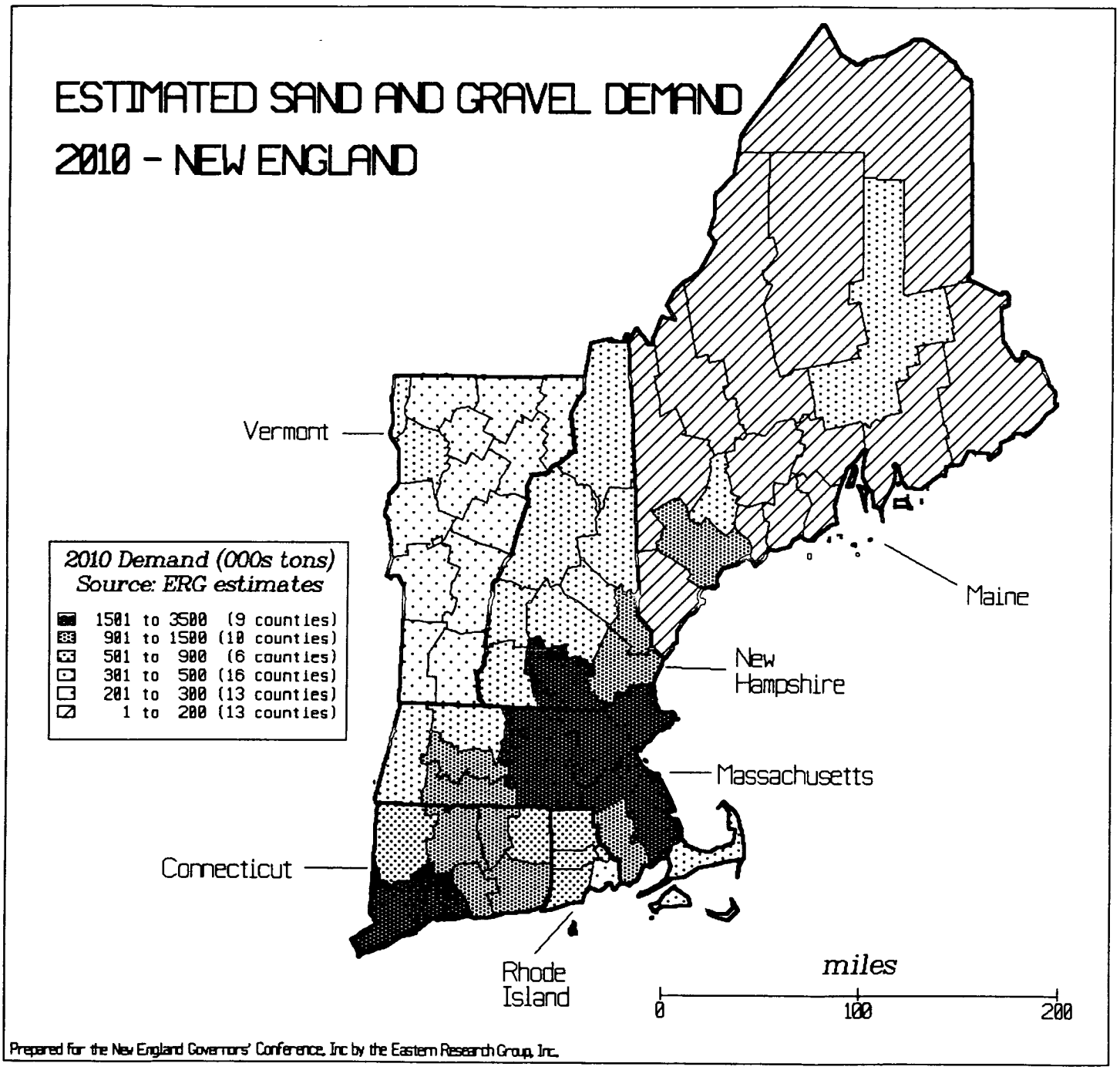


Prepared for the New England Governors' Conference, Inc by the Eastern Research Group, Inc.

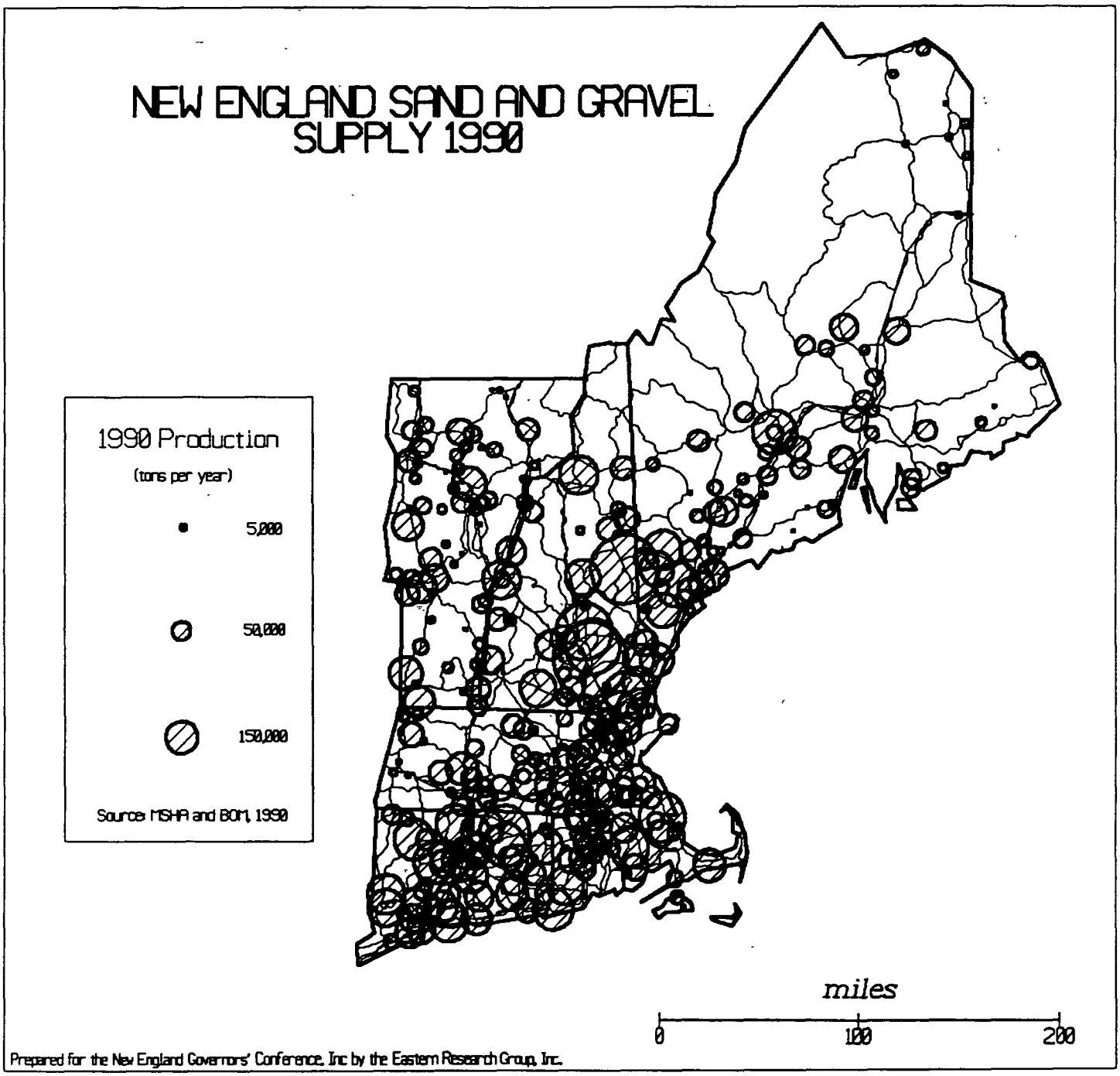
Map 4-3


ESTIMATED SAND AND GRAVEL DEMAND
2000 - NEW ENGLAND
Vermont
Maine
New Hampshire
Massachusetts
Connecticut
Rhode Island
2000 Demand (000s tons)
Source: ERG estimates
1501 to 3500 (8 counties)
901 to 1500 (5 counties)
501 to 900 (7 counties)
301 to 500 (11 counties)
201 to 300 (23 counties)
1 to 200 (13 counties)
miles
0
100
200
Prepared for the New England Governors' Conference, Inc by the Eastern Research Group, Inc.

Map 4-4

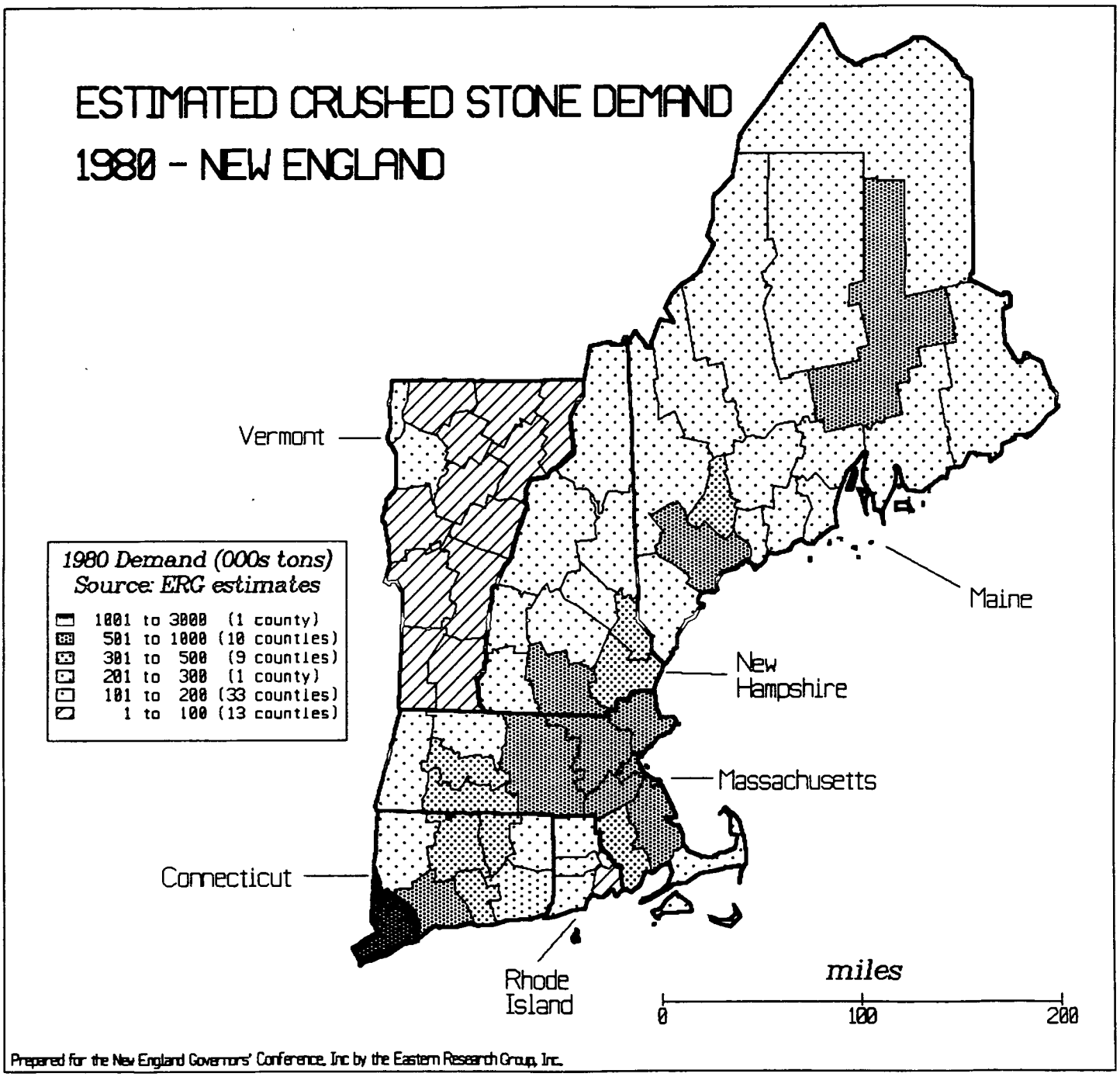

ESTIMATED SAND AND GRAVEL DEMAND
2010 - NEW ENGLAND
Vermont
Maine
New Hampshire
Massachusetts
Connecticut
Rhode Island
2010 Demand (000s tons)
Source: ERG estimates
1501 to 3500 (9 counties)
901 to 1500 (10 counties)
501 to 900 (6 counties)
301 to 500 (16 counties)
201 to 300 (13 counties)
1 to 200 (13 counties)
miles
0
100
200
Prepared for the New England Governors' Conference, Inc by the Eastern Research Group, Inc.

Map 4-5

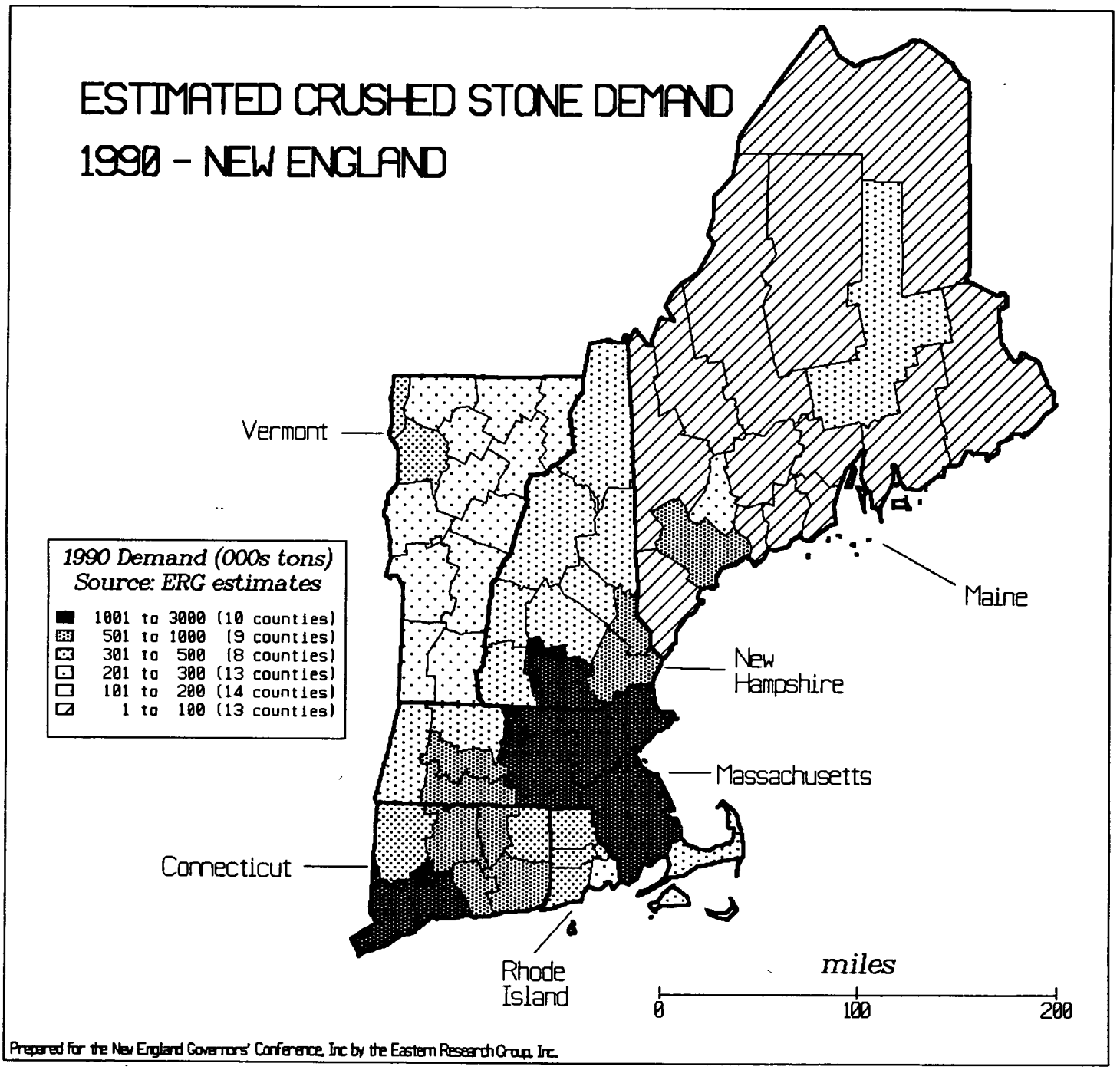


Production locations shown include aggregate producers and processors. Some producers of non-construction aggregates may also be included.

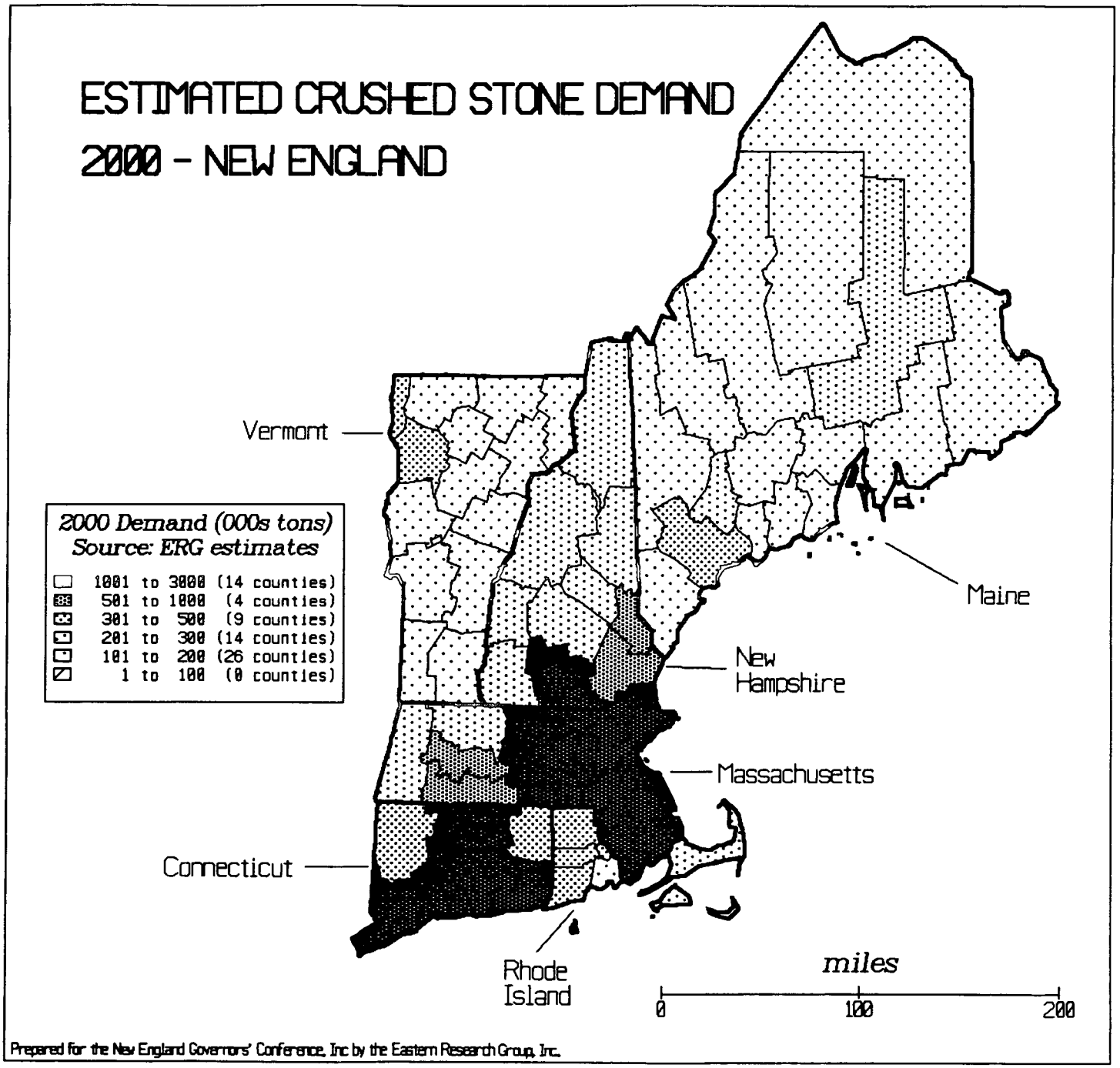
Map 4-6


ESTIMATED CRUSHED STONE DEMAND
1980 - NEW ENGLAND
Vermont
Maine
New Hampshire
Massachusetts
Connecticut
Rhode Island
1980 Demand (000s tons)
Source: ERG estimates
1001 to 3000 (1 county)
501 to 1000 (10 counties)
301 to 500 (9 counties)
201 to 300 (1 county)
101 to 200 (33 counties)
1 to 100 (13 counties)
miles
0
100
200
Prepared for the New England Governors' Conference, Inc by the Eastern Research Group, Inc.

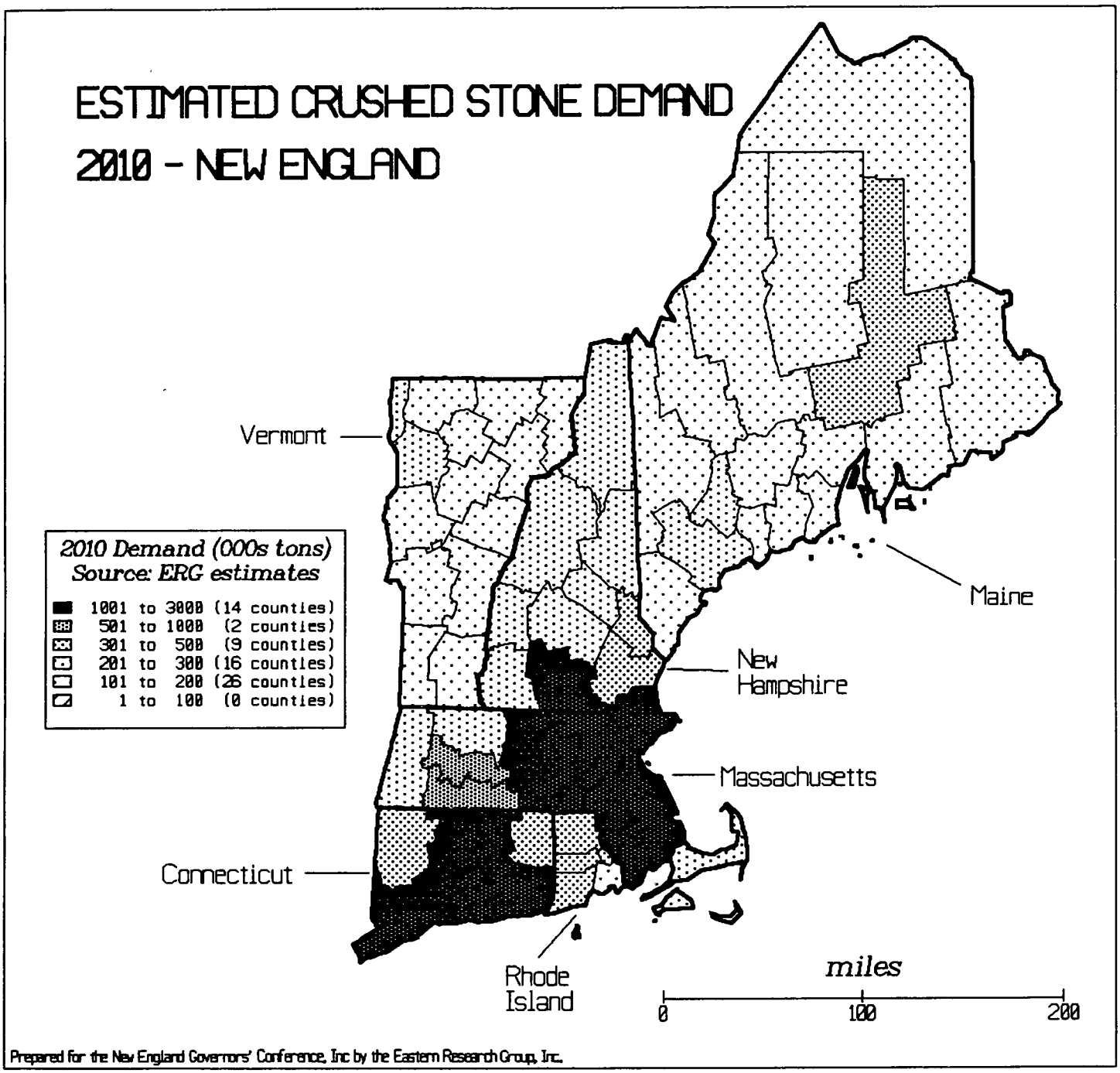
Map 4-7


ESTIMATED CRUSHED STONE DEMAND
1990 - NEW ENGLAND
1990 Demand (000s tons)
Source: ERG estimates
1001 to 3000 (10 counties)
501 to 1000 (9 counties)
301 to 500 (8 counties)
201 to 300 (13 counties)
101 to 200 (14 counties)
1 to 100 (13 counties)
Vermont
Maine
New Hampshire
Massachusetts
Connecticut
Rhode Island
miles
0
100
200
Prepared for the New England Governors' Conference, Inc by the Eastern Research Group, Inc.

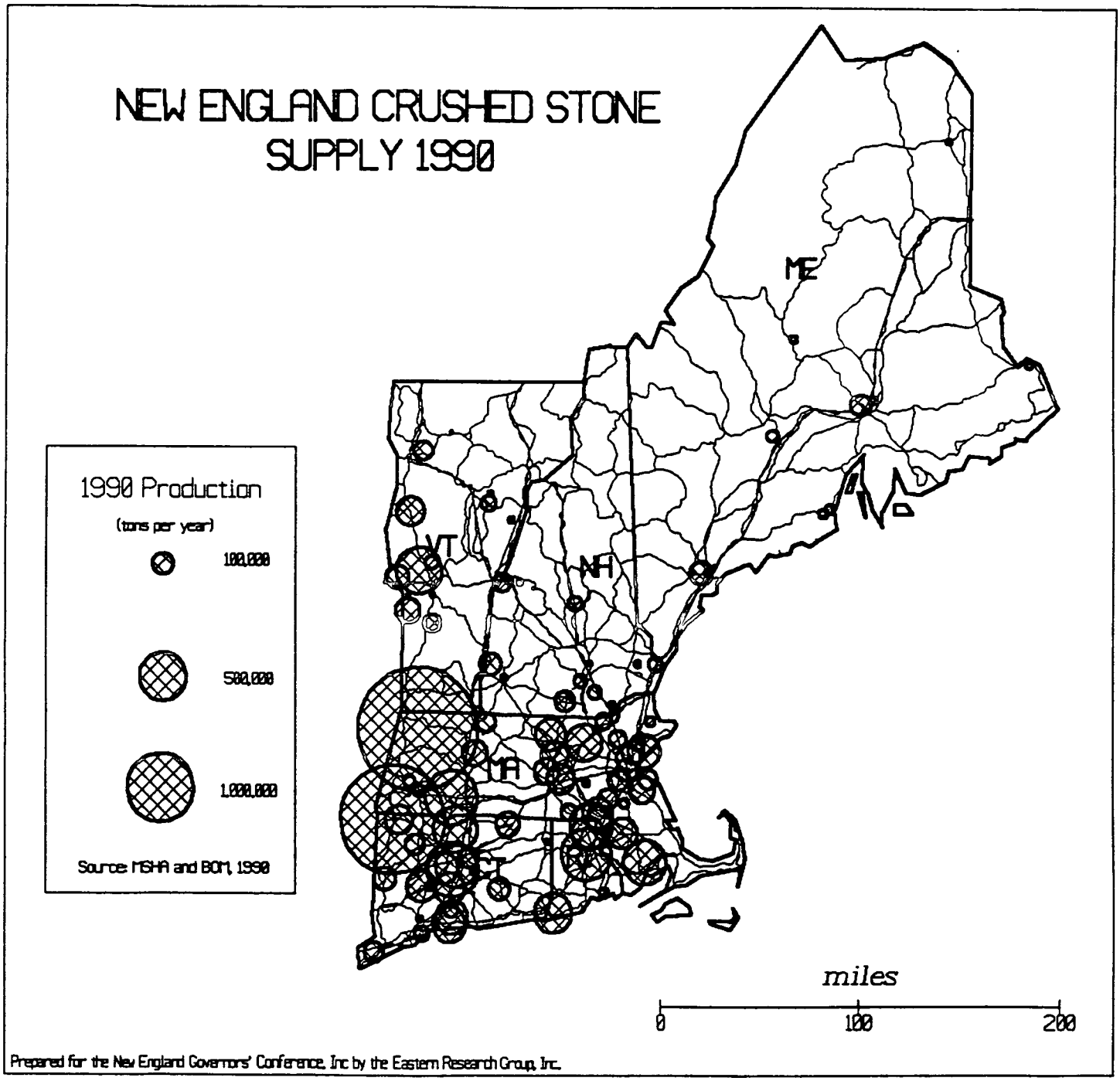
Map 4-8


ESTIMATED CRUSHED STONE DEMAND
2000 - NEW ENGLAND
2000 Demand (000s tons)
Source: ERG estimates
1001 to 3000 (14 counties)
501 to 1000 (4 counties)
301 to 500 (9 counties)
201 to 300 (14 counties)
101 to 200 (26 counties)
1 to 100 (0 counties)
Vermont
Maine
New Hampshire
Massachusetts
Connecticut
Rhode Island
miles
0
100
200
Prepared for the New England Governors' Conference, Inc by the Eastern Research Group, Inc.

Map 4-9


ESTIMATED CRUSHED STONE DEMAND
2010 - NEW ENGLAND
2010 Demand (000s tons)
Source: ERG estimates
1001 to 3000 (14 counties)
501 to 1000 (2 counties)
301 to 500 (9 counties)
201 to 300 (16 counties)
101 to 200 (26 counties)
1 to 100 (0 counties)
Vermont
Maine
New Hampshire
Massachusetts
Connecticut
Rhode Island
miles
0
100
200
Prepared for the New England Governors' Conference, Inc by the Eastern Research Group, Inc.

Map 4-10



Production locations shown include aggregate producers and processors. Some producers of non-construction aggregates may also be included.

SECTION FIVE

LAND USE PERMIT ISSUES RELATED TO AGGREGATE PIT AND QUARRY SITING

Land use controls in the form of local, state, and federal permitting processes help determine the availability and accessibility of aggregate extraction sites. The precise influence of land use controls on aggregate pit and quarry siting is complicated, however, by several variables, such as the geographic distribution of aggregate resources and aggregate demand, economic conditions, and associated political issues. Influence from these other factors is so significant as to prevent a clear judgement of the contribution of land use controls to the accessibility and availability of aggregates. Nevertheless, understanding the number and variety of land use controls is important for comprehending the present situation facing the aggregate industry in New England.

This chapter provides a summary of federal, state, regional, and local land use controls in the six New England states. It begins with a description of issues facing the region as a whole (Section 5.1). Specific permit and regulatory programs for each level of government are summarized in Section 5.2. The permits are grouped into federal, state and local categories. Administrative time requirements of the various state and local permits are found in Section 5.3. The results of the ERG mail survey of aggregates producers is discussed in Section 5.4.

5.1 Overview

Aggregate extraction operations are regulated by several programs at the local, state, and federal levels, but local zoning controls are generally considered the most important by the industry. States, however, wield strong regulatory tools because they impart power to local governments and they administer the major federal environmental programs. The federal government role, on the other hand, is usually passive except for certain siting locations, such as those near navigable waterways. The main federal contribution is setting standards for state-administered environmental programs. Direct federal government reviews are usually reserved for very large scale projects that involve federal resources or funding.

While federal and state regulatory processes demand extensive information, they are generally well-defined, consistent, and reasonably predictable. New programs, such as stormwater runoff permits under National Pollution Discharge Elimination System (NPDES), are exceptions, however, because they do not have established and tested procedures.

Applicant difficulties are most frequent in local permitting processes. Aggregates producers have commonly cited problems with the unpredictability of permit requirements and the length of permit processing. While these problems exist for other permits, they were more severe for local zoning processes. Some larger firms with operations spanning several municipalities encounter a wide variety of local requirements. The variation in the degree and content of local enforcement compounds the difficulties and unpredictability of complying with requirements in multiple jurisdictions. Long permitting processes delay projects, require greater expenditures, and may discourage future applications. While most firms agree that the permit approval process is too long, the unpredictability of the process was more often the greater concern.

Aggregate firms frequently complain that the actual permit processes do not meet processing schedules specified in the regulations. The most common deviation from specified schedules occur when government officials interrupt prescribed timetables with requests for more information or studies. Administrative rulings that applications are complete, the first step in most application processes, are often mistaken by producers as indicating that no other information will be required. Aggregate firms often view requests for additional information during the permit review process as mere delaying tactics. On the other hand, government officials state that many information or data gaps become apparent only during thorough review of initial applications. To compound the problems, the statutory and regulatory requirements of state and federal programs have increased dramatically over the past ten to fifteen years.

Additionally, local requirements are particularly volatile since they can change with the passage of new municipal council resolutions. For instance, aggregate firms cited examples of town councils changing their zoning ordinances specifically to block their proposed aggregate facility permits. Local land use controls also vary in stringency, technical detail, and sophistication of design. These controls are a product of their specified requirements, review procedures, and implementation authority. Some municipalities ban aggregate extraction by omitting it as an

appropriate activity for any land use category. Other municipalities codify technical requirements, such as assessing the implications of aggregate development on groundwater resources, that strain the technical knowledge of these typically voluntary local zoning boards. Lastly, many small local jurisdictions have governmental officials serving multiple roles. Government officials with multiple responsibilities are more prone to mixing other town issues into extraction siting decisions. Many aggregate firms objected to their lack of influence over the combining of their permit decision with other local concerns.

5.2 Specific Jurisdictions

Land use permits and regulations are discussed below in descending order of their government hierarchy: federal, state, and local.

5.2.1 Federal Programs

Direct federal controls extend only to potential aggregate sites located on either:

- Coastal lands,
- Wetlands,
- Land affecting navigable waters, or
- Federally-owned land.

In addition, the federal government is responsible for developing standards for many pertinent programs implemented by the states, such as water quality, wellhead protection, air quality, and stormwater discharge programs.

Coastal Zone Management Program

The Coastal Zone Management (CZM) Program represents the most significant federal involvement in aggregate pit and quarry siting in New England. Overall CZM's significance is due partly to a general absence of other strong federal control programs. The significance of CZM is due specifically to:

- The extent and intensity of coastal development in New England as compared with interior regions
- The limited need for the involvement by the Environmental Protection Agency (EPA) and the US Army Corps of Engineers and given the strength of local wetlands controls in New England
- The limited extent of federally owned lands in New England, largely eliminating a role for the large land-owning federal agencies, such as the National Park Service, National Forest Service, Fish and Wildlife Service, and the Bureau of Land Management

CZM is federally authorized and administered by each state. It addresses land use controls rather than specific mining operation proposals. The CZM program ensures that land use controls in the coastal region are consistent with the coastal zone management plan developed for that state under federal guidelines. CZM is administered as a last stage in the review process. While it is typically the last official review, most CZM program staff monitor projects throughout their administrative processing to minimize unexpected requirements for the applicant. In addition, the CZM program coordinates other federal parties by ensuring notification of applicable programs for review.

U.S. Army Corps of Engineers' Dredge and Fill Program

The U.S. Army Corps of Engineers is the second most active direct federal reviewer of aggregate extraction proposals in New England. This status is due primarily to their authority under Section 404 of the Clean Water Act (33 U.S.C. 1344) empowering the Dredging and Filling Program, as well as Sections 9 and 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 401 and 403). The Corps controls any dredge and fill operation activity in navigable waters, a definition that

encompasses wetlands. Guidelines for the Dredging and Filling Program are found in 40 CFR Section 230. While the USEPA assisted in developing these guidelines, the Army Corps of Engineers implements them. Other regulations guiding Corps permit reviews are found in 33 CFR Sections 320-330.

The most common extraction proposals involving Army Corps reviews are operations that require access roads over or through neighboring wetlands or waterways. Strong state-level wetland controls in New England limit the Corp's role primarily to reviewing projects affecting navigation and to the larger projects. Completion and submission of a standard application (ENG Form 4345) with a full description and drawings, along with a $100 fee, triggers a 15-30 day public comment period. The Corps considers comments on nineteen different subject areas, including: aesthetics, cultural values, fish and wildlife values, flood hazards, water quality, safety, needs and welfare of people, and general environmental concerns. Typical permit processing times range from two to three months.

The amount of area defined as wetlands, and thus the amount of land under U.S. Army Corps of Engineers jurisdiction, is currently under revision as the result of the redrafting of the 1989 Manual for Identifying and Delineating Jurisdictional Wetlands. This federal manual also serves the other three federal agencies with wetland regulatory responsibilities: Department of the Interior's Fish and Wildlife Service, Environmental Protection Agency, and the Department of Agriculture's Soil Conservation Service.

Proposed revisions to the Manual (see 56 FR 40446 through 40480 in the August 14, 1991 Federal Register) categorize wetlands based on attributes, such as their hydrology, hydrologic vegetation, and hydric soils. The resultant categories are used to rank wetlands. The purpose of the modifications to the 1989 version of the Manual is to reduce the overall scope of the U.S. Army Corps permit program and allow focussed attention on the wetlands in most need of protection. The proposed revisions are receiving close scrutiny and are proving to be quite controversial. Consequently, approval of the proposed modifications are expected to take up to two years.

While the modifications, as proposed, would remove significant amounts of wetlands from U.S. Army Corps jurisdiction in all of the New England states, the existing and relatively stringent

state and local wetland permitting programs will probably remain unchanged. In summary, with or without the U.S. Army Corps of Engineers permit program, aggregate extraction proposals located in New England's wetlands will continue to face strong government regulation and public concern.

Other Federal Programs

The Environmental Protection Agency (USEPA) and the Department of the Interior (USDOI) are also involved in some aggregate pit and quarry proposal reviews. The USEPA has review responsibilities (jointly with the US Army Corps of Engineers) over pit and quarry proposals affecting wetlands, while the USDOI has controls over activities occurring on federally-owned lands.

Lastly, the USEPA is developing stormwater discharge permits under their authority under the Clean Water Act. This national program requires dischargers of stormwater, including aggregate pits and quarries, in all New England states to complete detailed applications describing the nature and magnitude of their discharges. As the NPDES program, this permit program will be administered by each state. Standard methods to reduce or mitigate the effects of stormwater discharges, however, have not been established. Consequently, the future effects of this program remain uncertain.

5.2.2 State Programs Across New England

The state permits relevant to aggregate extraction cover land use, wetlands, air, water supply wellhead protection, and explosive blasting. All six New England states have permit programs that affect wetlands, air quality, public water supply wellheads, and explosive blasting. These programs are mandated by federal legislation and administered by the states. In addition, two of the six states have direct land use and extraction permit programs. Another state permit program for extraction operations is the fledgling stormwater discharge program. A summary of the existing major state-level permit programs for the New England states is shown in Table 5.1.

Table 5.1

SUMMARY OF EXISTING PERMIT PROGRAM AREAS APPLICABLE TO AGGREGATE EXTRACTION OPERATIONS IN THE NEW ENGLAND STATES

State	State-Level Land Use Controls	Aggregate Extraction Restrictions	Wetlands Development Reviews	Air Quality Permits	Explosives/ Blasting Licensing	Stormwater Discharge Permits	Wellhead Protection Restrictions
Connecticut	no	yes	yes	yes	yes	yes	yes
Maine	yes	no	yes	yes	no	yes	yes
Massachusetts	no	no	yes	yes	yes	yes	yes
New Hampshire	yes	yes	yes	yes	yes	yes	yes
Rhode Island	no	no	yes	yes	yes	yes	yes
Vermont	yes	no	yes	yes	yes	yes	yes

State-level aggregate extraction regulations and land use controls exist or are proposed in only a few of the New England states. The other five controls are found in all of New England. The five universal controls are discussed below by category, while land use and extraction programs are discussed in Section 5.2.3.

Wetlands

The wetlands protection programs are similar in all six New England states. Wetlands protection programs seek to minimize degradation of wetland resources from development, including aggregate extraction. States have authorized local authorities to review developments for their impacts on wetlands. States provide technical resources and perform review of the larger projects. All new or expansion proposals for aggregate pits and quarries locating in wetlands are regulated. Existing aggregate pits and quarries in wetlands areas are allowed to continue to avoid "unreasonable takings." These pits are "grandfathered" to allow their continued operation.

Wetland permits require applicants to submit comprehensive site plans. Many of the information requirements are satisfied by the information normally provided to local zoning boards. Soils assessments, wetlands delineations, and species identification, however, are not normally required in typical local zoning submissions. Public comment periods and or hearings are used to elicit public comments on these plans. Wetlands permits add, however, another one to five months to permit processing depending on the complexity of the proposal, completeness of the original submission, and the degree of public concern.

Many aggregate firms noted that if a proposed site affects wetlands, then the approval process would automatically become more controversial and difficult. The reliance of opponents to aggregate site proposals on wetlands restrictions indicates the strength of these controls in absolute terms and relative to the other land use controls.

Air Quality

Air quality standards are derived from federal regulations mandated by the Clean Air Act. These rules are administered and adapted by each state. Nuisance issues, such as traffic and noise, are issues typically addressed in local zoning ordinances. State-issued air quality permits address dust and particulates emanating from extraction machinery, such as crushers and screens.

New facilities usually must first obtain a construction permit before they are eligible to get an operating permit. Some states like Maine, however, combine construction and operating permit processes into one. All air permit processes in New England, however, are very similar.

Air quality permit eligibility is based on aggregate production volumes or particulate emission limits. Some states base their air quality requirements on the level of production at aggregates facilities; the larger the production volume, the more extensive the required controls. Other states specify controls depending on the amount of air emissions from an aggregate facility. All aggregate processing operations that meet the eligibility criteria must obtain operating permits. In aggregate operations, air emissions originate from rock crushing equipment and from screening and sorting operations; both generate considerable fugitive dust. Traffic and other extraction activities also contribute to fugitive dust emissions. Aggregate pits and quarries that do not use full-size crushers or screens may not require air permits (Small crushers or screens may also be allowed). The major categories of aggregate pits and quarries that must obtain permits are listed in the tables summarizing the major state programs (tables 5-2 through 5-7 shown below). As part of this process, each applicant must conduct a best available technology assessment to justify their choices of control equipment and procedures. Typical aggregate extraction air quality permit

conditions require operators to:

- Limit production, operation, or feed rates
- Pave roadways near road entrances
- Wet roads for dust suppression
- Cover trucks and piles with tarps
- Limit the drop-distance for aggregate falling off conveyor belts onto piles
- Use and maintain air filters
- Develop dust suppression programs for operations and access roads to comply with minimum visual standards for dust

All New England states require applicants to issue public notice of their air permit's operating conditions. The state then makes a determination about whether to hold a public hearing based on requests for hearings received in the public comments. Most aggregate operation permits have not required public hearings. Nevertheless, public hearings may be appropriate in some cases such as where sensitive populations (e.g., schools, residences, or hospitals) are in close proximity to the facility. Public hearings usually add at least two months to the permitting process. Ultimately, air quality permits are not usually major obstructions to siting an aggregates operation. Rather, companies merely adjust the extraction operations to make them acceptable within the state's air quality plan.

Explosive Blasting

Explosive blasting necessary for rock quarrying operations is controlled by all three levels of government: local, state, and federal. The federal government regulates storage of explosives and each state regulates the transportation of explosives and licensing of explosives engineers. Local governments generally review site-specific blasting operations. In general, states are responsible for licensing blasters.

While each New England state has a slightly different approach, their overall controls are fairly consistent. In general, New England states issue licenses to quarry blasters and local

governments issue permits for specific blasting sites. The exceptions to the pattern are Maine and Rhode Island. In Maine there are no state-issued licenses. Maine relies on insurance companies to require the requisite experience or training. Maine municipalities control actual blasting site conditions. In Rhode Island, the state issues the permits. The state permit, however, also requires local government approval.

State licenses take up to two to three months to obtain. Connecticut, the one exception based on a conversation with a representative of the Connecticut aggregates industry, has a waiting period for licenses of several months due to the backlog of license applicants. Local permits are usually granted within one day where applicable, unless a preblast survey is required. Preblast surveys notify abutters to the blasting site of proposed blasting operations and survey their structures to enable reimbursement in the event that damage results. Preblast surveys usually take about two weeks, but vary depending on the number of abutters. Permits typically delineate permissible blasting frequencies and sometimes specify the precise time of the blasts. Local fire officials commonly monitor blasting activities on-site.

Stormwater Discharges

Stormwater discharge controls are required under a new section of the National Pollutant Discharge Elimination System mandated by the federal Clean Water Act. As noted earlier, this program is still under development. While some states have begun collecting permit applications, the review procedures and operating requirements are not clearly defined. These permits will generally be similar to air quality permits in that they require submission of detailed descriptions of discharges resulting from operations and measures to minimize their impacts. Erosion control measures are the primary methods that will be used to address stormwater discharges. Typical control measures include seeding of embankments, creation of retention ponds, creation of sedimentation ponds, and placement of hay bales to inhibit erosion.

Wellhead Protection

Wellhead protection programs, also present in all New England States, are mandated by federal law, developed by the states, and implemented by local zoning boards. Wellhead protection programs are designed to prevent inappropriate land uses in and near public water supply wellheads. This program uses local zoning controls to achieve its goals.

The first step in this process is for local governments to identify and locate public water supply wellheads within their jurisdictions and then delineate buffer zones. The first buffer zone, immediately surrounding the wellhead (usually within a few hundred feet), will have the most stringent land use limitations. The second buffer zone will have less stringent limitations but will include a much larger area and will vary depending on the local topography, geology, and groundwater resources. Some states have a third tier buffer zone that is again larger and less stringently controlled. The land use restrictions for all the buffer zones are incorporated into the local zoning ordinance. The local planning, zoning, and zoning appeals boards implement the wellhead protection program as part of the local zoning review process for aggregate extraction proposals. Since wellhead protection measures are part of the local zoning program, this requirement does not add any time to the permit processing time.

5.2.3 State-Specific Programs

All New England states implement the above mentioned programs to suit the conditions and needs of the state. They also have additional programs that may restrict aggregate operations in their particular state. Each state's individual programs are briefly reviewed below.

Connecticut Permit Programs

While there are several permit programs relevant to aggregate extraction proposals, Connecticut has no specific state-level regulations targeted specifically at aggregate extraction. A summary of Connecticut's pertinent permits and controls are contained in Table 5.2. In general, Connecticut state government delegates land use controls to local authorities and then takes a "hands-off" approach which is consistent with their tradition of strong home rule. Proposed aggregate extraction operations in Connecticut must conform to wetlands protection permit and wellhead protection program requirements. The State's most active role is as a provider of technical assistance to localities. Typically, localities request state help for resolving overly sophisticated and complex environment issues.

In addition to existing state programs, the Connecticut Department of Environmental Protection (CDEP) is developing guidelines for municipalities to regulate all extraction operations, although this action will target aggregate extraction primarily. The guidelines are still in development and are not yet at the legislative proposal stage. The CDEP guidelines for municipalities will center around a special town extraction permit. The permit criteria include appropriateness of location; conformance with existing controls; safety; and impacts on the historic, scenic, and general character. In addition, the guidelines contain operation standards including:

- Limit operational size to 5 or fewer acres to limit overall extraction activity
- Provide setbacks of 100 feet or more from property boundaries, public roads, utility right-of-ways, and high water lines
- Limit operations to areas with four or more feet between extraction operations and the spring high water table
- Require dustless access roads for 500 feet or more from public roads
- Require 300 foot buffer zones between residential structures and extraction operations or buildings

Other standards address erosion, topsoil preservation, hazardous material management, safety, and site restoration. The guidelines also discuss performance bonds, permit renewals, and violations.

Table 5.2
PERMIT REQUIREMENT PROFILES FOR
CONNECTICUT

Permit Area	Permit Title	Issuing Agency	Applicability	Information Requirements	Time Allotments	Public Hearing	Comments
Land Use Controls	Zoning	Local Zoning Board Local Zoning Board of Appeals	All new mines	Complete site plan, including plat map and construction plan	Varies from 1 month to 24 months	Required	Wide local variation in: Specific requirements Board's technical proficiency
Wetlands C.G.L Sections 22a-36...22a-45	Wetlands Permit	Department of Environmental Protection, Water Management Bureau	All new mines affecting wetlands	Complete site plan, including soils maps and and analysis, wetlands delineation, and commonly, species identification.	1-4 months	Required	Sometimes requires special studies of ecology system
Wellhead Protection Public Act 89-305	Review Criteria for Local Zoning	Local Zoning Board with appeals to the State level	All new mines within wellhead protection zones	Complete site plan, including plat map and construction plan	Incorporated into the Local Zoning Process	NA	Requires municipalities to have aquifer recharge areas protection provisions in their zoning process
Munic. Reg of Mining, Extract., or Sol. Earth Remov. (PROPOSED)	Municipal Mining Permit	Local Zoning Board	All new pits and quarries with practical exemptions	Complete site plan & operational plan, with specification of operating hours and production amounts	NA	NA	Contains evaluation criteria, permitting standards, and restoration standards.
Air Pollution Control Permits Pub. Act 89-225 Reg.: Sect 22a-174	Air Quality Permits	Bureau of Air Management; Engineering & Enforcement Division CT DEP	All aggregate operations w/ crushers or screens w/ >2,000 lbs/hr or >10,000 lbs/day of emissions	Operation Description: production rates, pollutants emitted, control equipment, and location	2-9.5 months	Only if public commenters request	The time required depends on the emissions volume/permit type; These permits requires analysis of best available technology to justify applicant's selction
Navigable Waters: Sections 9&10 of Rivers & Harbors Act; Wetlands: Section 404 of Clean Water Act (33 USC 1344)	Army Corps Permit: General or Individual	U S Army Corps of Engineers	New aggregate operations with major impacts on wetlands or navigable waterways	Complete site plan, with vicinity map, plan view, elevations, and operation description	2.5 to 3.5 months	Only if the proposal has major impacts	General permits are for dispersed projects with minor impacts; Individual permits are for single projects with major impacts

Maine Permit Programs

Maine has two unique regulatory programs: the Growth Management and Site Location programs. These two controls, in addition to the standard air quality, wetlands, wellhead, and local zoning programs, make Maine one of the most closely controlled states for aggregate operation development. A summary of Maine's pertinent permits and controls are contained in Table 5.3.

The Growth Management Program establishes comprehensive state goals to enable evaluation of local growth. This broad-based program aims at maintaining and improving the quality of life. It is administered by the Maine Department of Economic and Community Development's Office of Comprehensive Planning. The state's primary role is to scrutinize local and regional growth management programs for consistency with state goals. As an incentive for local zoning boards, the Growth Management program provides technical and financial assistance for local implementation efforts. While this does not directly affect an aggregate extraction application time schedule or the permitting information requirements, this program enhances and strengthens the local zoning process, especially in Maine's large expanses of unincorporated areas where there are no formal municipal government structures.

The Site Location Program seeks to minimize damage to the natural environment from larger development projects. This program covers proposed aggregate operations that involve activity on five or more acres or that remove more than 1,000 cubic yards of material annually (excluding construction activities), which covers the vast majority of proposed sites. Proposals of this size require submission of a permit application to the Maine Department of Environmental Protection. This process takes from one to six months to complete depending on the complexity of the proposal and completeness of the original submission.

Table 5.3
PERMIT REQUIREMENT PROFILES FOR
MAINE

Permit Area	Permit Title	Issuing Agency	Applicability	Information Requirements	Time Allotments	Public Hearing	Comments
Land Use Controls	Zoning	Local Zoning Board Local Zoning Board of Appeals	All new operations	Complete site plan, including plat map and construction plan	Varies from 1 month to 24 months	Required	Wide local variation in: Specific requirements Board's technical proficiency
Site Location and Development Law MRSA 481–490	Site Location and Development Permit	Department of Environmental Protection, Bureau of Land Quality Control	Operations that encompass >5 acres or remove >1,000 cubic yards	Complete site plan, including plat map and construction plan	1 to 6 months	Not Required	
Freshwater Wetlands Natural Resources Protection Act, MRSA 480–A...480–T	Natural Resources Permit	Department of Environmental Protection, Division of Natural Resources	Operations that alter or abut freshwater wetlands	Complete site plan: soils maps and analysis, wetlands delineation, and commonly, species identification	3–5 months	Required	Permit–by–Rule program is in the proposal stage. This system will save application time by setting review time limits for permits that meet performance standards
Wellhead Protection Program MRSA 601.11	Provision for Controls within the Local Zoning Program	Department of Human Services	Operations that located within a well recharge zone	Complete site plan, including plat map and construction plan	Included in local zoning review	Not Required	
Maine Growth Management Review MRSA 4960	Comprehenaive Plan Approval	Department of Economic & Community Development	All new operations	NA	Included in local zoning review	NA	Application fees range from $800 to $2,500
Mandatory Shoreline Zoning Program MRSA 435–449	Implemented through local zoning process	Local Zoning Board Local Zoning Board of Appeals	All new operations within prescribed shoreline and wetland areas	Complete site plan, including plat map and construction plan	Included within zoning review time	NA	
Maine Clean Air Act (38 MRSA) Chapter 115	Air Quality Permits	Bureau of Air Quality Control; Licensing & Enforcement Division ME DEP	All aggregate operations w/ crushers or screens w/ > 10 lbs/hr or > 100 lbs/day of emissions	Operation Description: production rates, pollutants emitted, control equipment, and location	2–3 months (currently, 4–6 months due to staff shortage)	Only if public commenters request	Construction and operating permits are combined into one process
Navigable Waters: Sections 9&10 of Rivers & Harbors Act, Wetlands: Section 404 of Clean Water Act (33 USC 1344)	Army Corps Permit: General or Individual	U. S. Army Corps of Engineers	New aggregate operations with major impacts on wetlands or navigable waterways	Complete site plan, with vicinity map, plan view, elevations, and operation description	2 5 to 3 5 months	Only if the proposal has major impacts	General permits are for dispersed projects with minor impacts; Individual permits are for single projects with major impacts

Massachusetts Permit Programs

Massachusetts does not have any state-level programs specifically targeted at aggregate extraction operations. The general wetlands, air quality, and wellhead protection programs, however, affect many aggregate extraction proposals. A summary of Massachusetts' pertinent permits and controls are contained in Table 5.4. The one unique control mechanism in Massachusetts is the regional authority vested in the Cape Cod Commission.

The Cape Cod Commission, a regional authority providing planning services, is uniquely empowered to override local land use controls in certain circumstances within Barnstable County (i.e., Cape Cod). Under its enabling legislation the Commission is authorized to conduct a development review impact process (DRI) for certain categories of proposals. The DRI category of outdoor commercial activities consuming more than a single acre covers aggregate operation proposals. A DRI consists of checking proposed developments for consistency with the regional development plan for Cape Cod. The two exemptions from this review process are hardship and existing developments. Cape Cod's high property values discourages aggregate extraction proposals and therefore minimizes use of the DRI. The importance of the DRI to aggregate extraction proposals is that it sets a precedent for a regional authority overriding local land use control. However, this is an unusual precedent since it required state legislation to empower the Cape Cod Commission.

Table 5.4

PERMIT REQUIREMENT PROFILES FOR
MASSACHUSETTS

Permit Area	Permit Title	Issuing Agency	Applicability	Information Requirements	Time Allotments	Public Hearing	Comments
Land Use Controls	Zoning	Local Zoning Board Local Zoning Board of Appeals	All new operations	Complete site plan, including plat map and construction plan	Varies from 1 month to 24 months	Required	Wide local variation in: Specific requirements Board's technical proficiency
Cape Cod	Cape Cod Commission Review	Cape Cod Commission	Operations of >40,000 sq ft	Development of Regional Impact Form. site plan, soils map, and operational plan	7.5 months	Required	Projects are referred to the Cape Cod Commission by municipalities for projects that meet the criteria
Wetlands 310 CMR 10	Ruling of Determination	Local Conservation Commissions	Operations that affect wetlands	Preliminary site plan	1.5 months without appeals	Not Required	Ruling of Determinations are primarily for smaller projects, while Notices of Intent are mostly for larger projects with significant impacts
	Notice of Intent	Local Conservation Commissions or State DEP		Complete site plan, including plat map and construction plan	1.5 months without appeals	Required	
Wellhead Protection 310 CMR 22	Zoning provisions	Local Zoning Board	Operations that affect public water supply wells, >100,000 GPD	Wellhead, well recharge, and recharge contribution zone delineation to prohibit excavation 4' from watertable	NA	Not Required	
Air Pollution Control Permits 310 CMR 7	Air Quality Permits	Division of Air Quality Control; Bureau of Waste Management; MA DEP	All aggregate operations w/ crushers or screens w/ >2,000 lbs/hr emissions	Operation Description: production rates, pollutants emitted, control equipment, and location	5–12 months	Only if public commenters request	Permit categories depend on the amount of emissions: Limited Plant Permit: > 1 ton/yr Non-Major Plant Permit: > 5 tons/yr Major Plant Permit: >100 tons/yr
Navigable Waters: Sections 9&10 of Rivers & Harbors Act; Wetlands: Section 404 of Clean Water Act (33 USC 1344)	Army Corps Permit: General or Individual	U S. Army Corps of Engineers	New aggregate operations with major impacts on wetlands or navigable waterways	Complete site plan, with vicinity map, plan view, elevations, and operation description	2.5 to 3.5 months	Only if the proposal has major impacts	General permits are for dispersed projects with minor impacts; Individual permits are are for single projects with major impacts

New Hampshire Permit Programs

In addition to controlling aggregate extraction developments affecting wetlands and water supply wellheads, New Hampshire controls development through Site Specific Permits (also known as Alteration of Terrain Permits) and through prescribed excavation standards. A summary of New Hampshire's pertinent permits and controls are contained in Table 5.5.

Site Specific permits are intended to control the impact of erosion on water quality from any developments disturbing more than 100,000 square feet. These permits address temporary and continuing disturbances to vegetated soils by requiring erosion control measures as conditions for approval. Permit applications are submitted to New Hampshire's Water Supply and Pollution Control Division of the Department of Environmental Services. These permits are often reviewed with wetlands permits because of their similar information requirements.

New Hampshire also sets guidelines for local governments for controlling excavations, including aggregate extraction. The Law Governing Excavations of Earth Materials (RSA 155-E) contains model local zoning ordinances and planning procedures to minimize negative environmental impacts of excavations. This law also contains a provision to ensure that localities provide a reasonable effort to accommodate aggregate extraction (i.e., ensure that the localities do not use the law as a method to exclude all aggregate extraction from their jurisdiction). This provision in the law provides a powerful tool for aggregate operators to challenge unreasonable local zoning ordinances.

RSA 155-E's provisions are unique to New Hampshire since they address aggregate extraction directly and provide for state override of inappropriate local opposition. While it provides a powerful tool to address impasses at the local level, it is rarely used. Most commonly, the mere existence of the provision for overriding local decisions is used to persuade local officials to be more reasonable. The only other major land use controls in New England with provisions for state override of local decisions are Vermont's Act 250 process and Massachusetts Wetland Protection Program.

Table 5.5

PERMIT REQUIREMENT PROFILES FOR
NEW HAMPSHIRE

Permit Area	Permit Title	Issuing Agency	Applicability	Information Requirements	Time Allotments	Public Hearing	Comments
Land Use Controls	Zoning	Local Zoning Board Local Zoning Board of Appeals	All new operations	Complete site plan, including plat map and construction plan	Varies from 1 month to 24 months	Required	Wide local variation in. Specific requirements Board's technical proficiency
Local Regulation of Excavations RSA 155–E	Zoning	Local Zoning Board Local Zoning Board of Appeals	All new operations	Same as local zoning	Incorporated into the Local Zoning Process	NA	
Wetlands R S A. 483–A	Wetlands Board Permit	Local Wetlands Board or Governor and Council	Three Impact Levels: Minimum <3,000 cqft Minor. 3,000–20,000 sqft Major· >20,000 sqft	Complete site plan incl.. soil maps and analysis, wetlands delineation, and commonly, species ident	2 – 4 months	Required, only for minor and major permits	
Wellhead Protection R S.A. 485:48	Specific Review Criteria under Local Zoning	Local Zoning Board with appeals to the State level	All new operations	Same as local zoning	Incorporated into the Local Zoning Process	NA	Requires municipalities to have aquifer recharge areas protection provisions in their zoning process
Erosion and Sediment Control Program RSA 485	Site Specific Permit or Alteration of Terrain Permit	Local Zoning Board or State Dept. of Environ. Services	All new operations involving >100,000 sqft	Same as local zoning	1.5 to 2 months	Not Required	General permits are valid for 2 years before renewal
Air Quality Control Program RSA 125–C	Air Quality Permits	Air Quality Division NH DES	All aggregate operations w/ crushers or screens processing > 10,000 tons/yr	Operation Description· production rates, pollutants emitted, control equipment, and location	3 – 4 months	Only if public commenters request	Permit periods depend on emission volumes: 3–year permits for <100 tons/yr 2–year permits for 100–1,000 tons/yr 1–year permits for >1,000 tons/yr
Navigable Waters: Sections 9&10 of Rivers & Harbors Act; Wetlands: Section 404 of Clean Water Act (33 USC 1344)	Army Corps Permit: General or Individual	U. S. Army Corps of Engineers	New aggregate operations with major impacts on wetlands or navigable waterways	Complete site plan, with vicinity map, plan view, elevations, and operation description	2.5 to 3 5 months	Only if the proposal has major impacts	General permits are for dispersed projects with minor impacts; Individual permits are for single projects with major impacts

Rhode Island Permit Programs

Rhode Island does not have any additional programs specifically targeted at aggregate extraction operations, besides the conventional local zoning, air quality, wetlands, and wellhead protection programs. A summary of Rhode Island's pertinent permits and controls are contained in Table 5.6.

Rhode Island's small geographic size is unique and has an impact on permit processes in the State. For example, the blasting permits, which are local functions in every other New England state, are issued by the state of Rhode Island with local signatures required for full approval. No other state in New England could contemplate this type of arrangement.

Table 5.6

PERMIT REQUIREMENT PROFILES FOR
RHODE ISLAND

Permit Area	Permit Title	Issuing Agency	Applicability	Information Requirements	Time Allotments	Public Hearing	Comments
Land Use Controls	Zoning	Local Zoning Board Local Zoning Board of Appeals	All new operations	Complete site plan, including plat map and construction plan	Varies from 1 month to 24 months	Required	Wide local variation in: Specific requirements Board's technical proficiency
Freshwater Wetlands RIGL 2.1.18-27	Freshwater Wetlands Permit	Division of Groundwater and Wetlands, RI DEM	Operations that alter freshwater wetlands	Complete site plan, including soils maps and analysis, wetlands delineation, and commonly, species identification.	3 months	Required	State review includes a site inspection.
Groundwater Classification and Standards RIGL 46-13.1	Underground Injection Control Regulations	Division of Groundwater & Wetlands, RI DEM	Operations that discharge to groundwater	Complete site plan, including plat map and construction plan	about 2.5 months	Not Required	Integrated with RI's Wellhead Protection Program
Ambient Water Quality Standards RIGL 46 & 42	Certification of Water Quality Standards	Division of Water Resources, RI DEM	Operations that discharge to surface water	Complete site plan, including plat map and construction plan	from 1 to 6 months	Not Required	
Wellhead Protection RIGL 46-13.1	Standards for Local Protection Plan	Division of Groundwater & Wetlands, RI DEM	Operations that affect any public water supply wells	Same as local zoning	NA	Not Required	Integrated with RI's Groundwater Classification Program
RI Clean Air Act, Title 23, Chapter 23, Regulation #9	Air Quality Permits	Division of Air and Hazardous Materials, RI DEM	All aggregate operations w/ crushers or screens w/ > 10 lbs/hr or > 100 lbs/day of emissions	Operation Description· production rates, pollutants emitted, control equipment, and location	3 - 6 months	Not Required	Aggregate plants are exempt, if they do not exceed emission standards
Navigable Waters: Sections 9&10 of Rivers & Harbors Act, Wetlands· Section 404 of Clean Water Act (33 USC 1344)	Army Corps Permit. General or Individual	U. S. Army Corps of Engineers	New aggregate operations with major impacts on wetlands or navigable waterways	Complete site plan, with vicinity map, plan view, elevations, and operation description	2 5 to 3.5 months	Only if the proposal has major impacts	General permits are for dispersed projects with minor impacts; Individual permits are for single projects with major impacts

Vermont Permit Programs

Vermont promulgated a sweeping land use control program under Act 250, the Land Use and Development Law. Act 250 permits are required in addition to other state and local requirements. A summary of Vermont's pertinent permits and controls are contained in Table 5.7.

An Act 250 review includes consideration of the project's impact on water pollution, groundwater, streams, shorelines, sediment and erosion control, storm and flood water control, natural areas, wildlife habitat, public investments, recreation, and aesthetics. Act 250 covers a wide variety of land use projects including all new aggregate operations of greater than ten acres. Aggregate pits and quarries that expand beyond 10 percent of their 1972 base operations also require an Act 250 permit. Many aggregate extraction permit applications are submitted for such expansions. Projects that require this permit are first reviewed by a three-member district Environmental Commission appointed by the Governor. If their decision is challenged, appeals are reviewed by the State Environmental Board. Lastly, if this decision is unsatisfactory, State Environmental Board decisions are appealed to the Vermont Supreme Court.

The multi-tiered appeals process is unique among the other land use controls in New England. Vermont's Act 250 moderates local power to oppose all aggregate proposals by providing a process with appeals available to all parties. Firms interviewed for this project noted delays in the process in the late 1980s, but usually acknowledged recent improvements to streamline the system.

Table 5.7
PERMIT REQUIREMENT PROFILES FOR
VERMONT

Permit Area	Permit Title	Issuing Agency	Applicability	Information Requirements	Time Allotments	Public Hearing	Comments
Land Use Controls	Zoning	Local Zoning Board Local Zoning Board of Appeals	All new operations	Complete site plan, including plat map and construction plan	Varies from 1 month to 24 months	Required	Wide local variation in: Specific requirements Board's technical proficiency
Land Use Controls Title 10 Chapt 37	Act 250 Permit	District Environmental Commission	All new operations >10 acres	Complete site plan, including plat map and construction plan	2/3 month, if application complete	Required	Appeals go to State Environmental Board and then appeals go to the Vermont Supreme Court
Wetlands Title 10 Chapt 37	Standing to Review Under Act 250 Process	Agency of Natural Resources, Water Quality Division	All new operations >10 acres	Complete site plan incl soils maps and analysis, wetlands delineation, and commonly, species ident.	NA	Not Required	This program is built into the Act 250 process
Wellhead Protection Title 10 Chapt 37	Standing to Review Under Act 250 Process	Department of Health, Division of Environmental Health	All new operations >10 acres	See local zoning	NA	Not Required	This program is built into the Act 250 process
Air Permits Title 10, Chapter 37 and Air Poll. Control Division Regulations Sect. 5-101...901	Air Emmissions Permit	Agency of Natural Resources, Air Pollution Control Division	Quarries with All aggregate operations w/ crushers or screens w/ > 25 tons/hr production	Facility and operation description: production rates, pollutants emitted, control equipment, and location	2 - 4 months	Not Required	Aggregate operations not covered by the air permit program are reviewed under Act 250 for nuisance issues
Navigable Waters: Sections 9&10 of Rivers & Harbors Act; Wetlands: Section 404 of Clean Water Act (33 USC 1344)	Army Corps Permit: General or Individual	U S Army Corps of Engineers	New aggregate operations with major impacts on wetlands or navigable waterways	Complete site plan, with vicinity map, plan view, elevations, and operation description	2.5 to 3.5 months	Only if the proposal has major impacts	General permits are for dispersed projects with minor impacts; Individual permits are for single projects with major impacts

5.2.4 Local Zoning and Regional Authorities

Local zoning is generally based on a comprehensive plan that inventories existing resources and integrates it with the development goals of the community. The local zoning plan is normally defined by a map that delineates land use districts and a zoning ordinance defining the different land uses allowed in each district. The precise decision-making process is also described in the ordinance.

Zoning districts attempt to group compatible land uses into neighborhoods to prevent friction between incompatible activities. Zoning districts specify a variety of residential, commercial, and industrial zones. Older, more diverse, and more densely settled communities require more complex zoning ordinances to accommodate the diversity of land uses. In addition, communities with fragile environments, such as those with highly porous soils that are vulnerable to groundwater pollution, will also have detailed and sophisticated zoning ordinances. Many local communities have also developed more sophisticated zoning controls to protect their quality of life.

Urban areas cannot afford to permit incompatible development that squanders valuable land resources. Land use controls are a much higher priority in urban areas than in rural communities and therefore receive higher priority attention, funding, and staff. Rural communities can also have relatively sophisticated zoning controls but rural land use concerns are usually considered less pressing, however, because of the abundance of space. Nevertheless, many rural communities design the complex controls with state or regional assistance. Unfortunately, these same rural communities do not receive technical assistance in administering the controls. Consequently, complex land use controls are often administered by laypersons in rural areas.

Although each municipality has its own zoning ordinance, virtually all zoning permit processes are the same. Some towns have specific earth removal permits instead of zoning permits, but again the permit processes are fairly similar. Existing aggregate operations are usually allowed to remain in operation as existing uses, that is, they are "grandfathered" into compliance. New aggregate operations are generally allowed only in industrial zones.

If a new potential site is not in a zone allowing aggregate extraction activity, then the applicant has to apply for a variance. Zoning applications and variances require local zoning board review. Appeals of zoning board decisions are generally handled by a Zoning Board of Appeals. Redress after the Zoning Board of Appeals is generally difficult. Most appeals at this point are made to the courts based on procedural issues.

Rural communities and unincorporated areas do not have municipal structures and are usually incapable of developing a zoning program. Connecticut, Maine, New Hampshire and Vermont have some form of direct state level involvement in local land use decisions. Unincorporated areas, however, are common only in Maine and New Hampshire.

Regional planning commissions or state agencies sometimes fill this void. Regional planning commissions in New England, such as the Rockingham Planning Commission in New Hampshire or the Pioneer Valley Planning Commission in Massachusetts provide planning services to small municipalities and unincorporated areas that cannot otherwise perform such functions. Maine uses the state-level Land Use Commission to provide these same planning services. These agencies provide the technical planning work to enable local zoning boards to review projects against a comprehensive set of goals. Also, by providing these services to a region, these agencies provide regional perspective to local issues. The one exception is the Cape Cod Commission in Massachusetts.

5.3 Permit Time Requirements

This study reviewed the administrative time required to process permits. The time required of the applicants to prepare applications was not considered because of the wide variation of compliance requirements for each site. The time required for administering permits depends on the complexity of the proposal, the completeness of the original submission, and the degree of public concern. The process of administering the permits, however, remains consistent. Estimates of processing times were derived from agency staff, information brochures, survey responses, and several published reports.

All permit processes have three basic parts: submission, review, and approval. Some permits for particular categories or sizes of proposals also require public hearings. Public hearings occur after initial review of the permit application and before issuance of the permit determination.

Applicants must first collect and submit the required information and materials for review. Agencies typically initiate permit processing after formally notifying the applicant that their application is complete. During the review process, however, additional information may be required to resolve unanticipated issues revealed by the initial review. The amount of supplemental information required and the time needed for the preparation of further studies is the most unpredictable and important aspect of permit processes.

Public hearings have the greatest potential for adding to permit processing time. In addition to the time, public hearings may broaden the scope of issues discussed in the permit process. The public discussion of the issues commonly generates additional controversy for aggregates proposals because some community members may feel aggregate extraction is an undesirable land use. The controversy generated by a proposal introduces more uncertainty for the applicant. The public hearing may generate requests for unforeseen information requirements, studies, or mitigation measures.

Time requirements for the most commonly acquired permits, by state, are shown in Table 5.8. The Table contains the range of time required to process an application and the "most likely" time required. The most likely time is based on a review process without additional information requests, non-mandated public hearings, or other delays. The average typical approval time for all permits for all New England States is about 6 months and the range is from 3 to 29 months The wide variation in the range of times underscores the tentative validity of the average statistics. Clearly the basis for the wide variation in time requirements is the broad range of compliance requirements in the local zoning process.

Table 5.8

TIME ESTIMATES FOR MAJOR PERMIT PROGRAMS*
(in months)

Permit Type (a)	CT		ME		MA		NH		RI		VT		Average	
	Range	Most Likely	Range	Most Likely	Range	Most Likely	Range	Most Likely	Range	Most Likely	Range	Most Likely	Range	Most Likely
Wetlands	1-4	2	3-5	3	1.5-3	2	2-4	3	3-6	3	0(c)	0(c)	2-3	2
Land Use	---	---	1-6	2	---	---	0	0	---	---	1-12	2	1-12	2
Extraction	---	---	---	---	---	---	1.5-2	1.5	---	---	---	---	1.5-2	1.5

* Estimates were derived from agency staff, information brochures, reports, and survey responses.

(a) This table contains the primary permits required of aggregate pit and quarry proposals. Other permits and regulatory programs pertinent to some extraction proposals include:

- Air quality permits issued at the state level for certain crushing operations, covering permissible dust and noise levels.
- Dredge and fill permits issued by the Corps of Engineers for projects affecting waterways and wetlands.
- Coastal Zone Management programs for all the New England states, except Vermont, pertain directly to relatively few aggregate projects, but enhance planning processes in coastal municipalities.

(b) Local zoning includes basic local considerations, as well as special excavation controls and state-mandated control provisions.

(c) Vermont's wetlands protection program is incorporated into the Act 250 (Vermont's comprehensive environmental land use law) review and local zoning programs.

5.4 Mail Survey Results

ERG mailed questionnaires to private aggregate producers to assess their perspective on siting problems. The mailing list was based on the U.S. Bureau of Mines annual survey mailing list and augmented with producer's names from key industry persons and trade associations. The attained response rate was a result of a multi-stage effort, including letters announcing the survey and introducing the study, trade-journal announcements, and follow-up telephone calls. Ninety-one additional questionnaires were sent to government agencies with aggregate operations. Their contributions to construction aggregate supplies were found, however, to be negligible as virtually all such agencies supply sand and gravel only for internal use. The governmental agencies results were not compiled with these results. A copy of the 12-question survey is in Appendix C.

ERG ultimately received 31 responses from aggregates firms representing at least one or more extraction sites. The total number of extraction sites represented by the responses was not known because respondents were not required to identify themselves and because those firms representing several sites, in several cases, chose not to identify all their sites. The distribution of responses by state is contained in Table 5.9.

Private aggregates firms comprised seventy percent of the respondents, with the remaining thirty percent from government respondents. Sand and gravel pit operations accounted for slightly over half of the private respondents with sixteen completed surveys. A collection of ten construction firms and supply companies made up about one third of the private respondents. Lastly, five asphalt and concrete companies accounted for the remaining 16 percent. Response patterns followed state population patterns, with most respondents coming from Massachusetts and Connecticut.

5.4.1 Permitting Difficulties

One of the main topics of the survey was the extent of permitting difficulties among aggregates producers. The most commonly cited permitting problems involved uncertainty in timing, approval, and information requirements. While the timing and schedule of permit approval

Table 5.9

SUMMARY OF AGGREGATE SURVEY RESPONSE BY STATE, BY SAMPLE/RESPONDENT TYPE

Distribution of Sampled Population

Sample Category	CT #	CT Col %	ME #	ME Col %	MA #	MA Col %	NH #	NH Col %	RI #	RI Col %	VT #	VT Col %	Total #	Total Col %
Sand and Gravel Pits	60	69%	70	46%	100	64%	40	61%	4	67%	70	64%	350	60%
Construction/Etc Firms	18	21%	35	23%	27	17%	18	27%	5	33%	15	14%	118	20%
Concrete/Asphalt Firms	2	2%	2	1%	12	8%	8	12%	0	0%	2	2%	26	4%
Governments	7	8%	44	29%	17	11%	0	0%	0	0%	23	21%	91	16%
Sampled Total	87	100%	151	100%	156	100%	66	100%	4	100%	110	100%	585	100%

Distribution of Respondent Population

Respondent Category	CT #	CT Col %	ME #	ME Col %	MA #	MA Col %	NH #	NH Col %	RI #	RI Col %	VT #	VT Col %	Total #	Total Col %
Sand and Gravel Pits	5	36%	0	0%	6	43%	2	67%	0	0%	3	60%	16	36%
Construction/Etc Firms	2	14%	3	43%	4	29%	0	0%	1	100%	0	0%	10	23%
Concrete/Asphalt Firms	2	14%	0	0%	2	14%	1	33%	0	0%	0	0%	5	11%
Governments/Towns	5	36%	4	57%	2	14%	0	0%	0	0%	2	40%	13	30%
Respondent Total	14	100%	7	100%	14	100%	3	100%	1	100%	5	100%	44	100%

Source: ERG Mail Survey, 1991

were usually defined in the enabling legislation, most permit processes have provisions for administrators to request additional information to resolve issues that surface during the process. This led to delays while applicants gathered the necessary information. Furthermore, the additional information sometimes did not support approval for the permit application. Finally, respondents felt that most permitting boards were not favorably disposed towards new aggregate pit and quarry sites.

The combination of these aspects with additions or changes in permit requirements due to new legislative mandates produced many complaints from aggregates producers. All of these uncertainties added to the price of obtaining permit approvals. Larger firms complained of changes in requirements from jurisdiction to jurisdiction. Smaller operators said that they were not staffed to undertake such generally complex permit processes and would have to hire a consultant. Duplication of requirements, however, was not considered onerous by our respondents.

The inability of many non-professional permit approval boards to proficiently evaluate the technical and complex data routinely found in applications was the last permit difficulty voiced by respondents. Respondents felt that permit board appointments focussed almost exclusively on political aspects, rather than technical competency. Some suggested region-based permits would raise the technical competency of the average board. Several thought that taking authority away from local boards would improve the process.

A total of fourteen respondents provided written descriptions of permitting difficulties. A summary of the comments differentiated by state separated by respondent is contained in Table 5.10. The most populated states generated the most commenters on these topics with five from Connecticut, three each from Massachusetts and New Hampshire, and one each from Maine, Rhode Island, and Vermont. The only other pattern found in these responses was that construction firms requiring aggregates for specific projects encountered more difficulties than other types of operations.

Table 5.10

SUMMARY OF PERMIT PROBLEM COMMENTS DERIVED FROM ERG SURVEY

State	Comment (*)
Connecticut	
	• Zoning boards have an anti-extraction attitude • Communities generally have a "Not in My Back Yard (NIMBY)" attitude
	• Unreasonable permit requirements • Communities have an anti-extraction attitude • Communities consider sand and gravel operations unsightly and undesirable
	• Permitting processes are too long and costly • Permitting processes are too political • Females have a more difficult time in this male-dominated industry • Permit-approval boards are generally under-qualified • Permit boards and communities are generally unreasonable
	• Permit process is too costly • The mention of "aquifer" during the permit process dooms permit approval
	• Permit-approval boards are generally under-qualified • Common misrepresentation of the "truth" at public hearings
Maine	
	• Permit approval time is often too long and unpredictable to schedule specific projects • Permits require excessive information • Contends sand and gravel pits reduce stormwater runoff and therefore do not need stormwater permits • Permit-approval boards are generally under-qualified
(*) Comments are grouped by individual respondent within each box.	(CONTINUED)

Table 5.10

SUMMARY OF PERMIT PROBLEM COMMENTS DERIVED FROM ERG SURVEY

State	Comment (*)
Massachusetts	
	• Aggregate supplies are more scarce • Communities have an anti-extraction attitude
	• Without an existing permit, there is very little chance of gaining permit approval
	• Permits are too numerous and complex
New Hampshire	
	• Permit requirements are overlapping (e.g., Planning, Zoning, and Conservation permits)
	• Communities generally have a "Not in My Back Yard (NIMBY)" attitude
	• Unnecessary delays by the permitting agencies • Permit-approval boards are generally under-qualified • Too much variation in state law interpretation by local and regional administrators
Rhode Island	
	• Too much variation in local permit requirements • Communities generally have a "Not in My Back Yard (NIMBY)" attitude • Permit requirements are overlapping
Vermont	
	• Permit requirements are overlapping
(*) Comments are grouped by individual respondent within each box.	

5.4.4 Other Industry Commentary on the Permit Process

As the preceding discussion indicates, several permits are required to establish and operate an aggregate operation in New England. The precise number and nature of the permits depends heavily on the type, configuration, and magnitude of the proposed operation. In addition, each state has their own administrative procedures and requirements. The most significant permits and controls facing New England aggregate operations include:

- Local zoning
- Wetlands protection review, local, state, and federal
- Wellhead protection programs, state and local
- Explosives/Blasting licenses and permits, local and state
- Air quality permits, state and federal
- Land use controls, state
- Extraction activity controls, local and state

While the specific requirements of these programs were reviewed in the previous section, the review did not include all of their direct effects on the aggregate producing community.

Regulator and producer interviews, as well as trade publications, professional journals, and regional studies were reviewed to assess the impact of these programs on aggregate producers. Four major complaints surfaced repeatedly throughout our contacts with producers and industry associations concerning all of these permit requirements:

- Inadequate clarity or inability to comprehend all the different permit requirements
- Difficulty of complying with requirements that change over time and between jurisdictions
- Problems with presenting technical and complex materials to under-informed and or politicized local review boards
- Difficulty of complying with unanticipated technical information requests during permit processing, especially after the administrative ruling of application completeness

Aggregate producers, trade associations, and agency representatives uniformly confirmed the existence of these complaints. Unfortunately, no quantitative data exist to more clearly define the issues involved with these assertions. Our findings are presented below.

Producer complaints about specific applications were difficult to evaluate objectively due to the dearth of statistical data for constructing an assessment. No data exist on the number of applicants who were overwhelmed by permit requirements and did not attempt obtaining the necessary approvals. Furthermore, extremely little data exists pertaining to the permit approval rate for aggregate proposals submitted for review. Even if such data existed, too many site-specific factors affect individual permit applications to support generalizations. For instance, the annual survey by Pit and Quarry published in the December, 1989 issue noted that 56 percent of the surveyed establishments experienced permitting/zoning/land-use problems (Kuhar, 1989). While this appears to be authoritative, it is based on responses from only 24 establishments in New England. This is a small percentage of the hundreds of aggregates establishments operating in New England, based on the establishments reporting to the Mine Safety and Health Administration's data.

One issue sometimes raised about permit processes proved not to be troubling. This is the issue of duplicate information requirements among permit processes. Interviews with agency officials indicated that overlapping requirements are usually satisfied by resubmitting materials and consequently do not add significantly to the applicant's burden. Producers said this also. Thus the apparent duplication of permit information, while sometimes irritating to applicants, does not cause great concern in the industry.

Many producers also complained about length and cost of permit processes. Due to the increased number of permit types, the overall approval process requires more of the applicant's time and resources than only a few years ago and much more than ten to fifteen years ago. In addition, community opposition to proposals is more common and usually more sophisticated, which adds to permit processing time and the applicant's expenses. Many aggregate companies cited permits that were in process for over two years from initial application to final approval. Many of these lengthy processes have resulted in permit denials. While the permit process requires significant information and expenditures by applicants, applicants most often cited the lack of receptivity of review boards as the most significant obstacle to permit approval.

All of these industry-wide problems are more pronounced for small aggregate firms. Smaller aggregate firms with fewer staff and modest revenues are less able to afford the increased price of obtaining all the requisite permits to establish a new source of supply. These smaller operations typically have only operation-related staff and lack the specialized staff to address all of the permit requirements. The permitting process is, in effect, a "barrier to entry" for the aggregates industry for smaller firms. This may be the most significant impact of the increased restrictions on aggregate extraction in New England.

REFERENCES TO SECTION FIVE

Mencacci, M C. 1989. Moving It Out By Truck. Rock Products. Chicago, Illinois. September, 1989.

Kuhar, M. 1989. Not In My Backyard. Pit and Quarry Magazine. Cleveland, Ohio. December, 1989.

APPENDIX A

USE FACTORS
DEFLATOR SERIES
HISTORICAL PRODUCTION DATA FROM
THE U.S. BUREAU OF MINES

Table A.1 Construction Aggregates Use–Factors (Tons/$ Const. Expenditure)

Construction Category	Crushed Stone	Sand & Gravel
One–family Housing	0.001061	0.002291
Two–family Housing	0.000998	0.001806
Multi–family Housing	0.000877	0.001515
Residential Additions & Alterations	0.001635	0.001483
Hotels & Motels	0.000885	0.004327
Dormitories	0.000697	0.001543
Public Housing	0.000911	0.001597
Manufacturing Buildings	0.000652	0.001070
Office Buildings	0.000899	0.001441
Stores and Restaurants	0.001058	0.001903
Auto Service Buildings	0.000765	0.003847
Religious Buildings	0.000577	0.003667
Educational Buildings	0.000476	0.002038
Hospital and Healthcare Buildings	0.000911	0.002055
Nursing Home	0.000718	0.002313
Amusement, Social, and Recreational Buildings	0.000913	0.002766
Other Nonresidential Buildings	0.000665	0.002430
Utility Service Buildings	0.001168	0.001939
Natural Resource and Conservation, incl. river and harbor construction	0.002794	0.001912
Electical Utility Facilities	0.001499	0.001927
Water Utility Facilities	0.000798	0.002483
Gas Utility Facilities	0.001049	0.000819
Sewer and Sewage Treatment	0.001395	0.002505
Local Public Transportation	0.001912	0.005041
Mineral Exploration Structures	0.001042	0.002741
Defense Construction	0.002417	0.002798
Airports	0.004139	0.006238
Streets and Highways		
Connecticut	0.010123	0.007877
Maine	0.039930	0.031070
Massachusetts	0.009561	0.007439
New Hampshire	0.025308	0.019692
Rhode Island	0.007874	0.006126
Vermont	0.029807	0.023193

Sources: (a) For nonhighway construction, Bureau of Labor Statistics,
1987 Input–Output Transactions, (Use Table), unpublished data, 1991
(b) For highway construction, Federal Highway Administration, 1987,
"Federal–Aid Highway Construction Usage Factors 1986–1987–1988"

Table A.2 Implicit Price Deflators, Construction (1987=100.0)

Year	Nonresidential	Residential	Nonbuilding	Streets & Highways
1980	87.0	76.9	73.5	94.3
1981	96.2	83.3	80.0	90.9
1982	102.6	86.1	87.0	85.5
1983	101.3	88.0	92.6	85.5
1984	100.4	91.2	94.3	90.1
1985	100.2	93.2	95.2	100.0
1986	101.8	95.6	97.1	100.0
1987	100.0	100.0	100.0	100.0
1988	101.2	103.0	103.1	107.5

Source: (a) U.S. Department of Commerce, Bureau of Economic Analysis,
"Business Statistics, 1961–1988". Washington, D.C: U.S. Government Printing Office, December, 1989.

Table A.3a – New England Sand and Gravel Production (Tons, 000), 1980 – 1990: States, Region, U.S.

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Connecticut	7,103	6,500	4,887	5,000	6,718	6,000	7,254	8,400	8,275	5,800	6,200
Maine	6,978	7,500	6,701	4,800	7,885	7,200	8,572	8,600	10,183	8,600	6,200
Massachusetts	13,925	12,500	12,003	10,400	14,168	14,900	19,200	21,800	22,168	13,900	9,200
New Hampshire	590	4,528	4,332	4,000	5,637	6,300	8,418	9,100	9,089	6,000	8,000
Rhode Island	2,506	1,332	1,146	1,000	1,483	1,200	2,269	2,700	1,853	1,100	1,000
Vermont	1,320	3,196	3,218	3,000	3,802	2,700	4,834	4,700	6,047	6,900	6,100
New England Total	32,422	35,556	32,287	28,200	39,693	38,300	50,547	55,300	57,615	42,300	36,700
United States Total	763,100	690,000	594,000	655,100	773,900	800,100	883,000	896,200	923,400	897,300	924,000

Sources:

US Bureau of Mines. 1991. State Mineral Summaries.

US Bureau of Mines. January, 1991. Mineral Industry Surveys: Sand and Gravel in 1990.

US Bureau of Mines. 1980–1990. Minerals Yearbook.

Table A.3b–New England Crushed Stone Production (Tons, 000), 1980 – 1990: States, Region, U.S.

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Connecticut	7,977	6,837	6,100	7,692	8,300	7,277	7,700	11,412	11,400	11,480	9,700
Maine	1,130	1,375	1,200	848	1,300	1,459	1,600	2,010	1,400	1,591	1,500
Massachusetts	7,316	7,997	6,900	7,740	8,400	9,345	10,000	14,907	17,500	11,880	9,100
New Hampshire	590	665	600	946	850	1,612	1,800	2,479	2,400	771	500
Rhode Island	203	141	130	971	1,000	1,135	1,000	1,228	1,500	1,208	1,400
Vermont	1,320	1,319	1,200	1,339	1,800	1,689	1,600	2,159	2,000	3,119	3,900
New England Total	18,536	18,334	16,130	19,536	21,650	22,517	23,700	34,195	36,200	30,049	26,100
United States Total	983,500	872,600	790,030	861,600	956,000	1,000,800	1,023,200	1,200,100	1,250,000	1,213,000	1,216,000

Sources:

US Bureau of Mines. 1991. State Mineral Summaries.
US Bureau of Mines. January, 1991. Mineral Industry Surveys: Crushed Stone in 1990.
US Bureau of Mines. 1980–1990. Minerals Yearbook.

APPENDIX B

DEMAND PROJECTIONS
1980-2010

REGION, STATE AND MSA LEVEL PROJECTIONS

Table B.1 – New England Sand and Gravel Demand (Tons, 000), 1980 – 2010: Region, States, MSAs

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
New England	30,910	24,048	31,514	35,625	37,774	46,700	50,016	55,297	55,736	56,805
Metro. Areas	22,717	17,181	22,989	26,516	28,855	35,535	39,651	43,955	43,535	44,983
Nonmetro. Areas	8,193	6,867	8,525	9,109	8,919	11,165	10,365	11,341	12,201	11,822
Connecticut–Total	5,964	4,239	6,202	7,045	7,963	10,006	12,674	15,113	14,154	15,361
Bridgeport MSA	1,932	1,393	2,022	2,184	2,387	2,946	3,400	3,696	3,577	3,782
Hartford MSA	1,945	1,659	2,062	2,400	2,704	3,318	4,384	5,371	5,047	5,421
New Haven MSA	1,203	628	1,183	1,364	1,702	2,189	2,840	3,398	3,174	3,471
New London MSA	469	294	472	627	616	757	926	1,330	1,081	1,328
Nonmetro. Counties	415	265	463	470	554	797	1,125	1,318	1,275	1,358
Maine–Total	6,271	5,037	6,196	5,747	5,114	6,666	3,859	4,613	4,239	4,224
Bangor MSA	824	604	675	633	538	819	351	519	386	400
Lewiston MSA	567	438	499	526	459	520	306	301	352	315
Portland MSA	1,277	1,092	1,325	1,194	1,271	1,631	1,095	1,328	1,307	1,247
Nonmetro. Counties	3,602	2,903	3,697	3,393	2,847	3,696	2,107	2,465	2,194	2,261
Massachusetts–Total	11,123	7,911	11,613	13,423	14,535	17,399	20,370	21,663	21,652	22,266
Boston MSA	7,437	5,309	7,829	8,863	9,457	10,797	12,472	13,061	13,336	13,407
New Bedford MSA	676	486	729	814	888	1,157	1,363	1,791	1,769	1,861
Pittsfield MSA	192	101	202	248	258	329	430	477	446	456
Springfield MSA	1,113	718	1,019	1,155	1,211	1,291	1,979	2,132	1,886	2,010
Worcester MSA	953	607	1,034	1,210	1,342	2,125	2,342	2,475	2,386	2,670
Nonmetro. Counties	752	690	800	1,132	1,379	1,700	1,784	1,727	1,829	1,863
New Hampshire–Total	4,165	3,614	3,542	4,904	5,255	6,799	6,826	7,126	8,188	7,452
Manchester MSA	1,358	1,192	1,204	1,854	2,089	2,514	2,233	2,324	2,433	2,616
Portsmouth	1,157	1,036	1,005	1,389	1,509	2,081	2,148	2,162	2,207	1,836
Nonmetro. Counties	1,651	1,385	1,334	1,660	1,657	2,204	2,445	2,641	3,548	3,001
Rhode Island–Total	1,208	1,280	1,111	1,471	1,812	2,485	2,775	2,821	3,321	3,417
Providence MSA	1,083	1,134	992	1,323	1,620	2,175	2,477	2,537	3,033	3,112
Nonmetro. Counties	125	146	119	148	192	310	298	283	288	305
Vermont–Total	2,178	1,968	2,849	3,034	3,095	3,345	3,511	3,960	4,182	4,085
Burlington MSA	531	490	737	729	803	889	905	1,052	1,116	1,051
Nonmetro. Counties	1,648	1,478	2,112	2,305	2,291	2,457	2,606	2,908	3,067	3,034

Source: Eastern Research Group, Inc.

Table B.1 – New England Sand and Gravel Demand (Tons, 000), 1980 – 2010: Region, States, MSAs

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
New England	57,085	57,363	57,640	57,917	58,192	58,467	58,759	59,123	59,485	59,846
Metro. Areas	45,253	45,521	45,788	46,054	46,319	46,583	46,848	47,183	47,516	47,848
Nonmetro. Areas	11,832	11,842	11,852	11,863	11,873	11,883	11,912	11,940	11,969	11,997
Connecticut–Total	15,490	15,618	15,746	15,872	15,997	16,121	16,254	16,458	16,660	16,861
Bridgeport MSA	3,787	3,792	3,797	3,802	3,807	3,812	3,822	3,833	3,843	3,854
Hartford MSA	5,450	5,478	5,506	5,535	5,563	5,592	5,623	5,655	5,687	5,719
New Haven MSA	3,478	3,485	3,491	3,498	3,505	3,511	3,521	3,530	3,539	3,549
New London MSA	1,408	1,487	1,565	1,642	1,718	1,792	1,860	2,000	2,138	2,274
Nonmetro. Counties	1,367	1,377	1,386	1,395	1,405	1,414	1,427	1,440	1,453	1,466
Maine–Total	4,272	4,321	4,370	4,418	4,467	4,516	4,546	4,576	4,606	4,636
Bangor MSA	404	409	414	418	423	428	431	435	438	441
Lewiston MSA	323	331	339	346	354	362	364	367	370	372
Portland MSA	1,250	1,252	1,254	1,256	1,259	1,261	1,263	1,265	1,268	1,270
Nonmetro. Counties	2,295	2,329	2,363	2,397	2,431	2,465	2,487	2,509	2,531	2,553
Massachusetts–Total	22,405	22,544	22,682	22,821	22,960	23,098	23,233	23,367	23,501	23,636
Boston MSA	13,473	13,538	13,604	13,669	13,735	13,800	13,863	13,925	13,988	14,051
New Bedford MSA	1,880	1,900	1,919	1,938	1,958	1,977	1,996	2,014	2,032	2,050
Pittsfield MSA	460	465	470	475	479	484	487	490	494	497
Springfield MSA	2,023	2,037	2,051	2,064	2,078	2,092	2,104	2,116	2,128	2,139
Worcester MSA	2,695	2,719	2,743	2,767	2,791	2,816	2,841	2,866	2,892	2,917
Nonmetro. Counties	1,874	1,885	1,896	1,907	1,918	1,929	1,942	1,955	1,968	1,981
New Hampshire–Total	7,408	7,364	7,320	7,276	7,232	7,188	7,170	7,152	7,134	7,116
Manchester MSA	2,603	2,591	2,579	2,567	2,554	2,542	2,539	2,535	2,532	2,528
Portsmouth	1,821	1,806	1,791	1,776	1,761	1,745	1,736	1,727	1,717	1,708
Nonmetro. Counties	2,984	2,967	2,951	2,934	2,917	2,900	2,895	2,890	2,885	2,879
Rhode Island–Total	3,461	3,505	3,550	3,594	3,638	3,683	3,721	3,759	3,797	3,835
Providence MSA	3,154	3,195	3,236	3,278	3,319	3,360	3,394	3,428	3,462	3,496
Nonmetro. Counties	308	310	313	316	319	322	327	331	335	339
Vermont–Total	4,048	4,010	3,973	3,936	3,898	3,861	3,836	3,812	3,787	3,762
Burlington MSA	1,044	1,037	1,030	1,023	1,016	1,009	1,002	996	989	983
Nonmetro. Counties	3,004	2,974	2,943	2,913	2,883	2,852	2,834	2,816	2,798	2,779

Source: Eastern Research Group, Inc.

Table B.1 – New England Sand and Gravel Demand (Tons, 000), 1980 – 2010: Region, States, MSAs

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
New England	59,923	60,039	60,155	60,270	60,385	60,500	60,486	60,471	60,456	60,441
Metro. Areas	47,897	48,006	48,115	48,224	48,332	48,440	48,441	48,442	48,443	48,444
Nonmetro. Areas	12,026	12,033	12,040	12,047	12,054	12,061	12,045	12,029	12,013	11,997
Connecticut–Total	16,776	16,828	16,879	16,930	16,981	17,031	17,028	17,025	17,021	17,018
Bridgeport MSA	3,864	3,861	3,857	3,854	3,850	3,847	3,840	3,833	3,826	3,819
Hartford MSA	5,750	5,762	5,774	5,786	5,798	5,810	5,806	5,802	5,798	5,794
New Haven MSA	3,558	3,558	3,558	3,558	3,558	3,558	3,544	3,530	3,516	3,502
New London MSA	2,125	2,164	2,202	2,240	2,278	2,315	2,342	2,368	2,394	2,419
Nonmetro. Counties	1,479	1,483	1,488	1,492	1,497	1,501	1,497	1,492	1,488	1,483
Maine–Total	4,668	4,700	4,732	4,763	4,795	4,827	4,857	4,886	4,915	4,945
Bangor MSA	444	448	452	455	459	463	467	470	474	478
Lewiston MSA	375	381	386	391	397	402	405	407	410	413
Portland MSA	1,274	1,275	1,276	1,277	1,278	1,279	1,280	1,281	1,282	1,283
Nonmetro. Counties	2,574	2,596	2,618	2,640	2,662	2,684	2,705	2,727	2,749	2,771
Massachusetts–Total	23,770	23,835	23,899	23,964	24,028	24,093	24,101	24,109	24,118	24,126
Boston MSA	14,113	14,138	14,163	14,188	14,213	14,238	14,236	14,234	14,232	14,230
New Bedford MSA	2,068	2,078	2,087	2,096	2,105	2,114	2,120	2,126	2,132	2,138
Pittsfield MSA	500	502	504	505	507	509	510	512	513	515
Springfield MSA	2,151	2,159	2,166	2,173	2,180	2,187	2,190	2,192	2,194	2,197
Worcester MSA	2,943	2,954	2,965	2,977	2,988	2,999	3,002	3,005	3,008	3,011
Nonmetro. Counties	1,994	2,004	2,015	2,025	2,035	2,046	2,043	2,041	2,038	2,035
New Hampshire–Total	7,098	7,071	7,044	7,017	6,991	6,964	6,932	6,899	6,867	6,834
Manchester MSA	2,525	2,518	2,511	2,504	2,497	2,490	2,480	2,470	2,460	2,449
Portsmouth	1,699	1,689	1,680	1,670	1,661	1,652	1,640	1,628	1,617	1,605
Nonmetro. Counties	2,874	2,864	2,853	2,843	2,832	2,822	2,811	2,801	2,791	2,780
Rhode Island–Total	3,873	3,896	3,918	3,941	3,963	3,986	3,994	4,002	4,010	4,018
Providence MSA	3,530	3,551	3,571	3,592	3,612	3,632	3,643	3,653	3,663	3,673
Nonmetro. Counties	343	345	347	349	351	354	351	349	347	345
Vermont–Total	3,738	3,710	3,682	3,654	3,627	3,599	3,574	3,549	3,525	3,500
Burlington MSA	976	970	963	957	950	944	937	931	924	918
Nonmetro. Counties	2,761	2,740	2,719	2,697	2,676	2,655	2,637	2,619	2,600	2,582

Source: Eastern Research Group, Inc.

Table B.1 – New England Sand and Gravel Demand (Tons, 000), 1980 – 2010: Region, States, MSAs

	2010
New England	60,426
Metro. Areas	48,445
Nonmetro. Areas	11,981
Connecticut–Total	17,014
Bridgeport MSA	3,812
Hartford MSA	5,790
New Haven MSA	3,488
New London MSA	2,445
Nonmetro. Counties	1,479
Maine–Total	4,974
Bangor MSA	482
Lewiston MSA	416
Portland MSA	1,284
Nonmetro. Counties	2,793
Massachusetts–Total	24,134
Boston MSA	14,228
New Bedford MSA	2,144
Pittsfield MSA	517
Springfield MSA	2,199
Worcester MSA	3,013
Nonmetro. Counties	2,033
New Hampshire–Total	6,802
Manchester MSA	2,439
Portsmouth	1,593
Nonmetro. Counties	2,770
Rhode Island–Total	4,027
Providence MSA	3,683
Nonmetro. Counties	343
Vermont–Total	3,475
Burlington MSA	911
Nonmetro. Counties	2,564

Source: Eastern Research Group, Inc.

Table B.2 New England Crushed Stone Demand (Tons, 000), 1980 – 2010: Region, States, MSAs

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
New England	18,459	13,820	18,851	20,854	21,810	26,488	28,006	31,454	31,716	32,024
Metro. Areas	13,287	9,557	13,414	15,211	16,408	19,855	22,134	24,953	24,751	25,203
Nonmetro. Areas	5,172	4,263	5,437	5,643	5,403	6,633	5,872	6,501	6,965	6,821
Connecticut–Total	3,425	2,196	3,602	3,875	4,437	5,492	7,106	8,424	8,079	8,631
Bridgeport MSA	1,053	691	1,137	1,146	1,361	1,619	1,955	2,118	2,087	2,187
Hartford MSA	1,186	893	1,209	1,338	1,477	1,818	2,415	2,900	2,857	2,982
New Haven MSA	677	317	713	757	942	1,198	1,591	1,903	1,815	1,954
New London MSA	269	166	276	364	345	408	525	773	615	757
Nonmetro. Counties	239	129	268	270	311	449	620	729	706	752
Maine–Total	4,176	3,323	4,111	3,706	3,262	4,200	2,156	2,569	2,331	2,384
Bangor MSA	550	405	456	414	351	531	211	316	216	260
Lewiston MSA	379	290	338	344	292	333	180	172	192	191
Portland MSA	841	706	844	745	795	1,012	595	705	716	656
Nonmetro. Counties	2,406	1,922	2,474	2,203	1,823	2,324	1,169	1,376	1,207	1,277
Massachusetts–Total	6,174	4,044	6,460	7,459	7,872	9,351	11,134	12,267	11,961	12,109
Boston MSA	4,018	2,624	4,174	4,798	5,062	5,782	6,823	7,515	7,388	7,330
New Bedford MSA	390	243	431	476	493	617	774	999	969	1,028
Pittsfield MSA	108	56	125	144	136	188	241	271	253	258
Springfield MSA	711	431	661	739	709	748	1,081	1,204	1,046	1,164
Worcester MSA	544	336	621	700	760	1,169	1,273	1,346	1,316	1,349
Nonmetro. Counties	403	354	448	603	711	848	942	932	990	980
New Hampshire–Total	2,607	2,273	2,215	3,052	3,226	3,909	3,844	4,097	4,810	4,373
Manchester MSA	844	751	732	1,160	1,294	1,371	1,226	1,376	1,446	1,515
Portsmouth	740	659	639	861	924	1,226	1,224	1,240	1,342	1,102
Nonmetro. Counties	1,023	863	844	1,031	1,008	1,312	1,394	1,481	2,022	1,756
Rhode Island–Total	714	769	664	841	1,059	1,462	1,626	1,618	1,982	1,989
Providence MSA	641	686	595	759	951	1,296	1,458	1,456	1,809	1,816
Nonmetro. Counties	73	82	68	81	108	166	168	161	173	173
Vermont–Total	1,363	1,215	1,799	1,920	1,956	2,073	2,141	2,479	2,553	2,537
Burlington MSA	334	302	463	466	514	540	561	658	685	654
Nonmetro. Counties	1,029	913	1,336	1,454	1,441	1,533	1,580	1,821	1,868	1,883

Source: Eastern Research Group, Inc.

Table B.2 New England Crushed Stone Demand (Tons, 000), 1980 – 2010: Region, States, MSAs

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
New England	32,139	32,254	32,369	32,483	32,598	32,712	32,839	33,007	33,173	33,340
Metro. Areas	25,320	25,436	25,552	25,667	25,782	25,897	26,013	26,169	26,325	26,480
Nonmetro. Areas	6,819	6,818	6,817	6,816	6,816	6,816	6,826	6,837	6,848	6,859
Connecticut–Total	8,704	8,777	8,848	8,919	8,990	9,060	9,135	9,250	9,365	9,479
Bridgeport MSA	2,190	2,193	2,196	2,199	2,202	2,205	2,212	2,218	2,225	2,231
Hartford MSA	2,997	3,013	3,028	3,043	3,059	3,074	3,091	3,108	3,125	3,143
New Haven MSA	1,958	1,962	1,965	1,969	1,973	1,977	1,982	1,987	1,992	1,998
New London MSA	802	847	892	935	979	1,021	1,060	1,139	1,218	1,296
Nonmetro. Counties	757	762	767	773	778	783	790	797	804	811
Maine–Total	2,387	2,390	2,393	2,397	2,401	2,406	2,403	2,399	2,397	2,394
Bangor MSA	263	266	269	272	275	279	281	283	285	287
Lewiston MSA	193	195	197	200	202	204	206	207	209	211
Portland MSA	639	622	605	588	571	555	538	521	504	487
Nonmetro. Counties	1,291	1,306	1,321	1,337	1,352	1,368	1,378	1,389	1,399	1,409
Massachusetts–Total	12,182	12,255	12,327	12,400	12,472	12,545	12,613	12,682	12,751	12,819
Boston MSA	7,365	7,401	7,437	7,473	7,509	7,545	7,579	7,613	7,647	7,681
New Bedford MSA	1,039	1,049	1,060	1,071	1,081	1,092	1,102	1,112	1,122	1,132
Pittsfield MSA	261	264	266	269	272	274	276	278	280	282
Springfield MSA	1,172	1,180	1,188	1,196	1,204	1,212	1,218	1,225	1,232	1,239
Worcester MSA	1,359	1,369	1,379	1,389	1,398	1,408	1,419	1,429	1,439	1,449
Nonmetro. Counties	986	991	997	1,003	1,008	1,014	1,020	1,025	1,031	1,036
New Hampshire–Total	4,347	4,321	4,295	4,269	4,243	4,217	4,206	4,195	4,185	4,174
Manchester MSA	1,507	1,500	1,493	1,486	1,479	1,472	1,470	1,468	1,466	1,464
Portsmouth	1,093	1,084	1,075	1,065	1,056	1,047	1,042	1,036	1,031	1,025
Nonmetro. Counties	1,747	1,737	1,727	1,717	1,707	1,697	1,694	1,691	1,688	1,685
Rhode Island–Total	2,005	2,022	2,038	2,054	2,071	2,087	2,099	2,112	2,124	2,137
Providence MSA	1,831	1,845	1,860	1,875	1,889	1,904	1,914	1,924	1,934	1,944
Nonmetro. Counties	175	176	178	180	181	183	185	188	190	192
Vermont–Total	2,514	2,491	2,468	2,445	2,421	2,398	2,383	2,368	2,352	2,337
Burlington MSA	650	646	641	637	633	628	624	620	616	612
Nonmetro. Counties	1,864	1,845	1,826	1,807	1,789	1,770	1,759	1,747	1,736	1,725

Source: Eastern Research Group, Inc.

Table B.2 New England Crushed Stone Demand (Tons, 000), 1980 – 2010: Region, States, MSAs

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
New England	33,343	33,371	33,400	33,428	33,456	33,485	33,447	33,410	33,373	33,337
Metro. Areas	26,473	26,503	26,532	26,562	26,591	26,620	26,592	26,564	26,536	26,507
Nonmetro. Areas	6,871	6,869	6,867	6,866	6,865	6,864	6,855	6,846	6,838	6,829
Connecticut–Total	9,430	9,459	9,487	9,516	9,544	9,572	9,570	9,568	9,566	9,564
Bridgeport MSA	2,238	2,236	2,233	2,231	2,229	2,227	2,223	2,218	2,214	2,210
Hartford MSA	3,160	3,166	3,173	3,179	3,185	3,192	3,190	3,188	3,185	3,183
New Haven MSA	2,003	2,003	2,003	2,003	2,003	2,003	1,995	1,987	1,979	1,971
New London MSA	1,211	1,233	1,255	1,277	1,298	1,319	1,334	1,349	1,364	1,379
Nonmetro. Counties	819	821	823	826	828	831	828	826	823	821
Maine–Total	2,391	2,390	2,388	2,387	2,387	2,386	2,385	2,384	2,384	2,383
Bangor MSA	289	292	294	296	299	301	304	306	309	311
Lewiston MSA	212	214	216	217	219	221	223	225	226	228
Portland MSA	470	453	436	419	402	385	368	351	334	317
Nonmetro. Counties	1,420	1,432	1,443	1,455	1,467	1,479	1,491	1,503	1,515	1,527
Massachusetts–Total	12,888	12,919	12,950	12,981	13,012	13,043	13,049	13,054	13,060	13,066
Boston MSA	7,716	7,729	7,743	7,757	7,770	7,784	7,783	7,782	7,780	7,779
New Bedford MSA	1,142	1,147	1,152	1,157	1,162	1,167	1,170	1,173	1,176	1,180
Pittsfield MSA	283	284	285	286	287	288	289	290	291	292
Springfield MSA	1,246	1,250	1,254	1,259	1,263	1,267	1,268	1,270	1,271	1,272
Worcester MSA	1,460	1,464	1,469	1,473	1,478	1,483	1,484	1,485	1,486	1,487
Nonmetro. Counties	1,041	1,044	1,047	1,049	1,052	1,054	1,055	1,055	1,055	1,056
New Hampshire–Total	4,163	4,148	4,132	4,116	4,101	4,085	4,066	4,047	4,027	4,008
Manchester MSA	1,462	1,458	1,454	1,450	1,446	1,442	1,436	1,430	1,424	1,418
Portsmouth	1,019	1,014	1,008	1,002	997	991	984	977	970	963
Nonmetro. Counties	1,682	1,676	1,670	1,664	1,658	1,652	1,645	1,639	1,633	1,627
Rhode Island–Total	2,149	2,152	2,155	2,158	2,161	2,164	2,158	2,152	2,146	2,141
Providence MSA	1,954	1,956	1,958	1,959	1,961	1,963	1,958	1,954	1,949	1,945
Nonmetro. Counties	195	196	197	198	200	201	200	198	197	196
Vermont–Total	2,321	2,304	2,287	2,270	2,253	2,235	2,220	2,205	2,189	2,174
Burlington MSA	608	604	600	596	592	588	584	580	576	572
Nonmetro. Counties	1,713	1,700	1,687	1,674	1,661	1,647	1,636	1,625	1,614	1,602

Source: Eastern Research Group, Inc.

Table B.2 New England Crushed Stone Demand (Tons, 000), 1980 – 2010: Region, States, MSAs

	2010
New England	33,300
Metro. Areas	26,479
Nonmetro. Areas	6,821
Connecticut–Total	9,562
Bridgeport MSA	2,205
Hartford MSA	3,181
New Haven MSA	1,963
New London MSA	1,393
Nonmetro. Counties	819
Maine–Total	2,383
Bangor MSA	314
Lewiston MSA	230
Portland MSA	300
Nonmetro. Counties	1,540
Massachusetts–Total	13,072
Boston MSA	7,778
New Bedford MSA	1,183
Pittsfield MSA	293
Springfield MSA	1,274
Worcester MSA	1,488
Nonmetro. Counties	1,056
New Hampshire–Total	3,989
Manchester MSA	1,412
Portsmouth	956
Nonmetro. Counties	1,621
Rhode Island–Total	2,135
Providence MSA	1,940
Nonmetro. Counties	195
Vermont–Total	2,159
Burlington MSA	568
Nonmetro. Counties	1,591

Source: Eastern Research Group, Inc.

APPENDIX C

AGGREGATES PRODUCER QUESTIONNAIRE

INFORMATION SOUGHT FROM

PRODUCERS OF CONSTRUCTION AGGREGATES

Please mail completed form to:
John Eyraud
Eastern Research Group, Inc.
6 Whittemore St.
Arlington, MA
For questions or clarifications, call
(617) 641-5325

Note - The information provided by your company will not be separately identified nor made public, but only incorporated in the report as part of the overall summary of regulatory issues and transportation patterns.

Facility Identification Data - Please fill out the basic information below.

1. Name of company - _____

2. Location of your company sand and gravel pits and crushed stone production facilities (Please give town, type of facility and zip code) -

	City/Town	Indicate if Producing Sand and Gravel (SG) or Crushed Stone (CS)	Zip Code of Facility
1.	_____	_____	_____
2.	_____	_____	_____
3.	_____	_____	_____
4.	_____	_____	_____
5.	_____	_____	_____
6.	_____	_____	_____
7.	_____	_____	_____
8.	_____	_____	_____

Questions on Permitting and Zoning Approval Processes

3. Can you describe one or two recent, major efforts by your firm to site, develop and/or expand a production facility that were unsuccessful due to state, regional or local land use restrictions or permitting processes?

Case A:
Town or city of proposed site:_____

Approximate dates during which necessary approvals were being sought:
_____

Specific permits or approvals that could not be obtained and principal basis for denial: _____

_____

_____

Case B:

Town or city of proposed site: _____

Approximate dates during which necessary approvals were being sought:

_____

Specific permits or approvals that could not be obtained and, if possible, principal basis for denial:

_____

_____

_____

4. Are there towns in the market area you serve that have aggregates resources but which are effectively closed to new production facilities within their borders? Please list as many of these as you can.

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

If none, check here _____

If don't know, check here _____

Comment, if any _____

_____

5. What towns in or near your service areas appear to be most attractive with reference to zoning and permitting for locating new production facilities?

_____ _____

_____ _____

_____ _____

If none, check here _____

If don't know, check here _____

Comment, if any _____

_____

6. What are the significant permits or approvals that you normally seek for locating production sites for sand and gravel or crushed stone?

Please list names of specific permits or approvals (generic or representative names for local approvals are satisfactory) and the period of time normally needed to complete the process, from the time that permit preparations begin to receipt of final approvals.

Permit Name	Typical Time to Completion

7. We would like to know if there are any difficult and/or time-consuming permit or approval processes that you have faced in locating sand and gravel or crushed stone facilities?

If you have not needed to seek new permits or facility approvals in the past three years, please check here _____

If you have sought approvals and encountered no significant difficulties, please check here _____

If you sought approvals and faced some difficulties, please fill in your response as appropriate below.

Delays in permit reviews and/or replies from agencies?

_____

Time-consuming or hard-to-generate information requirements?
Specify_____

_____

_____

Difficulties due to lack of clarity, ambiguities in requirements?

_____

_____

_____

Overlapping or duplicative requirements for information among the permit processes? Please name the permit processes with overlapping requirements?

_____
_____
_____

Other difficulties? _____
_____
_____

8. How many new production facilities has your company opened in the last five years? (This information is needed in order to provide the context to understand your other answers.) _____

Questions on Transportation of Sand and Gravel and Crushed Stone

We are collecting information about the distances that sand and gravel and crushed stone are transported. This information is needed to determine whether supply will be adequate to meet the demand levels forecasted in some of the major metropolitan areas or whether aggregates will need to be hauled from remote sites.

9. Has the distance that you are transporting sand and gravel and crushed stone changed over the past ten years?

Yes, we are transporting materials farther _____ Please estimate how much farther for representative one-way trips _____

Yes, we are not transporting materials as far _____ Please estimate how much the one-way transportation distance has decreased _____

No change in transportation distances _____

Don't Know _____

10. Do you expect to be transporting sand and gravel and crushed stone farther to users in the next 5 to 10 years?

Yes _____
If yes, what are the main reasons for the increase in transportation distances? _____
No _____
Don't Know _____

11. Detailed Transportation Patterns

We wish to be able to describe in some detail the distances that sand and gravel and crushed stone are now being shipped. In subsequent work, we will wish to compare current transportation distances to potential future distances in order to document whether the distances are increasing.

On the accompanying sheet(s), please list the areas to which you are making your largest shipments. Please include the mode of transportation used (truck, rail, barge). Also, we hope to identify locations at the zip codes level of detail for the purpose of geographic analysis that is being performed. That is why we have asked for the zip code of the shipping destination.

Name and telephone of person filling out information (We request this only for possible use if we have questions about the information provided.)

_____

THANK YOU VERY MUCH FOR YOUR ASSISTANCE

NEW ENGLAND GOVERNORS' CONFERENCE, INC.
AGGREGATE DEMAND STUDY
PROJECT TECHNICAL COMMITTEE

Connecticut
Sid Quarrier, Supervising Environmental Analyst
Department of Environmental Protection

Maine
Walter Anderson, State Geologist
Maine Geological Survey, Department of Conservation

Massachusetts
Joseph A. Sinnott, State Geologist
Executive Office of Environmental Affairs

New Hampshire
Eugene L. Boudette, State Geologist
University of New Hampshire

Rhode Island
Dr. J. Allan Cain, State Geologist
Department of Geology, University of Rhode Island

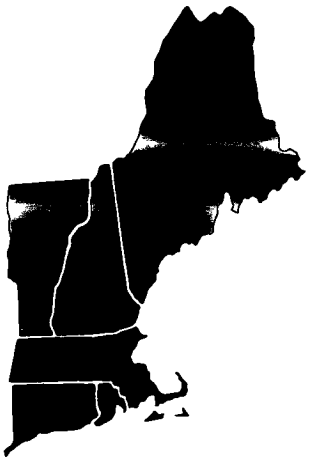
Vermont
Diane Conrad, State Geologist
Agency of Natural Resources

U.S. Minerals Management Service
Donald Hill

U.S. Bureau of Mines
Aldo Barsotti

New England Governors' Conference, Inc.
Dr. Arthur A. Socolow, Project Manager

NEW ENGLAND GOVERNORS' CONFERENCE, INC.



Governor
WILLIAM F. WELD
Massachusetts
Chairman

Governor
HOWARD DEAN, M.D.
Vermont
Vice Chairman

Governor
LOWELL P. WEICKER, JR.
Connecticut

Governor
JOHN R. McKERNAN, JR.
Maine

Governor
JUDD GREGG
New Hampshire

Governor
BRUCE SUNDLUN
Rhode Island

New England Governors' Conference, Inc.
76 Summer Street, Boston, Massachusetts 02110-1226
(617) 423-6900 FAX (617) 423-7327