

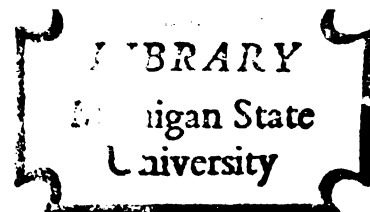
SIMULATED LONG-RUN HOUSING REQUIREMENTS  
BY TYPE AND REGION

Thesis for the Degree of Ph. D.

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THOMAS MARCIN

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This is to certify that the

thesis entitled

Simulated Long-Run Housing  
Requirements by Type and Region

presented by

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of the requirements for

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## ABSTRACT

### SIMULATED LONG-RUN HOUSING REQUIREMENTS BY TYPE AND REGION

By

Thomas Marcin

Better knowledge of long-run housing requirements is necessary to plan for the nation's future material requirements for shelter. Long-run housing projections in the past have generally been made in an informal manner which allows no basis for testing or revision of assumptions. Changes in the age composition of the population which can have a major effect on the long-run housing requirements are often ignored. This study provides a systematic framework for projecting the number, type, and geographic distribution of the future requirement for dwelling units which is based on explicit consideration of age-related demographic factors. Projections are made for the period 1970 to 2000.

The foundation of the study is a computer model. The model developed in the study brings together many aspects of housing requirements into a single quantified framework. The type of housing unit required, the components of its final disposition, and the regional distribution of housing are integrated into the computer model. Mobile homes are incorporated directly into the model. Annual housing projections are for the first time developed directly from annual projections of population by age class. Alternative time-paths of housing requirements are generated simply and



economically by rerunning the computer model.

The effect of alternative assumptions of future population and economic conditions on the housing requirement can be quickly and economically assessed by using the computer model.

The model is used to examine various assumptions about the rate of household formation by population age class (the headship rate), vacancy rates, removal rates, the type of housing unit occupied, and the regional distribution of population.

Three series of housing projections are presented in the study for the United States and by region. The highest series assumes the level of housing requirement assumed by the national housing goals. The next series assumes a more modest increase in the housing requirement. These two series form the upper and lower limits of probable housing requirements. The third series is an analytic series which measures the effect of population change only.

The study indicates that population pressure alone will not cause a housing boom of great magnitude. Substantial increases in headship, vacancy, and replacement rates are necessary to reach the level of construction envisioned in the national housing goals. Population pressure will increase in the 1970's, reach a peak in the early 1980's and then decline for the rest of that decade.

The total housing requirement is projected to increase in the 1970's and level off in the 1980's. In the 1990's

the total housing requirement will for the first time be significantly affected by current population growth.

Unprecedented changes in the age composition of the population which will occur in the next 30 years will lead to dramatic shifts in the type-mix of the housing requirement, since the type of housing unit required varies systematically with the age of the household head. As the great bulge of population born from 1940 to 1960 passes through its life cycle a shift toward single-family housing units is projected to begin in the late 1970's. The study also shows that no change in multiunit occupancy rates by age of household head is required to account for the number of multiple dwelling units constructed in the 1960's. The apartment boom of the 1960's can be accounted for by demographic factors and by a return of housing production to normal mix of the housing stock (30 percent multiunit in 1960) from the abnormal period of high single-family house production of the 1950's.

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## I. INTRODUCTION

### The Problem

Estimates of future housing requirements are necessary to plan for the wise use of our forest resources. Residential construction is the largest market for lumber and panel products. Residential construction activity has been subject to violent fluctuations which have adversely affected the stability of the forests products industry and the efficient allocation of our forest resource. Annual variations in housing starts of over 30 percent have occurred four times from 1950 to 1968. Even more dramatic movements have marked the long swings of residential construction activity over the last century. Peaks in housing starts several times higher than troughs have been common.

Striking changes have also taken place in the type-mix of dwelling units constructed during this century. Grebler, Blank, and Winnick (1953) have pointed out that through the twenties the trend was away from single-family houses. With the exception of one three-year period, the ratio of single-family houses to total housing units declined fairly continuously over the first three decades of this century. The ratio generally ranged from 60 to 70 percent, reaching a low of 56 percent in 1927. In the early thirties the trend

reversed, and the ratio of single-family houses reached an all time high of over 90 percent of all housing starts in the mid-fifties. In the late fifties the trend reversed again, and by 1968 the proportion of single-family units to total housing starts was about the same as it was in 1928, 57 percent. Over the long run it appears that about two-thirds of total housing starts are normally single-family units.

In the sixties, the mobile home emerged as a dynamic and significant innovation in the housing market. The number of mobile home units shipped increased from 90 thousand in 1961 to 390 thousand in 1969. The mobile unit itself has undergone a dramatic evolution in the last decade. The maximum size of mobile units has increased from 8 feet by 45 feet before 1955 to 12 feet and even 14 feet by 68 feet today. "Double wide" units and units with "expandable" rooms are also offered today. Further relaxation of public highway regulations regarding trailer size could allow even bigger units to be transported. The mobile home became considerably more competitive with conventional housing units with the introduction of the 12-foot wide mobile home in 1962.

The changing type-mix of housing units is of great importance in determining future material requirements for residential construction. For example, a single-family housing unit requires about 13,000 board feet equivalent of wood products, a multiunit housing unit requires about 6,000

board feet equivalent, and a mobile home requires only about 3,400 board feet equivalent.

Better knowledge of future housing requirements is needed to plan for future material requirements for shelter. To adequately plan for the proper development and allocation of our forest resource through time more information is needed about the number, type, and geographic distribution of future housing units.

The term housing requirement is defined as the addition to the housing stock required by a given population under a particular set of economic and social assumptions. The term housing demand is often used for our definition of housing requirement. However, the term housing demand may be used in other ways. The economist usually reserves the term demand to mean the "effective demand" in the market place, or the number of housing units which consumers are willing and able to purchase or rent. Closely related to the economist's concept of demand is the concept of housing "need". Housing need is defined as the number and quality of housing units required to provide every member of the population with a certain minimum socially adequate level of housing regardless of ability to pay. The distinction between housing need and housing demand is not as clear as the definition would indicate. The standard of decent housing is determined by the same social and economic forces which determine the effective demand for housing. Housing need may be transformed into effective demand by various

forms of government action. For example, the National Housing Goals (First Annual Report on Housing Goals, 1969) represent housing need. Government programs concerned with housing attempt to translate this need into effective demand. To meet future housing needs a systematic framework for long-run projections of housing requirements is necessary for planning realistic national housing goals and for designing government programs which may effectively utilize the economic forces of the housing market.

The most common method of making long-run housing projections is to consider the components of the housing inventory. The components of final disposition of housing units which are usually identified are new households, changes in vacant units, and units for replacement of those units removed from the housing stock by design or disaster. Estimates of future housing requirements are made for each of these components and totaled to obtain the final requirement. This method of projection is not objectionable if performed properly. But most often the estimates of these components are made in an informal unscientific manner, and the resulting projections have no basis on which they can be tested or revised to investigate alternative conditions and assumptions. For example, see "The First Annual Report on Housing Goals" (1969), especially pages 14 and 15 where 1967 assumptions are used to determine 1968 goals. An unrealistic vacancy rate of 13.2 percent for 1977 is used, and mobile homes are not considered in meeting the goals.

## Purpose and Objectives

The purpose of this study is: (1) to develop a computer model for projecting long-run housing requirements which makes maximum use of available information related to housing requirements, and (2) to project the number, type, and regional distribution of housing units likely to be required from 1970 to 2000. A computer model is used to develop housing projections in an effective and systematic manner. The many forces which influence the level of housing requirements are best studied by separating the housing market into components of housing requirements. Each component is studied in detail and relations formulated. As new information becomes available the model can be easily updated by changing the appropriate model section.

In the long-run projection model the use of exogenous variables whose values can be projected with some degree of confidence is highly desirable. One of the few variables which can be projected with some certainty is population already born. The major emphasis of this study is the analysis of the effect of demographic variables in the projection of housing requirements. In summary, the model was developed with the following specific objectives in mind:

(1) To develop a comprehensive framework for projecting long-run housing requirements in the form of a computer model. The advantages of this approach are: (a) it forces us to quantify vague concepts, (b) alternative projections may be made quickly and economically, (c) we can disaggregate

to a degree otherwise impossible, and (d) the model could serve as a basis for development of more elaborate models.

(2) To utilize long-run population projections as the basis for projecting long-run housing requirements. Population already born is one of the few variables that can be projected with confidence over long periods of time. The number of housing units required for the next 20 years is largely determined by the population already born, since over 99 percent of all household heads are over 20 years old. The projection model is based on annual projections of population by age.

(3) To relate long-run housing requirements to the demographic characteristics of the population. The very important relationship of age of household head to the number and type of housing units required over the human life cycle is explicitly included.

(4) To develop regional projections of housing requirements.

(5) To use the computer model to examine the effects of changes in the size and age composition of the population on housing requirements. The model is also used to examine alternative conditions and assumptions about future housing requirements.

The computer model has two major sections--the national demographic sector and the regional housing market sector. The demographic sector calculates age-related parameters for allocating the total housing requirement by type of unit.

Estimates are derived of the number of households by age class and the type of housing (i.e., single unit, multiunit, or mobile home) that would "normally" be required for the given population when all households are provided with units which are "normally" suited to their needs and preferences. The measure of normalcy is occupancy rates by age class as calculated from the 1960 census, with the following exception. The occupancy rate for mobile homes is adjusted upward at the expense of single-family housing units so that the mobile home requirement is consistent with 1969 levels of consumption of mobile homes. ✓

The regional housing market sector distributes total households by region and calculates the total housing requirement for each region. The total housing requirement is allocated by type of unit using the age-related parameters from the demographic sector and adjustment factors for regional variation. National totals are obtained by summing over the regions.

### Organization of Study

In Chapter 2, the study begins with an enumeration of the basic concepts and background information upon which the computer model is based. First the housing life cycle and the relationship of age of household head to the number and type of housing unit demanded is developed. The last part of Chapter 2 is devoted to the development of a housing market model. A framework for analysis is constructed from basic definitions and identities as a first approximation of

the housing market process. The concept of components of housing demand is presented and each component of final demand is discussed.

In Chapter 3, the actual computer model is formulated. The input data requirements, the mechanics of the computer relationships, and the output are discussed. Past demographic patterns and projection of future patterns of household formation and housing type requirements are analyzed in Chapter 4. The effect of fluctuation in the number of births on the age composition of future population is examined. The rising trend in the ratio of households to population (headship) is also explored. Chapter 5 presents the summary of housing requirements by region and nationally. The housing projections are broken down by type of unit and by components of requirement. Alternative sets of projection series are presented for various assumptions. Chapter 6 summarizes the results of the study and discuss possible uses of the model.

### Summary of Findings

In the short run, the age composition of the population can change very little. But over long periods of time changes in the age composition of the population are pronounced and have a major impact on the housing requirement. Failure to consider the age composition of the population can lead to fallacious conclusions about trends in residential construction and consumer preferences.

Housing preferences and needs change several times from



man's college days until his twilight years. A measure of the effect of age-related changes in the population was derived by dividing the population into age classes and determining the proportion of household heads (headship) in each age class. The number of households in each age class was multiplied by occupancy rates for each housing type to obtain a measure of the housing requirement by type. On the basis of these data it was shown that the wide swings in the number of births since 1925 will lead to unprecedented change in population age classes in the next 30 years. Assuming 1960 occupancy rates for multiple housing units, it was found that over half of the shift from single unit housing to multiple unit housing from 1955 to 1968 can be accounted for by changes in the age composition of the population. The requirement for multiple housing units by additional households increased from 27 percent in 1955 to a projected 45 percent in 1971, then declined to a projected 44 percent in 1975 and to only 18 percent in 1990. This has obvious implications for the type-mix of future housing. The requirements for multiple units have ebbed and flowed with the long swings in population. A direct implication of the change in the type of housing required of the population over the human life cycle is that a bulge in births or immigration that increases the population change from one period to the next for young households will initially increase the demand primarily for multiple units. Then, with a delay of as much as 20 years after the initial effects on the requirement for multiple units is felt, the peak increase in the demand for

single-family housing units will take place. Considering the upgrading in quality of housing units over the housing life cycle, especially within the ownership market, the peak impact of a population wave on some types of single-family housing units may not occur until 30 or 40 years later.

The primary projections, series 1, illustrated in Chapter 5 presume a strong economy and an effective government housing program. The total housing requirement is projected to increase rapidly through the 1970's, level off in the 1980's and then to increase again in the 1990's. The type-mix of the housing requirement is projected to shift dramatically. The requirement for mobile homes and apartments will continue strong through the 1970's, but will weaken in the 1980's. The single-family housing requirement is expected to increase slowly until the late 1970's when it will rise sharply. By the mid-1980's, single-family housing units are projected to dominate the housing requirement while the number of multiple units required will decline in absolute numbers. In the 1990's, the trend should reverse again. The degree of the change will be determined by the number of births in the 1970's.

## II. ANALYTIC FRAMEWORK AND BACKGROUND

An analytic framework for projecting housing requirements is developed in this chapter. Background information on the conceptual formulation of the model is provided. The analytic framework can also be used to simulate previous patterns of housing demand. First, the demographic basis for projecting housing requirements will be considered by exploring the relationship of age of household head to the number and type of housing units required. This relationship is fundamental to the model developed in this study. Next a model of the housing market consisting of a complex system of many interacting forces is developed. The influence of these forces is studied by separating the housing requirement into components. An analytic framework is constructed from definitions and identities and is used to show how the demand for housing may be conceptually separated into components of final disposition, i.e., households, vacant units, and replacement. The many factors which influence housing demand are considered as each component is discussed.

A general background of the determinates of housing demand and the housing market process are presented by Grebler and Maisel (1960), Needleman (1965), Grebler, Blank, and Winnick (1953), Gribsby (1963), Maisel (1963), Smith (1966), Winnick (1957), Beyer (1965), Campbell (1963, 1966), Martin (1966), and Atkinson (1966). Projections are discussed by Atkinson (1960, 1963), Gillogly (1964), and Newcomb (1963, 1966, 1967). Smith and Campbell emphasize

the demographic aspects of housing demand. The complexities involved in choosing a measure of income and relating income to housing is emphasized by Reid (1963) and Muth (1960). Recent econometric models of housing were developed by Maisel (1965) and Sparks (1967). Long-run studies of resource requirements which include housing projections were made by the Stanford Research Institute (1954), Resources in America's Future, Inc. (Landsberg, et al., 1963), and the Forest Service (1958, 1965).

#### The Demographic Basis of Housing Demand

The ultimate purpose of all housing units is to provide shelter for people. Therefore, the most logical and important place to begin a long-run projection model is by studying the characteristics of the population. For a population with a given set of characteristics, a particular mix of housing types would be necessary to provide for their housing needs and preferences. Variables which relate primarily to the characteristics of the population are termed demographic. These variables may include age, sex, race, family status, number of children, etc. Other variables are primarily economic in nature. Economic variables may include income, income expectation, assets, employment status, etc.

The first consideration of the model is the relationship of population to household formation. The desire and ability to establish a separate household varies with an individual's age, sex, marital status, income, etc. But the primary variable associated with household formation is age

(Smith 1966, p. 53). Many variables of interest are highly intercorrelated with age. For example, the sex ratio, marital status, income, and assets have age-related cycles. Age serves as a good proxy for many of these variables. Age also has the advantage for projection because its future value is determined. Age is also a primary factor in other aspects of housing demand.

Typically, total population is included in housing demand models directly as an independent variable or indirectly as a basis for determining household formation. The usual procedure is to assume an average number of persons per household and to use this ratio to determine the number of households from the total population. A refinement of this approach is to consider the population above a minimum age level as being the relevant housing population variable. This approach fails to consider changes in housing requirement over an individual's lifetime and is unsatisfactory for this reason. Campbell (1966, p. 3) states that:

The number of separate dwelling units demanded by a given number of individuals, the type of dwelling unit demanded, and the average value of the dwelling units demanded all vary systematically between life-cycle stages. Moreover, these differences in housing demand by age class have remained remarkably stable over long periods of time in the United States--even as real income has risen in all age classes--and seems to be the result of relatively stable patterns of income, income expectation, family situations, and tastes over the life cycle.

Most models of housing demand ignore the effect of changes in the age composition of the population on housing demand. The effect of changes in the age composition as well as the size of the population can be of great importance in

determining long-run housing demand. In fact, changes in age composition of the population can lead to changes in housing demand even if economic condition and consumer preferences remain constant. An increase in births such as occurred during and after World War II has its first impact on apartment demand, then after a number of years the peak demand for single-family houses will occur.

The number of births in the United States has undergone several long-run cycles over the last 50 years which will lead to unprecedented changes in the age composition over the next 30 years. Campbell (1966) has constructed a model which establishes how and why swings in age composition are important in explaining residential building cycles. Wide swings in age composition of the population which have occurred over the last century in the United States were shown by his studies to be important in determining the type-mix of housing demand. He states that (p. 41):

Clearly, if we are ever to properly evaluate the place of population changes in determining past residential building cycles and long swings in economic growth, or to utilize population projections to assess the prospects for future developments in housing markets, the housing life cycle will have to be included in the analytical process.

The model developed in this study is similar to Campbell's (1963, 1966) life-cycle model of housing demand. Other authors have used similar approaches to the same problem in a less formal manner (Smith 1966). The starting point of this approach is to divide total population into age classes. The procedure is then to formulate

relationships with respect to age. The first life-cycle effect to be considered is the relation of population by age to household formation.

Ideally, it would be desirable to represent the entire population profile by single years of age and to move this demographic model through time by applying appropriate birth, mortality, and migration factors. The Census Bureau (Current Population Report Series P-25, No. 381, 1967) has constructed such a model for population projection. The results of the Census Bureau's model, single-year projections of population by age class, are used as the population input of our model. The number of births for the period 1966 to 1969 was slightly below the population series D projection, which was the lowest series. Eight age classes were considered to be significant in the model formulation in this study. They are: (1) 15-19, (2) 20-24, (3) 25-29, (4) 30-34, (5) 35-44, (6) 45-54, (7) 55-64, and (8) over 65.

#### The Household Life-Cycle Model

A primary goal of this analysis is to isolate demographic factors. For this purpose the concept of headship,  $h$ , is defined to be the proportion of the population that heads households; or,

$$h = \left( \frac{\text{households}}{\text{population}} \right).$$

The number of households (HH) can be calculated from the headship rate and the population as follows:

$$HH = h * POP.$$

Where POP represents the demographic characteristics of the population and  $h$  is a function of economic and social rather than demographic forces. Age will be the only demographic variable to be considered in this study. But other dimensions such as sex, race, marital status, etc., could be added to further distinguish the population array.

Household headship first becomes significant in the late teens. Over 99 percent of all households are headed by individuals over 20 years old. The headship rate rises sharply from ages 20 to 29. Almost 50 percent of the population of age 30 individuals head households, most of whom are married couples. The rate rises slightly from ages 30 to 50. It then increases more rapidly until at age 75 about two-thirds of the population heads a separate household. After age 80, headship decreases rapidly as individuals are no longer able to maintain separate quarters. Headship will approach some definitional upper bound. The ultimate limit would be 100 percent, but if everyone cohabitated as couples then the maximum headship rate would be 50 percent. This state of affairs (so to speak) is reached during the middle age classes in which over 80 percent of the population lives as couples.

The Census Bureau (Current Population Report Series P-25, No. 394, 1968) has recently provided projections of households by type and age class for the period 1967 to 1985. These projections follow the same age cohort format. The basis for the projections is an extrapolation of headship



from 3-year averages centered around 1957 and 1964 to 1985. This inflexible mechanical projection method leads to the odd result that headship in 1985 will be 55 percent for the 35- to 44-year-old age group and only 51.8 percent for the 45- to 54-year-old group. The projections are also based on population series B which is outdated by present birth rates. Fortunately, birth rates are not important until after 1985, and the census projections do provide a usable estimate of the mix of household types between families and primary individuals. These projections can serve as an adequate beginning for projecting housing requirements for the next decade if used judiciously. The model developed in this study may use Census Bureau projections, but it also has the capacity for generating other household projections which could be more meaningful in the long run. For example, it is of interest to develop household projections related to alternative rates of GNP or income growth. Alternative population projection series may also be used. Population series D best fits present birth rates.

The general household formation relationship can be formulated for the  $i^{\text{th}}$  population age class and the  $k^{\text{th}}$  household type in time period as follows:

$$HH_n^{ik} = h_n^{ik} * POP_n^i$$

where for year  $n$ :

$HH^{ik}$  = total household for age class

$i$  and type  $k$

$POP^i$  = population in age class  $i$

$h^{ik}$  = headship for household type  $k$  in  
age class  $i$ .

Household types might include husband and wife families, other families, and primary individuals. Our model will not distinguish household types because of inadequate data, however, this would be worthwhile refinement. The total number of households can be obtained by summing over the age classes and household types. Then:

$$HHT_n = \sum_i \sum_k HH_n^{ik}.$$

The intertemporal household increment for the  $i^{th}$  age class and  $k^{th}$  household type will be:

$$\begin{aligned} \Delta HH^{ik} &= HH_n^{ik} - HH_{n-1}^{ik} \\ &= h_n^{ik} * POP_n^i - h_{n-1}^{ik} * POP_{n-1}^i \\ &= (h_{n-1}^{ik} + \Delta h^{ik})(POP_{n-1}^i + \Delta POP^i) - \\ &\quad h_{n-1}^{ik}(h_{n-1}^{ik} * POP_{n-1}^i) * POP_{n-1}^i \\ &= \Delta h_n^{ik} POP_{n-1}^i + h_{n-1}^{ik} \Delta POP_n^i + \Delta h^{ik} \Delta POP^i. \end{aligned}$$

The first term of the expression represents the effects of change in the headship rate or the effect of nondemographic factors. The second term represents the effect due to change in the size of the population in the  $i^{th}$  age class. The third term represents the interaction of changes in both headship and population. If headship does not change then

$$\Delta HH^{ik} = h_{n-1}^{ik} \Delta POP_n^i,$$

and household formation is a function of demographic factors only. The total increment in households may be obtained by summing over  $k$  and  $i$ .

$$\Delta HHT = \sum \sum_{ki} \Delta HH_n^{ik}$$

For the remainder of this section the superscript  $k$  for the household type will be dropped since our model will consider only the gross overall headship rates. However, it should be remembered that in theory household types can be differentiated.

The tenure relationship of housing demand can be calculated in a manner similar to household formation. A homeownership function can be defined for each age class of households. The homeownership requirement for the  $i^{th}$  age class in year  $n$  is:

$$HO_n^i = O_n^i * HH_n^i$$

where:

$HO^i$  = the number of homeowners

$O^i$  = the homeownership rate among  
households in age class  $i$

$HH^i$  = the households in the  $i^{th}$  age class.

The increment in homeowners is:

$$\Delta HO^i = O_n^i HH_n^i - O_{n-1}^i HH_{n-1}^i$$

$$\begin{aligned}
&= (O_{n-1}^i + \Delta O^i) (HH_{n-1}^i + \Delta HH^i) - \\
&\quad O_{n-1}^i HH_{n-1}^i \\
&= \Delta O^i HH_{n-1}^i + O_{n-1}^i \Delta HH^i + \Delta O^i \Delta HH^i.
\end{aligned}$$

If homeownership rates are unchanged, then:

$$\Delta HO^i = O_{n-1}^i \Delta HH^i.$$

The totals can again be obtained by summation:

$$\begin{aligned}
HOT_n &= \sum_n^i HO_n^i \\
\Delta HOT &= \sum \Delta HO^i.
\end{aligned}$$

The rental housing requirement will be defined to be the residual of the total requirement and the homeowner requirement. Then for households in age class  $i$  the rental rate is:

$$r^i = (1 - O^i).$$

The rental requirement is:

$$HR^i = HH^i - HO^i$$

and the increment is

$$\Delta HR^i = \Delta HH^i - \Delta HO^i.$$

The total rental requirement and increment will be:

$$HRT = HHT - HOT$$

$$\Delta HRT = \Delta HHT - \Delta HOT.$$

## Housing Types

The type-mix of the housing requirement is a major concern of this model. Various classifications of housing type may be made. Either structural types, value classes, or final uses can be distinguished. In this model three structural types are considered: single-family houses, multiple unit structures, and mobile homes. Second homes will also be considered but as a separate classification. Occupancy rates will be defined for each housing type in relation to age class in a manner similar to headship. Occupancy rates for the three structural types must add to one. The second home possession rate is independent of the structural types.

The  $j^{\text{th}}$  housing type required by the  $i^{\text{th}}$  age class can be expressed as follows:

$$HT_n^{ij} = t_n^{ij} * HH_n^i$$

where in year  $n$ :

$HT_n^{ij}$  = housing type  $j$  occupied by household holds in the  $i^{\text{th}}$  age class

$t_n^{ij}$  = the occupancy rates of housing type  $j$  by household in the  $i^{\text{th}}$  age class

$HH_n^i$  = households in  $i^{\text{th}}$  age class.

The housing type increment is

$$\Delta HT_n^{ij} = HT_n^{ij} - HT_{n-1}^{ij}$$

$$\begin{aligned}
&= (t_{n-1}^{ij} + \Delta t) (HH_{n-1}^i + \Delta HH^i) - \\
&\quad t_{n-1}^{ij} HH_{n-1}^i \\
&= \Delta t^{ij} * HH_{n-1}^i + t_{n-1}^{ij} * \Delta HH^i + \Delta t^{ij} * \Delta HH^i.
\end{aligned}$$

If housing type occupancy rates remain constant, then:

$$\Delta HT^{ij} = t_{n-1}^{ij} * \Delta HH^i.$$

The total requirement and increment for each housing type may be made by summing over the age classes:

$$\begin{aligned}
HTT_n^j &= \sum HT_n^{ij} \\
\Delta HTT^j &= \sum \Delta HT^{ij}.
\end{aligned}$$

#### Components of Housing Demand

In this section the analytical framework for the housing market is outlined. Beginning with some simple definitions and relationships the demand for housing will be conceptually separated into components of final disposition.

New housing will be produced either: (1) to be occupied by additional households, (2) to be added to the inventory of vacant units, or (3) to replace units removed from the existing housing stock. This convenient classification of housing demand by end use serves as a useful device for examining the various aspects of the determinants of housing demand. The determinants of housing demand are the many variables which influence final demand such as income, credit,

costs, price, population, etc. Our model can serve as a beginning for the analysis of the determinants of demand. Just as the concept of supply and demand is useful in analyzing market behavior and the concept of national income is useful in the analysis of the national economy, so too is the concept of the components of housing demand useful in studying the housing market. For a variable to affect final housing demand, it must affect at least one of the components of demand. The determinants of housing demand will be examined with respect to each component of demand.

To begin the housing market model,  $HU_n$  is defined to be the stock of housing units in existence in time period  $n$ . Those units which are occupied as primary residences as defined by the Census Bureau are designated as households,  $HH_n$ . Units which are not occupied as primary residences are termed vacant units,  $V_n$ . At any point in time,  $n$ , the demand for housing units is divided between households and vacant units. This is stated in the following identity:

$$HU_n \equiv HH_n + V_n.$$

Similarly at the next point in time

$$HU_{n+1} \equiv HH_{n+1} + V_{n+1}.$$

The incremental demand for housing can be derived from the above.

$$(HU_{n+1} - HU_n) \equiv (HH_{n+1} - HH_n) + (V_{n+1} - V_n)$$

$$\Delta HU \equiv \Delta HH + \Delta V$$

Then by definition the increment to the housing stock between periods must be reflected in a change in either the number of households or the number of vacant units.

The number of existing housing units may be altered either by the addition of new housing units or by the removal of existing ones. New units may be added by new construction, production of mobile homes, or from other sources such as conversion or adaptation of existing structures. Housing units may be removed from the housing stock for many reasons such as demolition, natural disaster, merger, or abandonment. A net replacement demand,  $R_n$ , is defined to be total removals minus net additions from sources other than new conventional construction and mobile homes.

The increment to the housing stock may also be defined to be the sum of new conventional construction plus mobile homes minus net replacement. Then:

$$\Delta HU \equiv (HC_n + MH_n) - R_n.$$

Total housing demand may be derived by equating the two identities for the housing increment.

$$(HC_n + MH_n) \equiv \Delta HH + \Delta V + R_n$$

Conventional housing construction is:

$$HC_n \equiv \Delta HH + \Delta V + R_n - MH_n.$$

Total housing demand, new construction plus mobile homes, will be determined if relationships can be derived for each of the components of demand.



### Household Formation

In the long run the most important component of housing demand is household formation. The number of households at any point in time is determined by the number of individuals willing and able to occupy separate dwelling units. The most obvious and necessary determinant of household formation is, therefore, the size and structure of the population. A person by definition may have only one primary residence which will be called his household. Any dwelling maintained as second home for occasional use must be considered as vacant. Population sets only an upper limit on the number of households. The number of households is also bounded by the size of the housing stock. A household is an occupied housing unit, thus the number of households cannot by definition exceed the size of the housing stock. If the housing stock is not allowed to expand freely through new construction, then household formation may be restricted by lack of adequate housing units. For example, some families doubled up because of the housing shortage caused by World War II. In the long run, population factors dominate the level of household formation and the supply of housing units adjust to meet this demand. The supply of housing units may come from sources other than convention housing starts, such as the conversions of existing units in the thirties and forties and the additions of mobile homes today.

As the previous discussion has indicated, demographic variables are the most important determinants of household

formation. These variables are not affected very much by outside economic forces (Adelman 1963). In the long run it can be expected that demographic variables will dominate household formation (Maisel 1963, p. 363).

Nondemographic variables are also important in determining the level of household formation. These variables may be classified as social, economic, and institutional. The most important economic variable is the level of personal income, both its size and its distribution. The level of a consumer's permanent income largely determines his ability to establish a separate household (Reid 1963; Freidman 1957). During the Great Depression income, or more precisely the lack of it, retarded household formation. However, for the entire decade of the thirties household formation was only slightly below what was expected from population growth (Campbell 1966, p. 66; Grebler, et al. 1953, p. 76). During the great economic expansion since World War II, the rapid rise in personal income has been accompanied by a steady rise in headship; i.e., an increase in the proportion of households to population. This increase in headship, which is greatest among the young and old age groups, seems to be related to the prosperous economy and the consequent social changes that affluence has allowed. The distribution of income can also be an important determinant of household formation. The use of social security taxes to distribute a permanent income stream to the elderly and the increase in retirement payments has undoubtedly made possible the rapid

increase in headship among the senior citizens. Government action to redistribute income, such as a guaranteed minimum income plan, could also increase the ability of the poor to form households. Household formation may be influenced by other economic variables such as consumer's assets and the cost of housing and credit condition, but the significance and direct effect of these other variables is not easily established.

Among social variables, the changing structure and attitude of the family are probably the most important. The increased mobility of our society and the loosening of family ties seems to have been reflected in the willingness of the young and older age groups to maintain separate quarters. The number of individuals maintaining households has increased much faster than the total. The increase is paced by older women who outlive their mates. A movement to communal living correspondingly would decrease household formation.

Government action can also be an important institutional influence on housing demand. A government program to supply low cost or free housing to the poor and the elderly could increase household formation among these groups. If poverty is to be eliminated, then household formation must surely be increased among the poor, and in particular the nonwhite minorities. So any government program to redistribute income or housing services could increase household formation. The recent open housing law could also influence household formation by eliminating market restrictions.

Vacancies

The second component of housing demand is the vacant unit. Vacancies may occur for many reasons, but two broad categories of vacant units can be distinguished: (1) those units available for sale or rent in the market and (2) those units held vacant for other reasons and not available in the housing market. Available vacancies are the housing market inventory of new and used homes which is needed for an orderly exchange of real estate and the migration of people plus a number of units built or held on speculation of future demand. The available inventory will fluctuate widely in response to changes in credit conditions and builders expectations. The construction process from planning to completion of a project or a house and the response of builder to changes in condition takes a considerable length of time. This timelag inherent in the construction activity response can lead to the cyclical behavior of homebuilding activity. In the United States available vacancies in recent years have ranged from a war-induced shortage of 1.6 percent in 1950 to 3.5 percent during the early 1960's. During normal times, it can be expected that available vacancies will range between 2 and 4 percent of the total housing stock.

The primary factor associated with available vacancies is credit. Credit may have several dimensions such as its cost (i.e., the rate of interest), the availability of funds, and the terms of debt. Vacancy is a lagged variable with

respect to credit due to the length of the construction process. Also important are the level of vacancies in the previous period and the rate of change of household formation. Expectations also can play an important role in determining the level of vacancies, especially in relation to the factors mentioned above. Other variables which could be significant are rents, prices, and the cost of construction.

In the long run the level of available vacancies is a relatively unimportant component of the total housing requirement since it will normally fluctuate between 2 and 4 percent of the total stock. Typically the long-term lag in mobilization of resources and the inertia of the construction process in response to an increase in long-run demand will lead to overbuilding and unwanted vacancies. This was the case in the late 1920's and the early 1960's. It is likely the late 1980's will also be the same.

The second category of vacancy is the intended or unavailable vacant housing unit. The most important type of vacancy in this group is the second home. Housing units may also be held off the market for a variety of reasons, such as speculation during rising prices, lack of buyers in a particular location, dilapidation, or units sold or rented and awaiting occupancy. Unavailable vacancies will be divided between second homes and other miscellaneous vacancies.

Second homes are growing in number in this affluent society and have been the object of much discussion and also

much confusion. There is a great deal of discrepancy in estimating the size of the second home market and its effect on total housing demand. Estimates of the number of second homes range from 2.6 to 5.0 percent of the total housing stock. A special survey conducted by the Census Bureau and the Forest Service cited below indicated the lower figure. Other surveys by Weyerhaeuser Company, American Telephone and Telegraph, and the University of Michigan Survey Center report the higher figures (Lansing 1966, p. 2; Sumichrast and Seldin 1967, p. 21).

These differences arise from the definition of a second home and from neglecting to consider the role of exchange of existing second homes. Most of the second home market is already considered in our model. In the last 10 years there has been no increase in unavailable vacancies rate. If we assume 4 percent of the vacancies are second homes and the increment to the housing stock is about 1 million units a year, then 40,000 units a year are needed to maintain the overall vacancy rate. An additional 30,000 units a year would be needed to maintain a 1 percent rate of replacement of the housing stock. A recent survey by the Census Bureau (Current Housing Report H-121, No. 16, 1969) and the Forest Service reports that second home construction averaged 55,000 units annually from 1960 to 1967. This survey used a rather strict definition of a second home and found a total of only 1.7 million units in 1967 or about 2.6 percent of total housing units. It also reported that 110,000

second homes were acquired in 1967. This indicates a large turnover of existing units which requires no new construction.

In any case the second home requirement is included in our model and should not be added on separately. Second home demand is by definition vacancies and must be added to the vacancy total. Some second homes are also replacements. There is no statistical evidence that in the last decade the possession rate of second homes has increased, although this is often assumed to be the case. Some forecasters may be guilty of double counting by assuming a vacancy rate and a replacement rate and then an estimated additional need for second homes which may already have been implicitly included.

Second home possession is age-related. Generally only the older age classes are financially able to afford an additional home. According to the Census survey only 8 percent of the households heads who possess a second home are under age 35, while 24 percent of all household heads are under 35. The greatest occurrence of second home ownership is from ages 45 to 64. The level of personal income would also seem to be an important factor in determining the demand for second homes. Other factors could include leisure time, availability of credit, and the cost of construction.

The second home relationship can be formulated in the age cohort manner which was outlined in an earlier section. For the  $i^{\text{th}}$  age class in year  $n$ :

$$SHH^i = S_n^i * HH_n^i$$

where:

$SHH^i$  = second home households of age i

$S^i$  = second home possession rate of age i

$HH^i$  = households of age i.

The total number of second homes can be obtained by summing over i.

$$SHHT = \sum_n^i S_n^i * HH_n^i$$

In this manner change in the number and age composition of households can be isolated from the rate of occurrence of second home possession. The S parameter may be assumed to have a secular tend upward through time.

Other miscellaneous vacancies are a relatively unimportant and stable part of overall vacancies. It will be assumed that they will move in the same direction as available vacancies reflecting the overall condition of the housing market.

The total number of vacancies can be calculated from the housing stock and the vacancy rate for year n.

$$V_n^T = v_n^T * HV_n$$

Vacancies may also be calculated from the household total and the vacancy rate.

$$V_n^T = \frac{HHT_n}{(1-v_n^T)}$$



### Replacement

The third component of housing demand is the number of housing units required to replace existing units which are withdrawn from the housing stock. Each year a substantial number of units are lost from the housing stock. Replacement demand constitutes approximately 30 to 40 percent of the yearly housing demand. Estimates of replacement are difficult to make because of a paucity of data. Housing units may be lost from fires, floods, storms, or other disaster. Units may be removed by demolition either by government or private action. Other units may be abandoned and left to deteriorate. Conversions may make two or more units from existing units. Conversely, fewer units may result from merger of existing units. Nonresidential structures may also be adapted for residential purposes.

This study is concerned with the net replacement rate of housing units. A certain number of units are added each year by sources other than new construction or mobile home production. These units are subtracted from the gross number of units removed from the housing stock to obtain the net number of removals. The net replacement rate is the percentage of the total housing stock removed in a given year.

The replacement rate for housing is dependent on many factors. The age and characteristic of the existing housing stock is very important. The general level of economic growth can be important in stimulating alternative land use

and increase the level of personal income. The level of available vacant units which reflects the general availability of housing can also affect removals. When housing is plentiful more units can be withdrawn from the market. Government action to rehabilitate deteriorating units may reduce the need to replace these units with new ones. However, government action also has been one of the most important factors in destroying housing units through urban renewal and highway construction programs.

The replacement requirement for housing may be considered in the short run and long run. In the short run the government may set a goal of removing all substandard housing units. In this case the replacement requirement would consist of replacing or rehabilitating the backlog of units not meeting the minimum standard of decent housing. The relative cost of rehabilitating units versus the cost of new construction would be important in determining the level of each activity.

In the long run it is useful to consider the average life of housing. Let us consider the average life of a housing unit to be the number of years that elapse before half of the housing units built in a particular period have been lost from the housing stock.

In the long run the normal replacement rate of the housing stock should approximate some average housing life to avoid the accumulation of a quality backlog of outdated units. If the size of the housing stock remains constant

then the average life will simply be  $1/r$ , where  $r$  is the rate of replacement. If the replacement rate is 1 percent, then the average life is 100 years. For a housing stock that is growing, its average life may be calculated from the formula (Needleman 1966):

$$n = \frac{\log(1 + \frac{g}{r} + \frac{g^2}{2r} + gr)}{\log(1 + g)}$$

where:

$n$  = average life

$g$  = annual rate of growth of housing stock

$r$  = annual rate of replacement of housing stock.

For a housing stock growing at a rate of 1.5 percent a year with a replacement rate of 1 percent a year, the average life would be 62 years.

The characteristics of the housing inventory are also important in determining long-run replacement demand. Relatively few new apartment buildings were constructed from 1930 to 1959. Thus, the potential replacement demand for the stock of older apartment buildings is high. The mobile home construction process is less material intensive than conventional construction. The stock of mobile homes is considered to have an average life much shorter than the average life of conventional units. The average life of a mobile home has been estimated to be only 14 years. If we assume that the mobile home stock will grow at an annual rate of 5 percent, then a replacement rate of 5 percent

would mean an average life of 14.8 years. In any case, mobile homes are significantly different from conventional types of construction. Today's rapid advance of technology would indicate a shorter average life for housing and thus a larger replacement demand is likely.

Total replacements can be calculated from the replacement rate and the housing stock by age class. For the housing stock of age class  $i$  in year  $n$  replacement is:

$$R_n^{ij} = r_n^{ij} * HV_n^{ij}$$

where:

$HV_n^{ij}$  = housing stock of type  $j$  in age class  $i$

$r_n^{ij}$  = replacement rate for type  $j$  in age class  $i$

$R_n^{ij}$  = total replacement for type  $j$  in age class  $i$ .

The total for each type may be obtained by summing over the age class.

$$R_n^j = \sum_i r_n^{ij} HV_n^{ij}$$

Two housing types, conventional housing units and mobile homes, will be used in our model. No differentiation for age will be made. For conventional units the relation is:

$$R_n^1 = r_n^1 HV_n^1$$

and for mobile homes it is:

$$R_n^2 = r_n^2 HV_n^2.$$

Then total replacement is:

$$RT_n = R^1 + R^2.$$

### III. THE COMPUTER MODEL

The purpose of this chapter of the study will be to present a computer model to aid in the projection of housing requirements over extended periods of time. The use of the computer model will enable us to examine in detail the effect of changes in the age distribution and size of the population on future housing requirements. Population by age class is used as a foundation for projecting housing requirement by type. The effects of changes in the components of housing demand can be considered systematically in a comprehensive overall framework. Considered explicitly are household formation, vacant units including second homes, and the effect of mobile homes on new construction. Projections are made for households, home ownership, new construction by type, mobile homes, and second homes.

The housing market is essentially local in nature. The model recognizes this fact. It is designed to operate on regional or area vacancy and replacement rate data. National totals are arrived at by aggregating the geographic divisions. The total number of households will be distributed on the basis of projected future population of each geographic division, adjusted for its variation from the national average according to 1960 census data. The total housing requirement will be distributed according to housing type parameters from the demographic sector of the model; again adjusted for geographic variation as recorded by the 1960 census. Four major regional divisions defined by the

Census Bureau are used in this study. The regions are the Northeast, North Central, South and West.

In theory, the approach taken in this model will permit any degree of geographic disaggregation desired. The only restriction is that the set of regions must be mutually exclusive and cover the nation. For example, one could choose the Chicago SMSA, the rest of the North Central region, and the rest of the U.S. as his geographic divisions. It should be noted that each division increases the data requirements of the model and makes manipulation of model parameters more complex. This type of system could be used to arrive at estimates of present housing need by gathering data on a regional basis and to project future housing requirements by geographic division.

In this first model most of the parameters are estimated exogenously and combined over time via the computer. Judgment and analytic relationships are combined into an overall framework from which hypotheses and econometric relationships could be formulated. Alternative parameter levels could be specified to fit particular sets of assumptions.

The model considers the period 1950 to 2000. Of particular interest is the projection period 1970 to 2000. Annual projections are generated for all model variables. Figure 1 presents the flow chart of the model.

The computer model has two main sections--the national demographic sector and the regional housing requirement section. The demographic sector is based on eight

## DEMOGRAPHIC SECTOR



population age classes. They are: 15-19, 20-24, 25-29, 30-34, 35-44, 45-54, 55-64, and over 65. Household formation is estimated for these age classes. The occurrence of three types of housing structures (single-family houses, multiunit structures, and mobile homes) and second homes are also considered. The demographic sector calculates age-related parameters for allocating the total housing requirement by type.

#### The Demographic Sector

The basic steps for the demographic section of the program are listed below. The index I refers to age class, J refers to housing type and N to the year.

##### (1) Population.

Estimates and projections of population,  $POP(I, N)$ , by age class are read in by single years from 1950-2000.

##### (2) Headship.

Estimates and projections of headship,  $H(I, N)$ , by age class are read in for 5-year intervals from 1950-2000.

##### (3) Households.

Households by age class are derived from population and headship. For each age class I households are:

$$HH(I, N) = H(I, N) * POP(I, N).$$

The household increment from the previous year is:

$$DHH(I, N) = HH(I, N) - HH(I, N-1).$$

Total households and the total household increment are obtained by summing over I.

$$HOT(N) = \sum^I HH(I, N)$$

$$DHHT(N) = \sum^I DHH(I, N)$$

(4) Homeownership.

Estimates of homeownership rates,  $O(I, N)$ , were made for 1960. Annual rates were set equal to these estimates.

The number of homeowners was derived from ownership and households.

$$HO(I, N) = O(I, N) * HH(I, N)$$

The homeowner increment is:

$$DHO(I, N) = HO(I, N) - HO(I, N-1).$$

The totals for homeowners and the increment to homeowners in all age classes are:

$$HOT(N) = \sum^I HO(I, N)$$

$$DHOT(N) = \sum^I DHO(I, N).$$

The percentage of households that are homeowners is also calculated.

$$HOP(N) = HOT(N)/HHT(N)$$

$$DHOP(N) = DHOT(N)/DHHT(N)$$

(5) Housing type occupancy rates.

Two housing type occupancy rates are defined.

They are:

(i) The overall occupancy rate for the housing types by age class.-- $T_1(J, I, N)$ .

(ii) The incremental occupancy rate is the rate at which the net annual increment to households by age class occupy different housing types.-- $T(J, I, N)$ .

If the overall rate is known then the number of housing units for each type required by households is:

$$HT(J, I, N) = T_1(J, I, N) * HH(I, N).$$

Given the incremental rate, the incremental requirement for each type is:

$$DT(J, I, N) = T(J, I, N) * DHH(I, N).$$

And the requirement by age class for each type is:

$$HT(J, I, N) = HT(J, I, N-1) + DT(J, I, N).$$

Given the incremental rate, the overall rate can also be calculated as:

$$T_1(J, I, N) = HT(J, I, N)/HHT(N).$$

The total requirement and the increment requirement are:

$$HTT(J, N) = \sum^I HT(J, I, N),$$

and

$$DHT(J, N) = \sum^I DT(J, I, N).$$

The percentage of household occupancy for each housing type and for the increment of each housing type can be calculated as follows:

$$PHT(J, N) = HTT(J, N)/HHT(N)$$

$$PDHT(J, N) = PHT(J, N)/DHHT(N).$$

The housing types considered were:

- J = 1 - single-family units
- 2 - multiunit structures
- 3 - mobile homes
- 4 - second homes

(6) Second Homes.

A secular time trend is assumed for the second home occurrence rate. The rate was adjusted as follows:

$$T(4, I, N) = (1 + AT^4 * (N-20)) * T(4, I, 20)$$

Where  $AT^4$  is a constant.

The Regional Housing Requirement Sector

This phase of our model projects the components of housing requirement by region. It distributes the total number of households by region on the basis of regional population projections. Vacancy rates and replacement rates are input for the regions and total housing requirement by type is estimated for each region. The national total is obtained by summing over the regions. The steps in this section of the model are:

(7) Regional distribution of households.

The total number of households will be distributed on the basis of the population over 21 years in the region adjusted for the variation of the region from the national household formation rate.

The adjustment factor is:

$$A1(K) = \left( \frac{\text{Household Population 21+}}{\text{Household Population 21+}} \right) \begin{matrix} \text{Region K} \\ \text{U.S.} \end{matrix}$$

The adjustment is made on the basis of the 1960 Census.

Estimates of the regional adult population  $POPR(K, N)$ , are input by 5-year intervals. Single-year estimates are by interpolation.

The equation for distributing households between the  $K$  regions is:

$$HHR(K, N) = HHT(N) * (A1(K) * POPR(K, N)),$$

where  $A1$ 's are restricted so that  $\sum^k A1(K) = 1$ .

(8) Vacancies and the housing stock.

Estimates of vacancy rates,  $V(K, N)$ , by region are made by 5-year intervals for the period 1950-2000. Annual rates are obtained by interpolation. Vacancy rates include an allowance for second homes.

The housing stock,  $HU(K, N)$ , is estimated from the vacancy rate and the number of households as follows:

$$HU(K, N) = \frac{HHR(K, N)}{1 - V(K, N)}.$$

Total vacant units are then:

$$VR(K, N) = HU(K, N) - HHR(K, N), \text{ and}$$

the national totals are:

$$HU(N) = \sum^K HU(K, N); VR(K, N) = \sum^K V(K, N).$$

## (9) Replacement.

Replacement rates,  $R(K, N)$ , by region are estimated for 5-year intervals for the period 1950-2000. Annual rates are obtained by interpolation. These rates apply to conventional constructed housing units only. The mobile home inventory is considered separately. A mobile home replacement rate is estimated separately.

The total of conventional replacements needed each year is estimated as follows:

$$RR(K, N) = R(K, N) * (HU(K, N) - HUMH(K, N)).$$

The mobile home replacements are estimated by the relationship

$$RMH(K, N) = S * HUMH(K, N),$$

where  $S$  is based on an estimate of the average life of a mobile home. The national totals for replacement are obtained by summing over the  $K$  regions.

## (10) New construction.

New construction for each region is estimated from the components of housing demand; household formation, net change in vacant units, net replacement and the net number of new mobile home households. Then new construction is:

$$HC(K, N) = HF(K, N) + DVR(K, N) + RR(K, N) - AMH(K, N),$$

where household formation is:

$$HF(K, N) = HHR(K, N) - HHR(K, N-1),$$

and the net change in vacant units is:

$$DVR(K, N) = VR(K, N) - VR(K, N-1).$$

The net addition of occupied mobile homes,  $AMH(K, N)$ , is defined later.

(11) The type-mix.

The number of single-family units is estimated by assuming that the net increment to the housing stock will be distributed according to the increment housing types derived from the demographic section of this model. The component of replacement demand will be assumed to be distributed according to the distribution of the total housing stock. The relation for single-family units for each region  $K$  and year  $n$  is:

$$HCS(K, N) = (HF(K, N) + DVR(K, N) - AMH(K, N)) * B1(K) *$$

$$\frac{DHT(1, N)}{DHHT(N) - DHT(3, N)} + RR(K, N) * B1(K) * \frac{HHT(1, N)}{HHT(N) - HHT(3, N)}$$

where:

$$B1(K) = \frac{\% \text{ mobile homes in region } K}{\% \text{ mobile homes in U. S.}}$$

Multi-family dwellings,  $HCM$ , are simply the difference:

$$HCM(K, N) = HC(K, N) - HCS(K, N)$$

The national total is obtained by summing over the  $K$  regions.

(12) Mobile homes.

An estimate of the additional number of mobile homes used in each region as primary households is obtained by adjusting the national percentage of new mobile households for regional variation and multiplying this by the household formation of the region:

$$AMH(K, N) = HF(K, N) * B3(K) * PDHT(3, N),$$

where:

$$B3(K) = \frac{\% \text{ mobile homes in region K.}}{\% \text{ mobile homes in U. S.}}$$

This adjustment is based on 1960 Census data.

Total mobile home shipment will be net mobile homes plus replacement adjusted for units not used for primary residences.

$$TMH(K, N) = \frac{AMH(K, N) + RMH(K, N)}{SX},$$

where:

$$SX = \% \text{ mobile homes used as residences.}$$

National totals are obtained by summing over the regions.

(13) Total housing requirement.

The total housing requirement is the sum of new construction plus mobile homes used as primary residences:

$$Total(K, N) = HC(K, N) + SX * TMH(K, N).$$

The national total is again obtained by summing over the regions.



#### IV. DEMOGRAPHIC PATTERNS

The information input and output for the demographic sector of the housing requirements model is presented in this chapter. The input information requirement for this sector includes population, headship, ownership rates, and housing type occupancy rates for the age classes considered in the model. The relationship of population by age to household formation and housing type occupancy is considered for the period 1950 to 2000. The output information provided by this sector is the total and annual increment for households, homeowners, and the housing types. The ratio of homeowners and the housing types to the household total and annual household increment is also calculated. A summary of the model output is provided in Appendix B for 1970 to 2000. Specific information by age class is also included in the Appendix.

##### Population

Until the 1920's, immigration was an important factor in population change in the United States. But since the enactment of the Immigration Act of 1924, the basis of population change has been fluctuations in the number of births. As Figure 2 shows, the number of births in the United States has undergone some wide swings in this century. These swings will lead to unprecedented changes in the age composition of the population for the remainder of this century.

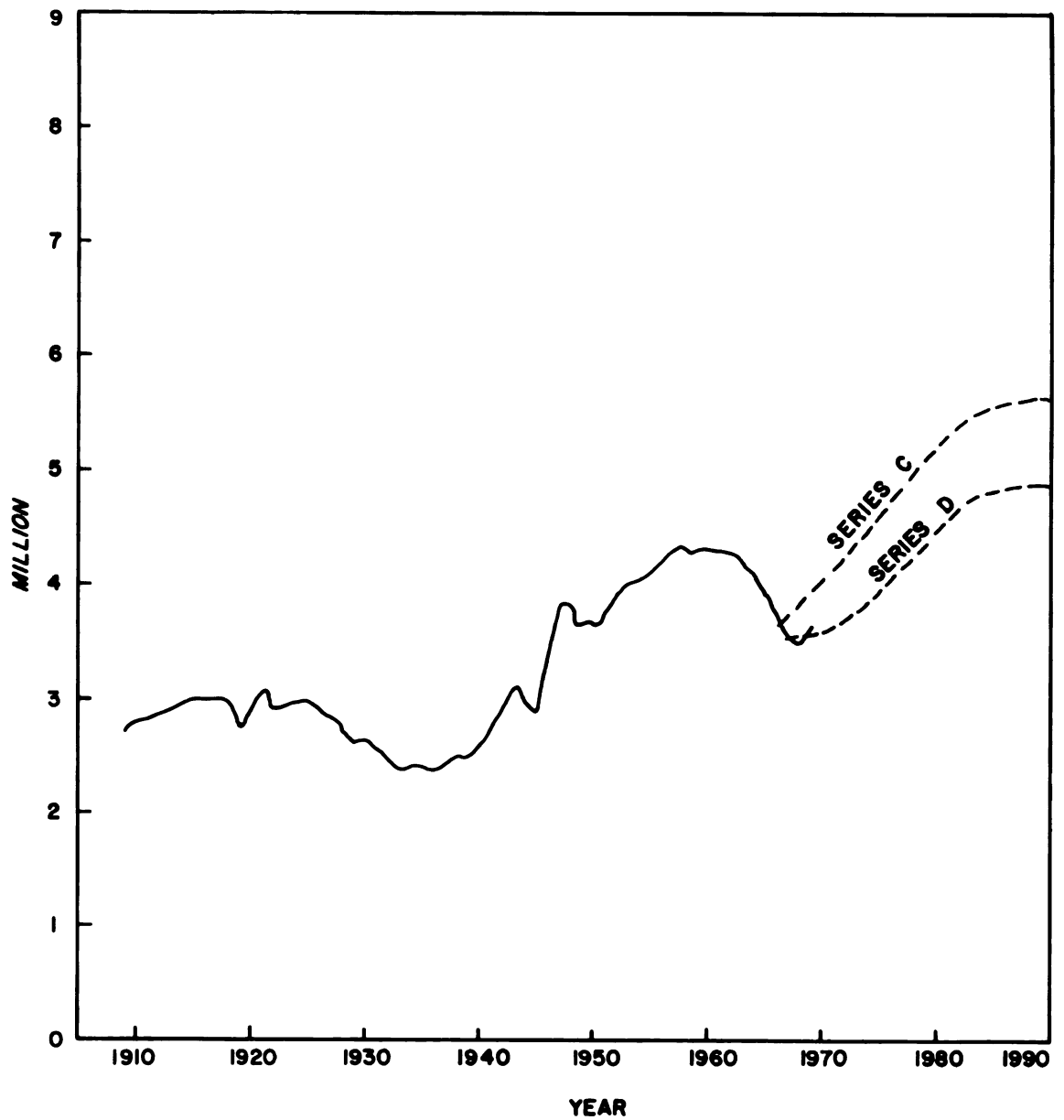


Figure 2. The number of births in the United States from 1909 to 1990. Source: U.S. Public Health Service, Vital Statistics of the United States.

A major decline in births occurred from 1925 to 1933 as births fell from almost 3 million to only 2.3 million. An enormous increase in births followed as the "war baby" boom raised births from under 2.5 million in 1939 to over 4.3 million in 1957. A sharp decline in births followed, starting in 1962. Births dropped by 800,000 to less than 3.5 million in 1968. A recovery in the number of births is expected in the 1970's as the "war babies" reach child bearing ages. Even the Census Bureau's most pessimistic population projection series D projects births to reach an all time high of 4.5 million by 1980. Actual births for the period 1966 to 1969 were slightly below the series D projection.

Future population may be projected from an appropriate model of births, mortality, and net immigration. The Census Bureau has constructed such a model and its output is used as input for our model. Annual projections of population by age group were obtained for the period 1960 to 2000 from the Census Bureau (Current Population Report P-25, No. 381, 1967). Annual estimates of population for the 1950's were also obtained from Census Bureau estimates (CPR P-25, No. 310, 1965). Population series D was used in the model since this series most closely approximates recent birth rates. Other birth rate assumptions such as those of series C could be used in the model, but the birth rate assumption does not significantly affect our model until after 1990.

The difference in population change by age class due to the past fluctuations in births are illustrated in Table 1. For example, from 1960 to 1970 the number of persons aged 30 to 39 decreased by 2 million, but those of ages 15 to 24 increased by 11.8 million. Figure 3 compares the change in the 1960's. The figures show that the population increase is concentrated in those age groups which were born from 1940 to 1960. In 1970 this population bulge was of ages 10 to 30; by 1990 it will be ages 30 to 50. The annual population projections used in the model are present in Table B3 in Appendix B.

### Headship

The second input to our model is headship. Headship is the proportion of the population that heads households. As such it is a measure of the nondemographic factors in household formation. A headship curve is the relation of headship to age. Figure 4 shows the headship curve for various points in time. The headship curve has a well-defined shape as the chart indicates.

Headship rates have remained relatively constant through the first half of this century. But since WW II headship has increased steadily. The greatest increase has been among the younger and older age classes. The trend toward increased headship cannot continue unabated. Some upper limit of headship will be approached. The ultimate limit is, of course, 100 percent. More realistically, if 86 percent of the population is living as couples and the

Table 1. Population change by age class for decades from 1950 to 2000 for projection series D.

Age class	Total number						Change from previous decade					
	1950	1960	1970	1980	1990	2000	1950- 1960	1960- 1970	1970- 1980	1980- 1990	1990- 2000	
Under 5	16,410	20,364	17,625	20,736	23,765	23,859	3,954	-2,739	3,110	3,029	94	
5-9	13,375	18,825	20,591	18,489	23,182	23,784	5,450	1,766	-2,102	4,693	602	
10-14	11,213	16,910	20,688	17,948	21,044	24,061	5,697	3,778	-2,740	3,096	3,017	
15-19	10,675	13,467	19,100	20,870	18,788	23,458	2,792	5,633	1,779	-2,091	4,670	
20-24	11,680	11,116	17,261	20,997	18,300	21,372	-564	6,145	3,736	-2,697	3,072	
25-29	12,362	10,933	13,878	19,475	21,234	19,172	-1,429	2,945	5,597	1,759	-2,062	
30-34	11,674	11,978	11,437	17,522	21,215	18,559	304	-541	6,085	3,693	-2,656	
35-39	11,347	12,542	11,061	13,980	19,502	21,248	1,195	-1,481	2,919	5,522	1,746	
40-44	10,290	11,681	11,900	11,396	17,362	20,996	1,391	219	-504	6,066	3,634	
45-49	9,142	10,926	12,223	10,812	13,653	19,018	1,784	1,297	-1,411	2,841	5,365	
50-54	8,296	9,655	11,103	11,335	10,889	16,578	1,359	1,448	232	-446	5,689	
55-59	7,253	8,465	10,040	11,262	10,006	12,666	1,212	1,575	1,222	-1,256	2,660	
60-64	6,074	7,162	8,451	9,770	10,022	9,687	1,088	1,289	1,329	252	-335	
65-69	5,013	6,264	6,883	8,223	9,299	8,325	1,251	619	1,340	1,079	-974	
70-74	3,419	4,769	5,214	6,234	7,302	7,569	1,350	445	1,020	1,068	267	
75-79	2,133	3,084	3,917	4,362	5,297	6,080	951	833	445	935	783	
80-84	1,151	1,601	2,326	2,583	3,139	3,731	450	725	257	556	592	
Over 85	578	940	1,242	1,661	1,969	2,480	362	302	419	308	511	
Total	152,271	180,684	204,923	227,665	255,967	282,642	28,413	24,239	23,044	28,302	26,675	
Over 20	100,598	111,118	126,919	150,016	169,910	187,883	10,520	15,801	23,097	19,575	18,292	

Source: U.S. Bureau of the Census, Current Population Rpt. Series P-25, No. 310 and 381.

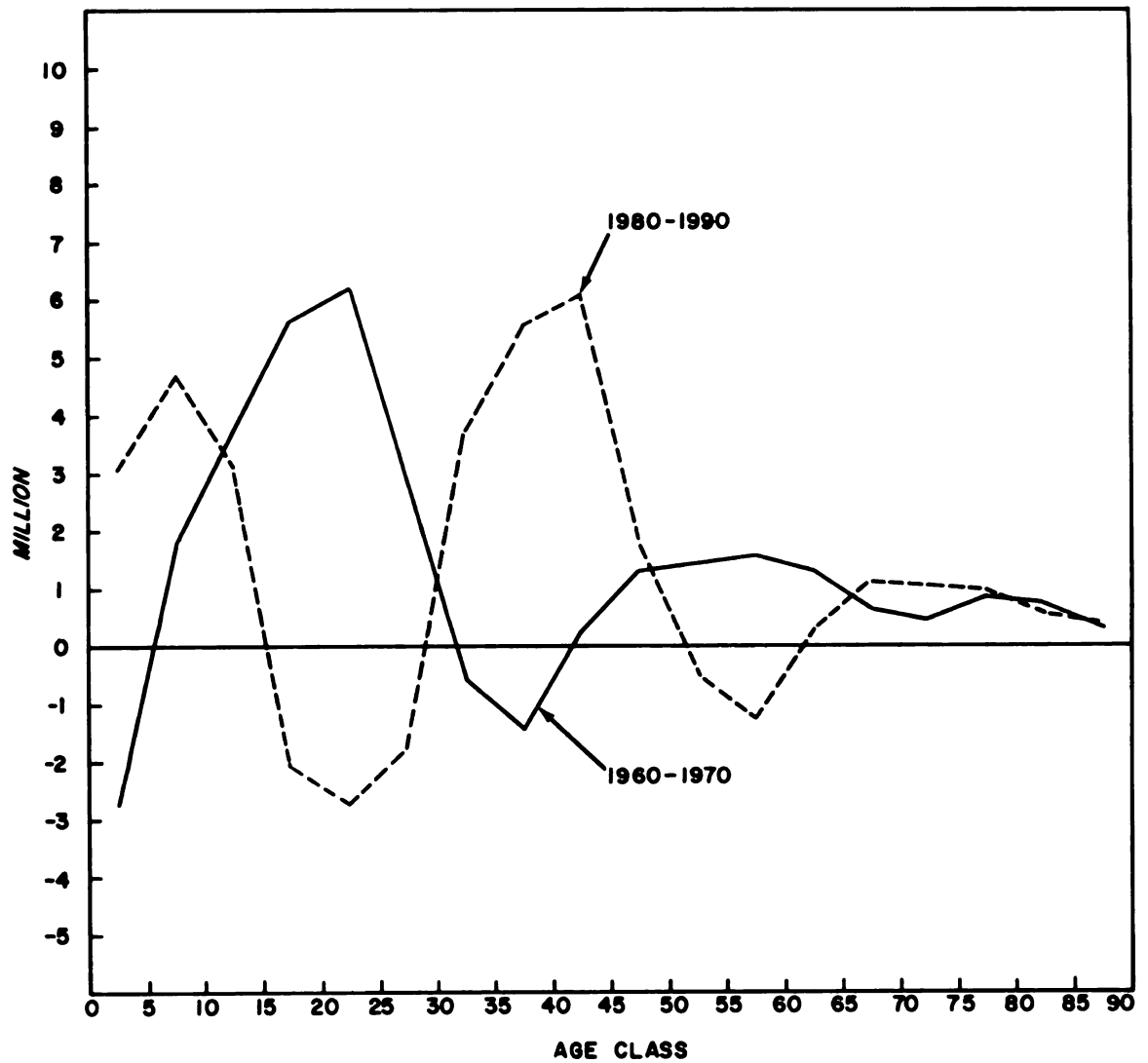


Figure 3. Population change by age class for 1960 to 1970 and 1980 to 1990. Source: Table 1.

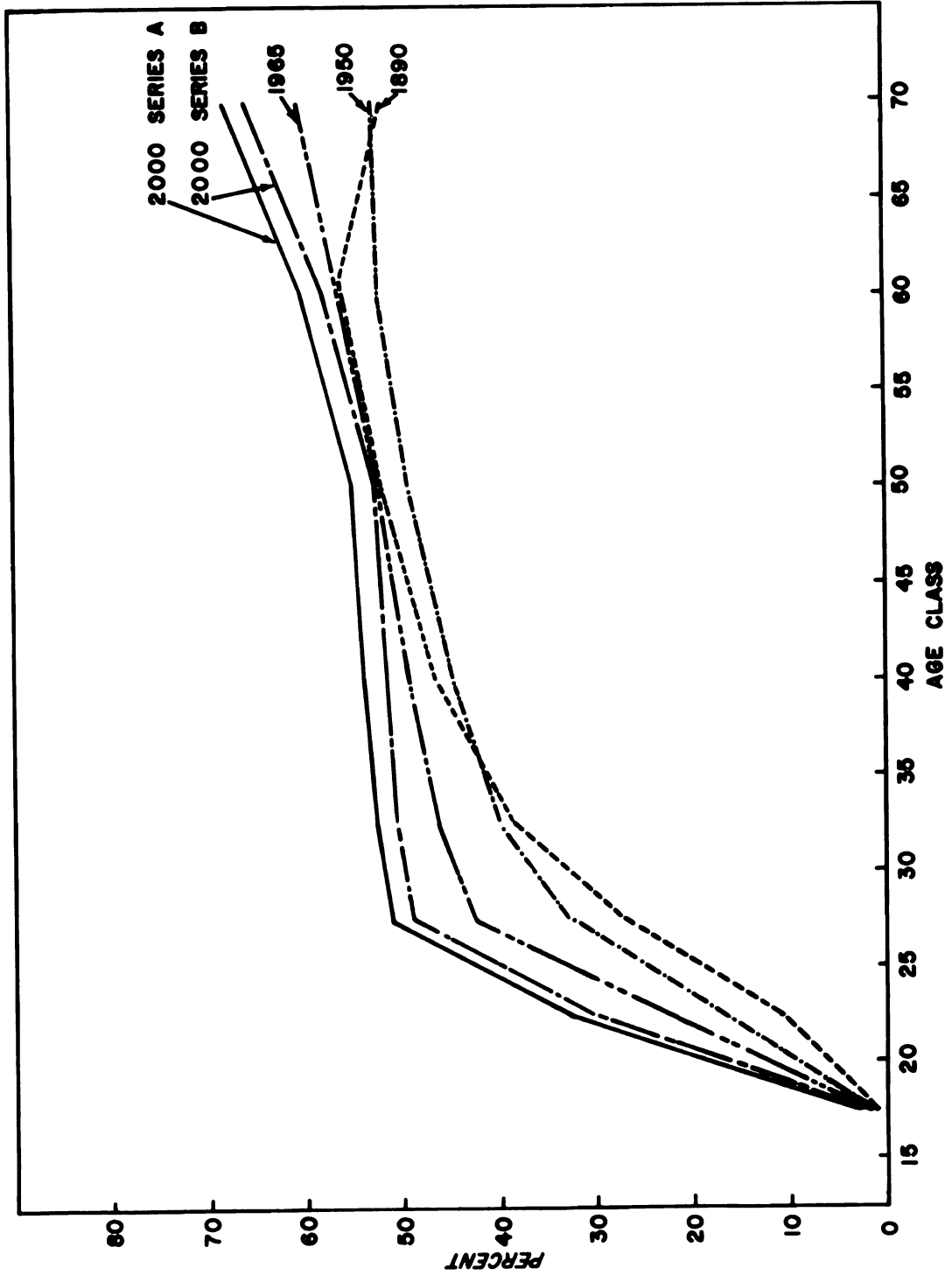


Figure 4. Headship rates by age class for 1890, 1950, and projections for 2000.  
Source: Table 2.

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remaining 14 percent as singles, then the maximum headship rate would be 57 percent. In fact, headship for the 45- to 54-year-old group increased from 49 percent in 1950 to 53 percent in 1958 and then leveled off to 52 percent in the 1960's.

The headship curve rises abruptly from age 20 until age 30, where it levels off at just under 50 percent. Most people by this time are married and cohabit in a separate household. Headship rises slowly after this until late middle age and then it increases moderately as death and separation produce more single-person households. Headship increases until about two-thirds of the population in their late seventies have a separate household. Headship declines rapidly after age 80 as individuals no longer are able to maintain separate households. In our model this last decline in headship for the very old is lost due to the aggregation of the 65 and over age group.

Headship rates were calculated from estimates of households and population by age class. Estimates were made from the decennial census of 1950 and 1960. Annual estimates were also made for 1954 to 1968. Unfortunately, the annual series for households has a high variance suggesting that an average of several years be used. Current Population Report Series P-20 by the Census Bureau reports estimates of household characteristics annually. As an input to our model, headship estimates from the decennial census of 1950 and 1960 are used for those years. For 1955 and 1965 a

3-year average from the annual headship series is used.

For the projection period, 1970 to 2000, three alternative assumptions can be made about headship. These assumptions are designated Series A, Series B, and Series K. The primary projection series, illustrated in this study, Series A, projects present trends with the following restrictions. Headship trends will be modified for a conceptual upper bound and headship will increase with age up to the 65 and over age class. Series B assumes a more moderate increase in headship, while Series K assumes constant 1965 headship rates. The headship rates used in the model are illustrated in Table 2. The annual headship rates are also in Table B4 of the Appendix B for Series A.

Many other assumptions about future headship could be easily examined with the model. By assuming headship to remain constant at 1965 rates, we can measure the effect of changes in the size and age composition of the population on household formation. It would also be possible to develop household projections related to alternative rates of GNP or income growth. In this case, the primary headship series would be associated with a real GNP growth rate of say 4 percent. A higher GNP growth rate assumption would be associated with higher headship and a lower GNP growth rate would mean lower headship projections.

Table 2. Headship rates by age class for 1890, 1930, 1940 and for 5-year intervals from 1950 to 2000.

Year		Age class							
		: 15-19	: 20-24	: 25-29	: 30-34	: 35-44	: 45-54	: 55-64	: 65+
(percentages)									
1890		0.6	10.7	27.3	38.5	46.5	52.0	56.0	51.8
1930		.7	11.7	( 32.8 )		44.9	50.4	53.7	53.2
1940		.6	11.3	28.2	37.7	44.6	50.7	54.0	56.8
1950		1.2	16.1	32.9	39.9	44.8	49.2	52.0	52.8
1955		1.6	19.0	35.7	42.8	47.5	51.1	54.4	55.1
1960		1.8	22.1	39.6	45.0	48.4	52.6	56.2	56.1
1965		1.6	22.9	42.4	46.1	49.1	52.2	56.4	60.4
Projection series									
1970	A,B	1.9	25.1	45.6	47.6	50.5	52.3	57.7	62.9
1975	A	2.0	26.7	46.9	48.8	51.4	52.8	58.0	64.1
	B	1.9	26.0	46.3	48.3	50.8	52.3	57.7	63.6
1980	A	2.1	28.2	48.1	49.9	52.1	53.2	58.4	65.2
	B	2.0	26.9	46.9	48.9	51.0	52.3	57.7	64.3
1985	A	2.2	29.6	49.2	50.8	52.6	53.6	58.8	66.3
	B	2.0	27.8	47.5	49.4	51.2	52.3	57.7	65.0
1990	A	2.3	30.6	49.8	51.4	53.0	54.0	59.2	67.0
	B	2.1	28.7	48.1	49.9	51.3	52.3	57.7	65.5
1995	A	2.4	31.5	50.4	52.0	53.4	54.4	59.6	67.6
	B	2.1	29.6	48.6	50.3	51.4	52.3	57.7	65.9
2000	A	2.5	32.4	51.0	52.6	53.8	54.8	60.0	68.0
	B	2.1	30.5	49.0	50.6	51.5	52.3	57.7	66.2

Source: 1890 - 1950 Campbell (1966), 1955 - 1965 author's estimates based on data from U.S. Bureau of the Census, Current Population Rpt. Series P-20 and P-25.

### Homeownership Rates

Homeownership rates are the proportion of households who own a home. The relation of ownership rates to age in an ownership curve shows that the frequency of ownership increases with age. As Figure 5 indicates, in 1960 ownership rose rapidly for those aged 20 to 35 years. Ownership reached a level of 65 percent for the 35- to 44-year-old age class and increased slowly to 72 percent for the 65 and over class. The 1960 estimates of ownership rates were derived from the 1960 Census of Housing and Population (U.S. Bureau of the Census 1963).

In the model, ownership rates are assumed to be constant at 1960 rates in order to measure the effect of changes in the size and age composition of the population on the tenure of the number of occupied housing units required. The homeownership rates are reproduced in Table B7 of Appendix B.

Many other assumptions about ownership rates can be considered in our model. Decreasing or increasing ownership rates could be assumed over time. Ownership is positively related to income and negatively related to the real cost of mortgage loans. These relationships could be formulated. But for now the model measures just the demographic effects of population on homeownership.

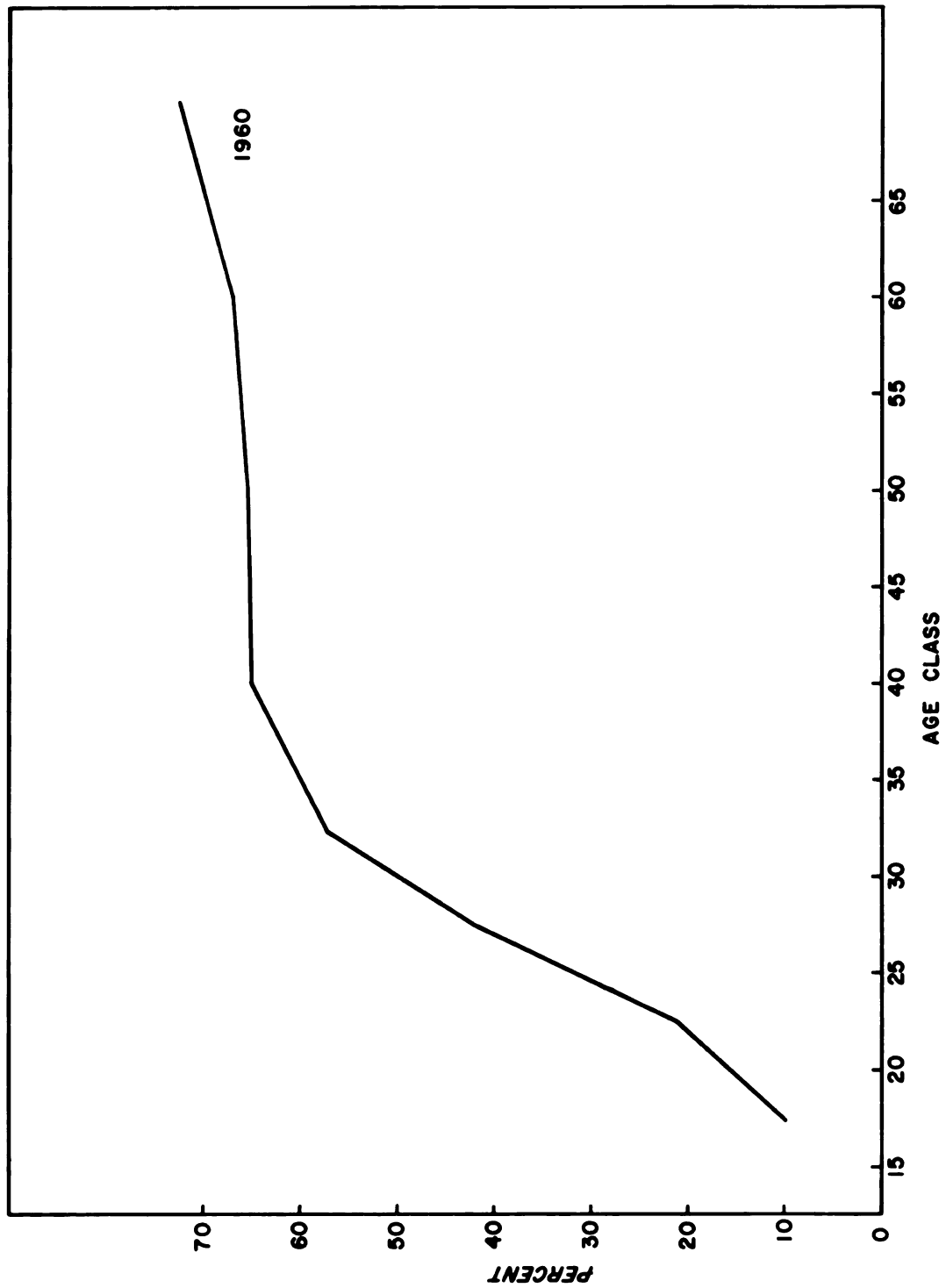


Figure 5. Ownership rates by age class for 1960. Source: Author's estimates based on data from U.S. Bureau of the Census (1963).

### Housing Type Occupancy Rates

Housing type occupancy rates define the proportion of households that occupy a particular class of housing. These rates are defined for household head age classes. Housing types considered are single-family houses, multiunit structures, and mobile homes. An estimate of the second home possession rate is also made. The housing type occupancy rates are presented in Table 3.

Housing type occupancy rates were approximated for 1960 from the following considerations. The 1960 census reported 62 percent of the occupied housing stock was owner occupied. It also reported that 69 percent of the housing stock was detached one-unit dwellings.

In the model it was assumed that in the future single-unit dwellings would be distributed in a proportion similar to owner occupied units, except that persons over 60 years (past the age for having children at home) would occupy relatively fewer one-unit dwellings. Mobile homes were assumed to be occupied in relatively greater proportion by persons under 35 years. Mobile homes accounted for only about 1.4 percent of the occupied housing inventory in 1960. Multiunit occupancy rates were calculated as the residual of single unit and mobile home occupancy estimates for the eight age classes. These occupancy rates are only approximations; but the important factor, the general relationship of age to the housing type required, is adequately represented. A more satisfactory and formal

Table 3. Occupancy rates by age class for 1960 and 2000.

Year	Housing type a/	Age class							
		15-19	20-24	25-29	30-34	35-44	45-54	55-64	65+
(Percentages)									
1960	1	21.5	25.7	48.2	63.2	78.5	80.0	75.0	65.0
	2	70.0	70.0	49.0	35.0	21.5	19.3	24.0	33.0
	3	4.5	4.3	2.8	1.8	1.0	.7	1.0	2.0
2000	1	9.4	11.0	35.3	54.9	71.3	74.4	71.4	57.1
	2	70.0	70.0	49.1	35.0	21.5	19.3	24.0	33.0
	3	18.2	19.0	15.7	10.0	7.8	6.4	4.6	9.9
Incremental occupancy rules									
1970-2000	0	0	0	21.0	45.0	63.5	65.7	61.0	47.0
	70.0	70.0	49.0	35.0	21.5	19.3	24.0	33.0	
	30.0	30.0	30.0	20.0	15.0	15.0	15.0	20.0	
Second homes									
1960	0	.2	.9	1.7	3.4	6.8	6.8	4.3	
2000	.1	.4	2.1	4.1	8.2	16.4	16.4	10.3	

a/Housing types: 1 = one-unit detached house  
 2 = multiunit structure  
 3 = mobile home

Source: 1960 - Author's estimates based on data from U.S. Bureau of the Census (1963).

procedure would be to obtain the occupancy rates directly from Census Bureau data tapes for the 1960 census.

The second home possession rate was assumed to be age-related. The recent Forest Service-Census Bureau survey of second homes confirms this relation. Second home possession rates are assumed to increase at a constant rate of 0.3 percent over time for Series A.

To adjust the occupancy rate shown in Table 3 for the present high level of mobile home additions to the housing stock, new type occupancy rates are defined for the annual increment to households. These incremental rates are also seen in Table 3. Mobile home occupancy is known to be greater among those under 35, so the curve is weighed as such.

The occupancy rates for detached one-unit housing (single-family houses and mobile homes) are assumed to remain constant. The increase in mobile home occupancy rates is subtracted from single unit occupancy rates as an alternative type of detached one-unit housing. Multiunit occupancy rates are assumed to remain the same. The incremental occupancy rates apply only to the annual household increment. They are used to calculate the required increment for each type. The increment rates are held constant for the projection period 1970 to 2000. By applying these rates to the household increment the overall occupancy rate can be changed each year. The result of this is shown in Table 3 for 2000. Tables of the housing type occupancy rates are



listed in the computer output tables in Appendix B.

The housing type occupancy rates considered here are just one example of how the relation of the age of population to the type of housing unit required can be formulated. The simplest example would be to assume no age effect; i.e., age of occupant has no relation to the type of housing unit. The occupancy rate for each age class would be the same as the overall proportion in this case.

#### Households

The basic output of the demographic sector is households by age class. Households are determined by headship and population. Both the number of households and net household formation are calculated annually for the period 1950 to 2000. Net household formation is defined as the increment to total households from the previous period. The number of households and net household formation for Series A are listed by age class in Table B5 and Table B6, respectively, in Appendix B. The totals for all age class are present in the demographic summary Tables B1 and B2 for Series A. The summaries for Series B and Series K are contained in Tables B25-B29.

Long-run fluctuations in the number of households in the model correspond to fluctuations in population. Figure 6 shows how Series A net household formation projects for selected age classes vary through time as the population bulge of persons born from 1940-1960 passes through the various age classes. As the chart indicates, household

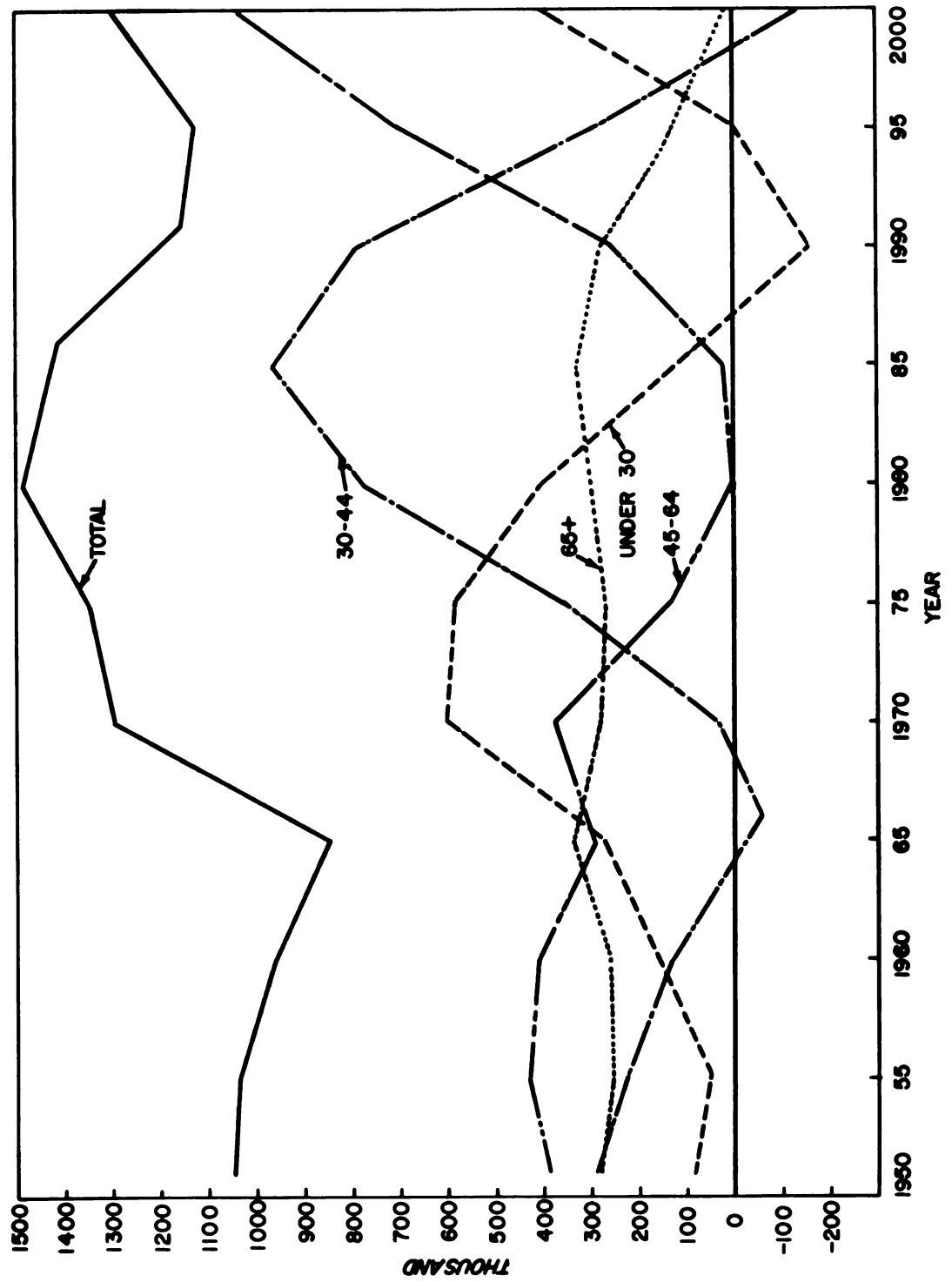


Figure 6. Net household formation for selected age groups from 1950 to 2000.  
Source: Author's estimates.

formation for the 30 to 44 age group declines in the 1960's but will increase by almost a million a year by 1985.

For the projection period, many sets of assumptions can be made which will generate alternative sets of household projects. Table 4 shows the three alternative projections of total net household formation made in this study. Projected total household formation will reach a peak in the early 1980's, then decline for the rest of the 1980's in all three series. An upswing in household formation in the 1990's will require an upswing in births in the 1970's as population Series D projections.

#### Homeowners

The number of homeowners is determined by the product of homeownership and the number of households. The number of homeowners and the net increment of homeowners for Series A projections are listed in Tables B8 and B9, respectively, of Appendix B. The totals for all age groups are listed in the summary Table D-1. The percentage of total households who are owners and the percentage of household increment who are owners is also listed in the summary tables in Appendix B.

The ownership requirement for total net housing formation varies widely over time due to changes in the age composition of households. Under the assumption of constant ownership at 1960 rates, the homeownership percentage of total net household formation decreases from over 65 percent in 1955 to 49 percent in 1967 and 1971. As Figure 7 indicates a long upswing in ownership will raise the annual

Table 4. Household estimates and projections for 1960 to 2000.

Year	:	Total households	:	Average household increment from previous period		
Current population survey						
1960 (March 1)	:	52,799	:	959		
1965 "	:	57,251	:	890		
1969 "	:	61,805	:	1,139		
Projections						
	Series A	Series B	Series K	Series A	Series B	Series K
1970(July 1)	63,251	63,251	61,123			
1975	69,606	68,857	65,869	1,271	1,121	949
1980	76,793	75,247	71,290	1,437	1,278	1,084
1985	84,160	81,831	76,897	1,473	1,317	1,121
1990	90,251	87,428	81,793	1,218	1,119	929
1995	95,762	92,343	86,160	1,102	983	873
2000	101,862	97,682	90,907	1,220	1,068	949

Source: 1960 to 1969 - U.S. Bureau of the Census, Current Population Rpt.  
Series P-20.

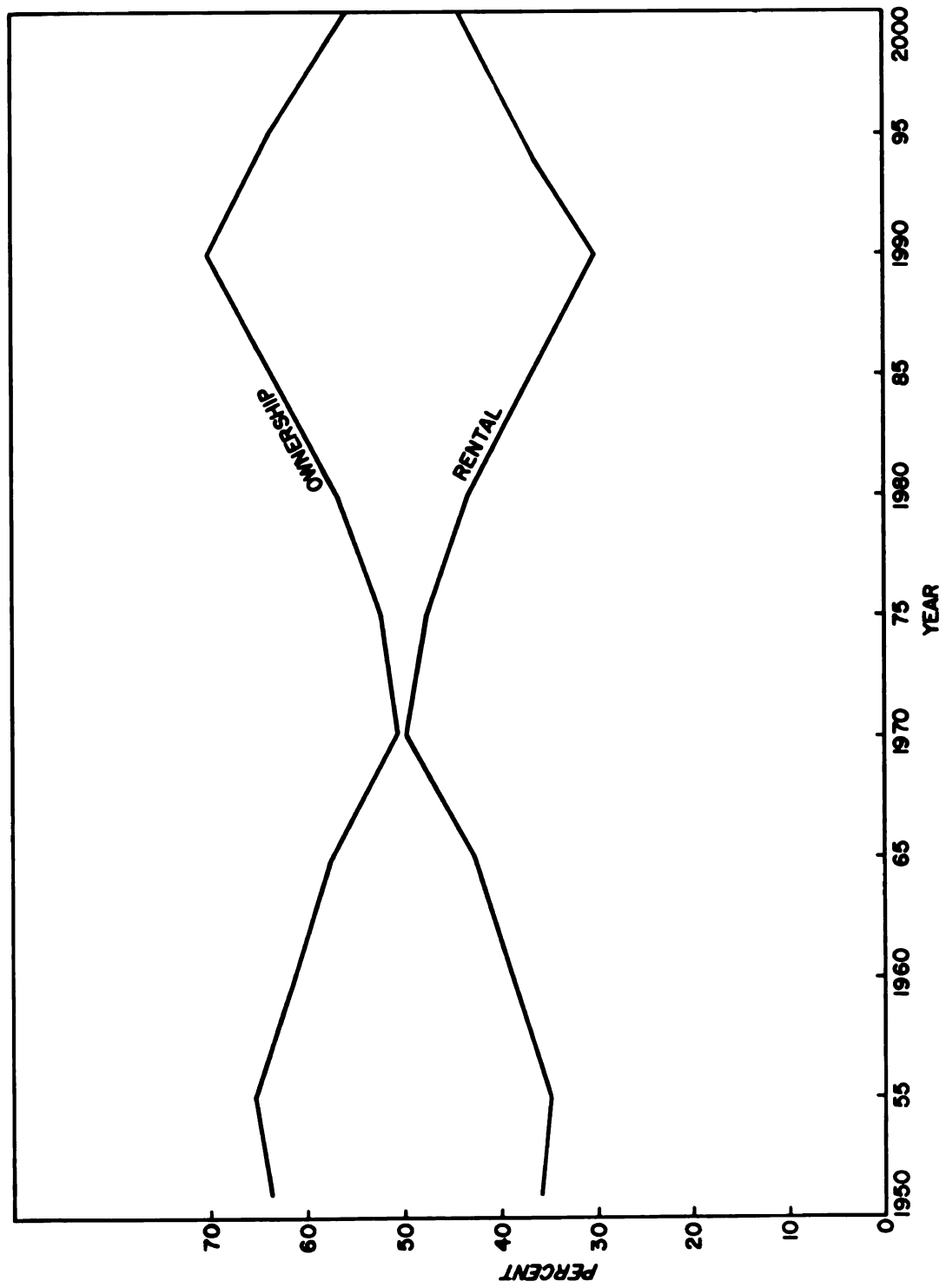


Figure 7. Ownership and rental requirements for net household formation from 1950 to 2000 assuming 1960 ownership rates.

requirement to 70 percent of total net household formation by 1990.

If we assume that all households who are not owners are renters, then the percentage who are renters is the complement of the owners. In this case the renter requirement increased from 35 percent in 1955 to 50 percent by 1970. Then, by the late 1980's the rented requirement will drop to 30 percent.

### Housing Types

The housing type requirement by age class is derived from the housing type occupancy rates and the number of households. In the model until 1960 the housing type requirement is established by the 1960 estimates of occupancy. After 1960 net household formation is multiplied by the increment in housing types to calculate the required increment for each type. The increment is added to the existing occupied housing stock by type and the overall type occupancy rate for the total stock is derived. For 1960 to 1969 the increment occupancy rates are adjusted to approximate net additions to mobile home households. For the projection period the rates are held constant at a level which approximates 1969 mobile home additions. Second homes are calculated from the second home possession rate and households.

The housing type-mix required by households is summarized for Series A in Table B1 of Appendix B. The percentages of each housing type required in the mix are also listed in

Table B2. These percentages are used as parameters to allocate the housing stock increment in the housing requirements section of the model. The figures used in the individual housing type calculations for Series A are listed in Tables B10 to B25 for single-family houses, multiunit structures, mobile homes, and second homes, in that order.

The mix of housing types will change dramatically according to the assumptions used in this sector of the housing requirement model. The multiunit requirement increases from 27 percent in 1955 to 45 percent in 1971. It then falls to only 18 percent in 1991. The conventional single-family house requirement falls from 71 percent to 32 percent and increases to 69 percent for the same years. Similarly the mobile homes requirement goes from 1.3 percent to 24 percent and back to 13 percent of total net household formation for the same period.

## V. HOUSING REQUIREMENTS

Time-paths of housing requirements are generated in the housing requirements sector of the model. The data input requirement for this sector of the model includes projections of total households and regional projections of population, vacancy rates, and removal rates. The output includes annual housing requirements by region and for the United States. The housing requirement series is broken down by type of unit and by component of final demand. The national housing summary is presented in Tables A1 and A2 of the computer printout in Appendix A. The regional summaries are contained in Tables A3 to A10.

Three series of future housing requirements are presented to show how the model can be used to examine alternative time-paths of housing requirements under various assumptions. The series are designated series 1, series 2, and series 30. Series 1 assumes a large increase in headship, vacancy, and replacement rates. This upper time-path assumes that the National Housing Goals will be met through a strong economy and a very high priority for housing. Series 30 is an analytic series which measures the housing requirement due to increase in population only. It assumes constant headship, vacancy, and replacement rates. Series 30 is important because it shows the effect of population pressure alone on the housing requirement. Series 2 is an intermediate series between series 1 and series 30. It assumes moderately increasing headship, vacancy, and



replacement rates. This series can be considered as the lower range of likely housing requirement. Other series could be generated for various sets of assumption, but they are likely to fall between series 1 and series 2. The assumptions for the components of housing demand used to develop the three series will be considered next.

### Input Information

#### Household Formation

The first input requirement for the housing market sector is net household formation. Household formation will be defined to be the net change in total households from the previous period. Household formation may be obtained from the demographic sector or it may be input exogenously. This provision permits the use of the Census Bureau household projection series which are standard reference series. Of course, it is possible to use many alternative series of household projections.

Three series of household formation based on the assumptions of Census Bureau series 1, series 2, and series K will be considered (Current Population Report P-25, No. 394, 1967). These series are analogous to our series A, B, and K. Each series has been extended to the year 2000. Headship rates have been adjusted among age classes to remove illogical relationships which were pointed out earlier in Chapter 2. The series are also based on population series D rather than original series B basis. It should be pointed out again that in the model the population

series used has absolutely no effect until after 1985 and no significant effect till the 1990's. The household formation projection series are listed in Table 10 on page 87. Series 1 assumes headship will increase at the pace of the last 20 years. This pace cannot continue indefinitely, if only by definition. Series 30 assumes constant headship and measures the increase in households due to changes in the size and age composition only. Series 2 assumes headship will increase at a more moderate rate than the last two decades.

#### Vacancy Rates

Vacancy rates by region are the next input to the model. Vacancy rates can be obtained from the Decennial Census of Housing for 1950 and 1960. Quarterly vacancy rates estimates by region were begun by the Census Bureau in 1955 (Current Housing Reports, Housing Vacancies, Series H-111). Vacancy rates have varied widely by region. These variations will be assumed to continue in the future. Three assumptions about the overall United States vacancy rates are made for the series 1, 2, and 30 projections. The projected rates are listed in Table 5.

Series 1 assumes a rapid increase in vacancies after 1970. The average long-run vacancy rate is assumed to increase to 13.6 percent by 2000. Series 30 assumes vacancies will remain at the average rate of 9 percent recorded in 1969. Series 2 is an intermediate assumption which assumes average long-run vacancies will rise moderately to 11.3 percent in 2000. Short-run fluctuations in vacancies

Table 5. Total and available vacancy rate estimates and projections for the United States from 1950 to 2000.

Year	:	Available and total vacancy rates	
(Percentages)			
Estimate			
1950 Census		(1.9)	6.7
1955 Annual series H-111		(2.3)	8.3
1960 Census		(3.4)	9.1
1960 Annual series H-111		(3.4)	10.1
1965 Annual series H-111		(3.5)	10.5
1969 Annual series H-111		(2.2)	9.1
Projections			
	<u>Series 1</u>	<u>Series 2</u>	<u>Series 30</u>
1970	(2.0) 8.7	(2.0) 8.7	(2.2) 9.0
1975	(2.6) 9.6	(2.5) 9.3	(2.2) 9.0
1980	(3.1) 10.4	(2.8) 9.7	(2.2) 9.0
1985	(3.4) 11.2	(3.0) 10.1	(2.2) 9.0
1990	(3.5) 12.0	(3.1) 10.5	(2.2) 9.0
1995	(3.6) 12.8	(3.2) 10.9	(2.2) 9.0
2000	(3.6) 13.6	(3.2) 11.3	(2.2) 9.0

Source: U.S. Bureau of the Census, 1950 Census of Housing, 1960 Census of Housing, and Current Housing Rpt. Series H-111.

will occur about these projected long-run trends.

The projected vacancy rates do not include vacant mobile homes, since vacant mobile homes are not counted in housing statistics. It will be assumed that 10 percent of the shipment of new mobile homes will not be used as primary residence. They may be used as second homes or for other purposes. One study indicated one of eight mobile homes used as a second home (Muncy 1968). Accordingly, actual vacancies rates including mobile homes may be higher than indicated vacancy rates. Including vacant mobile homes would raise the series 1 vacancy rate to 15 percent in 2000.

Vacancies can also be distinguished between those available for sale or rent and those not available.

During normal times the available housing market inventory can be expected to fluctuate between 2 and 4 percent of the housing stock. In 1969 the available housing inventory was 2.2 percent. In 1970 it is expected to drop to 2.0 percent. This rate is projected to rebound from this acute low level to 3.6 percent for series 1 and 3.2 percent for series 2 by the end of the century. The second major type of vacancy is the unavailable vacant unit, including second homes. It is projected to rise by 2000 to 10.0 percent for series 1 and 8.1 percent for series 2. The majority of second home buyers are between 40 and 60. This age group will increase very little in number until the late 1980's, when an upswing in second home requirements is likely to occur.

1

Replacement Rates

Regional replacement rates for conventional housing units are also required by the model. The replacement rates are based on the 1960 Census of Housing, Components of Inventory Change (U.S. Bureau of the Census, 1963). Information is provided on replacement requirements for the periods 1950 to 1956 and 1957 to 1959 by region and by type of unit. The type of housing unit lost did not vary significantly from the overall mix of the housing stock. But significant differences in replacement rates existed between periods and among regions. These differences will be assumed to exist in the future. Table 6 shows the conventional replacement rates by region for 1950 to 1956 and 1957 to 1959.

Three replacement rate projections are shown in Table 7. Series 1 assumes conventional replacement rates for the United States will advance to 1.05 percent. Slight variation occurs because of the changing regional distribution of the total housing stock. Series 30, the status quo series, assumes the conventional housing stock will be replaced at the 0.84 percent rate of 1957-59. Series 2 makes an intermediate assumption of a replacement rate of 0.95 percent.

Mobile homes are considered separately. A mobile home is not included in the housing stock by the Census Bureau when it is not used as a primary residence. Mobile homes are assumed to be withdrawn from use as primary residences at a rate of 5 percent of the occupied mobile home stock.

Table 6. Replacement rates for 1950-1956 and 1957-1959  
for the United States and regions.

Period	United States	North- east	North- central	South	West
(Percentages)					
1950-56	0.46	0.27	0.33	0.76	0.49
1957-59	.85	.48	.65	1.27	1.03

Source: U.S. Bureau of the Census, 1960 Census of  
Housing, Components of Inventory Change (1963).

Table 7. Convention and overall replacement rate  
projections for the United States to 2000.

Year	: Conventional replacement			: Overall replacement		
	:			:		
	: Series 1	: Series 2	: Series 30	: Series 1	: Series 2	: Series 30
(Percentages)						
1970	0.94	0.94	0.84	1.07	1.07	0.95
1975	1.03	.94	.84	1.22	1.13	1.01
1980	1.03	.94	.85	1.28	1.18	1.06
1985	1.04	.94	.85	1.33	1.23	1.10
1990	1.05	.95	.85	1.35	1.25	1.13
1995	1.05	.95	.85	1.37	1.27	1.15
2000	1.05	.96	.85	1.39	1.29	1.17



This assumption is made for all regions and for all three series. By adding mobile home replacement to conventional replacement an overall average replacement can be calculated.

#### Regional Population Distribution

Estimates of the regional population over 21 years of age are required to distribute net household formation by region. Projections and estimates of population over age 21 are available from the Census Bureau to 1985 (Current Population Report P-25, No. 375, 1967). The assumptions and methodology used to make these projections are outlined in the reference cited above. Census Bureau projection series I-D is used as an input to the model until 1985. Extrapolation of trends is used to make projections for the period from 1990 to 2000. Recent population statistics indicate that the South's share of the population is likely to be greater than was projected by the Census Bureau. Again, other projections of population by region may be easily considered in the model. The projected regional adult population percentages used in the model are illustrated in Figure 8. A change in the migration rates between regions will, of course, effect regional housing requirements but will have little effect on the national housing requirement. The model assumes a continuation of present trends in the regional distribution of population.

To adjust the model for regional variations in household size, and type of housing unit, the number of households, the population, and the stock of housing units by type of

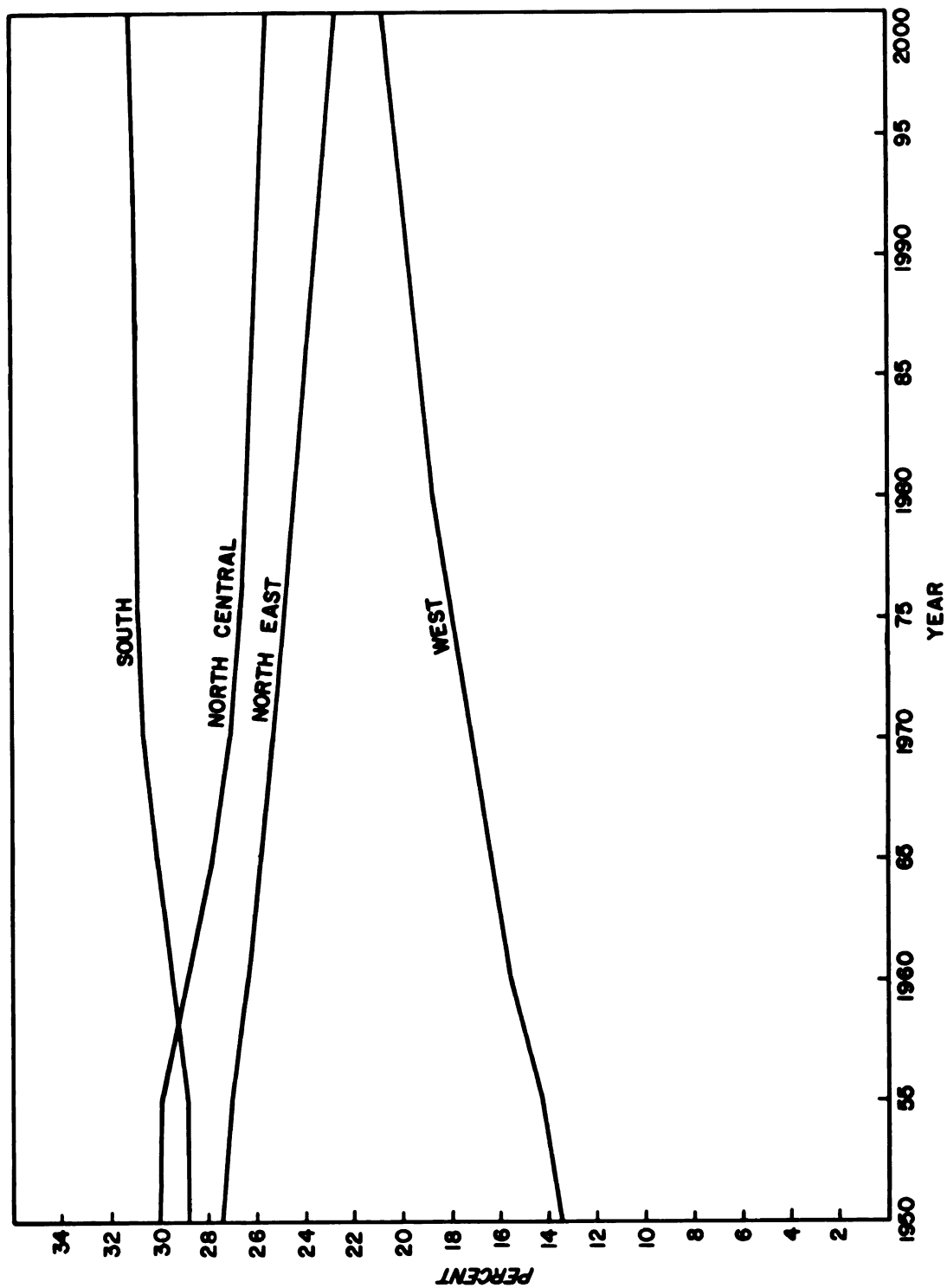


Figure 8. Regional distribution of population over 21 years for 1950 to 2000.  
 Source: U.S. Bureau of the Census, Current Population Rpt. Series P-25,  
 No. 375.

unit must be known for each region for some base year. Estimates of these factors were obtained from the 1960 census.

### The Output Information

The computer model generates the total housing requirements from the preceding information according to the procedures described in Chapter 3. The increment to the housing stock is assumed to be distributed in proportion to the type-mix for the household increment. The replacement requirement is assumed to be distributed according to the proportion of each type in the total housing stock.

Total housing requirements for all types of units are provided as the model output. The units are separated into conventional new construction and mobile homes. New construction is further divided between one-unit and multiunit structures. The housing requirement is also divided into components of households, vacancies, and replacement. Projections of the total housing stock, occupied and vacant, are presented along with the vacancy rates, the conventional replacement rate, and the overall replacement rate. The regional summary also provides information on each region's percentage share of population, total housing requirement, and new construction requirement.

### Total Housing Requirement

The total national housing requirement for series 1 and series 2 is summarized in Table 8. Figure 9 shows the range of requirements for all three series. The series 1 housing projections for the United States by unit type are presented in Figure 10. Table 9 lists past housing production from 1959 to 1969 and series 1 housing projections by type of unit and by region. Table 10 compares the variation in the components of housing requirements for all three series, while Figure 11 illustrates the components for projection series 1.

The future housing requirement is likely to fall between series 1 and series 2. Alternative time-paths of housing requirements can be examined with the model. For example, one could use household assumption 1, vacancy assumption 2, and replacement assumption 3, and generate a new series.

The output data provided in Tables 8-10 have been used to develop projection of housing requirements for the U.S. Forest Service. An earlier mid-1969 version of projection series 1 is compared in Table 11 with projections made by the Department of Housing and Urban Development. The revised projections prepared at that time by HUD total 24,900 million units for the 10-year period 1969-1978. This figure agrees with the 24,887 million units generated by the computer model. The time-path of housing requirement generated from our model can be easily revised to fit the

Table 8. National housing requirements by type of unit for projection series 1 and series 2.  
(Thousands of units)

Year	: Total requirement :				: l-Unit		: Multiunit		: Mobile homes	
	: Series 1 : Series 2	: Series 1 : Series 2	: Series 1 : Series 2	: Series 1 : Series 2	: Series 1 : Series 2	: Series 1 : Series 2	: Series 1 : Series 2	: Series 1 : Series 2	: Series 1 : Series 2	
1970	1,869	1,660	778	708	626	537	465	416		
1971	2,310	2,040	938	826	880	768	492	446		
1972	2,486	2,196	1,048	924	891	774	546	498		
1973	2,547	2,241	1,098	963	904	782	546	497		
1974	2,620	2,296	1,085	943	954	823	581	530		
1975	2,698	2,352	1,096	943	996	855	607	554		
1976	2,747	2,380	1,125	964	992	842	630	575		
1977	2,830	2,460	1,269	1,100	952	807	609	554		
1978	2,887	2,513	1,281	1,110	967	820	640	584		
1979	2,932	2,551	1,319	1,143	959	811	654	597		
1980	2,972	2,590	1,306	1,132	983	834	682	625		
1981	3,016	2,631	1,313	1,138	1,000	849	703	645		
1982	3,046	2,663	1,465	1,281	897	756	683	626		
1983	3,038	2,658	1,460	1,276	890	750	689	632		
1984	3,028	2,650	1,465	1,281	872	734	692	635		
1985	3,000	2,623	1,488	1,302	828	694	684	627		
1986	2,999	2,629	1,561	1,350	760	649	679	630		
1987	2,949	2,573	1,599	1,377	693	588	657	608		
1988	2,956	2,571	1,628	1,398	672	567	656	606		
1989	2,966	2,571	1,642	1,405	665	558	659	607		
1990	2,948	2,543	1,644	1,402	653	544	650	597		
1991	2,889	2,470	1,640	1,388	621	509	628	573		
1992	2,955	2,521	1,674	1,414	638	522	643	585		
1993	2,965	2,520	1,656	1,393	656	534	653	593		
1994	3,011	2,553	1,660	1,391	681	554	670	608		
1995	3,060	2,589	1,635	1,363	727	592	699	634		
1996	3,112	2,611	1,626	1,345	758	610	727	656		
1997	3,193	2,678	1,597	1,315	828	669	768	694		
1998	3,283	2,753	1,603	1,318	881	714	798	721		
1999	3,354	2,808	1,616	1,324	912	738	825	746		
2000	3,444	2,884	1,604	1,310	975	791	865	782		

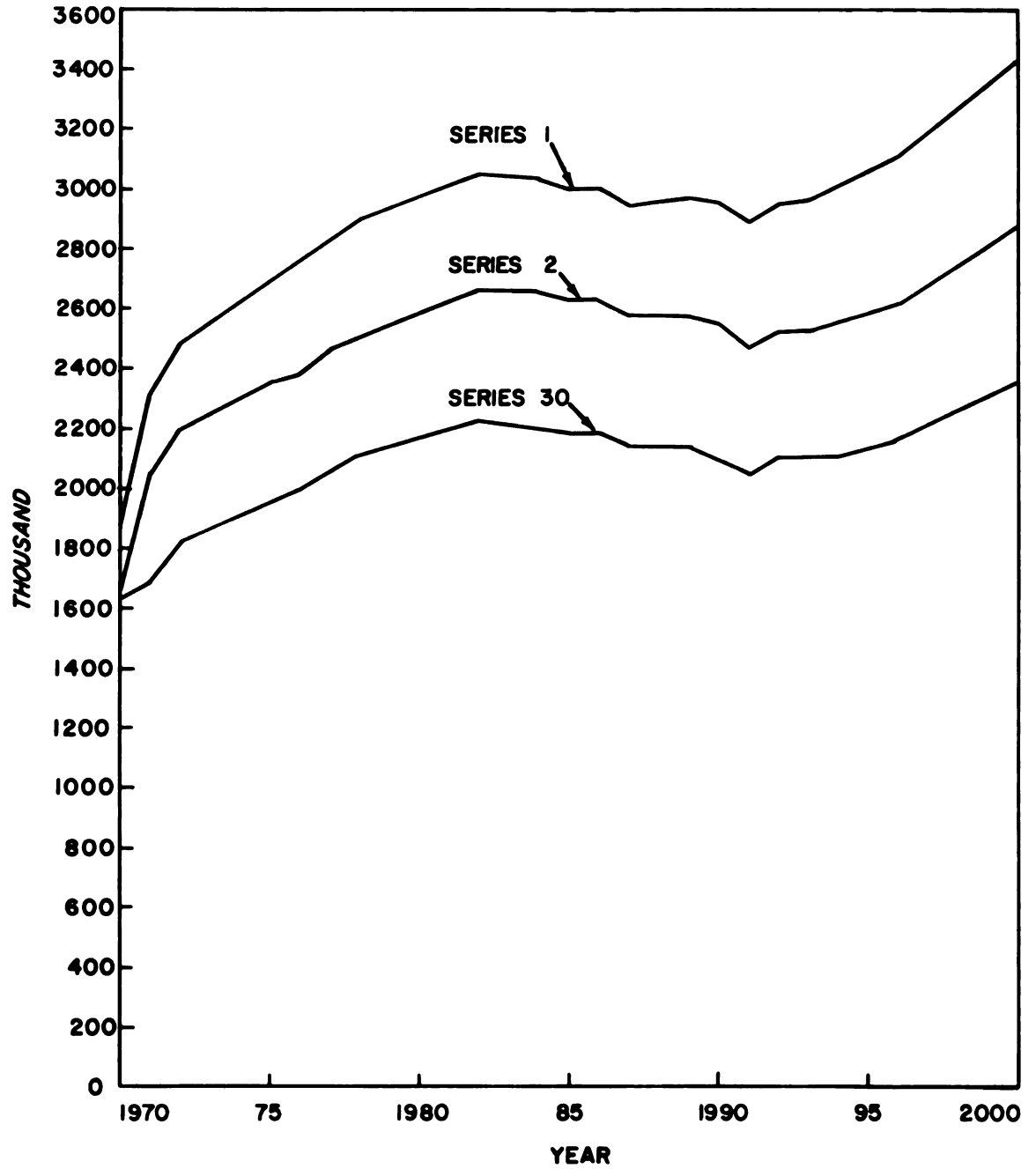


Figure 9. Total annual housing requirement projections for series 1, series 2 and series 30.

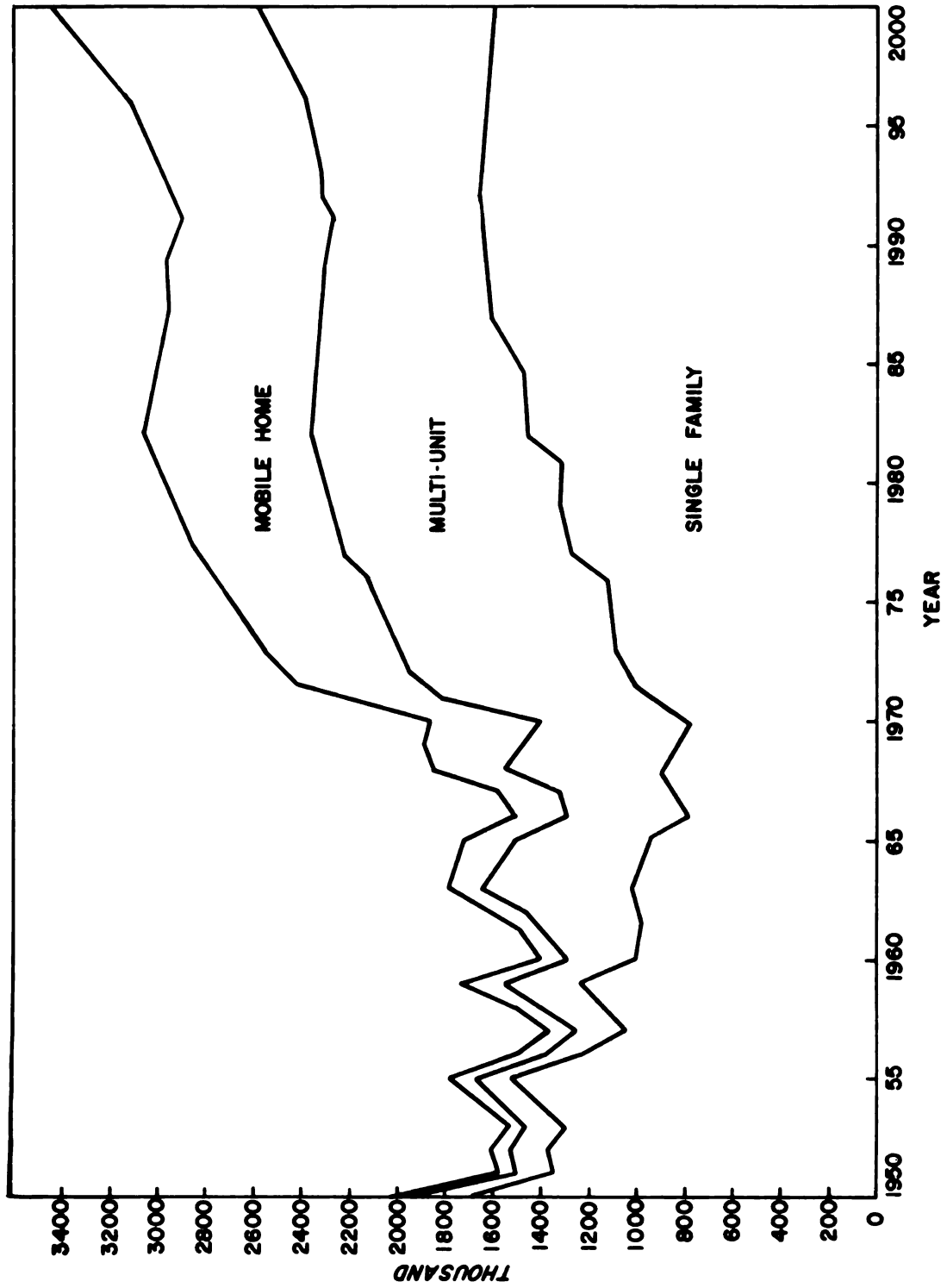


Figure 10. Estimates of past housing production and of series 1 housing projections by type of unit from 1950 to 2000.

Table 9. Past housing production and series 1 housing projections by type of unit and by region for 1959 to 2000.

(Thousands of units)

Year	Total	Type of unit				Region			
		: l-unit	: Percent	: Multi-unit	: Percent	: Mobile homes	: Percent	: North-east	: South-West
		:	:	: unit	:	: homes	:	: Central	:
1959	1,674	1,251	74.7	303	18.1	120	7.2	292 a/	561
1960	1,400	1,009	72.1	287	20.5	104	7.4	247	422
1961	1,455	989	68.0	376	25.8	90	6.2	274	352
1962	1,610	996	61.9	496	30.8	118	7.3	286	517
1963	1,793	1,022	57.0	620	34.6	151	8.4	287	357
1964	1,753	973	55.5	589	33.6	191	10.9	282	426
1965	1,726	965	55.9	545	31.6	216	12.5	303	493
1966	1,413	780	55.2	416	29.4	217	15.4	238	629
1967	1,562	845	54.1	477	30.5	240	15.4	249	351
1968	1,862	901	48.3	647	34.7	317	17.0	268	281
1969	1,887	810	42.9	687	36.4	390	20.7	262	611
Projections									
1970	1,869	778	41.6	626	33.5	465	24.9	332	737
1971	2,310	938	40.6	880	38.1	492	21.3	421	417
1972	2,486	1,048	42.2	891	35.8	546	22.0	460	750
1973	2,547	1,098	43.1	904	35.5	546	21.4	471	425
1974	2,620	1,085	41.4	954	36.4	581	22.2	484	553
1975	2,698	1,096	40.6	996	36.9	607	22.5	498	611
1976	2,747	1,125	41.0	992	36.1	630	22.9	502	618
1977	2,830	1,269	44.8	952	33.7	609	21.5	518	637
1978	2,887	1,281	44.4	967	33.5	640	22.2	527	659
1979	2,932	1,319	45.0	959	32.7	654	22.3	533	678
1980	2,972	1,306	44.0	983	33.1	682	22.9	538	694
									707
									1,002
									720



(Table 9 continued)

1981	3,016	1,313	43.5	1,000	33.2	703	23.3	537	727	1,007	745
1982	3,046	1,465	48.1	897	29.4	683	22.4	540	733	1,017	755
1983	3,038	1,460	48.1	890	29.3	689	22.7	533	729	1,017	759
1984	3,028	1,465	48.4	872	28.8	692	22.8	527	724	1,015	762
1985	3,000	1,488	49.6	828	27.6	684	22.8	516	715	1,008	761
1986	2,999	1,561	52.1	760	25.2	679	22.7	497	719	1,033	751
1987	2,949	1,599	54.3	693	23.4	657	22.3	481	704	1,020	745
1988	2,956	1,628	55.1	672	22.6	656	22.3	479	704	1,024	750
1989	2,966	1,642	55.4	665	22.3	659	22.3	477	705	1,028	755
1990	2,998	1,644	55.9	653	22.0	650	22.1	470	698	1,025	755
1991	2,889	1,640	56.7	621	21.6	628	21.7	454	667	1,012	755
1992	2,955	1,674	56.5	638	27.8	643	21.7	467	683	1,034	772
1993	2,965	1,656	55.7	656	22.3	653	22.0	466	684	1,039	777
1994	3,011	1,660	55.0	681	22.8	670	22.2	473	694	1,055	790
1995	3,060	1,635	53.3	727	23.9	699	22.8	481	705	1,071	803
1996	3,112	1,626	52.2	758	24.4	727	23.4	473	712	1,093	833
1997	3,193	1,597	50.0	828	25.9	768	24.1	488	732	1,119	854
1998	3,283	1,603	48.8	881	26.8	798	24.3	505	754	1,149	876
1999	3,354	1,616	48.2	912	27.2	825	24.6	517	771	1,172	894
2000	3,444	1,604	46.6	975	28.3	865	25.1	533	702	1,201	917

a/ Includes author's estimates of mobile home distribution by region.

Source: 1959 to 1969 - U.S. Department of Commerce, various issues of Construction Review.

Table 10. Components of housing requirements for projection series 1, series 2 and series 30.

Year	Household formation				Vacancy change				Replacement			
	Series 1	Series 2	Series 30	Series 1	Series 2	Series 30	Series 1	Series 2	Series 1	Series 2	Series 30	Series 30
(Thousands of units)												
1970	1,205	1,019	861	-80	-96	120	738	737	654			
1971	1,233	1,049	890	302	235	127	773	756	671			
1972	1,345	1,162	992	321	253	142	814	781	690			
1973	1,356	1,177	1,009	334	259	143	858	805	710			
1974	1,373	1,197	1,024	346	268	147	902	831	731			
1975	1,394	1,219	1,046	358	277	151	946	856	751			
1976	1,416	1,245	1,069	353	252	155	976	883	772			
1977	1,460	1,294	1,116	361	258	158	1,008	908	792			
1978	1,475	1,314	1,131	376	266	161	1,040	933	813			
1979	1,479	1,320	1,140	380	271	164	1,073	960	834			
1980	1,477	1,326	1,144	390	277	167	1,105	987	855			
1981	1,480	1,334	1,151	398	282	169	1,138	1,015	877			
1982	1,474	1,338	1,156	402	284	167	1,169	1,041	898			
1983	1,433	1,307	1,128	405	284	165	1,200	1,067	919			
1984	1,391	1,274	1,099	406	283	162	1,232	1,093	939			
1985	1,335	1,226	1,062	404	280	158	1,260	1,117	958			
1986	1,304	1,206	1,047	407	283	158	1,288	1,140	976			
1987	1,232	1,136	993	402	274	150	1,315	1,163	994			
1988	1,211	1,114	980	405	273	148	1,341	1,184	1,011			
1989	1,193	1,092	958	408	274	147	1,365	1,205	1,026			
1990	1,152	1,049	917	407	269	145	1,390	1,225	1,038			
1991	1,077	967	854	400	260	132	1,409	1,243	1,056			
1992	1,110	994	894	411	267	139	1,434	1,260	1,069			
1993	1,093	974	868	415	268	136	1,457	1,278	1,083			
1994	1,107	984	874	424	272	138	1,479	1,297	1,097			
1995	1,123	996	877	435	278	142	1,502	1,315	1,109			
1996	1,139	995	894	446	282	144	1,527	1,334	1,126			
1997	1,179	1,030	918	462	294	150	1,553	1,354	1,142			
1998	1,226	1,074	954	478	304	155	1,579	1,375	1,159			
1999	1,256	1,099	976	491	312	159	1,607	1,397	1,176			
2000	1,300	1,140	1,005	508	324	166	1,636	1,420	1,194			

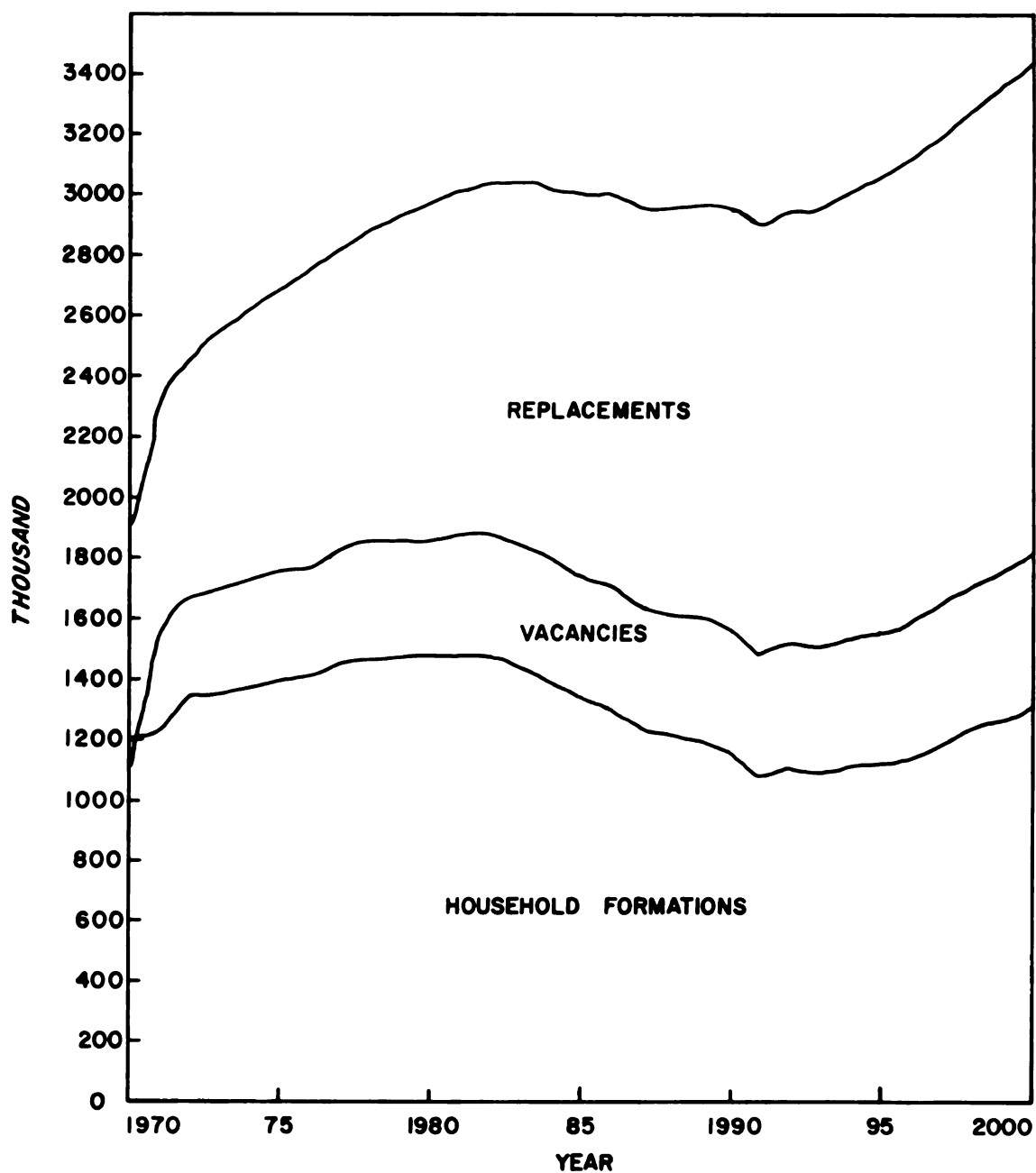


Figure 11. Components of housing requirements for projection series 1.

Table 11. A comparison of revised housing goals by HUD with housing requirement projections from the model.

(Thousands of units)

Year	Total		Single unit		Multiunit		Mobile home unit							
	all types	HUD	Model	HUD	Model	HUD	Model							
:	:	:	:	:	:	:	:							
:	:	:	:	:	:	:	:							
:	:	:	:	:	:	:	:							
:	:	:	:	:	:	:	:							
:	:	:	:	:	:	:	:							
1969	1,975	1,819	945	47.8	799	43.9	630	31.9	664	36.4	400	20.3	356	19.6
1970	2,159	2,159	963	44.6	955	44.2	796	36.9	807	37.4	400	18.5	397	18.4
1971	2,311	2,340	987	42.7	980	41.9	924	40.0	929	39.7	400	17.3	431	18.4
1972	2,450	2,507	960	39.2	1,119	44.6	1,090	44.5	930	37.1	400	16.3	458	18.3
1973	2,600	2,564	955	36.7	1,154	45.0	1,245	47.9	942	36.7	400	15.4	468	18.3
1974	2,660	2,629	990	37.2	1,142	43.4	1,270	47.8	994	37.8	400	15.0	493	18.8
1975	2,680	2,701	1,010	37.7	1,148	42.5	1,270	47.4	1,036	38.4	400	14.9	517	19.1
1976	2,680	2,644	1,030	38.4	1,141	43.1	1,250	46.7	975	36.9	400	14.9	528	20.0
1977	2,705	2,733	1,055	39.0	1,267	46.4	1,250	46.2	937	34.3	400	14.8	529	19.3
1978	2,680	2,791	1,030	38.4	1,301	46.6	1,250	46.7	952	34.1	400	14.9	538	19.3
Total	24,900	24,887	9,925	39.8	11,000	44.2	10,975	44.1	9,166	36.8	4,000	16.1	4,715	19.0

Source: Letter sent Sept. 10, 1969 from Don Paarlberg, Director Agricultural Economics, U.S. Department of Agriculture to Hendrik S. Houthakker, Member, Council of Economic Advisors.

condition of the housing market expected in the 1970's. The revision can be done quickly and economically by simply changing the assumptions for 1970's and rerunning the computer model. Thus the model can provide up-to-date projections to fit any conditions. The projections presented in this study were made in February of 1970.

#### The Housing Type-Mix

The model presents only one mix of housing types. It is based on the assumptions that housing units will be replaced according to the existing mix of the housing stock and that the increment to the housing stock will be distributed in proportion to the housing type-mix of the household increment as discussed previously. Slight variations occur among the three series because of the differing proportions of required housing increment to the required replacement. Figure 12 shows the relative housing mix for series 1. Other housing type-mix series could be constructed from the basic mix series. The model could then be used to project how occupancy rates by age class would have to change through time to be consistent with that series. For example, one could assume 1 percent annual shift from single-family units to multiunit structures from 1970 to 1975. The mix of housing types presented projects the effect of changing age composition upon which other assumptions or trends can be superimposed.

A surprising conclusion that can be drawn from the results of this study is that the occupancy rates by age for

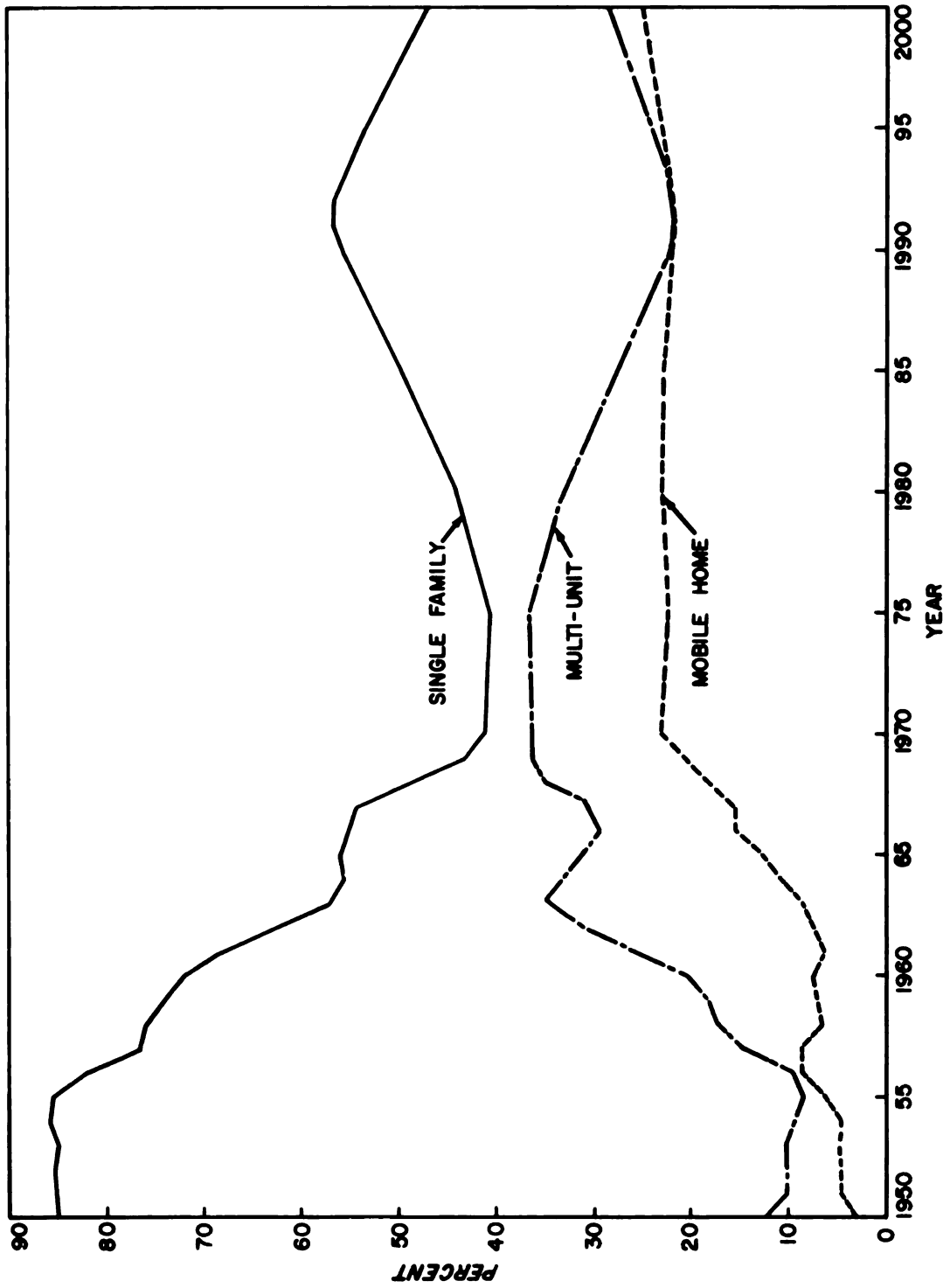


Figure 12. The housing type-mix from 1950 to 2000 for projection series 1. Source: Table 9 and author's estimates for 1950-1958.

multiunit structures appear not to have changed much in the 1960's. While there has been a major shift from the 1950's to the 1960's in the production of multiunit structures, this has been more of a shift back to the normal mix of the total housing stock. There has also been a shift to large apartment complexes from multiunit structures of less than four units. The overall mix of the housing stock in 1960 was 70 percent detached one-unit structures (69 percent houses and 1 percent mobile homes) and 30 percent multiunit structures. In 1940 and 1950 it was 64 percent detached one-units and 36 percent multiunit structures. The 1950's were an unusual decade when almost 90 percent of new housing units were single-unit structures. Historically this was an abnormal high percentage. Many factors contributed to this boom in sales housing, particularly the availability of funds for government-insured mortgages. By 1960 there was a large stock of recently built single-family houses, while the stock of multiunit structures was mostly either built before 1930 or converted from existing structures in the 1930's and 1940's. With favorable demographic patterns, increased apartment construction was a natural occurrence in the 1960's.

In the 1960's the mix of housing units produced, including mobile homes, between detached one-unit structures and multiunit structures is about what would be expected assuming 1960 occupancy rates of housing types by age class. In the last decade 16,460,000 housing units were produced including 9,290,000 single-family houses, 2,047,000 mobile

homes, and 5,123,000 multiunit structures. Of the total 31.1 percent were multiunit structures. This is only slightly above the 30 percent share multiunits had of the housing stock in 1960. In other words, multiunits are holding their share of the total stock taking age composition into account, while mobile homes are increasing their share relative to conventional single-family houses.

The impact of ignoring mobile homes in housing start statistics is also apparent from the model output. For example, in 1969 over 45 percent of housing starts were multiunit structures. But only 36 percent of total housing production were multiunit structures when mobile homes are included.

The overwhelming preference of families for single-family homes seems undiminished in the 1960's. Studies by the Survey Research Center of the University of Michigan indicate fully 85 percent of all families state their preference is to live in a single-family house, and that as one proceeds up the income scale the proportion of families living in single-family homes increases to over 90 percent (Lansing 1964, 1966). Projected increases in per capita income and the shifting of demographic patterns in favor of early middle age groups by the late 1970's seem to indicate that a swing toward single-family structures in the long run is likely.

By projecting these occupancy rates the model has been very useful in indicating the effect of changing age



composition of the population on housing requirements. The model provides a logical reason for projecting one time-path of housing mix other than the usual conjecture about changing consumer preferences, land costs, etc. Other time-paths of housing mix could be developed from this basic series.

Projection of the type-mix of the housing requirement was also prepared by HUD as shown in Table 11. HUD used a method and assumptions similar to this model's. Ownership rates derived from the 1960 census were applied to Census Bureau series 1 household formation projections for 1969 to 1978. HUD projections are for sales units. A 7.3 percent difference exists between the HUD projections and projections made in this study. This difference probably arose from the approximately 8 percent difference between renter occupied housing units and multiunit structures in 1960. The HUD projections equate rental units required with multiple units required. Our model maintains the 8 percent difference. If this adjustment is made the HUD projections are almost the same as the results of this study. The data from 1966 survey of occupancy of new housing by HUD (1968) affirm the ownership rates used.

#### Regional Housing Requirements

The model is developed on a regional basis, so regional series exist for each of the three time-paths of housing requirement. These series are available in computer printout in the appendix. Replacement rates, vacancy rates, and the mix of housing types vary widely by region. The model has

assumed that these factors will continue to vary in the same proportion in the future. The South and the West previously have had higher replacement rates, vacancy rates, and rates of population growth than the Northeast or North Central regions. They also have had a larger share of the new housing construction than they have had of total population.

Mobile homes also constitute a large proportion of the housing stock in the West and South. The Northeast has the largest percentage of multiunit structures. All of these factors are implicitly included in the housing market of each region. The model assumes these variations to continue. The regional projections of total housing requirements are presented in Figure 13 for projection series 1.

A detailed study of the housing requirement for each region was not possible due to the lack of adequate regional data. Therefore, only a general estimate for each region is possible. But the model developed here attacks the problem of geographic disaggregation directly by developing its projections on a regional basis. The model presents long-run projections of housing requirements for each region which are consistent with national time-paths of housing requirement. These series should prove useful at least as a starting point for regional planning and regional analysis of future housing requirements.

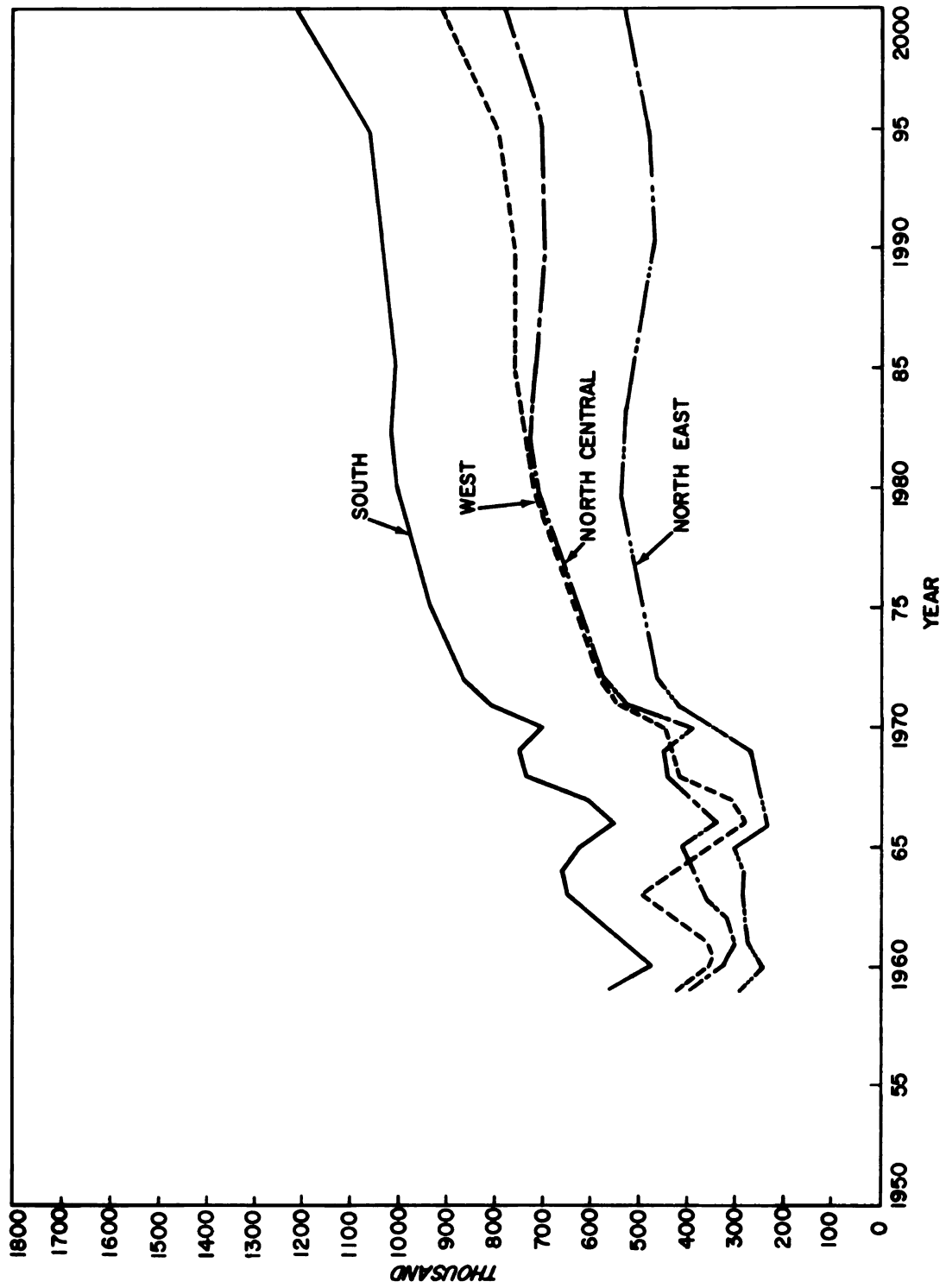


Figure 13. The total housing requirement by region for projection series 1. Source: Table 9.

## VI. SUMMARY

This study was undertaken to develop a computer model to project long-run housing requirements by type of unit and by region. The study provides annual projections of housing requirements for the next 30 years. The study is the first in a series of studies that are needed to determine the impact of future housing requirements on forest land management. The next step in the process is to determine the volume of wood that would be required to project the total housing requirement. A step in this direction is being made in a concurrent thesis by Paul Ellefson which is designed to measure the volumes of wood that will be required in single-family homes in the North Central region.

The information provided by this study is of general housing needs for the entire nation and should be of interest to anyone concerned with the long-run housing requirement. The foundation of the study is a computer model which uses the ability of the computer to disaggregate and process information to generate alternative time-paths of housing requirements simply and economically. Mobile homes are incorporated directly into the housing supply by the model.

The model relates housing requirements directly to projections of annual population by age class. This unique feature allows us to consider explicitly changes in the age composition of the population with respect to a person's housing life cycle. In these times of concern about population growth this model is well-suited for examining



the impact of alternative rates of population growth on the long-run housing requirement.

The model examines alternative time-paths of housing requirements for a population of given characteristics. These elaborate examinations of the housing requirement are not sufficient to predict future housing market behavior. To simulate the housing market requires an equilibrium model of both supply and demand in the housing market. But when dealing with a product in relatively fixed supply and subject to lags in the construction process it is useful to consider the probable housing requirement rather than the actual market behavior. In the long run it can be assumed that the supply of housing units will respond to changing patterns of housing requirements. The supply response may be subject to considerable lag and can take many forms. By examining the model results we can state the conditions necessary to achieve a particular level of housing requirement. And by considering demographic factors directly, the model provides an insight into the nature of future changes in the size and type of the housing requirement. In the long run demographic factors must be satisfied.

The model is used to examine alternative assumptions about future housing requirements. The question the model addresses itself to is: Given an assumed population base and certain assumptions about the components of housing requirements, what set of housing requirement projections will satisfy these conditions? The model can also be used

to work backward from a given housing requirement to determine the assumptions consistent with the requirement. Three series of housing requirement projections are provided by the study to help answer this question.

The model can also be used to examine the mix of housing types projected to occur in a particular housing projection series. One important question to be answered concerns the relation of mobile homes to conventional housing starts. Mobile homes are a substitute for conventional construction. What the actual housing type-mix will be in the future is a very difficult question to answer because many factors must be considered. We can answer the question: Given a certain pattern of housing type occupancy, what will be the required housing type-mix if these rates are assumed to remain constant in the future? The model used in this way is very useful for estimating the effect of changes in the age composition of the population on the type of housing unit required. The model provides a logical reason for making housing type-mix projections. Other assumptions may be entertained about change in preferences and life styles, but the age composition effect must still be considered.

Regional summaries of housing requirements are provided by the model; in fact, the national summary is obtained from the regional summaries. The model provides an estimate of the housing requirements in each region for any set of regions covering the United States, given a set of

assumptions about the regional components of housing requirement. Thus, the model provides regional projection series which are consistent with a national housing requirement series. These series should be useful for regional studies and planning.

On the basis of the projections provided in the study, the following conclusions can be drawn about housing prospects:

(1) Population pressure alone is not enough to cause a housing boom of large magnitude. Population pressure will increase in the 1970's and reach a peak in the early 1980's. But increases in headship, vacancy, and replacement rates are also necessary to produce a large increase in housing requirements.

(2) The national housing goals as indicated in projection series 1 will not be met unless there is a drastic reordering of national priorities and substantial spending to rebuild our cities. Projection series 1 requires steady increases in headship, vacancy and replacement rates. Some necessary conditions for this to occur are:

(a) Continued low unemployment and growth of per capita real income particularly for the young and the poor.

(b) Expanded housing opportunities for the old and the poor either by direct or indirect subsidies.

(c) A substantial budget surplus to be used to provide capital and to free resources for housing. One study estimates a \$20 billion surplus would be needed by



the mid-1970's.

(d) A major rebuilding program for our cities.

It is unlikely that series 1 housing requirement projections can be attained in this decade. It is simply a case of "missiles or houses", not both.

(3) Mobile homes now fill a substantial proportion of the housing requirement. It is misleading to consider only housing start statistics. Total housing production including mobile homes in 1969 was nearly 1,900,000 units, of which nearly 21 percent were mobile homes. Production of mobile home housing units will continue to diminish the requirement for conventional housing starts.

(4) The projected increase in population and housing requirements is largely concentrated in those age groups born from 1940 to 1960. The type of housing unit required over the next 30 years is anticipated to shift to meet the needs and preferences of these age groups as they pass through the stages of the housing life cycle. The great concentration of population increase in this relatively small range of age classes at similar stages in their life cycle will probably produce a large market for housing units of similar characteristics. Of the projected increase in population over 20 years of age in the 1970's of 23 million, 15.4 million will be of ages 20 to 34. In the 1980's, of a projected increase in population over 20 years old of 19.6 million, 15.3 million will be of ages 30 to 44. In the 1990's, 14.7 million of an increase of 18.3 million in

projected population over 20 years of age will be 40 to 54 years old. Dramatic changes in the type of housing unit required will occur in the next 30 years if the historic relationship of type of housing unit occupied to the age of household head continues in the future. How the housing supply will respond to these changes in the age composition of the population is not known but we can surmise the following:

(a) Large-scale apartment developments and mobile home production will continue to fulfill the housing requirements of the large number of young households in the 1970's. Multiunit structures could account for 50 percent of housing starts from 1970 to 1974.

(b) A large potential market for some type of moderately priced single-family housing unit will build up in the mid-1970's as the number of households in the 25-34 year old age group increases rapidly. This is the age group in which households usually acquire their first single-family house. Some type of large community tract development featuring both single-family housing units and multiunit structures is likely to occur. "Operation Breakthrough", the recent program of the Department of Housing and Urban Development to promote new building systems and the pooling of local markets for the large-scale production of housing units should stimulate this type of development.

(c) In the 1980's the number of households in the 30-44 year old age classes are projected to increase by

nearly a million a year. This age group occupies a high percentage of single-family housing units and, unless there is a drastic change in living patterns, there will be a tremendous increase in the requirement for single-family housing units.

(d) A large number of apartments will still be built in the early 1980's, but over-capacity is likely to occur by the mid-1980's as the decline in births of the 1960's has its effect. In the 1980's an absolute decline in the number of households under age 25 is projected.

(e) The second home requirement in the 1970's will not be as great as is often anticipated since there will be little growth in the number of households aged 40-60. This age group is the major market for second homes. By the late 1980's a large potential increase in the second home market should develop as the number of households in their 40's increases rapidly.

(f) Custom built and individually styled homes are also demanded principally by individuals in the 40 to 60 age group who are upgrading the quality of their housing. In the 1990's when the number of households in this age group is projected to grow sharply, a new era of individually styled homes is likely as our affluent middle-aged society seeks to improve the quality of its housing.

(g) The requirement for housing by our senior citizens will continue at its present strong pace until the late 1990's when the decline in births from 1925 to 1935 becomes significant.

(5) The present acute housing shortage is likely to continue to get worse in the early 1970's. New housing production will be absorbed by population pressure and will keep vacancy rates from rising. Replacement of housing units will be retarded by the shortage of housing and little progress will be made in upgrading the housing stock unless there is a massive increase in the supply of housing units. In the 1970's it will be difficult to improve the quality of the housing stock.

(6) The 1980's should present an excellent opportunity to upgrade the housing stock. Population pressure will reach a peak in the early 1980's and decline significantly in the decade. The momentum of housing programs and the mobilization of resources for homebuilding in the 1970's should provide a large housing production capacity. The combination of an adequate housing supply plus a decline in population pressure should allow for substantial rebuilding of cities and replacement of substandard housing units.

(7) The 1990's should be marked by continued upgrading of the housing stock and the addition of a large number of second homes. The number of births in the 1970's or current population growth will for the first time become a significant factor in determining the total housing requirement.

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## APPENDICES

## APPENDIX A - HOUSING REQUIREMENT TABLES

- Table A1-2. Series 2 housing requirements for the United States - type of unit required.
- Table A2-2. Series 2 housing requirements for the United States - components of housing requirements.
- Table A3-2. Series 2 housing requirements for the Northeast - type of unit required.
- Table A4-2. Series 2 housing requirements for the Northeast - components of housing requirements.
- Table A5-2. Series 2 housing requirements for the North Central Region - type of unit required.
- Table A6-2. Series 2 housing requirements for the North Central Region - components of housing requirements.
- Table A7-2. Series 2 housing requirements for the South - type of unit required.
- Table A8-2. Series 2 housing requirements for the South - components of housing requirements.
- Table A9-2. Series 2 housing requirements for the West - type of unit required.
- Table A10-2. Series 2 housing requirements for the West - components of housing requirements.

TABLE A1-1. SERIES 1 HOUSING REQUIREMENTS FOR THE UNITED STATES -  
TYPE OF UNIT REQUIRED

YEAR	TOTAL ALL TYPES	NEW CONSTRUCTION		PERCENT 1-UNIT	MOBILE HOMES
		TOTAL (THOUSANDS OF UNITS)	MULTI-UNIT		
1970	1869	1404	778	55.4	465
1971	2310	1817	938	51.6	492
1972	2486	1940	1048	54.1	546
1973	2547	2001	1098	54.8	546
1974	2620	2040	1085	53.2	581
1975	2698	2091	1096	52.4	607
1976	2747	2117	1125	53.1	630
1977	2830	2221	1269	57.1	609
1978	2887	2248	1281	57.0	640
1979	2932	2278	1319	57.9	654
1980	2972	2290	1306	57.1	682
1981	3016	2313	1313	56.8	703
1982	3046	2362	1465	62.0	683
1983	3038	2349	1460	62.1	689
1984	3028	2337	1465	62.7	692
1985	3000	2316	1488	64.2	684
1986	2999	2321	1561	67.3	679
1987	2949	2292	1599	69.8	657
1988	2956	2300	1628	70.8	656
1989	2966	2307	1642	71.2	659
1990	2948	2298	1644	71.6	650
1991	2889	2261	1640	72.5	628
1992	2955	2312	1674	72.4	643
1993	2965	2312	1656	71.6	653
1994	3011	2341	1660	70.9	670
1995	3060	2362	1635	69.2	699
1996	3112	2384	1626	68.2	727
1997	3193	2425	1597	65.9	768
1998	3283	2485	1603	64.5	798
1999	3354	2528	1616	63.9	825
2000	3444	2579	1604	62.2	865

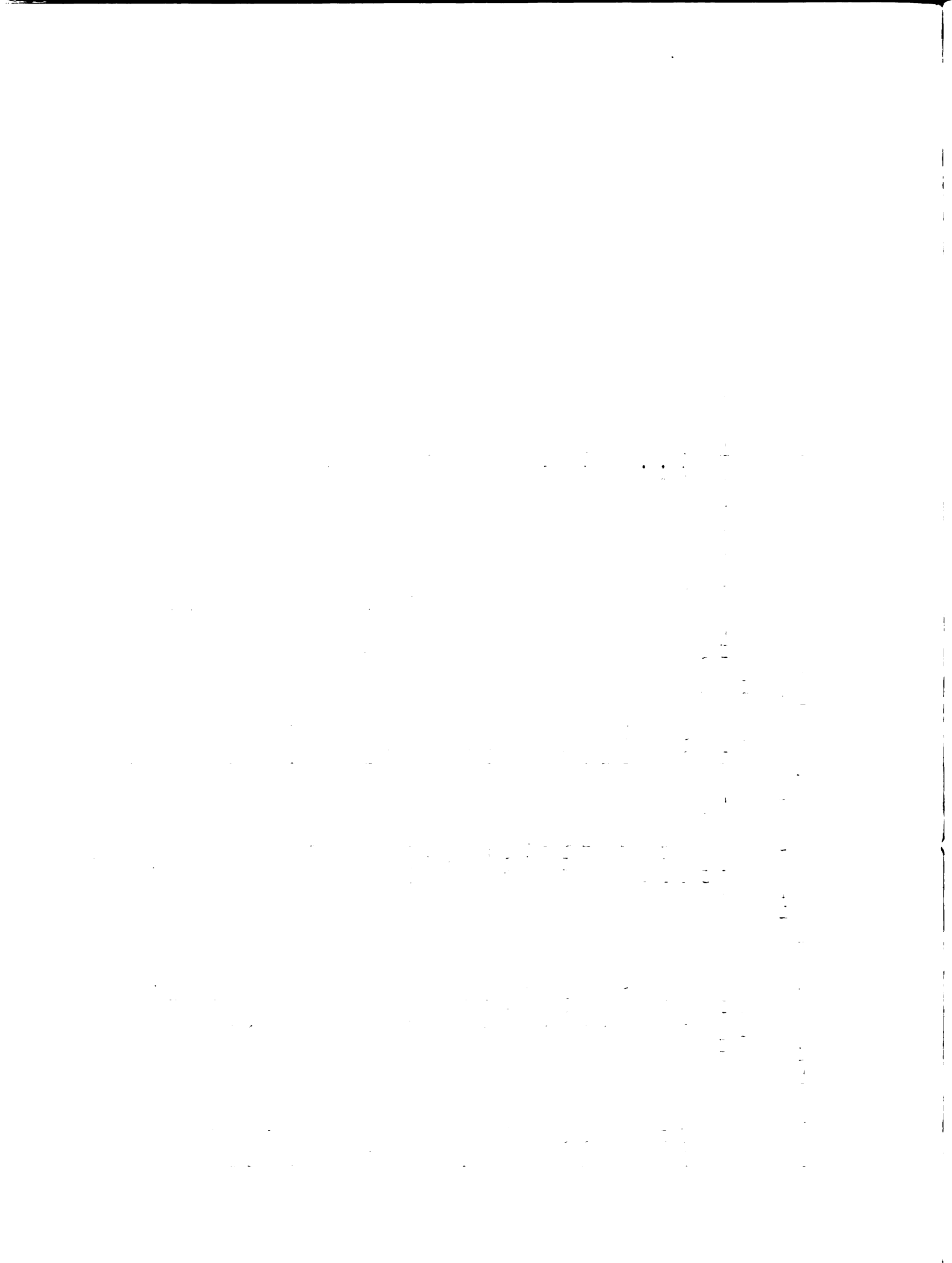


TABLE A2-1. SERIES 1 HOUSING REQUIREMENTS FOR THE UNITED STATES -  
COMPONENTS OF HOUSING REQUIREMENTS

YEAR	HOUSEHOLD FORMATION	VACANCY CHANGE	REPLACEMENT CONV. MOBILE (THOUSANDS OF UNITS)	NET MOBILE ADDITIONS	HOUSING STOCK	OCCUPIED UNITS	VACANT UNITS	VACANCY RATE (PERCENTAGE)	REPLAC. CONV. (OVERALL PERCENTAGE)	RATE
1970	1205	-120	628	110	309	69191	63165	8.71	.94	1.07
1971	1233	255	650	123	320	70679	64398	8.89	.95	1.04
1972	1345	272	675	139	353	72296	65743	9.06	.97	1.13
1973	1356	279	703	155	337	73931	67099	9.24	.99	1.16
1974	1373	288	731	171	352	75592	68472	9.42	1.01	1.14
1975	1394	297	759	187	359	77282	69866	9.60	1.03	1.22
1976	1416	290	774	204	362	78988	71282	9.76	1.03	1.24
1977	1460	300	789	219	328	80748	72742	9.91	1.03	1.25
1978	1475	308	805	235	341	82532	74217	10.07	1.03	1.26
1979	1479	315	821	252	337	84326	75696	10.23	1.03	1.27
1980	1477	322	837	268	346	86124	77173	10.39	1.03	1.28
1981	1480	328	853	285	348	87933	78653	10.55	1.03	1.29
1982	1474	334	869	300	315	89741	80127	10.71	1.04	1.30
1983	1433	336	885	315	305	91509	81560	10.87	1.04	1.31
1984	1391	337	902	330	293	93237	82951	11.03	1.04	1.32
1985	1335	336	917	343	272	94908	84286	11.19	1.04	1.33
1986	1304	339	933	355	255	96551	85590	11.35	1.04	1.33
1987	1232	336	949	366	225	98119	86822	11.51	1.04	1.34
1988	1211	339	964	377	214	99670	88034	11.67	1.04	1.34
1989	1193	342	979	386	206	101204	89226	11.84	1.04	1.35
1990	1152	342	994	396	190	102698	90378	12.00	1.05	1.35
1991	1077	337	1009	403	162	104112	91455	12.16	1.05	1.36
1992	1110	347	1022	412	167	105569	92565	12.32	1.05	1.36
1993	1093	350	1037	420	168	107012	93658	12.48	1.05	1.36
1994	1107	357	1051	428	175	108477	94765	12.64	1.05	1.36
1995	1123	365	1065	437	191	109965	95888	12.80	1.05	1.37
1996	1139	373	1080	447	207	111477	97027	12.96	1.05	1.37
1997	1179	385	1094	459	232	113040	98206	13.12	1.05	1.37
1998	1226	398	1109	470	248	114664	99432	13.28	1.05	1.38
1999	1256	408	1124	483	260	116328	100688	13.44	1.05	1.38
2000	1300	421	1140	496	282	118049	101988	13.61	1.05	1.39





TABLE A3-1. SERIES I HOUSING REQUIREMENTS FOR THE NORTHEAST -  
TYPE OF UNIT REQUIRED

YEAR	TOTAL ALL TYPES	NEW CONSTRUCTION (THOUSANDS OF UNITS)			MOBILE HOMES	REGIONAL PERCENTAGES		
		TOTAL	1- UNIT	MULTI- UNIT		TOTAL UNITS	NEW CONSTR.	POPULATION
1970	332	284	106	179	48	17.8	20.3	25.3
1971	421	372	129	243	49	18.2	20.5	25.2
1972	460	405	149	255	56	18.5	20.9	25.1
1973	471	415	156	259	56	18.5	20.7	25.0
1974	484	424	154	270	60	18.5	20.8	24.9
1975	498	436	156	280	62	18.5	20.8	24.8
1976	502	437	159	278	65	18.3	20.7	24.7
1977	518	455	180	275	63	18.3	20.5	24.6
1978	527	461	182	279	67	18.3	20.5	24.5
1979	533	465	187	278	68	18.2	20.4	24.4
1980	538	467	185	282	71	18.1	20.4	24.4
1981	537	465	183	281	72	17.8	20.1	24.3
1982	540	469	204	265	71	17.7	19.9	24.2
1983	533	462	202	260	71	17.6	19.7	24.1
1984	527	455	201	255	71	17.4	19.5	24.0
1985	516	445	202	244	71	17.2	19.2	23.9
1986	497	428	203	225	68	16.6	18.5	23.9
1987	481	415	204	211	66	16.3	18.1	23.8
1988	479	413	206	207	66	16.2	17.9	23.7
1989	477	411	206	205	66	16.1	17.8	23.6
1990	470	404	204	200	66	15.9	17.6	23.5
1991	454	391	200	191	64	15.7	17.3	23.4
1992	467	401	205	197	65	15.8	17.4	23.3
1993	466	400	202	198	66	15.7	17.3	23.3
1994	473	405	202	203	67	15.7	17.3	23.2
1995	481	411	200	211	70	15.7	17.4	23.1
1996	473	402	192	211	71	15.2	16.9	23.0
1997	488	414	190	224	74	15.3	17.1	22.9
1998	505	428	193	235	77	15.4	17.2	22.9
1999	517	437	195	243	79	15.4	17.3	22.8
2000	533	450	195	255	83	15.5	17.5	22.7

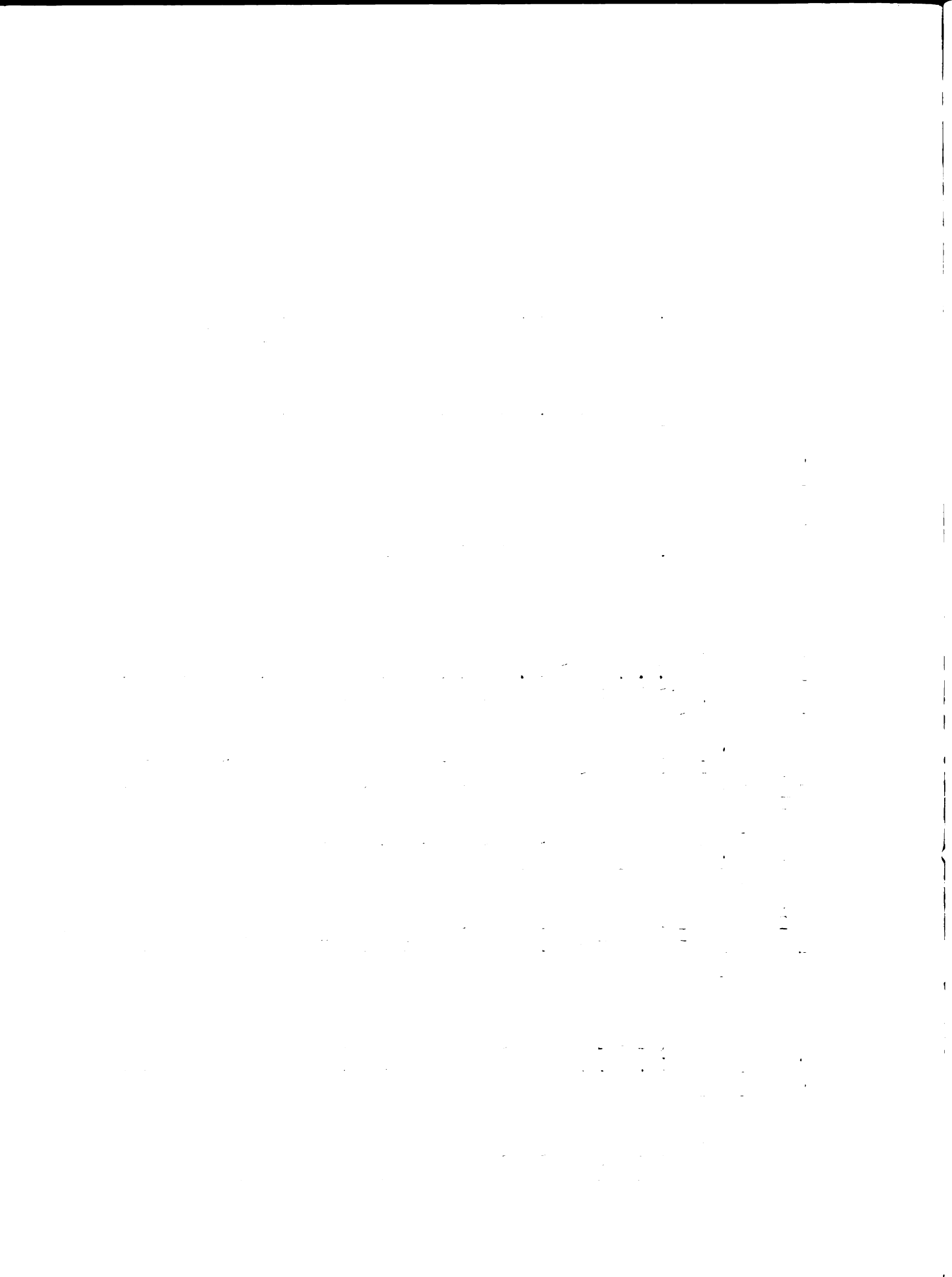


TABLE A4-1. SERIES 1 HOUSING REQUIREMENTS FOR THE NORTHEAST -  
COMPONENTS OF HOUSING REQUIREMENTS

YEAR	HOUSEHOLD FORMATION	VACANCY CHANGE	REPLACEMENT CONV. MOBILE (THOUSANDS OF UNITS)	NET MOBILE ADDITIONS	HOUSING STOCK	OCCUPIED UNITS	VACANT UNITS	VACANCY RATE	REPLAC. CONV. (OVERALL PERCENTAGE)	RATE
1970	248	-33	98	14	29	17421	15906	8.70	.57	.64
1971	244	54	103	15	29	17720	16150	8.86	.59	.67
1972	272	58	108	17	33	18049	16421	9.02	.61	.69
1973	274	59	113	19	31	18383	16695	9.18	.63	.72
1974	277	61	119	21	33	18721	16972	9.34	.65	.75
1975	282	63	124	23	33	19066	17255	9.50	.67	.77
1976	285	60	126	25	33	19410	17539	9.64	.67	.78
1977	295	62	128	26	30	19768	17834	9.78	.67	.78
1978	298	64	131	28	32	20130	18133	9.92	.67	.79
1979	299	65	133	30	31	20493	18432	10.06	.67	.79
1980	298	66	135	32	32	20857	18730	10.20	.67	.80
1981	293	66	137	34	31	21216	19022	10.34	.67	.81
1982	291	67	139	35	28	21574	19313	10.48	.67	.81
1983	280	67	142	37	27	21922	19594	10.62	.67	.81
1984	270	67	144	39	26	22259	19864	10.76	.67	.82
1985	257	66	146	40	24	22582	20120	10.90	.67	.82
1986	231	69	148	41	20	22863	20352	11.06	.67	.83
1987	214	68	150	42	17	23165	20566	11.22	.67	.83
1988	209	69	152	43	17	23442	20775	11.38	.67	.83
1989	204	69	153	44	16	23715	20979	11.54	.67	.83
1990	194	69	155	45	14	23978	21173	11.70	.67	.83
1991	178	67	157	46	12	24224	21351	11.86	.67	.84
1992	186	69	158	46	12	24480	21537	12.02	.67	.84
1993	182	70	160	47	12	24731	21719	12.18	.67	.84
1994	185	71	162	48	13	24988	21905	12.34	.67	.84
1995	189	73	163	49	14	25250	22094	12.50	.67	.84
1996	179	72	165	49	14	25502	22273	12.66	.67	.84
1997	169	75	167	50	16	25765	22462	12.82	.67	.84
1998	200	77	168	51	18	26043	22662	12.98	.67	.84
1999	207	79	170	53	19	26329	22870	13.14	.67	.85
2000	217	82	172	54	21	26628	23087	13.30	.67	.85



TABLE A5-1. SERIES 1 HOUSING REQUIREMENTS FOR THE NORTH CENTRAL REGION -  
TYPE OF UNIT REQUIRED

YEAR	TOTAL ALL TYPES	NEW CONSTRUCTION			MOBILE HOMES	REGIONAL PERCENTAGES			
		TOTAL	1- UNIT (THOUSANDS OF UNITS)	MULTI- UNIT		PERCENT 1-UNIT	TOTAL UNITS	NEW CONSTR.	POPULATION
1970	388	292	170	122	58.2	96	20.7	20.8	27.0
1971	529	421	225	197	53.4	108	22.9	23.2	26.9
1972	576	454	255	199	56.1	122	23.2	23.4	26.8
1973	590	468	266	201	56.9	122	23.2	23.4	26.7
1974	607	477	263	214	55.2	130	23.2	23.4	26.7
1975	626	489	266	223	54.3	137	23.2	23.4	26.6
1976	659	513	282	231	55.0	146	24.0	24.2	26.5
1977	680	538	319	218	59.4	143	24.0	24.2	26.4
1978	694	544	322	222	59.2	150	24.0	24.2	26.4
1979	704	550	331	219	60.3	154	24.0	24.1	26.3
1980	712	552	327	224	59.3	160	24.0	24.1	26.3
1981	727	562	331	230	59.0	166	24.1	24.3	26.2
1982	733	572	370	201	64.8	162	24.1	24.2	26.2
1983	729	566	367	199	64.9	163	24.0	24.1	26.1
1984	724	561	367	194	65.5	163	23.9	24.0	26.1
1985	715	553	372	182	67.2	162	23.8	23.9	26.1
1986	719	558	392	166	70.3	161	24.0	24.0	26.0
1987	704	547	399	148	73.0	156	23.9	23.9	26.0
1988	704	548	406	142	74.1	156	23.8	23.8	26.0
1989	705	548	408	140	74.5	157	23.8	23.7	25.9
1990	698	543	407	137	74.9	155	23.7	23.6	25.9
1991	667	519	392	126	75.6	148	23.1	23.0	25.9
1992	683	531	401	130	75.5	151	23.1	23.0	25.8
1993	684	530	396	134	74.7	153	23.1	22.9	25.8
1994	694	537	397	140	73.9	157	23.0	22.9	25.7
1995	705	542	391	151	72.1	163	23.0	23.0	25.7
1996	712	544	385	159	70.8	168	22.9	22.8	25.7
1997	732	555	379	176	68.3	177	22.9	22.9	25.6
1998	754	571	382	189	66.9	183	23.0	23.0	25.6
1999	771	581	385	196	66.2	189	23.0	23.0	25.5
2000	792	594	383	212	64.4	198	23.0	23.0	25.5



TABLE A6-1. SERIES 1 HOUSING REQUIREMENTS FOR THE NORTH CENTRAL REGION -  
COMPONENTS OF HOUSING REQUIREMENTS

YEAR	HOUSEHOLD FORMATION	VACANCY CHANGE	CONV. MOBILE (THOUSANDS OF UNITS)	NET MOBILE ADDITIONS	HOUSING STOCK	OCCUPIED UNITS	VACANT UNITS	VACANCY RATE	REPLAC. CONV. (PERCENTAGES)	RATE OVERALL
1970	250	-41	139	30	19397	17845	1552	8.00	.74	.87
1971	262	59	144	33	19738	18128	1611	8.16	.76	.90
1972	314	63	150	37	20115	18441	1674	8.32	.77	.93
1973	316	64	156	41	20495	18757	1738	8.48	.79	.95
1974	320	66	163	45	20882	19077	1804	8.64	.81	.99
1975	325	68	169	49	21275	19403	1872	8.80	.83	1.03
1976	348	72	172	54	21695	19751	1944	8.96	.83	1.04
1977	360	74	175	57	22129	20111	2018	9.12	.83	1.05
1978	364	76	178	61	22569	20474	2094	9.28	.83	1.07
1979	365	78	181	65	23011	20839	2172	9.44	.83	1.07
1980	364	79	184	69	23454	21202	2252	9.60	.83	1.08
1981	369	81	187	73	23905	21571	2333	9.76	.83	1.09
1982	367	83	190	77	24355	21939	2416	9.92	.83	1.10
1983	356	83	193	81	24793	22294	2499	10.08	.83	1.10
1984	344	83	196	84	25221	22638	2583	10.24	.83	1.11
1985	329	83	200	87	25633	22967	2660	10.40	.84	1.12
1986	326	84	203	90	26043	23293	2750	10.56	.84	1.12
1987	306	83	206	93	26433	23599	2834	10.72	.84	1.13
1988	301	84	209	95	26818	23900	2918	10.88	.84	1.13
1989	295	85	211	97	27198	24195	3003	11.04	.84	1.14
1990	284	85	214	99	27567	24479	3087	11.20	.84	1.14
1991	252	82	217	101	27901	24731	3170	11.36	.84	1.14
1992	261	84	220	103	28246	24992	3254	11.52	.84	1.14
1993	256	85	222	105	28587	25248	3339	11.68	.84	1.14
1994	260	87	225	107	28934	25508	3426	11.84	.84	1.15
1995	264	89	227	109	29287	25772	3514	12.00	.84	1.15
1996	265	90	230	111	29641	26037	3604	12.16	.84	1.15
1997	276	93	233	113	30010	26312	3697	12.32	.84	1.15
1998	268	96	235	116	30394	26601	3793	12.48	.84	1.16
1999	296	99	238	119	30789	26897	3892	12.64	.84	1.16
2000	308	102	241	122	31199	27206	3993	12.80	.84	1.16

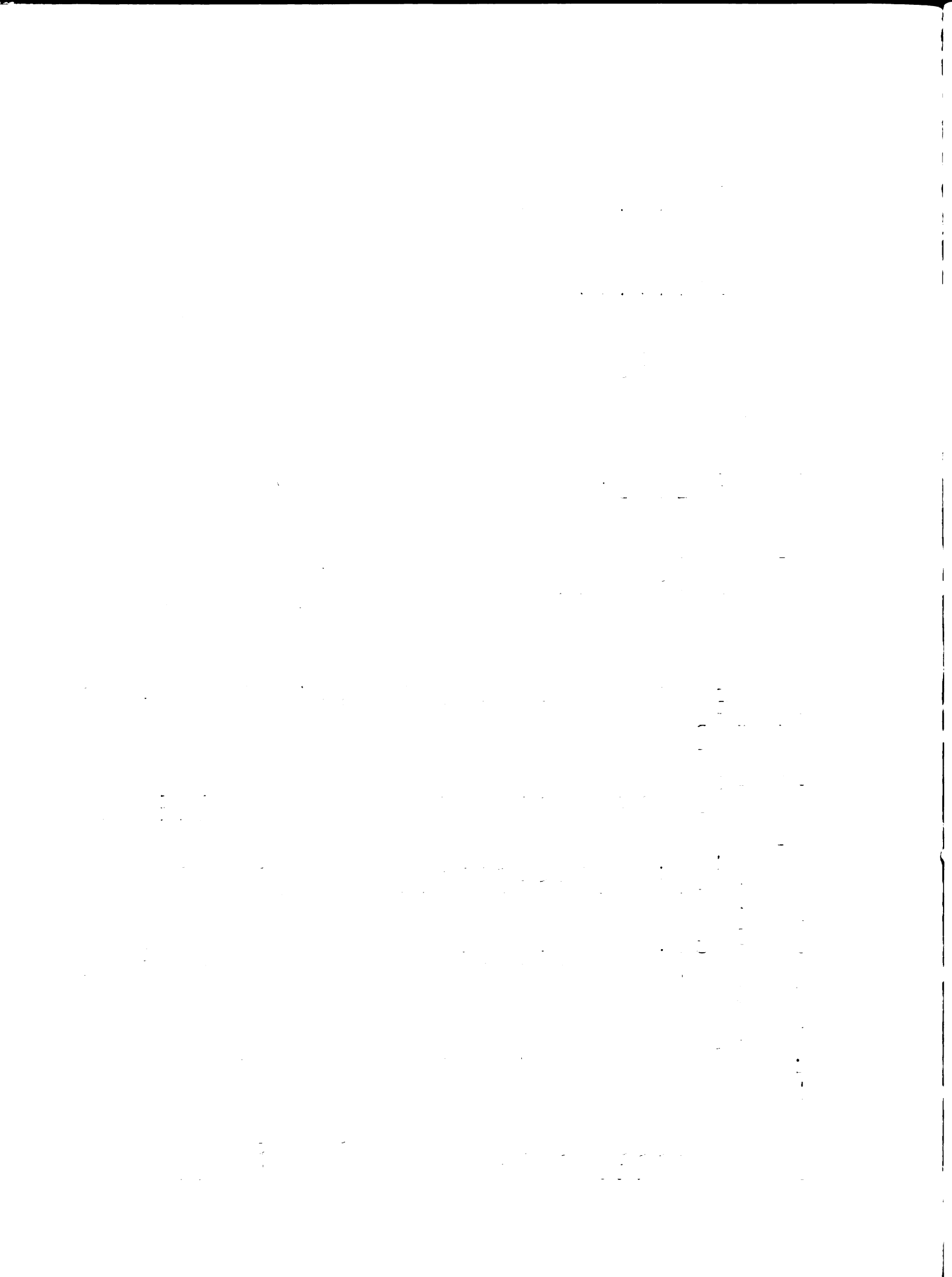




TABLE A7-1. SERIES 1 HOUSING REQUIREMENTS FOR THE SOUTH -  
TYPE OF UNIT REQUIRED

YEAR	TOTAL ALL TYPES	NEW CONSTRUCTION				MOBILE HOMES	REGIONAL PERCENTAGES			
		TOTAL	1- UNIT		MULTI- UNIT		PERCENT 1-UNIT	TOTAL UNITS	NEW CONSTR.	POPULATION
			(THOUSANDS OF UNITS)							
1970	704	552	347	205	62.9	152	37.7	39.3	30.6	
1971	811	657	391	266	59.5	154	35.1	36.1	30.6	
1972	866	695	431	264	62.0	171	34.8	35.8	30.7	
1973	887	716	449	267	62.8	171	34.8	35.8	30.7	
1974	911	730	445	284	61.1	182	34.8	35.8	30.8	
1975	937	747	450	298	60.2	190	34.7	35.7	30.8	
1976	927	737	450	286	61.1	190	33.7	34.8	30.8	
1977	953	769	501	269	65.1	184	33.7	34.6	30.8	
1978	973	779	506	274	64.9	193	33.7	34.7	30.8	
1979	988	790	519	271	65.7	198	33.7	34.7	30.8	
1980	1002	796	516	280	64.8	206	33.7	34.7	30.8	
1981	1007	797	514	283	64.5	210	33.4	34.5	30.8	
1982	1017	813	567	246	69.7	204	33.4	34.4	30.8	
1983	1017	811	565	246	69.7	206	33.5	34.5	30.8	
1984	1015	809	568	241	70.2	206	33.5	34.6	30.8	
1985	1008	804	576	228	71.7	204	33.6	34.7	30.8	
1986	1033	826	616	210	74.5	207	34.4	35.6	30.8	
1987	1020	819	630	189	76.9	200	34.6	35.8	30.8	
1988	1024	824	642	182	77.9	200	34.6	35.8	30.9	
1989	1028	828	648	180	78.2	201	34.7	35.9	30.9	
1990	1025	827	650	177	78.6	198	34.8	36.0	30.9	
1991	1012	821	652	169	79.5	192	35.0	36.3	30.9	
1992	1034	838	665	173	79.4	196	35.0	36.2	30.9	
1993	1039	840	660	180	78.6	199	35.0	36.3	31.0	
1994	1055	850	662	188	77.9	204	35.0	36.3	31.0	
1995	1071	858	654	204	76.2	213	35.0	36.3	31.0	
1996	1093	872	655	217	75.1	221	35.1	36.6	31.0	
1997	1119	886	645	241	72.8	234	35.1	36.5	31.0	
1998	1149	906	648	258	71.5	243	35.0	36.5	31.1	
1999	1172	921	653	268	70.9	251	34.9	36.4	31.1	
2000	1201	938	650	289	69.2	263	34.9	36.4	31.1	

TABLE A6-1. SERIES 1 HOUSING REQUIREMENTS FOR THE SOUTH -  
COMPONENTS OF HOUSING REQUIREMENTS

YEAR	HOUSEHOLD FORMATION	VACANCY CHANGE	REPLACEMENT CONV. MOBILE (THOUSANDS OF UNITS)	NET MOBILE ADDITIONS	HOUSING STOCK	OCCUPIED UNITS	VACANT UNITS	VACANCY RATE (PERCENTAGES)	REPLAC. CONV. OVERALL RATE
1970	410	-24	268	34	20666	18703	1963	9.50	1.34
1971	397	84	277	39	21147	19100	2047	9.68	1.36
1972	430	89	286	44	21666	19530	2136	9.86	1.37
1973	434	92	296	48	22191	19963	2228	10.04	1.39
1974	439	94	306	54	22724	20402	2322	10.22	1.41
1975	445	97	317	59	23267	20847	2420	10.40	1.43
1976	428	92	323	64	23788	21276	2512	10.56	1.44
1977	441	96	330	69	24324	21717	2608	10.72	1.44
1978	446	98	336	73	24868	22163	2706	10.88	1.44
1979	447	100	342	78	25416	22610	2806	11.04	1.44
1980	447	102	349	84	25964	23056	2908	11.20	1.44
1981	438	103	356	89	26506	23495	3011	11.36	1.44
1982	437	105	362	93	27047	23931	3116	11.52	1.44
1983	424	105	369	98	27576	24355	3221	11.68	1.44
1984	412	105	375	102	28093	24767	3326	11.84	1.44
1985	395	105	382	106	28593	25162	3431	12.00	1.44
1986	406	108	388	110	29108	25568	3539	12.16	1.44
1987	385	107	395	113	29599	25953	3647	12.32	1.44
1988	378	108	401	116	30086	26331	3755	12.48	1.44
1989	373	109	407	119	30568	26704	3864	12.64	1.44
1990	361	109	413	122	31038	27065	3973	12.80	1.45
1991	341	108	420	124	31487	27406	4081	12.96	1.45
1992	351	111	426	127	31949	27757	4192	13.12	1.45
1993	346	112	432	129	32407	28103	4304	13.28	1.45
1994	350	114	438	132	32871	28454	4418	13.44	1.45
1995	355	117	444	135	33343	28808	4535	13.60	1.45
1996	364	120	450	138	33827	29172	4655	13.76	1.45
1997	376	124	456	141	34326	29548	4778	13.92	1.45
1998	390	128	462	145	34844	29938	4906	14.08	1.45
1999	399	131	469	148	35373	30336	5037	14.24	1.45
2000	412	135	475	152	35921	30748	5173	14.40	1.45



TABLE A9-1. SERIES 1 HOUSING REQUIREMENTS FOR THE WEST -  
TYPE OF UNIT REQUIRED

YEAR	TOTAL ALL TYPES	NEW CONSTRUCTION (THOUSANDS OF UNITS)			MOBILE HOMES	REGIONAL PERCENTAGES		
		TOTAL	1- UNIT	MULTI- UNIT		TOTAL UNITS	NEW CONSTR.	POPULATION
1970	445	275	155	120	56.4	23.8	19.6	17.1
1971	548	367	193	175	52.5	23.7	20.2	17.3
1972	584	386	213	172	55.3	23.5	19.9	17.4
1973	600	403	226	177	56.1	23.5	20.1	17.6
1974	618	409	223	186	54.4	23.6	20.1	17.7
1975	637	419	225	195	53.6	23.6	20.1	17.8
1976	659	430	234	196	54.4	24.0	20.3	18.0
1977	678	459	269	190	58.5	24.0	20.7	18.1
1978	694	464	271	193	58.4	24.0	20.6	18.3
1979	707	473	281	192	59.4	24.1	20.7	18.4
1980	720	475	278	197	58.5	24.2	20.7	18.5
1981	745	490	285	205	58.1	24.7	21.2	18.7
1982	755	509	324	185	63.7	24.8	21.5	18.8
1983	759	510	325	185	63.8	25.0	21.7	18.9
1984	762	512	329	183	64.3	25.2	21.9	19.1
1985	761	513	339	175	66.0	25.4	22.2	19.2
1986	751	509	351	158	68.9	25.0	21.9	19.3
1987	745	511	365	145	71.5	25.3	22.3	19.4
1988	750	516	375	141	72.6	25.4	22.4	19.5
1989	755	521	380	140	73.0	25.5	22.6	19.6
1990	755	524	384	139	73.4	25.6	22.8	19.7
1991	755	530	396	135	74.6	26.1	23.5	19.8
1992	772	541	403	139	74.4	26.1	23.4	19.9
1993	777	542	399	143	73.6	26.2	23.5	20.0
1994	790	548	399	150	72.7	26.2	23.4	20.1
1995	803	550	390	160	70.8	26.2	23.3	20.2
1996	833	566	394	172	69.7	26.8	23.7	20.3
1997	854	570	383	187	67.1	26.7	23.5	20.4
1998	876	581	382	199	65.7	26.7	23.4	20.5
1999	894	589	383	206	65.0	26.7	23.3	20.6
2000	917	596	377	219	63.2	26.6	23.1	20.7

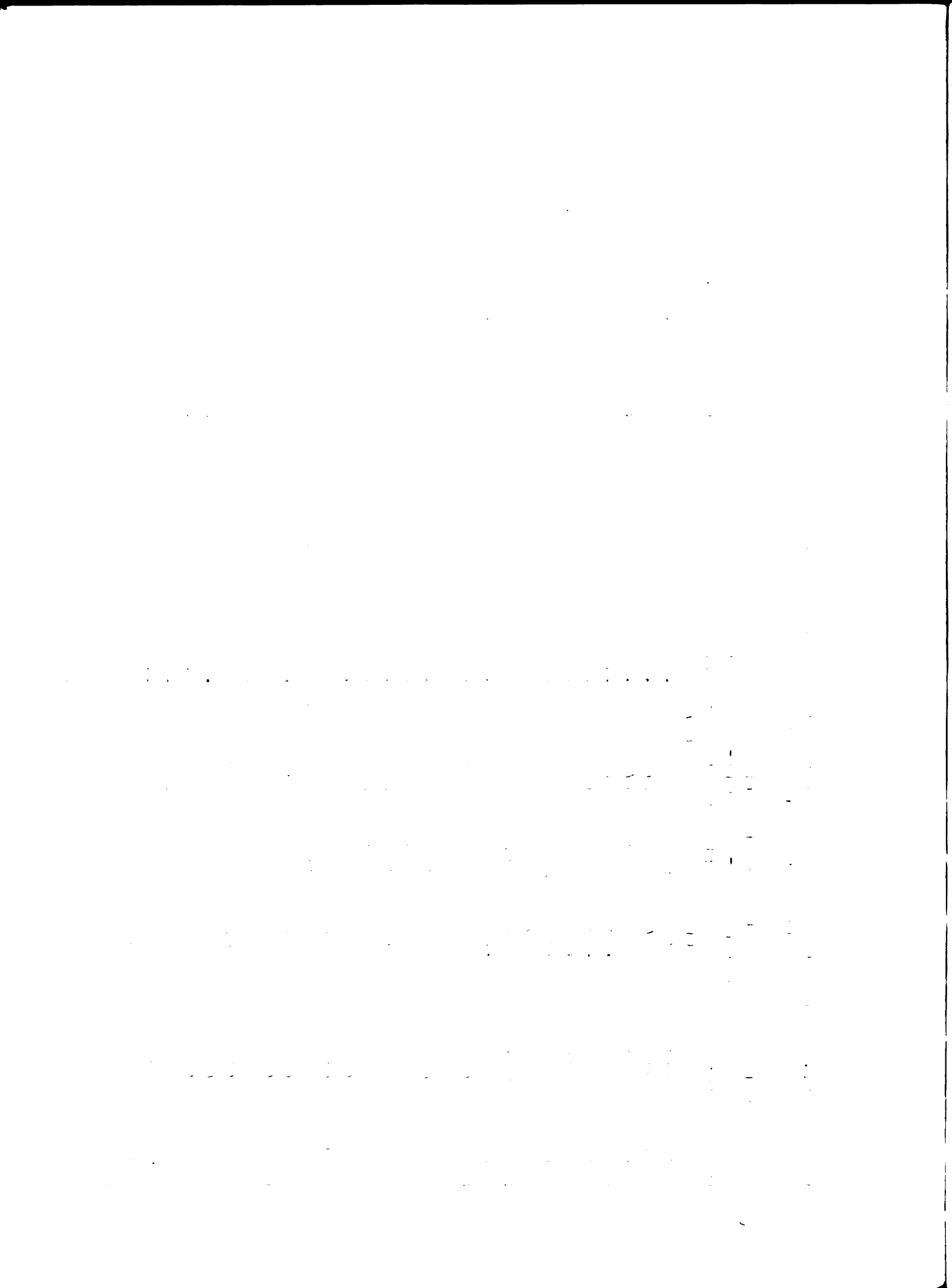


TABLE A10-1. SERIES 1 HOUSING REQUIREMENTS FOR THE WEST  
COMPONENTS OF HOUSING REQUIREMENTS

YEAR	HOUSEHOLD FORMATION	VACANCY CHANGE	REPLACEMENT CONV. MOBILE (THOUSANDS OF UNITS)	NET MOBILE ADDITIONS	HOUSING STOCK	OCCUPIED UNITS	VACANT UNITS	VACANCY RATE (PERCENTAGES)	REPLAC. CONV. OVERALL RATE (PERCENTAGES)
1970	296	-22	122	32	120	11706	10711	995	8.50
1971	310	58	126	36	127	12074	11021	1053	8.72
1972	330	62	132	41	137	12466	11351	1114	8.94
1973	333	64	137	46	131	12862	11684	1178	9.16
1974	337	66	143	51	137	13265	12020	1244	9.38
1975	341	69	149	56	139	13674	12361	1313	9.60
1976	355	66	153	62	144	14095	12717	1379	9.78
1977	364	68	157	67	130	14527	13080	1447	9.96
1978	367	71	161	72	135	14965	13448	1517	10.14
1979	368	72	165	78	133	15406	13816	1590	10.32
1980	369	74	169	83	137	15849	14185	1664	10.50
1981	380	77	173	89	141	16306	14565	1742	10.68
1982	380	79	177	95	128	16765	14944	1821	10.86
1983	373	80	182	100	124	17218	15317	1901	11.04
1984	365	81	186	105	120	17664	15682	1982	11.22
1985	355	82	190	110	113	18100	16037	2063	11.40
1986	341	77	195	114	104	18518	16377	2141	11.56
1987	327	77	199	118	92	18922	16705	2218	11.72
1988	324	78	203	122	88	19324	17028	2296	11.88
1989	320	79	207	126	85	19723	17348	2375	12.04
1990	313	79	211	129	79	20115	17661	2454	12.20
1991	306	80	215	132	70	20501	17967	2534	12.36
1992	312	82	219	136	72	20895	18279	2616	12.52
1993	309	83	223	139	72	21287	18588	2699	12.68
1994	312	85	227	142	75	21683	18899	2784	12.84
1995	315	87	231	146	62	22085	19214	2871	13.00
1996	331	91	235	150	91	22507	19545	2962	13.16
1997	339	94	239	154	101	22939	19884	3055	13.32
1998	348	97	243	159	107	23384	20232	3152	13.48
1999	354	99	247	163	112	23836	20585	3251	13.64
2000	362	102	252	169	120	24301	20948	3354	13.80



TABLE A1-2. SERIES 2 HOUSING REQUIREMENTS FOR THE UNITED STATES -  
TYPE OF UNIT REQUIRED

YEAR	TOTAL ALL TYPES	NEW CONSTRUCTION			PERCENT 1-UNIT	MOBILE HOMES
		TOTAL (THOUSANDS OF UNITS)	1-UNIT	MULTI-UNIT		
1970	1660	1244	708	537	56.9	416
1971	2040	1594	826	768	51.8	440
1972	2196	1699	924	774	54.4	498
1973	2241	1745	963	782	55.2	497
1974	2296	1766	943	823	53.4	530
1975	2352	1798	943	855	52.4	554
1976	2380	1805	964	842	53.4	575
1977	2460	1906	1100	807	57.7	554
1978	2513	1930	1110	820	57.5	564
1979	2551	1955	1143	811	58.5	597
1980	2590	1966	1132	834	57.6	625
1981	2631	1987	1138	849	57.3	645
1982	2663	2037	1281	756	62.9	626
1983	2658	2026	1276	750	63.0	632
1984	2650	2015	1281	734	63.6	635
1985	2623	1996	1302	694	65.3	627
1986	2629	1999	1350	649	67.5	630
1987	2573	1965	1377	588	70.1	608
1988	2571	1965	1398	567	71.2	606
1989	2571	1963	1405	558	71.6	607
1990	2543	1946	1402	544	72.1	597
1991	2470	1897	1388	509	73.1	573
1992	2521	1936	1414	522	73.1	585
1993	2520	1927	1393	534	72.3	593
1994	2553	1945	1391	554	71.5	608
1995	2589	1955	1363	592	69.7	634
1996	2611	1955	1345	610	68.8	656
1997	2678	1984	1315	669	66.3	694
1998	2753	2032	1318	714	64.9	721
1999	2808	2062	1324	738	64.2	740
2000	2884	2101	1310	791	62.3	752





TABLE A2-2. SERIES 2 HOUSING REQUIREMENTS FOR THE UNITED STATES -  
COMPONENTS OF HOUSING REQUIREMENTS

YEAR	HOUSEHOLD FORMATION	VACANCY CHANGE	REPLACEMENT CONV. MOBILE (THOUSANDS OF UNITS)	NET MOBILE ADDITIONS	HOUSING STOCK	OCCUPIED UNITS	VACANT UNITS	VACANCY RATE (PERCENTAGE)	REPLAC. CONV. OVERALL RATE
1970	1019	-138	628	109	68987	62979	6008	8.71	.94
1971	1049	190	635	121	70226	64028	6198	8.83	.94
1972	1162	205	645	136	71593	65190	6403	8.94	.94
1973	1177	210	656	149	72980	66367	6612	9.06	.94
1974	1197	215	667	164	74392	67564	6828	9.18	.94
1975	1219	222	678	178	75833	68783	7049	9.30	.94
1976	1245	195	689	194	77273	70028	7245	9.38	.94
1977	1294	203	701	207	78770	71322	7447	9.45	.94
1978	1314	208	713	220	80291	72636	7655	9.53	.94
1979	1320	211	725	235	81822	73956	7866	9.61	.94
1980	1326	214	737	250	83363	75282	8081	9.69	.94
1981	1334	218	750	265	84915	76616	8299	9.77	.94
1982	1338	221	762	279	86474	77954	8520	9.85	.94
1983	1307	221	775	292	88002	79261	8740	9.93	.94
1984	1274	220	788	305	89495	80535	8960	10.01	.94
1985	1226	217	800	317	90939	81761	9177	10.09	.94
1986	1206	219	812	328	92363	82968	9396	10.17	.94
1987	1136	213	825	338	93713	84104	9609	10.25	.95
1988	1114	213	836	348	95039	85217	9822	10.33	.95
1989	1092	213	848	357	96344	86310	10034	10.42	.95
1990	1049	210	860	365	97603	87358	10244	10.50	.95
1991	967	203	871	372	98772	88325	10447	10.58	.95
1992	994	208	881	379	99974	89319	10655	10.66	.95
1993	974	208	892	386	101156	90293	10863	10.74	.95
1994	984	211	903	394	102352	91278	11074	10.82	.95
1995	996	215	913	402	103562	92273	11289	10.90	.95
1996	995	217	924	410	104774	93268	11506	10.98	.95
1997	1030	224	934	420	106028	94298	11729	11.06	.95
1998	1074	231	945	430	107333	95373	11961	11.14	.95
1999	1099	237	956	441	108669	96472	12198	11.22	.95
2000	1140	244	967	453	110054	97612	12442	11.31	.95



TABLE A3-2. SERIES 2 HOUSING REQUIREMENTS FOR THE NORTHEAST -  
TYPE OF UNIT REQUIRED

YEAR	TOTAL ALL TYPES	NEW CONSTRUCTION			MOBILE HOMES	REGIONAL PERCENTAGES		
		TOTAL	1- UNIT (THOUSANDS OF UNITS)	MULTI- UNIT 1-UNIT		TOTAL UNITS	NEW CONSTR.	POPULATION
1970	280	239	91	148	38.1	42	16.9	25.3
1971	355	311	108	203	34.7	43	17.4	25.2
1972	390	340	126	215	36.9	49	17.7	25.1
1973	397	347	131	217	37.6	50	17.7	25.0
1974	406	353	128	225	36.2	53	17.7	24.9
1975	416	360	128	232	35.5	56	17.7	24.8
1976	416	358	130	228	36.3	58	17.5	24.7
1977	432	375	150	226	39.8	57	17.6	24.6
1978	441	381	151	230	39.7	60	17.6	24.5
1979	446	385	156	229	40.5	62	17.5	24.4
1980	452	387	154	233	39.8	64	17.4	24.4
1981	451	385	153	233	39.6	66	17.1	24.3
1982	455	391	172	218	44.1	64	17.1	24.2
1983	450	385	170	215	44.2	65	16.9	24.1
1984	445	379	169	210	44.6	65	16.8	24.0
1985	435	370	170	200	45.9	64	16.6	23.9
1986	418	355	169	187	47.5	63	15.9	23.9
1987	402	341	168	173	49.3	61	15.6	23.8
1988	398	338	169	168	50.1	61	15.5	23.7
1989	395	334	169	166	50.4	61	15.4	23.6
1990	386	326	165	161	50.7	60	15.2	23.5
1991	368	310	159	151	51.4	58	14.9	23.4
1992	377	318	164	155	51.4	59	15.0	23.3
1993	375	315	160	155	50.8	60	14.9	23.3
1994	380	319	160	159	50.2	61	14.9	23.2
1995	385	322	157	165	48.9	63	14.9	23.1
1996	373	310	148	161	47.9	63	14.3	23.0
1997	385	319	147	172	46.1	66	14.4	22.9
1998	400	331	149	182	45.1	69	14.5	22.9
1999	409	338	151	187	44.6	71	14.6	22.8
2000	423	348	150	198	43.2	74	14.7	22.7

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TABLE A4-2. SERIES 2 HOUSING REQUIREMENTS FOR THE NORTHEAST -  
COMPONENTS OF HOUSING REQUIREMENTS

YEAR	HOUSEHOLD FORMATION	VACANCY CHANGE	REPLACEMENT CONV. MOBILE (THOUSANDS OF UNITS)	NET MOBILE ADDITIONS	HOUSING STOCK	OCCUPIED UNITS	VACANT UNITS	VACANCY RATE (PERCENTAGES)	REPLAC. CONV. OVERALL RATE (PERCENTAGES)
1970	202	-37	98	14	17370	15859	1511	8.70	.57
1971	198	38	99	15	17606	16057	1549	8.80	.57
1972	226	41	100	17	17874	16283	1591	8.90	.57
1973	230	42	102	18	18146	16513	1633	9.00	.57
1974	234	43	103	20	18424	16747	1677	9.10	.57
1975	240	45	104	22	18708	16987	1721	9.20	.57
1976	244	37	106	23	18989	17231	1758	9.26	.57
1977	256	39	107	25	19283	17486	1797	9.32	.57
1978	260	40	109	26	19583	17747	1837	9.38	.57
1979	262	40	110	28	19885	18008	1877	9.44	.57
1980	263	41	112	30	20189	18271	1918	9.50	.57
1981	259	41	113	31	20489	18530	1959	9.56	.57
1982	260	41	115	33	20789	18789	2000	9.62	.57
1983	252	41	117	34	21082	19041	2041	9.68	.57
1984	244	40	118	36	21366	19285	2081	9.74	.57
1985	232	39	120	37	21638	19518	2121	9.80	.57
1986	211	42	121	38	21891	19728	2163	9.88	.57
1987	194	41	122	39	22126	19922	2204	9.96	.57
1988	188	41	124	40	22354	20110	2244	10.04	.57
1989	183	40	125	41	22578	20293	2285	10.12	.57
1990	173	40	126	41	22790	20466	2325	10.20	.57
1991	155	38	127	42	22983	20620	2363	10.28	.57
1992	161	39	128	43	23184	20782	2402	10.36	.57
1993	157	39	129	43	23380	20939	2441	10.44	.57
1994	160	40	131	44	23579	21098	2481	10.52	.57
1995	162	40	132	45	23782	21261	2521	10.60	.57
1996	149	39	133	45	23970	21410	2560	10.68	.58
1997	158	41	134	46	24169	21568	2601	10.76	.58
1998	169	42	135	47	24380	21737	2643	10.84	.57
1999	175	43	136	48	24598	21912	2686	10.92	.57
2000	184	45	137	49	24827	22096	2731	11.00	.57

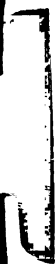


TABLE AS-2. SERIES 2 HOUSING REQUIREMENTS FOR THE NORTH CENTRAL REGION -  
TYPE OF UNIT REQUIRED

YEAR	TOTAL ALL TYPES	NEW CONSTRUCTION (THOUSANDS OF UNITS)			MOBILE HOMES	REGIONAL PERCENTAGES		
		TOTAL	1- UNIT	MULTI- UNIT		TOTAL UNITS	NEW CONSTR.	POPULATION
				PERCENT 1-UNIT				
1970	329	247	148	98	60.1	19.8	19.8	27.0
1971	454	359	192	167	53.5	22.3	22.5	26.9
1972	496	388	218	169	56.3	22.6	22.8	26.8
1973	506	397	227	170	57.1	22.6	22.8	26.7
1974	519	402	222	180	55.2	22.6	22.8	26.7
1975	532	409	222	188	54.2	22.6	22.8	26.6
1976	561	428	235	193	54.9	23.5	23.7	26.5
1977	581	452	270	182	59.7	23.6	23.7	26.4
1978	594	458	273	185	59.6	23.6	23.7	26.4
1979	602	463	281	182	60.7	23.6	23.7	26.3
1980	611	466	278	188	59.7	23.6	23.7	26.3
1981	626	475	281	193	59.3	23.8	23.9	26.2
1982	633	485	318	167	65.5	23.8	23.8	26.2
1983	630	481	316	165	65.6	23.7	23.7	26.1
1984	626	476	316	161	66.3	23.6	23.6	26.1
1985	617	469	320	150	68.1	23.5	23.5	26.1
1986	623	474	333	140	70.4	23.7	23.7	26.0
1987	607	462	338	124	73.2	23.6	23.5	26.0
1988	605	461	342	118	74.3	23.5	23.4	26.0
1989	603	459	343	116	74.8	23.5	23.4	25.9
1990	594	452	340	112	75.2	23.4	23.2	25.9
1991	560	425	324	102	76.1	22.7	22.4	25.9
1992	572	435	331	104	76.0	22.7	22.5	25.8
1993	571	432	324	107	75.1	22.6	22.4	25.8
1994	578	436	324	112	74.3	22.6	22.4	25.7
1995	586	439	318	121	72.4	22.6	22.4	25.7
1996	586	435	310	126	71.2	22.4	22.3	25.7
1997	602	443	304	140	68.5	22.5	22.4	25.6
1998	621	456	305	151	67.0	22.6	22.4	25.6
1999	634	464	307	156	66.3	22.6	22.5	25.5
2000	652	474	304	169	64.3	22.6	22.6	25.5





TABLE A6-2. SERIES 2 HOUSING REQUIREMENTS FOR THE NORTH CENTRAL REGION -  
COMPONENTS OF HOUSING REQUIREMENTS

YEAR	HOUSEHOLD FORMATION	VACANCY CHANGE	REPLACEMENT CONV. MOBILE (THOUSANDS OF UNITS)	NET MOBILE ADDITIONS	HOUSING STOCK	OCCUPIED UNITS	VACANT UNITS	VACANCY RATE (PERCENTAGES)	REPLAC. CONV. OVERALL RATE (PERCENTAGES)
1970	197	-45	139	29	19340	17793	1547	8.00	.74
1971	231	41	140	32	19612	18023	1589	8.10	.74
1972	263	45	142	36	19919	18286	1633	8.20	.74
1973	267	46	143	40	20232	18553	1679	8.30	.74
1974	272	47	145	43	20551	18824	1726	8.40	.74
1975	278	48	147	47	20877	19102	1775	8.50	.74
1976	301	47	149	51	21224	19403	1821	8.58	.74
1977	315	48	151	54	21587	19718	1869	8.66	.74
1978	320	50	153	57	21957	20038	1919	8.74	.74
1979	322	50	156	61	22329	20360	1969	8.82	.74
1980	323	51	158	65	22704	20683	2021	8.90	.74
1981	330	52	160	68	23066	21013	2073	8.98	.74
1982	331	53	162	72	23470	21344	2126	9.06	.74
1983	322	53	165	75	23845	21666	2179	9.14	.74
1984	313	53	167	78	24211	21979	2232	9.22	.74
1985	300	52	169	81	24563	22279	2284	9.30	.74
1986	300	53	172	83	24917	22579	2337	9.38	.74
1987	281	51	174	86	25249	22860	2389	9.46	.74
1988	275	51	176	88	25575	23135	2440	9.54	.74
1989	269	51	178	90	25895	23404	2491	9.62	.74
1990	257	51	180	92	26203	23661	2542	9.70	.74
1991	223	47	183	93	26474	23885	2589	9.78	.74
1992	231	49	184	95	26753	24115	2638	9.86	.74
1993	225	49	186	96	27027	24341	2687	9.94	.74
1994	228	49	188	98	27305	24569	2736	10.02	.74
1995	231	50	190	100	27587	24801	2786	10.10	.74
1996	227	50	192	102	27865	25028	2837	10.18	.74
1997	237	52	193	104	28154	25265	2889	10.26	.74
1998	249	54	195	106	28457	25515	2942	10.34	.74
1999	256	55	197	108	28769	25771	2998	10.42	.74
2000	267	57	199	111	29093	26038	3055	10.50	.74

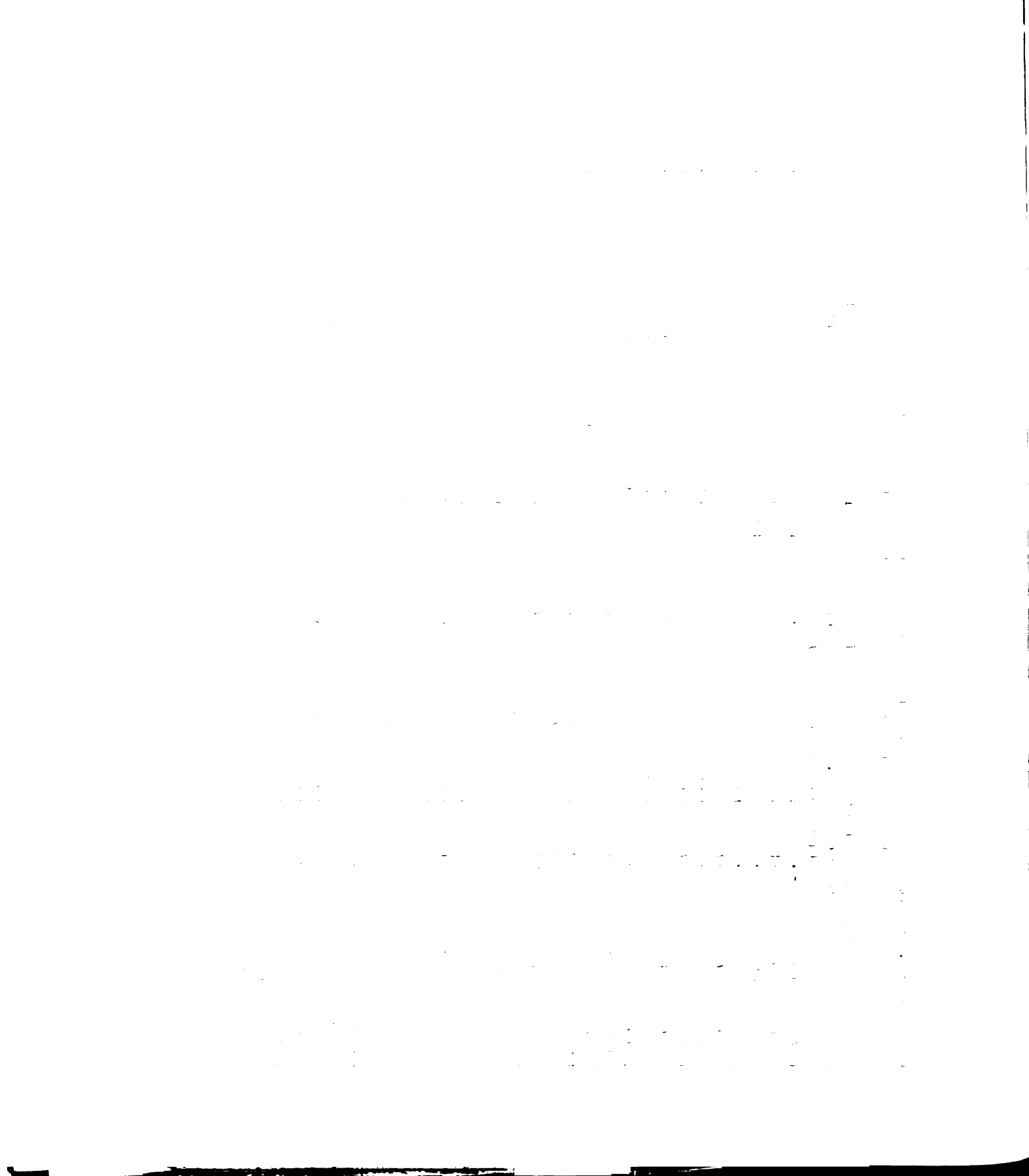


TABLE A7-2. SERIES 2 HOUSING REQUIREMENTS FOR THE SOUTH -  
TYPE OF UNIT REQUIRED

YEAR	TOTAL ALL TYPES	NEW CONSTRUCTION (THOUSANDS OF UNITS)				MOBILE HOMES	REGIONAL PERCENTAGES		
		TOTAL	1- UNIT	MULTI- UNIT	PERCENT 1-UNIT		TOTAL UNITS	NEW CONSTR.	POPULATION
1970	642	505	323	182	64.0	137	38.7	40.6	30.6
1971	729	590	352	238	59.6	140	35.8	37.0	30.6
1972	778	622	388	235	62.3	156	35.4	36.6	30.7
1973	794	638	402	236	63.0	155	35.4	36.6	30.7
1974	812	646	395	251	61.2	166	35.4	36.6	30.8
1975	831	658	396	262	60.2	173	35.3	36.6	30.8
1976	814	641	394	248	61.4	173	34.2	35.5	30.8
1977	840	673	441	232	65.6	167	34.1	35.3	30.8
1978	857	681	445	236	65.3	176	34.1	35.3	30.8
1979	870	690	457	233	66.3	180	34.1	35.3	30.8
1980	884	695	454	241	65.3	188	34.1	35.4	30.8
1981	887	696	452	244	65.0	192	33.7	35.0	30.8
1982	898	712	501	211	70.4	186	33.7	34.9	30.8
1983	898	710	500	210	70.5	188	33.8	35.0	30.8
1984	897	708	502	206	71.0	189	33.9	35.1	30.8
1985	890	703	510	193	72.5	187	33.9	35.2	30.8
1986	916	724	540	184	74.6	192	34.8	36.2	30.8
1987	900	715	551	165	77.0	185	35.0	36.4	30.8
1988	902	717	559	158	78.0	185	35.1	36.5	30.9
1989	903	718	563	155	78.4	185	35.1	36.6	30.9
1990	896	714	562	152	78.7	182	35.2	36.7	30.9
1991	879	704	561	143	79.7	175	35.6	37.1	30.9
1992	895	717	571	146	79.7	178	35.5	37.0	30.9
1993	896	716	565	151	78.9	181	35.6	37.1	31.0
1994	908	723	565	158	78.2	185	35.6	37.1	31.0
1995	920	727	556	171	76.5	193	35.5	37.2	31.0
1996	932	733	553	180	75.4	200	35.7	37.5	31.0
1997	954	743	542	201	73.0	211	35.6	37.4	31.0
1998	978	759	544	215	71.6	219	35.5	37.3	31.1
1999	996	769	546	223	71.0	227	35.5	37.3	31.1
2000	1020	783	542	241	69.2	238	35.4	37.3	31.1

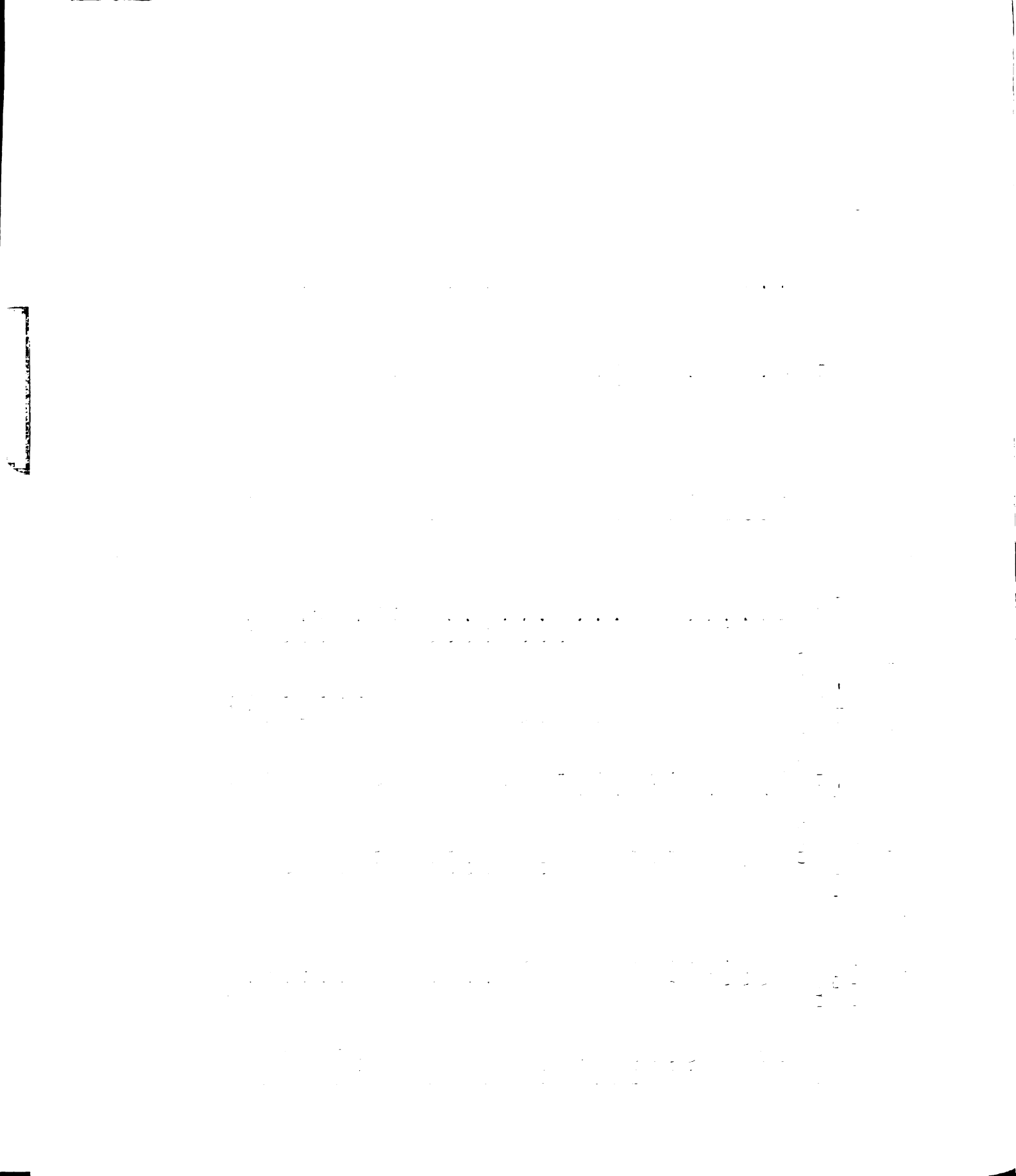


TABLE A8-2. SERIES 2 HOUSING REQUIREMENTS FOR THE SOUTH -  
COMPONENTS OF HOUSING REQUIREMENTS

YEAR	HOUSEHOLD VACANCY REPLACEMENT		NET MOBILE HOUSING		STOCK	OCCUPIED UNITS	VACANT UNITS	RATE	(PERCENTAGES)		
	FORMATION CHANGE	CONV. MOBILE ADDITIONS	ADDITIONS	REPLAC. RATE					CONV. OVERALL		
1970	355	-30	268	34	89	20606	18648	1958	9.50	1.35	1.47
1971	342	64	272	38	88	21011	18990	2021	9.62	1.34	1.47
1972	375	68	276	43	98	21455	19365	2090	9.74	1.34	1.49
1973	380	70	281	47	93	21905	19745	2160	9.86	1.34	1.50
1974	386	72	286	51	98	22363	20131	2232	9.98	1.34	1.51
1975	393	74	291	56	100	22830	20524	2306	10.10	1.34	1.52
1976	377	63	296	61	95	23270	20901	2369	10.18	1.34	1.53
1977	392	66	301	65	86	23727	21293	2434	10.26	1.34	1.54
1978	398	67	306	69	90	24192	21691	2501	10.34	1.34	1.55
1979	399	68	311	73	89	24660	22090	2570	10.42	1.34	1.56
1980	401	69	316	78	92	25130	22491	2639	10.50	1.34	1.57
1981	395	69	322	82	90	25594	22886	2708	10.58	1.34	1.58
1982	396	70	327	87	81	26060	23282	2778	10.66	1.34	1.59
1983	387	70	332	91	79	26517	23669	2848	10.74	1.34	1.59
1984	377	70	337	94	76	26963	24046	2917	10.82	1.35	1.60
1985	363	69	343	98	70	27394	24408	2986	10.90	1.35	1.61
1986	376	71	347	101	71	27842	24785	3057	10.98	1.35	1.61
1987	355	69	353	104	62	28266	25140	3126	11.06	1.35	1.62
1988	349	69	358	107	59	28684	25489	3195	11.14	1.35	1.62
1989	342	69	363	110	56	29096	25831	3265	11.22	1.35	1.63
1990	329	68	368	113	51	29493	26160	3333	11.30	1.35	1.63
1991	308	66	373	115	43	29867	26468	3399	11.38	1.35	1.63
1992	316	68	377	117	44	30250	26784	3467	11.46	1.35	1.63
1993	310	68	382	119	44	30628	27094	3534	11.54	1.35	1.64
1994	313	69	386	121	45	31010	27406	3603	11.62	1.35	1.64
1995	316	70	391	124	50	31396	27722	3673	11.70	1.35	1.64
1996	320	71	396	126	53	31786	28042	3744	11.78	1.35	1.64
1997	330	73	400	129	61	32190	28372	3818	11.86	1.35	1.64
1998	343	76	405	132	65	32609	28715	3893	11.94	1.35	1.65
1999	351	78	410	136	68	33037	29066	3971	12.02	1.35	1.65
2000	363	80	414	139	75	33480	29429	4051	12.10	1.35	1.65



TABLE A9-2. SERIES 2 HOUSING REQUIREMENTS FOR THE WEST -  
TYPE OF UNIT REQUIRED

YEAR	TOTAL ALL TYPES	NEW CONSTRUCTION			MOBILE HOMES	REGIONAL PERCENTAGES		
		TOTAL	1- UNIT	MULTI- UNIT		PERCENT 1-UNIT	TOTAL UNITS	NEW CONSTR.
		(THOUSANDS OF UNITS)						
1970	409	254	145	109	155	57.2	24.6	20.4
1971	501	333	174	160	168	52.1	24.6	20.9
1972	533	348	193	156	184	55.3	24.2	20.5
1973	544	362	203	159	182	56.1	24.3	20.8
1974	558	365	198	167	194	54.3	24.3	20.7
1975	573	371	198	173	202	53.3	24.4	20.6
1976	590	378	205	173	212	54.3	24.8	20.9
1977	607	406	239	167	201	58.9	24.7	21.3
1978	621	409	240	169	212	58.7	24.7	21.2
1979	632	416	249	167	216	59.8	24.8	21.3
1980	644	418	246	172	226	58.8	24.9	21.3
1981	667	431	252	179	236	58.4	25.4	21.7
1982	677	449	289	160	228	64.4	25.4	22.0
1983	680	450	290	160	230	64.5	25.6	22.2
1984	682	451	294	158	231	65.1	25.8	22.4
1985	681	453	303	150	228	66.8	26.0	22.7
1986	672	446	308	138	226	69.0	25.6	22.3
1987	664	446	320	126	218	71.7	25.8	22.7
1988	667	450	328	122	217	72.8	25.9	22.9
1989	670	452	331	121	217	73.2	26.0	23.0
1990	667	453	334	119	214	73.7	26.2	23.3
1991	663	457	344	114	206	75.1	26.8	24.1
1992	676	466	349	117	210	74.9	26.8	24.1
1993	678	464	344	120	214	74.1	26.9	24.1
1994	687	468	342	126	220	73.2	26.9	24.1
1995	698	467	333	135	230	71.2	26.9	23.9
1996	720	478	335	143	242	70.1	27.6	24.4
1997	736	479	322	156	258	67.3	27.5	24.1
1998	755	487	320	166	268	65.8	27.4	24.0
1999	769	491	320	172	274	65.1	27.4	23.8
2000	788	496	313	183	292	63.2	27.3	23.6



TABLE A10-2. SERIES 1 HOUSING REQUIREMENTS FOR THE WEST -  
COMPONENTS OF HOUSING REQUIREMENTS

YEAR	HOUSEHOLD FORMATION	VACANCY CHANGE	REPLACEMENT CONV. MOBILE (THOUSANDS OF UNITS)	NET MOBILE ADDITIONS	HOUSING STOCK	OCCUPIED UNITS	VACANT UNITS	VACANCY RATE (PERCENTAGES)	REPLAC. CONV. OVERALL RATE
1970	265	-25	122	32	108	10680	992	8.50	1.11
1971	278	47	124	36	116	10958	1039	8.66	1.10
1972	298	50	127	40	126	11256	1089	8.82	1.10
1973	301	51	129	44	119	11556	1140	8.98	1.10
1974	305	53	132	49	125	11861	1193	9.14	1.10
1975	309	55	135	54	128	12170	1248	9.30	1.10
1976	323	48	138	59	132	12493	1296	9.40	1.10
1977	332	50	142	63	118	12825	1346	9.50	1.10
1978	336	51	145	68	123	13161	1398	9.60	1.10
1979	337	52	148	73	121	13498	1450	9.70	1.10
1980	339	53	151	78	126	13837	1503	9.80	1.10
1981	351	56	155	83	130	14188	1559	9.90	1.10
1982	352	57	158	88	117	14539	1615	10.00	1.10
1983	346	57	162	92	114	14885	1672	10.10	1.10
1984	340	57	165	97	111	15225	1729	10.20	1.10
1985	331	57	169	101	104	15556	1786	10.30	1.10
1986	319	52	172	105	98	15875	1839	10.38	1.10
1987	306	52	175	109	87	16182	1890	10.46	1.10
1988	302	52	179	113	83	16483	1942	10.54	1.11
1989	298	52	182	116	79	16781	1994	10.62	1.11
1990	289	52	185	119	73	17071	2045	10.70	1.11
1991	281	51	188	122	63	17352	2097	10.78	1.11
1992	286	52	192	125	64	17638	2149	10.86	1.11
1993	282	52	195	128	65	17920	2201	10.94	1.11
1994	284	53	198	131	67	18204	2254	11.02	1.11
1995	286	54	201	134	73	18489	2309	11.10	1.11
1996	298	56	204	137	81	18788	2365	11.18	1.11
1997	305	58	207	141	91	19092	2423	11.26	1.11
1998	313	59	210	145	96	19405	2482	11.34	1.11
1999	318	61	214	149	100	19723	2543	11.42	1.11
2000	326	62	217	154	109	20049	2605	11.50	1.11



TABLE A1-3. SERIES 30 HOUSING REQUIREMENTS FOR THE UNITED STATES -  
TYPE OF UNIT REQUIRED

YEAR	TOTAL ALL TYPES	NEW CONSTRUCTION			PERCENT 1-UNIT	MOBILE HOMES
		TOTAL (THOUSANDS OF UNITS)	1-UNIT	MULTI-UNIT		
1970	1644	1265	698	567	55.2	379
1971	1694	1293	691	601	53.5	402
1972	1830	1383	774	609	55.9	448
1973	1868	1423	809	614	56.8	445
1974	1908	1434	788	646	55.0	474
1975	1954	1459	788	671	54.0	495
1976	2002	1490	819	671	55.0	512
1977	2071	1580	940	640	59.5	491
1978	2110	1595	947	647	59.4	516
1979	2143	1615	974	642	60.3	528
1980	2171	1620	962	658	59.4	551
1981	2202	1634	966	668	59.1	568
1982	2226	1678	1092	586	65.1	548
1983	2216	1663	1084	579	65.2	553
1984	2204	1650	1085	565	65.8	555
1985	2182	1634	1101	532	67.4	549
1986	2185	1633	1137	496	69.6	551
1987	2141	1607	1161	447	72.2	533
1988	2143	1611	1182	429	73.4	532
1989	2135	1603	1183	420	73.8	532
1990	2104	1582	1178	404	74.4	521
1991	2046	1545	1168	378	75.6	501
1992	2106	1593	1207	386	75.8	513
1993	2091	1573	1182	391	75.1	518
1994	2113	1584	1180	404	74.5	529
1995	2132	1583	1154	428	72.9	549
1996	2168	1596	1150	446	72.1	572
1997	2213	1611	1123	487	69.7	603
1998	2272	1647	1126	521	68.4	625
1999	2315	1669	1132	537	67.8	646
2000	2368	1692	1117	575	66.0	676

TABLE A2-J. SERIES 30 HOUSING REQUIREMENTS FOR THE UNITED STATES -  
COMPONENTS OF HOUSING REQUIREMENTS

YEAR	HOUSEHOLD FORMATION			VACANCY REPLACEMENT		NET MOBILE ADDITIONS		HOUSING STOCK		OCCUPIED UNITS		VACANT UNITS		VACANCY RATE		REPLACEMENT RATE		OVERALL RATE
	CHANGES	CONV.	(THOUSANDS OF UNITS)	CONV.	(THOUSANDS OF UNITS)	ADDITIONS	STOCK	UNITS	UNITS	PERCENTAGES	PERCENTAGES	UNITS	UNITS	PERCENTAGES	PERCENTAGES			
1970	861	87	546	112	229	67222	61155	6067	9.03	.84	.98							
1971	890	89	553	122	239	68201	62045	6156	9.03	.84	.99							
1972	992	99	560	135	268	69292	63037	6255	9.03	.84	1.00							
1973	1009	101	568	146	255	70402	64046	6356	9.03	.84	1.01							
1974	1024	102	576	158	268	71528	65070	6459	9.03	.84	1.03							
1975	1046	104	584	171	275	72679	66116	6563	9.03	.84	1.04							
1976	1069	106	592	183	278	73854	67185	6669	9.03	.84	1.05							
1977	1116	111	600	195	247	75081	68301	6781	9.03	.84	1.06							
1978	1131	113	609	206	258	76325	69432	6893	9.03	.84	1.07							
1979	1140	113	618	218	256	77578	70572	7007	9.03	.84	1.08							
1980	1144	114	627	231	265	78836	71716	7120	9.03	.84	1.09							
1981	1151	114	636	243	268	80101	72867	7235	9.03	.84	1.10							
1982	1156	115	646	255	239	81372	74023	7350	9.03	.84	1.11							
1983	1128	112	655	266	232	82612	75151	7462	9.03	.85	1.11							
1984	1099	109	664	277	223	83821	76250	7571	9.03	.85	1.12							
1985	1062	106	673	286	207	84988	77312	7677	9.03	.85	1.13							
1986	1047	104	682	296	200	86140	78359	7781	9.03	.85	1.14							
1987	993	99	691	304	175	87232	79352	7880	9.03	.85	1.14							
1988	980	98	700	312	167	88310	80332	7977	9.03	.85	1.15							
1989	958	95	708	320	159	89364	81291	8073	9.03	.85	1.15							
1990	917	91	716	327	142	90372	82207	8164	9.03	.85	1.15							
1991	854	85	725	333	118	91310	83061	8249	9.03	.85	1.16							
1992	894	89	732	339	123	92294	83955	8338	9.03	.85	1.16							
1993	868	87	740	344	122	93248	84823	8425	9.04	.85	1.16							
1994	874	87	748	350	126	94210	85698	8512	9.04	.85	1.17							
1995	877	87	756	357	137	95174	86575	8600	9.04	.86	1.17							
1996	894	89	763	364	151	96158	87469	8689	9.04	.86	1.17							
1997	918	92	771	372	170	97167	88387	8781	9.04	.86	1.18							
1998	954	95	779	381	182	98217	89341	8876	9.04	.86	1.18							
1999	976	97	787	390	191	99290	90317	8973	9.04	.86	1.19							
2000	1005	100	795	400	208	100395	91322	9073	9.04	.86	1.19							

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TABLE A3-3. SERIES 30 HOUSING REQUIREMENTS FOR THE NORTH EAST -  
TYPE OF UNIT REQUIRED

YEAR	TOTAL ALL TYPES	NEW CONSTRUCTION					MOBILE HOMES	REGIONAL PERCENTAGES		
		TOTAL	1- UNIT	MULTI- UNIT	PERCENT 1-UNIT	TOTAL UNITS		NEW CONSTR.	POPULATION	
(THOUSANDS OF UNITS)										
1970	276	239	88	151	36.7	37	16.8	18.9	25.3	
1971	275	237	84	152	35.5	38	16.2	18.3	25.2	
1972	306	262	99	163	37.7	44	16.7	19.0	25.1	
1973	313	269	103	165	38.5	44	16.7	18.9	25.0	
1974	319	272	101	172	37.0	47	16.7	19.0	24.9	
1975	328	278	101	178	36.2	49	16.8	19.1	24.8	
1976	334	283	105	178	37.1	51	16.7	19.0	24.7	
1977	349	299	123	177	41.0	50	16.9	18.9	24.6	
1978	356	303	124	179	40.9	53	16.9	19.0	24.5	
1979	361	307	128	179	41.7	54	16.8	19.0	24.4	
1980	364	308	126	182	41.0	56	16.8	19.0	24.4	
1981	363	305	124	181	40.8	57	16.5	18.7	24.3	
1982	366	310	142	169	45.7	56	16.4	18.5	24.2	
1983	361	305	139	165	45.7	56	16.3	18.3	24.1	
1984	356	299	138	161	46.2	57	16.1	18.1	24.0	
1985	348	292	139	153	47.5	56	15.9	17.9	23.9	
1986	328	273	134	140	48.9	55	15.0	16.7	23.9	
1987	315	262	133	129	50.8	53	14.7	16.3	23.8	
1988	314	260	134	126	51.6	53	14.6	16.2	23.7	
1989	309	256	133	123	51.9	53	14.5	16.0	23.6	
1990	300	248	130	118	52.3	52	14.3	15.7	23.5	
1991	286	236	125	111	53.0	51	14.0	15.3	23.4	
1992	298	247	131	115	53.3	52	14.2	15.5	23.3	
1993	293	241	127	114	52.7	52	14.0	15.3	23.3	
1994	296	243	127	116	52.3	53	14.0	15.4	23.2	
1995	299	244	125	119	51.1	55	14.0	15.4	23.1	
1996	291	236	118	118	50.1	55	13.4	14.8	23.0	
1997	300	242	117	125	48.5	58	13.5	15.0	22.9	
1998	311	251	119	132	47.5	60	13.7	15.3	22.9	
1999	318	257	121	136	47.1	62	13.8	15.4	22.8	
2000	323	264	121	143	45.7	64	13.9	15.6	22.7	

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TABLE A4-3. SERIES 30 HOUSING REQUIREMENTS FOR THE NORTH EAST -  
COMPONENTS OF HOUSING REQUIREMENTS

YEAR	HOUSEHOLD FORMATION	VACANCY CHANGE	REPLACEMENT CONV. MOBILE (THOUSANDS OF UNITS)	NET MOBILE ADDITIONS	MOBILE STOCK	OCCUPIED UNITS	VACANT UNITS	VACANCY RATE (PERCENTAGES)	REPLAC. CONV. OVERALL (PERCENTAGES)	RATE
1970	163	16	79	14	19	16922	15399	9.00	.47	.55
1971	160	16	80	15	19	17098	15559	9.00	.47	.56
1972	166	18	80	17	23	17302	15745	9.00	.47	.56
1973	190	19	81	18	22	17511	15935	9.00	.47	.57
1974	194	19	82	19	23	17724	16129	9.00	.47	.57
1975	199	20	83	21	24	17943	16328	9.00	.47	.58
1976	203	20	84	22	24	18166	16531	9.00	.47	.58
1977	214	21	85	23	21	18402	16745	9.00	.47	.59
1978	218	22	86	25	23	18641	16964	9.00	.47	.59
1979	220	22	87	26	22	18883	17184	9.00	.47	.60
1980	221	22	88	27	23	19127	17405	9.00	.47	.60
1981	218	22	89	29	23	19366	17623	9.00	.47	.61
1982	219	22	90	30	20	19606	17842	9.00	.47	.61
1983	212	21	91	31	20	19839	18054	9.00	.47	.62
1984	205	20	92	32	19	20065	18259	9.00	.47	.62
1985	196	19	93	33	17	20281	18455	9.00	.47	.62
1986	177	17	94	34	15	20475	18632	9.00	.48	.63
1987	164	16	95	35	13	20655	18796	9.00	.48	.63
1988	161	16	96	36	12	20832	18957	9.00	.48	.63
1989	156	15	96	36	11	21003	19113	9.00	.48	.63
1990	146	14	97	37	10	21164	19259	9.00	.48	.63
1991	133	13	98	38	8	21309	19392	9.00	.48	.64
1992	142	14	99	38	9	21466	19534	9.00	.48	.64
1993	137	14	99	39	8	21616	19670	9.00	.48	.64
1994	138	14	100	39	9	21768	19809	9.00	.48	.64
1995	139	14	101	40	10	21921	19948	9.00	.48	.64
1996	131	13	101	40	10	22065	20079	9.00	.48	.64
1997	137	14	102	41	11	22216	20216	9.00	.48	.64
1998	146	14	103	42	12	22376	20362	9.00	.48	.64
1999	151	15	103	42	13	22543	20514	9.00	.48	.65
2000	158	16	104	43	14	22717	20672	9.00	.48	.65





TABLE A5-3. SERIES 30 HOUSING REQUIREMENTS FOR THE NORTH CENTRAL REGION -  
TYPE OF UNIT REQUIRED

YEAR	TOTAL ALL TYPES	NEW CONSTRUCTION			MOBILE HOMES	REGIONAL PERCENTAGES		
		TOTAL	1- UNIT (THOUSANDS OF UNITS)	MULTI- UNIT PERCENT 1-UNIT		TOTAL UNITS	NEW CONSTR.	POPULATION
1970	324	251	145	106	57.8	19.7	19.9	27.0
1971	364	280	154	126	55.0	21.5	21.7	26.9
1972	401	305	176	129	57.6	21.9	22.1	26.8
1973	410	314	184	130	58.6	22.0	22.0	26.7
1974	420	317	179	138	56.6	22.0	22.1	26.7
1975	431	323	179	144	55.5	22.1	22.1	26.6
1976	461	344	194	150	56.3	23.0	23.1	26.5
1977	479	365	225	141	61.5	23.1	23.1	26.4
1978	488	369	227	143	61.4	23.1	23.1	26.4
1979	496	374	233	141	62.4	23.1	23.1	26.3
1980	502	374	230	145	61.4	23.1	23.1	26.3
1981	514	382	233	149	61.0	23.4	23.4	26.2
1982	520	391	265	126	67.8	23.3	23.3	26.2
1983	516	386	262	124	67.8	23.3	23.2	26.1
1984	511	381	261	120	68.4	23.2	23.1	26.1
1985	504	375	264	112	70.3	23.1	23.0	26.1
1986	510	379	275	105	72.4	23.3	23.2	26.0
1987	497	370	278	92	75.2	23.2	23.0	26.0
1988	496	370	283	87	76.5	23.1	23.0	26.0
1989	493	367	282	85	76.9	23.1	22.9	25.9
1990	483	360	279	81	77.5	23.0	22.7	25.9
1991	455	337	264	73	78.4	22.2	21.8	25.9
1992	470	349	275	74	78.7	22.3	21.9	25.8
1993	465	343	268	76	77.9	22.2	21.8	25.8
1994	469	346	267	79	77.2	22.2	21.8	25.7
1995	473	346	261	84	75.6	22.2	21.8	25.7
1996	478	346	257	89	74.4	22.0	21.7	25.7
1997	489	351	252	99	71.9	22.1	21.8	25.6
1998	503	360	254	106	70.4	22.1	21.9	25.6
1999	514	366	256	110	69.9	22.2	21.9	25.5
2000	526	372	253	119	67.9	22.2	22.0	25.5

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TABLE A6-3. SERIES 30 HOUSING REQUIREMENTS FOR THE NORTH CENTRAL REGION -  
COMPONENTS OF HOUSING REQUIREMENTS

YEAR	HOUSEHOLD FORMATION	VACANCY CHANGE	REPLACEMENT CONV. MOBILE (THOUSANDS OF UNITS)	NET MOBILE ADDITIONS	HOUSING STOCK	OCCUPIED UNITS	VACANT UNITS	VACANCY RATE	REPLAC. CONV. OVERALL (PERCENTAGES)	RATE
1970	155	14	117	30	18841	17277	1564	8.30	.64	.78
1971	188	17	118	33	19046	17465	1581	8.30	.64	.79
1972	217	20	119	36	19282	17682	1600	8.30	.64	.80
1973	222	20	120	39	19524	17904	1620	8.30	.64	.81
1974	226	20	121	42	19770	18129	1641	8.30	.64	.83
1975	232	21	123	45	20023	18361	1662	8.30	.64	.84
1976	254	23	124	48	20300	18615	1685	8.30	.64	.85
1977	267	24	125	51	20592	18883	1709	8.30	.64	.86
1978	271	25	127	54	20888	19154	1734	8.30	.64	.86
1979	274	25	128	57	21186	19428	1758	8.30	.64	.87
1980	275	25	130	60	21486	19703	1783	8.30	.64	.88
1981	281	25	132	63	21793	19984	1809	8.30	.64	.89
1982	283	26	133	65	22102	20267	1834	8.30	.64	.90
1983	275	25	135	68	22402	20542	1859	8.30	.64	.91
1984	267	24	136	71	22693	20809	1884	8.30	.64	.91
1985	257	23	138	73	22973	21067	1907	8.30	.64	.92
1986	259	23	140	75	23255	21325	1930	8.30	.64	.92
1987	244	22	141	77	23521	21569	1952	8.30	.64	.93
1988	240	22	143	79	23783	21809	1974	8.30	.64	.93
1989	234	21	144	81	24038	22043	1995	8.30	.64	.93
1990	223	20	146	82	24282	22266	2015	8.30	.64	.94
1991	195	18	147	83	24494	22461	2033	8.30	.64	.94
1992	206	19	148	85	24719	22667	2052	8.30	.64	.94
1993	199	18	150	86	24936	22866	2070	8.30	.64	.94
1994	201	18	151	87	25155	23067	2088	8.30	.64	.95
1995	202	18	152	89	25375	23269	2106	8.30	.64	.95
1996	203	18	153	90	25596	23472	2125	8.30	.64	.95
1997	210	19	154	92	25825	23682	2143	8.30	.64	.95
1998	220	20	156	94	26065	23901	2163	8.30	.64	.96
1999	226	20	157	96	26311	24127	2184	8.30	.64	.96
2000	234	21	158	98	26565	24360	2205	8.30	.64	.96



TABLE A7-3. SERIES 30 HOUSING REQUIREMENTS FOR THE SOUTH -  
TYPE OF UNIT REQUIRED

YEAR	TOTAL ALL TYPES	NEW CONSTRUCTION			MOBILE HOMES	REGIONAL PERCENTAGES		
		TOTAL	1- UNIT (THOUSANDS OF UNITS)	MULTI- UNIT 1-UNIT		TOTAL UNITS	NEW CONSTR.	POPULATION
1970	630	505	316	189	125	38.3	39.9	30.6
1971	622	496	304	192	126	36.7	38.4	30.6
1972	664	524	334	190	140	36.3	37.9	30.7
1973	677	537	347	190	139	36.2	37.8	30.7
1974	690	542	340	202	148	36.2	37.8	30.8
1975	705	551	340	211	155	36.1	37.7	30.8
1976	696	542	341	201	153	34.7	36.4	30.8
1977	718	570	384	186	148	34.6	36.1	30.8
1978	731	575	387	189	155	34.6	36.1	30.8
1979	742	583	396	186	159	34.6	36.1	30.8
1980	751	585	393	193	166	34.6	36.1	30.8
1981	752	584	390	194	168	34.2	35.7	30.8
1982	761	598	433	164	163	34.2	35.6	30.8
1983	759	595	431	163	164	34.2	35.7	30.8
1984	756	591	432	160	165	34.3	35.9	30.8
1985	751	588	438	150	163	34.4	36.0	30.8
1986	774	606	463	143	168	35.4	37.1	30.8
1987	762	599	472	127	162	35.6	37.3	30.8
1988	764	602	480	121	162	35.6	37.3	30.9
1989	762	600	482	119	162	35.7	37.5	30.9
1990	754	595	481	115	159	35.8	37.6	30.9
1991	741	588	481	107	153	36.2	38.0	30.9
1992	760	603	495	108	156	36.1	37.9	30.9
1993	756	598	487	111	158	36.2	38.0	31.0
1994	764	603	487	116	161	36.2	38.0	31.0
1995	771	603	479	125	167	36.1	38.1	31.0
1996	786	612	480	132	174	36.3	38.4	31.0
1997	801	618	471	147	183	36.2	38.4	31.0
1998	820	630	472	158	190	36.1	38.3	31.1
1999	834	638	475	163	196	36.0	38.2	31.1
2000	851	648	470	176	205	35.9	38.2	31.1

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TABLE A8-3. SERIES 30 HOUSING REQUIREMENTS FOR THE SOUTH -  
COMPONENTS OF HOUSING REQUIREMENTS

YEAR	HOUSEHOLD FORMATION	VACANCY CHANGE	REPLACEMENT CONV. MOBILE (THOUSANDS OF UNITS)	NET MOBILE ADDITIONS	HOUSING STOCK	OCCUPIED UNITS	VACANT UNITS	VACANCY RATE (PERCENTAGES)	REPLAC. CONV. OVERALL (PERCENTAGES)	RATE
1970	307	33	242	35	20075	18108	1967	9.80	1.25	1.38
1971	294	32	245	38	20401	18402	1999	9.80	1.25	1.39
1972	324	35	248	42	20760	18726	2034	9.80	1.25	1.40
1973	329	36	252	46	21125	19055	2070	9.80	1.25	1.41
1974	333	36	256	50	21495	19388	2106	9.80	1.25	1.42
1975	340	37	259	53	21872	19728	2143	9.80	1.25	1.43
1976	324	35	263	57	22231	20053	2179	9.80	1.25	1.44
1977	338	37	267	61	22606	20391	2215	9.80	1.25	1.45
1978	343	37	271	64	22986	20734	2253	9.80	1.25	1.46
1979	345	38	275	68	23369	21079	2290	9.80	1.25	1.47
1980	347	38	279	72	23754	21426	2328	9.80	1.25	1.48
1981	340	37	282	76	24131	21766	2365	9.80	1.25	1.48
1982	342	37	286	79	24510	22108	2402	9.80	1.25	1.49
1983	333	36	290	82	24880	22441	2438	9.80	1.25	1.50
1984	325	35	294	86	25240	22766	2473	9.80	1.25	1.51
1985	314	34	298	89	25588	23080	2508	9.80	1.25	1.51
1986	328	36	302	92	25951	23408	2543	9.80	1.25	1.52
1987	312	34	306	94	26297	23720	2577	9.80	1.25	1.52
1988	308	33	309	96	26638	24028	2611	9.80	1.25	1.52
1989	301	33	313	99	26972	24329	2643	9.80	1.25	1.53
1990	289	31	317	101	27293	24618	2675	9.80	1.25	1.53
1991	273	30	321	103	27595	24891	2704	9.80	1.25	1.53
1992	285	31	324	104	27911	25175	2735	9.80	1.25	1.53
1993	277	30	328	106	28218	25452	2765	9.80	1.26	1.54
1994	279	30	331	108	28527	25731	2796	9.80	1.26	1.54
1995	279	30	334	110	28836	26010	2826	9.80	1.26	1.54
1996	288	31	338	112	29156	26298	2857	9.80	1.25	1.54
1997	295	32	341	114	29483	26593	2889	9.80	1.25	1.55
1998	306	33	345	117	29822	26899	2923	9.80	1.25	1.55
1999	312	34	348	120	30168	27212	2956	9.80	1.25	1.55
2000	321	35	352	123	30524	27532	2991	9.80	1.25	1.56



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TABLE A9-3. SERIES 30 HOUSING REQUIREMENTS FOR THE WEST -  
TYPE OF UNIT REQUIRED

YEAR	TOTAL ALL TYPES	NEW CONSTRUCTION				MOBILE HOMES	REGIONAL PERCENTAGES		
		TOTAL	1- UNIT	MULTI- UNIT	PERCENT 1-UNIT		TOTAL UNITS	NEW CONSTR.	POPULATION
(THOUSANDS OF UNITS)									
1970	413	270	149	121	55.3	143	25.1	21.3	17.1
1971	433	280	149	131	53.4	154	25.6	21.6	17.3
1972	460	292	165	127	56.5	168	25.1	21.1	17.4
1973	469	303	174	129	57.5	165	25.1	21.3	17.6
1974	479	303	169	135	55.6	175	25.1	21.2	17.7
1975	490	308	168	140	54.7	182	25.1	21.1	17.8
1976	512	321	178	142	55.7	191	25.6	21.5	18.0
1977	526	346	209	137	60.5	180	25.4	21.9	18.1
1978	536	347	210	137	60.5	189	25.4	21.8	18.3
1979	545	352	216	136	61.4	192	25.4	21.8	18.4
1980	553	352	213	139	60.5	201	25.5	21.7	18.5
1981	573	363	218	145	60.1	210	26.0	22.2	18.7
1982	579	379	252	127	66.6	201	26.0	22.6	18.8
1983	581	378	252	126	66.6	202	26.2	22.7	18.9
1984	581	378	254	124	67.2	203	26.4	22.9	19.1
1985	579	379	261	118	69.0	201	26.5	23.2	19.2
1986	573	375	266	109	70.9	199	26.2	23.0	19.3
1987	567	376	277	99	73.7	191	26.5	23.4	19.4
1988	570	379	284	95	74.9	191	26.6	23.5	19.5
1989	571	380	286	94	75.4	191	26.7	23.7	19.6
1990	566	380	289	91	76.1	186	26.9	24.0	19.7
1991	564	385	298	86	77.5	180	27.6	24.9	19.8
1992	578	394	306	88	77.7	184	27.4	24.7	19.9
1993	577	391	300	90	76.9	186	27.6	24.8	20.0
1994	583	392	299	94	76.2	191	27.6	24.8	20.1
1995	589	390	290	100	74.4	200	27.6	24.6	20.2
1996	612	401	294	107	73.4	211	28.3	25.1	20.3
1997	624	400	283	117	70.7	224	28.2	24.8	20.4
1998	638	405	281	125	69.2	233	28.1	24.6	20.5
1999	649	408	280	128	68.6	241	28.0	24.5	20.6
2000	662	410	273	136	66.7	253	28.0	24.2	20.7

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TABLE A10-3. SERIES 30 HOUSING REQUIREMENTS FOR THE WEST -  
COMPONENTS OF HOUSING REQUIREMENTS

YEAR	HOUSEHOLD FORMATION	VACANCY CHANGE	REPLACEMENT		NET MOBILE ADDITIONS	HOUSING STOCK	OCCUPIED UNITS	VACANT UNITS	VACANCY RATE (PERCENTAGES)	REPLAC. CONV. (PERCENTAGES)	OVERALL RATE
			CONV.	MOBILE							
			(THOUSANDS OF UNITS)								
1970	235	23	108	33	96	11383	10370	1013	8.90	1.01	1.23
1971	248	24	110	36	102	11656	10618	1037	8.90	1.00	1.25
1972	265	26	112	40	111	11947	10884	1063	8.90	1.00	1.27
1973	268	26	114	44	105	12242	11152	1090	8.90	1.00	1.29
1974	271	26	116	47	110	12539	11423	1116	8.90	1.00	1.31
1975	275	27	119	51	113	12841	11698	1143	8.90	1.00	1.32
1976	268	28	121	56	116	13157	11986	1171	8.90	1.00	1.34
1977	296	29	123	59	102	13482	12282	1200	8.90	1.00	1.36
1978	299	29	126	63	107	13809	12580	1229	8.90	1.00	1.37
1979	300	29	128	68	106	14139	12881	1258	8.90	1.00	1.39
1980	301	29	131	72	109	14469	13181	1288	8.90	1.00	1.40
1981	312	30	133	76	113	14811	13493	1318	8.90	1.00	1.41
1982	313	31	136	80	100	15155	13806	1349	8.90	1.00	1.43
1983	307	30	139	84	98	15492	14113	1379	8.90	1.00	1.44
1984	302	29	141	88	95	15823	14415	1408	8.90	1.01	1.45
1985	295	29	144	92	89	16147	14710	1437	8.90	1.01	1.46
1986	284	28	147	95	84	16458	14994	1465	8.90	1.01	1.47
1987	274	27	149	98	74	16759	15267	1492	8.90	1.01	1.48
1988	271	26	152	101	71	17057	15539	1518	8.90	1.01	1.48
1989	267	26	154	104	68	17350	15806	1544	8.90	1.01	1.49
1990	259	25	157	107	61	17634	16064	1569	8.90	1.01	1.49
1991	253	25	159	109	53	17912	16318	1594	8.90	1.01	1.50
1992	261	26	162	111	54	18198	16579	1620	8.90	1.01	1.50
1993	256	25	164	114	54	18479	16834	1645	8.90	1.01	1.50
1994	256	25	166	116	56	18761	17091	1670	8.90	1.01	1.51
1995	257	25	169	119	61	19042	17348	1695	8.90	1.01	1.51
1996	272	27	171	122	68	19341	17619	1721	8.90	1.01	1.51
1997	276	27	173	125	76	19644	17896	1748	8.90	1.01	1.52
1998	283	28	176	128	81	19954	18178	1776	8.90	1.01	1.53
1999	287	28	178	132	84	20269	18465	1804	8.90	1.01	1.53
2000	292	29	181	136	91	20589	18757	1832	8.90	1.01	1.54

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APPENDIX B - DEMOGRAPHIC TABLES



## APPENDIX B

### DEMOGRAPHIC TABLES

- Table B1. Series A U.S. demographic summary for households by type of unit.
- Table B2. Series A U.S. demographic summary for households by type of unit.
- Table B3. Series A U.S. demographic summary by age class for population.
- Table B4. Series A U.S. demographic summary by age class for headship.
- Table B5. Series A U.S. demographic summary by age class for total households.
- Table B6. Series A U.S. demographic summary by age class for the household increment.
- Table B7. Series A U.S. demographic summary by age class for ownership rates.
- Table B8. Series A U.S. demographic summary by age class for total homeowners.
- Table B9. Series A U.S. demographic summary by age class for the homeowner increment.
- Table B10. Series A U.S. demographic summary by age class for single-family housing occupancy rates.
- Table B11. Series A U.S. demographic summary by age class for single-family housing incremental occupancy rates.
- Table B12. Series A U.S. demographic summary by age class for total occupied single-family houses.
- Table B13. Series A U.S. demographic summary by age class for the increment to occupied single-family houses.
- Table B14. Series A U.S. demographic summary by age class for multiunit housing occupancy rates.



- Table B15. Series A U.S. demographic summary by age class for multiunit housing incremental occupancy rates.
- Table B16. Series A U.S. demographic summary by age class for total occupied multiunit housing.
- Table B17. Series A U.S. demographic summary by age class for the increment to occupied multiunit housing.
- Table B18. Series A U.S. demographic summary by age class for mobile home occupancy rates.
- Table B19. Series A U.S. demographic summary by age class for mobile home incremental occupancy rates.
- Table B20. Series A U.S. demographic summary by age class for total occupied mobile homes.
- Table B21. Series A U.S. demographic summary by age class for the increment to occupied mobile homes.
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- Table B26. Series B U.S. demographic summary for households by type of unit.
- Table B27. Series B U.S. demographic summary for households by type of unit.
- Table B28. Series K U.S. demographic summary for households by type of unit.
- Table B29. Series K U.S. demographic summary for households by type of unit.

TABLE B1. SERIES A  
U.S. DEMOGRAPHIC SUMMARY FOR HOUSEHOLDS BY TYPE OF UNIT

YEAR	TOTALS BY TYPE OF UNIT OCCUPIED					2ND HOME	NET CHANGE FROM PREVIOUS PERIOD				2ND HOME	
	HOUSE- HOLDS	OWNER	1- UNIT		MULTI- UNIT		HOUSE- HOLDS	OWNER	1- UNIT			MULTI- UNIT
			(THOUSANDS)	MOBILE HOME					(THOUSANDS)	MOBILE HOME		
1970	63251	38234	41413	19760	2181	3554	1291	657	439	549	303	146
1971	64333	38172	41762	20238	2437	3690	1082	538	349	478	256	136
1972	65638	39464	42225	20766	2750	3832	1305	692	463	528	314	143
1973	66941	40162	42709	21289	3047	3978	1303	699	484	522	297	145
1974	68262	40852	43171	21837	3357	4122	1321	690	462	548	310	145
1975	69606	41547	43630	22405	3674	4268	1344	695	459	568	317	145
1976	71011	42283	44126	22985	4003	4417	1406	736	497	580	329	149
1977	72382	43062	44700	23500	4285	4571	1370	779	573	515	282	154
1978	73747	43834	45266	24009	4574	4727	1365	772	567	510	289	156
1979	75309	44725	45937	24575	4900	4892	1563	892	671	566	326	165
1980	76793	45566	46556	25123	5218	5055	1484	841	619	547	318	164
1981	78289	46411	47176	25678	5538	5221	1496	844	620	556	320	165
1982	79799	47319	47918	26152	5831	5405	1510	908	743	474	293	165
1983	81277	48216	48649	26614	6116	5591	1478	898	731	462	285	166
1984	82751	49122	49392	27065	6397	5781	1474	906	743	451	281	190
1985	84160	50016	50136	27470	6656	5973	1408	894	745	405	259	192
1986	85464	50884	50883	27798	6886	6171	1304	869	747	328	229	197
1987	86696	51739	51643	28069	7087	6379	1232	855	760	271	201	208
1988	87907	52586	52412	28320	7278	6603	1211	847	770	251	191	224
1989	89100	53420	53180	28561	7461	6826	1193	834	768	241	184	222
1990	90251	54225	53936	28789	7630	7053	1152	805	756	227	168	227
1991	91328	54987	54672	28987	7772	7281	1077	761	736	198	142	229
1992	92438	55752	55426	29195	7919	7552	1110	765	754	208	147	271
1993	93531	56492	56155	29412	8067	7819	1093	741	729	216	148	267
1994	94639	57227	56878	29643	8222	8090	1107	734	722	231	154	271
1995	95762	57942	57573	29902	8390	8364	1123	715	695	259	169	273
1996	96901	58643	58252	30181	8571	8646	1139	701	679	279	181	282
1997	98080	59338	58903	30505	8775	8935	1179	696	651	324	204	289
1998	99306	60049	59554	30862	8992	9237	1226	711	651	358	218	301
1999	100562	60762	60206	31237	9221	9545	1256	713	652	374	229	308
2000	101862	61486	60844	31650	9470	9856	1300	724	638	413	249	312



TABLE B2. SERIES A  
U.S. DEMOGRAPHIC SUMMARY FOR HOUSEHOLDS BY TYPE OF UNIT

YEAR	PERCENT - TYPE OF UNIT OCCUPIED				2ND HOME	NET CHANGE FROM PREVIOUS PERIOD				2ND HOME
	HOUSE- OWNER HOLDS	1- UNIT	MULTI- MOBILE HOME			HOUSE- OWNER HOLDS	1- UNIT	MULTI- MOBILE HOME		
			(PERCENTAGES)	HOME				(PERCENTAGES)	HOME	
1970	60.4	65.5	31.2	3.4	5.6	50.9	34.0	42.5	23.5	11.3
1971	60.3	64.9	31.5	3.8	5.7	49.7	32.2	44.1	23.6	12.6
1972	60.1	64.3	31.6	4.2	5.8	53.0	35.5	40.5	24.0	10.9
1973	60.0	63.8	31.8	4.6	5.9	53.6	37.1	40.1	22.8	11.1
1974	59.8	63.2	32.0	4.9	6.0	52.3	35.0	41.5	23.5	11.0
1975	59.7	62.7	32.2	5.3	6.1	51.7	34.1	42.3	23.6	10.8
1976	59.5	62.1	32.4	5.6	6.2	52.4	35.3	41.3	23.4	10.6
1977	59.5	61.8	32.5	5.9	6.3	56.8	41.8	37.5	20.6	11.3
1978	59.4	61.4	32.6	6.2	6.4	56.5	41.5	37.3	21.2	11.4
1979	59.4	61.0	32.6	6.5	6.5	57.1	42.9	36.2	20.9	10.5
1980	59.3	60.6	32.7	6.8	6.6	56.7	41.7	36.9	21.4	11.0
1981	59.3	60.3	32.8	7.1	6.7	56.4	41.5	37.2	21.4	11.1
1982	59.3	60.0	32.8	7.3	6.8	60.1	49.2	31.4	19.4	12.2
1983	59.3	59.9	32.7	7.5	6.9	60.7	49.4	31.3	19.3	12.3
1984	59.4	59.7	32.7	7.7	7.0	61.4	50.4	30.6	19.0	12.9
1985	59.4	59.6	32.6	7.9	7.1	63.5	52.9	28.7	18.4	13.8
1986	59.5	59.5	32.5	8.1	7.2	66.6	57.3	25.2	17.6	15.1
1987	59.7	59.6	32.4	8.2	7.4	69.4	61.7	22.0	16.3	16.9
1988	59.8	59.6	32.2	8.3	7.5	69.9	63.5	20.7	15.8	18.5
1989	60.0	59.7	32.1	8.4	7.7	70.0	64.4	20.2	15.4	18.6
1990	60.1	59.8	31.9	8.5	7.8	69.9	65.6	19.8	14.6	19.7
1991	60.2	59.9	31.7	8.5	8.0	70.7	68.4	18.4	13.2	21.2
1992	60.3	60.0	31.6	8.6	8.2	68.9	67.9	18.8	13.3	24.4
1993	60.4	60.0	31.4	8.6	8.4	67.8	66.7	19.8	13.5	24.4
1994	60.5	60.1	31.3	8.7	8.5	66.3	65.2	20.9	13.9	24.5
1995	60.5	60.1	31.2	8.8	8.7	63.7	61.9	23.1	15.0	24.3
1996	60.5	60.1	31.1	8.8	8.9	61.6	59.6	24.5	15.9	24.8
1997	60.5	60.1	31.1	8.9	9.1	59.0	55.3	27.5	17.3	24.5
1998	60.5	60.0	31.1	9.1	9.3	58.0	53.1	29.2	17.8	24.6
1999	60.4	59.9	31.1	9.2	9.5	56.8	52.0	29.8	18.2	24.5
2000	60.4	59.7	31.1	9.3	9.7	55.7	49.1	31.8	19.1	24.0

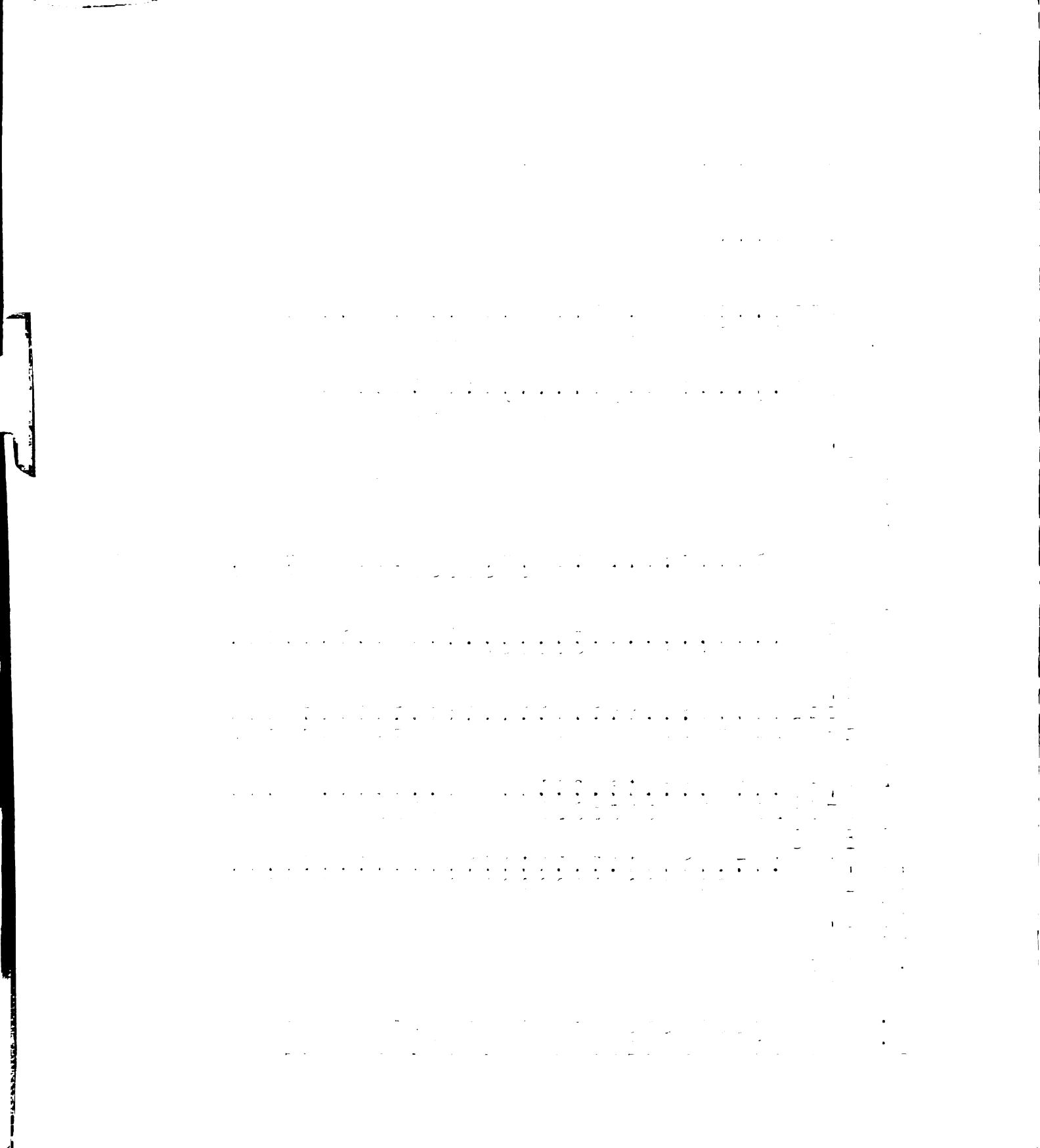
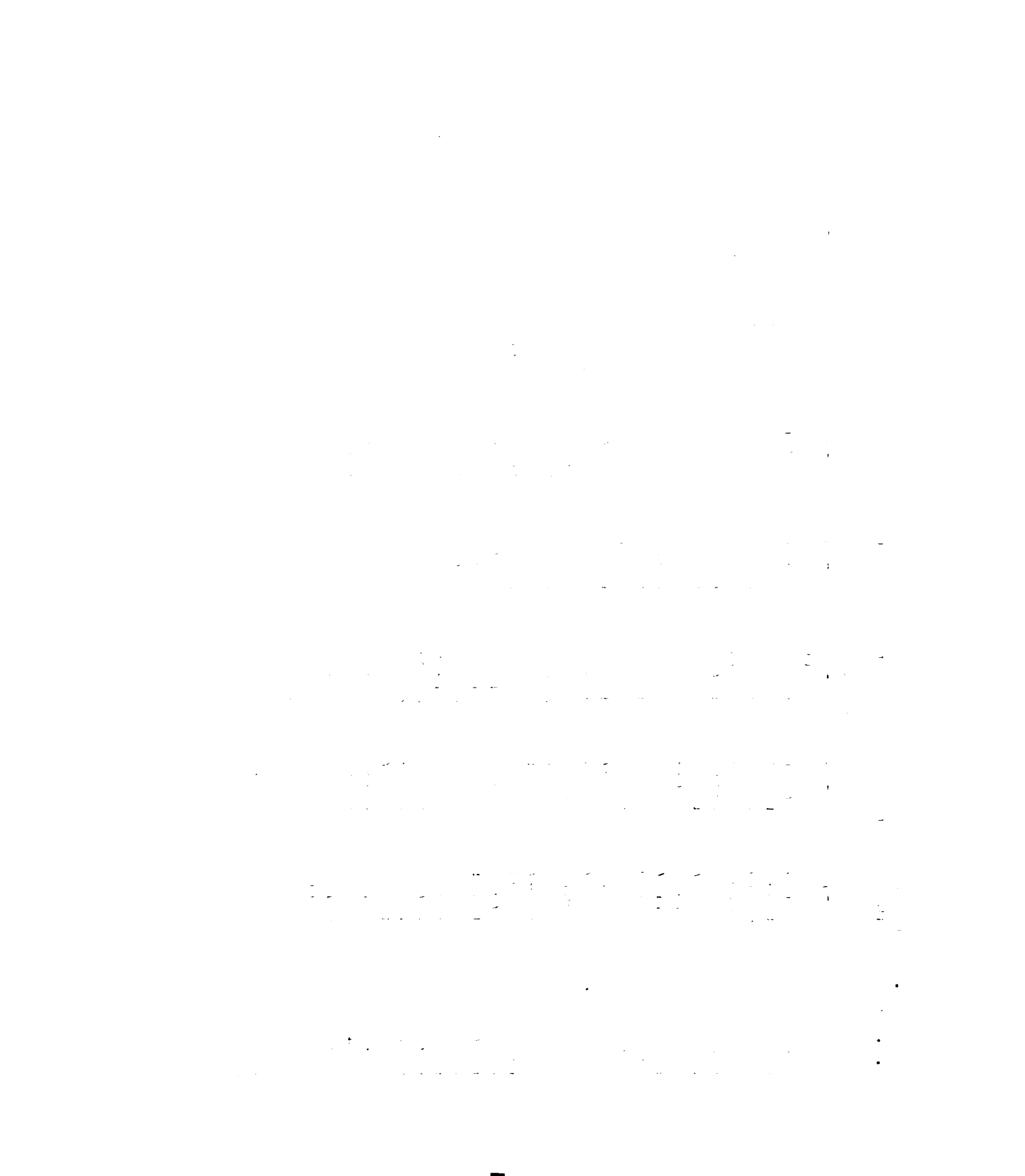


TABLE B3. SERIES A  
U.S. DEMOGRAPHIC SUMMARY BY AGE CLASS FOR POPULATION

YEAR	AGE CLASS					45-54	55-64	65+
	15-19	20-24	25-29	30-34	(THOUSANDS)			
1970	19100	17261	13878	11437	22961	23326	18491	19585
1971	19548	18097	14259	11724	22706	23486	18772	19881
1972	20010	18065	15389	12197	22505	23606	19039	20181
1973	20350	18384	15979	12926	22413	23667	19299	20490
1974	20628	18779	16733	13457	22401	23644	19561	20815
1975	20807	19299	17449	13974	22459	23532	19831	21159
1976	21096	19744	18280	14353	22773	23347	20103	21521
1977	21187	20204	18248	15475	23136	23090	20371	21901
1978	21189	20542	18565	16062	23800	22767	20624	22291
1979	21133	20819	18958	16811	24702	22413	20847	22680
1980	20879	20997	19475	17522	25376	22147	21032	23063
1981	20297	21284	19918	18347	26034	21910	21181	23440
1982	19616	21375	20374	18316	27622	21725	21294	23809
1983	19007	21377	20710	18632	28910	21645	21352	24181
1984	18447	21321	20986	19032	30173	21641	21333	24569
1985	18095	21068	21163	19536	31384	21705	21236	24978
1986	17958	20489	21449	19976	32571	21918	21074	25401
1987	18061	19812	21539	20430	33644	22373	20849	25834
1988	18230	19206	21541	20764	34535	23192	20566	26258
1989	18470	18650	21486	21039	35657	23890	20256	26652
1990	18788	18300	21234	21215	36864	24542	20028	27005
1991	19185	18164	20659	21449	38106	25174	19825	27318
1992	19634	18267	19987	21589	38530	26701	19672	27591
1993	20126	18434	19385	21592	39174	27953	19617	27818
1994	20647	18674	18832	21537	39832	29168	19630	27994
1995	21182	18991	18485	21288	40513	30329	19703	28120
1996	21712	19385	18349	20717	41228	31467	19913	28207
1997	22222	19832	18452	20050	41765	32498	20344	28251
1998	22692	20322	18619	19452	42098	33360	21108	28243
1999	23108	20840	18857	18903	42315	34439	21752	28193
2000	23458	21372	19172	18559	42244	35596	22353	28184







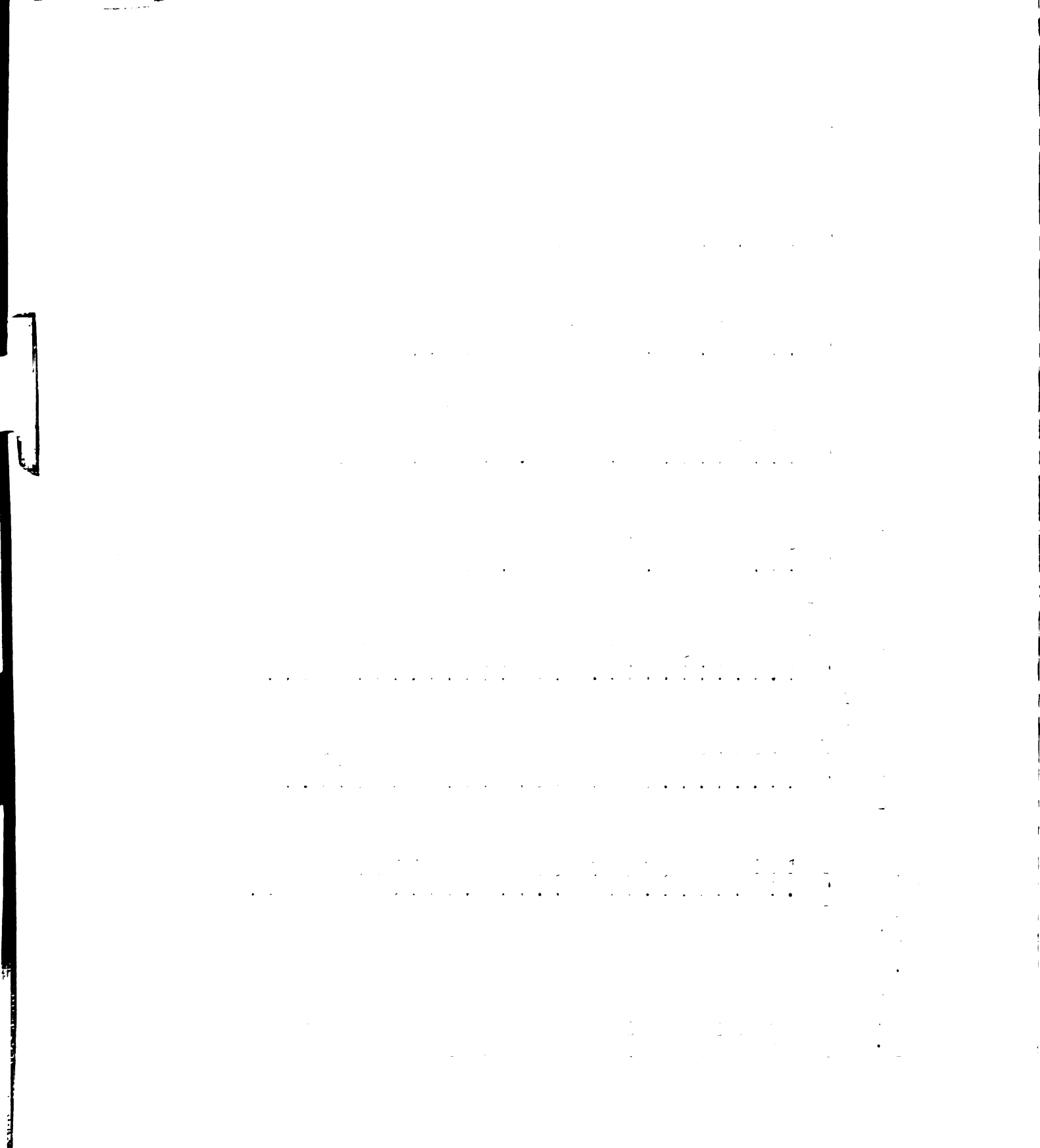


TABLE B5. SERIES A  
U.S. DEMOGRAPHIC SUMMARY BY AGE CLASS FOR TOTAL HOUSEHOLDS

YEAR	AGE CLASS					45-54	55-64	65+
	15-19	20-24	25-29	30-34	35-44			
			(THOUSANDS)					
1970	363	4333	6328	5444	11595	12199	10669	12319
1971	375	4600	6539	5609	11507	12307	10843	12553
1972	388	4650	7097	5864	11446	12393	11008	12791
1973	399	4791	7411	6246	11440	12449	11170	13036
1974	408	4954	7804	6535	11474	12460	11334	13292
1975	416	5153	8184	6819	11544	12425	11502	13563
1976	426	5331	8617	7036	11737	12346	11676	13842
1977	432	5516	8646	7620	11957	12228	11848	14135
1978	436	5670	8841	7944	12333	12076	12011	14436
1979	440	5809	9073	8352	12835	11906	12158	14737
1980	438	5921	9367	8743	13221	11782	12283	15037
1981	430	6062	9624	9188	13590	11674	12387	15334
1982	420	6147	9890	9206	14446	11592	12470	15628
1983	411	6208	10098	9398	15149	11567	12521	15926
1984	402	6251	10279	9634	15841	11582	12527	16235
1985	398	6236	10412	9924	16508	11634	12487	16560
1986	399	6106	10579	10172	17158	11766	12408	16878
1987	405	5944	10649	10427	17751	12028	12293	17200
1988	412	5800	10676	10623	18248	12487	12142	17519
1989	421	5670	10674	10789	18870	12881	11975	17820
1990	432	5600	10575	10905	19538	13253	11857	18093
1991	445	5591	10313	11051	20227	13614	11752	18336
1992	459	5655	10001	11149	20483	14461	11677	18552
1993	475	5740	9724	11176	20856	15162	11660	18738
1994	491	5849	9469	11173	21238	15844	11684	18890
1995	508	5982	9316	11070	21634	16499	11743	19009
1996	525	6141	9270	10798	22049	17143	11884	19090
1997	542	6318	9344	10474	22369	17731	12158	19143
1998	558	6511	9451	10185	22581	18228	12631	19160
1999	573	6715	9594	9920	22732	18845	13034	19149
2000	586	6925	9778	9762	22727	19507	13412	19165

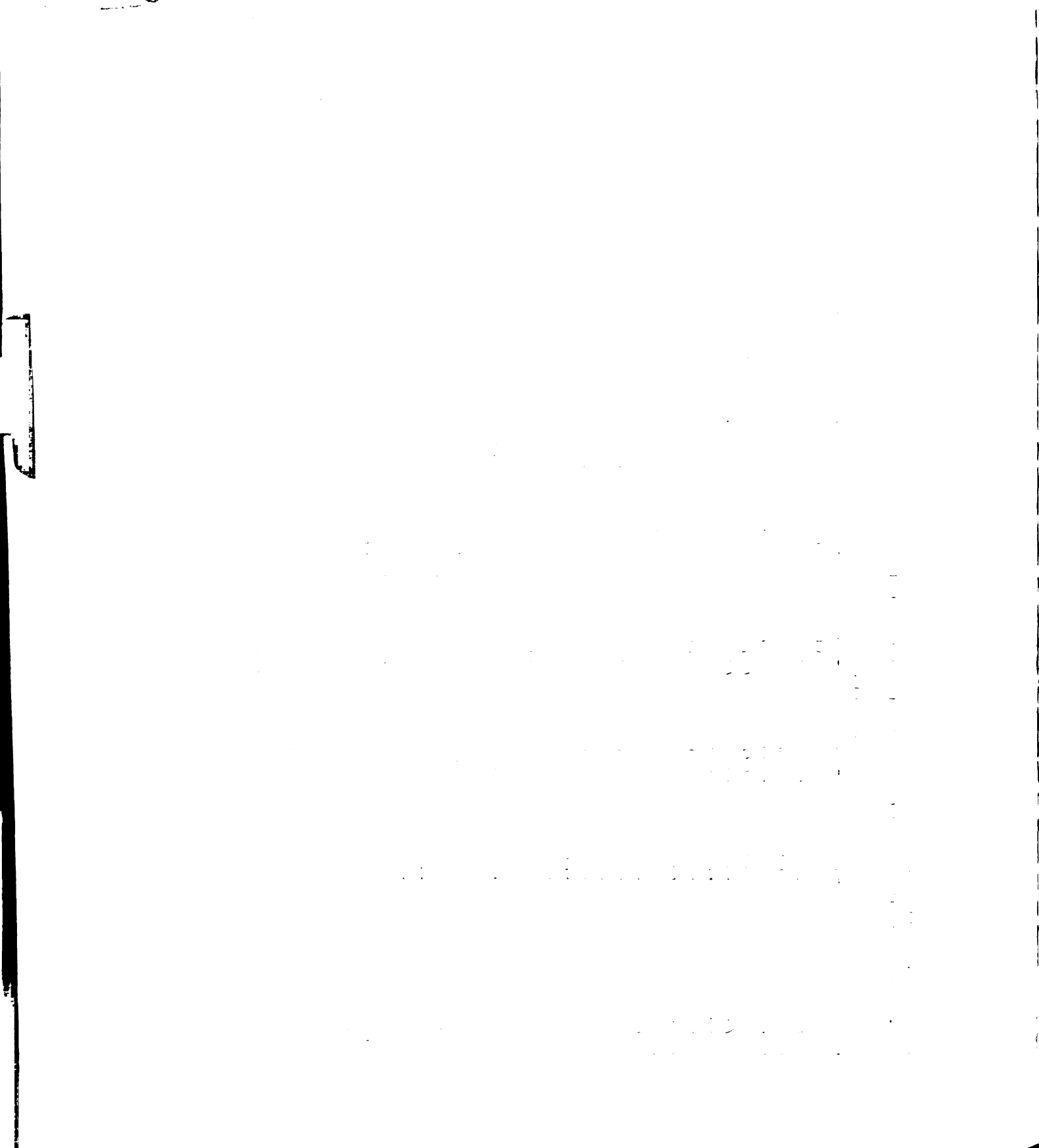


TABLE B6. SERIES A  
U.S. DEMOGRAPHIC SUMMARY BY AGE CLASS FOR THE HOUSEHOLD INCREMENT

YEAR	15-19	20-24	AGE CLASS (THOUSANDS)				35-44	45-54	55-64	65+
1970	21	254	323	112	-79	160	218	261		
1971	12	268	211	165	-88	107	173	234		
1972	13	50	558	256	-61	86	166	238		
1973	11	141	314	382	-6	56	162	245		
1974	10	163	393	289	34	12	163	257		
1975	8	199	379	285	70	-35	168	270		
1976	10	178	434	217	193	-79	174	279		
1977	6	185	29	584	219	-117	172	293		
1978	4	154	195	324	376	-153	164	301		
1979	3	139	233	407	502	-170	147	302		
1980	-1	113	294	392	386	-124	125	300		
1981	-8	141	257	445	369	-109	104	297		
1982	-11	86	265	17	857	-81	83	294		
1983	-9	60	209	192	703	-25	51	297		
1984	-8	43	181	236	692	15	6	310		
1985	-4	-15	133	290	667	52	-40	325		
1986	*	-130	166	247	650	132	-78	316		
1987	6	-162	70	256	592	262	-116	324		
1988	7	-143	27	195	498	459	-150	319		
1989	9	-131	-1	166	621	395	-167	300		
1990	11	-70	-100	116	668	371	-119	274		
1991	13	-9	-262	146	689	361	-104	242		
1992	14	65	-311	98	256	847	-75	216		
1993	16	85	-278	27	374	700	-17	186		
1994	16	108	-255	-3	382	682	23	152		
1995	17	133	-152	-104	396	655	59	119		
1996	17	159	-47	-272	415	644	141	81		
1997	17	177	74	-324	321	588	273	52		
1998	16	193	107	-289	212	497	473	17		
1999	15	203	143	-265	150	617	403	-11		
2000	13	210	183	-158	-4	662	378	16		

TABLE B7. SERIES A  
U.S. DEMOGRAPHIC SUMMARY BY AGE CLASS FOR OWNERSHIP RATES

YEAR	AGE CLASS					45-54	55-64	65+
	15-19	20-24	25-29	30-34	35-44			
			(RATES)					
1970	.100	.207	.419	.574	.648	.652	.669	.724
1971	.100	.207	.419	.574	.648	.652	.669	.724
1972	.100	.207	.419	.574	.648	.652	.669	.724
1973	.100	.207	.419	.574	.648	.652	.669	.724
1974	.100	.207	.419	.574	.648	.652	.669	.724
1975	.100	.207	.419	.574	.648	.652	.669	.724
1976	.100	.207	.419	.574	.648	.652	.669	.724
1977	.100	.207	.419	.574	.648	.652	.669	.724
1978	.100	.207	.419	.574	.648	.652	.669	.724
1979	.100	.207	.419	.574	.648	.652	.669	.724
1980	.100	.207	.419	.574	.648	.652	.669	.724
1981	.100	.207	.419	.574	.648	.652	.669	.724
1982	.100	.207	.419	.574	.648	.652	.669	.724
1983	.100	.207	.419	.574	.648	.652	.669	.724
1984	.100	.207	.419	.574	.648	.652	.669	.724
1985	.100	.207	.419	.574	.648	.652	.669	.724
1986	.100	.207	.419	.574	.648	.652	.669	.724
1987	.100	.207	.419	.574	.648	.652	.669	.724
1988	.100	.207	.419	.574	.648	.652	.669	.724
1989	.100	.207	.419	.574	.648	.652	.669	.724
1990	.100	.207	.419	.574	.648	.652	.669	.724
1991	.100	.207	.419	.574	.648	.652	.669	.724
1992	.100	.207	.419	.574	.648	.652	.669	.724
1993	.100	.207	.419	.574	.648	.652	.669	.724
1994	.100	.207	.419	.574	.648	.652	.669	.724
1995	.100	.207	.419	.574	.648	.652	.669	.724
1996	.100	.207	.419	.574	.648	.652	.669	.724
1997	.100	.207	.419	.574	.648	.652	.669	.724
1998	.100	.207	.419	.574	.648	.652	.669	.724
1999	.100	.207	.419	.574	.648	.652	.669	.724
2000	.100	.207	.419	.574	.648	.652	.669	.724

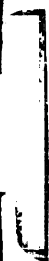


TABLE B8. SERIES A  
U.S. DEMOGRAPHIC SUMMARY BY AGE CLASS FOR TOTAL HOMEOWNERS

YEAR	AGE CLASS					45-54	55-64	65+
	15-19	20-24	25-29	30-34	35-44			
			(THOUSANDS)					
1970	36	897	2652	3125	7514	7954	7138	8919
1971	38	952	2740	3219	7457	8024	7254	9088
1972	39	963	2974	3366	7417	8080	7365	9260
1973	40	992	3105	3585	7413	8117	7473	9438
1974	41	1025	3270	3751	7435	8124	7582	9624
1975	42	1067	3429	3914	7480	8101	7695	9820
1976	43	1103	3611	4039	7606	8050	7811	10022
1977	43	1142	3623	4374	7748	7973	7926	10234
1978	44	1174	3704	4560	7992	7873	8036	10451
1979	44	1202	3802	4794	8317	7763	8134	10670
1980	44	1226	3925	5019	8567	7682	8217	10887
1981	43	1255	4033	5274	8806	7611	8287	11102
1982	42	1273	4144	5284	9361	7558	8342	11315
1983	41	1285	4231	5394	9816	7542	8376	11530
1984	40	1294	4307	5530	10265	7552	8380	11754
1985	40	1291	4363	5697	10697	7585	8354	11990
1986	40	1264	4432	5839	11119	7671	8301	12219
1987	40	1230	4462	5985	11502	7842	8224	12453
1988	41	1201	4473	6098	11825	8141	8123	12684
1989	42	1174	4473	6193	12228	8399	8012	12901
1990	43	1159	4431	6259	12661	8641	7932	13100
1991	45	1157	4321	6343	13107	8876	7862	13275
1992	46	1171	4191	6399	13273	9429	7812	13432
1993	47	1188	4074	6415	13515	9885	7801	13586
1994	49	1211	3967	6414	13762	10330	7816	13677
1995	51	1238	3904	6354	14019	10757	7856	13763
1996	53	1271	3884	6198	14288	11177	7950	13822
1997	54	1308	3915	6012	14495	11561	8133	13859
1998	56	1348	3960	5846	14633	11885	8450	13872
1999	57	1390	4020	5694	14730	12287	8720	13884
2000	59	1433	4097	5603	14727	12718	8972	13876





TABLE B9. SERIES A  
U.S. DEMOGRAPHIC SUMMARY BY AGE CLASS FOR THE HOMEOWNER INCREMENT

YEAR	AGE CLASS					35-44	45-54	55-64	65+
	15-19	20-24	25-29	30-34	(THOUSANDS)				
1970	2	52	135	64		-51	104	146	204
1971	1	55	88	95		-57	70	116	169
1972	1	10	234	147		-40	56	111	172
1973	1	29	131	219		-4	36	108	177
1974	*	34	165	166		22	8	109	186
1975	*	41	159	163		45	-23	113	196
1976	*	37	182	124		125	-52	116	202
1977	*	38	12	335		142	-77	115	212
1978	*	32	82	186		244	-100	109	216
1979	*	29	97	234		325	-111	98	219
1980	-*	23	123	225		250	-61	83	217
1981	-*	29	108	255		239	-71	70	215
1982	-1	18	111	10		555	-53	56	213
1983	-*	13	87	110		455	-17	34	215
1984	-*	9	76	135		448	10	4	224
1985	-*	-3	56	167		432	34	-27	235
1986	*	-27	70	142		421	86	-52	229
1987	*	-34	29	147		384	171	-77	234
1988	*	-30	11	112		323	299	-101	231
1989	*	-27	-*	95		403	257	-112	217
1990	1	-14	-42	66		433	242	-79	198
1991	1	-2	-110	84		446	236	-70	176
1992	1	13	-131	56		166	552	-50	157
1993	2	18	-116	16		242	457	-11	135
1994	2	22	-107	-2		248	445	16	110
1995	2	28	-64	-59		256	427	40	86
1996	2	33	-19	-156		269	420	94	59
1997	2	37	31	-186		208	383	183	48
1998	2	40	45	-166		137	324	317	12
1999	1	42	60	-152		97	402	269	-2
2000	1	43	77	-91		-3	431	253	12

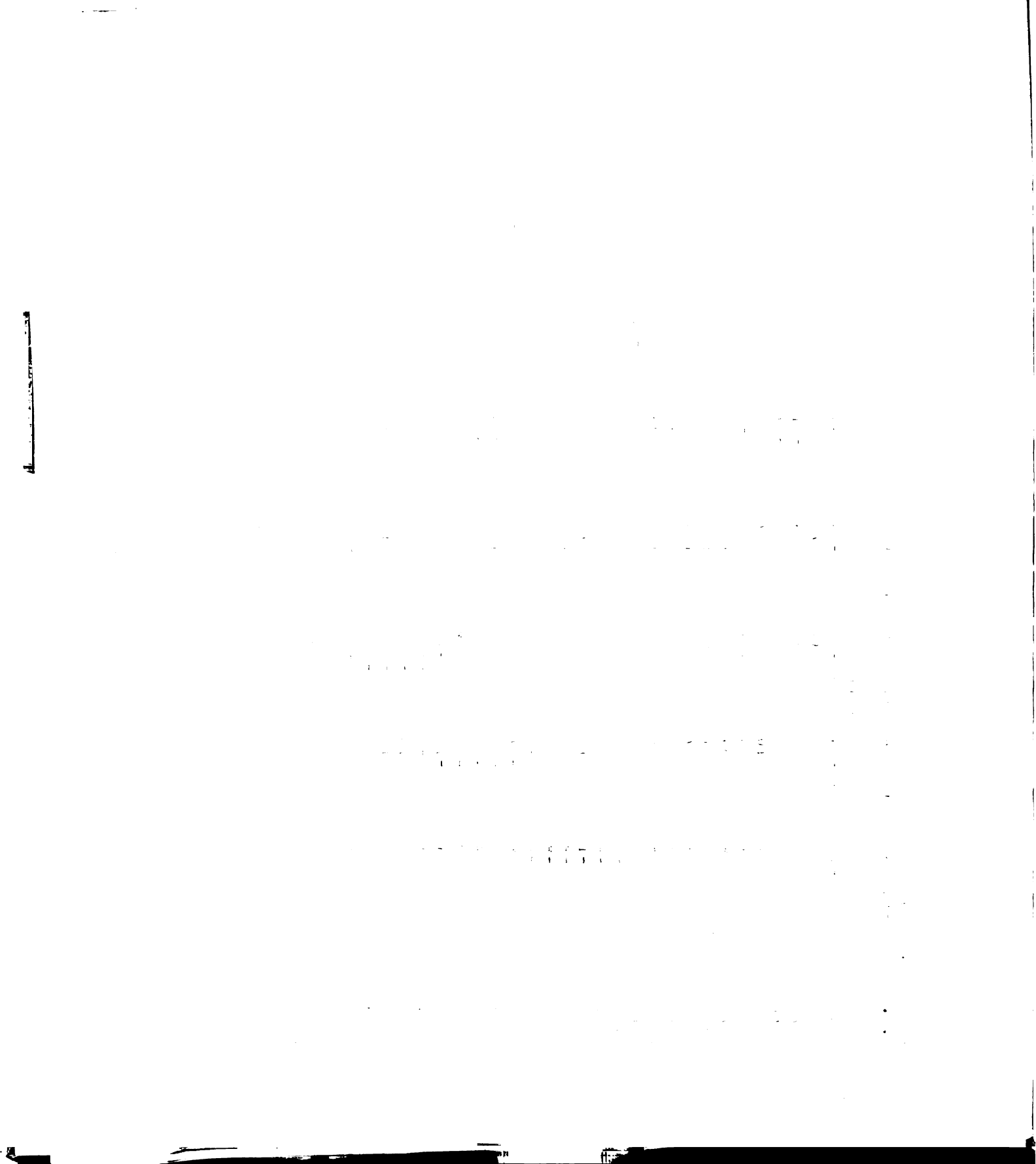


TABLE B10. SERIES A  
U.S. DEMOGRAPHIC SUMMARY BY AGE CLASS FOR SINGLE FAMILY HOUSING OCCUPANCY RATES

YEAR	AGE CLASS					65+
	15-19	20-24	25-29	30-34	35-44	
				(RATES)		
1970	.153	.176	.431	.628	.787	.740
1971	.148	.166	.424	.623	.788	.738
1972	.143	.164	.407	.615	.789	.736
1973	.139	.159	.399	.605	.789	.735
1974	.136	.154	.389	.598	.789	.733
1975	.133	.148	.381	.592	.788	.731
1976	.130	.143	.372	.588	.785	.729
1977	.128	.138	.372	.577	.782	.727
1978	.127	.135	.368	.572	.778	.726
1979	.126	.131	.364	.566	.772	.724
1980	.126	.129	.359	.561	.768	.723
1981	.129	.126	.355	.555	.765	.722
1982	.132	.124	.352	.555	.757	.722
1983	.135	.123	.349	.553	.751	.721
1984	.138	.122	.346	.551	.746	.721
1985	.139	.122	.344	.548	.742	.721
1986	.139	.125	.342	.545	.738	.722
1987	.137	.128	.341	.543	.734	.723
1988	.134	.132	.341	.541	.732	.725
1989	.132	.135	.341	.540	.728	.726
1990	.128	.136	.342	.539	.725	.727
1991	.124	.137	.346	.538	.722	.728
1992	.121	.135	.350	.537	.721	.729
1993	.117	.133	.354	.537	.720	.729
1994	.113	.131	.358	.537	.718	.729
1995	.109	.128	.360	.538	.716	.728
1996	.105	.124	.361	.540	.715	.727
1997	.102	.121	.360	.542	.714	.724
1998	.099	.117	.358	.545	.713	.720
1999	.097	.114	.356	.548	.713	.717
2000	.094	.110	.353	.549	.713	.714

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TABLE B11. SERIES A  
U.S. DEMOGRAPHIC SUMMARY BY AGE CLASS FOR FOR SINGLE FAMILY HOUSING INCREMENTAL OCCUPANCY RATES

YEAR	AGE CLASS (RATES)					
	15-19	20-24	25-29	30-34	35-44	45-54
1970	0.000	0.000	.210	.450	.635	.657
1971	0.000	0.000	.210	.450	.635	.657
1972	0.000	0.000	.210	.450	.635	.657
1973	0.000	0.000	.210	.450	.635	.657
1974	0.000	0.000	.210	.450	.635	.657
1975	0.000	0.000	.210	.450	.635	.657
1976	0.000	0.000	.210	.450	.635	.657
1977	0.000	0.000	.210	.450	.635	.657
1978	0.000	0.000	.210	.450	.635	.657
1979	0.000	0.000	.210	.450	.635	.657
1980	0.000	0.000	.210	.450	.635	.657
1981	0.000	0.000	.210	.450	.635	.657
1982	0.000	0.000	.210	.450	.635	.657
1983	0.000	0.000	.210	.450	.635	.657
1984	0.000	0.000	.210	.450	.635	.657
1985	0.000	0.000	.210	.450	.635	.657
1986	0.000	0.000	.210	.450	.635	.657
1987	0.000	0.000	.210	.450	.635	.657
1988	0.000	0.000	.210	.450	.635	.657
1989	0.000	0.000	.210	.450	.635	.657
1990	0.000	0.000	.210	.450	.635	.657
1991	0.000	0.000	.210	.450	.635	.657
1992	0.000	0.000	.210	.450	.635	.657
1993	0.000	0.000	.210	.450	.635	.657
1994	0.000	0.000	.210	.450	.635	.657
1995	0.000	0.000	.210	.450	.635	.657
1996	0.000	0.000	.210	.450	.635	.657
1997	0.000	0.000	.210	.450	.635	.657
1998	0.000	0.000	.210	.450	.635	.657
1999	0.000	0.000	.210	.450	.635	.657
2000	0.000	0.000	.210	.450	.635	.657

1. *Journal of the American Medical Association*, 2000; 283: 2686-2692.

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TABLE B12. SERIES A  
U.S. DEMOGRAPHIC SUMMARY BY AGE CLASS FOR TOTAL OCCUPIED SINGLE FAMILY HOUSES

YEAR	AGE CLASS					45-54	55-64	65+
	15-19	20-24	25-29	30-34	(THOUSANDS)			
1970	55	764	2729	3418	9126	9700	7900	7722
1971	55	764	2773	3493	9070	9770	8005	7832
1972	55	764	2890	3608	9031	9827	8106	7944
1973	55	764	2956	3779	9027	9864	8205	8059
1974	55	764	3039	3909	9049	9871	8305	8179
1975	55	764	3118	4037	9093	9848	8407	8307
1976	55	764	3209	4135	9216	9796	8514	8438
1977	55	764	3215	4398	9355	9719	8618	8575
1978	55	764	3256	4544	9594	9618	8718	8717
1979	55	764	3305	4727	9913	9507	8808	8859
1980	55	764	3367	4903	10158	9425	8884	8999
1981	55	764	3421	5103	10392	9354	8947	9139
1982	55	764	3477	5111	10936	9301	8998	9277
1983	55	764	3520	5198	11382	9284	9029	9417
1984	55	764	3558	5304	11822	9294	9033	9582
1985	55	764	3586	5435	12245	9328	9008	9715
1986	55	764	3621	5546	12658	9414	8960	9884
1987	55	764	3636	5661	13034	9587	8890	10016
1988	55	764	3642	5749	13350	9889	8798	10166
1989	55	764	3641	5824	13745	10148	8696	10307
1990	55	764	3620	5876	14169	10392	8624	10436
1991	55	764	3565	5941	14607	10630	8560	10550
1992	55	764	3500	5985	14769	11187	8514	10651
1993	55	764	3442	5998	15006	11647	8504	10739
1994	55	764	3388	5997	15249	12096	8518	10810
1995	55	764	3356	5950	15500	12527	8554	10866
1996	55	764	3346	5828	15764	12950	8641	10904
1997	55	764	3362	5682	15967	13337	8807	10929
1998	55	764	3384	5552	16102	13663	9096	10937
1999	55	764	3415	5433	16197	14069	9342	10932
2000	55	764	3453	5362	16194	14504	9572	10940

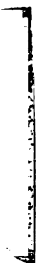




TABLE B13. SERIES A  
U.S. DEMOGRAPHIC SUMMARY BY AGE CLASS FOR THE INCREMENT TO OCCUPIED SINGLE FAMILY HOUSES

YEAR	15-19	20-24	AGE CLASS (THOUSANDS)		35-44	45-54	55-64	65+
1970	0	0	68	51	-50	105	133	132
1971	0	0	44	74	-56	70	106	110
1972	0	0	117	115	-39	57	101	112
1973	0	0	66	172	-4	37	99	115
1974	0	0	83	130	22	8	100	121
1975	0	0	80	128	45	-23	103	127
1976	0	0	91	97	123	-52	106	131
1977	0	0	6	263	139	-77	105	138
1978	0	0	41	146	239	-100	100	141
1979	0	0	49	183	319	-112	89	142
1980	0	0	62	176	245	-81	76	141
1981	0	0	54	200	234	-71	63	140
1982	0	0	56	8	544	-53	51	138
1983	0	0	44	87	446	-17	31	146
1984	0	0	38	106	439	10	4	146
1985	0	0	28	131	424	34	-24	153
1986	0	0	35	111	413	87	-48	149
1987	0	0	15	115	376	172	-71	152
1988	0	0	6	88	316	302	-92	150
1989	0	0	-*	75	395	260	-102	141
1990	0	0	-21	52	424	244	-72	129
1991	0	0	-55	66	437	238	-64	114
1992	0	0	-65	44	162	557	-46	102
1993	0	0	-58	12	237	461	-10	87
1994	0	0	-54	-1	243	449	14	72
1995	0	0	-32	-47	251	431	36	56
1996	0	0	-10	-122	263	424	86	38
1997	0	0	16	-146	204	386	167	25
1998	0	0	22	-130	135	327	289	8
1999	0	0	30	-119	95	406	246	-5
2000	0	0	38	-71	-3	435	231	8

TABLE B14. SERIES A  
U.S. DEMOGRAPHIC SUMMARY BY AGE CLASS FOR MULTIUNIT HOUSING OCCUPANCY RATES

YEAR	AGE CLASS					45-54	55-64	65+
	15-19	20-24	25-29	30-34	(RATES)			
1970	.700	.700	.490	.350	.215	.192	.240	.330
1971	.700	.700	.490	.350	.215	.192	.240	.330
1972	.700	.700	.490	.350	.215	.192	.240	.330
1973	.700	.700	.490	.350	.215	.192	.240	.330
1974	.700	.700	.490	.350	.215	.192	.240	.330
1975	.700	.700	.490	.350	.215	.192	.240	.330
1976	.700	.700	.490	.350	.215	.192	.240	.330
1977	.700	.700	.490	.350	.215	.192	.240	.330
1978	.700	.700	.490	.350	.215	.192	.240	.330
1979	.700	.700	.490	.350	.215	.192	.240	.330
1980	.700	.700	.490	.350	.215	.192	.240	.330
1981	.700	.700	.490	.350	.215	.192	.240	.330
1982	.700	.700	.490	.350	.215	.192	.240	.330
1983	.700	.700	.490	.350	.215	.192	.240	.330
1984	.700	.700	.490	.350	.215	.192	.240	.330
1985	.700	.700	.490	.350	.215	.192	.240	.330
1986	.700	.700	.490	.350	.215	.192	.240	.330
1987	.700	.700	.490	.350	.215	.192	.240	.330
1988	.700	.700	.490	.350	.215	.192	.240	.330
1989	.700	.700	.490	.350	.215	.192	.240	.330
1990	.700	.700	.490	.350	.215	.192	.240	.330
1991	.700	.700	.490	.350	.215	.192	.240	.330
1992	.700	.700	.490	.350	.215	.192	.240	.330
1993	.700	.700	.490	.350	.215	.192	.240	.330
1994	.700	.700	.490	.350	.215	.192	.240	.330
1995	.700	.700	.490	.350	.215	.192	.240	.330
1996	.700	.700	.490	.350	.215	.192	.240	.330
1997	.700	.700	.490	.350	.215	.192	.240	.330
1998	.700	.700	.490	.350	.215	.192	.240	.330
1999	.700	.700	.490	.350	.215	.192	.240	.330
2000	.700	.700	.490	.350	.215	.192	.240	.330

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TABLE B15. SERIES A  
U.S. DEMOGRAPHIC SUMMARY BY AGE CLASS FOR MULTIUNIT HOUSING INCREMENTAL OCCUPANCY RATES

YEAR	AGE CLASS					45-54	55-64	65+
	15-19	20-24	25-29	30-34	35-44			
				(RATES)				
1970	.700	.700	.490	.350	.215	.192	.240	.330
1971	.700	.700	.490	.350	.215	.192	.240	.330
1972	.700	.700	.490	.350	.215	.192	.240	.330
1973	.700	.700	.490	.350	.215	.192	.240	.330
1974	.700	.700	.490	.350	.215	.192	.240	.330
1975	.700	.700	.490	.350	.215	.192	.240	.330
1976	.700	.700	.490	.350	.215	.192	.240	.330
1977	.700	.700	.490	.350	.215	.192	.240	.330
1978	.700	.700	.490	.350	.215	.192	.240	.330
1979	.700	.700	.490	.350	.215	.192	.240	.330
1980	.700	.700	.490	.350	.215	.192	.240	.330
1981	.700	.700	.490	.350	.215	.192	.240	.330
1982	.700	.700	.490	.350	.215	.192	.240	.330
1983	.700	.700	.490	.350	.215	.192	.240	.330
1984	.700	.700	.490	.350	.215	.192	.240	.330
1985	.700	.700	.490	.350	.215	.192	.240	.330
1986	.700	.700	.490	.350	.215	.192	.240	.330
1987	.700	.700	.490	.350	.215	.192	.240	.330
1988	.700	.700	.490	.350	.215	.192	.240	.330
1989	.700	.700	.490	.350	.215	.192	.240	.330
1990	.700	.700	.490	.350	.215	.192	.240	.330
1991	.700	.700	.490	.350	.215	.192	.240	.330
1992	.700	.700	.490	.350	.215	.192	.240	.330
1993	.700	.700	.490	.350	.215	.192	.240	.330
1994	.700	.700	.490	.350	.215	.192	.240	.330
1995	.700	.700	.490	.350	.215	.192	.240	.330
1996	.700	.700	.490	.350	.215	.192	.240	.330
1997	.700	.700	.490	.350	.215	.192	.240	.330
1998	.700	.700	.490	.350	.215	.192	.240	.330
1999	.700	.700	.490	.350	.215	.192	.240	.330
2000	.700	.700	.490	.350	.215	.192	.240	.330

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TABLE B16. SERIES A  
U.S. DEMOGRAPHIC SUMMARY BY AGE CLASS FOR TOTAL OCCUPIED MULTIUNIT HOUSING

YEAR	AGE CLASS (THOUSANDS)					65+
	15-19	20-24	25-29	30-34	35-44	
1970	254	3033	3101	1905	2493	2348
1971	263	3220	3204	1963	2474	2369
1972	272	3255	3478	2053	2461	2366
1973	279	3354	3631	2166	2460	2396
1974	286	3468	3824	2287	2467	2399
1975	291	3607	4010	2387	2482	2392
1976	298	3732	4222	2463	2523	2377
1977	303	3861	4236	2667	2571	2354
1978	306	3969	4332	2780	2652	2325
1979	308	4066	4446	2923	2760	2292
1980	307	4145	4590	3060	2842	2268
1981	301	4243	4716	3216	2922	2247
1982	294	4303	4846	3222	3106	2232
1983	287	4346	4948	3289	3257	2227
1984	282	4376	5037	3372	3406	2230
1985	279	4365	5102	3474	3549	2240
1986	279	4274	5184	3560	3689	2265
1987	283	4161	5218	3650	3816	2315
1988	288	4060	5231	3718	3923	2404
1989	295	3969	5230	3776	4057	2480
1990	302	3920	5182	3817	4201	2551
1991	312	3914	5053	3868	4349	2621
1992	322	3959	4901	3902	4404	2784
1993	332	4018	4765	3912	4484	2919
1994	344	4094	4640	3911	4566	3050
1995	356	4188	4565	3874	4651	3176
1996	368	4299	4542	3779	4740	3300
1997	380	4423	4579	3666	4809	3413
1998	391	4558	4631	3565	4855	3509
1999	401	4700	4701	3472	4887	3628
2000	411	4847	4791	3417	4886	3755



TABLE B17. SERIES A  
U.S. DEMOGRAPHIC SUMMARY BY AGE CLASS FOR THE INCREMENT TO OCCUPIED MULTIFAMILY HOUSING

YEAR	AGE CLASS							65+
	15-19	20-24	25-29	30-34	35-44	45-54	55-64	
(THOUSANDS)								
1970	15	177	158	39	-17	31	52	93
1971	9	187	103	58	-19	21	42	77
1972	9	35	274	89	-13	17	40	78
1973	7	99	154	134	-1	11	39	41
1974	7	114	193	101	7	2	39	55
1975	5	139	186	100	15	-7	40	59
1976	7	125	212	76	42	-15	42	92
1977	4	129	14	204	47	-23	41	97
1978	3	108	95	114	81	-29	39	99
1979	2	97	114	143	108	-33	35	100
1980	-8	79	144	137	83	-24	30	99
1981	-6	98	126	156	79	-21	25	98
1982	-7	60	130	6	184	-16	20	97
1983	-6	42	102	67	151	-5	12	98
1984	-6	30	89	83	149	3	1	102
1985	-3	-11	65	102	143	10	-10	107
1986	*	-91	82	87	140	25	-19	104
1987	4	-113	34	89	127	50	-28	107
1988	5	-100	13	68	107	88	-36	105
1989	6	-91	-*	58	134	76	-40	99
1990	8	-49	-49	40	144	71	-29	90
1991	9	-6	-128	51	148	70	-25	80
1992	10	45	-153	34	55	163	-18	71
1993	11	59	-136	10	80	135	-4	61
1994	11	76	-125	-*	82	131	6	50
1995	12	93	-75	-36	85	126	14	39
1996	12	111	-23	-95	89	124	34	27
1997	12	124	36	-113	69	113	60	17
1998	11	135	52	-101	46	96	114	6
1999	10	142	70	-93	32	119	97	-4
2000	9	147	90	-55	-*	127	91	5





TABLE B18. SERIES A  
U.S. DEMOGRAPHIC SUMMARY BY AGE CLASS FOR MOBILE HOME OCCUPANCY RATES

YEAR	AGE CLASS						65+
	15-19	20-24	25-29	30-34	35-44	45-54	
			(RATES)				
1970	.110	.124	.079	.022	.008	.012	.020
1971	.116	.134	.086	.027	.007	.014	.022
1972	.122	.136	.103	.035	.006	.015	.024
1973	.127	.141	.111	.045	.006	.015	.025
1974	.131	.146	.121	.052	.007	.015	.027
1975	.134	.152	.129	.058	.007	.015	.029
1976	.138	.157	.138	.062	.010	.014	.031
1977	.140	.162	.138	.073	.012	.013	.033
1978	.142	.165	.142	.078	.017	.011	.034
1979	.143	.169	.146	.084	.022	.009	.036
1980	.142	.171	.151	.089	.026	.008	.037
1981	.140	.174	.155	.095	.029	.006	.038
1982	.135	.176	.158	.095	.036	.005	.038
1983	.132	.177	.161	.097	.041	.005	.039
1984	.128	.178	.164	.099	.046	.005	.039
1985	.127	.178	.166	.102	.050	.006	.039
1986	.127	.175	.168	.105	.054	.007	.038
1987	.129	.172	.169	.107	.057	.010	.037
1988	.132	.168	.169	.109	.060	.016	.035
1989	.136	.165	.169	.110	.063	.020	.034
1990	.140	.164	.168	.111	.066	.023	.033
1991	.145	.163	.164	.112	.069	.027	.032
1992	.150	.165	.160	.113	.070	.034	.031
1993	.155	.167	.156	.113	.071	.039	.031
1994	.159	.169	.152	.113	.073	.044	.031
1995	.164	.172	.150	.112	.074	.048	.032
1996	.169	.176	.149	.110	.075	.052	.033
1997	.173	.179	.150	.108	.076	.055	.036
1998	.176	.183	.152	.105	.077	.058	.040
1999	.179	.186	.154	.102	.078	.061	.043
2000	.182	.190	.157	.101	.078	.064	.045

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TABLE B19. SERIES A  
U.S. DEMOGRAPHIC SUMMARY BY AGE CLASS FOR MOBILE HOME INCREMENTAL OCCUPANCY RATES

YEAR	AGE CLASS (RATES)					
	15-19	20-24	25-29	30-34	35-44	45-54
1970	.300	.300	.300	.200	.150	.150
1971	.300	.300	.300	.200	.150	.150
1972	.300	.300	.300	.200	.150	.150
1973	.300	.300	.300	.200	.150	.150
1974	.300	.300	.300	.200	.150	.150
1975	.300	.300	.300	.200	.150	.150
1976	.300	.300	.300	.200	.150	.150
1977	.300	.300	.300	.200	.150	.150
1978	.300	.300	.300	.200	.150	.150
1979	.300	.300	.300	.200	.150	.150
1980	.300	.300	.300	.200	.150	.150
1981	.300	.300	.300	.200	.150	.150
1982	.300	.300	.300	.200	.150	.150
1983	.300	.300	.300	.200	.150	.150
1984	.300	.300	.300	.200	.150	.150
1985	.300	.300	.300	.200	.150	.150
1986	.300	.300	.300	.200	.150	.150
1987	.300	.300	.300	.200	.150	.150
1988	.300	.300	.300	.200	.150	.150
1989	.300	.300	.300	.200	.150	.150
1990	.300	.300	.300	.200	.150	.150
1991	.300	.300	.300	.200	.150	.150
1992	.300	.300	.300	.200	.150	.150
1993	.300	.300	.300	.200	.150	.150
1994	.300	.300	.300	.200	.150	.150
1995	.300	.300	.300	.200	.150	.150
1996	.300	.300	.300	.200	.150	.150
1997	.300	.300	.300	.200	.150	.150
1998	.300	.300	.300	.200	.150	.150
1999	.300	.300	.300	.200	.150	.150
2000	.300	.300	.300	.200	.150	.150

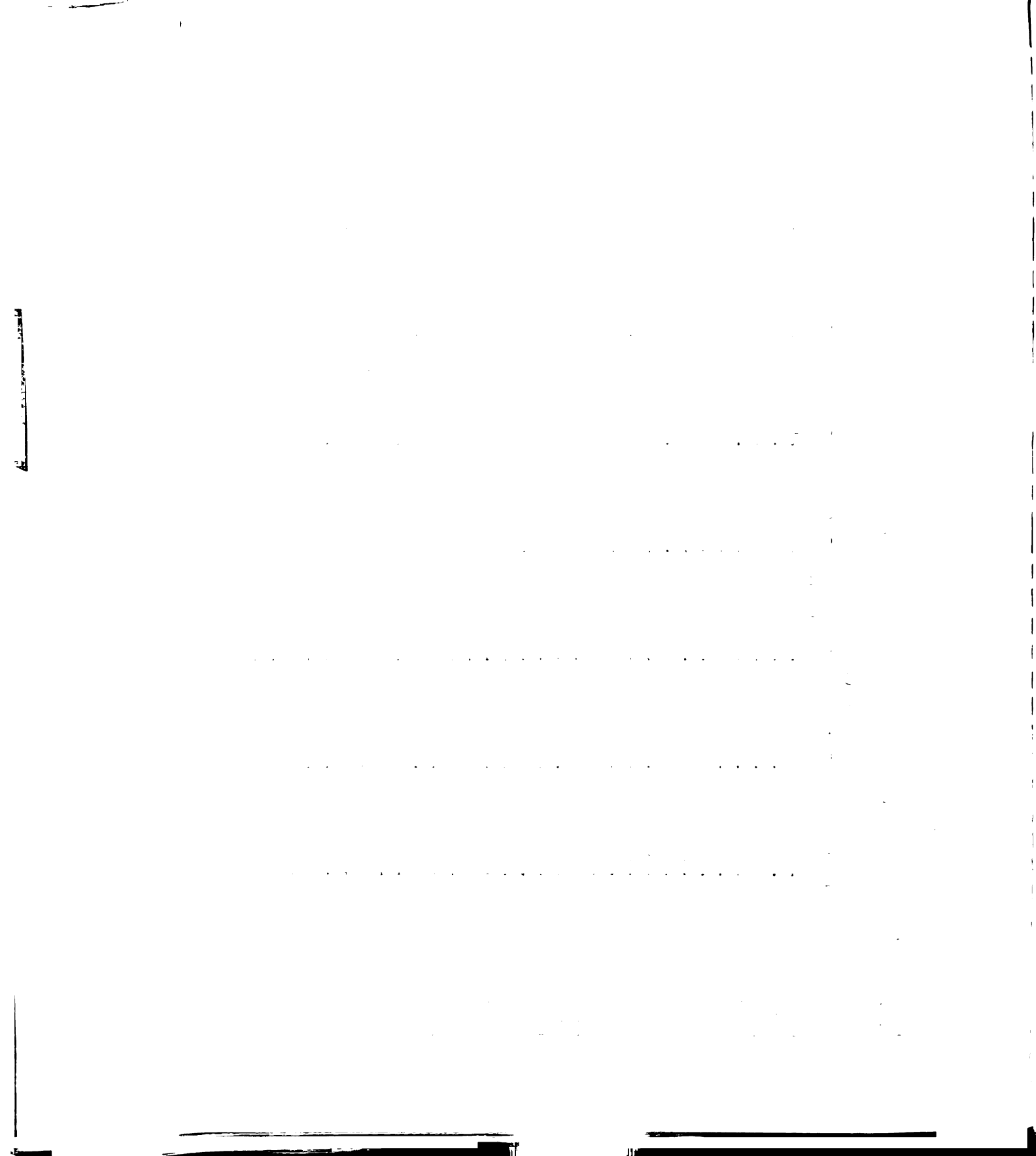


TABLE B20. SERIES A  
U.S. DEMOGRAPHIC SUMMARY BY AGE CLASS FOR TOTAL OCCUPIED MOBILE HOMES

YEAR	AGE CLASS						65+
	15-19	20-24	25-29	30-34	35-44	45-54	55-64
			(THOUSANDS)				
1970	40	536	499	120	93	151	209
1971	44	616	562	153	80	167	235
1972	47	631	730	204	71	180	260
1973	51	674	824	281	70	189	284
1974	53	723	942	338	75	190	309
1975	56	782	1055	395	86	185	334
1976	59	836	1185	439	115	173	360
1977	61	891	1194	555	148	156	386
1978	62	937	1252	620	204	133	410
1979	63	979	1322	702	279	107	432
1980	62	1013	1411	780	337	89	451
1981	60	1055	1488	869	393	72	467
1982	57	1081	1567	873	521	60	479
1983	54	1099	1630	911	626	56	487
1984	52	1112	1684	958	730	59	488
1985	50	1107	1724	1016	830	66	482
1986	51	1068	1774	1066	928	86	470
1987	52	1019	1795	1117	1017	126	453
1988	55	976	1803	1156	1091	194	430
1989	57	937	1803	1189	1185	254	405
1990	61	916	1773	1212	1285	309	387
1991	64	914	1694	1241	1388	364	372
1992	69	933	1601	1261	1426	491	360
1993	73	958	1517	1267	1483	596	358
1994	78	991	1441	1266	1540	698	361
1995	83	1031	1395	1245	1599	796	370
1996	89	1079	1381	1191	1661	893	391
1997	94	1132	1404	1126	1709	981	432
1998	98	1190	1436	1068	1741	1056	503
1999	103	1251	1479	1015	1764	1148	564
2000	107	1314	1534	984	1763	1247	621

TABLE B21. SERIES A  
U.S. DEMOGRAPHIC SUMMARY BY AGE CLASS FOR THE INCREMENT TO OCCUPIED MOBILE HOMES

YEAR	AGE CLASS						65+
	15-19	20-24	25-29	30-34	35-44	45-54	55-64
			(THOUSANDS)				
1970	6	76	97	22	-12	24	33
1971	4	80	63	33	-13	16	26
1972	4	15	167	51	-9	13	23
1973	3	42	94	76	-*	8	24
1974	3	49	118	58	5	2	25
1975	2	60	114	57	11	-5	25
1976	3	53	130	43	29	-12	26
1977	2	55	9	117	33	-18	26
1978	1	46	58	65	56	-23	25
1979	*	42	70	81	75	-25	22
1980	-*	34	88	78	58	-19	19
1981	-2	42	77	89	55	-16	16
1982	-3	26	80	3	128	-12	12
1983	-3	18	63	38	105	-4	8
1984	-3	13	54	47	104	2	*
1985	-1	-5	40	58	100	8	-6
1986	*	-39	50	49	98	20	-12
1987	2	-49	21	51	89	39	-17
1988	2	-43	8	39	75	69	-23
1989	3	-39	-*	33	93	59	-25
1990	3	-21	-30	23	100	56	-18
1991	4	-3	-78	29	103	54	-16
1992	4	19	-93	20	38	127	-11
1993	5	25	-83	5	56	105	-3
1994	5	33	-76	-*	57	102	4
1995	5	40	-46	-21	59	98	9
1996	5	48	-14	-54	62	97	21
1997	5	53	22	-65	48	88	41
1998	5	58	32	-58	32	75	71
1999	4	61	43	-53	23	93	60
2000	4	63	55	-32	-*	99	57

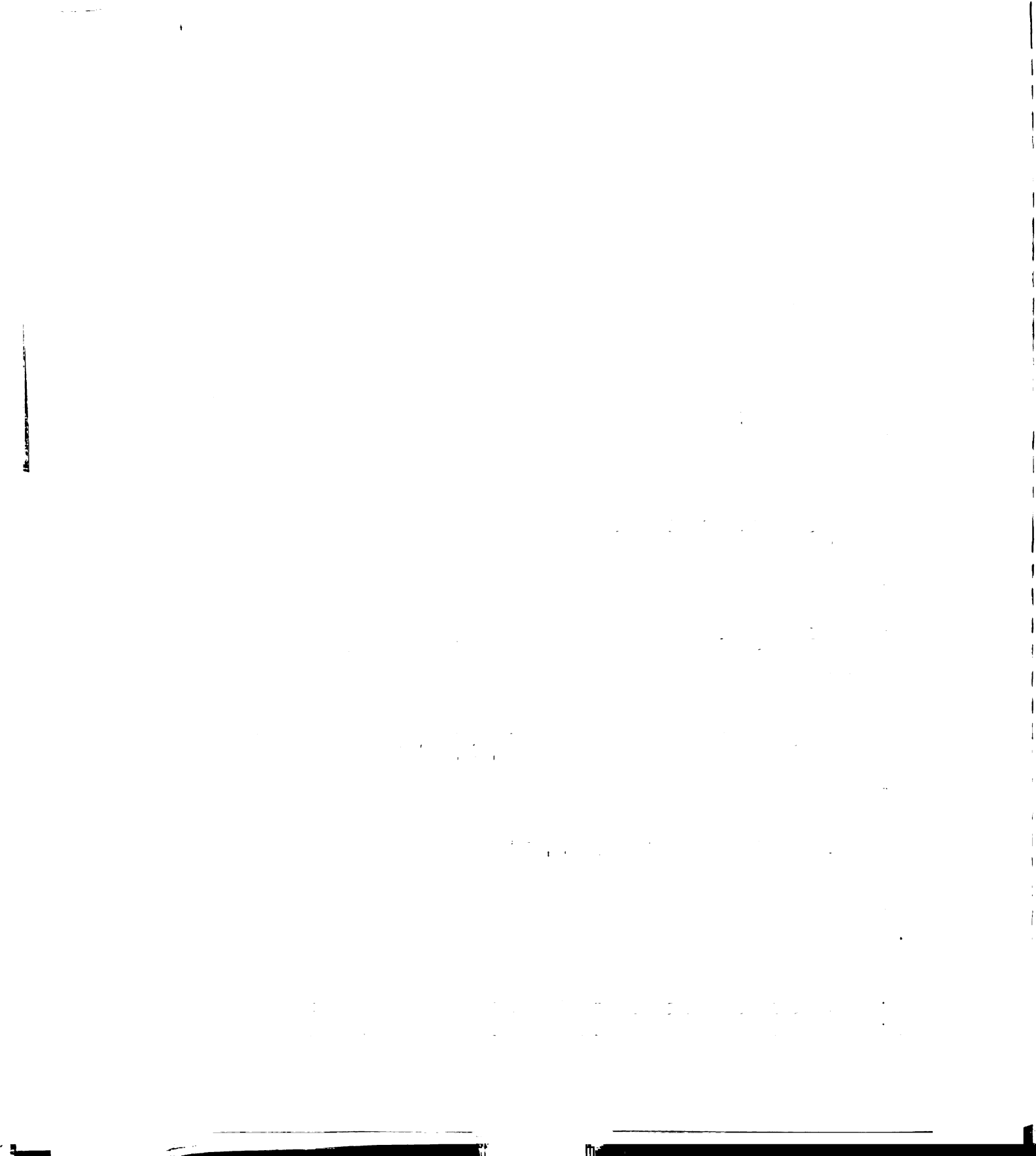




TABLE B22. SERIES A  
U.S. DEMOGRAPHIC SUMMARY BY AGE CLASS FOR SECOND HOME OCCUPANCY RATES

YEAR	AGE CLASS (RATES)					65+	
	15-19	20-24	25-29	30-34	35-44	45-54	55-64
1970	.001	.002	.011	.023	.046	.092	.092
1971	.001	.002	.012	.024	.047	.094	.094
1972	.001	.002	.012	.024	.048	.097	.097
1973	.001	.002	.012	.025	.050	.099	.099
1974	.001	.003	.013	.025	.051	.102	.102
1975	.001	.003	.013	.026	.052	.104	.104
1976	.001	.003	.013	.027	.053	.106	.106
1977	.001	.003	.014	.027	.054	.109	.109
1978	.001	.003	.014	.028	.056	.111	.111
1979	.001	.003	.014	.028	.057	.114	.114
1980	.001	.003	.014	.029	.058	.116	.116
1981	.001	.003	.015	.030	.059	.118	.118
1982	.001	.003	.015	.030	.060	.121	.121
1983	.001	.003	.015	.031	.062	.123	.123
1984	.001	.003	.016	.031	.063	.126	.126
1985	.001	.003	.016	.032	.064	.128	.128
1986	.001	.003	.016	.033	.065	.130	.130
1987	.001	.003	.017	.033	.066	.133	.133
1988	.001	.003	.017	.034	.068	.135	.135
1989	.001	.003	.017	.034	.069	.138	.138
1990	.001	.003	.017	.035	.070	.140	.140
1991	.001	.004	.018	.036	.071	.142	.142
1992	.001	.004	.018	.036	.072	.145	.145
1993	.001	.004	.018	.037	.074	.147	.147
1994	.001	.004	.019	.037	.075	.150	.150
1995	.001	.004	.019	.038	.076	.152	.152
1996	.001	.004	.019	.039	.077	.154	.154
1997	.001	.004	.020	.039	.078	.157	.157
1998	.001	.004	.020	.040	.080	.159	.159
1999	.001	.004	.020	.040	.081	.162	.162
2000	.001	.004	.020	.041	.082	.164	.164

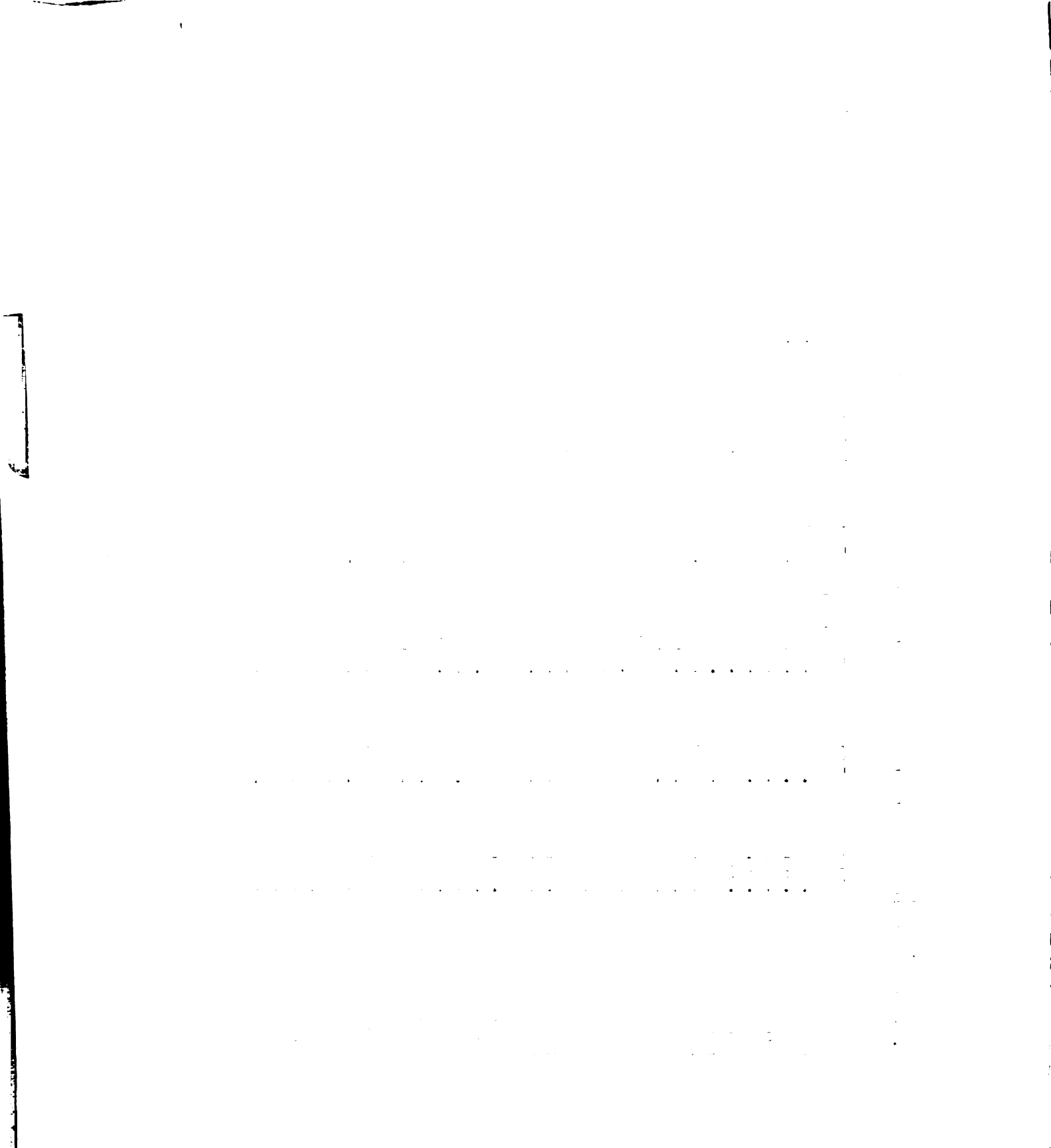


TABLE B23. SERIES A  
U.S. DEMOGRAPHIC SUMMARY BY AGE CLASS FOR SECOND HOME INCREMENTAL OCCUPANCY RATES

YEAR	15-19	20-24	AGE CLASS (RATES)					35-44	45-54	55-64	65+
1970	.001	.002	.011	.023	.046	.092	.092	.092	.092	.092	.092
1971	.001	.002	.012	.024	.047	.094	.094	.094	.094	.094	.094
1972	.001	.002	.012	.024	.048	.097	.097	.097	.097	.097	.097
1973	.001	.002	.012	.025	.050	.099	.099	.099	.099	.099	.099
1974	.001	.003	.013	.025	.051	.102	.102	.102	.102	.102	.102
1975	.001	.003	.013	.026	.052	.104	.104	.104	.104	.104	.104
1976	.001	.003	.013	.027	.053	.106	.106	.106	.106	.106	.106
1977	.001	.003	.014	.027	.054	.109	.109	.109	.109	.109	.109
1978	.001	.003	.014	.028	.056	.111	.111	.111	.111	.111	.111
1979	.001	.003	.014	.028	.057	.114	.114	.114	.114	.114	.114
1980	.001	.003	.014	.029	.058	.116	.116	.116	.116	.116	.116
1981	.001	.003	.015	.030	.059	.118	.118	.118	.118	.118	.118
1982	.001	.003	.015	.030	.060	.121	.121	.121	.121	.121	.121
1983	.001	.003	.015	.031	.062	.123	.123	.123	.123	.123	.123
1984	.001	.003	.016	.031	.063	.126	.126	.126	.126	.126	.126
1985	.001	.003	.016	.032	.064	.128	.128	.128	.128	.128	.128
1986	.001	.003	.016	.033	.065	.130	.130	.130	.130	.130	.130
1987	.001	.003	.017	.033	.066	.133	.133	.133	.133	.133	.133
1988	.001	.003	.017	.034	.068	.135	.135	.135	.135	.135	.135
1989	.001	.003	.017	.034	.069	.138	.138	.138	.138	.138	.138
1990	.001	.004	.017	.035	.070	.140	.140	.140	.140	.140	.140
1991	.001	.004	.018	.036	.071	.142	.142	.142	.142	.142	.142
1992	.001	.004	.018	.036	.072	.145	.145	.145	.145	.145	.145
1993	.001	.004	.018	.037	.074	.147	.147	.147	.147	.147	.147
1994	.001	.004	.019	.037	.075	.150	.150	.150	.150	.150	.150
1995	.001	.004	.019	.038	.076	.152	.152	.152	.152	.152	.152
1996	.001	.004	.019	.039	.077	.154	.154	.154	.154	.154	.154
1997	.001	.004	.020	.039	.078	.157	.157	.157	.157	.157	.157
1998	.001	.004	.020	.040	.080	.159	.159	.159	.159	.159	.159
1999	.001	.004	.020	.040	.081	.162	.162	.162	.162	.162	.162
2000	.001	.004	.020	.041	.082	.164	.164	.164	.164	.164	.164

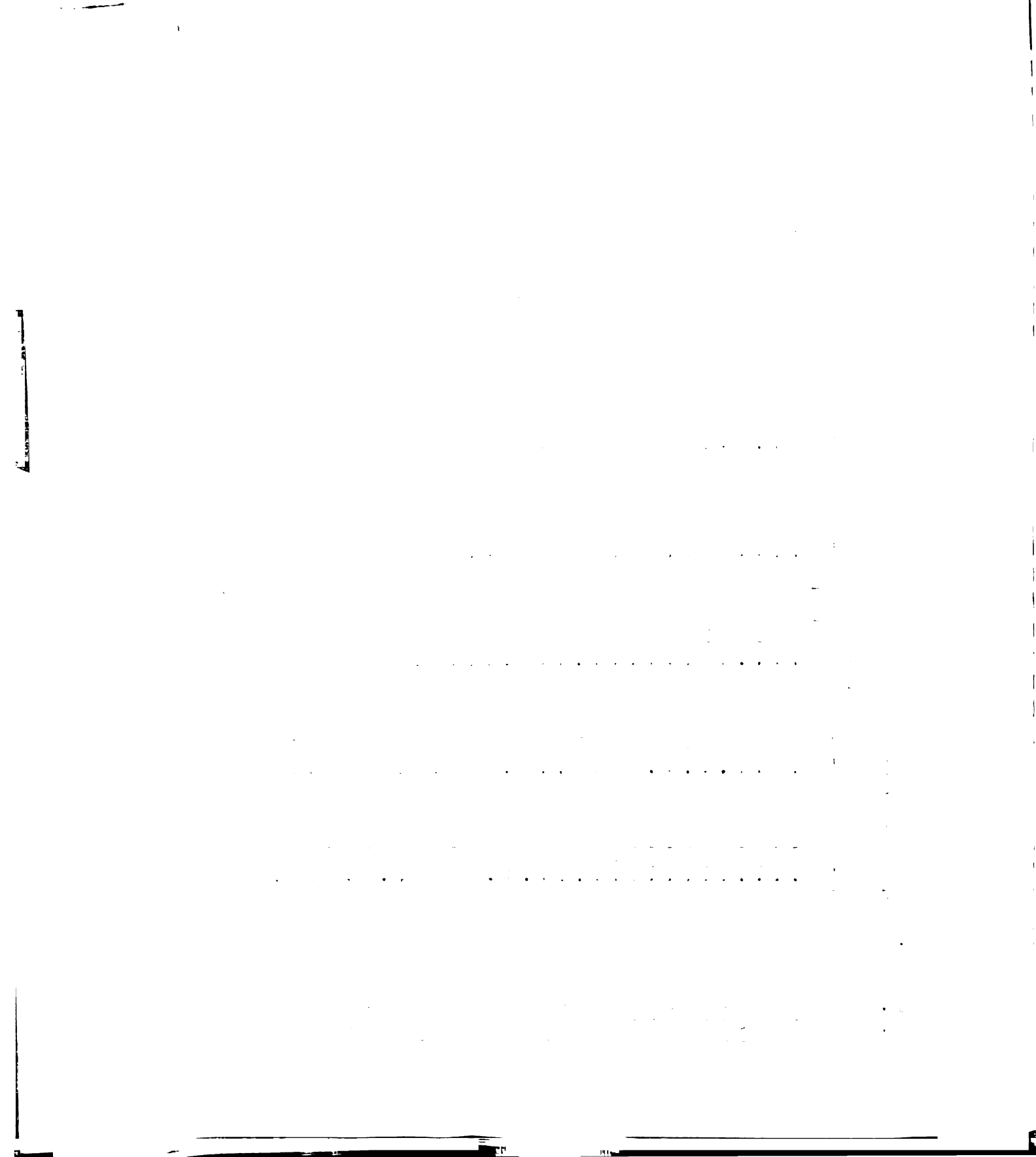


TABLE B24. SERIES A  
U.S. DEMOGRAPHIC SUMMARY BY AGE CLASS FOR TOTAL SECOND HOMES

YEAR	AGE CLASS						45-54	55-64	65+
	15-19	20-24	25-29	30-34	35-44	(THOUSANDS)			
1970	*	10	73	125	533		1122	982	708
1971	*	11	77	132	543		1162	1024	741
1972	*	11	86	142	554		1200	1056	774
1973	*	12	92	155	567		1235	1108	808
1974	*	13	99	166	583		1266	1151	844
1975	*	13	106	177	600		1292	1196	882
1976	*	14	115	187	624		1314	1242	921
1977	*	15	118	207	650		1330	1289	961
1978	*	16	123	221	686		1343	1336	1003
1979	*	16	129	237	729		1352	1381	1046
1980	*	17	136	254	767		1367	1425	1090
1981	*	18	142	272	805		1382	1467	1135
1982	*	19	149	278	873		1400	1506	1180
1983	*	19	156	289	933		1425	1543	1226
1984	*	20	161	303	995		1455	1573	1274
1985	*	20	167	318	1057		1489	1598	1325
1986	*	20	172	332	1119		1534	1618	1375
1987	*	20	177	346	1179		1597	1632	1428
1988	*	20	180	359	1234		1688	1642	1480
1989	*	20	184	371	1298		1772	1648	1532
1990	*	20	185	382	1368		1855	1660	1583
1991	*	20	184	393	1440		1939	1674	1632
1992	*	20	181	404	1483		2094	1691	1679
1993	*	21	179	411	1535		2232	1716	1724
1994	*	22	177	418	1589		2370	1748	1766
1995	*	23	177	421	1644		2508	1785	1806
1996	*	24	179	417	1702		2647	1835	1842
1997	*	25	183	411	1754		2780	1906	1876
1998	*	26	188	405	1797		2902	2011	1905
1999	*	27	194	401	1837		3045	2106	1934
2000	*	28	200	400	1864		3199	2200	1964

TABLE B25. SERIES A  
U.S. DEMOGRAPHIC SUMMARY BY AGE CLASS FOR THE SECOND HOME INCREMENT

YEAR	15-19	20-24	AGE CLASS				30-34	35-44	45-54	55-64	65+
			25-29	(THOUSANDS)							
1970	*	*	6	6			10		44	45	54
1971	*	*	4	7			10		39	42	52
1972	*	*	9	10			11		38	42	53
1973	*	*	6	13			13		35	42	54
1974	*	*	7	11			15		31	43	56
1975	*	*	7	11			17		26	45	58
1976	*	*	8	10			24		21	46	59
1977	*	*	3	20			26		17	47	61
1978	*	*	5	14			35		12	47	62
1979	*	*	6	16			43		10	45	63
1980	*	*	7	16			38		14	44	64
1981	*	*	7	18			38		15	42	65
1982	-*	*	7	6			58		18	40	65
1983	-*	*	6	11			61		25	36	66
1984	-*	*	6	13			62		30	31	66
1985	*	*	5	15			62		34	25	60
1986	*	-*	6	14			62		45	20	51
1987	*	-*	4	15			60		63	14	52
1988	*	-*	4	13			55		91	9	53
1989	*	-*	3	12			65		84	6	52
1990	*	*	1	11			69		83	12	51
1991	*	*	-1	12			72		83	14	49
1992	*	*	-3	10			43		155	17	47
1993	*	*	-2	8			52		138	26	45
1994	*	*	-2	7			54		138	31	42
1995	*	*	-*	3			56		138	37	40
1996	*	*	2	-4			58		139	50	38
1997	*	1	4	-6			52		133	71	34
1998	*	1	5	-5			44		122	105	30
1999	*	1	6	-5			39		143	95	28
2000	*	1	7	-*			27		154	93	20

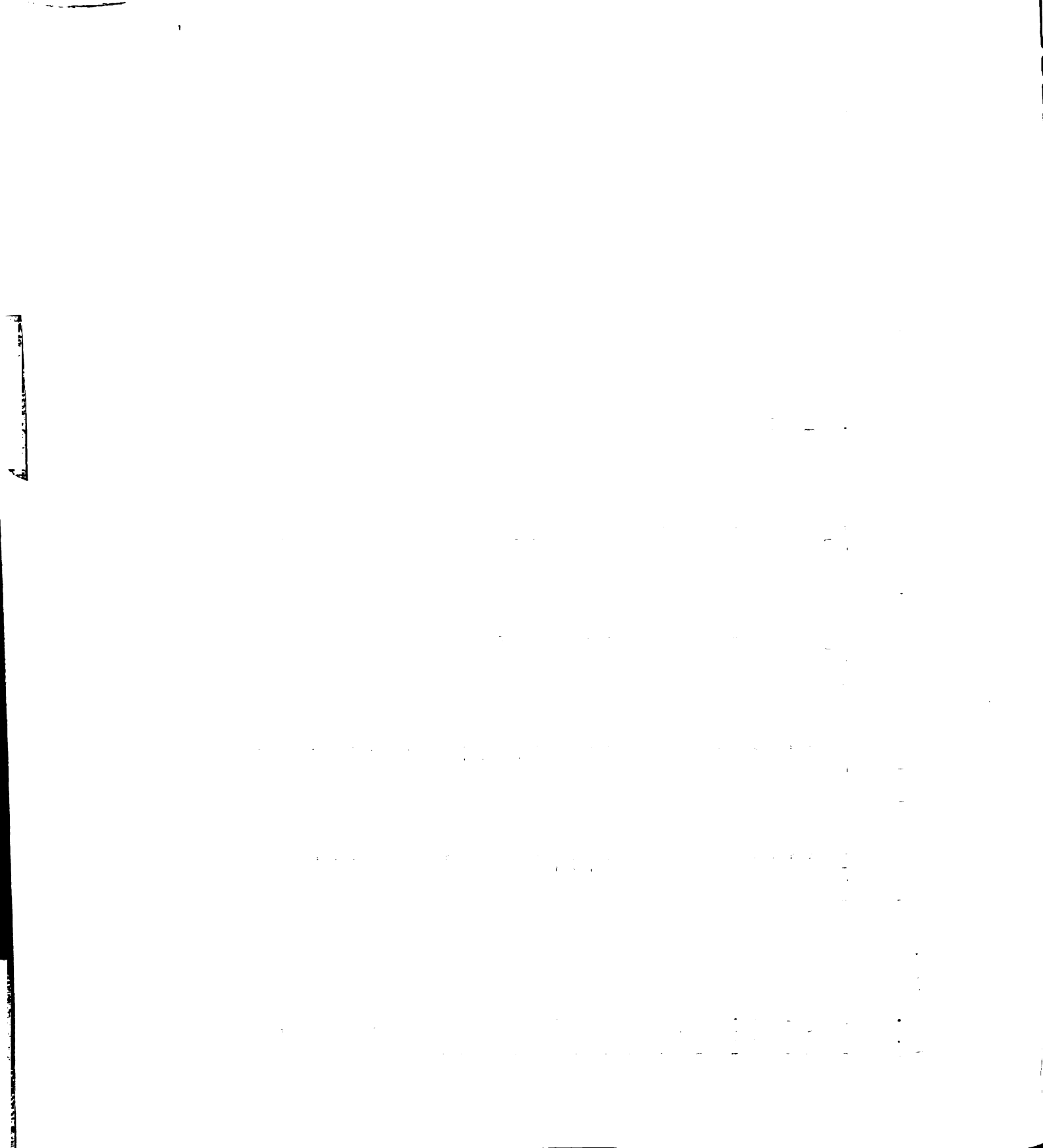


TABLE B26. SERIES B  
U.S. DEMOGRAPHIC SUMMARY FOR HOUSEHOLDS BY TYPE OF UNIT

YEAR	TOTALS BY TYPE OF UNIT OCCUPIED					NET CHANGE FROM PREVIOUS PERIOD					2000 HOPE	
	HOUSE- HOLDS	OWNER	1- UNIT			2ND HOME	HOUSE- HOLDS	OWNER	1- UNIT			
			UNIT	MULTI- UNIT	MOBILE HOME				UNIT	MULTI- UNIT		MOBILE HOME
(THOUSANDS)												
1970	63251	38234	41413	19760	2181	3554	1291	657	439	549	303	146
1971	64193	38697	41704	20185	2407	3683	942	463	291	425	226	130
1972	65354	39313	42108	20659	2690	3819	1161	615	404	474	283	136
1973	66507	39932	42531	21125	2954	3957	1154	620	423	466	265	138
1974	67673	40541	42932	21614	3231	4095	1166	609	400	489	277	137
1975	68857	41153	43327	22119	3514	4232	1184	612	396	506	283	137
1976	70112	41810	43764	22641	3810	4373	1255	657	437	522	296	141
1977	71329	42507	44276	23097	4059	4519	1216	697	512	456	249	146
1978	72536	43195	44779	23546	4314	4666	1207	688	503	449	255	147
1979	73932	43998	45382	24049	4605	4821	1396	803	603	503	290	155
1980	75247	44749	45932	24532	4887	4975	1315	751	550	483	282	154
1981	76590	45511	46490	25029	5173	5130	1343	762	558	497	287	156
1982	77945	46334	47167	25447	5434	5304	1355	823	677	417	261	174
1983	79266	47145	47831	25852	5686	5479	1321	811	664	405	252	175
1984	80581	47962	48504	26246	5934	5657	1315	817	674	394	248	178
1985	81831	48766	49178	26595	6161	5837	1250	804	674	349	227	180
1986	83038	49570	49866	26900	6374	6024	1206	804	688	305	213	186
1987	84174	50359	50566	27150	6560	6220	1136	790	700	250	186	196
1988	85287	51139	51274	27380	6736	6432	1114	780	708	230	176	211
1989	86380	51906	51979	27599	6904	6641	1092	767	705	219	168	209
1990	87428	52642	52671	27803	7057	6854	1049	736	692	204	153	213
1991	88395	53331	53340	27976	7182	7069	967	689	668	173	125	214
1992	89389	54021	54024	28157	7311	7323	994	690	684	181	129	224
1993	90363	54685	54682	28344	7440	7573	974	664	658	187	129	250
1994	91348	55341	55332	28544	7574	7826	984	656	650	200	134	254
1995	92343	55977	55954	28770	7722	8081	996	635	622	226	148	255
1996	93338	56591	56553	29010	7878	8344	995	614	599	240	156	263
1997	94368	57198	57124	29292	8055	8613	1030	607	571	282	177	269
1998	95442	57819	57693	29606	8246	8893	1074	621	569	314	191	280
1999	96542	58440	58262	29936	8447	9178	1099	621	569	329	201	285
2000	97682	59070	58816	30302	8667	9466	1140	630	554	367	220	288



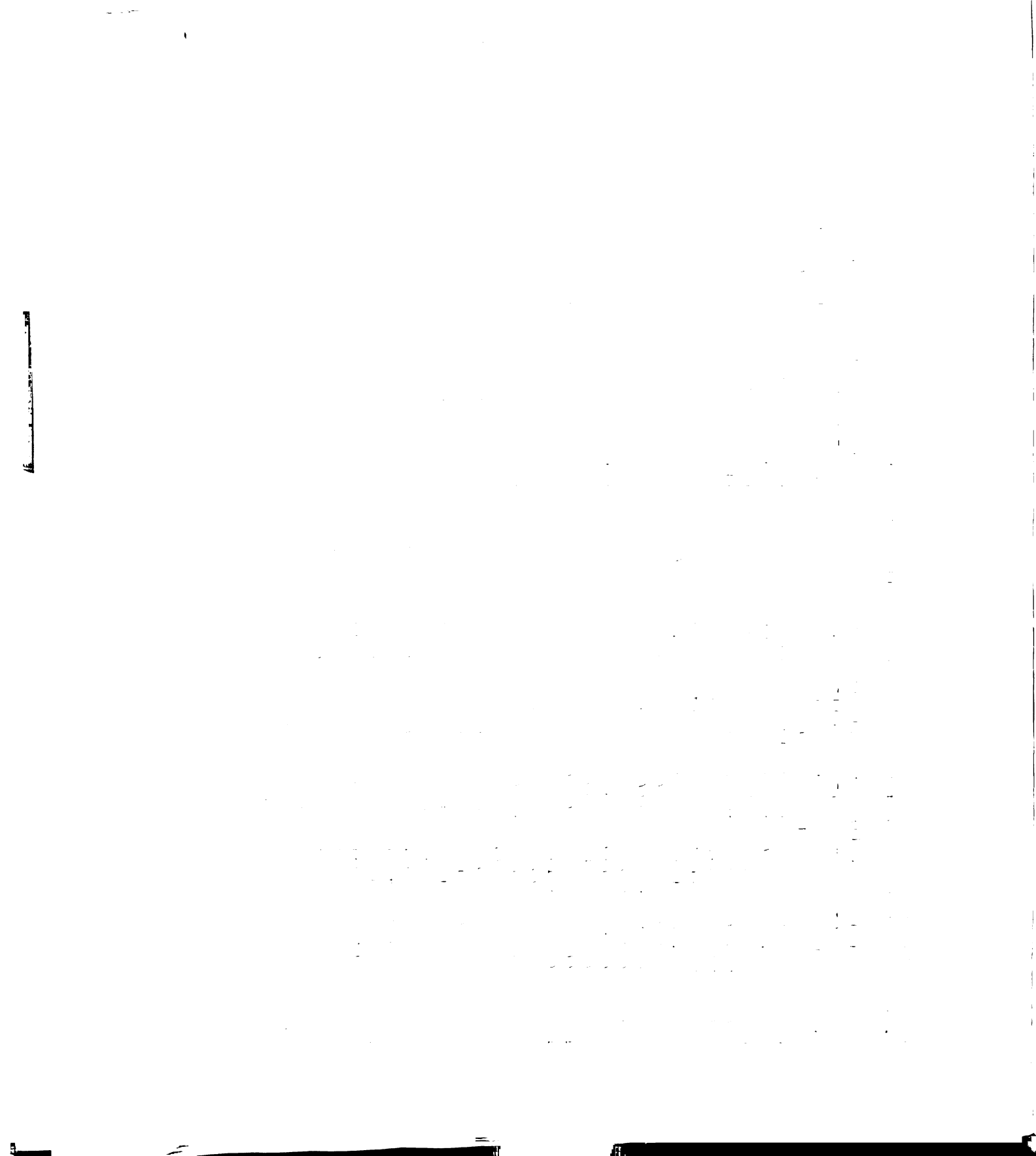


TABLE B27. SERIES B  
U.S. DEMOGRAPHIC SUMMARY FOR HOUSEHOLDS BY TYPE OF UNIT

YEAR	PERCENT - TYPE OF UNIT OCCUPIED				NET CHANGE FROM PREVIOUS PERIOD		2ND HOME
	HOUSE- HOLDS	OWNER	1- UNIT (PERCENTAGES)	MULTI- UNIT HOME	HOUSE- HOLDS	OWNER	
1970	60.4	65.5	31.2	3.4	50.9	34.0	11.3
1971	60.3	65.0	31.4	3.7	49.2	30.9	13.2
1972	60.2	64.4	31.6	4.1	53.0	34.8	11.7
1973	60.0	63.9	31.8	4.4	53.7	36.7	12.0
1974	59.9	63.4	31.9	4.8	52.2	34.3	11.8
1975	59.8	62.9	32.1	5.1	51.7	33.4	11.6
1976	59.6	62.4	32.3	5.4	52.4	34.8	11.3
1977	59.6	62.1	32.4	5.7	57.3	42.1	12.0
1978	59.5	61.7	32.5	5.9	57.0	41.7	12.2
1979	59.5	61.4	32.5	6.2	57.5	43.2	11.1
1980	59.5	61.0	32.6	6.5	57.1	41.8	11.7
1981	59.4	60.7	32.7	6.8	56.8	41.6	11.6
1982	59.4	60.5	32.6	7.0	60.7	50.0	12.9
1983	59.5	60.3	32.6	7.2	61.4	50.2	13.2
1984	59.5	60.2	32.6	7.4	62.1	51.2	13.5
1985	59.6	60.1	32.5	7.5	64.3	53.9	14.4
1986	59.7	60.1	32.4	7.7	66.6	57.0	15.4
1987	59.8	60.1	32.3	7.8	69.5	61.6	17.3
1988	60.0	60.1	32.1	7.9	70.1	63.6	19.0
1989	60.1	60.2	32.0	8.0	70.2	64.5	19.2
1990	60.2	60.2	31.8	8.1	70.2	66.0	20.4
1991	60.3	60.3	31.6	8.1	71.2	69.1	22.2
1992	60.4	60.4	31.5	8.2	69.4	68.8	25.6
1993	60.5	60.5	31.4	8.2	68.2	67.6	25.6
1994	60.6	60.6	31.2	8.3	66.6	66.0	25.2
1995	60.6	60.6	31.2	8.4	63.8	62.4	25.6
1996	60.6	60.6	31.1	8.4	61.8	60.2	26.4
1997	60.6	60.5	31.0	8.5	58.9	55.4	26.1
1998	60.6	60.4	31.0	8.6	57.8	53.0	26.0
1999	60.5	60.3	31.0	8.7	56.5	51.8	26.0
2000	60.5	60.2	31.0	8.9	55.3	48.6	25.3

Figure 1. The effect of the number of trials on the number of correct responses. The number of correct responses was plotted against the number of trials for each condition. The number of correct responses increased with the number of trials for all conditions. The number of correct responses was highest for the condition with the highest number of trials (10 trials) and lowest for the condition with the lowest number of trials (2 trials).

TABLE B28. SERIES K  
U.S. DEMOGRAPHIC SUMMARY FOR HOUSEHOLDS BY TYPE OF UNIT

YEAR	TOTALS BY TYPE OF UNIT OCCUPIED				NET CHANGE FROM PREVIOUS PERIOD		2ND HOME
	HOUSE- HOLDS	OWNER	1- UNIT (THOUSANDS)	MULTI- UNIT (THOUSANDS)	HOUSE- HOLDS	OWNER	
1970	61123	37126	40121	18884	2228	3477	128
1971	61911	37519	40371	19235	2415	3600	124
1972	62904	38053	40725	19633	2656	3730	129
1973	63889	38591	41098	20021	2879	3861	131
1974	64875	39114	41446	20426	3111	3991	130
1975	65869	39636	41788	20844	3347	4120	129
1976	66932	40203	42171	21276	3595	4254	133
1977	67967	40812	42626	21649	3801	4391	137
1978	68985	41407	43070	22014	4011	4529	138
1979	70178	42108	43607	22427	4253	4674	143
1980	71290	42758	44092	22821	4487	4818	144
1981	72426	43417	44585	23227	4724	4963	145
1982	73584	44139	45194	23561	4939	5126	163
1983	74711	44849	45789	23885	5146	5290	164
1984	75833	45563	46393	24200	5350	5456	166
1985	76897	46265	46995	24476	5535	5624	168
1986	77944	46978	47620	24721	5713	5799	175
1987	78937	47683	48258	24921	5868	5984	185
1988	79917	48385	48909	25102	6015	6184	200
1989	80876	49071	49556	25274	6155	6382	198
1990	81793	49731	50192	25430	6280	6584	202
1991	82646	50356	50813	25560	6383	6787	203
1992	83540	50995	51463	25697	6490	7032	245
1993	84409	51607	52086	25836	6596	7271	240
1994	85283	52212	52702	25985	6706	7515	244
1995	86160	52794	53291	26153	6825	7760	245
1996	87054	53371	53871	26337	6955	8013	254
1997	87972	53938	54424	26556	7102	8273	260
1998	88926	54518	54975	26801	7260	8543	270
1999	89902	55097	55527	27059	7426	8819	276
2000	90907	55682	56063	27346	7607	9098	279

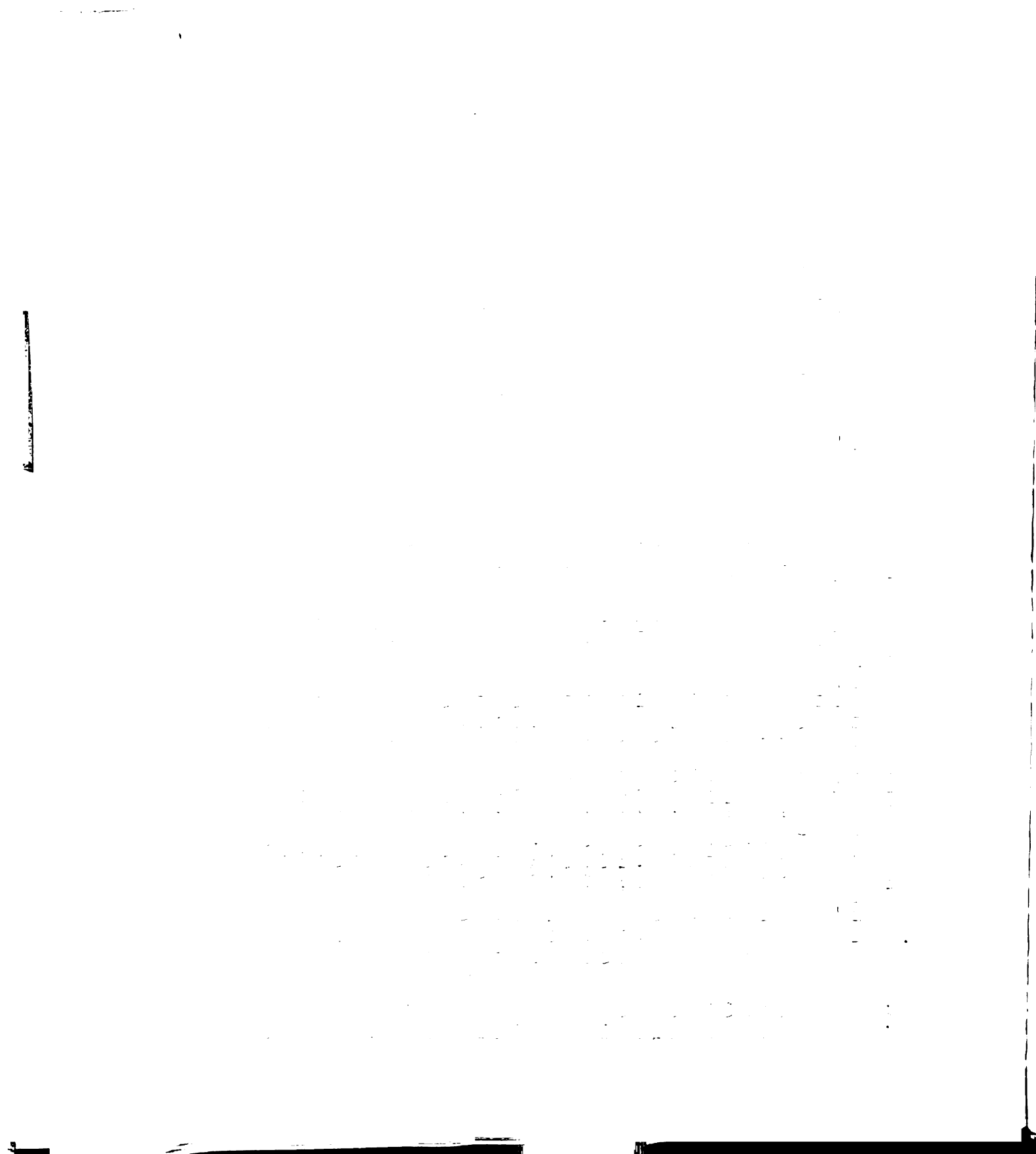


TABLE B29. SERIES K  
U.S. DEMOGRAPHIC SUMMARY FOR HOUSEHOLDS BY TYPE OF UNIT

YEAR	PERCENT - TYPE OF UNIT OCCUPIED				2ND HOME	HOUSEHOLDS	NET CHANGE FROM PREVIOUS PERIOD				2ND HOME
	HOUSE-OWNER	1-UNIT	MULTI-UNIT	MOBILE HOME			HOUSE-OWNER	1-UNIT	MULTI-UNIT	MOBILE HOME	
	HOLDS	(PERCENTAGES)	(PERCENTAGES)				(PERCENTAGES)	(PERCENTAGES)	(PERCENTAGES)		
1970	60.7	65.6	30.9	3.6	5.7		50.8	33.6	42.7	23.7	15.4
1971	60.6	65.2	31.1	3.9	5.8		49.8	31.7	44.5	23.8	15.7
1972	60.5	64.7	31.2	4.2	5.9		53.8	35.7	40.1	24.2	13.9
1973	60.4	64.3	31.3	4.5	6.0		54.6	37.9	39.4	22.7	13.3
1974	60.3	63.9	31.5	4.8	6.2		53.1	35.3	41.1	23.5	13.2
1975	60.2	63.4	31.6	5.1	6.3		52.5	34.3	42.0	23.7	13.0
1976	60.1	63.0	31.8	5.4	6.4		53.4	36.1	40.6	23.3	12.6
1977	60.0	62.7	31.9	5.6	6.5		58.8	43.9	36.1	20.0	13.3
1978	60.0	62.4	31.9	5.8	6.6		58.4	43.6	35.8	20.6	13.6
1979	60.0	62.1	32.0	6.1	6.7		58.8	45.0	34.7	20.3	12.2
1980	60.0	61.8	32.0	6.3	6.8		58.4	43.6	35.4	21.0	12.7
1981	59.9	61.6	32.1	6.5	6.9		58.1	43.4	35.7	20.9	12.8
1982	60.0	61.4	32.0	6.7	7.0		62.3	52.6	28.9	18.5	14.1
1983	60.0	61.3	32.0	6.9	7.1		63.0	52.8	28.8	18.4	14.5
1984	60.1	61.2	31.9	7.1	7.2		63.7	53.8	28.0	18.1	14.8
1985	60.2	61.1	31.8	7.2	7.3		65.9	56.6	26.0	17.4	15.2
1986	60.3	61.1	31.7	7.3	7.4		68.1	59.6	23.4	17.0	15.7
1987	60.4	61.1	31.6	7.4	7.6		71.0	64.3	20.1	15.6	18.6
1988	60.5	61.2	31.4	7.5	7.7		71.5	66.4	18.5	15.0	20.4
1989	60.7	61.3	31.3	7.6	7.9		71.7	67.5	17.9	14.6	20.6
1990	60.8	61.4	31.1	7.7	8.0		72.0	69.4	17.0	13.6	22.0
1991	60.9	61.5	30.9	7.7	8.2		73.2	72.7	15.3	12.0	23.2
1992	61.0	61.6	30.8	7.8	8.4		71.5	72.7	15.3	12.0	27.4
1993	61.1	61.7	30.6	7.8	8.6		70.5	71.8	16.0	12.2	27.0
1994	61.2	61.8	30.5	7.9	8.8		69.1	70.4	17.0	12.5	27.8
1995	61.3	61.9	30.4	7.9	9.0		66.5	67.2	19.2	13.7	27.9
1996	61.3	61.9	30.3	8.0	9.2		64.5	64.9	20.6	14.5	27.4
1997	61.3	61.9	30.2	8.1	9.4		61.8	60.2	23.8	16.0	28.3
1998	61.3	61.8	30.1	8.2	9.6		60.7	57.7	25.7	16.5	28.3
1999	61.3	61.8	30.1	8.3	9.8		59.4	56.6	26.3	17.0	28.3
2000	61.3	61.7	30.1	8.4	10.0		58.2	53.3	28.6	18.1	27.8



## APPENDIX C - PROGRAM LISTING



```

PROGRAM HOUSE (INPUT, OUTPUT, IAPF1=1, IAPF2=1, IAPF3=0, IAPF4=1)
  DIMENSION POP(10,75), POPF(5,75), HMF(75), HMF(75), HMF(75),
  /HUT(75), H(8,55), U(8,75), H(75), H(75), H(75), H(75), H(75),
  /T(7,8,76), UH(7,76), H(7,76), H(7,76), H(7,76), H(7,76), H(7,76),
  /FUP(75), H(75), H(75), H(75), H(75), H(75), H(75), H(75),
  /V(5,76), H(75), H(75), H(75), H(75), H(75), H(75), H(75),
  /HUM(5,76), H(75), H(75), H(75), H(75), H(75), H(75), H(75),
  / T(7,8,76), U(7,76), H(7,76), H(7,76), H(7,76), H(7,76),
  /USY(55), USL(55), USL(55), USL(55), USL(55), USL(55), USL(55),
  /L(8), L(8), L(8), L(8), L(8), L(8), L(8), L(8), L(8), L(8),
  /USL(75), USL(75), USL(75), USL(75), USL(75), USL(75), USL(75),
  /RI(5,55),
  K1=5
  K2=55
  K3=1
  S=0.05
  SA=0.4
  A12=1.0
  A13=0.7
  A14=0.03
  READ (1,101) ((POP(I,J), I=1,75), J=1,75)
  READ (1,102) ((POPF(I,J), I=1,75), J=1,75)
  READ (1,103) ((H(I,J), I=1,75), J=1,75)
  READ (1,104) ((V(I,J), I=1,75), J=1,75)
  READ (1,104) ((H(I,J), I=1,75), J=1,75)
  DO 1 J=1,75
    1 READ (1,103) (T(J,I,76), I=1,75)
    DO 10 N=K1,K2,K3
      DO 10 I=1,75
        U(I,N)=U(I,10)
        DO 2 J=1,4
          USK=1+(+I,76)
          2 U(I,I,N)=T(J,I,76)
          U(4,I,N)=USK*(1.0+A14*(N-76))
        10 CONTINUE
        K2=K1+10
        K3=U(1,76) ((T(J,I,76), I=1,75), J=1,75)

```

```

      DO 9 N=K1,K2,K3
      DO 9 I=1,N
      IF (N-K2) GO,65,65
65  CONTINUE
      A13=5.0
      IF (N-24) GO,67,68
68  CONTINUE
      DO 69 J=1,3
69  I(J,1,N)=I(J,1,25)
      A12=1.0
      A13=1.0
      GO TO 66
67  CONTINUE
      A13=4.0
      A12=1.0
66  CONTINUE
      Z13=(A13-1.0)*I(3,1,N)
      Z12=(A12-1.0)*I(2,1,N)
      I(1,1,N)=I(1,1,N)-Z13-Z12
      I(2,1,N)=I(2,1,N)+Z12
      I(3,1,N)=I(3,1,N)+Z13
9  CONTINUE
11  CONTINUE
      KX=K2-5
      DO 42 N=5,KX,5
      DO 40 I=1,5
      PX=POPR(I,N+5)-POPR(1,N)
      PR=K(I,N+5)-K(I,N)
      PV=V(I,N+5)-V(1,N)
      K=N
      DO 40 J=1,4
      K=K+1
      F=J
      K(I,K)=K(I,N)+F*PR/F
      V(I,K)=V(I,N)+F*PV/F
40  POPR(I,K)=POPR(1,N)+F*PX/F
      DO 41 J=1,N

```

```

PY=H(1,N+5)-P(1,N)
PZ=POP(1,N+5)-POP(1,N)
K=N
DO 41 J=1,4
  K=K+1
  F=J
  H(1,K)=H(1,N)+F*PY/D.
  IF (N-5) 41,37,37
39 POP(1,K)=POP(1,N)+F*PZ/D.
41 CONTINUE
42 CONTINUE
READ (1,104) ((V(K,N), K=1,5), J=21,24)
DO 55 L=1,2
  READ (1,105) M1
  DO 25 N=1,K2,23
    M1=N-K3
    H(1,N)=0.
    M1(N)=0.
    GOUT(N)=0.0
    DO 3 J=1,4
      H(J,1,N)=0.0
      H(J,N)=0.0
      DO 14 I=1,2
        H(I,N)=0.0
      IF (1,N)=H(1,N) AND (1,N)
      H(1,N)=H(1)+H(1,N)
      K2=K1+1
    IF (I-K2) 17,17,17
17 CONTINUE
    H(1,N)=H(1,N)+H(1,N)
    H(1,N)=H(1,N)+H(1,N)
    DO 15 J=1,4
      H(J,1,N)=H(J,1,N)
      H(J,1,N)=H(J,1,N)+H(1,N)
15 H(1,N)=H(1,N)+H(1,N)
    DO 16 27

```

```

16  UPH(I,N)=UPH(I,N)-UPH(I,N1)
   UPH(N)=UPH(N)-UPH(N1)
   UPH(I,N)=U(I,N)*UPH(I,N)
   UPH(I,N)=UPH(I,N1)+UPH(I,N)
   UPH(N)=UPH(N)+UPH(N1)
   UPH(N)=UPH(N1)+UPH(N)
   UPH(N)=(UPH(N)/UPH(N))*100.
DO 18 J=1,3
  U(I,J,N)=I(J,I,N)*UPH(I,I)
  U(I,J,I,N)=U(I,I,N1)+U(I,J,I,N)
  U(I,J,I,N)=U(I,J,I,N)/UPH(I,I)
  UPH(I,J,N)=UPH(I,N)+I(J,I,N)*UPH(I,I)
  UPH(I,J,N)=UPH(I,N1)+UPH(I,J,I)
  UPH(I,J,N)=(UPH(I,J,N)/UPH(N))*100.
18  UPH(I,J,N)=U(I,J,I,N)*UPH(I,I)
  U(I,J,I,N)=U(I,J,I,N)-U(I,J,I,N1)
  U(I,J,I,N)=UPH(I,J,I,N)/UPH(I,I)
  UPH(I,J,N)=UPH(I,J,I)+UPH(I,I)
  UPH(I,J,N)=UPH(I,J,I)-UPH(I,J,I)
  UPH(I,J,N)=(UPH(I,J,N)/UPH(N))*100.
CC CONTINUE
DO 19 J=1,4
  UPH(I,J,N)=UPH(I,J,N)/UPH(N)*100.
  UPH(N)=(UPH(N)/UPH(N))*100.
19  CONTINUE
  N=N+1945
  YR=AR(N)=800
  SAVE=UPH(I)
  UPH(N)=UPH(N)
  IF (N1) 55,53,50
50  IF (N-25) 53,51,51
51  IF (N-40) 52,52,54
52  IF 40 (1,100) 500
  WRITE (3,200) 500
  WRITE (3,210) 51
54  UPH(N)=SAVE+UPH(N)
55  CONTINUE
  SAVE=UPH(I)

```

```

P1=53024./115461.
P2=(40103./58315.)*100.
P3=(/65.565/53024.)*100.0
A1(1)=(13522./29573.)/P1
A1(2)=(15379./32063.)/P1
A1(3)=(15503./34878.)/P1
A1(4)=(08620./18947.)/P1
B1(1)=(07300./14795.)/P2
B1(2)=(12328./16793.)/P2
B1(3)=(13579./17171.)/P2
B1(4)=(06895./09556.)/P2
B3(1)=(078.042/13522.)/P3
B3(2)=(213./147153/9.)/P3
B3(3)=(239.050/15503.)/P3
B3(4)=(215.743/08620.)/P3
HPI=0.
DO 5 K=1,4
  HK(K)=POPR(K,N)*A1(K)
5  HPI=HPI+HK(K)
DO 6 K=1,4
  HK(K,V)=(HK(K)/HPI)*GINT(N)
  HUN=0.
  VRN=0.
DO 7 K=1,4
  HU(K,N)=HHR(K,K)/(1.-V(K,N))
  VR(K,N)=HU(K,N)-HHR(K,N)
  HUN=HUN+HU(K,N)
  VRN=VRN+VR(K,N)
  IF (N-K1) 25,25,12
12 CONTINUE
  HPI1=(HPI(1,N)/GINT(1,N)+HPI(2,N))/100.
  HFN=0.
  UVRN=0.
  VRN=0.
  A1HFN=0.
  HCN=0.
  HCSN=0.

```

```

PCMN=0.
PCPN=0.
PPN=0.
PCPKN=0.0
TOTALN=0.0
DO 13 K=1,4
  HF(K,IJ)=HH(K,IJ)-HH(K,IJ)
  VVK(K,V)=VVK(K,N)-VVK(K,V,I)
  PCMH=HH(K,IJ)*PHT(3.0)*B3(K)
  PC(K,IJ)=PC(K,N)*(HU(K,IJ)-PCMH)*B3
  APH(K,N)=PH(K,N)*PHT(3.0)*B3(P)
  HC(K,N)=PH(K,N)+UVK(K,V)-APH(K,IJ)+PC(K,IJ)
  PCS(K,N)=(PH(K,IJ)+UVK(K,V)-APH(K,IJ)+PC(K,IJ))*PHT(1
/ (PHT(1,N)*H1(K))
  PCM(K,N)=HC(K,N)-PCS(K,V)
  PPH(K,N)=HH(K,N)*PHT(3.0)*B3(P)*B3
  PPH(K,N)=APH(K,IJ)+PCM(K,N)
  PPH(K,N)=PCM(K,N)/SX
  TOTAL(K,IJ)=HC(K,IJ)+PH(K,IJ)
  H1(K,V)=(PCM(K,N)+PCM(K,N))/HU(K,IJ)*100.0
  H1(K,N)=(PCM(K,N))/HU(K,N)*100.0
  H1(K,IJ)=(PCM(K,N))/(HU(P,IJ)-PCPKN)*100.0
  V1(K,IJ)=V(K,IJ)*100.0
  P(PCN=PCPH+PCPKN)
  TOTALN=TOTAL+TOTAL(K,N)
  PCN=PCN+PC(K,IJ)
  VVK(I)=VVK+UVK(K,IJ)
  PCN=PCN+PC(K,N)
  APH=APH+APH(K,IJ)
  PCN=PCN+HC(K,IJ)
  PCSN=PCSN+PCS(K,N)
  PCMN=HCMN+PCM(K,IJ)
  PCPN=PCPN+PC(K,IJ)
  PCPKN=PCPKN+PC(K,N)
13 CONTINUE
V1=VVK/HU
PCN=PCN/PCM

```

1

```

KK=RRN/(HUN-HIT(3,N))
KFI=(RRN+RMHN)/HUN
US1(N)=HCN+IMHN
US2(N)=HCN
US3(N)=HCSN
US4(N)=HCMN
US6(N)=IMHN
US7(N)=MFN
US8(N)=UVKN
US9(N)=RMN
US10(N)=RMHN
US11(N)=HUN
US12(N)=SAVE2
US13(N)=VMN
US14(N)=VN*100.
US15(N)=KN*100.
US16(N)=KNI*100.
US17(N)=AMHN
DO 26 K=1,4
PST(K,N)=(HCS(K,N)/HC(K,N))*100.0
PSFN=(HCSN/HCN)*100.0
PHC(K,N)=(HC(K,N)/HCN)*100.0
PK(K,N)=(POPF(K,N)/POPFN)*100.0
PTOT(K,N)=(TOTAL(K,N)/TOTALN)*100.0
26 CONTINUE
US5(N)=PSFN
21 CONTINUE
HFI(N)=SAVE
25 CONTINUE
KB = 25
KB = 25
WRITE (3,199)
KPAU (1,11) IT
WRITE (3,112) IT
WRITE (3,222)
WRITE (3,223) (YEARN(N),HFI(N),HFI(N),HFI(J,N),J=1,4),HFI(N),
/PTOT(N),HFI(J,N),J=1,4), (PFI(N),PFI(N))

```



```

WRITE (3,199)
READ (1,111) IT
WRITE (3,112) IT
WRITE (3,225)
WRITE (3,226) (YEAR(N), HUP(N), (PHI(J,N), J=1,4),
/ OHP(N), (PHI(J,N), J=1,4), N=K5,55)
WRITE (3,199)
READ (1,111) IX
WRITE (3,113) IX
READ (1,111) IT
WRITE (3,219) IT
WRITE (3,229)
WRITE (3,220) (YEAR(N), (OHP(1,N), I=1,4), N=K6,55)
WRITE (3,199)
READ (1,111) IX
WRITE (3,113) IX
READ (1,111) IT
WRITE (3,219) IT
WRITE (3,229)
WRITE (3,221) (YEAR(N), ( OHP(1,N), I=1,4), N=K6,55)
WRITE (3,199)
READ (1,111) IX
WRITE (3,113) IX
READ (1,111) IT
WRITE (3,219) IT
WRITE (3,229)
WRITE (3,220) (YEAR(N), ( OHP(1,N), I=1,4), N=K6,55)
WRITE (3,199)
READ (1,111) IX
WRITE (3,113) IX
READ (1,111) IT
WRITE (3,219) IT
WRITE (3,229)
WRITE (3,220) (YEAR(N), (OHP(1,N), I=1,4), N=K6,55)
WRITE (3,199)
READ (1,111) IX
WRITE (3,113) IX

```



```

      READ (1,111) IT
      WRITE (3,219) IT
      WRITE (3,228)
      WRITE (3,221) (YEAR(N), ( U(1,N), I=1,8), N=80,55)
      WRITE (3,199)
      READ (1,111) IX
      WRITE (3,113) IX
      READ (1,111) IT
      WRITE (3,219) IT
      WRITE (3,229)
      WRITE (3,220) (YEAR(I), ( MU(1,N), I=1,8), M=80,55)
      WRITE (3,199)
      READ (1,111) IX
      WRITE (3,113) IX
      READ (1,111) IT
      WRITE (3,219) IT
      WRITE (3,229)
      WRITE (3,220) (YEAR(N), (LMU(1,N), I=1,8), L=80,55)
      UC 95 J=1,4
      WRITE (3,199)
      READ (1,111) IX
      WRITE (3,113) IX
      READ (1,111) IT
      WRITE (3,219) IT
      WRITE (3,228)
      WRITE (3,221) (YEAR(N), (I1(J,1,N), I=1,8), I=80,55)
      WRITE (3,199)
      READ (1,111) IX
      WRITE (3,113) IX
      READ (1,111) IT
      WRITE (3,219) IT
      WRITE (3,228)
      WRITE (3,221) (YEAR(N), ( I1(J,1,N), I=1,8), I=80,55)
      WRITE (3,199)
      READ (1,111) IX
      WRITE (3,113) IX
      READ (1,111) IT

```









[illegible]