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SPATIAL DIFFUSION OF POPULAR MUSIC
VIA RADIO IN THE UNITED STATES

BY

ANNE ELIZABETH KELLOGG

A DISSERTATION

Submitted to
Michigan State University
In Partial Fulfillment of
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ABSTRACT

SPATIAL DIFFUSION OF POPULAR MUSIC VIA RADIO IN THE UNITED STATES

by

Anne Elizabeth Kellogg

Popular music has been an important cultural phenomenon in the United States whose diffusion via radio has intensified during the last fifty years. The spread of popular music via the national radio network has not been investigated by geographers. This study takes a step toward rectifying that omission. Weekly data regarding the broadcast of songs by 264 radio stations in 140 United States cities were gathered from Billboard, a publication of the radio industry which provides many ratings charts for popular songs. The 1981-1983 data were analyzed by computation of partial and Pearson correlation coefficients and multiple regression coefficients for the following variables: 1) population density, 2) format type of radio stations, 3) regional radio station density (stations per 100,000 square miles), 4) adoption rate as indicated by the data, 5) transmission power of radio stations, and 6) city size.

Results were scrutinized to ascertain the presence or absence of the three features common to diffusion processes noted by Brown and Cox, namely hierarchical movement through the urban system from large to small cities, neighborhood effect diffusion which is contrary to hierarchical

expansion, and an S-shaped logistic curve of the cumulative number of adopters plotted against time. Of the three, only the logistic curve was found in this research. Several variations from the national norms were discovered within the eight regions of the United States. The Southeast region and California emerged as early adopters. Very large cities, thought originally to be among the first to adopt popular songs, frequently displayed slower diffusion rates than those found in smaller cities. It was discovered that radio station format type had virtually no impact on adoption rates of popular songs. Radio station density and population concentration were negatively correlated with the rate of adoption, indicating that as those variables increased, the average number of days required for radio stations to adopt popular songs decreased.

DEDICATION

For my daughter, Cecily.

May the rough places
in her path be made
plainer because of this.

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This seems an appropriate place to express my heartfelt gratitude to a number of people who have unfailingly provided me with inspiration and support over the years required to complete my doctoral program and this dissertation.

I wish to thank my parents for opening broad vistas to my view which ultimately set my feet on the path to geography. I am grateful to my daughter who was willing to leave our home in the promised land and accompany me to Michigan State University.

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CHAPTER I

INTRODUCTION

Popular music, long a durable element of culture in the United States, has increased its impact via radio broadcasting during the last fifty years. As a cultural phenomenon, it has served as the subject of investigations by musicologists, sociologists, ethnomusicologists, and geographers. Musicological research has focused on the technical/structural aspects of the music. Sociologists have been interested in the impact of social constructs, i.e., perceptions, expectations, and social status, upon popular music. Generally, studies undertaken by ethnomusicologists have been concerned with providing a more holistic view of music in society. Styles and functions of music have been scrutinized and cross-cultural regularities sought. Geographers have been particularly interested in tracing the spatial distribution and diffusion of music types.

United States popular music is generally characterized by a lack of flexibility in structure. Adorno (1962) has linked this rigidity of musical form to the social organization of the popular music industry. He suggests that the representatives of the business are interested in

popular songs for their economic value rather than their musical merit (or lack of it).

Building on Adorno's work, Etzkhorn (1964) investigated the social reference groups of songwriters.¹ He discovered that the majority of composers' significant others are persons in the music business whose positions allow them a fair amount of influence over the choice of songs to be recorded and aired on the radio. Etzkhorn concluded that writers of popular songs and the members of their social reference groups share a strong desire for economic security and exhibit the "...American phenomenon of canonizing that which has become financially successful... ." ² Therefore, within a framework of shared values and close interaction with their significant others, popular songwriters tend to produce new songs which are structurally similar to those that have proven to be economically rewarding.

Referring to patterns of interaction between composer and listener, Etzkhorn states, "In the case of popular music, the dominant trend seems to be of manifest one-way communication from the creator to the audience with

¹Etzkhorn's thesis is that the reference group of "significant others" (a phrase coined by G.H. Mead referring to persons who influence one's behavior) of songwriters exert a measure of control over the composers' musical activities.

²Etzkhorn, P.K., "The Relationship Between Musical and Social Patterns in American Popular Music," Journal of Research in Music Education 12:279-286, 1964, p.285.

relatively little direct feedback."³ One might conclude that the lack of such audience information would have the effect of increasing the impact of significant others' values and opinions upon the musical creations of composers.

From a geographic perspective, popular music in the United States has been studied in terms of its spread over space. Source areas and regions of subsequent expansion have been defined for rock and roll⁴ (Ford, 1971 and Francaviglia, 1973), bluegrass⁵ (Carney, 1974), and jazz⁶ (Glasgow, 1979). However, spatial diffusion of popular songs that occurs among the radio communications network in the United States has not been previously explored. The current study seeks to make a beginning toward filling that omission.

³Ibid, pp.285-286.

⁴Rock and roll is a kind of popular music typified by simple lyrics and strong rhythm. Chapple, S. and Garofalo, R. Rock 'n' Roll Is Here To Pay. Chigago: Nelson-Hall, Inc., 1977, pp.36-37.

⁵Bluegrass may be defined as a musical genre which combines elements of white folk songs with the use of a characteristic panoply of accompanying instruments such as a banjo, mandolin, and fiddle. Cantwell, R. Bluegrass Breakdown. Urbana, Illinois: University of Illinois Press, 1984, p.xi.

⁶Jazz is a musical combination of African influences and white folk song elements. Improvisation is essential. Charters, S. Jazz: New Orleans, 1985-1963. New York: Oak Publications, 1963, pp.156-158.

The Spatial Diffusion Approach

Over the past 50 years, most geographic diffusion studies have focused on the spread of innovations whose spatial expansion depended, to some extent, upon interpersonal communication as the dispersal medium. Hagerstrand (1952,1953) provided a fresh impetus to diffusion research with the articulation of his quantitative approach, emphasizing the role of geographic proximity as an important influence on the process. He coined the phrase "the neighborhood effect" to describe the inverse relationship between a) the distance separating innovators and potential adopters and b) the probability of their communication regarding the innovation.

Another principal strand within the skein of geographic research has dealt with hierarchical diffusion downward through the urban place system. At the core of this inquiry is central place theory, first postulated by Christaller (1933) to explain patterns which he observed in the distribution of urban places in southern Germany. Christaller categorized the settlements by population and ascertained that a city's economic functions increased in direct proportion to its population size. He also found an inverse relationship between a given city's population and the number of cities of that magnitude, i.e., as city size grew, the number of cities of that size became fewer.

More recently, many geographers have researched the spatial diffusion of a variety of phenomena. Examples of proponents of this research include the following. Sauer (1952) examined the global diffusion of agricultural techniques and concluded that they originated at a few points and was dispersed outward from them. Bell (1965), tracing the spread of radio broadcasting in the United States during the 1920s, discovered hierarchical and contagious diffusion (which requires personal contact) occurring simultaneously. Berry (1967) studied the distance biases of a variety of goods and services. In so doing, he demonstrated the practical applicability of the central place theory to urban hierarchies in the midwestern United States. Pyle (1968) deduced the effect of the emerging urban system in the United States on three successive cholera epidemics during the nineteenth century. Ford (1971) and Francaviglia (1973) focused on the spread of rock and roll music in the United States and identified a number of culture hearths as points of origin in the diffusion process.

Sociological investigations of diffusion have concentrated on the traits of the innovations or the characteristics of adopters. Rogers (1962, 1983) is a leader in this type of inquiry. Based on a large body of sociological research, he categorized adopters according to the time of acceptance and described attributes of

innovations that have an impact upon the rates of their diffusion. Roger's classifications are supported by the work of a number of other scholars. Ryan and Gross (1943) discovered that early adopters of hybrid seed corn among a group of Iowa farmers made more than the average number of trips to urban areas such as Des Moines where the latest information on corn seed improvements was available . Mansfield (1961) in his study regarding businesses involved in a variety of economic enterprises (coal, steel, railroad, and brewing firms) found that two attributes of innovations, i.e., relative advantage (profitability) and observability (the extent of communication among adopters about the innovation) explained one half of the variance in the adoption rate. The investigation by Clinton (1973) of innovation adoption among elementary school teachers displayed that 55 percent of the variance of acceptance rate was explained by the attributes of relative advantage and observability.

The applicability of adopters' traits and innovation attributes to the study of popular music diffusion will be examined in the following section. The function of radio station personnel, especially program directors, will also be discussed.

Role of Program Directors in Popular Music Diffusion⁷

The diffusion of popular music occurs via a series of decisions to adopt, i.e., to accept an innovation. In this research, acceptance of an innovation is comprised of selecting a song from among a number of songs. Motivation for the choice is usually economic and involved with financial gain for all connected with the particular song. Points at which adoption decisions are made include the following. Initially, songs are composed by songwriters and sent to music publishers, where decisions are made regarding the acceptance or rejection of the songs. The next decisions in the series occur when representatives of music publishers make contact with musicians whom they hope to interest in particular songs. The musicians decide to adopt or reject the songs. Once specific songs are recorded, agents of record retailers attempt to induce program directors at radio stations' to adopt the songs by adding them to the stations' play lists. This last step in the chain of adoptions is an important one in allowing songs an opportunity to reach a wide audience. The number of songs selected at each decision making point in the adoption series is increasingly small.

The adoption of songs by radio station program directors may be enhanced by a number of circumstances,

⁷For extensive discussion, see Denisoff, R. Solid Gold. New Bruswick, N.J.: Transaction Books, 1975, pp.216-279.

perhaps the most important of which is that they are probably early adopters, i.e., within the first 16 percent of those who adopt, or innovators, who comprise the initial 2.5 percent of those accepting an innovation. The reasoning behind this conclusion is that the principal objective of radio station program directors is to attract an increasingly large audience and thus increase the revenue from advertizers and the profitability of the stations. Advertizers naturally wish to subscribe to the station with the largest audience in order to maximize the number of listeners, i.e., potential customers, who hear their messages. The most powerful method of attracting a radio audience is by the content of the stations' programs. Program directors select the material to be broadcast. In the case of music stations, that material consists of songs. Each song title which is added to the play list (list of items to be aired) constitutes an adopted innovation.

It is argued that program directors have social, economic motivations that help make them early adopters and sometimes innovators. For them to remain economically secure (employed), program directors must be fairly consistent and successful in selecting songs, i.e., adopting innovations, that increase or at least maintain the level of listening audiences of their stations. Certainly, successful program directors obtain a social benefit, prestige, among their colleagues. For both of these

reasons, program directors are self-interested propagators of innovations, insofar as they desire the timely and complete diffusion of the songs they have selected for broadcast.

Program directors wish to add titles to their play lists early in the diffusion sequence, but they also prefer not to be the first to choose a particular song that fails to please the current audience and to attract more listeners. Guidelines and data sources that provide program directors with a basis for decision making in compilation of play lists include audience surveys, director's own opinions and weekly publications such as Billboard and Radio and Records that contain listings from other stations indicating recently adopted songs.

Traits of songs as innovations may have considerable impact upon their adoption rates. As noted above, program directors derive prestige from their ability to assess the relative advantage of individual songs. The greater the degree to which a particular song is compatible with program director's values, needs, beliefs, and previously adopted songs, the greater the probability that it will be adopted. Since the length of songs of these genres is short, as indicated by Hirsch, (1969) and simple, as noted by Kasdan and Appleton (1970), and Denisoff (1975), their complexity is low and their trialability (capacity of an innovation to be examined before actual adoption) is enhanced.

Two other factors of importance are the neighborhood effect and the phenomenon of overlapping market areas. They are considered together because they strongly influence one another. Overlapping market areas occur where there are closely spaced, high powered radio stations with considerable transmission overlap.

One strategy employed by radio stations is to select a format⁸ of musical presentation that, if not unique in a locality, occurs rarely and yet is deemed to have potential popularity. Hesbacher et al. state, "Sound Format (is) the overriding, integrating theme which the station employs to achieve an identifiably homogeneous air sound..."⁹

Statement of the Research Problem

Several geographers have investigated the spatial expansion of popular music, focusing on interpersonal contact as the medium of diffusion. Despite the fact that popular music has been a major cultural factor during the last half-century, radio stations as source locations for its dispersal has not been studied. Since the choice of songs to be broadcast is based on decisions made by program

⁸Formats indicate the type of music broadcast by a station and its intended audience. For example, the Top Forty format is comprised of ephemerally popular songs which have a fast pace and a strong rhythm. Denisoff, R. Solid Gold. New Brunswick, N.J.: Transaction Books, 1975, pp.233-235.

⁹Hesbacher, P., N. Clasky, B. Anderson, and D. Berger, "Radio Format Strategies," Journal of Communication, 26:110-119, 1976.

directors at individual stations, sociological insights into the diffusion process will be pertinent in addition to geographic postulates relating to diffusion. The current study uses data regarding the broadcast of 60 songs on three different formats during a three year period at 264 stations located in 140 cities in the United States.

The primary purpose of this study is to determine whether songs diffused through the mass medium of radio display the three spatial diffusion process regularities noted by Brown and Cox (1971) in their retrospective review of geographic diffusion research. These regularities are 1) the hierarchical expansion of items from large cities to intermediate size cities to small urban areas, 2) an S-shaped logistic curve resulting from graphing the cumulative percentage of adopters on one axis and time on the other axis, and 3) the neighborhood effect on diffusion.

This research analyzes the collected data in order to ascertain the presence or absence of the three diffusion commonalities. The particular diffusion process under scrutiny has three principal dissimilarities from others studies in the past. 1) The adoptions of the songs investigated occur in the context of a series of selections and each point in the series constitutes an important adoption in terms of further dissemination of the diffusion items. 2) Acceptance of a particular song involves no long term commitment of time and resources as does a farmer's

adoption of a new type of seed. 3) Therefore, the choice of a given song doesn't exclude the possibility of choosing to adopt other songs.

There are also differences in the research methods employed. 1) The diffusion area of the current study is much larger than that of the majority of previous investigations. 2) The number of items whose diffusion is tracked is much greater, as earlier studies focused mostly on individual items. 3) Data regarding song adoptions were gathered from a mass medium. In other diffusion research, adoption of the a diffusion items has been ascertained either by survey (e.g., Grilches' (1957,1960) hybrid corn diffusion studies), by review of government documents (as was the case in Hagerstrand's (1958) research into the spatial expansion of the acceptance of a government subsidy in the area of Asby, Sweden) or by searching the records of a commercial institution (as DeTemple (1970) did in his work on the diffusion of HarvestStore silo systems). The data for the current study was obtained from a weekly radio/television/video trade magazine, Billboard, which provides a plethora of current information about these media. Charts of radio station play lists figure prominently in these data. Information for the study was gleaned from the "Singles Radio Action" chart.

Past diffusion studies have been concerned with the adoption rate and pattern of individual items. Although the

diffusion processes of a broad range of phenomena have been researched, from the spread of bluegrass music to the use of television receivers to the acceptance of various agricultural techniques and equipment, each study has investigated the dispersal of a single item. The present research traces the diffusion of sixty separate songs.

Most spatial diffusion investigations have been carried out within a fairly narrowly circumscribed geographic context. Often, the diffusion area has been a limited number of counties, as was the case in Hagerstrand's (1964) study of radio broadcasting in southern Sweden. Griliches' (1957,1960) work on diffusion of hybrid corn included five states within the Corn Belt of the United States. In his investigation of the spatial dispersal of covered bridges, Kniffen's (1951) study area consisted of a regional segment of the central United States. With the exception of the work of researchers who employed data of a global or a national scale, e.g., Sauer's (1952) examination of the spread of agricultural techniques, Seig's (1963) tobacco diffusion study, and Pyle's (1969) research into the spread of cholera in the United States during the 19th century, the area of the present study, the conterminous United States, is much larger than that delimited in most other diffusion research. In undertaking the research, three procedural objective were recognized. The first goal, the identification of the analogs to Hagerstrand's six elements of

diffusion, creates the conceptual framework of the dissertation. The second goal of this inquiry is to rank the data locations according to their population size thereby revealing the hierarchical relationship of the data sites to one another. This provides a spatial pattern within which the neighborhood effect and hierarchical diffusion may be sought. The third objective is to consider Rogers' adopter categories and attributes of innovations and evaluate their potential postulatory/explanatory power for the study.

Hypotheses

The proposed hypotheses, based on the results of previous studies, are as follows:

1. Diffusion of the sixty songs will expand through the urban hierarchy from radio stations located in larger cities to stations in cities of intermediate size to radio stations in small cities.

This hypothesis is suggested by Hagerstrand's (1952) description of diffusion within a central place hierarchy, by phases noted by Griliches (1957,1960) in his logistic curve of hybrid corn expansion and by Brown (1968) who discerned that diffusion through the central place system was being affected by social stresses on adopters.

2. Diffusion of the songs will occur in a manner such that, if the cumulative percentage of adopters in the entire

study area and in each region is plotted against time, then logistic curves will result.

The logistic curve is noted as a consistent feature by Rogers (1962,1983) who explained its sections in terms of adopter categories, by Hagerstrand (1952) in his description of the stages of the diffusion process, and by Griliches (1957,1960) in his investigation of the spread of hybrid corn, as well as by many others.

3. Songs will be diffused from a larger city to a nearby much smaller city and bypass cities of intermediate size within the urban system via the neighborhood effect.

This hypothesis is suggested by Hagerstrand's (1952) early work in which he coined the phrase "the neighborhood effect" and defined it as a temporal increase of adopters within close geographic proximity of a possessor of the innovation. Brown (1968) encountered the same type of diffusion and referred to it as distance bias. Griliches' (1957,1960) research also upheld the existence of the neighborhood effect.

4. A faster adoption rate will be found among songs broadcast on radio stations that have the Top Forty format¹⁰ than for songs broadcast on stations with the Adult

¹⁰See footnote 9.

Contemporary format,¹¹ which in turn will have a faster rate of acceptance than songs on the play lists of station with the Middle-of-the-Road format.¹² Hesbacher et al. (1976) emphasize the crucial importance of format in attracting a radio audience. The pace of the radio announcers' delivery and of the music aired varies a great deal from format to format, as noted by Quaal and Martin (1968) and Lull et al. (1978). Specifically, the most rapid announcing pace is found on stations with the Top Forty format, followed sequentially by lesser rates of delivery on the Adult Contemporary stations and those having the Middle-of-the-Road format. A more rapid announcing pace is thought to require a faster rate of turnover, i.e., a faster adoption rate, of songs.

5. Faster rates of adoption will occur in regions with greater densities of radio stations (number of stations per 100,000 square miles) than in areas with lower radio station densities.

¹¹The Adult Contemporary format broadcasts 1) rock and roll songs which feature a less insistent rhythm than is usually in that genre and 2) songs that were popular 5-10 years previously. Hirsch, P. The Structure of the Popular Music Industry. Ann Arbor, Michigan: Institute for Social Research, 1969.

¹²The Middle-of-the-Road format features songs with a slower pace, e.g., ballads and older songs known as "oldies." Hirsch, P. The Structure of the Popular Music Industry. See discussion in Denisoff, R. Solid Gold. New Brunswick, N.J.: Transaction Books, 1975, p.37.

A greater amount of overlap in the geographic range of radio stations will occur in regions that have more stations. This competition provides program directors with an incentive to adopt new songs more frequently.

6. Population density will be negatively associated with song adoption rates.

Greater densities of population increase the potential listening audience of radio stations. Diffusion downward through the urban hierarchy, as noted by Hagerstrand (1952), Brown (1968), and Griliches (1957,1960), suggests the concept of faster rates of adoption in locations of larger population.

7. Radio station transmission power will be negatively associated with song adoption rates.

More powerful transmitting wattages increase the geographic scope of radio stations. It is suggested that increasing stations' ranges will decrease adoption rates of songs among them.

In this chapter, the context of the investigation at hand has been given. The research problem has been delimited. Hypotheses have been specifically stated and linked to the work of other researchers in the area of spatial diffusion. Chapter Two reviews the pertinent geographic and sociological literature in order to provide a framework for the study.

CHAPTER II

LITERATURE REVIEW

This chapter is comprised of three sections. The first reviews diffusion research undertaken by geographers or studies that have a geographic approach.¹³ The next portion discusses the relevant literature in sociology, particularly the work of Rogers (1962,1983). The final section consists of an evaluation and summary of the major points gleaned from the literature that are pertinent for this research.

Geographic Diffusion Research

Studies of the spatial diffusion of a variety of phenomena have formed a substantial portion of geographic research during the past half-century. Sauer and Brand (1930) employed archaeological evidence from several Azatlan Pueblo locations in Mexico to delineate culture areas and the diffusion of cultural influence among the sites and their former inhabitants. Stanislawski (1946) tracked the spread of the grid pattern town in the United States. Kniffen (1951) traced the establishment of covered bridges in the United States. Sauer (1952) also used the concept of diffusion to explain the expansion of agricultural techniques and goods outward from a few points of dissemination. Seig (1963) used historical data to study the dispersal of tobacco from the New World to the eastern

¹³The work of economist Griliches (1957,1960) is included in the section concerning geographic research, because of the geographic nature of his studies.

hemisphere. Clark (1965) employed data which were obtained via carbon dating of sites to trace the spread of agriculture. Edmonson (1968) calculated the mean rates of diffusion for specific cultural traits by noting their appearance at different times in a variety of locations.

Several geographers have investigated the diffusion of popular music. Ford (1971) described the spread of rock and roll music and also delineated geographic source areas of various musical types that influences it. Francaviglia (1973) traced the movement of rock and roll music from a major culture hearth in the Mississippi Valley to several distribution centers by noting the appearance of independent record companies that made rock and roll records during the 1950s. Carney (1974) tracked the expansion of bluegrass music via the changing geographic distribution of its practitioners and concluded that the musicians' migration was the principal mode of diffusion for the music. Glasgow (1979) used biographical data regarding jazz musicians to display the necessity of interpersonal contact in the diffusion of jazz music from 1880 to the 1940s.

Hagerstrand (1952) initiated the use of quantitative methods in diffusion research. In order to do so, he adopted a series of simplifying assumptions and identified six elements of importance. The assumptions include: 1) the diffusion area or model plane has a uniform distribution

of population, 2) the model plane has an ideal transportation surface, 3) an innovation is diffused from a single individual living at the center of the area, 4) information is spread only via direct interpersonal contact, excluding the mass media, group meetings, etc., 5) immediate adoption and re-transmission of an innovation occurs after a single contact with it, and 6) during an individual operation of the model all transferrals of data regarding the innovation occur simultaneously. Hagerstrand's elements of diffusion are: 1) the area in which the diffusion is taking place, 2) the time during which the process is occurring, 3) the item(s) being spread, 4) the points of origin of the process, 5) the places of destination of the item(s), and 6) the paths which the process follows.

Having made the above assumptions and identifications, Hagerstrand then placed a grid over the model plane and employed probabilities of contact between the cells thus delimited in order to determine mean information fields. The original assumptions were modified to conform to the data of each specific study undertaken, i.e., in regard to the number of potential adopters and initial possessors of the innovation within each cell of the grid. Hagerstrand also assumed that the probability of a carrier of information about an innovation passing on that information to another person was inversely proportional to the geographic distance between the two individuals. As

indicated previously, he termed this influence of proximity the neighborhood effect.

In addition, Hagerstrand discussed diffusion within the central place system. He identified three phases which are reflected in the familiar logistic curve of diffusion processes. The first phase was the time during which the dissemination centers were set in place. The next stage saw the establishment of secondary centers and the occurrence of diffusion via the neighborhood effect. The third phase Hagerstrand called saturation, i.e., the stage during which the process slows and after which diffusion stops.

A great deal of diffusion research has been based on the work of Hagerstrand. Morrill (1968) emphasized the importance of time and noted that at the sites of diffusion action, "...the occurrences of preceding time periods have a powerful influence on subsequent time."¹⁴ Morrill demonstrated also that the medium through which the diffusion expands can alter its rate of movement. Brown (1975) viewed diffusion from an economic perspective with the adopters who wanted the innovation representing demand and the innovators who provided the new idea representing supply. Griliches (1957,1960) studied the spread of hybrid seed corn by plotting the percentage of total acreage planted with the hybrid seed against a fifteen year span of

¹⁴Morrill, R., "Waves of Spatial Diffusion." Journal of Regional Science 8:1, p.2, 1968.

time for five states in the United States, revealing a logistic curve in each case. Bowden (1965) used Hagerstrand's model with a few modifications of the basic assumptions to simulate the spread of irrigation wells in a Colorado county. His simulations were very close to the actual distribution and confirmed the operation of the neighborhood effect. In his investigation of the diffusion of television receivers in southern Sweden, Brown (1968) experimented with three different models, including 1) a completely random model, 2) a model with acquaintanceship bias, and 3) a social pressure model, that took into account the effect of the awareness of television aerials on housetops upon potential adopters. He concluded that the third model predicted results closest to the empirical data. In this study, Brown also suggested a classification system for innovations which would allow for the effect of self-interested propagators of innovations, i.e., agencies (or agents) that are interested in the swift and total diffusion of innovations.

Brown and Cox (1971) have noted three features that are so common to diffusion processes that they have termed them regularities. They are 1) Hagerstrand's neighborhood effect, i.e., the addition of new adopters of an innovation around initial foci of its introduction without regard to the urban hierarchy, 2) the temporal increase of adopters within a diffusion area which displays a logistic curve when

graphed as a cumulative percentage of adopters against time, and 3) diffusion down the central place hierarchy from larger cities to smaller urban settlements. Hagerstrand's early work has been so influential that its impact is observed in all three of the features mentioned by Brown and Cox.

Researchers utilizing central place theory have based their work upon that of two German scholars, Christaller and Losch. These two, working independently, produced a model of central place regularities. Christaller (1933) has had the greater impact on his fellow geographers. His model is underlain by assumptions and conditions as is true for Hagerstrand's. Christaller's assumptions are as follows:

- 1) the number of goods and services offered by a central place varies in direct proportion to its population, 2) the hierarchy of central places is a closed system, 3) each central place provides all the services and goods found in a smaller urban center and also additional ones which require a larger population for support, i.e., goods and services which have higher thresholds or are needed less frequently, 4) perfect competition and complete information are present within the system, 5) the central place system must have an isotropic or ideal transportation surface upon which is an uneven distribution of the market attributes of purchasing power, needs, and desire, 6) the population clusters are uniformly spaced and discontinuous, 7) services and goods

having a range of thresholds are ordered from largest to smallest and are considered to be sufficiently small in areal terms as to be point-occupying within their respective settlements.

It may be observed that Christaller's assumptions are so rigorous as to create a model which is patently unrealistic. Unlike Hagerstrand's model, Christaller's system is static and no modification of its underlying postulates that would render it more true to life was undertaken by Christaller. Indeed the real value of his work lies in its provision of a conceptual system which serves as a basis and a point of departure for future research.

Brian Berry has undertaken a prodigious amount of research based on central place theory, with particular attention to its economic impact on spatial structure, Berry (1967) studied the ranges of various goods and services in the area of Omaha, Nebraska, and Council Bluffs, Iowa. He collected data via interviews with area residents regarding where they traveled to obtain groceries, the care of a physician, women's clothing, the services of a hospital, and newspapers. As expected, Berry found that the ranges and thresholds of these items varies from smallest to largest, beginning with groceries and increasing through the market area of newspapers. He discovered that while the newspapers from Omaha indeed had large market areas, many residents

subscribed to the Des Moines paper although that city is both smaller and farther away from the study area than Omaha. Berry and Tennant (1962) examined the trade areas of central places of various sizes in western Iowa and determined that considerable overlap existed between them. They concluded that the sharing of markets was caused by the divergence of reality from theory which so frequently occurs, i.e., consumers are not provided with complete information about available goods and their locations relative to those of the consumers nor do potential consumers always behave in such a fashion as to minimize distance traveled to obtain a service or to maximize the quality/quantity of a desired good.

Garrison and Berry (1958) established the threshold populations for fifty-two goods and services and showed that a settlement's position in an urban hierarchy could be determined if its population and the number of economic functions it offered were known. Berry and Pred (1961) in their review of central place theory and its applications confirmed Christaller's third assumption, i.e., that larger settlements performed all the functions of smaller ones and additionally offered a set of economic activities which possess higher thresholds.

Webb (1959) and Borchert (1963) were also concerned with the applications of central place theory. Both undertook, independently, studies in the northern section of

the mid-western United states. Webb focused his research on the small cities of Minnesota and ascertained that the principal distinction among them was between those in the north and east of the state which had an economic emphasis upon mining and manufacturing and those in the west and south which were relatively unspecialized. Webb also discovered a sizable overlap in the trade areas of the various urban settlements. Borchert (1963) gathered data in Montana, North Dakota, South Dakota, and Minnesota in regard to the goods and services provided by their central places. Although some variation was discovered from town to town, in general, the pattern was as expected, i.e., a smaller number of goods with shorter ranges were found in small centers and a greater number of functions with higher thresholds and larger ranges were located in the larger towns. Borchert noted exceptions to the pattern in the clusters of small settlements in southwestern South Dakota and in western Montana, all of which were connected with mining.

Central place theory explains the reasons for the spatial structure of the urban system. Since that is the case, it provides the conceptual underpinning for two types of diffusion. 1) Hierarchical diffusion is by definition an expansion via the urban hierarchy. 2) The neighborhood effect denotes a pattern which differs from the more common hierarchical diffusion.

Early geographic research revealed that the hierarchical structure of central places and the geographic proximity of innovators to potential acceptors affect the spatial diffusion of innovations. The precept of innovation adoption occurring first in the largest or first order cities of an area, second in smaller, second order cities, etc., shares a great deal, conceptually, with central place theory. However, unlike Hagerstrand's (1952,1953) earliest diffusion work which was somewhat deterministic in nature, the market area research carried out subsequently has been probabilistic. Two additional factors involved in the diffusion process have been identified. They are the overlapping market areas of central places and the increase in the number of functions in an urban center with the increase of its population.

Sociological Diffusion Research

Chief among the sociologists who have been involved in diffusion research is Rogers (1962,1983). His work has focused on the underlying social and psychological processes which cause observable diffusion patterns. Rogers has classified adopters in four categories, each with specific characteristics. The adopter types are based on the criterion of innovativeness that Rogers describes as

"... the degree to which an individual or other unit of adoption is relatively earlier in adopting

new ideas than other members of a social system."¹⁵

The amount of innovativeness of an individual is indicated by the time of adoption of an innovation relative to the time of introduction of the new item or concept. Rogers points out that if the diffusion data from which a logistic curve is derived is plotted one year at a time, that is, by frequency rather than on a cumulative basis, the resulting curve is bell-shaped. Rogers divided the frequency curve into five sections based on the mean time of adoption and the standard deviation (a measure of dispersal about the mean).

Innovators comprise two and one-half percent of all adopters and are found on the frequency curve to the left of the mean minus two standard deviations. Early adopters, who represent thirteen and one-half percent of all acceptors, lie in the range between the mean minus two standard deviations and the mean minus one standard deviation. The early majority of thirty-four percent falls between the mean minus one standard deviation and the mean itself. The fourth category, the late majority, comprise thirty-four percent of all adopters and are located within the range of the mean to the mean plus one standard deviation. The final classification, laggards, are found adjacent to the area on the frequency curve which indicates the mean plus one

¹⁵Rogers, E., Diffusion of Innovations, The Free Press, New York, 1983, p.242.

standard deviation and comprise sixteen percent of adopters. Figure 1 depicts the adopter categories' locations on the frequency curve.

Rogers (1983) likens the social system of the diffusion process to the individual's learning process, with each adoption in the former analogous to a learning trial (an attempt to do what has been taught in order to ascertain if learning has occurred) in the latter. He suggests that information and the reduction of uncertainty play a role in diffusion processes that is essentially identical to their role in a learning process. When graphed, both result in a logistic or S-shaped curve, which is indeed called a learning curve by psychologists.

According to Rogers, innovators and early adopters are observed to be better educated and of higher socio-economic status than is true either for late adopters or for the last group, the laggards. The innovators also are much more likely to obtain information from a variety of sources such as mass media, professional journals and meetings as well as from interpersonal contacts than either late adopters or laggards. Individuals in the two latter categories tend to rely more heavily and, often solely on interaction with others.

In their content analysis of 900 empirical diffusion studies, Rogers and Shoemaker (1971) conclude that the

Adopter categorization on the basis of innovativeness

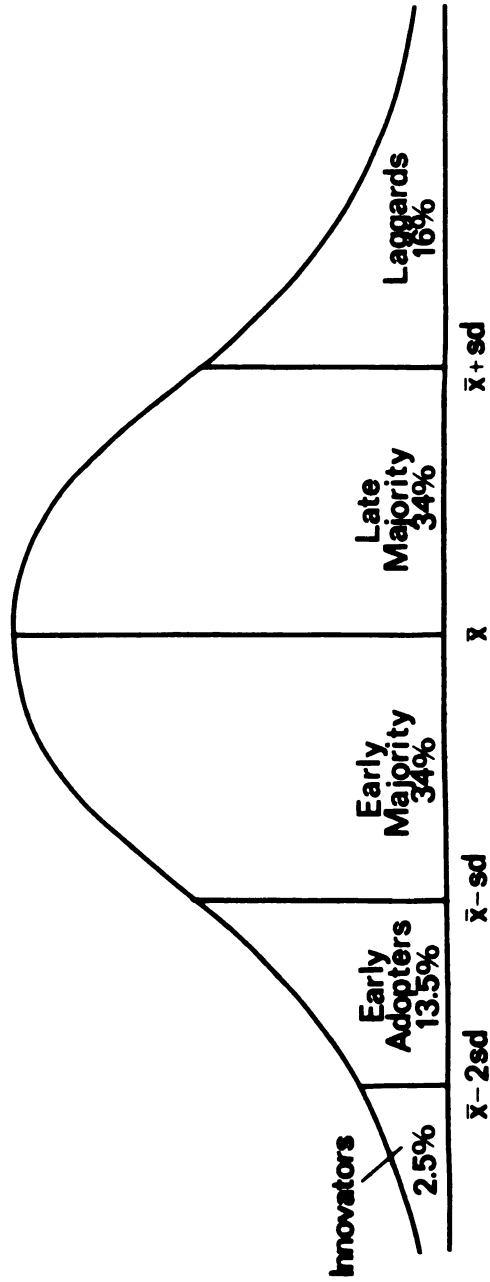


Figure 1. Adopter Categorization on the basis of innovativeness; after Rogers, Diffusion of Innovations, 3rd ed. New York: The Free Press, 1983.

importance of adopter traits is supported by high percentages of the research findings. Positive associations were discovered for 1) higher educational attainment in 74 percent of sample, 2) commercial economic orientation in 71 percent of the studies, 3) connection with the social system in 100 percent of the investigations, and 4) cosmopoliteness¹⁶ in 76 percent of the studies analyzed.

Rogers (1983) has additionally identified five attributes of innovations which have considerable influence on their rates of adoption, collectively. They are 1) relative advantage, 2) compatibility, 3) complexity, 4) trialability, and 5) observability. Each is important, particularly in regard to the manner in which it is perceived by potential adopters. These perceptions may vary among individuals and among cultures. Kasdan and Appleton (1970) stress the variations which occur across cultures. In addition, they also emphasize the significance of perceptions and the fact that they are transmitted culturally when they write, "The cultural patterning of perceptions has long been accepted fact. The ways we see and hear are learned."¹⁷ In turn, their work was based in

¹⁶"Cosmopoliteness is the degree to which an individual is oriented outside the social system." Rogers, E., Diffusion of Innovation, The Free Press, New York, p.259, 1983.

¹⁷Kasdan, L. and J. Appleton, "Tradition and Change: The Case of Music," Comparative Studies in Society and History 12, p.50.

part on Becker's (1963) thesis that an individual learns to filter experiences in order to produce culturally correct perceptions.

The first of Rogers' five characteristics of innovations is relative advantage, which is the extent to which an innovation is viewed by potential acceptors as superior to the item that it replaces. The advantage to the adopter depends a great deal upon the character of the innovation. Frequently, the advantage is economic, but it can certainly be social, such as the conferral of status upon the adopter. Rogers (1983) wrote, "For certain innovations, such as a new clothing fashion, the social prestige that the innovation conveys to its wearer is almost the sole benefit that the adopter receives."¹⁸ Kivlin and Fliegel (1967a) in their diffusion study of 80 small scale Pennsylvania farmers found that relative advantage, in terms of a savings of discomfort, alone accounted for 51 percent of the adoption rate variance.

Compatibility, i.e., the extent to which an innovation is consonant with a potential acceptor's needs, values, beliefs, and previously adopted innovations, is the next trait denoted by Rogers. He states, "Old ideas are the main tools with which new ideas are assessed."¹⁹ Supporting

¹⁸Rogers, E., Diffusion of Innovations, The Free Press, New York, p.294, 1983.

¹⁹Rogers, E., Diffusion of Innovations, The Free Press, New York, p.215, 1983.

evidence comes from the work of Holloway (1977) concerning innovation diffusion of new educational ideas among one hundred high school principals. Holloway found that relative advantage and compatibility combined were of the first importance in the significance of their relationship to the rate of adoption.

Complexity, Rogers' third characteristic of innovations, is defined as the degree to which an innovation is viewed as being difficult to use. Comparing music with speech, Hockett (1963) states, "In every human language, redundancy, measured in phonological terms, hovers near fifty percent."²⁰ Kasdan and Appleton (1970) hypothesize that music whose redundancy level, harmonically and lyrically, is within a few percentage points of Hockett's fifty percent is most likely to find acceptance. Petrini (1960) found that relative advantage and complexity were both significant in their effect on the rate of innovation adoption of new farming techniques among 1845 Swedish farmers.

The fourth attribute, trialability, is the extent to which an innovation may be investigated within limited bounds. Radio station program directors often employ portions of songs in audience surveys to determine the songs' appeal. The significance of trialability is

²⁰Hockett, E., "The Problem of Universals in Language," in J. Greenberg, ed., Universals of Language, Cambridge, M.I.T. Press, Chapter 1, 1963.

supported by Singh's (1966) study of farm innovation diffusion within a group of Canadian farmers where 87 percent of the adoption rate variance was explained by the four innovation attributes, relative advantage, complexity, trialability, and observability. Kivlin and Fliegel (1966a) showed that among a group of 229 large scale farmers in Pennsylvania, the trait of trialability was of the first significance in affecting an innovation (farm equipment) adoption rate. Together with relative advantage, trialability accounted for 51 percent of the variance of the adoption rate.

The last innovation trait suggested by Rogers is observability. It is the degree to which the results of adopting an innovation are visible to observers. Etzkhorn (1963) writes, "Listeners of popular music frequently listen with trusted individuals to music rather than listening for something in the music."²¹ Observability was found to have a significant influence on adoption rates of educational techniques among United States high school teachers investigated by Hahn (1974), among coal, steel, brewing, and railroad firms studied by Mansfield (1961), and of new agricultural products among Indian peasants as shown by Fliegel et al. (1968). Clinton (1973), in a study of the diffusion of new teaching methods among Canadian elementary

²¹Etzkhorn, K.P., "Social Context of Songwriting in the United States," Ethnomusicology v.7, p.98, 1963.

school teachers, explained 55 percent of the adoption rate variance in terms of relative advantage, complexity, compatibility, and observability.

The applicability of innovations' attributes and of adopter traits to the diffusion of popular music was discussed earlier. To summarize, popular songs have a high rate of redundancy both musically and lyrically, which gives them a low level of complexity. It may be surmised that the compatibility of specific songs with past adopted songs and with the radio station program directors' values and beliefs influences the acceptance of the songs. The trialability of songs is demonstrated in their use in audience surveys. Relative advantage plays an important role in the adoption rate of songs because program directors are sensitive to the prestige and the economic profitability which accrues to those directors who successfully and consistently adopt songs that become very popular with the audience.

Sociological research points to the traits of potential adopters and of the innovation itself and the social use to which it is put, e.g., religious, aesthetic, commercial, or political, as powerful influences on diffusion. One point of tangency between the approaches of the geographers and sociologists has been the logistic curve of cumulative percentage of adopters plotted opposite time. Only a few innovators possess the innovation at the outset of the curve. With acquisition of the innovation by early adopters

and the early majority, the curve slopes sharply upward. This trend is continued by the adoptions of the late majority. The curve levels off as a diminishing number of additional acceptors adopt the innovation. This last group is termed laggards by Rogers (1983). Hagerstrand (1952,1953) named the three phases of the logistic curve, respectively, the primary stage when the original points of dissemination were established, the diffusion stage when the neighborhood effect was observed, and the condensing or saturation stage after which no further diffusion occurred.

Summary

The geographical and sociological diffusion literature, reviewed in this chapter, are pertinent to the research at hand. Since diffusion is a spatial process, earlier geographic studies provide a historical frame of reference for the spread of popular music. Sociological insights into diffusion are particularly important because of the human aspects involved in diffusion through the United States radio network.

Chapter 3 discusses the research methods employed in the study. The sources of data are identified and described. The procedures and statistical tests used to analyze the data are presented and explained.

CHAPTER III

METHODOLOGY

As data for this study, several sources have been employed, including Billboard magazine, United States Census Bureau, 1980: Census of Population, v.1 Characteristics of Population and the Broadcasting/Cablecasting Yearbooks for the years 1981 through 1983. The information obtained from these publications and the method of their analysis will be discussed at length in this chapter.

A number of steps were followed in order to analyze the study's data. Initially, the six elements noted by Hagerstrand (1952) were identified. Cities were ranked according to population size. (See Table 1, p. 43.) An average transmission range was postulated to aggregate the adoption data. The study variables were identified. The regionalization method was examined.

Three types of statistical tests were used to analyze the data for the study; 1) Pearson correlation, 2) zero order partial correlation, and 3) multiple regression. Each of these tests results in a statistic known as a coefficient. A brief description of these statistical procedures and how they were employed in this research follows.

Pearson correlation coefficients as well as zero order coefficients, have an index of significance that varies between -1 and +1, on which 0 indicates no association and

-1 and +1 respectively indicate a perfect negative or a perfect positive association. The significance index is affected by the number of cases within the correlation variables. If the number of cases is large, then even a correlation coefficient (r) near 0 can indicate an association of significance (P). In order to consider a correlation statistically significant, it must have a P or significance value of .05 or less. Pearson correlation shows the amount of one data set's variation that is associated with another set of data. Zero order partial correlation tests the association between two individual variables, rather than between data sets. In this research, Pearson correlation coefficients are calculated in order to ascertain the association between primacy (dependent variable) and population per radio station, population size, and density of radio stations. Partial correlation coefficients were computed to test the degree of association between primacy, population size, radio station density and transmission power.

Multiple regression is a statistical test which measures the degree of association between two or more independent variables, in the aggregate, and one dependent variable. Multiple regression coefficients which are expressed as R^2 , indicate the percentage of variation in the dependent variable accounted for by the independent variables. Multiple regression coefficients were calculated

to examine the goodness of fit between the curves of the data points and logistic curves.

Data Sources

The primary source of the data for this investigation is the "Singles Radio Action" chart published weekly from November, 1975 until March, 1984, in Billboard, a radio/television/video trade magazine. The chart is comprised of song titles which have been added to the play lists of individual radio stations during the week-long period beginning eighteen days earlier than the date of the magazine. For example, in an issue dated September 17, 1983, the data listed reflect song titles added between August 31, 1983 and September 6, 1983. The number of radio stations reporting to the chart is 277. Represented by the data are 165 cities in the United States. The most recent three year period for which the data are available spans the years 1981 through 1983, therefore, this is the study period for this research. The cities are located in 42 of the 48 contiguous states of the United States, including Washington, D.C.

For each year of the study period, 20 songs were chosen at random from among songs listed in the "prime mover category." This classification denotes rapid movement upwards on the chart. In turn, that denotes a higher number of listener requests for the song, greater local sales of the recorded version of the song and more favorable

responses to the tune by participants in the radio station's weekly listener surveys. Determination of songs that fit the criteria for this category is made by the program director at each station.²² Song titles were randomly selected for inclusion in the study from the middle six months, April through September, of each year during the 1981-1983 period. The middle months of these years were used in order to allow observation of the songs first appearances at dates prior to and following the data selection period. Song titles in the "prime mover" class were chosen because such titles have displayed rapid increases in popularity. They display upward movement on the play lists of radio stations and are certain to have their first appearances noted on their respective charts.

A number of other data sources were consulted. The area of states in the United States and the populations of cities and regions were obtain from United States Census Bureau, 1980 Population Characteristics. The United States regions were obtained from Billboard. See Figure 2. The Broadcasting/Cablecasting Yearbooks of the years of the study period were employed in the gathering of data regarding the format and the transmission power levels of each radio station in the study. (Appendix p.117)

²²See earlier discussion on pages 7-10.

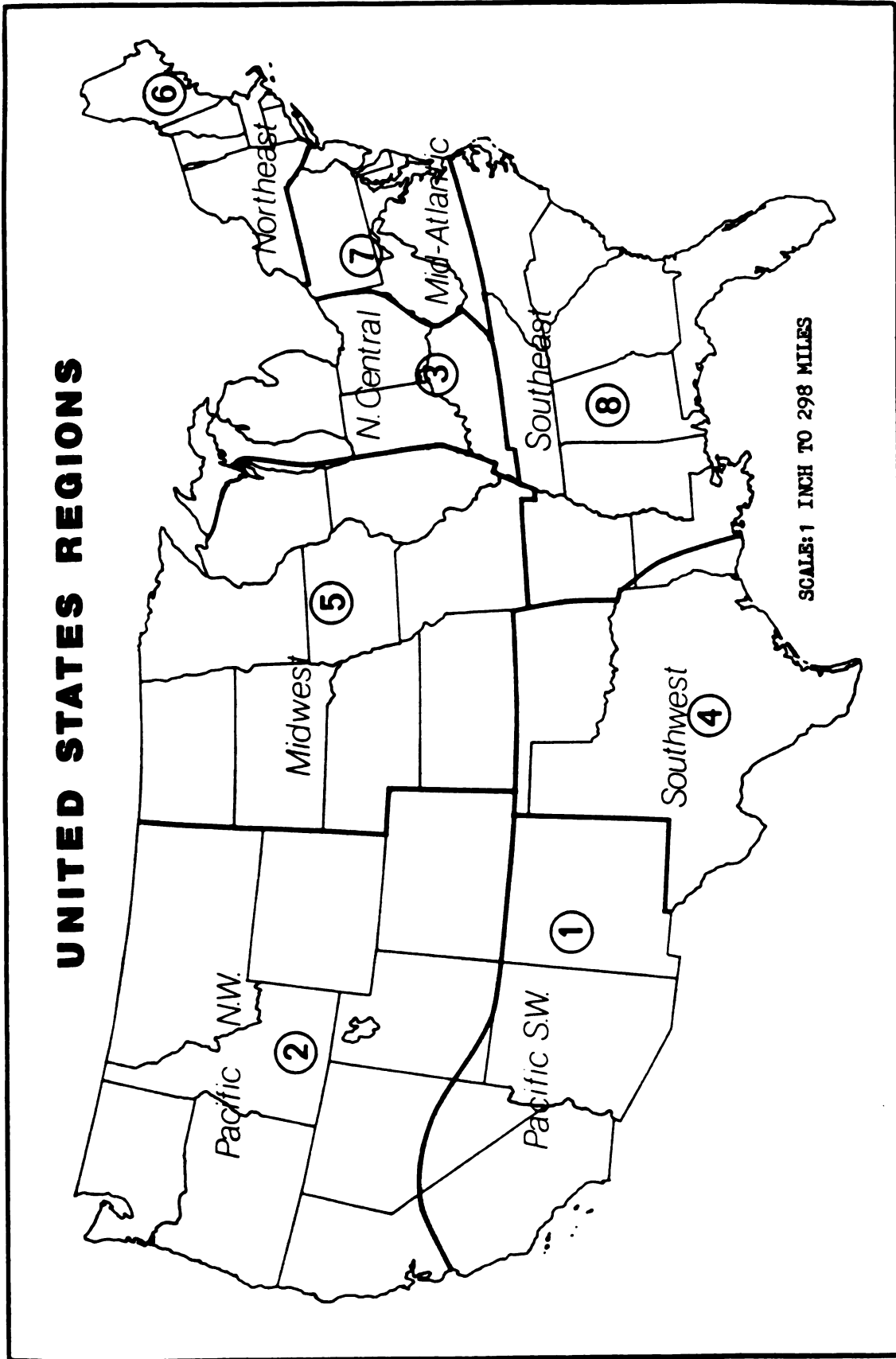


Figure 2. United States Regions.

Data Analysis

The first objective of this study was, by identifying the analogs to Hagerstrand's six diffusion elements, to provide a conceptual structure. The identified elements are as follows:

1. area: the conterminous United States are represented by data from 42 states and the District of Columbia.
2. time: January 1, 1981 through December 31, 1983, representing the three most recent years for which complete data are available. (Billboard's method of data collection and presentation changed in March, 1984 to a nationally aggregated data presentation.)
3. items: 20 songs for each year of the study period, chosen at random from those in the "prime mover" class.
4. points of origin: station(s) of low primacy or temporal rank (indicating a faster rate of adoption).
5. points of destination: station(s) which have higher primacy ratings (indicating a slower rate of adoption).
6. diffusion paths: communication/transportation routes joining points of origin with points of destination in sequence.

A numerical rank, based on population size, was assigned to each city in the study area. In this manner, the spatial pattern of the urban hierarchy of the sample cities was revealed, the study's second expressed objective. The cities' classifications are indicated in Table 1.

TABLE 1

CITY SIZE RANKING

Rank	Population
1	20,000 to 49,999
2	50,000 to 99,999
3	100,000 to 499,999
4	500,000 to 999,999
5	1,000,000 +

Although several variables are involved, a rough measure of average transmission range is approximately a 25 mile radius from the transmission tower.²³ In cities smaller than 20,000 where a station with a high transmission level was located and which was near a much larger city, i.e., within 25 miles, it was assumed that the inhabitants of the larger city were in fact the station's target audience. This adjustment allows a more clear-cut presentation of the neighborhood effect, if it is indeed occurring.

Seven variables were employed in the analysis of the data. They are 1) city population size, 2) regional city location, 3) radio station transmission power, 4) radio

²³In personal communication with John Hawkins, Chief Engineer of Radio Broadcasting Services at WKAR radio, he mentioned several factors that influence transmission distance, including use of directional or non-directional transmitting pattern, air and ground conductivity and moisture content.

station format, 5) average temporal rank (or primacy) of each city for all songs adopted by stations within that city, 6) density of radio stations per 100,000 square miles, and 7) density of population per radio station.

The cities' regional locations were coded as indicated in Table 2.

TABLE 2
UNITED STATES REGIONS

Region	Name
1	Pacific Southwest
2	Pacific Northwest
3	North Central
4	Southwest
5	Midwest
6	Northeast
7	Mid Atlantic
8	Southeast

This method of identification was used by Billboard until 1984 in its "Singles Radio Action" chart. See Figure 2, p.41.

The stations' transmission power and formats were taken from the Broadcasting/Cablecasting Yearbooks for 1981-1983. Actual transmission wattage figures for each station were used in the data analysis.

Although six different formats were encountered in the data, the three with the greatest numbers were Top Forty (TF) with 127 stations (48 percent of the sample), Adult Contemporary (AC) which was the format claimed by 85 stations (38 percent of the sample) and Middle-of-the-Road (MOR) with 34 stations (representing 13 percent of the sample). The type of format was treated as an ordinal variable. Adoption rates were expected to differ from the highest rate for the TF format to an intermediate rate for AC to the lowest acceptance rate for stations having the MOR format.

The primacy or average temporal rank of each city was ascertained by the creation of a primacy index. The date of appearance of each song at the radio stations was determined and assigned a number corresponding to the number of days from January 1 of the year during which the song appeared (Day 110 for April 20). For each station, a mean number of days was computed from the arrival dates of all the sample songs that reached the station, to give the primary rating. After completion of coding, an average primacy rank was calculated for each city that had more than one station reporting to Billboard. This made aggregate primacy ratings available without loss of data regarding differences in format. The days were converted to weeks in order to allow great clarity in the graphic depiction of the information. Therefore, the primacy rank, whether an average for several

stations or that of an individual station, indicates the average number of days a given city required to adopt the sample songs. To illustrate, if Song A appeared at City X on April 15, that city was coded 105 (the number of days from January 1 to April 15) for that song and so on. Table 3 displays an example of the primacy calculation process.

TABLE 3
SAMPLE PRIMACY RANKS

Songs	Cities		
	X	Y	Z
A	103	159	182
B	161	152	156
C	<u>164</u>	<u>139</u>	<u>167</u>
	<u>428</u>	<u>450</u>	<u>455</u>
	3	3	3
Primacy Ranks	=143	=150	=152

Radio stations which had fewer than five cases (dates when songs were adopted) were deleted from the study as unreliable indicators of primacy. This in addition to the aggregation of data from small cities near larger ones (discussed on page 43), reduces the number of stations from 277 to 264 and the locations from 165 cities to 140. Figure 3 shows cities' sites.

Two measures of regional density were used as variables in the study. The density of radio stations within each

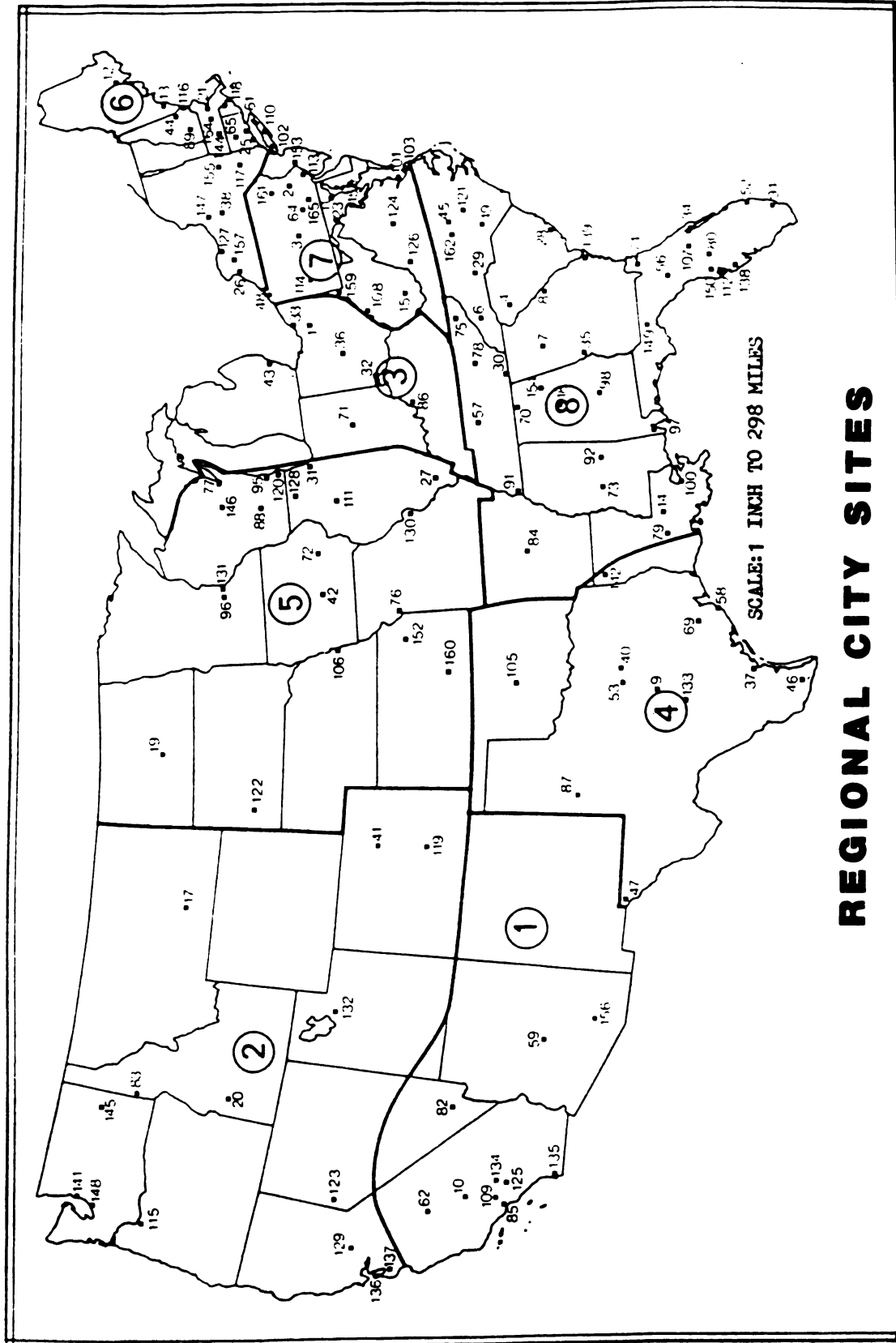


Figure 3. Regional City Sites. See Appendix city site identification.

region (number of stations per 100,000 square miles) was calculated by determining the areal extent of each region and dividing the number of reporting radio stations by that number. The total number of stations reporting to Billboard was assumed to be a reasonable proxy for the actual number of stations within the regions, since Billboard's objective was to obtain a geographically representational sample of the United States' radio markets.²⁴ The density of population per radio station was determined for each region by dividing the total population by the number of stations reporting to Billboard in each region.

In the following chapter, the results of the data analysis are detailed. The outcome of the statistical procedures and the manner in which the hypotheses were tested is outlined. A discussion of regional differences which were revealed is presented.

²⁴Personal communication with Michael Mongiovi, Billboard chart manager. Mr. Mongiovi also stated that 1) stations were selected for participation on a rotating basis, i.e., that one third of approximately 150 stations on the "Singles Radio Action" chart in each Billboard issue were replaced each year; 2) Billboard was most interested in documenting additions to play lists at stations with Top Forty, Adult Contemporary, and Middle-of-the-Road formats.

CHAPTER IV

RESULTS OF THE STUDY

This chapter is divided into two sections. First, a detailed discussion of the findings regarding regional variations from national norms is presented. The second segment of the chapter describes the testing of the hypotheses. The statistical tests performed in order to analyze the validity of the hypotheses result in acceptance or rejection of the hypotheses.

Regional Results

Although the initial point on each graph is designated as Week 1, the actual first day of adoption of a sample song varies among regions. The date of origin is indicated on each figure. The average day of initial adoption for all regions is Day 105 (April 15).

There are also differences in the initial percentage of adopters and in the duration of the diffusion process. The number of weeks required to reach 90 percent or more varies regionally. The mean starting adoption percentage is 5.5 percent. The average number of weeks during which diffusion continues is 10.5 weeks. Summaries of regional initial adoption dates, initial acceptance percentages, diffusion duration and goodness of fit between the regional adoption dates curves and logistic curves of the same data are listed in Tables 4-7.

TABLE 4
INITIAL PERCENTAGE OF ADOPTERS*

Region	Percentage
1-8	Mean=5.5
1	5
2	8.4
3	11.4
4	6.7
5	3.2
6	2.6
7	4.7
8	1.8

TABLE 5
INITIAL ADOPTION DATE+

Region	Day
1-8	Mean=105
1	104
2	117
3	122
4	117
5	110
6	54
7	116
8	97

*The regional average percent of the total number of adopters who accepted on the first adoption date.

+The regional average number of days from January 1 until the initial adoptions occur.

TABLE 6
DURATION OF DIFFUSION*

Region	Weeks
1-8	Mean=10.5
1	16
2	14
3	8
4	12
5	13
6	18
7	8
8	12

TABLE 7
GOODNESS OF FIT⁺

Region	R ²
1-8	.96898
1	.97539
2	.97672
3	.97135
4	.98058
5	.99717
6	.95356
7	.98659
8	.99133

*The number of weeks for which diffusion lasted.

⁺The amount of variation in the dependent variable (the data points) accounted for by the independent variables (logistic curve points).

Logistic Curve Graphs

This chapter segment focuses on regional differences in the research findings based on the multiple regression coefficients that were calculated to test Hypothesis 2. The results as revealed by the national and regional adoption curves indicate some significant diffusion patterns.

National Logistic Curve

Figure 4, the graph for the entire sample, shows a logistic curve that received an R^2 value of .969. This indicates that nearly 97 percent of the variation in the dependent variable (the slope of the data point curve of the adoption dates) is accounted for by the independent variable (the slope of a logistic curve for the same data points). The curves of the individual regions reveal variations from the national graph that will be discussed below.

Region 1, the Pacific Southwest Logistic Curve

Figure 5 displays the logistic curve for the Pacific Southwest. Approximately 5 percent of the total number of adopters added sample song titles to station play lists during the first week. The initial adoption occurred on Day 104 (April 14). Region 1 is therefore very close to the means for both the original adoption date (April 15) and for the beginning percentage of adopters (5.5 percent). The diffusion process lasted well over the average (10.5 weeks) in Region 1, a period of 16 weeks.

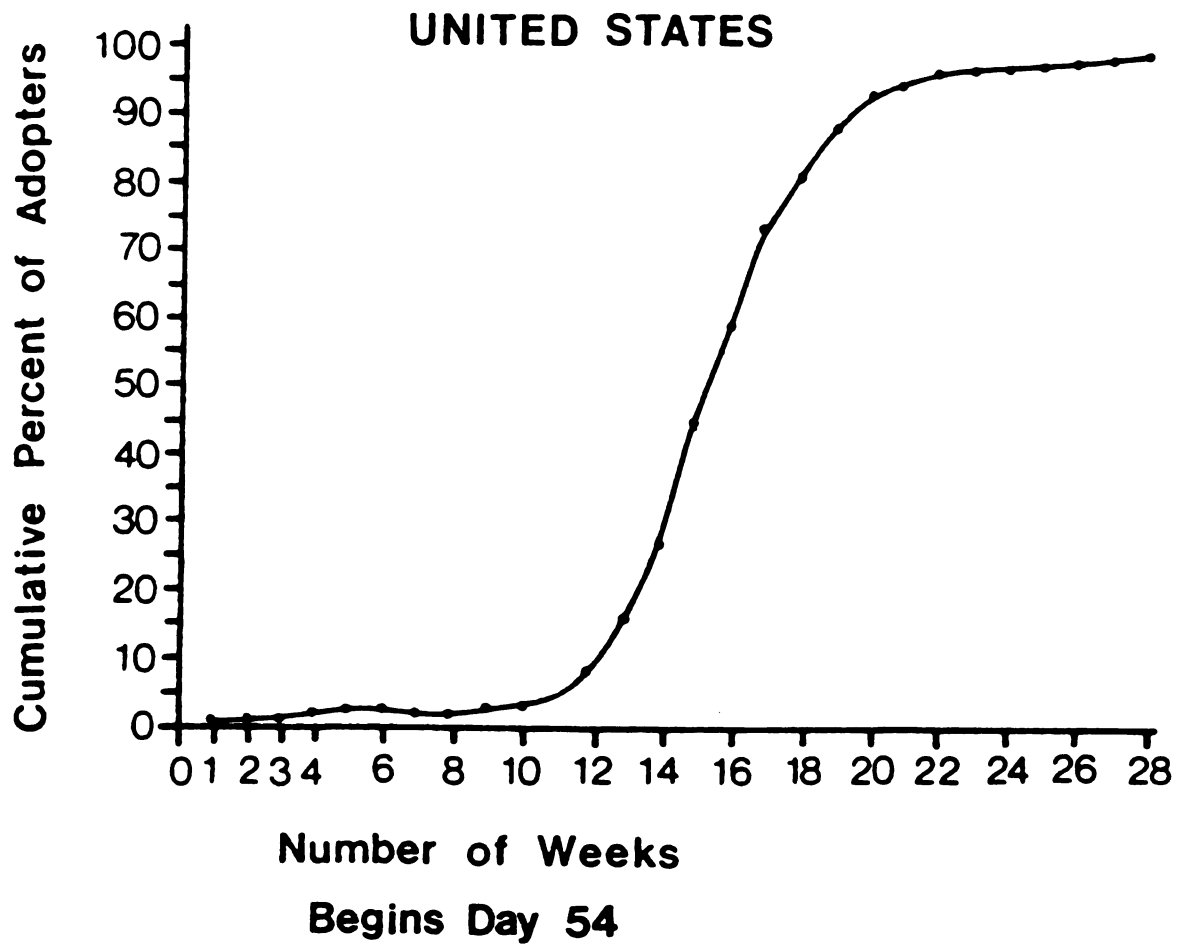


Figure 4. Cumulative Percent of Adopters over Time, United States.

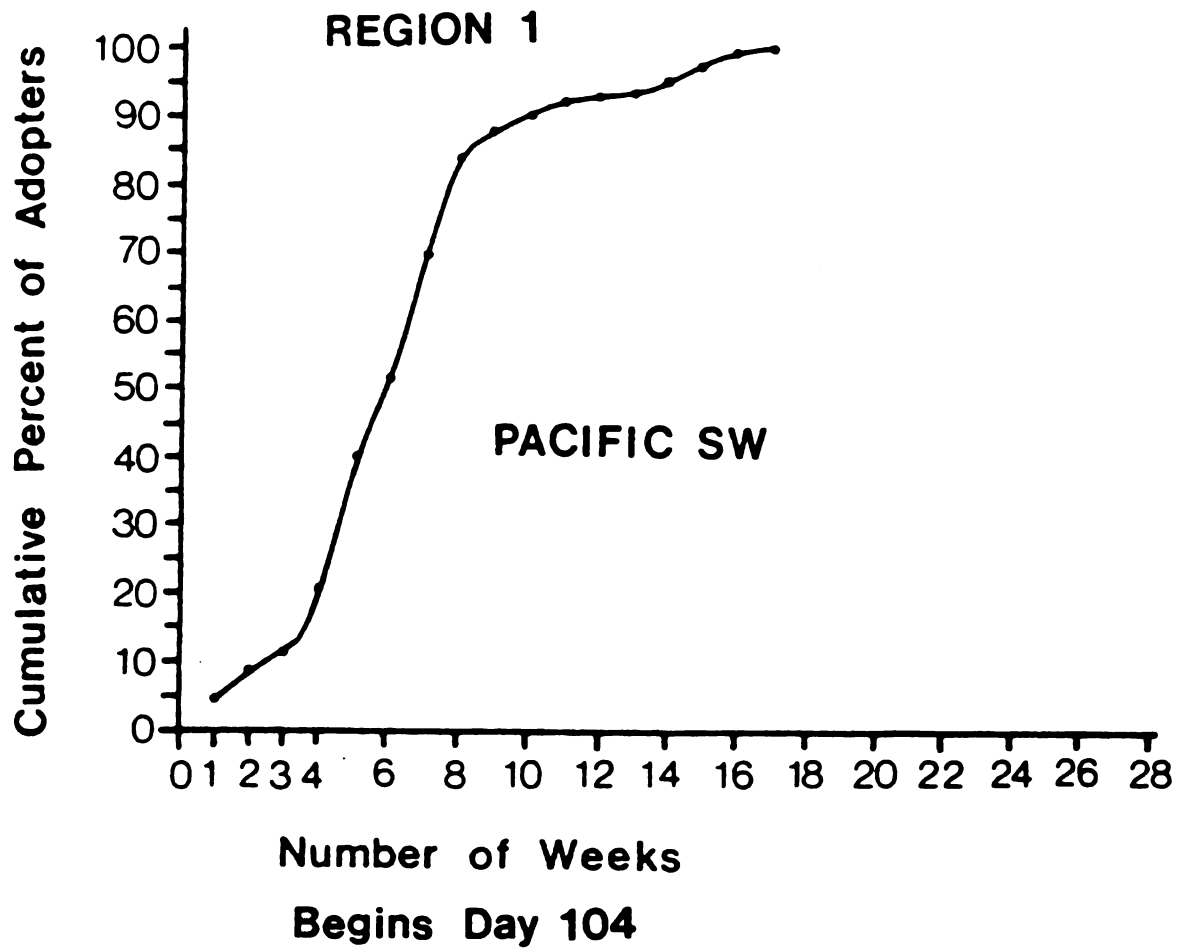


Figure 5. Cumulative Percent of Adopters over Time, Region 1.

The addition of adopters occurred slowly from Week 1 to Week 3. At Week 4, an additional 10 percent appeared. Week 5 shows a gain of 18.9 percent. The curve begins to level off at Week 8 when 84.4 percent of the total adopters have added sample songs to play lists. A cumulative adoption percentage of 98.6 percent is achieved at Week 16.

The Pacific Southwest has an R^2 value of .975, slightly above that of the entire sample. This region ranks sixth in goodness of fit among all the regions of the United States that are scrutinized in the study.

Region 2, the Pacific Northwest Logistic Curve

The S-curve for the Pacific Northwest is shown in Figure 6. A greater than average percentage of the adopters in Region 2, 8.4 percent, is in the initial week. Adoption occurs rapidly, with a substantial percentage increase each week until Week 4. The process slows to 5.9 percent additional adopters at Week 5, then increases again at Weeks 6, 7, and 8. More adopters are acquired at much lower percentages throughout the balance of the 14 week long diffusion period.

Initial acceptance of a song falls on Day 117 (April 27) in the Pacific Northwest. This is 12 days past the average of Day 105 (April 15) for the nation. Region 2 ranks number 5 in order of goodness of fit with a correlation coefficient of .977. This is somewhat higher than the R^2 value of the entire sample.

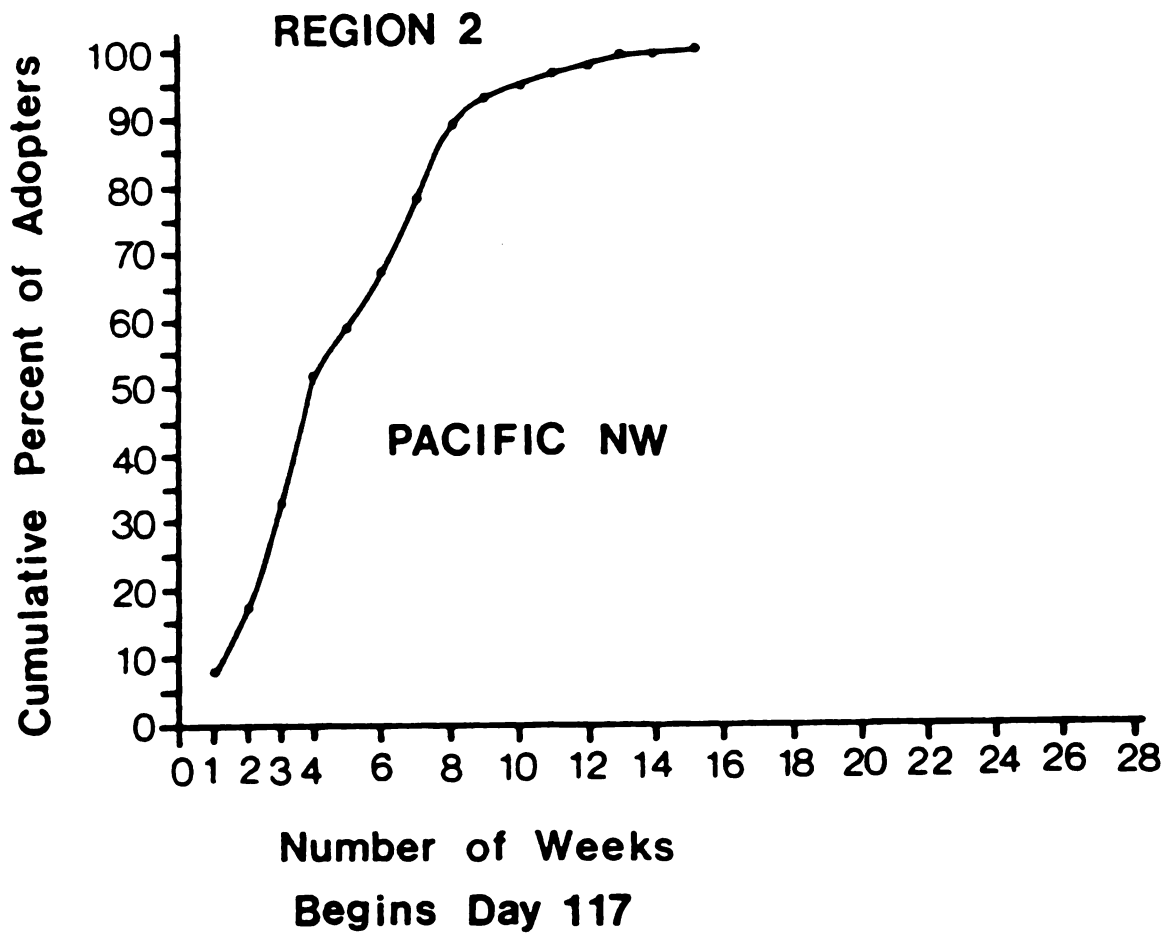


Figure 6. Cumulative Percent of Adopters over Time, Region 2.

Region 3, the North Central Logistic Curve

The logistic curve for the North Central region is revealed in Figure 7. The initial percentage of adopters is 11.4 percent, the highest of all the regions. The cumulative percentage of 99.4 percent is reached in only 8 weeks, well below the average of 10.5 weeks.

A short period of smaller additions occurs between Weeks 3 and 5. At Week 6, an additional 26.8 percent adopt. This unusual pattern is reflected in the goodness of fit ranking for this region. The R^2 value for the North Central region is .971, very close to the correlation coefficient for the entire sample (.969). This places Region 3 seventh for goodness of fit.

The initial adoption date for the North Central region is the latest one among all the regions. The process of diffusion occurs for 10 weeks here. This is very close to the average length of time required for sample song adoption nation-wide.

Region 4, the Southwest Logistic Curve

Figure 8 depicts the curve for the Southwest. The original adoption percentage is 6.7 percent, slightly above the national average of 5.5 percent. The initial date of adoption occurs on Day 117 (April 27) as is true also for Region 2, the Pacific Northwest.

The R^2 value for the Southwest is .981, placing it in the fourth position regarding its curve's goodness of fit.

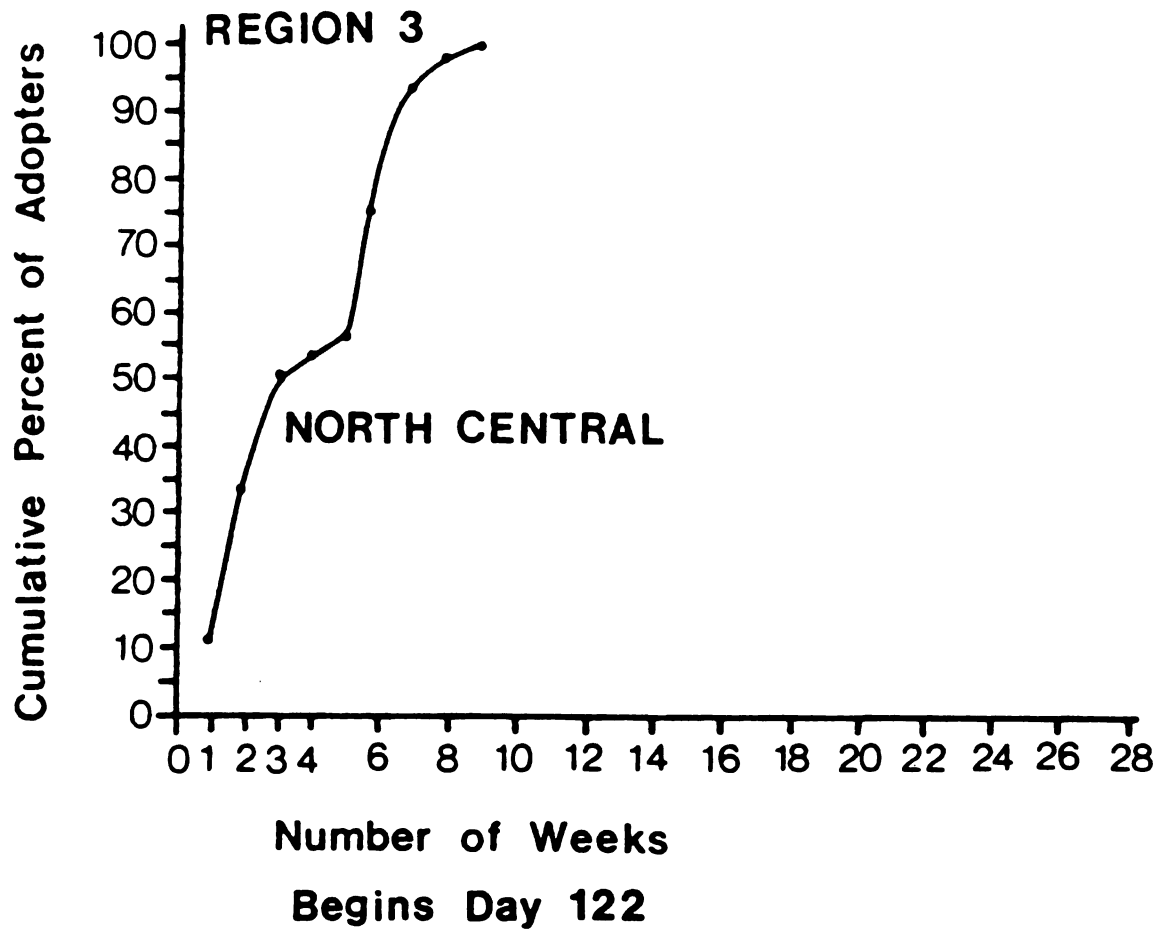


Figure 7. Cumulative percent of Adopters over Time, Region 3.

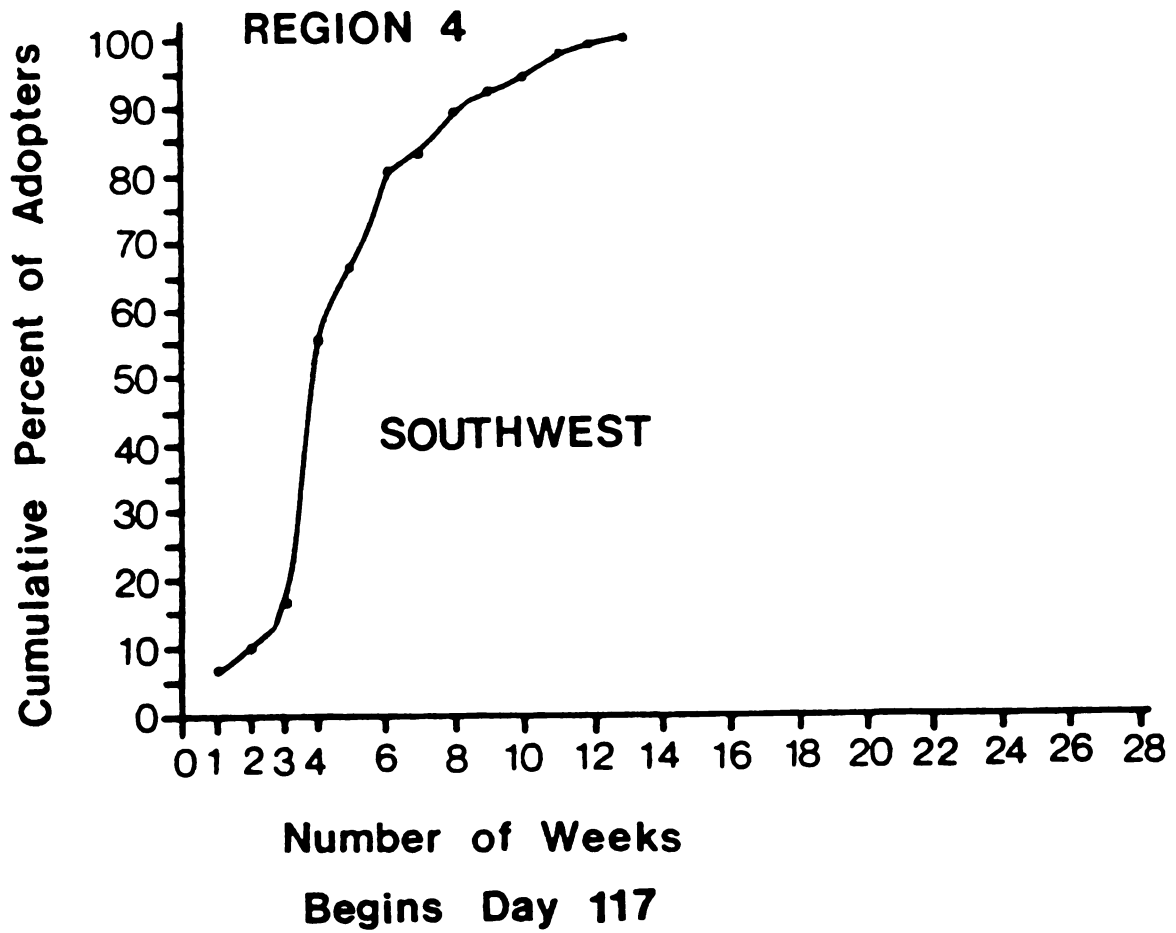


Figure 8. Cumulative Percent of Adopters over Time, Region 4.

This value is slightly over 1 percent above the average for the national sample.

The number of acceptors reaches a cumulative percentage of 99.6 percent by Week 12, 1.5 weeks past the national mean. Smaller percentages are added during the first 3 weeks. Between Weeks 3 and 4, there is a remarkable addition of 39.7 percent adopters. This is the largest percentage addition which occurs in the entire study area. The process then continues at a slower pace and levels off at Week 8.

Region 5, the Midwest Logistic Curve

The initial percentage of adopters in the Midwest is 3.2 percent, below the national average of 5.5 percent. As Figure 9 shows, the date of original acceptance is Day 110 (April 20). This date is 5 days past the mean for the nation.

The Midwest's diffusion process continues for 13 weeks, a period somewhat longer than the average of 10.5 weeks. Additional adopters are acquired gradually during Weeks 2 through 5. Quite large increments occur at Week 6 (13.7 percent) Week 7 (17.8 percent) and Week 10 (14 percent), then slow to reach 99.3 percent at Week 13.

Region 5's curve displays the best fit to the data points for a logistic curve among those graphed for all the regions. The R^2 value for the Midwest is .997. This indicates that nearly 100 percent of the variation in the

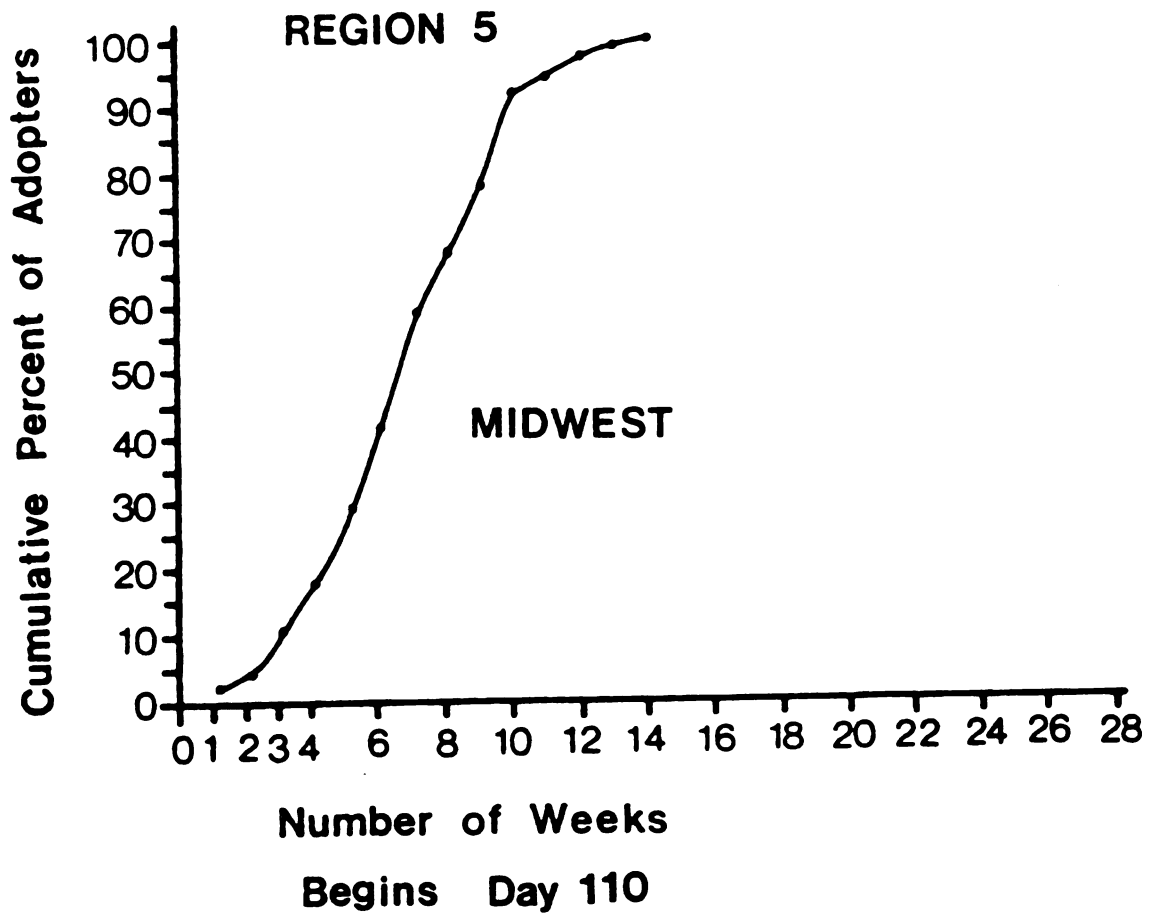


Figure 9. Cumulative Percent of Adopters over Time, Region 5.

dependent variable is accounted for by the independent variable.

Region 6, the Northeast Logistic Curve

Figure 10 illustrates the S curve of Region 6, the Northeast. The graph indicates that the Northeast region has the earliest initial adoption date, Day 54 (February 23) of all the regions. The date is 51 days before the national mean initial adoption date.

The beginning percentage of adopters comprises only 2.6 percent of the total number of adopters in the Northeast. This figure is considerably below the average initial percentage of 5.5 percent.

Diffusion proceeds for 18 weeks, 7.5 weeks beyond the national mean of 10.5 weeks. Additional adopters are acquired gradually. At Week 11, the cumulative percentage is only 15.6 percent. Between Week 12 and Week 13 an increment of 19.2 percent occurs. Week 14 shows an increase of 22.5 percent. Additional acceptors are gained at a much slower rate until diffusion ceases at Week 18 with 97.2 percent.

The Northeast displays the poorest fit to a logistic curve of all the study regions. The R^2 value for Region 6 is .953. This figure is slightly below the nation-wide average of .969, revealing the similarity between the two graphs.

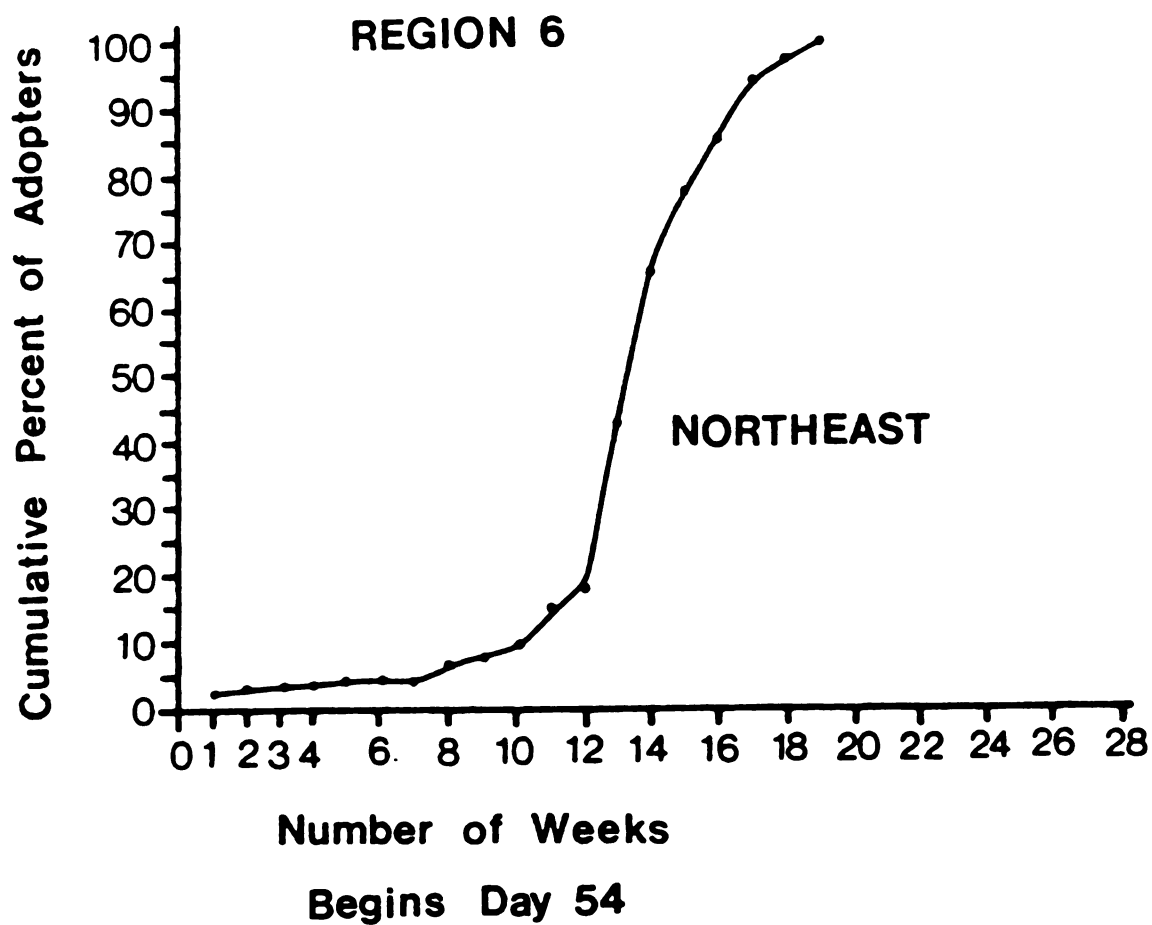


Figure 10. Cumulative Percent of Adopters over Time, Region 6.

Region 7, the Mid-Atlantic Logistic Curve

The Mid-Atlantic region's curve, shown in Figure 11, begins on Day 116 (April 26), 11 days later than the national mean. The graph displays a near average initial percentage of adopters, 4.7 percent versus the 5.5 nationwide average.

The process of diffusion continues for 8 weeks, 2.5 weeks shorter than the mean duration. Additional acceptors are acquired rapidly. An increment of 16.2 percent occurs between Week 2 and Week 3. Week 4's increase is 21.6 percent. Weeks 5 and 6 have large percentage increases, i.e., 13.6 percent and 19.6 percent, respectively.

Region 7 ranks third in goodness of fit. The Mid-Atlantic region's R^2 value is .987. This is nearly 2 percent above the average for all the regions.

Region 8, the Southeast Logistic Curve

The Southeast's song diffusion begins with the lowest initial percentage of adopters found among the regions, 1.8 percent. This starting figure is 3.7 percent below the mean for the entire sample. Figure 12 shows the S curve for Region 8.

The duration of diffusion in the Southeast is 12 weeks, 1.5 weeks beyond the national average. The initial date of adoption is the second earliest one, Day 97 (April 7). This date is 8 days ahead of the mean for the nation.

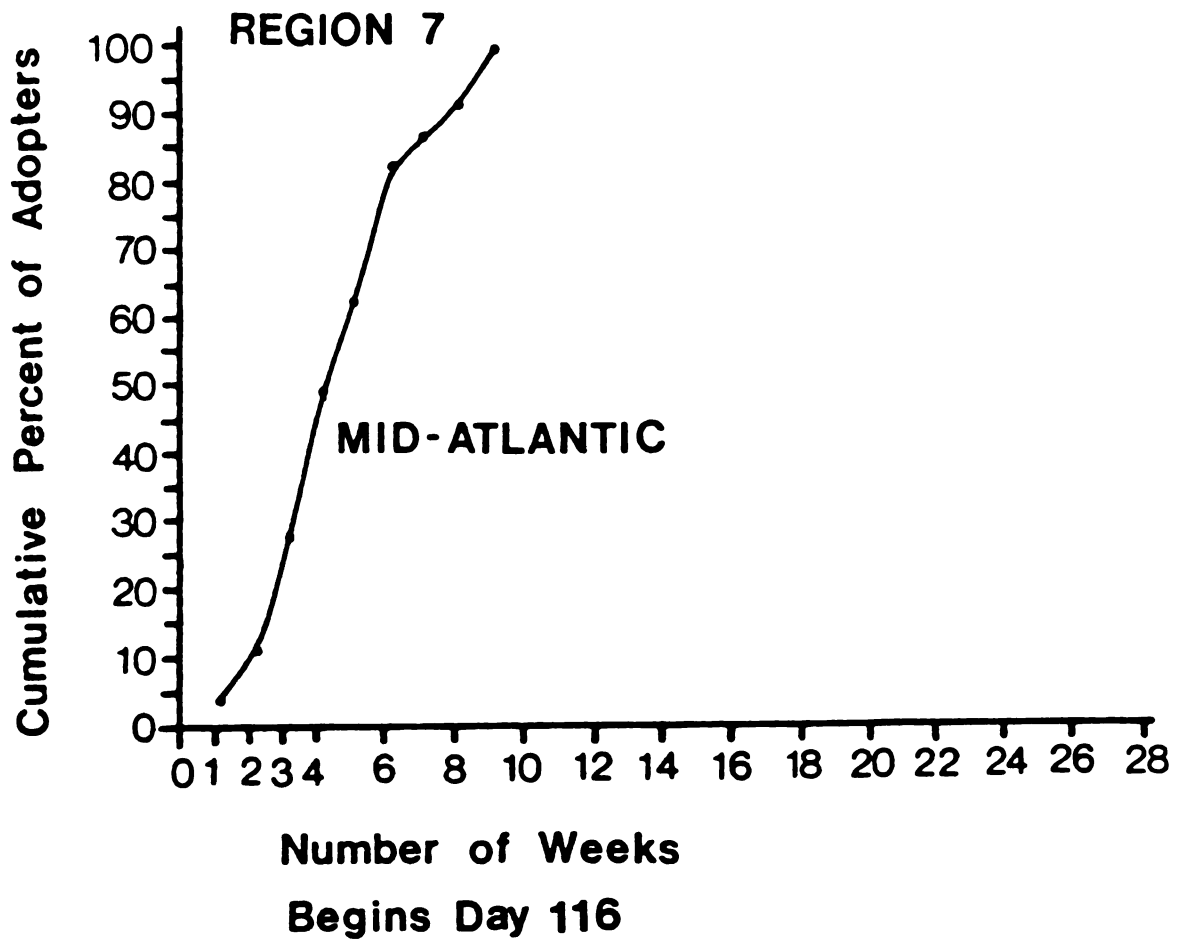


Figure 11. Cumulative Percent of Adopters over Time, Region 7.

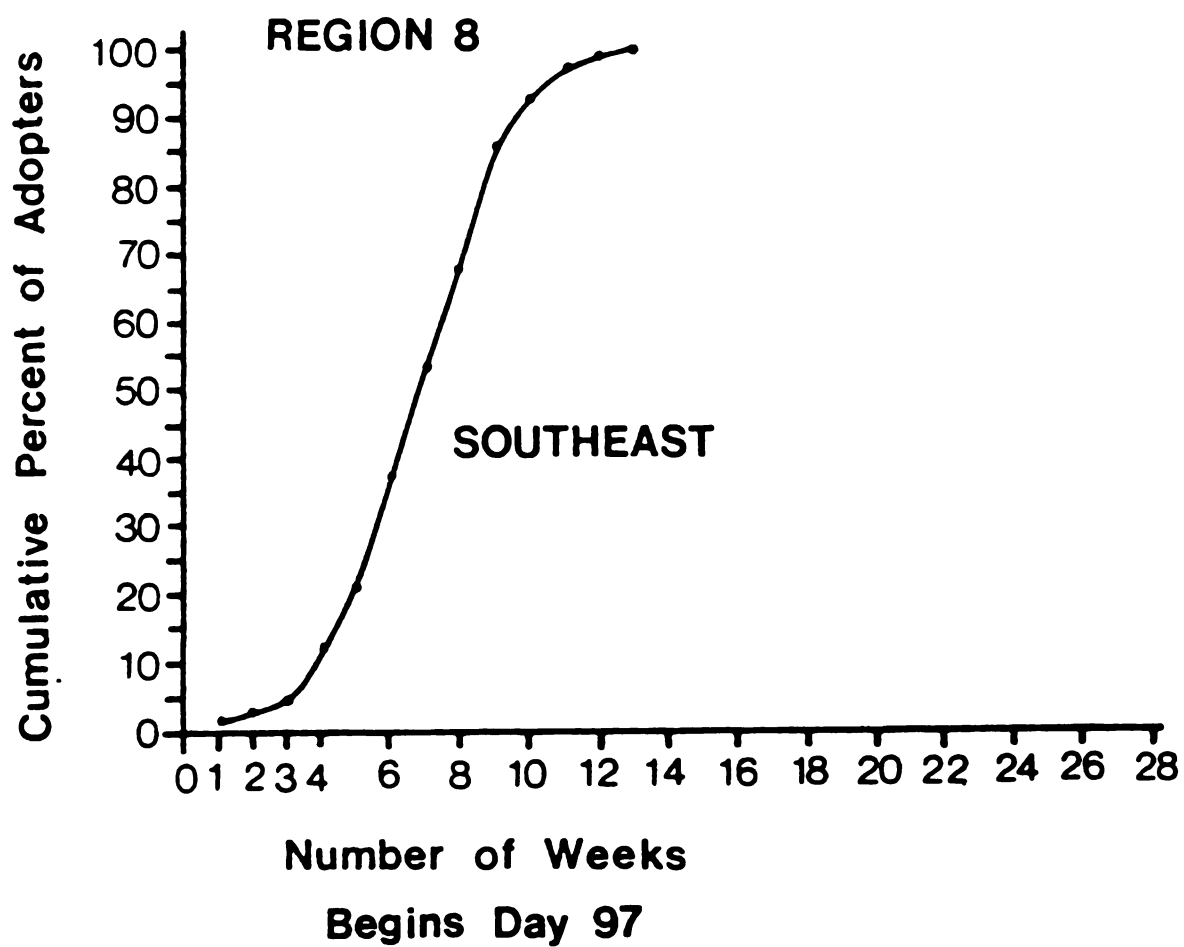


Figure 12. Cumulative Percent of Adopters over Time, Region 8.

Region 8's R^2 value is .991. It shows the second best fit to logistic curve data points. With a series of small increments in the percentage of adopters occurring during the period from Week 1 to Week 4, a cumulative total of 12.3 percent is reached. Larger increases occur between Week 5 and Week 9. Respectively, these increases are 16.4 percent, 16.4 percent again, 13.1 percent and 18.5 percent. The process then slows until 99.6 percent have adopted by Week 12.

Primacy Maps

Significant variations among primacy ratings were found among the regions of the United States. These differences emerged from the computations of average adoption time from January 1 (primacy) that were made in order to test Hypothesis 1.

National Primacy Map

Figure 13 shows the primacy ranks of all the sample cities in the nation. A 20 primacy point range was selected for the proportional symbols of the map in order to most effectively display the differences in the primacy ratings.

As the map shows, there is a predominance of two earliest adoption ranges in the Southeast and in California. The balance of the nation has a rather even distribution of the later primacy ranges, with the exception of the slowest adoption rate, i.e., between 170 days and 189 days. Only 6 sites have primacies in this range. Of those 6, 3 are found in The Midwest, Region 5. This is reflected in the region's

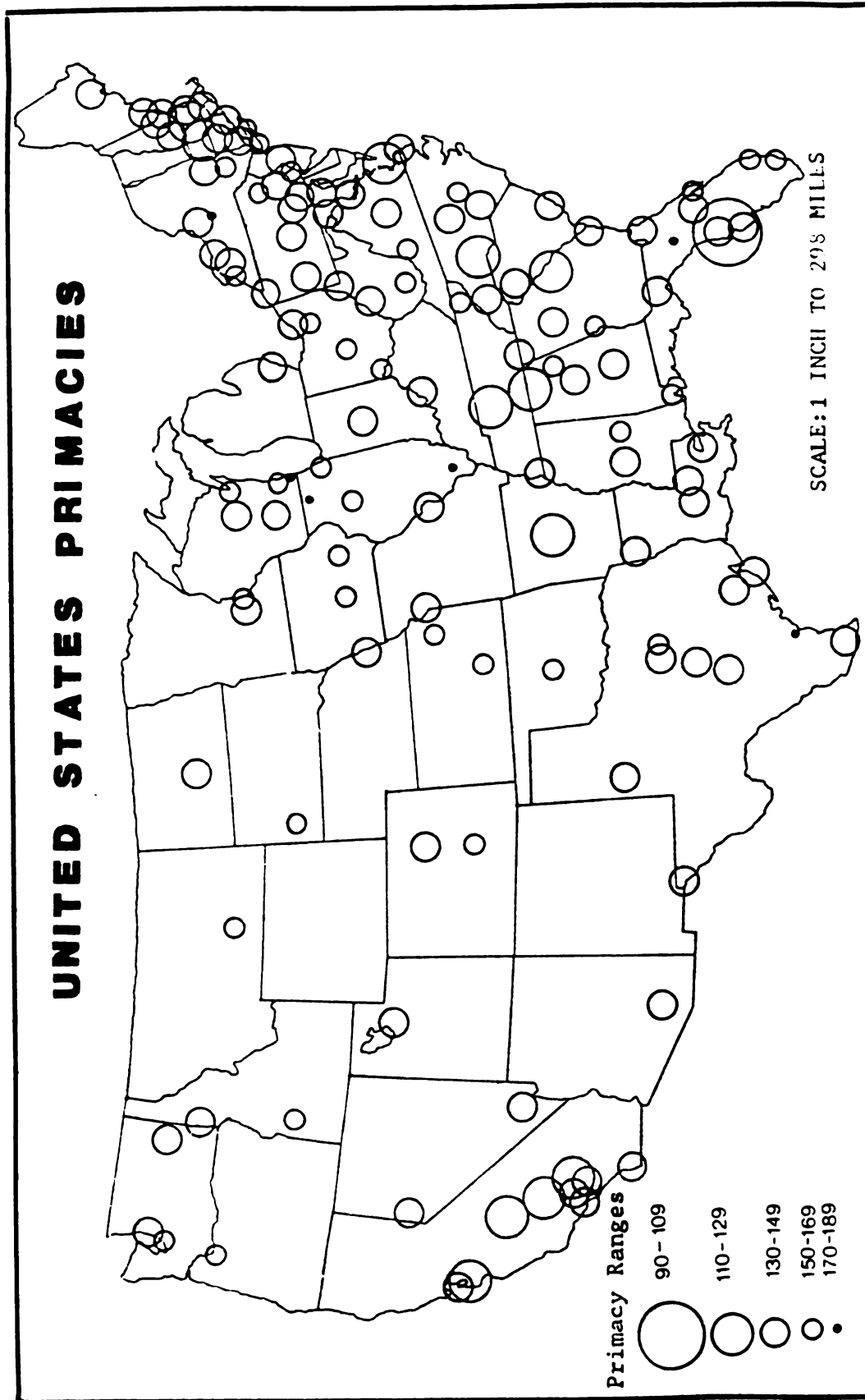


Figure 13. National Primacies.

average primacy of 151.82 days, the slowest among all regions.

Region 1, the Pacific Southwest Primacy Map

As indicated in Table 8, the Pacific Southwest has a population density of 39.2 persons per square mile and a density of radio stations equal to 3.39 per 100,000 square miles. The average primacy for the region is 142.7 days, somewhat faster than the national ranking of 144.1 days.

Within Region 1, Fresno (#62)²⁵ is the earliest adopter with a primacy of 122, as shown in Figure 14. Fresno's population is approximately 235,000.²⁶ The cities of Bakersfield (#10) and San Bernardino (#134) are the next to adopt. Each has a primacy ranking of 124 days. Both cities have populations of about 100,000. Figure 14 shows the primacy rates of the Pacific Southwest. Las Vegas (#82) displays the next fastest diffusion rate as indicated by its primacy rank of 110 days.

The largest city of the region, Los Angeles (#85) has a population greater than 2 million and a primacy rank of 147 days, far slower than the smaller cities of the region. Only Tucson (#156) has a slower rate of diffusion, with a primacy rating of 152 days.

²⁵Numbers refer to city sites as shown on Figure 3.

²⁶City populations are rounded. For exact data see Appendix, p.108.

TABLE 8

SUMMARY OF REGIONAL DENSITIES AND PRIMACIES*

Region	Radio Stations ----- 100,000 miles ²	Persons ----- mile ²	Primacy
1	3.39	39.2	142.70
2	2.06	36.85	145.99
3	7.50	164.99	146.37
4	3.77	52.67	146.13
5	3.10	54.41	151.82
6	22.57	270.09	141.51
7	11.27	232.70	145.14
8	10.55	105.59	138.63

*Primacy is the average number of days from January 1 required by a given city to adopt sample songs. The primacies listed here are regional averages.

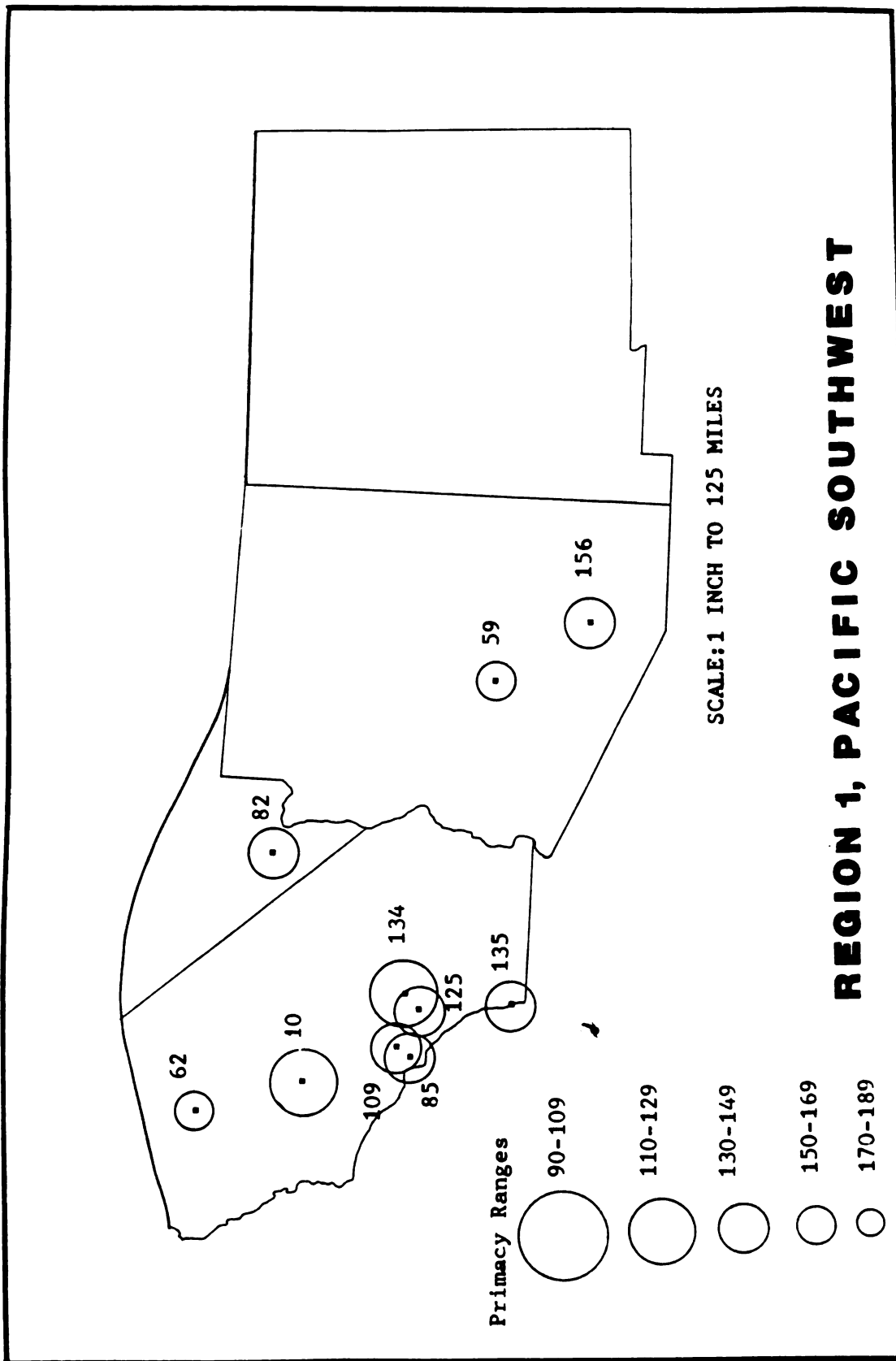


Figure 14. Region 1 Primacy Map. See Appendix city site identification.

With the exception of Los Angeles (#82), all Region 1 cities have one or two reporting radio stations. Los Angeles has seven stations which participated in the Billboard chart during the study period.

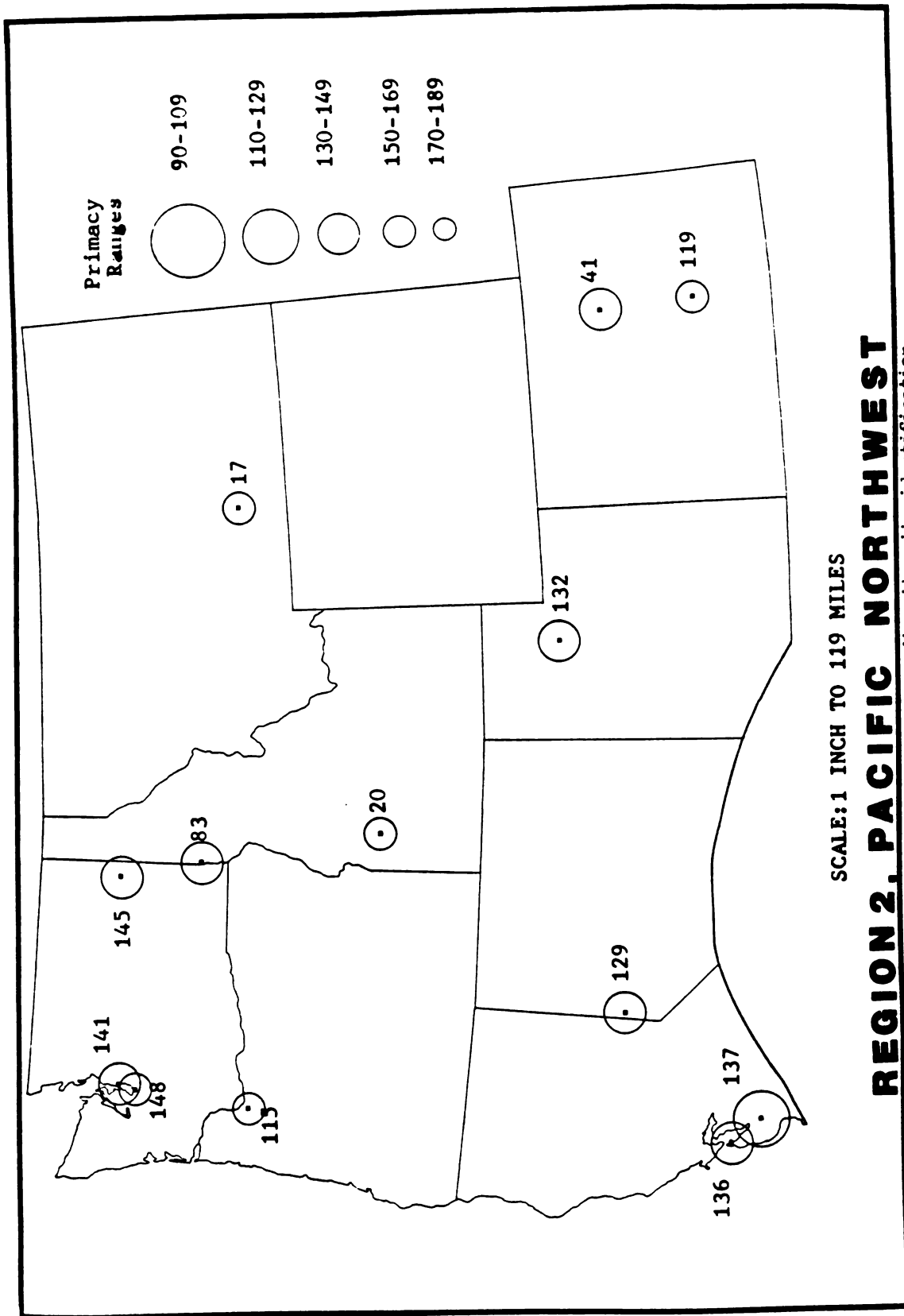
Other cities in this region that have primacies between 140 days and 150 days include San Diego (#135), Pasadena (#109), and Riverside (#125). These cities vary in population from 100,000 to 875,000 (San Diego).

Region 2 the Pacific Northwest Primacy Map

The Pacific Northwest, as Table 8 shows, has a population density of 36.85 persons per square mile and radio stations at a density of 2.06 per 100,000 square miles. The average regional primacy rating is 145.99.

The first adopter in Region 2 is the city of San Jose (#137) which has a primacy of 118 days. This is substantially earlier than that of any other city within Region 2, as indicated on Figure 15. San Jose, with its population of 630,000, is the second largest city in the Pacific Northwest. The next earlier adoption time is Seattle's (#141), with a primacy rank of 133 days.

Reno (#123), Lewiston (#83), and Salt Lake City (#132) also have fairly fast diffusion rates as their respective primacies of 134 days, 136 days, and 136 days illustrate. The largest city in Region 2 is San Francisco (#136), with 680,000 inhabitants. Its primacy is 143 days, indicating a slower diffusion rate than the smaller cities of the region.



Ten of the cities within the Pacific Southwest have one or two reporting stations. Among the remainder, Seattle (#141) has five, Salt Lake City (#132) and Portland (#115) have four each and Tacoma (#148) has three. Population of cities varies from Lewiston's 28,000 to 6 cities of approximately 100,000 to San Francisco's 680,000

Region 3, the North Central Primacy Map

The population density of the North Central region, 164.99 persons per square mile, is dramatically larger than those of Regions 1 and 2, the Pacific Southwest and the Pacific Northwest, respectively. Region 3 has a radio station density of 7.5 per 100,000 square miles. It has a primacy rank of 146.37 days, exceeding the national primacy rate.

In the North Central region, all of the cities received primacy ratings in the 140s and 150s, with the exception of Cleveland (#33). Figure 16 reveals that Cleveland's primacy is 135 days, displaying a somewhat faster diffusion rate than other North Central cities. Detroit, with its population of over 1 million, is the region's largest city. Its primacy is 143 days, with three stations reporting. Louisville (#86) has a population of 300,000, a primacy rank of 146 days and three participating stations. The balance of the North Central region cities had one or two stations and ranged in population from 230,000 in Akron (#1) to 700,000 in Indianapolis (#71).

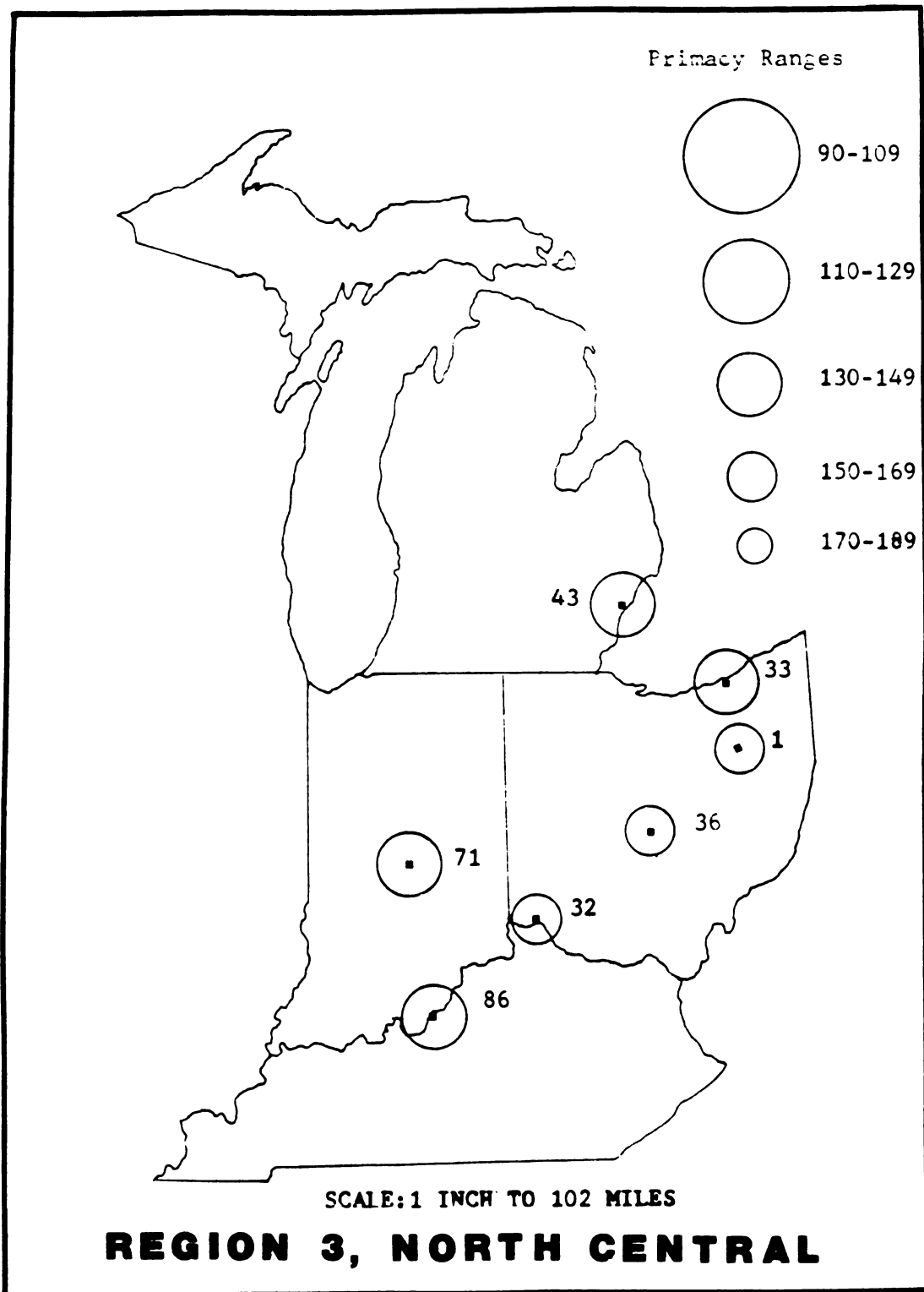


Figure 16. Region 3 primacies. See Appendix city site identification.

Region 4, the Southwest Primacy Map

There are 3.77 radio stations per 100,000 square miles in the Southwest. Region 4's population density is 52.67 persons per square mile. The average primacy in the region is 146.13 days. In the Southwest as Figure 17 displays, the primacy rate range is rather small. El Paso (#47) has the earliest primacy rate of 134 days. Its population totals 425,000. Galveston (#58) with its 62,000 inhabitants, and Fort Worth (#53) with a population of 385,000, closely follow with their respective primacy ranks of 135 days and 136 days. The majority of cities with the Southwest have primacy ranks in the 140s. Oklahoma City's (#105) average adoption time is 153 days. Corpus Christi (#37) with a primacy of 182 days, lags far behind the other cities in Region 4. The largest city in the Southwest is Houston (#69) with a population of 1.5 million. Its primacy rating is 147 days. Within the region city populations vary from Dallas' (#40) 900,000 to 24,000 in Edinburg (#46). With the exception of Houston with 5 reporting stations, each Region 4 city has one or two stations which participate in the Billboard chart.

Region 5, the Midwest Primacy Map

The Midwest has a population density of 54.41 persons per square mile and a concentration of radio stations at the rate of 3.10 per 100,000 square miles. The Midwest's

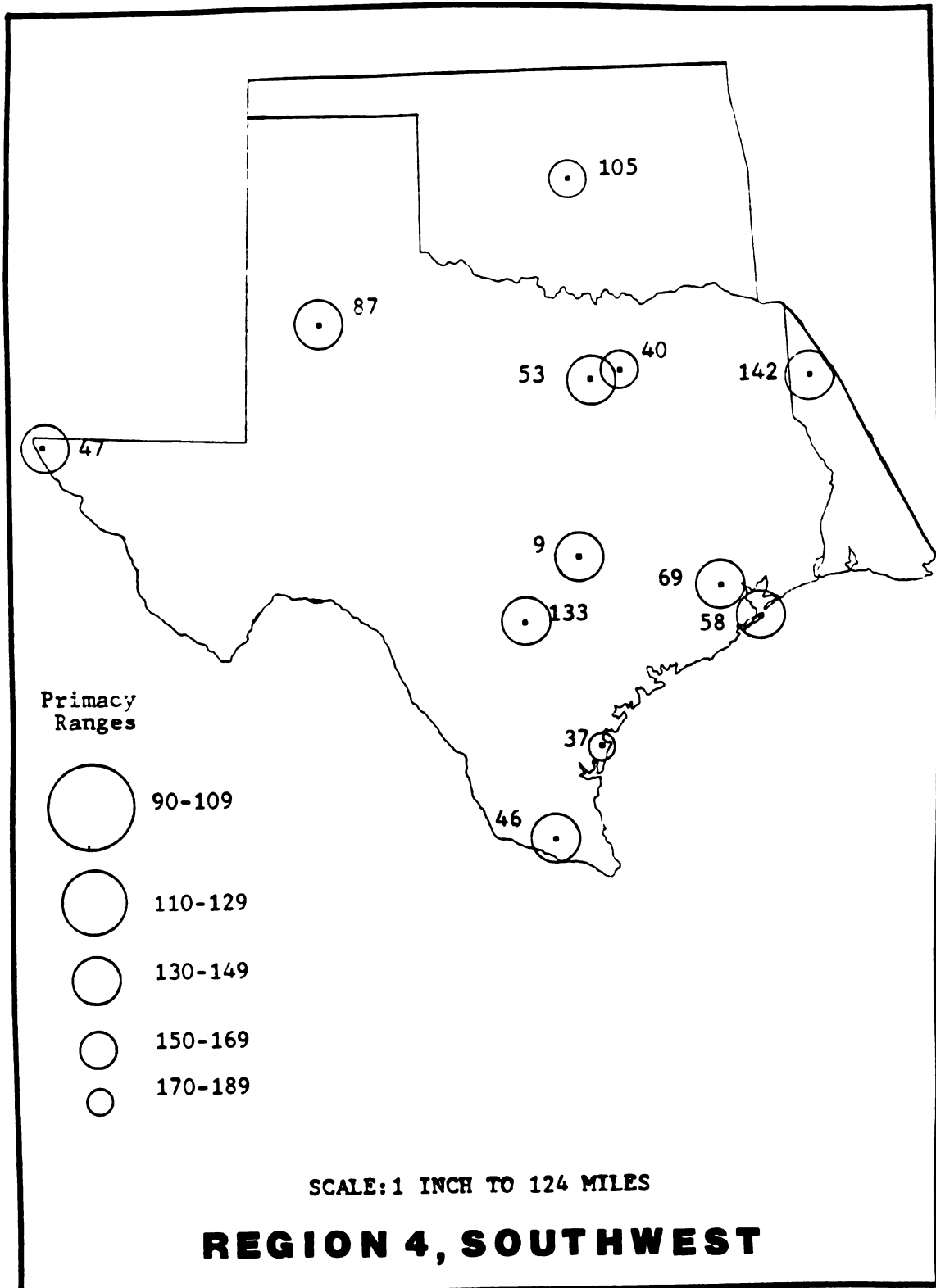


Figure 17. Region 4 primacies. See Appendix city site identification.

average primacy is 151.82 days. Figure 18 shows the primacies of Region 5.

Within the Midwest, two cities tie for the fastest adoption rate. Both Kansas City (#76), population 450,000, and Madison (#88), population 170,000, have primacy ratings of 141 days. Each of these cities has two reporting radio stations. Other adopters within the Midwest which have similar primacies include Omaha (#106) with a rating of 142 days and Steven's Point (#146) which has a rank of 143 days. These two cities have populations of one order of magnitude of difference, i.e., Omaha has 300,000 inhabitants and Steven's Point's population is 23,000. Six cities, varying in population from 50,000 for Iowa City (#72) to Milwaukee's 635,000, have primacy ranks in the 150s in the Midwest. A total of five Region 5 cities have slower rates of diffusion as revealed by their primacies in the 160s. Of the remaining cities, two ranked in the 170s and Rockford (#128) displayed the latest average adoption time in its primacy of 184. The Midwest's largest city is Chicago (#31), with a population of 3 million and a primacy rank of 163 days. Only St. Louis (#130) and Minneapolis (#96) have four reporting stations each. The balance of Midwestern cities have one or two stations sending Billboard adoption data.

Region 6, the Northeast Primacy Map

The Northeast has 22.57 radio stations per 100,000 square miles and a population density of 270.09 persons per

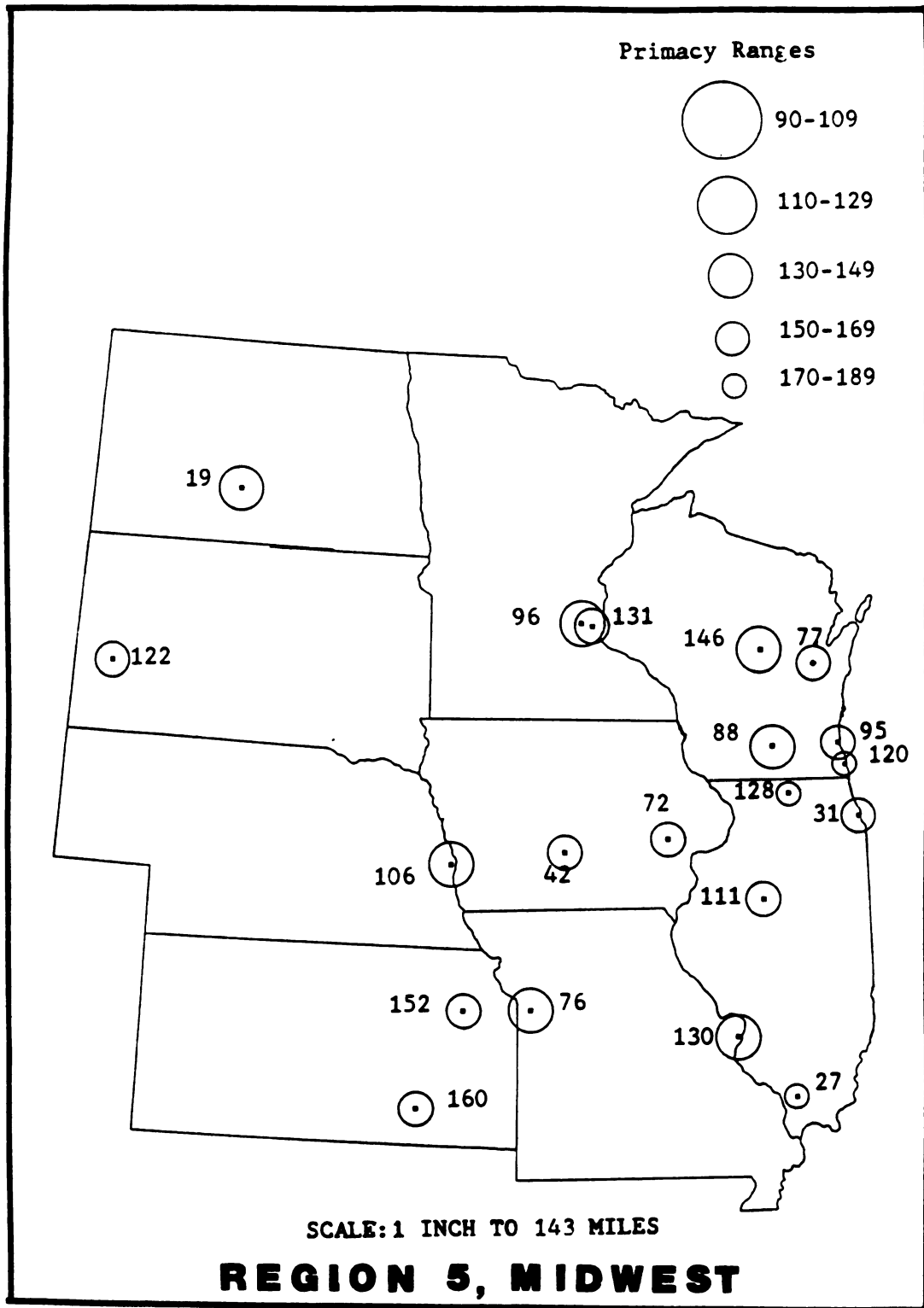


Figure 18. Region 5 primacies. See Appendix city site identification.

square mile. The average primacy for the region is 141.51 days. As Table 8 reveals, both radio station and population density are at their greatest in the Northeast.

New York City (#102) is the largest city in Region 6, with over 7 million inhabitants. It has four reporting stations and a primacy rank of 167 days. Only Portland (#38), population 20,000 has a slower average adoption time, 176 days. The city displaying the earliest average adoption time is Springfield (#144), population 150,000, with a primacy of 124 days. The city with the next fastest adoption rate is Worcester (#164) with a primacy of 128 days. Its population is 160,000. Four Northeastern cities have primacies in the 130s. They range in size from Dover's (#44) 22,000 to the 360,000 inhabitants of Buffalo (#26). Figure 19 reveals that 8 cities in Region 6 have Primacies in the 140s. Three of these have three reporting stations each. The balance have only one or two. One city, Bangor (#12) has five stations which report to Billboard. The slowest adoption rates of this region are in the 150s range.

Region 7, the Mid-Atlantic Primacy Map

The Mid-Atlantic region has 232.70 persons per square mile and a radio station density of 11.27 per 100,000 square miles. The regional average primacy rating is 145.14 days. Region 7's density of stations and of population is greater than that of all regions except the Northeast.

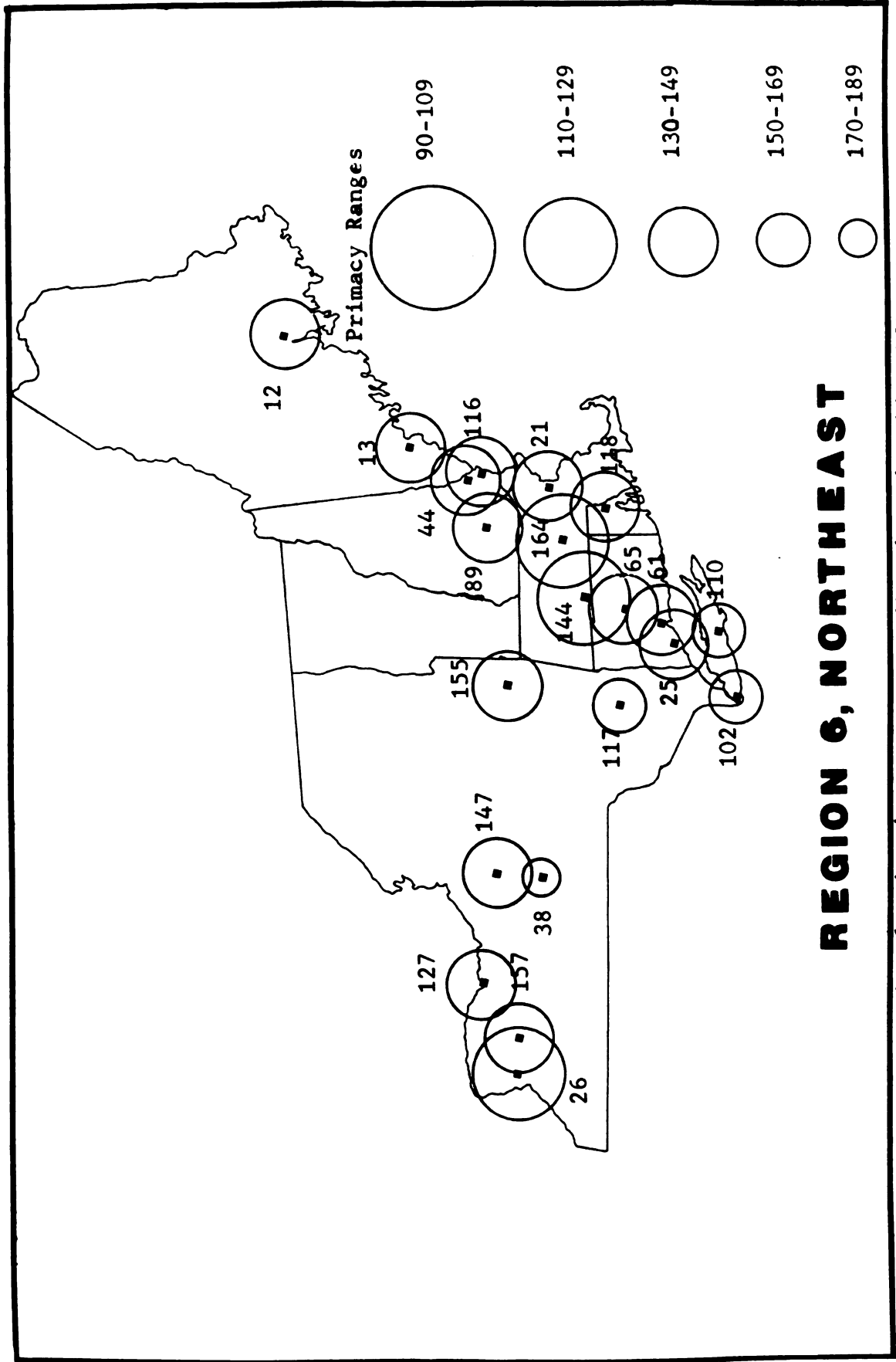


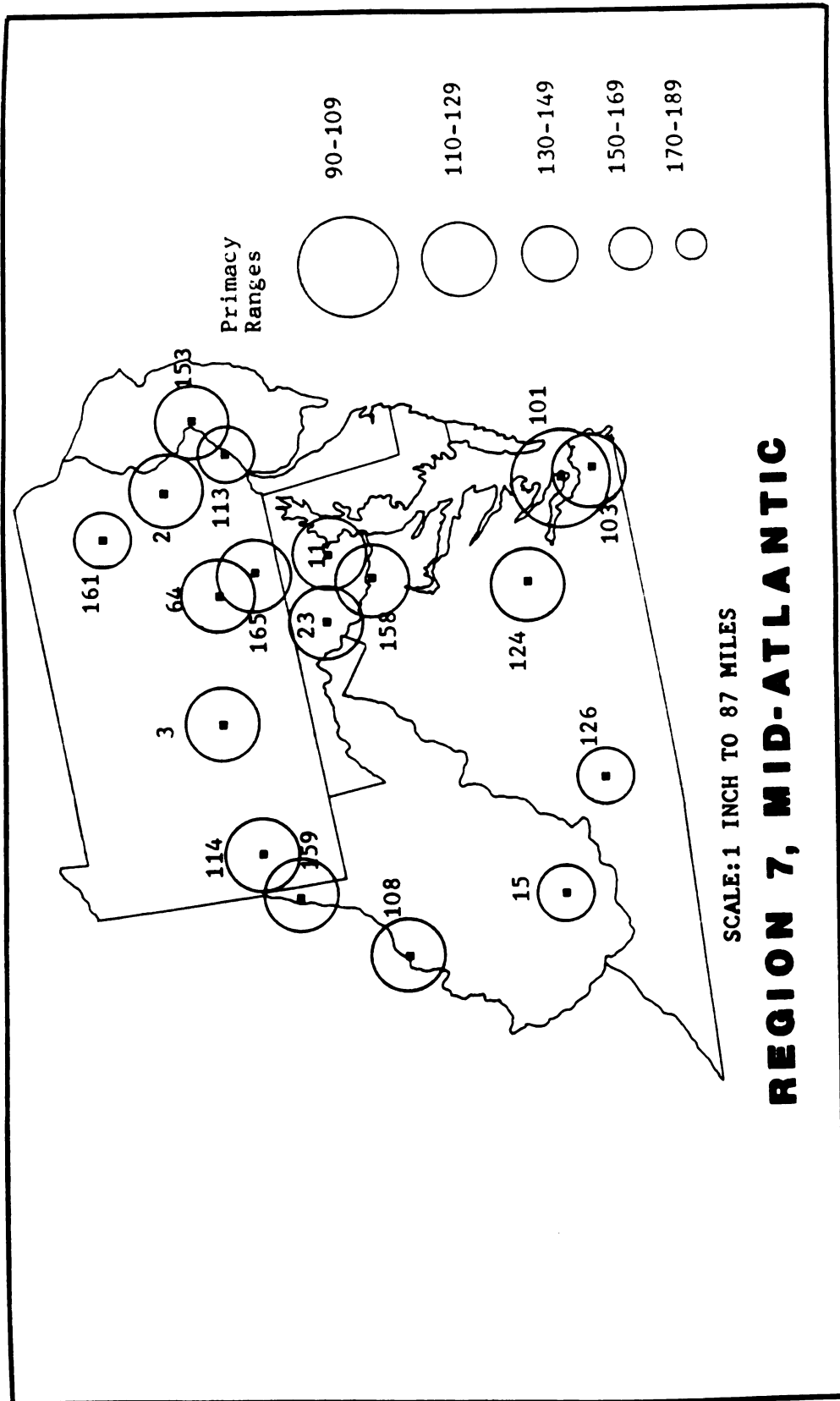
Figure 19. Region 6 primacies. See Appendix city site identification.

In the Mid-Atlantic region, the city of Newport News (#101), population 145,000, has the fastest diffusion rate as indicated by its primacy rating of 126 days. It has one reporting station. Baltimore (#11), population 790,000, Harrisburg (#64) with 53,000 inhabitants and York (#165) rank next, each with a primacy of 132 days. Baltimore has four participating stations. York and Harrisburg each has one. Eight cities have primacies in the 140s and populations ranging from 638,000 in Washington, D.C. (#158) to 28,000 in Frederick (#23). Philadelphia (#113), whose population is 1.6 million, making it the largest urban aggregation in this region, has five reporting stations and a primacy rank of 154 days. Wilkes-Barre (#161), with a population of 51,000 and one participating stations, is one primacy point earlier with a rating of 153 days. Roanoke (#126) with 100,000 inhabitants, has the slowest diffusion rate of 162 days with one reporting station. See Figure 20.

Region 8, the Southeast Primacy Map

The Southeast has 10.55 stations per 100,000 square miles and a population density of 105.59 persons per square mile. The average regional primacy rate is 138.63 days, the fastest adoption rates of all the regions.

In Region 8 there are cities that have the fastest average adoption rate in the entire nation. The Southeast has the largest number of cities as well as the most participating stations among the regions. St. Petersburg



(#112) has by far the most rapid rate of 97 days. The city's population is 240,000 and it has one reporting station. Huntsville (#70), population 143,000, has primacy of 114 days with one reporting station. Knoxville (#78), with a ranking of 116 days, has a population of 175,000 and four reporting stations. There are three cities with primacies in the 120s range, eleven with ratings in the 130s, twelve cities which have average adoption times in the 140s and five cities with primacies between 150 days and 159 days. All of these cities vary greatly in population and in the number of participating stations. Gainesville (#56) has the slowest primacy of 176 days. It has one reporting station. Figure 21 depicts Region 8 city primacies.

In summary, Region 3, the North Central, has the largest initial percentage of adopters and the latest initial adoption date among the regions. Region 8, the Southeast, begins song adoption with the lowest regional percentage of adopters and at the second earliest initial date. Logically, there seems to be a directly proportional relationship between the percentage of initial adopters and the initial adoption date. Actually, this association is supported by the data for Regions 1 through 4 and Regions 6 through 8. Region 5 is anomalous.

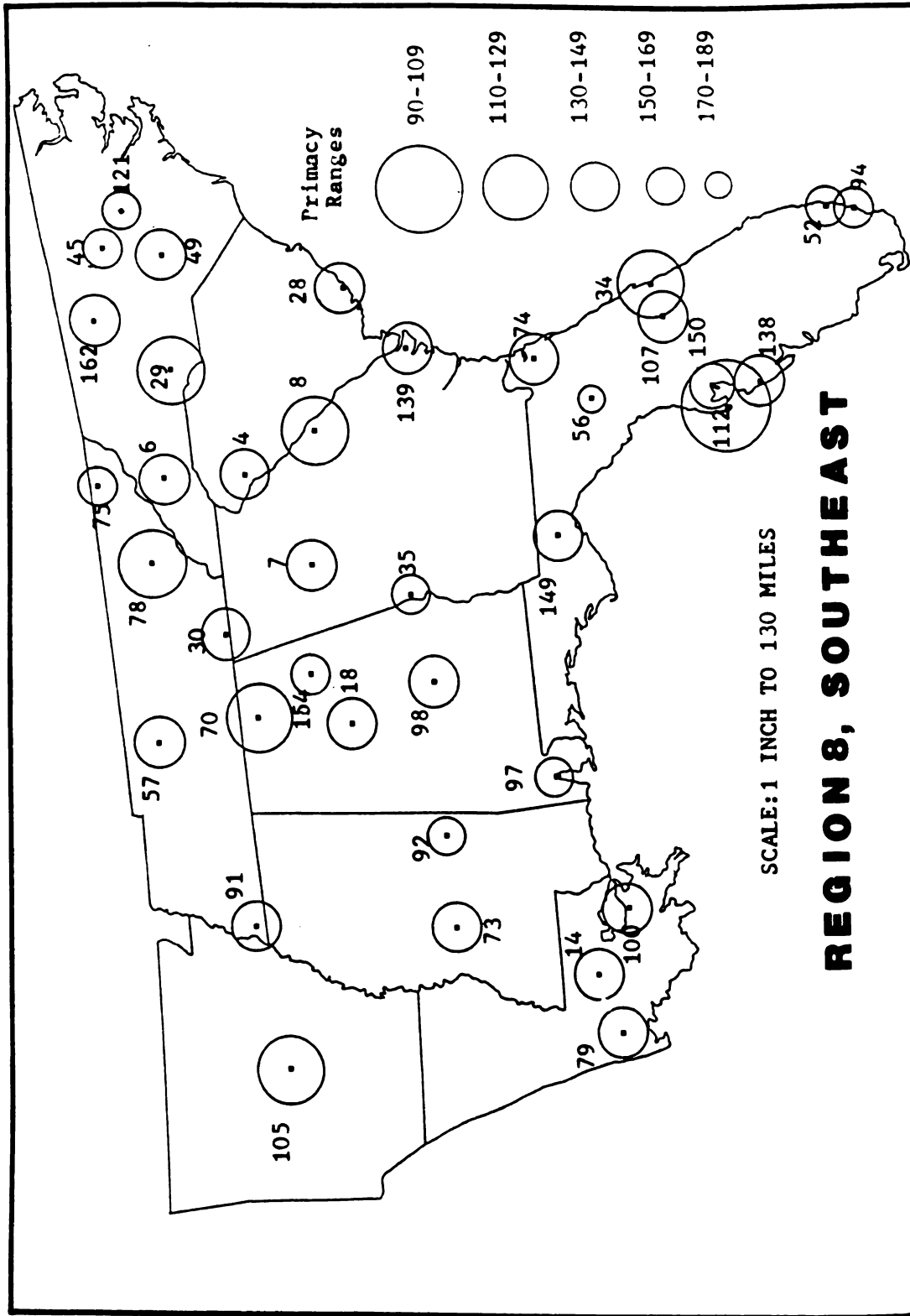


Figure 21. Region 8 Primacy Map. See Appendix city site identification.

All population sizes of individual cities lack the hypothesized negative association with primacy.²⁷ Population per radio station is positively associated with primacy. The Pearson correlation coefficient for primacy with population per radio station is $+0.1270$ (264 cases) with a P value of $.02$, indicating a significant relationship between the two variables. This correlation is repeated in numerous instances of cities with smaller populations having adoption rates faster than or equivalent to rates of larger cities. In fact, a Pearson correlation coefficient of $+0.1058$ (264 cases) with a P value of $.043$ was calculated for primacy with population size. This indicates that adoption rates increase with city populations.

Testing the Hypotheses

Initially, all data were employed in calculating partial and Pearson correlation coefficients for the variables. This was done in order to determine 1) the significance of each variable's influence on the process when the impact of one or more of the other variables was controlled (in the case of partial correlation) and 2) the amount of variance of the dependent variable which is associated with the entire set of independent variables (in the case of Pearson correlation).

²⁷It was hypothesized that as city size increased primacy ranks would decrease, i.e., that larger cities would display faster rates of adoption.

Comparison of the average primacy ranks for each city size with the mean primacy rank for the total sample and the calculation of a Pearson correlation coefficient were the methods employed to test Hypothesis 1. It was suggested that 1) primacy would decrease as population increased, indicating that larger cities' radio stations had faster rates of song adoption than smaller cities, and 2) that a significantly different average primacy rating would be in evidence for each population size, thus providing an indication that diffusion from large to smaller cities was taking place.

Hypothesis 1: Diffusion of the songs will expand through the urban hierarchy from radio stations located in larger cities to stations in cities of intermediate size to radio stations in smaller cities.

Hypothesis 1 was tested by the computation of a Pearson correlation coefficient for primacy with population (primacy being the dependent variable) and by the calculation of the average primacy for each city size and the mean primacy for the entire sample. The Pearson correlation coefficient was $+0.1058$, with a P value of $.043$ and 264 cases. Table 9 shows average primacies categorized by city size.²⁸

²⁸Table 1 on p.43 lists the population perimeters for city sizes.

TABLE 9

MEAN PRIMACY BY CITY SIZE

City Size	Mean Primacy
1-5	144.10
1	144.88
2	144.45
3	142.95
4	143.09
5	150.89

The significance index is greatly influenced by the number of cases involved in the variables. For example, if the number of cases is large, then even a coefficient near zero can indicate an association of significance. In order to consider a correlation significant, it must have a P of .05 or less. The coefficient computed for the correlation of primacy with city size had a P value of .043, indicating a significant positive correlation between the variables. A negative correlation was predicted.

For cities of all hierarchy ranks except the largest, the average primacy was too close to the entire population mean to be significant. Although stations in the largest cities had an average primacy of 150.89, or a difference of 6.8 from the mean for the entire sample, they constitute too small a sample to be statistically significant. Hypothesis 1 may be rejected.

Hypothesis 2: Diffusion of the songs will occur in a manner such that, if the cumulative percentage of adopters in the entire study area and in each region is plotted against time, logistic curves will result.

Hypothesis 2 was tested by computing values for the slope (indicated as b) of the adoption rate curve for the entire study area and for each separate region and calculating multiple regression coefficients for them with b values for logistic curves. Table 10 gives b values and the multiple regression coefficients (R^2) which resulted.

TABLE 10
LOGISTIC CURVE COEFFICIENT

Region	R^2 Value	b Value
1-8	.96898	.98437
1	.97539	.98762
2	.97672	.98829
3	.97135	.98557
4	.98058	.99024
5	.99717	.99858
6	.95356	.97651
7	.98659	.99327
8	.99133	.99565

The R^2 values indicate that the curves provide a very close fit when compared to the data. In other words, the

curves for the study's data are logistic curves. All of the R^2 values were over 95%, with the curve of the entire study area displaying a R^2 value of .969. See Figures 4-12.

Hypothesis 2 may be accepted.

Hypothesis 3: Diffusion of songs will occur via the neighborhood effect, moving from a larger city to a much smaller city that is in close proximity, and bypassing cities of intermediate size within the urban system.

Hypothesis 3 was to be tested by examination of small cities whose primacy ratings were uncharacteristically low, i.e., lower than the average minus one standard deviation, indicating a less than average number of days for song adoption to occur. If station A were in a city of rank 2 in the urban hierarchy but was within the broadcast range of station Q in a city of rank 5, it would be concluded that diffusion via the neighborhood effect was occurring at this site.

The plan to test Hypothesis 3 was predicated upon the assumption that city sizes would have well differentiated average primacies, so that primacy ratings would in effect act as indicators of hierarchical ranks. As stated in the discussion regarding Hypothesis 1, well defined primacy values were not found. Therefore, diffusion by the neighborhood effect was not distinguishable from other diffusion types ongoing in the study area. Thus, Hypothesis 3 was not testable.

Hypothesis 4: A faster rate of adoption of songs will be found among those broadcast on radio stations that have the Top Forty format than will be in evidence for songs broadcast on stations with the Adult Contemporary format, that will, in turn have a faster rate of acceptance than songs on the play lists of stations with the Middle-of-the-Road format.

Hypothesis 4 was tested by the computation of an average primacy rating for each format. The ratings were then compared with each other and with the average primacy rank for the total sample. See Table 11.

TABLE 11
FORMAT PRIMACIES

Format	Mean Primacies
1-3	144.10
1 (TF)	143.81
2 (AC)	144.23
3 (MOR)	145.41

The average primacy values did indeed fall in the predicted order, with Top Forty (TF) stations' average primacy equaling 143.81, Adult Contemporary (AC) stations having a primacy rate of 144.23 and the Middle-of-the-Road (MOR) stations averaging 145.41. However, the mean format primacies differ little from the average rank of all the

radio stations, 144.1 days. Thus the order of the primacies by format is not statistically significant. Hypothesis 4 ^{is} may not be accepted.

Hypothesis 5: Faster rates of adoption will occur in regions with greater densities of radio stations (number of stations per 100,000 square miles) than will be found in regions which have lower radio station densities.

Hypothesis 5 was tested by calculating a Pearson correlation coefficient for primacy with density. The coefficient obtained equaled $-.1245$ with a significance value of $.022$ (264 cases), indicating a strong influence of density upon primacy. This effect was most pronounced for stations with the AC format which had a partial correlation coefficient of $-.2254$ with a significance value of $.019$ (83 cases). Examination of the average regional primacy ratings and comparison of them with the national mean primacy, as shown in Table 12, reveals that, generally, regions with lower primacy ranks (faster adoption rates) tend to have higher densities (more stations per 100,000 square miles). This is a tendency, not an absolute order, to which the regions do not strictly adhere.

Although the average regional ranks do vary from the national mean, the differences are small. The primacy rating of Region 8, the Southeast, is lowest, indicating the fastest acceptance rate, although that region ranks only third in terms of its density of radio stations. However,

TABLE 12

REGIONAL PRIMACIES IN DESCENDING DENSITY ORDER

Region	Primacy
1-8	144.10
6	141.51
7	154.14
8	138.63
3	146.37
4	146.13
1	142.70
5	151.82
2	145.99

it must be noted that the difference between the actual densities within Regions 1, 2, and 3, the Pacific Southwest, the Pacific Northwest and the North Central, respectively, is small. Substantial increases in the number of stations per 100,000 square miles occur in the other five regions. The Pacific Southwest is sixth in the density listing and nearly 3.5 primacy points lower than the Southwest which placed fifth in the density ranking. A negative correlation of primacy with density was predicted. In the light of a significance level of .022 for primacy correlated with density, Hypothesis 5 may be accepted. <

Hypothesis 6: Population density will be negatively associated with song adoption rates.

Hypothesis 6 was tested by a computation of partial correlation coefficients for primacy by format with the following variables: 1) population, 2) transmission power, and 3) density of radio stations. The partial correlation coefficients were also calculated with the removal of the influence of transmission power, radio station density, both individually and in concert, in order to clarify the strength of the association between the variables and primacy and population. A negative correlation was predicted. Because of the hypothesized differences among the three major types of radio station formats, correlation coefficients were calculated for each format separately for purposes of comparison and clarification. The three formats of TF, AC, and MOR comprise 93 percent of the sample stations. See Tables 13-15.

A Pearson correlation coefficient was also computed for primacy correlated with population density for the entire sample. The coefficient equaled .1270 with a significance level of .02 (264 cases). Hypothesis 6 may be accepted. ~~8~~

Hypothesis 7: Radio station transmission power will be negatively associated with song adoption rates.

Hypothesis 7 was tested by the calculation of partial correlation coefficients by format for primacy, population, power, and radio station density.

For the TF format, a correlation coefficient of .1533, with a significance value of .043 (125 cases) was calculated

TABLE 13

CORRELATION COEFFICIENTS FOR TOP FORTY FORMATS

	Population	Power	Density	Primacy
Primacy	.0910	.1533	-.0949	XXXX
	n=125	n=125	n=125	XXXX
	P=.154	P=.043	P=.144	XXXX
Population	XXXX	-.0986	.0091	.0910
	XXXX	n=125	n=125	n=125
	XXXX	P=.135	P=.459	P=.154
Power	-.0986	XXXX	.0790	.1535
	n=125	XXXX	n=125	n=125
	P=.135	XXXX	P=.189	P=.043
Density	-.0091	-.0790	XXXX	.0949
	n=125	n=125	XXXX	n=125
	P=.459	P=.189	XXXX	P=.144

TABLE 14

CORRELATION COEFFICIENTS FOR ADULT CONTEMPORARY FORMATS

	Population	Power	Density	Primacy
Primacy	.1019	.0988	-.2254	XXXX
	n=83	n=83	n=83	XXXX
	P=.177	P=.184	P=.019	XXXX
Population	XXXX	.0071	.0519	.1019
	XXXX	n=83	n=83	n=83
	XXXX	P=.474	P=.319	P=.177
Power	.0071	XXXX	-.0991	.0988
	n=83	XXXX	n=83	n=83
	P=.474	XXXX	P=.183	P=.184
Density	-.0519	.0991	XXXX	.2254
	n=83	n=83	XXXX	n=83
	P=.319	P=.183	XXXX	P=.019

TABLE 15

CORRELATION COEFFICIENTS FOR MIDDLE-OF-THE-ROAD FORMATS

	Population	Power	Density	Primacy
Primacy	.2434 n=32 P=.083	-.0100 n=32 P=.478	-.0858 n=32 P=.315	XXXX XXXX XXXX
Population	XXXX XXXX XXXX	.1886 n=32 P=.143	-.0730 n=32 P=.341	.2434 n=32 P=.083
Power	.1886 n=32 P=.143	XXXX XXXX XXXX	.1707 n=32 P=.167	-.0100 n=32 P=.478
Density	.0730 n=32 P=.431	-.1707 n=32 P=.167	XXXX XXXX XXXX	.0858 n=32 P=.315

for primacy correlated with power. When primacy was correlated with population, controlling for power, the resultant coefficient was .1079 with a significance value of .115 (125 cases), indicating no significance. Therefore, the significant association is between population and radio transmission power for TF format stations.

Zero order correlations, which test the association between two variables, were computed for the correlation of primacy with density for the AC format. A coefficient of .2254 with a significance value of .019 (83 cases) was obtained, indicating a high degree of association between radio station density and primacy. When the coefficient is computed controlling for power, for density or both, the calculated coefficient is not significant. For example,

when the influence of both power and density is removed, the resultant coefficient is .1161 with a significance value of .148 (81 cases). This indicates a strong association between density and primacy and some degree of relationship between power, density, and primacy.

The zero order correlation coefficients for the MOR format reveal no significant connection between the variables of primacy, radio station density, transmission power and population, even when the effects of power and density are controlled. Since the TF format, which was positively and significantly correlated with transmission power, represents 48 percent of the sample stations, Hypothesis 7 must be rejected. ^x

Among the seven hypotheses, (three were accepted,) three were rejected, and one was not testable. Hypothesis 1, which predicted diffusion downward through the urban hierarchy, was rejected. No hierarchical diffusion was in evidence. Hypothesis 2 predicted that logistic curves would result from plotting the cumulative percent of adopters against time. Logistic curves were found and Hypothesis 2 was accepted. Hypothesis 3, which dealt with the neighborhood effect, was not testable. Dispersal via the neighborhood effect is a departure from hierarchical diffusion. Since downward movement of the songs through the urban system did not occur, it was not possible to differentiate expansion which was anomalous to hierarchical

diffusion. Hypothesis 4 predicted a difference in adoption rate among formats in a descending order from the TF format to AC to MOR. Although the average primacies for the formats did differ as Hypothesis 4 suggested, the differences were too small to be significant. Hypothesis 4 was not accepted. Hypothesis 5 suggested that greater densities of radio stations would occur with increased adoption rates of songs, i.e., lower the primacy ratings of radio stations. Lower primacies were in evidence in regions of greater radio station density. Therefore, Hypothesis 5 was accepted. Hypothesis 6 predicted that a negative relationship would exist between adoption rates and population density. This proved to be the case and Hypothesis 6 was accepted. Hypothesis 7 suggested that adoption rates and station transmission power would be negatively correlated. For virtually half of the sample stations, there was a significant positive correlation between primacy and power. Therefore, Hypothesis 7 was rejected.

Hypotheses 1,2, and 3 address the three regularities of diffusion processes as discussed by Brown and Cox (1971). Only one of the three was observed in the diffusion under study. Hypotheses 4, 5, 6, and 7 deal with rates of adoption and with phenomena which influence them. Radio station density, population, and station transmission power

were found to be significantly associated with adoption rates.

CHAPTER V

SUMMARY AND CONCLUSIONS

The purpose of this study was to ascertain whether the spatial diffusion of songs via radio displays the regularities found in other diffusion research. It was suggested that the diffusion pattern would show instances of neighborhood effect expansion, of movement downward through the urban hierarchy and a logistic curve when the cumulative percentage of adopters was graphed opposite time. It was also hypothesized that radio format, station density, population size and transmission power would affect adoption rates.²⁹

Analogous in the current investigation to Hagerstrand's diffusion elements were defined. Cities were aggregated into categories based on their population size in order to delimit an urban hierarchy. The sociological diffusion literature and materials regarding the sociology of music were examined for the insights they offer into the underlying social influences that affect acceptance rates.

Seven hypotheses were postulated. The first three predicted the presence of the features common to diffusion processes. Hypothesis 1 suggested that the songs would spread down the urban hierarchy. City size was found to increase with primacy, i.e., as urban populations increased,

²⁹See Hypotheses 4-7.

adoption rates slowed. As the primacy maps (Figures 13-21) indicate, the primacies (average number of days from January 1 required to adopt sample songs) of larger cities are greater. In general, the larger the city, the more days it required to adopt songs. Consequently, Hypothesis 1 was rejected. Hypothesis 2 predicted that logistic curves would appear when time was graphed opposite the cumulative percentage of adopters. Such curves were in evidence as revealed in Figures 5-12, for the entire sample and for the individual regions. Hypothesis 2 was accepted.

Testing Hypothesis 3 required the establishment of dispersal of the songs through the urban system from large cities to intermediate ones to small cities, so that neighborhood effect diffusion could be differentiated from it. However, motion via the urban system didn't occur and the neighborhood effect could not be tested.

The last four hypotheses concerned the impact of several factors on the songs' adoption rates. Hypothesis 4 suggested that radio stations' formats influenced adoption time. Mean primacies were computed for each format (Table 11, p. 91) that revealed that format type, in fact, had little influence on primacy ratings. Hypothesis 4 was rejected. Hypotheses 5 and 6 dealt with the relationship between geographically distributed phenomena and adoption rates. Hypothesis 5 predicted that song adoption rates would increase with radio station density. As examination

of Figures 13-21 reveals, regions with greater density of radio stations (stations per 100,000 square miles) generally do have lower primacies (faster adoption rates). (Also see Table 12 on p. 94.) Hypothesis 5 was accepted. Hypothesis 6 prognosticated that greater population density would occur with faster adoption rates. Correlation coefficients were calculated (Tables 13-15, pp. 95-96) which support this prediction. Hypothesis 6 was accepted. Hypothesis 7 suggested a negative relationship between radio station transmission power. Partial correlation coefficients for primacy and power, calculated by format, indicated a positive association between the two variables for approximately half of the sample stations. Hypothesis 7 was rejected.

Of the three regularities only one positively emerged; the logistic curve. The urban system apparently has little impact on the diffusion of songs among radio stations, either channeling them through levels of the hierarchy from large to small cities or in neighborhood effect diffusion. Although the diffusion process of the current study has sociologically explainable elements, it may be seen that space does influence the diffusion of songs via radio stations. Spatial distributions of urban populations and radio stations are both significantly affecting adoption rates. They are in inverse relation to primacy ratings,

i.e., the greater the population and the density of radio stations, the lower the primacy rank.

As was noted earlier, this study differs in a number of ways from previous diffusion investigations. The diffusion process being studied can be distinguished in three major particulars from others examined heretofore. 1) The adoptions under scrutiny occupy a place in a series of acceptances that is very important regarding further dispersal of the songs. 2) Adoptions may be made without long term involvement of time and capital such as is required in a farmer's acceptance of a new silo system. 3) Without the commitment of considerable resources, the adoption of one song doesn't prevent the addition of other songs to the play list.

The research method used is also different from others employed in past investigations. 1) Most diffusion studies have embraced an area much smaller than that of this study. 2) Individual items have constituted the foci of the majority of earlier studies. The current research focuses on 60 separate songs as the diffusion items. 3) A mass medium (Billboard) was the source of information regarding the adoptions of songs. Past research has employed surveys, government documents or business records as data sources.

Any of these differences, either individually or in combination may be influencing the outcome of this research. It seems probable, however, that the dissimilarities in the

diffusion process had a greater effect upon the results of the study than did the differences in the research method. Also, it may be concluded that some factor(s) in addition to those considered in the study are affecting the diffusion of songs via radio.

The findings of this research differ markedly from those of previous studies. Of the three features thought to be universally present in diffusion processes, not all were discovered in the process under investigation. Perhaps the most striking result was that cities over one million in population have rates of diffusion for popular music which are slower than those of smaller cities. The radio industry places great emphasis on the importance of station format. Although format type may indeed be influential in attracting a radio audience, the results of the study show that format does not significantly affect the primacy or song adoption rate. Thus, this diffusion process is different from any previously investigated.

The conclusion of greatest geographic importance is that the diffusion of popular music is closely related to the spatial distribution of population and the density of radio stations. Both factors increased the speed of diffusion of the sample songs studied nationally, although this relationship was not reflected in all regional findings.

Recommendation for Further Research

Possibly, a similar study done on a smaller scale which would allow the collection of data from radio station program directors via interviews would shed additional light on the spatial diffusion process of popular music via radio. Perhaps the project could best be undertaken by a multi-disciplinary team of researchers, including a geographer, an ethnomusicologist, and a sociologist. Spatial expertise, familiarity with social elements underlying the process of diffusion and musicological knowledge would thereby be assured. Also, information regarding the motivational structure of program directors could be collected and examined.

A number of results present themselves for further research. For example, Region 3, the Northeast, has the highest initial percentage of adopters of all the regions; Region 4, the Southwest, has the largest weekly increase (39.7 percent) of cumulative adopters observed in the entire study; Region 5, the Midwest, displays a curve for its data points which has the best fit to a logistic curve of all the regions; the Midwest also has three of only six sites in the nation that received primacies in the slowest range (170-189 days) as shown in the National Primacy Map, Figure 13.

The findings of this study raise a number of more general questions as well. For instance: 1) What effect does the structure of the radio industry have upon the rate

and distance of popular music diffusion? 2) Is neighborhood effect diffusion occurring? 3) Why do the largest cities display the slowest rates of song adoption when other diffusion items are accepted first at those sites? 4) What phenomena other than those considered are affecting program directors in their decision making regarding play lists additions? 5) Why does format type have so little influence on song adoption rates? Further research could be instituted to attempt to answer these and other questions.

Initially, field research could be instituted within one region to determine the presence and the impact of cultural factors. Differential regional diffusion rates may be attributable to cultural differences from one region to another.

A further possible approach would be to focus on an individual song's process of spatial expansion. The scrutiny, in detail, of one song's diffusion might provide insights regarding regional differences.

Popular music is an important and growing sector of the culture of the United States. As such, it is deserving of increased research by scholars from various disciplines. Because many characteristics of popular music are spatial in nature, the increased need for and role of future geographic research is apparent.

APPENDIX

TABLE 16
CITY IDENTIFICATION

Name	Number	Population	City Size Rank	Region
Akron, Oh	1	237,177	3	3
Allentown, PA	2	103,758	3	7
Altoona, PA	3	57,078	2	7
Anderson, SC	4	27,313	1	8
Asheville, NC	6	58,583	2	8
Atlanta, GA	7	425,022	3	8
Augusta, GA	8	47,532	1	8
Austin, TX	9	345,496	3	4
Bakersfield, CA	10	105,611	3	1
Baltimore, MD	11	786,775	4	7
Bangor, ME	12	31,643	1	6
Baton Rouge, LA	14	219,419	3	8
Beckley, WV	15	20,492	1	7
Billings, MT	17	66,798	2	2
Birmingham, AL	18	284,413	3	8
Bismarck, ND	19	44,485	1	5
Boise, ID	20	102,451	3	2
Boston, MA	21	562,994	4	6
Bridgeport, CT	25	142,546	3	6
Buffalo, NY	26	357,870	3	6
Carbondale, IL	27	26,287	1	5
Central Islip, NY	110	36,000	1	6
Charleston, SC	28	69,510	2	8

TABLE 16 (cont'd.)

Name	Number	Population	City Size Rank	Region
Charlotte, NC	29	314,447	3	8
Chatanooga, TN	30	169,565	3	8
Chicago, IL	31	3,005,072	5	5
Cincinnati, OH	32	385,457	3	3
Cleveland, OH	33	573,822	4	3
Columbus, GA	35	169,441	3	8
Columbus, OH	36	564,871	4	3
Corpus Christi, TX	37	231,999	3	4
Cortland, NY	38	20,138	1	6
Dallas, TX	40	904,078	4	4
Denver, CO	41	492,365	3	2
Des Moines, IA	42	191,003	3	5
Detroit, MI	43	1,203,339	5	3
Dover, NH	44	22,377	1	6
Durham, NC	45	100,831	3	8
Edinburg, TX	46	24,075	1	4
El Paso, TX	47	425,259	3	4
Fayetteville, NC	49	59,507	2	8
Frederick, MD	23	28,000	1	7
Fresno, CA	62	235,812	3	2
Fort Lauderdale, FL	52	153,279	3	8
Fort Worth, TX	53	385,164	3	4
Gainesville, FL	56	81,371	2	8
Galveston, TX	58	61,902	2	4

TABLE 16 (cont'd.)

Name	Number	Population	City Size Rank	Region
Green Bay, WI	77	36,000	1	6
Harrisburg, PA	64	53,264	2	7
Hartford, CT	26	136,392	3	6
Houston, TX	69	1,590,138	5	4
Huntsville, AL	70	142,513	3	8
Indianapolis, IN	71	700,807	4	3
Iowa City, IA	72	50,508	2	5
Jackson, MS	73	202,895	3	8
Jacksonville, FL	74	540,920	4	8
Johnson City, TN	75	39,753	1	8
Kansas City, MO	76	448,159	3	5
Knoxville, TN	78	175,030	3	8
Lafayette, LA	79	81,961	2	8
Las Vegas, NV	82	164,674	3	1
Lewiston, ID	83	27,986	1	2
Little Rock, AR	84	158,461	3	8
Los Angeles, CA	85	2,966,850	5	1
Louisville, KY	86	298,451	3	3
Madison, WI	88	170,616	3	5
Manchester, NH	89	90,932	2	6
Memphis, TN	91	646,356	4	8
Meridian, MS	92	46,577	1	8
Miami Beach, FL	94	96,298	2	8
Milwaukee, WI	95	636,212	4	5

TABLE 16 (cont'd.)

Name	Number	Population	City Size Rank	Region
Minneapolis, MN	96	370,951	3	5
Mobile, AL	97	200,452	3	8
Montgomery, AL	98	177,857	3	8
Nashville, TN	57	450,000	3	8
New Haven, CT	61	126,101	3	6
New Orleans, LA	100	557,515	4	8
Newport News, VA	101	144,903	3	7
New York, NY	102	7,071,639	5	6
Norfolk, VA	103	266,979	3	7
Oklahoma City, OK	105	403,213	3	4
Omaha, NE	106	314,255	3	5
Orlando, FL	107	128,291	3	8
Parkersburg, WV	108	39,967	1	7
Pasadena, CA	109	118,550	3	1
Peoria, IL	111	124,160	3	5
Philadelphia, PA	113	1,688,210	5	7
Phoenix, AZ	59	790,000	4	1
Pittsburg, PA	114	423,938	3	8
Portland, ME	13	65,000	2	6
Portland, OR	115	362,383	3	2
Portsmouth, NH	116	26,254	1	6
Poughkeepsie, NY	117	29,757	1	6
Providence, RI	118	156,804	3	6
Pueblo, CO	119	101,686	3	2

TABLE 16 (cont'd.)

Name	Number	Population	City Size Rank	Region
Racine, WI	120	85,725	2	5
Raleigh, NC	121	150,255	3	8
Rapid City, SD	122	48,492	1	5
Reno, NV	123	100,756	3	2
Richmond, VA	124	219,214	3	7
Riverside, CA	125	170,876	3	1
Roanoke, VA	126	100,220	3	7
Rochester, NY	127	241,741	3	6
Rockford, IL	128	139,712	3	5
St. Louis, MO	130	453,085	3	5
St. Paul, MN	131	270,230	3	5
St. Petersburg, FL	112	238,647	3	8
Salt Lake, UT	132	163,033	3	2
San Antonio, TX	133	785,880	4	4
San Bernardino, CA	134	117,490	3	1
San Diego, CA	135	875,538	4	1
San Fransisco CA	136	678,974	4	2
San Jose, CA	137	629,442	4	2
Sarasota, FL	138	48,868	1	8
Savannah, GA	139	141,390	3	8
Seattle, WA	141	493,846	3	2
Shreveport, LA	142	205,820	3	4
Springfield, MA	144	152,319	3	6
Spokane, WA	145	171,300	3	2

TABLE 16 (cont'd.)

Name	Number	Population	City Size Rank	Region
Steven's Point, WI	146	22,970	1	5
Syracuse, NY	147	170,105	3	6
Tacoma, WA	148	158,501	3	2
Tallahassee, FL	149	81,548	2	8
Tampa, FL	150	271,523	3	8
Titusville, FL	34	30,000	1	8
Topeka, KS	152	115,266	3	5
Trenton, NJ	153	92,124	2	7
Gadsden, AL	154	47,565	1	8
Troy, NY	155	56,638	2	6
Tucson, AZ	156	330,537	3	1
Utica, NY	157	75,632	2	6
Washington, DC	158	638,333	4	7
Wheeling, WV	159	43,070	1	7
Wichita, KS	160	279,542	3	5
Wilkes-Barre, PA	161	51,551	2	7
Winston-Salem, NC	162	131,885	3	8
Worcester, MA	164	161,799	3	6
York, PA	165	44,619	1	7

TABLE 17

DIFFUSION ITEMS - 1981

Song	Artist
All Those Years Ago	George Harrison
America	Neil Diamond
A Woman Needs Love	Ray Parker Jr. & Raydio
Being with You	Smokey Robinson
Boy From New York City	Manhattan Transfer
Find Your Way Back	Jefferson Starship
Fire and Ice	Pat Benatar
Fly Away	Blackfoot
Fool in Love With You	Jim Photoglo
Gemini Dream	Moody Blues
Give It To Me Baby	Rick James
How 'Bout Us	Champaign
I Love You	Climax Blues Band
Is It You	Lee Ritenour
Keep on Loving You	Reo Speedwagon
Stop Draggin My Heart Around	Stevie Nicks
Take It on the Run	Reo Speedwagon
Tom Sawyer	Rush
Urgent	Foreigner
Winning	Santana

TABLE 17 (cont'd.)
DIFFUSION ITEMS - 1982

Song	Artist
Abracadabra	The Steve Miller Band
Always on My Mind	Willie Nelson
Caught Up in You	.38 Special
Do You Believe in Love	Huey Lewis and the News
Ebony and Ivory	McCartney and Wonder
Even the Nights are Better	Air Supply
Hard to Say I'm Sorry	Chicago
Heat of the Moment	Asia
Hurts So Much	John Cougar
I Keep Forgettin'	Michael MacDonald
Just Another Day in Paradise	Bertie Higgins
Keep the Fire Burnin'	Reo Speedwagon
Let Me Go	Ray Parker, Jr.
Let's Hang On	Barry Manilow
Man on Your Mind	Little River Band
Sixty-Five Love Affair	Paul Davis
Take Me Down	Alabama
Valley Girl	Frank Zappa
Wasted on the Way	Crosby, Stills, and Nash
We Got the Beat	The GOGOs

TABLE 17 (cont'd.)
DIFFUSION ITEMS - 1983

Song	Artist
Affair of the Heart	Rick Springfield
Always Something There to	
Remind Me	Naked Eyes
Beat It	Michael Jackson
Every Breath You Take	The Police
Faithfully	Journey
Fascination	The Human League
Foolin'	Def Leppard
Human Nature	Michael Jackson
I'll Tumber 4 Ya	Culture Club
It Might Be You	Stephen Bishop
Let's Dance	David Bowie
Little Red Corvette	Prince
Makin' Love Out of	
Nothing at All	Air Supply
Maniac	Michael Sembello
Overkill	Men at Work
Rock 'n' Roll is King	Electric Light Orchestra
Sweet Dreams	Eurythmics
Take Me to Heart	Quarterflash
Tell Her About It	Billy Joel
True	Spandau Ballet

TABLE 18

IDENTIFICATION OF RADIO STATIONS

Radio Station	Code Number	Location	Format	Transmission Power (kilowatts)
CKLW	1	Detroit, MI/ Windsor, Canada	MOR	50
KAFM	2	Dallas, TX	TF	100
KBBK	3	Boise, ID	TF	44
KBEQ	4	Kansas City, MO	TF	50
KBFM	5	Edinburg, TX	TF	100
KCBN	6	Reno, NV	TF	1
KCBN ³⁰	7	Reno, NV	AC	1
KCNR	8	Portland, OR	AAC	100
KCNR	9	Portland, OR	AC	5
KCPX	10	Salt Lake City, UT	TF	5
KDVV	11	Topeka, KS	TF	100
KDWB	12	Minneapolis, MN	AC	5
KDWB	13	Minneapolis, MN	AOR ³¹	100
KDZA	14	Pueblo, CO	TF	1
KEEL	15	Shreveport, LA	AC	50
KEGL	16	Fort Worth, TX	AC	100
KENO	17	Las Vegas, NB	TF	5
KERN	18	Bakersfield, CA	MOR	1

³⁰If a change occurred at a station during the study period, that station was treated as a separate entity and given a different code number.

³¹Album Oriented Rock, one of the formats which comprised only 7% of the sample station formats.

TABLE 18 (cont'd.)

Radio Station	Code Number	Location	Format	Transmission Power (kilowatts)
KEYN	19	Wichita, KS	TF	95
KEZR	20	San Jose, CA	AC	50
KFI	21	Los Angeles, CA	AC	50
KFI	22	Los Angeles, CA	TF	50
KFMB ³²	24	San Diego, CA	AC	5
KFMK	25	Houston, TX	AC	100
KFRC	26	San Fransisco, CA	AC	5
KFRC	27	San Fransisco, CA	FF	5
KRYR	30	Bismarck, ND	AC	5
KGB	31	San Diego, CA	TF	5
KGGI	32	Riverside, CA	TF	49
KGGI	33	Riverside, CA	AC	4
KGW	34	Portland, OR	TF	5
KHFI	35	Austin, TX	TF	1
KIIS	37	Los Angeles, CA	TF	8
KILE	38	Galveston, TX	TF	1
KILT	39	Houston, TX	AC	5
KIMN	40	Denver, CO	TF	5
KINT	41	El Paso, TX	TF	60
KIOA	42	Des Moines, IA	AC	10
KIOY	43	Fresno, CA	TF	50

³²A deletion in the code number sequence indicates a station that was omitted because it had fewer than 5 adoption dates.

TABLE 18 (cont'd.)

Radio Station	Code Number	Location	Format	Transmission Power (kilowatts)
KIQQ	44	Los Angeles, CA	TF	58
KJR	45	Seattle, WA	TF	5
KJRB	46	Spokane, WA	AC	5
KKBQ	47	Houston, TX	TF	5
KKLS	48	Rapid City, SD	TF	5
KKXX	49	Bakersfield, CA	TF	6
KLAZ	50	Little Rock, AR	MOR	100
KLPQ	50	Little Rock, AR	TF	100
KLUC	52	Las Vegas, NV	AC	25
KMGK	54	Des Moines, IA	TF	100
KMJK	55	Portland, OR	TF	100
KNBQ	56	Tacoma, WA	TF	100
KNUS	57	Dallas, TX	AC	98
KOAQ	58	Denver, CO	TF	100
KOFM	59	Oklahoma City, OK	TF	100
KOFM	60	Oklahoma City, OK	AC	100
KOPA	61	Phoenix, AZ	TF	100
KPLZ	62	Seattle, WA	AC	100
KQKQ	277	Omaha, NE	TF	100
KRLA	63	Pasadena, CA	TF	50
KRLC	64	Lewiston, ID	TF	5
KRLC	65	Lewiston, ID	MOR	5
KRLY	66	Houston, TX	TF	20

TABLE 18 (cont'd.)

Radio Station	Code Number	Location	Format	Transmission Power (kilowatts)
KRNA	67	Iowa City, IA	AC	100
KROK	68	Shreveport, LA	TF	100
KRQQ	69	Tucson, AZ	TF	26
KRSP	70	Salt Lake City, UT	MOR	10
KRSP	71	Salt Lake City, UT	O ³³	10
KRSP	72	Salt Lake City, UT	TF	10
KRTH	73	Los Angeles, CA	AC	5
KRTH	74	Los Angeles, CA	MOR	58
KRTH	75	Los Angeles, CA	AC	58
KSFM	78	Sacramento, CA	TF	50
KSLQ	79	St. Louis, MO	TF	100
KSLQ	80	St. Louis, MO	AC	100
KSRR	81	Houston, TX	AC	100
KSTP	82	St. Paul, MN	AC	50
KSTP	83	St. Paul, MN	TF	100
KTAC	84	Tacoma, WA	TF	10
KTAC	85	Tacoma, WA	AC	10
KTKT	86	Tucson, AZ	TF	10
KTSA	87	San Antonio, TX	TF	5
KUBE	88	Seattle, WA	TF	100
KVIL	89	Dallas, TX	TF	1

³³Oldies, another format among the 7% mentioned in footnote 31.

TABLE 18 (cont'd.)

Radio Station	Code Number	Location	Format	Transmission Power (kilowatts)
KVOL	90	Lafayette, LA	TF	5
KWKN	91	Wichita, KS	TF	5
KXOK	93	St. Louis, MO	AC	5
KYST	94	Galveston, TX	TF	5
KYYA	95	Billings, MT	AC	100
KYYX	96	Seattle, WA	TF	81
KYYW	97	Seattle, WA	AC	81
KZFM	98	Corpus Christi, TX	AC	41
KZZP	99	Phoenix, AZ	TF	5
KZZP	100	Phoenix, AZ	AC	5
WAAY	101	Huntsville, AL	TF	50
WABC	102	New York City, NY	TF	50
WACZ	103	Bangor, ME	TF	5
WAEB	104	Allentown, PA	AC	1
WAEV	105	Savannah, GA	AC	100
WAKY	106	Louisville, KY	TF	5
WANS	108	Anderson, SC	O	5
WANS	109	Anderson, SC	AC	100
WANS	110	Anderson, SC	O	5
WAXY	112	Fort Lauderdale, FL	AC	100
WAYS	113	Charlotte, NC	AC	5
WBBF	114	Rochester, NY	AC	1
WBBQ	115	Augusta, GA	O	1

TABLE 18 (cont'd.)

Radio Station	Code Number	Location	Format	Transmission Power (kilowatts)
WBBQ	116	August, GA	AC	100
WBCY	117	Charlotte, NC	AOR	97
WBEN	118	Buffalo, NY	TF	105
WBEN	119	Buffalo, NY	MOR	5
WBGM	120	Tallahassee, FL	TF	100
WBJW	121	Orlando, FL	TF	100
WBLI	122	Central Islip, NY	O	10
WBLI	123	Central Islip, NY	EL ³⁴	10
WBSB	125	Bangor, ME	TF	1
WBYQ	126	Nashville, TN	AC	2
WBZZ	127	Pittsburgh, PA	AC	41
WCAO	128	Baltimore, MD	AC	5
WCAU	129	Philadelphia, PA	TF	13
WCCO	131	Minneapolis, MN	AC	100
WCGO	132	Columbus, GA	TF	100
WCIL	133	Carbondale, IL	MOR	1
WCIR	135	Beckley, WV	TF	25
WCKS	136	Titusville, FL	TF	100
WCSC	137	Charleston, SC	MOR	5
WDCG	139	Durham, NC	TF	99
WDRQ	140	Detroit, MI	TF	20

³⁴Easy Listening, one of the formats rarely encountered in the sample stations. See footnote 31.

TABLE 18 (cont'd.)

Radio Station	Code Number	Location	Format	Transmission Power (kilowatts)
WERC	141	Birmingham, AL	TF	5
WEZB	142	New Orleans, LA	EL	21
WFBG	143	Altoona, PA	AC	5
WFBR	144	Baltimore, MD	AC	5
WFEA	145	Manchester, NH	O	5
WFFM	146	Pittsburg, PA	AC	60
WFIL	147	Philadelphia, PA	MOR	5
WFLB	148	Fayetteville, NC	AC	1
WFLY	149	Troy, NY	TF	13
WFMF	150	Baton Rouge, LA	TF	100
WFTQ	151	Worcester, MA	AC	5
WGCL	152	Cleveland, OH	TF	40
WGH	153	Newport News, VA	TF	5
WGUY	154	Bangor, ME	AC	1
WGUY	155	Bangor, ME	TF	1
WGUY	156	Bangor, ME	TF	3
WHB	157	Kansas City, MO	AC	5
WHBQ	158	Memphis, TN	AC	5
WHEB	159	Portsmouth, NH	MOR	1
WHFM	160	Rochester, NY	TF	50
WHHY	161	Montgomery, AL	TF	5
WHHY	162	Montgomery, AL	MOR	5
WHHY	163	Montgomery, AL	AOR	100

TABLE 18 (cont'd.)

Radio Station	Code Number	Location	Format	Transmission Power (kilowatts)
WHYI	164	Fort Lauderdale, FL	TF	100
WHYN	165	Springfield, MA	AC	5
WHYT	166	Detroit, MI	TF	50
WHYW	167	Pittsburg, PA	AC	1
WICC	168	Bridgeport, CT	MOR	1
WIFI	169	Philadelphia, PA	TF	50
WIGY	170	Portland, ME	TF	50
WIKS	171	Indianapolis, IN	AC	50
WINZ	172	Miami, Beach, FL	AOR	100
WISE	173	Asheville, NC	AC	5
WISM	174	Madison, WI	MOR	20
WISM	175	Madison, WI	AC	5
WIVY	176	Jacksonville, FL	TF	60
WJDQ	178	Meridian, MS	AC	5
WJDX	179	Jackson, MS	AC	5
WKAU	180	Green Bay, WI	AC	1
WKBO	181	Harrisburg, PA	AC	1
WKBW	182	Buffalo, NY	TF	50
WKCI	183	New Haven, CT	AC	10
WKDD	184	Akron, OH	TF	50
WKFM	185	Syracuse, NY	TF	50
WKIX	186	Raliegh, NC	AC	10
WKJJ	187	Louisville, KY	EL	20

TABLE 18 (cont'd.)

Radio Station	Code Number	Location	Format	Transmission Power (kilowatts)
WKJJ	188	Louisville, KY	MOR	20
WKRQ	189	Mobile, AL	TF	100
WKRQ	190	Cincinnati, OH	TF	23
WKRZ	191	Wilkes-Barre, PA	O	1
WKTU	192	Milwaukee, WI	TF	16
WKTU	193	New York City, NY	AC	4
WKWK	194	Wheeling, WV	AC	1
WKWK	195	Wheeling, WV	TF	50
WKXX	196	Birmingham, AL	TF	5
WKXY	197	Sarasota, FL	AC	1
WKZW	198	Peoria, IL	TF	41
WLBZ	124	Bangor, ME	TF	5
WLCY	199	St. Petersburg	MOR	5
WLOL	200	Minneapolis, MN	MOR	100
WLOL	201	Minneapolis, MN	AC	100
WLS	202	Chicago, IL	TF	50
WLS	203	Chicago, IL	TF	6
WMAK	204	Nashville, TN	MOR	2
WMC	205	Memphis, TN	AC	300
WNAP	206	Indianapolis, IN	TF	13
WNBC	207	New York City, NY	AC	50
WNCI	208	Columbus, OH	AC	175
WNOX	209	Knoxville, TN	TF	10

TABLE 18 (cont'd.)

Radio Station	Code Number	Location	Format	Transmission Power (kilowatts)
WNVZ	210	Norfolk, VA	TF	50
WOKI	211	Knoxville, TN	MOR	1
WOKI	212	Knoxville, TN	AC	100
WOKW	213	Cortland, NY	MOR	14
WOKY	214	Milwaukee, WI	AC	5
WOLF	215	Syracuse, NY	TF	1
WOMP	216	Wheeling, WV	TF	14
WOW	218	Omaha, NE	MOR	5
WPGC	219	Washington, D.C.	MOR	50
WPGC	220	Washington, D.C.	AC	10
WPHD	221	Buffalo, NY	TF	49
WPJB	222	Providence, RI	TF	50
WPRO	223	Providence, RI	TF	50
WPRO	224	Providence, RI	AC	5
WPST	225	Trenton, NJ	TF	50
WQEN	226	Gadsden, AL	MOR	97
WQRK	227	Norfolk, VA	TF	50
WQRK	228	Norfolk, VA	AC	50
WQUE	229	New Orleans, LA	MOR	93
WQUT	230	Johnson City, TN	AOR	100
WQUT	231	Johnson City, TN	AC	100
WQXA	232	York, PA	TF	46
WQXA	233	York, PA	MOR	46
WQXI	234	Atlanta, GA	TF	70

TABLE 18 (cont'd.)

Radio Station	Code Number	Location	Format	Transmission Power (kilowatts)
WRBQ	235	Tampa, FL	TF	100
WRCK	236	Utica, NY	TF	50
WRJZ	237	Knoxville, TN	TF	5
WRKO	238	Boston, MA	AC	50
WRKR	239	Racine, WI	TF	50
WROR	240	Boston, MA	AC	6
WROX	241	Washington, D.C.	TF	36
WROX	242	Washington, D.C.	TF	5
WRVQ	243	Richmond, VA	TF	200
WSEZ	244	Winston-Salem, NC	EL	34
WSGA	245	Savannah, GA	TF	1
WSGF	246	Savannah, GA	TF	100
WSGN	247	Birmingham, AL	AC	5
WSKZ	248	Chattanooga, TN	MOR	100
WSKZ	249	Chattanooga, TN	TF	100
WSPK	250	Poughkeepsie, NY	AOR	50
WSPT	251	Steven's Point, WI	AC	50
WTIC	252	Hartford, CT	MOR	50
WTIX	253	New Orleans, LA	TF	10
WTMA	154	Charleston, SC	AC	5
WTRY	255	Troy, NY	TF	5
WTSN	256	Dover, NH	AC	5
WVBF	257	Boston, MA	MOR	50

TABLE 18 (cont'd.)

Radio Station	Code Number	Location	Format	Transmission Power (kilowatts)
WWKX	258	Nashville, TN	TF	100
WWSW	259	Pittsburg, PA	MOR	5
WXGT	260	Columbus, OH	TF	50
WXIL	261	Parkersburg, WV	MOR	to
WXKS	262	Boston, MA	O	5
WXXKX	263	Pittsburg, PA	AC	50
WXLK	264	Roanoke, VA	EL	93
WXLO	265	New York City, NY	AOR	5
WYCR	266	York, PA	TF	11
WYKS	267	Gainesville, FL	TF	3
WYRE	268	Baltimore, MD	MOR	250
WYYS	269	Cincinnati, OH	MOR	27
WZEE	270	Madison, WI	TF	6
WZGC	271	Atlanta, GA	AC	100
WZOK	272	Rockford, IL	AC	100
WZUU	273	Milwaukee, WI	TF	34
WZYQ	275	Frederick, MD	TF	230
WZZP	276	Cleveland, OH	TF	50

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