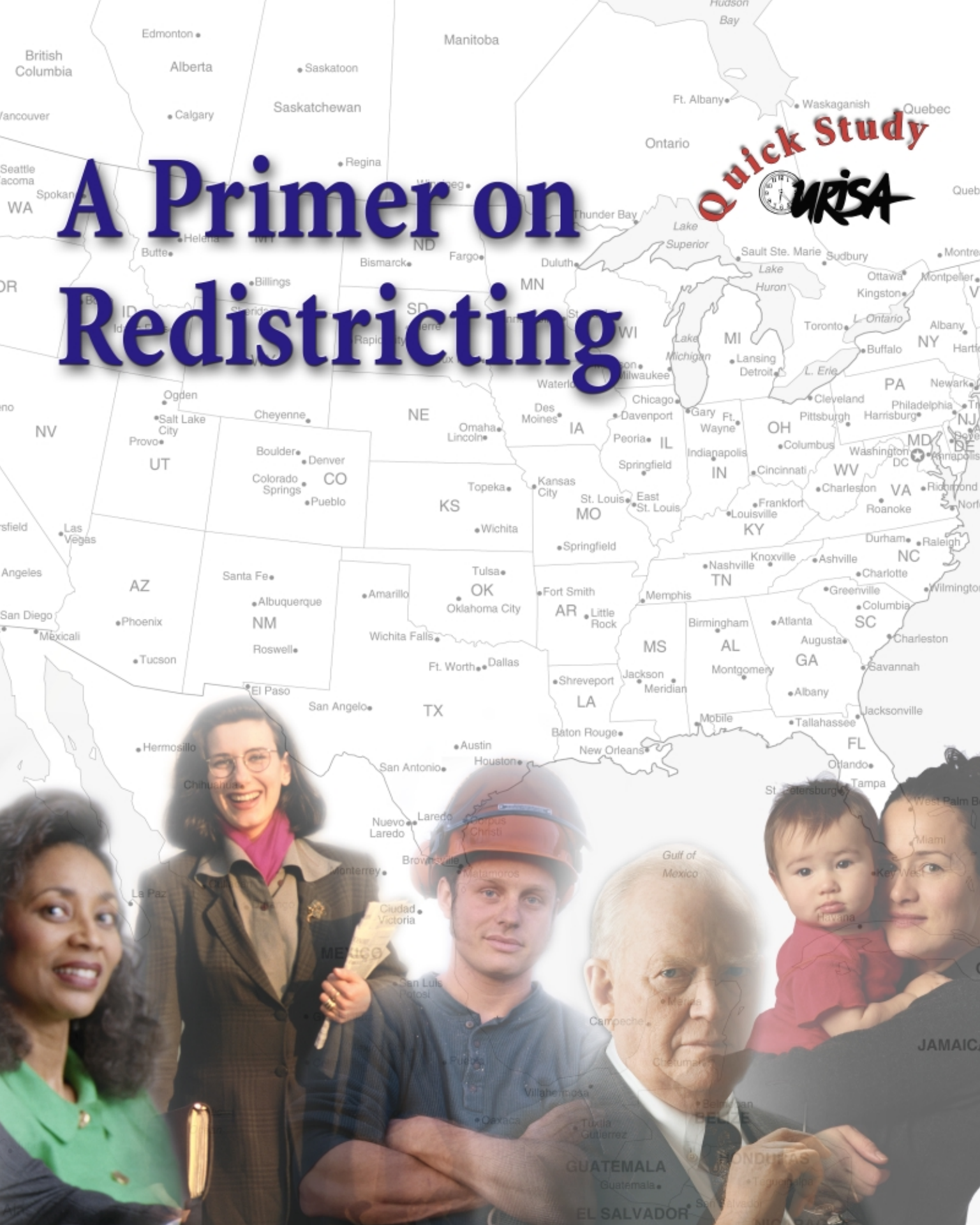
A Primer on Redistricting

Quick Study

URISA



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INTRODUCTION

Now that the population and race totals for the 2000 census have been released, state legislatures, cities, counties, public interest groups, political consultants, and others have begun drawing new congressional and state legislative boundaries, city wards, county commission districts, and other redistricting plans.

While the widespread use of personal computer-based redistricting software will make the drawing of plans easier from a technical perspective, changes to the data and the political and legal landscape are conspiring to make the redistricting process more difficult and contentious than ever before.

This *Primer on Redistricting* includes information you and your organization need to create effective redistricting plans. To set the stage, the primer begins with some background on congressional apportionment and redistricting. This is followed by a discussion of the data that will be used – Census TIGER 2000 geography, P.L. 94-171 population and race data, political data, and communities of interest data. The section on redistricting law covers important legal issues you need to understand to design a plan that could be defended successfully in a court of law.

The primer then launches into a discussion of redistricting software, including key terms and concepts, important considerations before drawing your first plan, managing plans and plan libraries, security, setting up a plan, redistricting tools, creating districts, verifying the plan, and creating reports. The primer includes thoughts on publishing plans on the Internet and sharing the plan with other organizations.

CHAPTER 1:

THE DECENNIAL CENSUS, CONGRESSIONAL APPORTIONMENT, AND REDISTRICTING

Every 10 years, the Census Bureau counts the number of people living in the United States. The resulting numbers lead to the reapportionment of legislative bodies and redistricting at all levels of government. Reapportionment refers to the reassigning of the number of seats in a legislative body (e.g., the U.S. Congress) to established geographic units (e.g., the states). Redistricting refers to redrawing the boundaries of the districts within the established geographic units. Reapportionment is done using a mathematical formula and is basically non-partisan. Redistricting plans are designed with all kinds of objectives in mind and can be very partisan.

The primary reason for the establishment of the decennial census of population is set forth in Article 1, Section 2, of the U.S. Constitution. The Constitution provides for an enumeration of the population to serve as the basis for the apportionment of the members of the U.S. House of Representatives among the states, with the provision that each state must have at least one representative. An apportionment has been made on the basis of each census from 1790 to 1990, except following the census of 1920.

The calculation of a Congressional apportionment requires three factors:

- the apportionment population of each state,
- the number of representatives to be allocated among the states, and
- a method to use for the calculation.

The apportionment population base always has included those persons who have established a residence in the United States. The Census Act of 1790 established the concept of "usual residence," which has been applied in that census and in each subsequent census. Usual residence is defined as the place where the person lives and sleeps most of the time (most of the week, month, or year).

In Census 2000, as in the censuses of 1970 and 1990, certain segments of the overseas population (U.S. Armed Forces personnel, civilian U.S. federal employees, and dependents of both groups) that were allocated to their home states were included in the populations of those states for apportionment purposes only. These segments of the overseas population were not distributed to the political subdivisions of the states and were not included in other 1970 or 1990 census data products.

The Constitution provides that each state will have a minimum of one member in the House of Representatives, and the current size of the House (435 seats) has not changed since the apportionment following the 1910 census. Thus, the apportionment calculation for Census 2000 will divide 385 seats among the 50 states. Congress decides the method used to calculate the apportionment.

The method for calculating the apportionment has changed over time. The methods used through most of this century have been based upon the use of a mathematically-determined priority listing of states. Adopted by Congress in 1941 and used through the 1990 census, the "**method of equal proportions"** also results in a listing of the states according to a priority value, calculated by dividing the population of each state by the geometric mean of its current and next seats, that assigns seats 51 through 435. This is the method used in Census 2000, according to provisions of Title 2, U.S. Code.

Title 13, U.S. Code, requires that the apportionment population counts be delivered to the President within 9 months of the census date. In Census 2000 and in most of the censuses done in the 20th century, the census date has been April 1, meaning that the Office of the President received the counts by December 31 of each census year.

According to Title 2, U.S. Code, within 1 week of the opening of the next session of the Congress, the President must report to the Clerk of the House of Representatives the apportionment population counts for each state and the number of Representatives to which each state is entitled. Within 15 days, the Clerk of the House must inform each state governor of the number of representatives to which each state is entitled.

The legislatures in each state are responsible for geographically defining the boundaries of their congressional and other election districts. Table 1 in the Appendix contains the congressional apportionment by state resulting from the 2000 census. Table 2 lists the number of congressional seats and the change from 1990.

CHAPTER 2:

REDISTRICTING DATA

In order to create redistricting plans using geographic information system (GIS) software, the official geographic boundary files and population and race data from the 2000 census are needed. The boundary files are extracts from the Census Bureau's TIGER files. TIGER does not include any statistical data. The population and race data, referred to as P.L. 94-171 after the public law that requires it, is also a census data product. While the geography in the TIGER files has improved since 1990 (precincts and state legislative districts for most states are included), the new P.L. 94-171 data structure is considerably more complex. In 1990, there were five race categories; for 2000, there are 63 race combinations.

TIGER 2000

TIGER is the name for the system and digital database developed at the Census Bureau to support its mapping needs for the Decennial Census and other Bureau programs. The TIGER/Line files, which are extracts of selected geographic and cartographic information from the TIGER database, are available to be public. The TIGER/Line files are a digital database of geographic features, such as roads, railroads, rivers, lakes, political boundaries, and census statistical boundaries, that cover the entire United States. The database contains information about these features such as their location in latitude and longitude, the name, the type of feature, address ranges for most streets, the geographic relationship to other features, and other related information. The TIGER/Line product does not include the census data. To use TIGER/Line, *a redistricter must have mapping or GIS software* that can import TIGER/Line data.

The Redistricting Census 2000 TIGER/Line files, which were released in January 2001, are specifically intended to support the needs of the redistricting community. One or more of the TIGER/Line files can be downloaded from the Census Bureau's web site *www.census.gov*. Each state folder contains a Counts file and individual county files. The county files are stored in a compressed Zip format. Because of the timing of this release, it does not include the ZIP Code Tabulation Areas (ZCTAs) or the updated address ranges based on the final Census 2000 information. The address ranges are comparable to those in the 1999 TIGER/Line files. The Redistricting Census 2000 TIGER/Line files cover all counties, parishes, boroughs, census geographic areas, and equivalent entities for each state, the District of Columbia, and Puerto Rico. They do not include files for American Samoa, Guam, the Northern Mariana Islands, the Minor Outlying Areas (Midway), or the U.S. Virgin

Islands. The Census 2000 TIGER/Line files, scheduled for release in the second quarter of 2001, will include files for these areas, as well as the ZCTA information and the updated Census 2000 address ranges.

What's New in TIGER 2000

If you have used earlier versions of TIGER/Line, there are a number of changes to be aware of in the 2000 TIGER/Line files.

Field Name Changes

Starting with the 1999 release, the Census Bureau updated field names in the TIGER/Line files to make them consistent with the field names that will be part of the geographic header used in all Census 2000 data files including the Summary Files.

Address Ranges and ZIP Codes

In the 1999 and subsequent TIGER/Line files, no single-address address ranges will appear, including out-of-parity and out-of-sequence addresses. That is, when there is a single address that is "out of place" geographically (e.g., across the street from all other odd addresses or four blocks away from all other 3000-series addresses), the Census Bureau will exclude that single address from *any* address range. These addresses are withheld to protect the confidentiality of individual addresses collected through census field operations as specified by Title 13, U.S. Code. Beginning with the 1999 TIGER/Line files, multiple ZIP+4 codes can be associated with a single-address range.

New Census Feature Class Code

A new Census Feature Class Code (CFCC) type may appear on some street features in the 1999 and subsequent TIGER/Line files. Some street features that normally would be classified with an "A" CFCC may be coded with a "P" instead of the "A" in the TIGER/Line files. These are provisional features that were added to the Census TIGER data base in preparation for Census 2000, but were not field verified by census staff during field operations or through the use of aerial photography or imagery. As these features are verified in future operations, the provisional flag will be removed for subsequent TIGER/Line releases. Features that still have the provisional flag at the time that the Census Bureau assigns the Census 2000 tabulation block numbers will not be held as Census 2000 tabulation block boundaries.

Diacritical Marks in the TIGER/Line Files

The Census Bureau no longer uses codes to represent the diacritical marks. Beginning with the 1999 TIGER/Line files, the Census Bureau is using the ISO 8859-1 character set, commonly referred to as Latin-1, to identify characters with diacritical marks.

Vintage of the TIGER/Line Files

The vintage of each version of the TIGER/Line files is reflected in the name of the TIGER/Line file and not in the version code. The year noted in the version of the TIGER/Line files normally represents the vintage of the boundaries in the file in those fields identified as "current," while the version code reflects the database extraction date for the TIGER/Line files. The 1999 TIGER/Line files are an exception because of the delay in their production. The "current" governmental unit boundaries in the 1999 TIGER/Line files generally represent the January 1, 2000 governmental unit boundaries as reported in the 2000 Boundary and Annexation Survey. These boundaries are subject to correction before the release of the 2000 TIGER/Line files in 2001.

P.L. 94-171 and the Census 2000 Redistricting Data Program

Following the "one-person, one-vote" court decision in the 1960s, state legislatures found that the small geographic census areas (such as census blocks) did not always coincide with voting district lines. This frustrated their efforts to merge local voting behavior data with small-area census counts to create legislative districts with balanced populations.

In 1972, the Census Bureau, the National Legislative Conference, the U.S. Congress, and state officials

began to design a 1980 census program to meet this critical need. Public Law 94-171, which amended the Census Law (Title 13, U.S. Code), was enacted by Congress in 1975. The purpose of this law is to provide state legislatures with small-area census population totals for legislative redistricting.

Public Law 94-171 requires that:

- The Census Bureau informs state governors and legislative leaders at least 4 years before each census of the technical guidelines they must follow to obtain population totals for their locally defined voting districts (e.g., election precincts). The Census Bureau will also make public announcements of this program in the Federal Register.
- States wishing to participate in this nonpartisan, voluntary program submit to the Census Bureau specific boundaries for their voting districts, following technical criteria established by the Bureau, under the provisions of P.L. 94-171.
- The Census Bureau provides small-area population totals to the legislature and governor of each state in a nonpartisan manner by 1 year after the census (e.g., April 1, 2001).

State participation is voluntary. If a state wishes to take part in the Redistricting Data Program, its legislative leaders jointly designate one or more technical liaisons to serve as the project coordinators and to work with the Census Bureau.

Phase 1: Block Boundary Suggestion Project
In April 1995, the Census Director invited state officials to join Phase 1 of the Census 2000 Redistricting Data Program. In Phase 1, the states made suggestions regarding features on census maps that they wished the Census Bureau to maintain in establishing boundaries for the "census blocks" for which the Bureau would provide population totals.

Most of the 46 states that participated in this voluntary program suggested features such as streams, ridge lines, and overhead power lines that corresponded as closely as possible with the current or projected boundaries of their election precincts, wards, and polling areas, which the Census Bureau refers to generically as "voting districts."

In the Block Boundary Suggestion Project (BBSP), states submitted suggested features on census maps or in electronic files from 1995 to 1998. In the BBSP Verification Phase (1997 to 1998), the Census Bureau returned completed maps and/or electronic files to states so they could verify that their suggested features had been accurately recorded and learn why some features were not technically acceptable for census operations.

Phase 2: Voting District Project
In the Voting District Project, the Census Bureau returned to the states (on a flow basis, from December 1998 through June 1999) census maps and electronic files showing all features (e.g., roads, rivers, and ridge lines) to be used in creating census blocks for tabulating population totals for redistricting.

States were given several months to define their election precincts (voting districts) in a GIS program or to outline them using the features shown on paper maps and return the files or maps to the Bureau for incorporation into the geographic databases that were eventually used to take the census.

On a flow basis, from September 1999 through January 2000, the Census Bureau returned revised maps or computer files showing the election precincts delineated by the state, for officials to verify that the precinct (voting district) boundaries, names, and codes had been accurately added by the census staff. Each state had several weeks to complete its review and notify the Bureau of any discrepancies.

Phase 3: Delivering the Data
Under the provisions of P.L. 94-171, the Census Bureau is required to provide each governor and the majority and minority leaders of each state legislature with Census 2000 population totals for counties,

American Indian areas, cities, towns, county subdivisions, census tracts, block groups, and blocks. States that participated in Phase 2 of the Redistricting Data Program received data summaries for local voting districts (e.g., election precincts) that meet the Bureau's technical criteria. The Census 2000 P.L. 94-171 Redistricting data included population totals by race, Hispanic origin, and voting age. These data were released by April 1, 2001.

The P.L. 94-171 data are accompanied by census maps showing blocks, census tracts, counties, towns, cities (as of their January 1, 2000 corporate limits), county subdivisions, and voting districts for participating states. States that also defined their current legislative districts receive data for these areas as well.

Race Categories

The 1990 P.L. 94-171 data included five race categories: White; Black; American Indian, Eskimo, or Aleut; Asian or Pacific Islander; or other race. The data were further broken down by voting age and Hispanic origin.

The 2000 P.L. 94-171 data included six race categories: White alone; Black or African American alone; American Indian and Alaska Native alone; Asian alone; Native Hawaiian and Other Pacific Islander alone; or some other race alone.

For Census 2000, respondents were permitted to check one or more races on the form, resulting in 63 possible race categories (six single-race categories and all combinations). Since the data are again reported for the total population, voting age population, and Hispanic origin, the new P.L. 94-171 data contain 504 fields.

Many of the multiple-category cells will have zeros in them. It is up to the governmental unit to determine which fields are important and which are not.

Unadjusted and Adjusted Data

As if 504 data fields are not enough, many states and local governments will be dealing with 1008 fields. This is because the Census Bureau is releasing two sets of P.L. 94-171 data, the unadjusted and the adjusted counts.

The Census Bureau estimated that, in 1990, 8.4 million people were missed (undercounted) and 4.4 million others were double-counted. This was the first census deemed less accurate than its predecessor. A National Academy of Sciences panel of experts was convened to study the problem. Their recommendation was that the Census Bureau should use statistical sampling and adjustments to correct the undercount.

The Census Bureau's decision to make the adjusted data the official counts for redistricting unleashed a torrent of controversy that culminated in a Supreme Court decision in *Department of Commerce v. United States House of Representatives, 525 U.S. 316 (1999)*. The Supreme Court ruled that the adjusted data could not be used to apportion seats among the states for representation in the House of Representatives. The ruling does not apply to redistricting.

Reference for this section:

Persily, N., L. Handley, and B. Grofman, 2000, *The Real Y2K Problem: Census 2000 Data and Redistricting Technology.* (New York: Brennan Center for Justice).

Census 2000 Data Products

In addition to the P.L. 94-171 data, the Census Bureau publishes a number of data products designed to meet a variety of data needs for different segments of the data user community. Table 3 in the Appendix lists the Census 2000 data products and the dates they are anticipated. These products provide a summary of the general tabulation and publication program for the 50 states, the District of Columbia, and Puerto Rico (which is treated as a state equivalent for each data product). The majority of these data products will not be available in time for redistricting.

Political Data

Political data include voter registration by political party and election results. Typically, these data are reported at the precinct level. Incorporation of the P.L. 94-171 data in a redistricting plan is straightforward,

since the data can be linked to each TIGER record by the Federal Information Processing Standard code for all levels of geography in a plan. By contrast, the use of political data is more problematic. Precinct boundaries may or may not coincide precisely with the voting district level of geography. While voting district boundaries must follow physical features, precincts can cut through backyards, so that persons living on both sides of the street can vote at the same polling place. In addition, precinct boundaries are being constantly updated as people move in and out of neighborhoods. Precinct boundaries, particularly those more than a few years old, may not exist in digital form.

Fortunately, GIS and other database tools can be used to adjust precinct data so that it is in a form suitable for use in a redistricting plan. Using a GIS, you can disaggregate precinct data down to the block layer. If the blocks nest within the precincts, the disaggregation can be accomplished using the ratio of people living in the block to those living in the precinct. If a block is split by a precinct boundary, a polygon overlay calculation can be used so that a GIS can allocate the data proportionally to the area of the block pieces. Once disaggregated, the data can be aggregated to higher levels of geography, such as the new voting districts and counties. Since precinct boundaries are fluid, political data from one year may not be directly comparable to political data from another year without these types of operations.

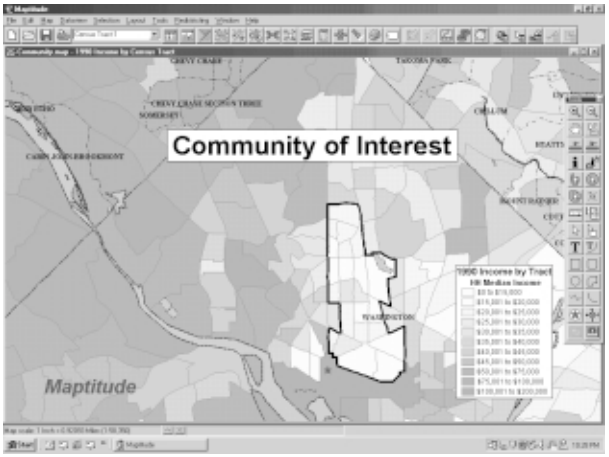

Figure 1: Example of a Community of Interest Based on Income Level

Communities of Interest Data

A community of interest is a geographic area in which its residents have shared interests. A community of interest could be a town, a neighborhood, a school district, or any compact and contiguous area where the population is of the same race, language group, country of origin, or income group. However, a community of interest cannot necessarily be based on race alone. The U.S. Supreme Court rejected a congressional district in Georgia that combined the relatively well off Black neighborhoods in Atlanta with an area of poor Blacks living 260 miles away. To use a community of interest in a redistricting plan, a geographic layer defining its boundary needs to be created (Figure 1).

CHAPTER 3:

REDISTRICTING LAW

Introduction to Federal Voting Rights Laws

The Voting Rights Act, adopted initially in 1965 and extended in 1970, 1975, and 1982, codifies and effectuates the 15th Amendment's permanent guarantee that, throughout the nation, no person shall be denied the right to vote on account of race or color. Sections 5 and 2 in the act relate specifically to redistricting.

The most basic tenet of redistricting law is the "one person, one vote" standard. As a result, districts need to be drawn taking into account population equality. This is often referred to as "no malapportionment." The requirement for strict equality is much more stringent for congressional districts than for state and local election districts. Congressional districts are usually drawn with near zero deviation, while state legislative districts and local districts may deviate by up to 10 percent.

The ideal district population for single-member districts is defined as the total population divided by the number of districts. For multi-member districts, the ideal population for each member is the total population divided by the number of members.

There are a number of ways to measure how much a district or the entire plan varies from the ideal. For these definitions, assume the following:

$\boldsymbol{N}$ = Number of districts

$\boldsymbol{i}$ = District ID; e.g., $\boldsymbol{Pop}_i$ is the population for district $\boldsymbol{i}$

$\boldsymbol{Pop}_{max}$ = Population in the district with the largest population

$\boldsymbol{Pop}_{min}$ = Population in the district with the smallest population

$\boldsymbol{Pop}_{ideal}$ = Ideal population in the district (total population/$\boldsymbol{N}$)

$$RelativeDeviation_i = Deviation_i / Pop_{ideal}$$

$$PopulationRange = Pop_{min} \text{ to } Pop_{max}$$

$$RatioRange = (Pop_{max} - Pop_{min}) / Pop_{min}$$

$$AbsoluteRange = Pop_{min} - Pop_{ideal} \text{ to } Pop_{max} - Pop_{ideal}$$

$$AbsoluteOverallRange = Pop_{max} - Pop_{min}$$

(also know as the total Population Deviation or the Overall Range)

$$RelativeRange = (Pop_{min} - Pop_{ideal}) / Pop_{ideal} \text{ to } (Pop_{max} - Pop_{ideal}) / Pop_{ideal}$$

$$RelativeOverallRange = (Pop_{max} - Pop_{min}) / Pop_{ideal}$$

$$AbsoluteMeanDeviation = \sum_{i=1}^{N} Abs(Deviation_i) / N$$

$$RelativeMeanDeviation = \sum_{i=1}^{N} Abs(RelativeDeviation_i) / N$$

$$StdDeviation = \sum_{i=1}^{N} \sqrt{(Pop_i - Pop_{ideal})^2} / N$$

While it is not necessary to achieve perfect population equality in a congressional plan, getting as close to parity as possible meets the constitutional requirement of "one person, one vote." For the 1990 congressional plans, the relative overall range for all states was less than 1%.

How much variance is permissible? According to Hebert et al.:

So long as a state consistently applies a legislative policy without discrimination, the following policies may justify some variance:

- making districts compact,
- respecting municipal boundaries,
- respecting county boundaries if the counties are small enough to represent communities of interest,
- respecting precinct boundaries,
- preserving the cores of prior districts, and
- avoiding contests between incumbents.

To defend successfully against a population inequality charge, the State must justify its plan by specifically relating each overpopulated or underpopulated district to one of those legitimate state policies. In deciding whether a State has succeeded in justifying the deviation, courts weigh several different factors:

- the size of the deviation,
- the importance of the state's interests,
- the consistency with which the plan reflects those interests overall, and
- the possibility that alternative plans can protect those interests while still maintaining population equality.

If the State cannot provide a legitimate justification and specifically relate that justification to each overpopulated or underpopulated district, then the apportionment plan probably will be found unconstitutional.

In 1973, the U.S. Supreme Court held certain legislative multi-member districts in Bexar County, Texas, unconstitutional under the 14th Amendment, on the ground that they systematically diluted the voting strength of minority citizens. This decision strongly shaped litigation through the 1970s against at-large systems and gerrymandered redistricting plans. In 1980, however, the Supreme Court required that any constitutional claim of minority vote dilution must include proof of a racially discriminatory purpose, a requirement that was widely seen as making such claims far more difficult to prove.

Political gerrymandering is legal. A political party can draw lines that maximize its candidates' chances as long as race is not an issue. It is also perfectly acceptable to design districts to protect incumbents.

Section 5 of the Voting Rights Act

Section 5 of the Voting Rights Act freezes changes in election practices or procedures in certain states until the new procedures have been "precleared," either after administrative review by the U.S. Attorney General or after a lawsuit before the U.S. District Court for the District of Columbia. This means that voting changes in covered jurisdictions may not be used until Section 5 preclearance has been obtained. Section 5 applies to all or parts of the following states: Alabama, Alaska, Arizona, California, Florida, Georgia, Louisiana, Michigan, Mississippi, New Hampshire, New York, North Carolina, South Carolina, South Dakota, Texas, and Virginia.

Under Section 5, a covered state, county, or local government entity must demonstrate to federal authorities that the voting change in question: (1) does not have a racially discriminatory purpose; and (2) will not make minority voters worse off than they were prior to the change (i.e., the change will not be "retrogressive"). Section 5 preclearance will be denied if the proposed change has not been shown to be free of the purpose and the effect of discriminating on the basis of race or membership in a language minority group.

Almost all voting changes are submitted to the Attorney General, and over the past decade the Attorney General has received submissions of between 14,000 and 22,000 voting changes per year. The Attorney General may deny Section 5 preclearance no later than 60 days after a voting change has been submitted. Most voting changes submitted to the Attorney General are precleared. Since Section 5 was enacted, the Attorney General has objected to approximately 1% of the voting changes that have been submitted. Section 5 preclearance will be denied if the proposed change has not been shown to be free of the purpose and the effect of discriminating on the basis of race or membership in a language minority group. Section 5 remains in effect through 2007.

Section 2 of the Voting Rights Act

Section 2 of the Voting Rights Act, as amended, 42 U.S.C. 1973, is a nationwide prohibition against voting practices and procedures, including redistricting plans and at-large election systems, poll worker hiring, and voter registration procedures, that discriminate on the basis of race, color, or membership in a language minority group. Section 2 prohibits not only election-related practices and procedures that are intended to be racially discriminatory, but also those that are shown to have a racially discriminatory impact. The U.S. Department of Justice, as well as affected private citizens, may bring lawsuits under Section 2 to obtain court-ordered remedies for violations of Section 2.

Section 2 makes it illegal for state and local governments to "dilute" the votes of racial minority groups. The election system should not make minority voters' votes less effective than those of other voters. One of many forms of minority vote dilution is the drawing of district lines that divide minority communities and keep them from putting enough votes together to elect representatives of their choice to public office. This is termed "fracturing." Depending on the circumstances, dilution can also result from at-large voting for governmental bodies. To show vote dilution in these situations, there must be a geographically concentrated minority population and voting that is polarized by race. In such instances, there is a pattern in which minority voters and white voters tend to vote differently as groups. It must also be shown that white voters, by voting as a block against minority-choice candidates, usually beat those candidates even if minority voters are unified or cohesive at the polls. This situation is termed "racial block voting."

The opposite of fracturing, "packing," is defined as concentrating a minority group into one or more districts so that that the group represents a large majority in these districts. One result is that there are fewer other districts with a sizable minority population.

Over 30 years ago, the U.S. Supreme Court held that jurisdictions are free to draw majority-minority election districts that follow traditional, non-racial districting considerations, such as geographic compactness and keeping communities of interest together. Later Supreme Court decisions have held that drawing majority-minority districts may be required to ensure compliance with the Voting Rights Act.

While it remains legally permissible for jurisdictions to consider race when drawing election districts, the Supreme Court has held that the Constitution requires a strong justification if racial considerations predominate over traditional districting principles. One such justification may be the need to remedy a violation of Section 2 of the Voting Rights Act. While such a remedy may include election district boundaries that compromise traditional districting principles, such districts must be drawn where the Section 2 violation occurs and must not compromise traditional principles more than is necessary to remedy the violation. Figure 2 shows an example of a majority/minority district in North Carolina that the Supreme Court found to be unconstitutional.

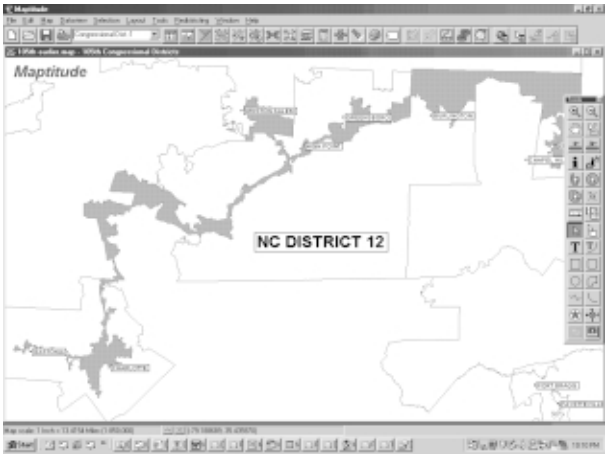

Figure 2: This Majority/Minority District in North Carolina was Found Unconstitutional by the Supreme Court

The voting protections of the 15th Amendment and Section 2 of the Voting Rights Act are permanent.

Redistricting law is complex. Deciding which principles to follow will vary from state to state and by local jurisdictions within a state. However, it is important to be consistent when applying these principles. While this cannot guarantee that litigation will be avoided, it can help when defending a plan in court.

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Redistricting Law 2000, 1999, National Conference of State Legislatures, Denver.

Wattson, P. S., 1999, *How to Draw Redistricting Plans That Will Stand Up in Court.* (National Conference of State Legislatures, Redistricting Task Force).

CHAPTER 4:

REDISTRICTING SOFTWARE

Ten years ago, most redistricting at the state level was done using expensive UNIX-based computers and software. If computers were used for local redistricting, the software ran under the MS-DOS operating system and was limited in functionality. Today, nearly all redistricting plans will be drawn on desktop or laptop personal computers running some variant of the Windows operating system. Because prices for these systems are low and the systems are easy to learn and use, even individuals have the means to create redistricting plans.

Using GIS software, it is possible to combine the geographic and cartographic data of TIGER/Line with the P.L. 94-171 population and race data, political data, and communities of interest data into a cohesive spatial-relational database system. Linking TIGER with the data results in a powerful database model suitable for building, analyzing, and reporting redistricting plans. Maps can be created that contain political boundaries, incumbent locations, highways, streets, natural features, and other geographic layers. Thematic mapping and charting let you visualize demographic, political, and other data, while layouts let you create presentations for meetings and reports.

GIS software runs well on any Pentium III or equivalent computer that might be purchased today. Depending on the size of the state and the format of the data, hard drive requirements may vary from a few hundred megabytes to several gigabytes. The most important hardware consideration is the size and resolution of the monitor. Windows 98/Me and Windows 2000 allow the use of multiple monitors so that the map can be displayed on one monitor and the data in another.

Key Terms and Concepts

Before describing the functionality of redistricting software, a number of terms and concepts are defined.

Geographic Layers and the Base Layer

One or more census geographic layers are used when building districts. The choice of layers depends on the type of plan and the laws of the state or the jurisdiction. The base layer is the most detailed geographic layer of the plan. Since most congressional plans strive for near total equality of population in each district, these plans are built using census blocks as the base layer. The other building blocks are typically voting districts and counties. Some states use block groups and tracts instead of (or in addition to) voting districts. Other states, particularly those in New

England as well as New York, New Jersey, and Minnesota, use Minor Civil Divisions (MCDs-county subdivisions). City boundaries and "communities of interest," such as cohesive neighborhoods or areas where an ethnic or racial group is congregated, might also be used.

State legislative districts (house and senate) do not have the strict population equality standards of congressional districts, and their populations can vary within a 10% range. For these plans, it may be possible to use voting districts, block groups, tracts, or MCDs as the base layer. Local redistricting plans are usually drawn using blocks as the base layer.

Layer Hierarchies
Using a hierarchical data structure to store and manipulate plans results in a significant increase in software performance. A layer hierarchy is a set of geographic layers where the geographic units in the hierarchy are aggregations of the polygons in the base layer.

The following are all valid hierarchies:

- blocks-block groups-tracts-counties
- blocks-voting districts-counties
- blocks-MCDS-counties
- blocks-voting districts-MCDs-counties (if the voting districts nest within MCDs)

The map can also include layers not in the hierarchy, such as places, cities, neighborhoods, and school districts.

Control Field
The control field is the field that you want to balance among districts. In political redistricting, this field is population. As features are added to a district, the software updates the control field for that district and any other district affected by the plan change.

Ideal Value
As discussed earlier, political redistricting plans strive for equal population in each district. The ideal value is arrived at by dividing the total population by the number of districts to be created (or by the number of members if there are multi-member districts). Redistricting plans created for other purposes might not require balancing of population. For example, school districts would be created based on the capacity of the schools.

Summary Fields
Additional fields can be identified to summarize along with the control field. In political redistricting, these summary fields are typically related to race, ethnicity, election results, or political affiliation.

Incumbent Database
The incumbent database is a point geographic layer that contains the location, current district, and party affiliation of the current elected officials. By displaying the incumbents' residences on the map, the line drawer can build districts that either preserve the incumbent's district or result in districts with multiple incumbents, depending on the intent. It is also possible to design an incumbent report that can contain the incumbents' current and previous districts and party affiliations, and the number of incumbents in each district.

Plan Template
A plan template is a plan file with all of the settings for the plan (e.g., the base map, control field, ideal value, and summary fields) but with no district assignments. A plan template lets you create a new plan very quickly, since the only information you need to enter is the name of the plan.

How Redistricting Software Works

Before creating your first plan, several things should already have been thought about:

- convention used in naming the plan,
- directory structure to store plans,
- where the plans will be stored (e.g., local hard drive or file server),
- types of plans and their settings, including any summary fields, base map layers and settings,

- who will edit or view plans,
- whether the plans will be public or private, and
- how the plans will be backed up.

This section is written in general terms, and the concepts apply to all redistricting software. All screen images are taken from Caliper Corporation's Maptitude for Redistricting software.

Managing Plans

An essential feature of redistricting software is the plan manager. This can take the form of a dialog box that manages plans on your computer or across a computer network. The plan manager should make it easy to create new plans, organize plans in libraries, copy plans, and delete plans. Several levels of security should be provided, including preventing others from viewing or editing the plans and plan libraries.

Any number of plan types may be created (e.g., congressional, house, senate, school district, county commission, city ward, and water districts), and saved as plan templates. A plan template contains all of the setup information for a plan, but none of the district assignments. A new plan can be created using a map and all new settings, by choosing the appropriate plan template or by copying an existing plan.

The Use of Security

Redistricting software should support user name and password security at both the plan library and the plan levels. The library administrator can assign user names and passwords for all users who have permission to access the plan library and one or more plans within the library. The permission can be limited to viewing a plan or can permit editing of the plan. The network administrator can also use the network tools to restrict access to certain folders for additional security.

Managing Plan Libraries

The plan manager should let you create plan libraries to store related plans. You might organize plans into libraries by purpose (e.g., congressional, state house, state senate, county commission, city ward, water district, or school district), by geography (e.g., for each county if you are creating county plans for multiple counties, or for each state if you are creating plans for multiple states), by person creating the plan, by accessibility (e.g., public plans and private plans), or by a combination of these. A different library can be created on your computer or on the network for each category.

Since a number of plans will likely be created, think carefully about how they will be named and where they will be stored, including the library, folder, computer, and file server. All plans may be stored in the same library in the same folder. However, if different people are creating plans within the same library, a different folder may be required for each user. For easier identification, the plan should have a descriptive name and provide a descriptive background. The plan manager should allow plan libraries and existing plans to be copied to other libraries. If you have created a plan library on another computer, it can be added to the list of libraries.

A plan library can be secured so that only the user and a selected group of users have access to it. Users who do not have access to a plan library will not see its name in the list of libraries.

Creating a New Plan

A new plan should be able to be created from a base map, a plan template, or an existing plan. When starting with a base map, all layers in the geographic hierarchy you intend to use should be included. It is best to set the style, autoscaling (the range of scales at which the layer is displayed) and labeling for each layer, so that these values do not need to be reset every time a new plan is created. Aggregate layers (e.g., counties) should be drawn with a wider boundary than disaggregate layers (e.g., blocks). A pleasing appearance can be obtained by drawing the blocks first and the counties last. If the streets are drawn in gray before the blocks are drawn in black, the block boundaries

will be seen clearly in addition to any streets that are not block boundaries.

Once you a plan is created, it should be saved as a template. The next time a plan of that type is created, the template serves as a model with all the appropriate settings. When using an existing plan as a starting point (perhaps you want to start with the existing districts and modify them for the new plan), a new plan can be created by copying an existing one.

Setting the Plan Parameters

When creating a new plan from a base map, designate the control field, the number of districts, and the ideal value. Next, identify the summary fields and their appropriate denominators for percent calculation. Included may be the race categories that are relevant for the locations, Hispanic origin, and political data. Also included may be the same fields for both unadjusted and adjusted data. Additional fields can be identified to summarize along with the control field. In political redistricting, these "summary fields" are typically related to race, ethnicity, election results, or political affiliation.

As part of the plan settings, you might want to enter plan properties that provide background information about the plan. A plan type (e.g., congressional, upper chamber, or lower chamber), an administrator (the person who created and controls the plan), and comments can be designated. The "Date Created" and "Date Last Modified" text boxes are filled in automatically by the program.

Other Plan Settings

Three other plan settings are layer hierarchies, incumbent database, and allowable deviation. "Layer hierarchies" were discussed earlier. The redistricting software should choose an appropriate hierarchy based on the layers in the map. However, if there is any ambiguity (e.g., the map has both tracts and voting districts or other layers that do not nest), be sure that the software is using the hierarchy you intend.

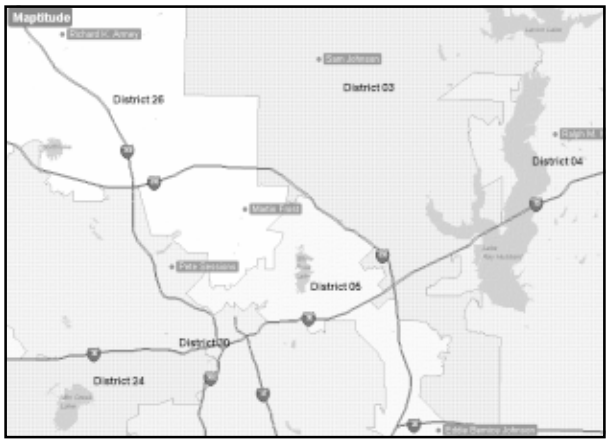


Figure 3: Example of a Map Showing Locations of Incumbents within their Districts

The Incumbent report is one of the standard reports in redistricting. It lists the incumbents, their current district, their political party, and their district under the new plan. In order to create this report, you must supply the redistricting software with the name of the point geographic file containing these data. Incumbent information is also used in the District Statistics report. When working on a redistricting plan, it is often desirable to see the incumbent locations. To display them, add this geographic file as a layer in your map. Figure 3 shows an example of the locations of incumbents within their districts.

Political redistricting plans strive to balance the control field (usually population). To set the "allowable deviation" from the ideal value, the number is entered as a percent. The software should take into account the number of seats when computing the deviation for multi-member districts. The software should use this value only as input to the Error Check report. It does not have any impact on plan building.

Changing the Backup Plan Settings

It is possible to set the number of plan backups. Once the limit is reached, the existing backup files will be replaced by newer ones, based on the order in which they were created. A backup can be created

automatically when the plan is closed or after a specified number of changes.

Once a new plan has been established, the computer screen might look like the following (Figure 4):

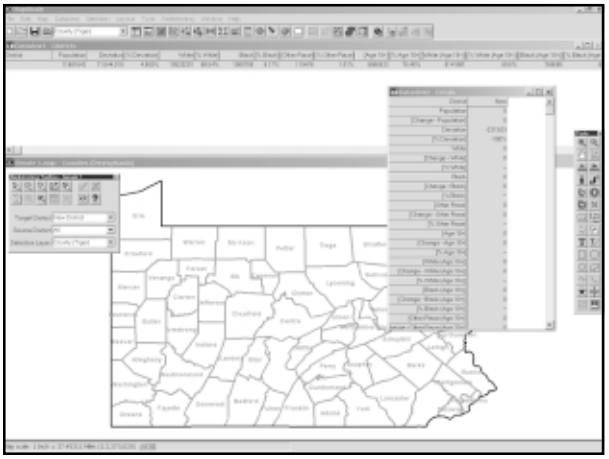


Figure 4.

The map is resized to occupy a large portion of the screen. At the top of the screen is the Districts dataview containing information about the control field and summary fields for each district. Since no districts have been created yet, the dataview has only one row that lists the values for the unassigned features. The Details dataview on the right of the screen displays the changes to the control and summary fields as areas are selected to add to a district. All summary fields and percents are shown for the target district and any districts affected by the selection. Information about the tools in the Redistricting toolbox is detailed in the next section.

Developing the Plan

Now that you have set up a plan, you are ready to start developing the plan.

Target District, Source District, and Selection Layer

Before selecting map features to add to a district, the Target District, Source District, and Selection Layer need to be identified. The Target District is the district to which the map features will be added. A map feature that you add to the Target District is either currently unassigned or has previously been assigned to another district. One way to be sure that you do not unwittingly select map features that are already assigned is by restricting the source of the map features, by setting the Source District to Unassigned.

Each district created is made up of one or more map features from the layers in the plan hierarchy. All layers in the hierarchy are aggregates of the base layer. If you select a feature from a layer that is not in the hierarchy, features that are in one of the layers in the hierarchy are selected.

You should always work at the highest level of aggregation. For example, if you want to add all of the census blocks in a county to the same district, it is faster to select the county than to try to select all of the census blocks in the county. To do this, you would choose County for the Selection Layer. If you add all blocks in a county to the same district, the redistricting software should substitute the county data for the individual block data.

Selecting Map Features with the Selection Tools

Using the selection tools, map features can be selected to add to the target district directly from the map. Map features are selected by pointing at them, by dragging a rectangle or a circle around them, by entering a radius, or by drawing a shape around them. They are also selected by specifying a condition based on attribute values. Following each selection, the redistricting software selects the map features and highlights the result on the map.

Features can be selected in any geographic layer, such as census blocks, voting districts, towns, or school districts. As you add areas to a district, both the district boundaries and data table are updated to reflect changes in the current plan. Once you have built a district, it can be locked so that it cannot be changed.

Displaying Districts Using a Color Theme

The redistricting software should distinguish the districts by using a boundary line and/or a color theme. It should let you display attributes for any layer using labels or color, pattern, dot-density, scaled-symbol, or chart themes.

Grouping Geographic Units

In addition to locking districts, any arbitrary geographic area should be able to be locked. Once locked, you can specify that the area not be reassigned to another district or, if a portion of the area is reassigned, then the entire area is reassigned. For example, you might wish to keep a city, a neighborhood, or some other community of interest together.

Verifying a Plan

Before assuming that a plan is finished, some verification checks should be performed (Figures 5—7):

- Are there any areas that have not been assigned to a district?
- Are any districts noncontiguous?
- Is the plan geography sound?
- Are the totals correct?

Reports

At any stage during the redistricting process, reports can be created and printed. There are a number of standard reports used in redistricting including Population Summary, Error Check, Incumbents, Political Subdivision Splits, Plan Components, District Statistics, Measures of Compactness, Contiguity, and Plan Comparison. It should also be possible to add your own reports using Crystal Reports or other programs such as Microsoft Access and Excel.

Population Summary Report

The Population Summary report is the most common redistricting report (Figure 8). It lists the population, the deviation from the target value, and the percent deviation from the target value for each district. The

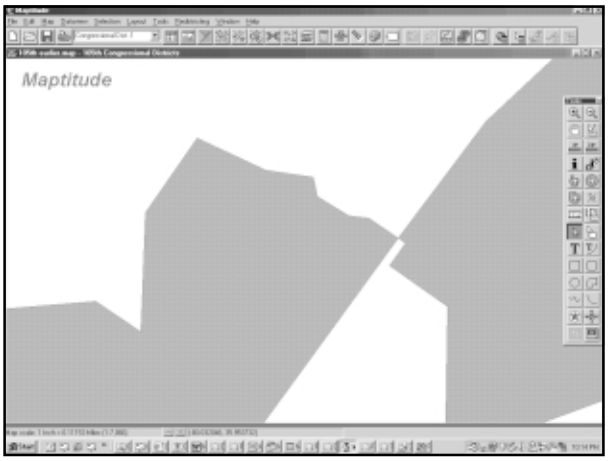


Figure 5: An Example of Point Contiguity

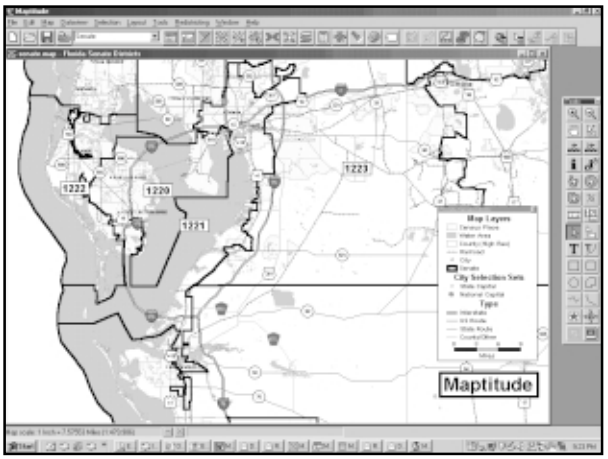
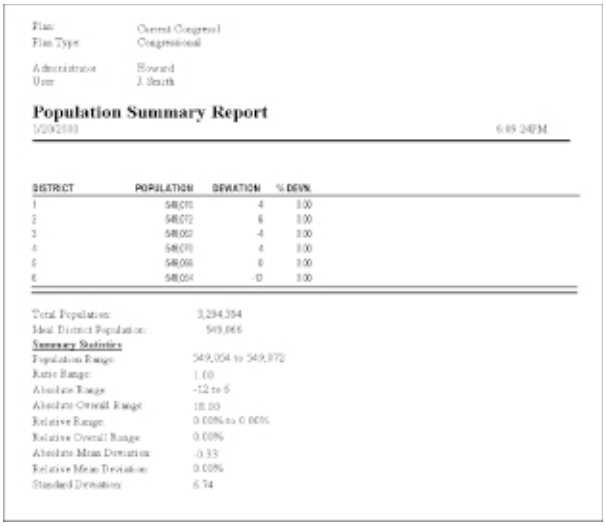


Figure 6: District 1220 is Contiguous across Water

Figure 7: A Noncontiguous District



Plan: Current Congress1
Plan Type: Congressional

Administrator: Howard
User: J. Smith

Population Summary Report

1/20/2003 6:05:24PM

DISTRICT	POPULATION	DEVIATION	% DEVN.
1	549,070	4	0.00
2	549,072	6	0.00
3	549,063	-4	0.00
4	549,070	4	0.00
5	549,066	0	0.00
6	549,064	-2	0.00

Total Population: 3,294,354
Ideal District Population: 549,066

Summary Statistics

Population Range: 549,054 to 549,072
Ratio Range: 1.00
Absolute Range: -12 to 6
Absolute Overall Range: 18.00
Relative Range: 0.00% to 0.00%
Relative Overall Range: 0.00%
Absolute Mean Deviation: -0.33
Relative Mean Deviation: 0.00%
Standard Deviation: 6.74

Figure 8: Sample Population Summary Report

report also lists the total population, ideal population, population range, ratio range, absolute range, absolute overall range, relative range, relative overall range, absolute mean deviation, relative mean deviation, and standard deviation.

Error Check Report

The Error Check report lists the population and percent deviation from the target value for each district, and indicates the districts with a population deviation outside the allowable limit. The report also lists the number of districts and their total population, and lists the unassigned units.

Incumbents Report

The Incumbents report lists the incumbents, their previous districts, their political parties, and the districts where they are located in the new plan.

Contiguity Report

The Contiguity report lists the number of distinct polygons for each district. For contiguity, there should be only one polygon for each district.

Political Subdivision Splits Report

The Political Subdivision Splits report lists all political subdivisions in the plan hierarchy that are split by districts, and the list of districts that the political

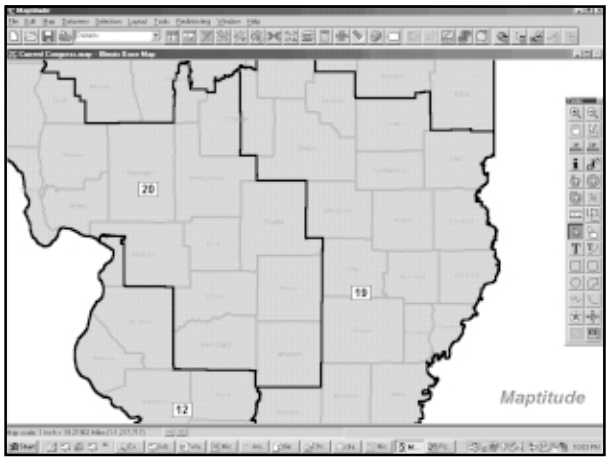


Figure 9: Congressional Districts in Illinois that follow County Boundaries

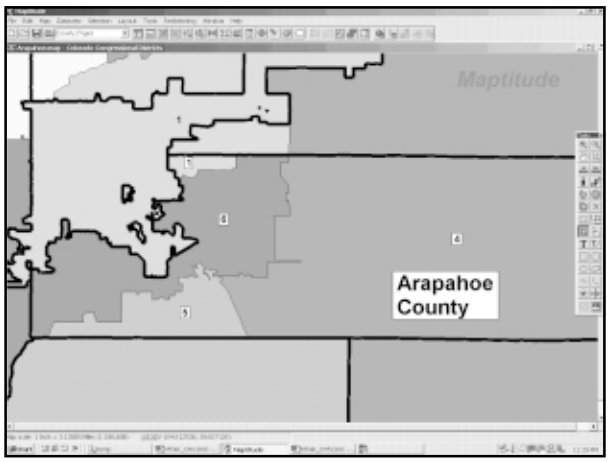


Figure 10: Example of a County in Colorado Split into Four Congressional Districts

subdivisions are in (Figures 9 and 10). A number of states have statutes that prohibit legislative boundaries from crossing county boundaries. However, the courts may find against such a plan if it violates the "one person, one vote" standard.

Plan Components Report

The Plan Components report lists the underlying geographic features that make up each district. You have the option of including just the base layer features or the base layer features plus aggregate layer features when an entire aggregate layer feature is part of a district.

District Statistics Report

The District Statistics report provides detailed information about each district, including ideal population, actual population, absolute deviation, relative deviation, total and voting age population broken down by selected summary fields, counties in the district, and incumbents in the district.

Measures of Compactness

The redistricting software should compute a variety of measures of compactness: Roeck, Schwartzberg, Perimeter, Polsby-Popper, Population Polygon, and Population Circle.

Roeck Test

The Roeck test is an area-based measure that compares each district to a circle, which is considered the most compact shape possible. For each district, the test computes the ratio of the area of the district to the area of the minimum enclosing circle for the district. The measure is always between zero and 1, with 1 being the most compact. The Roeck test computes one number for each district and the minimum, maximum, mean and standard deviation for the plan. See Roeck (1961) and Young (1988).

Schwartzberg Test

The Schwartzberg test is a perimeter-based measure that compares a simplified version of each district to a circle, which is considered to be the most compact shape possible. This test requires the base layer that was used to create the districts. The base layer is used to simplify the district to exclude complicated coastlines.

For each district, the test computes the ratio of the perimeter of the simplified version of the district to the perimeter of a circle with the same area as the original district. The district is simplified by only keeping those shape points where three or more areas in the base layer come together. Water features and a neighboring state also count as base layer areas. This measure is usually greater than or equal to 1, with 1 being the most compact. Unfortunately, the simplification procedure can result in a polygon that is substantially smaller that the original district, which can yield a ratio less than 1 (e.g., an island has a 0 ratio). The Schwartzberg test computes one number for each district and the minimum, maximum, mean, and standard deviation for the plan. See Schwartzberg (1966) and Young (1988).

Perimeter Test

The Perimeter test computes the sum of the perimeters of all the districts. The test computes one number for the whole plan. When comparing several plans, the plan with the smallest total perimeter is the most compact. See Young (1988).

Polsby-Popper Test

The Polsby-Popper test computes the ratio of the district area to the area of a circle with the same perimeter: $4p\text{Area}/(\text{Perimeter}^2)$. The measure is always between 0 and 1, with 1 being the most compact. The Polsby-Popper test computes one number for each district and the minimum, maximum, mean and standard deviation for the plan. See Cox (1929), Polsby and Popper (1991), and Niemi et al. (1990).

Population Polygon Test

The Population Polygon test computes the ratio of the district population to the approximate population of the convex hull of the district (minimum convex polygon which completely contains the district). The population of the convex hull is approximated by overlaying it with a base layer, such as census blocks. The measure is always between 0 and 1, with 1 being the most compact. The test computes one number for each district and the minimum, maximum, mean and standard deviation for the plan. See Hofeller and Grofman (1990) and Niemi et al. (1990).

Population Circle Test

The Population Circle test computes the ratio of the district population to the approximate population of the minimum enclosing circle of the district. The population of the circle is approximated by overlaying it with a base layer, such as census blocks. The measure is always between 0 and 1, with 1 being the most

compact. The test computes one number for each district and the minimum, maximum, mean and standard deviation for the plan. See Hofeller and Grofman (1990) and Niemi et al. (1990).

The following references provide detailed discussion on these measures:

Cox, E. P. A., 1927, Method of Assigning Numerical and Percentage Values to the Degree of Roundness of Sand Grains. *Journal of Paleontology*, 1, 179-183.

Hofeller, T., and B. Grofman, 1990, Comparing the Compactness of California Congressional Districts under Three Different Plans: 1980, 1982 and 1984. In B. Grofmann (Ed.), *Toward Fair and Effective Representation*. (New York, Agathon), 281-288.

Niemi, R. G., B. Grofman, C. Carlucci, and T. Hofeller, 1990, Measuring Compactness and the Role of a Compactness Standard in a Test for Partisan and Racial Gerrymandering. *Journal of Politics*, 52(4), 1155-1181.

Polsby, D. D., and R. D. Popper, 1991, The Third Criterion: Compactness as a Procedural Safeguard against Partisan Gerrymandering. *Yale Law and Policy Review*, 9, 301-353.

Roeck, E. C., Jr., 1961, Measuring the Compactness as a Requirement of Legislative Apportionment. *Midwest Journal of Political Science*, 5, 70-74.

Schwartzberg, J. E., 1966, Reapportionment, Gerrymanders, and the Notion of Compactness. *Minnesota Law Review*, 50, 443-452.

Young, H. P., 1988, Measuring the Compactness of Legislative Districts. *Legislative Studies Quarterly*, 13(1), 105-115.

Plan Comparison Report

The Plan Comparison report lists the base layer polygons that are assigned to different districts in two reports.

Layouts

When your plan is ready for others to review, you will want to print the map showing the districts and a table of data that lists the control and summary fields. Your layout might look like the following (Figure 11):

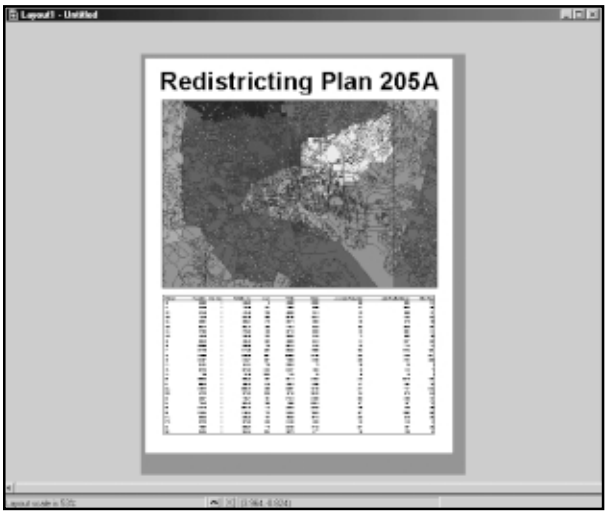


Figure 11. Example of a Plan, with a Map and Table of Data

CHAPTER 5:

PUBLISHING YOUR PLANS ON THE INTERNET

If your redistricting software allows you save your plans (maps, data tables, charts, layouts, and reports) as JPEG, PNG, or HTML files, you can publish the plans as static images on your web site. A better solution is to publish your plans as interactive mapping applications on the Web using software such as Caliper Corporation's Maptitude for the Web. For example, a user can locate their address on the map, pan and zoom, query the district assignments, and display tables of data and reports from their browser (Figures 12 and 13).

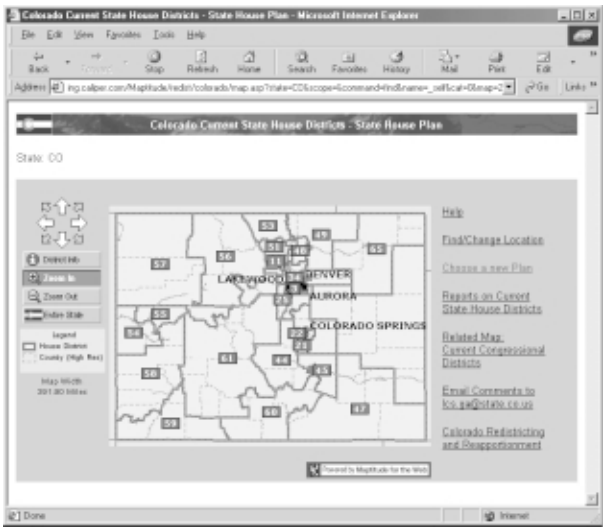


Figure 12.

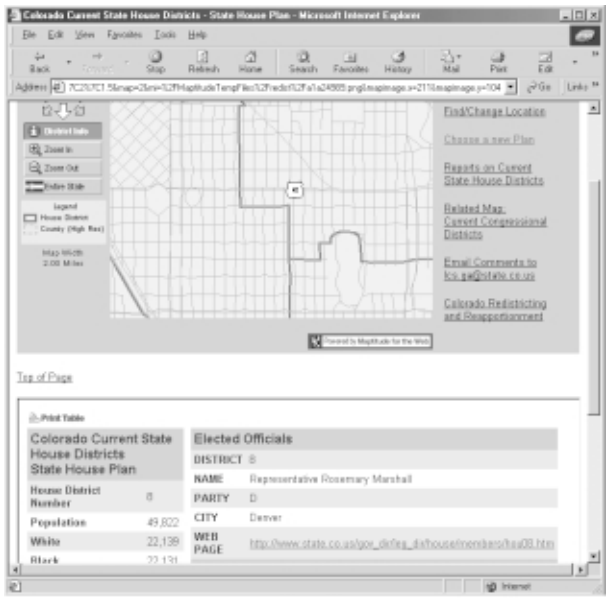


Figure 13.

CHAPTER 6:

SHARING PLANS

Introduction

There are a number of ways for sharing plans. If you store plans on a network, other users who have network and program permission can open your plans for viewing or editing. The redistricting software should let you save the plan as a Zip archive so that it can be put on a floppy disk and can be copied to a stand-alone computer. Plans can also be shared with those outside your organization who might be using different redistricting software. This is commonly done through an equivalency file.

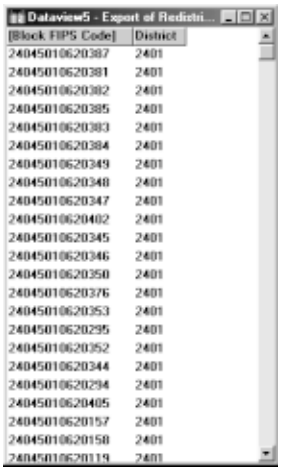


Figure 14.
An Equivalency File

An equivalency file usually contains two columns (Figure 14): (1) the field that identifies the map feature in the export layer (e.g., the block Federal Information Processing Standard (FIPS) code), and (2) the field that contains the district assignment.

Exporting a Plan

A redistricting plan can be exported at any stage of development. The map features can be from the base layer or any layer that aggregates to features in the base layer. In most cases, the plan's base layer is census blocks and that is the lowest level of geography. However, if you build a plan based on voting districts or tracts, an equivalency file could be created based on these layers or on blocks, since blocks aggregate to both voting districts and tracts.

The most common equivalency file is the single-layer equivalency file (described above), where the single layer is usually blocks. It is typically used to transfer the plan to other redistricting software or for reporting to the Department of Justice.

Importing a Plan

If you are given a plan equivalency file, the plan's assignments should be able to be imported when creating a new plan and can import partial plans. All that is needed is an equivalency file that contains the district identification for each map feature in the base layer.

Merging Plans

Sub-plans are often created for different geographic areas and then merged into a master plan. For this discussion, the merge plan is the plan being merged into the master plan. The merge plan must be a plan file based on the same geographic hierarchy as the master plan.

It is always good to make a backup of the master plan before merging a sub-plan into it.

CHAPTER 7:

CONCLUSIONS

The stage is set for one of the most exciting and, possibly, the most contentious redistricting cycles ever. Easy access to the geographic and attribute data, combined with easy-to-use and affordable software, means that the mystique of redistricting is no longer cloaked behind locked doors in smoke-filled rooms. With so many organizations and individuals able to draw informed and accurate plans, one can only wonder how all of these plans will be taken into account by the authority charged with developing the final plan.

Will all of this ease of use and accessibility lead to better plans, or will the end result be years of extended litigation with various interest groups jockeying to get parts or all of their plan enacted? Only time will tell. One thing is certain: 10 years from now, the hardware will be faster, the software will be better, and even more organizations and individuals will be participants in this fascinating aspect of our democracy.

ABOUT THE AUTHOR

Howard Simkowitz is Director of Government Services at Caliper Corporation and heads up Caliper's redistricting activities. Prior to this, Dr. Simkowitz was in charge of geographic information system development for the Office of Planning at the Federal Highway Administration. Other positions he has held include consultant to the Environment Directorate of the Organization for Economic Cooperation and Development in Paris, chief of downtown planning for the District of Columbia Department of Transportation, and operations research analyst at the Volpe Transportation Systems Center in Cambridge. He is a former member of the Mapping Science Committee of the National Academy of Sciences. Dr. Simkowitz received a Ph.D. in operations research from the University of Pennsylvania. Caliper Corporation provides software and technical services in geographic information systems, redistricting, transportation/ logistics, marketing research, and statistics and econometrics and is the developer of Maptitude, Maptitude for Redistricting, TransCAD, TransCAD AutoDistrict, and GISPlus software.

APPENDIX

Table 1. Congressional Apportionment—2000 Census Results

Resident Population of the 50 States, the District of Columbia, and Puerto Rico: April 1, 2000 (Census 2000) and April 1, 1990 (1990 Census)

Area	April 1, 2000	April 1, 1990	Numeric Change	Percent Change	State Rank Based on Numeric Change	State Rank Based on Percent Change
Alabama	4,447,100	4,040,587	406,513	10.1	25	25
Alaska	626,932	550,043	76,889	14.0	43	17
Arizona	5,130,632	3,665,228	1,465,404	40.0	5	2
Arkansas	2,673,400	2,350,725	322,675	13.7	29	19
California	33,871,648	29,760,021	4,111,627	13.8	1	18
Colorado	4,301,261	3,294,394	1,006,867	30.6	8	3
Connecticut	3,405,565	3,287,116	118,449	3.6	39	47
Delaware	783,600	666,168	117,432	17.6	40	13
District of Columbia	572,059	606,900	-34,841	-5.7	(NA)	(NA)
Florida	15,982,378	12,937,926	3,044,452	23.5	3	7
Georgia	8,186,453	6,478,216	1,708,237	26.4	4	6
Hawaii	1,211,537	1,108,229	103,308	9.3	41	31
Idaho	1,293,953	1,006,749	287,204	28.5	32	5
Illinois	12,419,293	11,430,602	988,691	8.6	9	34
Indiana	6,080,485	5,544,159	536,326	9.7	18	27
Iowa	2,926,324	2,776,755	149,569	5.4	36	43
Kansas	2,688,418	2,477,574	210,844	8.5	35	35
Kentucky	4,041,769	3,685,296	356,473	9.7	27	28
Louisiana	4,468,976	4,219,973	249,003	5.9	34	40
Maine	1,274,923	1,227,928	46,995	3.8	45	46
Maryland	5,296,486	4,781,468	515,018	10.8	20	23
Massachusetts	6,349,097	6,016,425	332,672	5.5	28	41
Michigan	9,938,444	9,295,297	643,147	6.9	15	39
Minnesota	4,919,479	4,375,099	544,380	12.4	17	21
Mississippi	2,844,658	2,573,216	271,442	10.5	33	24
Missouri	5,595,211	5,117,073	478,138	9.3	23	30
Montana	902,195	799,065	103,130	12.9	42	20
Nebraska	1,711,263	1,578,385	132,878	8.4	37	37
Nevada	1,998,257	1,201,833	796,424	66.3	13	1
New Hampshire	1,235,786	1,109,252	126,534	11.4	38	22

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Table 1. *continued from page 35*

Area	April 1, 2000	April 1, 1990	Numeric Change	Percent Change	State Rank Based on Numeric Change	State Rank Based on Percent Change
New Jersey	8,414,350	7,730,188	684,162	8.9	14	33
New Mexico	1,819,046	1,515,069	303,977	20.1	31	12
New York	18,976,457	17,990,455	986,002	5.5	10	42
North Carolina	8,049,313	6,628,637	1,420,676	21.4	6	9
North Dakota	642,200	638,800	3,400	0.5	50	50
Ohio	11,353,140	10,847,115	506,025	4.7	22	44
Oklahoma	3,450,654	3,145,585	305,069	9.7	30	26
Oregon	3,421,399	2,842,321	579,078	20.4	16	11
Pennsylvania	12,281,054	11,881,643	399,411	3.4	26	48
Rhode Island	1,048,319	1,003,464	44,855	4.5	47	45
South Carolina	4,012,012	3,486,703	525,309	15.1	19	15
South Dakota	754,844	696,004	58,840	8.5	44	36
Tennessee	5,689,283	4,877,185	812,098	16.7	12	14
Texas	20,851,820	16,986,510	3,865,310	22.8	2	8
Utah	2,233,169	1,722,850	510,319	29.6	21	4
Vermont	608,827	562,758	46,069	8.2	46	38
Virginia	7,078,515	6,187,358	891,157	14.4	11	16
Washington	5,894,121	4,866,692	1,027,429	21.1	7	10
West Virginia	1,808,344	1,793,477	14,867	0.8	49	49
Wisconsin	5,363,675	4,891,769	471,906	9.6	24	29
Wyoming	493,782	453,588	40,194	8.9	48	32
Total Resident Population[1]	281,421,906	248,709,873	32,712,033	13.2	(NA)	(NA)
Northeast	53,594,378	50,809,229	2,785,149	5.5	(NA)	(NA)
Midwest	64,392,776	59,668,632	4,724,144	7.9	(NA)	(NA)
South	100,236,820	85,445,930	14,790,890	17.3	(NA)	(NA)
West	63,197,932	52,786,082	10,411,850	19.7	(NA)	(NA)
Puerto Rico	3,808,610	3,522,037	286,573	8.1	(NA)	(NA)
Total Resident Population, including Puerto Rico	285,230,516	252,231,910	32,998,606	13.1	(NA)	(NA)

[1] Includes the population of the 50 states and the District of Columbia.
NA, Not applicable.

NOTE: Consistent with the January, 1999 U.S. Supreme Court ruling (*Department of Commerce v. House of Representatives, 525 U.S. 316, 119 S. Ct. 765 (1999)*), these resident population counts do not reflect the use of statistical sampling to correct for overcounting or undercounting.

Source: U.S. Department of Commerce, U.S. Census Bureau.

Table 2. Apportionment Population and Number of Representatives, by State: Census 2000

State	Apportionment Population	Number of Apportioned Representatives Based on Census 2000	Change From 1990 Census Apportionment
Alabama	4,461,130	7	0
Alaska	628,933	1	0
Arizona	5,140,683	8	+2
Arkansas	2,679,733	4	0
California	33,930,798	53	+1
Colorado	4,311,882	7	+1
Connecticut	3,409,535	5	-1
Delaware	785,068	1	0
Florida	16,028,890	25	+2
Georgia	8,206,975	13	+2
Hawaii	1,216,642	2	0
Idaho	1,297,274	2	0
Illinois	12,439,042	19	-1
Indiana	6,090,782	9	-1
Iowa	2,931,923	5	0
Kansas	2,693,824	4	0
Kentucky	4,049,431	6	0
Louisiana	4,480,271	7	0
Maine	1,277,731	2	0
Maryland	5,307,886	8	0
Massachusetts	6,355,568	10	0
Michigan	9,955,829	15	-1
Minnesota	4,925,670	8	0
Mississippi	2,852,927	4	-1
Missouri	5,606,260	9	0
Montana	905,316	1	0
Nebraska	1,715,369	3	0
Nevada	2,002,032	3	+1
New Hampshire	1,238,415	2	0
New Jersey	8,424,354	13	0
New Mexico	1,823,821	3	0
New York	19,004,973	29	-2
North Carolina	8,067,673	13	+1
North Dakota	643,756	1	0
Ohio	11,374,540	18	-1
Oklahoma	3,458,819	5	-1
Oregon	3,428,543	5	0
Pennsylvania	12,300,670	19	-2
Rhode Island	1,049,662	2	0
South Carolina	4,025,061	6	0
South Dakota	756,874	1	0
Tennessee	5,700,037	9	0
Texas	20,903,994	32	+2
Utah	2,236,714	3	0
Vermont	609,890	1	0
Virginia	7,100,702	11	0
Washington	5,908,684	9	0
West Virginia	1,813,077	3	0
Wisconsin	5,371,210	8	-1
Wyoming	495,304	1	0
Total Apportionment Population[1]	281,424,177	435	

[1] Includes the resident population for the 50 states, as ascertained by the Twenty-Second Decennial Census under Title 13, U.S. Code, and counts of overseas U.S. military and federal civilian employees (and their dependents living with them) allocated to their home state, as reported by the employing federal agencies. The apportionment population excludes the population of the District of Columbia.

NOTE: As required by the January, 1999 U.S. Supreme Court ruling (*Department of Commerce v. House of Representatives, 525 U.S. 316, 119 S. Ct. 765 (1999)*), the apportionment population counts do not reflect the use of statistical sampling to correct for overcounting or undercounting.
Source: U.S. Department of Commerce, U.S. Census Bureau.

Table 3. Census 2000 Data Products

Planned Release Date *(Dates in this column refer to the first medium of release.)*	**100-Percent Data Products**	**Lowest Level Geography**
MAR - APR 1, 2001	**Census 2000 Redistricting Data Summary File** State population counts for legislative redistricting. *Media: Internet, CD-ROM, DVD*	Blocks
JUN - SEP 2001	**Demographic Profile** Population totals and selected population and housing characteristics in a single table. *Media: Internet, CD-ROM, DVD, paper*	Places Census tracts *(Internet only)*
JUN - SEP 2001	**Congressional District Demographic Profile** Population totals and selected population and housing characteristics in a single table for Congressional Districts only. *Media: Internet, CD-ROM, DVD, paper*	Congressional Districts of the 106th Congress
JUL 2001	**Race and Hispanic or Latino Summary File on CD-ROM** *Medium: CD-ROM*	Places *States:*
JUN - SEP 2001 *Advance national:* NOV - DEC 2001 *Final national:* MAY - JUN 2002	**Summary File 1 (SF 1):** 1. Population counts for 63 race categories and Hispanic or Latino. 2. Population counts for many detailed race and Hispanic or Latino categories, and American Indian and Alaska Native tribes. 3. Selected population and housing characteristics. [Urban/rural data are on the final national file; this is the only difference from the advance national file.] *Media: Internet, CD-ROM, DVD*	1. Blocks 2. Census tracts 3. Blocks/ Census tracts
States: SEP - DEC 2001 *Advance national:* MAR - APR 2002 *Final national:* JUN - JUL 2002	**Summary File 2 (SF 2):** Population and housing characteristics iterated for many detailed race and Hispanic or Latino categories, and American Indian and Alaska Native tribes. [Urban/rural data are on the final national file; this is the only difference from the advance national file.] *Media: Internet, CD-ROM, DVD*	Census tracts
States: APR - DEC 2001 *National:* NOV 2001 - APR 2002	**Quick Tables** Table shells with population and housing characteristics where the user can specify a geographic area and a population group. *Medium: Internet*	Census tracts
States: APR 2001- JAN 2002 *National:* DEC 2001 - AUG 2002	**Geographic Comparison Tables** Population and housing characteristics for a list of geographic areas (e.g., all counties in a state). *Medium: Internet*	Places
SEP - DEC 2001 (Release subject to policy decisions on access and confidentiality.)	**Advanced Query Function** User specifies contents of tabulations from full microdata file. Includes safeguards against disclosure of identifying information about individuals and housing units. *Medium: Internet*	User defined down to block groups
JAN - NOV 2002	**Census 2000: Summary Population and Housing Characteristics** *Media: Internet, paper (printed report)*	Places
2003	**Census 2000: Population and Housing Unit Totals** *Media: Internet, paper (printed report with selected historical counts)*	Places

Table 3. Census 2000 Data Products *(continued)*

Planned Release Date *(Dates in this column refer to the first medium of release.)*	Sample Data Products	Lowest Level Geography
DEC 2001 - MAR 2002	**Demographic Profile** Demographic, social, economic, and housing characteristics presented in three separate tables. *Media: Internet, CD-ROM, DVD, paper*	Places Census tracts *(Internet only)*
DEC 2001 - MAR 2002	**Congressional District Demographic Profile** Demographic, social, economic, and housing characteristics presented in three separate tables for Congressional Districts only. *Media: Internet, CD-ROM, DVD, paper*	Congressional Districts of the 106th Congress
JUN - SEP 2002	**Summary File 3 (SF 3):** 1. Population counts for ancestry groups. 2. Selected population and housing characteristics. *Media: Internet, CD-ROM, DVD*	1. Census tracts 2. Block groups/ Census tracts
OCT 2002 - FEB 2003	**Summary File 4 (SF 4):** Population and housing characteristics iterated for many detailed race and Hispanic or Latino categories, American Indian and Alaska Native tribes, and ancestry groups. *Media: Internet, CD-ROM, DVD*	Census tracts
JUN 2002 - FEB 2003	**Quick Tables** Table shells with population and housing characteristics where the user can specify a geographic area and a population group. *Medium: Internet*	Census tracts
JUL 2002 - JAN 2003	**Geographic Comparison Tables** Population and housing characteristics for a list of geographic areas (e.g., all counties in a state). *Medium: Internet*	Places
For 1-percent sample: 2002 *For 5-percent sample:* 2003	**Public Use Microdata Sample (PUMS) Files** 1. 1-percent sample (information for the nation and states, as well as substate areas where appropriate). 2. 5-percent sample (information for state and sub-state areas). Media: CD-ROM, DVD	1. Super Public Use Microdata Areas (Super- PUMAs) of 400,000+ 2. PUMAs of 100,000+
DEC 2002 - MAR 2003 (Release subject to policy decisions on access and confidentiality.)	**Advanced Query Function** User specifies contents of tabulations from full microdata file. Includes safeguards against disclosure of identifying information about individuals and housing units. *Medium: Internet*	User defined down to census tracts
2003	**Census 2000: Summary Social, Economic, and Housing Characteristics** *Media: Internet, paper (printed report)*	Places
2003	**Congressional District Data Summary File** 100-percent and sample data for the redistricted 108th Congress. *Media: Internet, CD-ROM, DVD*	Census tracts within Congressional Districts

Source: U.S. Census Bureau, Population Division, Decennial Programs Coordination Branch