



Executive Summary

Maps are a familiar part of everyday life. They are used by the public for travel and navigation, and by business and government in managing their enterprises. Modern computer technology has enhanced the mapping process, allowing digital geographical data to be combined with statistical and demographic data to produce visually powerful results. For example, maps can show the density of needy populations within a city or county, while also showing the reach of the public programs that support them. Maps have the potential for assisting legal service programs in managing their practices and improving the delivery of legal service to low-income persons. The Legal Services Corporation (LSC) Office of Inspector General (OIG) undertook Phase I of this evaluation project with LSC's two Georgia grantees to explore the applicability of mapping in the legal services environment.

Objective

The objective of this evaluation is to determine the usefulness of maps in helping managers in their strategic and operational planning at the local, state and national levels.

Conclusions

The OIG, working closely with the two LSC grantees – Georgia Legal Services Program and Atlanta Legal Aid Society, has determined that maps are a useful management tool having potential long-range programmatic benefits in the following strategic and operational areas:

- ♦ **Increasing access to legal services for low-income persons** – Maps offer a picture of the geographic distribution and movements of poverty and LSC income-eligible populations. When compared with clients served and legal services provided, the under-served can be identified and addressed;
- ♦ **Strengthening planning, resource and performance management** – Mapping provides a visible model of the legal services environment supporting service provision, priority setting and deployment of office locations and staff. Maps have promise for measuring the success of grantees' various programs and outreach initiatives; and,
- ♦ **Improving program promotion** – Maps show potential funders the extent of the legal services contribution to the low-income community and clearly document the unmet need for legal services. Maps effectively communicate the disproportionate size of the income-eligible population compared to the available resources. They are a persuasive tool that managers can use when seeking additional funding from federal, state, local and private sources.

Additional work is needed to fully evaluate mapping and develop it into a viable legal services management tool. The sample maps must be updated with the recently available 2000 Census data and tested in the grantees' daily operations. More detailed neighborhood level maps must be generated and evaluated. The standards and methods for legal services mapping must be refined and tested in other geographical areas and under different operating environments. Cost-effective production and distribution technologies like Internet-mapping need to be evaluated. Legal services leaders and technical managers must be educated on the use and applicability of mapping.



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Background

Project Description

This project evaluates the management support capabilities of mapping by combining LSC grantee case data with Census data to create a series of sample maps that visually describe the legal services environment. For example, this project uses mapping to identify the distribution of the potential legal services clients as compared to legal services closed cases. The resulting maps provide a detailed picture of low-income persons' access to legal services.

When the evaluation is complete mapping will have been evaluated to determine its value in supporting a wide range of stakeholder interests, including:

- ♦ Access to legal services for low-income persons;
- ♦ Grantee management information to support resource acquisition, strategic and operational planning and implementation, deployment of office locations, staff and special outreach programs and program promotion; and
- ♦ LSC management functions including national program promotion, strategic and operational planning, the state planning initiative and performance evaluation.

In Phase I of the project, the project's members identified and designed 132 prototype maps thought to be most valuable to managers at various levels in the legal services environment. The OIG and the participating LSC grantee manager's in Georgia then assessed the usefulness of the maps in visually displayed trends, comparisons and management insights.

The products of the first phase are the map concepts, sample maps, evaluations, conclusions, and lessons learned. Additionally, this phase created standards in the design and procedures used to create the maps into a repeatable mapping recipe that will reduce the cost of future legal services mapping.

Mapping

Mapping is a system that combines digital map data (such as a county boundary) with tabular demographic and legal services operational information to display information in an easily understood, visual format. Maps readily answer questions such as, "where is the income-eligible population and how big is it?" or "where were the clients located that we served last year?"

Maps are inherently simple and universally accepted as a consolidator of large quantities of data into one easily interpreted graphic. The benefits of employing mapping to support managers include:

- ♦ Better decision-making;
- ♦ Greater use of existing data;
- ♦ Improved knowledge of the business environment;
- ♦ Enhanced resource management;
- ♦ Improved client satisfaction through refocused services;
- ♦ Greater efficiency and effectiveness; and,
- ♦ Resolution of complex problems.

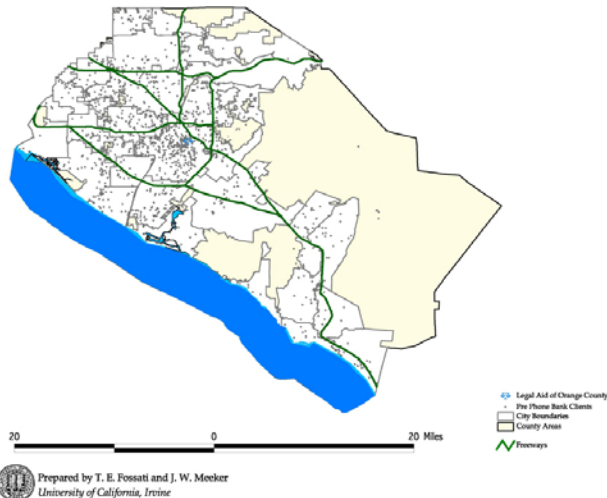
Mapping has a long tradition of use in natural sciences and land planning, with social service programs more recently adopting these same technologies. A growing number of social service practitioners across the nation are discovering ... (mapping) is a new way to help people understand the social problems, to show legislators and constituents alike the wide discrepancies between needs and resources, and where to place those resources in communities."¹

Virtually every federal government department and agency has a mapping program to support distributed operations and services across the United States. For example, the Departments of Health and Human Services and Housing and Urban Development use maps in their poverty assistance programs. The Department of Justice's Civil Rights Division, Geographical Information Systems group assists the 93 U.S. Attorneys' through litigation support mapping services for all voting rights and housing discrimination cases in the United States.

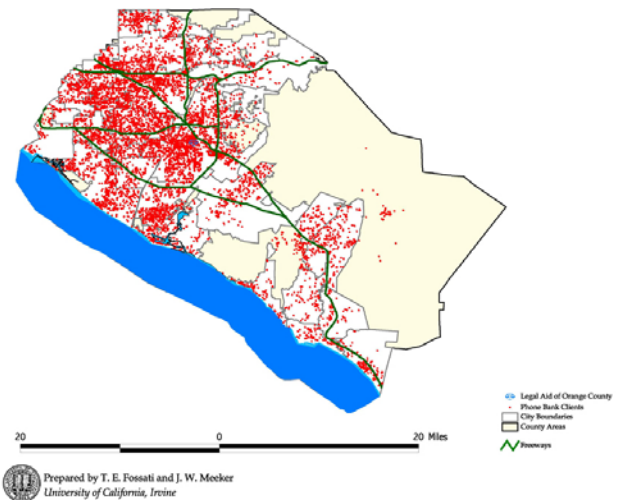
Mapping in Legal Services

The Legal Aid Society of Orange County (LASOC), in California was the first LSC grant recipient to apply mapping to support legal services. LASOC's Executive Director Mr. Robert Cohen, with the support of Professor James Meeker from the University of California Irvine, applied mapping in 1997 as part of an evaluation of a new hotline in making services more accessible to the low-income community. The before and after maps (shown below) effectively display the significant increase in service expansion within the Orange County service area in a manner that just was not possible through words – giving credence to the saying 'seeing is believing'.

Orange County Pre Phone Bank



Orange County Phone Bank Clients



In an interview, Mr. Cohen said, "mapping is a powerful planning and reporting tool. It is easy to use and provides insights that would otherwise be very difficult to obtain. I think the (legal services) programs would find mapping very useful in determining important demographic and service information. Internally, it is useful in planning and reporting on services and externally, for creating simple and powerful demonstrations to funders."

¹ Greene, R. W., *GIS in Public Policy: Using Geographic Information for More Effective Government*, Environmental Systems Research Institute, Inc., Redlands, Calif., 2000.

Georgia

The low-income Georgia population is served by two LSC funded grantees – Atlanta Legal Aid Society (ALAS) and Georgia Legal Services Program (GLSP). ALAS provides legal services in the five-county metropolitan area of Atlanta, shown in light yellow in Figure SL-RM1. In 2002, it received approximately 30% of its funding from LSC. The ALAS administration office is located in the city and it has five additional near-by offices. ALAS also runs the statewide senior hotline from Atlanta. GLSP serves all counties outside of Metro Atlanta. In 2002, it received approximately 57% of its funding from LSC. GLSP has 10 different service regions, highlighted by separate colors in Figure SL-RM1, and 13 offices. GLSP's main administrative office is located in Atlanta. The statewide Migratory Labor Force program is run from the Tifton office. Together, the grantees serve several large urban and rural legal services delivery areas, making Georgia a good site for the first phase of the Mapping Evaluation.

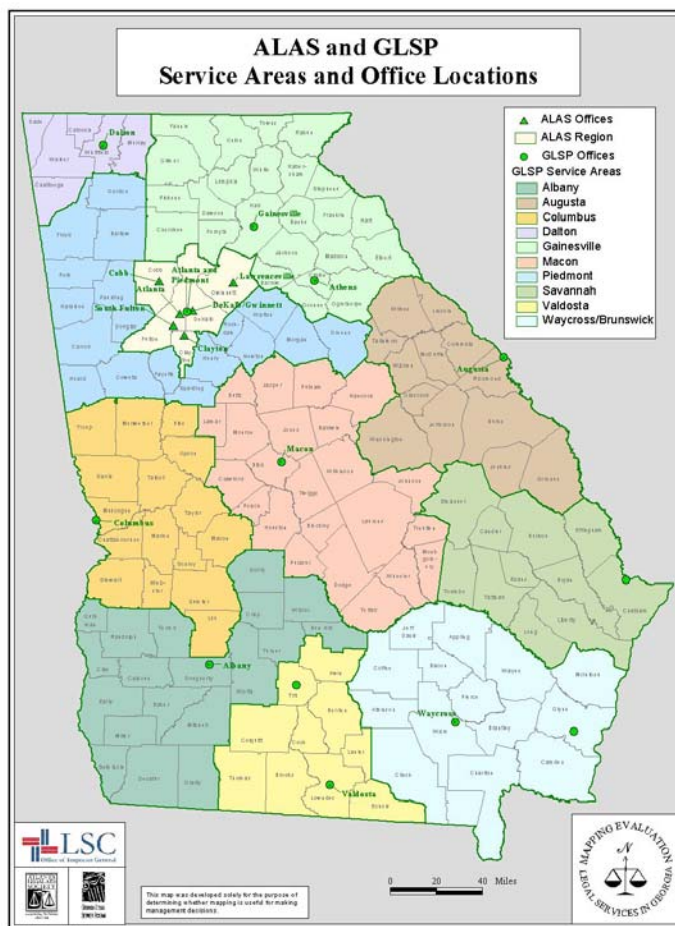


Figure SL-RM1

The two Georgia grantees actively participated in this project by:

- ◆ Providing case data for over 165,000 closed cases from 1996 through 2000;
- ◆ Articulating their mapping needs;
- ◆ Designing, selecting and reviewing maps appropriate to legal services decision-making;
- ◆ Interpreting mapped data;
- ◆ Commenting on the value and potential utility of the sample maps, and;
- ◆ Hosting and participating in several meetings.

Of the 165,409 total case records provided by the grantees, 160,623 cases or 97% contained at least a ZIP Code and were mapped at that level. At the County level, 148,926 records or 90% were able to be located on a map. To be mapped at a Census level, case records need to contain a usable residential street address, City or ZIP Code, and State. At the Census Tract and Block Group levels; 118,345 cases or 72% were geocoded; and, 117,102 cases or 71% were geocoded to the Census Block level. See Appendix A for the complete Geocoding of Legal Services Populations in Georgia report.



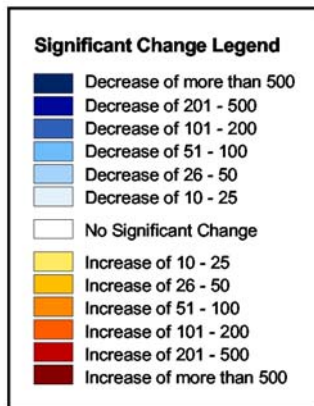
Evaluation of Maps

The three evaluation participants in phase I represented several unique perspectives from which to analyze the maps. The OIG's approach assessed the methods and mapping concepts for application in Georgia as well as other LSC services areas across the nation. The Georgia grantees focused on creating maps most helpful in analyzing their own service areas and data. The GLSP perspective closely represented that of a statewide program, whose service area covers over 57,900 square miles, across 154 counties, representing mostly rural, but also several mid-size urban areas. Their service area had almost one million persons eligible by income to receive LSC funded assistance in 2000. The ALAS perspective represented a densely populated urban legal services environment, serving five counties or 1,700 square miles with slightly under four hundred thousand income-eligible persons in 2000.

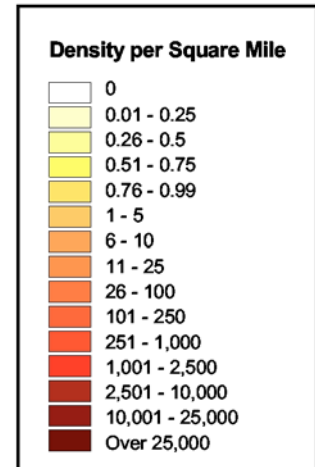
The maps model the reality of the geographic dispersions and concentrations of low-income persons and services rendered within the legal service areas. They provide a common format that allows for the comparison of several very different types of data. The following evaluation is a review of the most significant maps developed. Please refer to the project's website at <http://www.oig.lsc.gov/mapping/mapping.htm> or Volume II Final Maps for page-size reproductions of all 132-sample maps. Description documents of the mapping requirements and specifications, such as purpose, audience, statistical evaluation, frequency of use and data sources, are also found there.

The maps are presented in the following categories:

- ♦ Strategic and operations planning, analysis and program promotion;
- ♦ Identification of poverty and income-eligible populations;
- ♦ Service delivery;
- ♦ Access to legal services for low-income persons, identifying the under-served; and,
- ♦ Grantee management information to support priority setting, funder relations, allocation of office and staff resources, and case administration.



The color scheme is the key to reading the maps. It ranges from shades of blue, representing cold-spots or areas of negative growth, to white, representing zero, through yellow, orange, red and brown representing hot-spots or extreme activity (see the accompanying graphics left and right). The categorizations for the legal services maps were created after reviewing a number of categorization schemes. The selected system is easy to understand and standardizes the maps within a subject area, making them immediately comparable to each



other across the various measurement levels – Census block group, tract, county, state and national. (See appendices C and D for more information on these systems.)

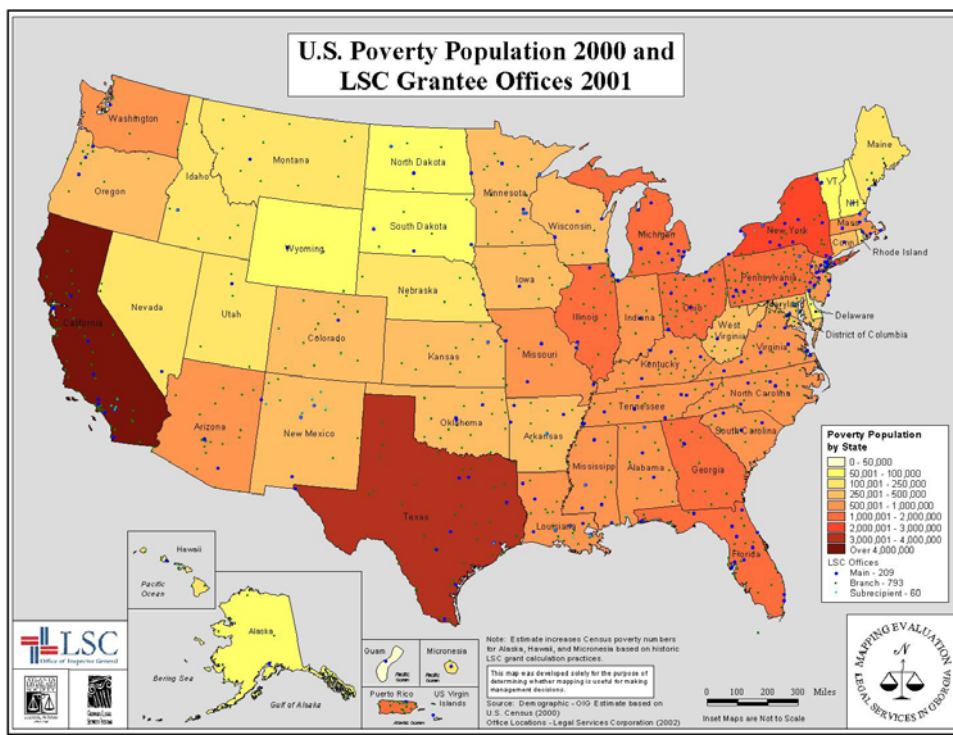
OIG Evaluation

The opinions expressed in this section are those of the OIG. The grantees' evaluations are included at the end this chapter in a separate section.

Strategic and Operations Planning, Analysis and Program Promotion

Maps can support program performance operations and promote access to legal services by providing a visual 'big picture' of the legal services environment. Many of the project maps are examples of reporting and analysis tools that could support the LSC Board of Director's Strategic Directions and LSC's State Planning Initiative, including increased and equal access to legal services, better allocation of limited resources, and improved service delivery. These maps could be useful for LSC in pursuing program support and attaining additional funding by presenting a stronger case for legal services. A sampling of strategic national maps supporting these goals is below; in addition, many of the concepts shown at the state level also can be applied at the national level.

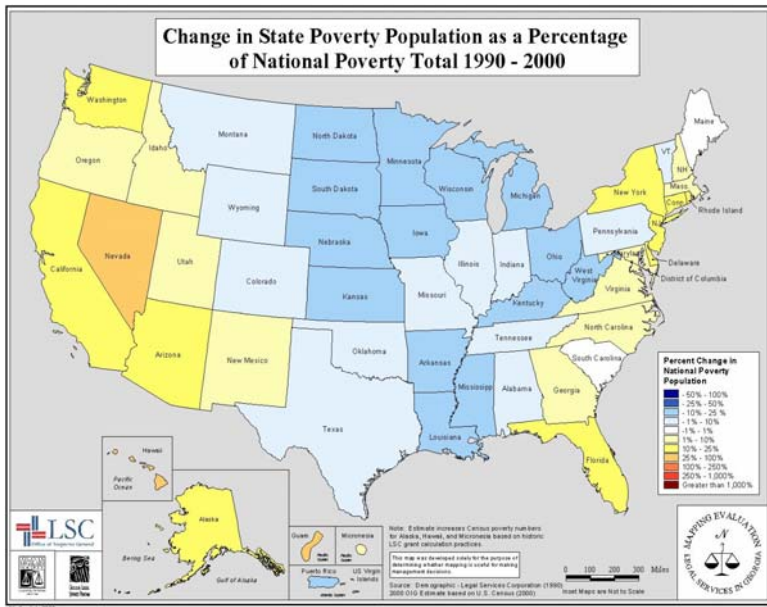
Knowledge about the movements or changes in the poverty population -- the potential client base -- is the key to an efficient and equitable legal services delivery system. The concentration of persons in poverty drives national, statewide and grantee planning. It affects resource management,



Map NL-2a

funding allocation, office locations, professional legal staff employed, the nature of services offered and ultimately the access to legal services for low-income persons.

Using maps to communicate geographic information, such as the poverty distribution, is much more effective than using spreadsheets or tables. For example, Map NL-2a shows the 2000 Census Poverty distribution across the United States. LSC grantees main offices are shown as blue dots while branch offices appear as smaller green dots. The lighter yellow colors represent lower numbers of persons in poverty, and the hotter darker colors represent greater numbers. The map vividly displays the relative proportions and distribution of poverty across the United States and enables state-to-state comparisons. The states with the largest numbers of persons in poverty are California, which has 4.7 million persons in poverty or almost 14% of the nation's total, Texas with 3.1 million persons in poverty, and New York with 2.7 million.

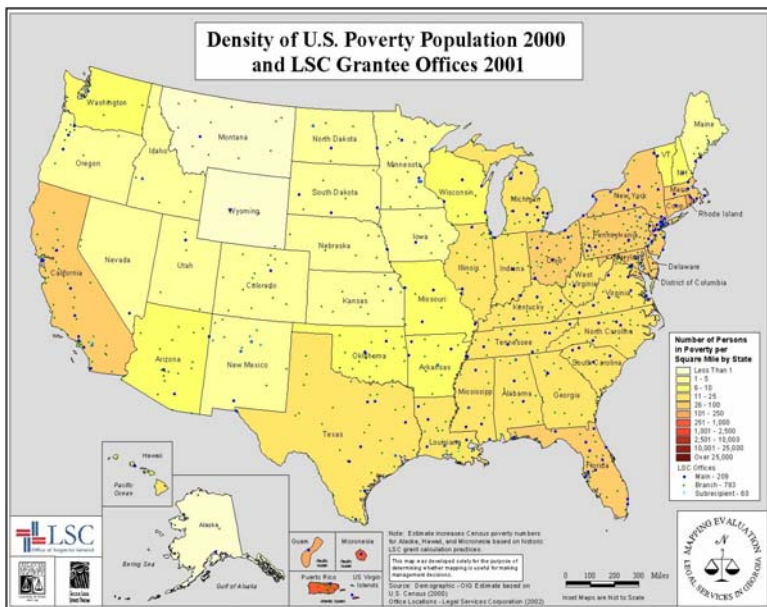


Map NL-4s

each state would receive based on the 2000 Census reallocations if level basic field funding had been appropriated in fiscal year 2003² or future out years. North Dakota shows the greatest loss, a decline of over 21%, with Iowa a close second. Conversely, Nevada gained over 62% in the ten-year period. Of the nation's total increase of 2 million people in poverty, California accounted for more than half. Under level basic field funding, California will gain \$7 million dollars to reach \$40 million in total LSC grants. The map and statistics clearly show there have been significant shifts in the distribution of the poverty population across the nation over the ten-year period.

Map NL-4s shows the change in the state poverty populations as a percentage of the national poverty total between the 1990 and 2000 Census. The relative decrease (blues) in the poverty population is in mid-America, while the growth (yellows and browns) is on the East and West coasts. Discovering this growth/loss pattern is not possible when looking at a data table.

Traditionally, LSC basic field funding uses this same poverty formula to distribute the annual LSC appropriation by the relative number of individuals in poverty on a per capita basis as counted by the last census. Therefore, the map shows the changes in the proportion of LSC funding that

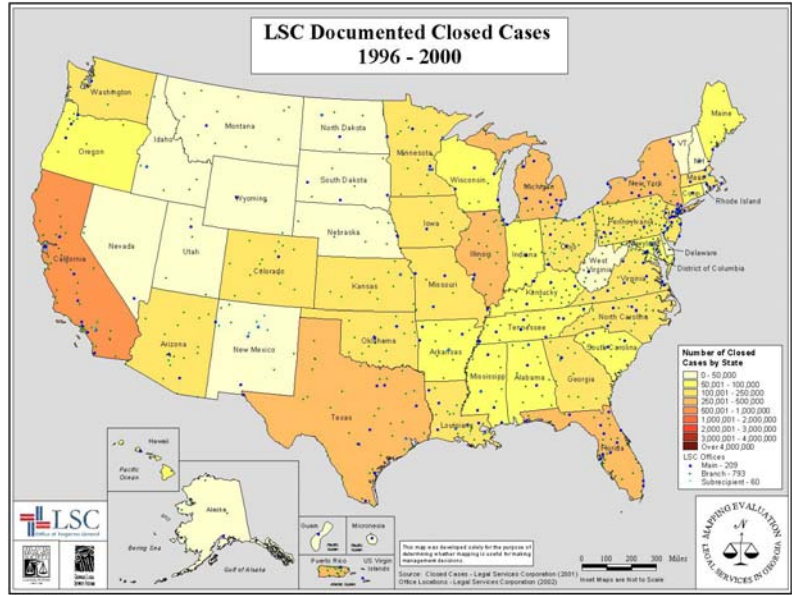


Map NL-2b

Map NL-2b compares the density of the 2000 poverty distribution per square mile by state and includes an overlay of 2001 LSC funded offices. This map is a generalized measure of the concentrations of poverty distributions. The Puerto Rico and Micronesia service areas have the densest poverty with over 251 persons in poverty per square mile, while Alaska, Montana and Wyoming have the least dense and extremely rural poverty populations. Identifying the low-income concentrations is a measure of the potential legal services client base, and provides important background information for all legal services access analysis and presentations, whether at the national, statewide or local level.

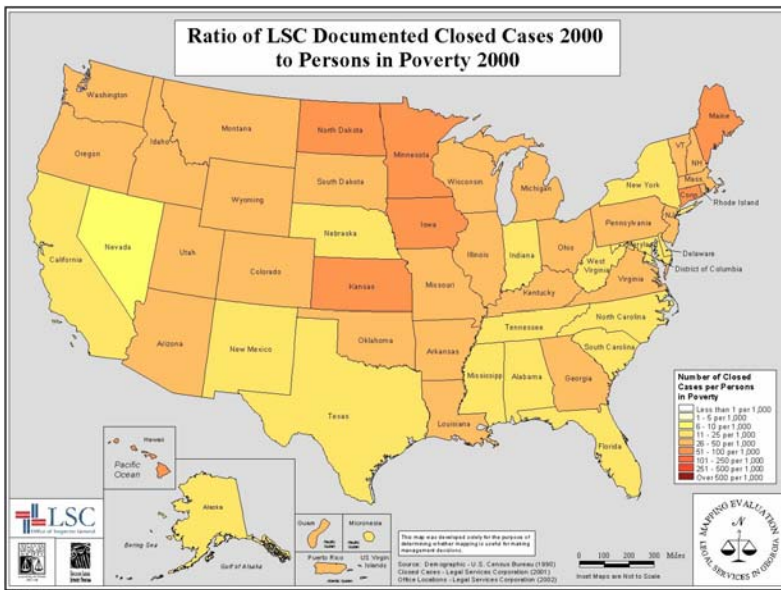
² The fiscal year 2003 LSC appropriation included a one-year addition of \$9.5 million dollars earmarked to partially supplement the states that received less LSC funding due the 2000 Census poverty redistributions.

Map NL-5 displays the LSC documented cases closed from 1996-2000. There are more than six million cases represented on this map that are at least partially funded with LSC grant funds. California leads with almost 750,000 cases, followed by Texas, New York, Michigan and Florida, each with more than 300,000 cases closed.



Map NL-5

Map NL-7 displays the ratio of LSC documented closed cases to persons in poverty by state in 2000. The ratio maps offer a measure of the strategically important access to legal services. Access to legal services in this instance is measured by the number of LSC documented cases closed per 1,000 persons in poverty in a state. Using this measure, the lowest access to legal services in the continental U.S. in 2000 was in Nevada where less than six “LSC cases” per 1,000 income-eligible were closed. This was due in part to Nevada having the greatest growth rate in the poverty population of over 62% between 1990 to 2000, yet receiving Federal funding based on the 1990 Census until the January 2003. At the high end, Iowa closed over 60 cases per 1,000 persons in poverty, a partial result of losing over 20% of its relative share of the poverty population and maintaining 1990 funding allocations. For comparison, the “LSC cases” closed per person in poverty were 10 times greater in Iowa than in Nevada in 2000.



Map NL-7

Access to legal services is the product of a myriad of factors such as distribution and density of the poverty population, its urban or rural nature, resource availability, delivery strategy, private bar involvement, degree of extended service and other circumstances. However, the maps provide state planners, grantees, and LSC program management a basis of comparison of the degree of access to

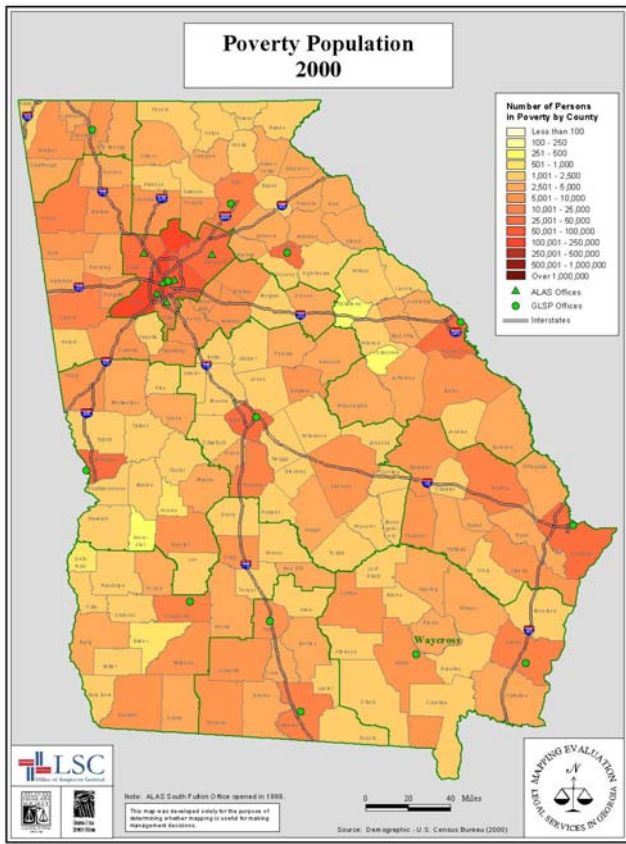
“LSC documented Closed Cases” legal services throughout the United States.

Nationwide maps provide LSC program management, state planning boards and grantees with limited visual comparisons. Such comparisons can provide a perspective on legal services in one state in relation to other states, and provide a national perspective to the legal services program. Although state comparative analysis must take into account the context of the individual situations, maps of this nature can assist in delivery and access performance base-lining, spotting year-on-year trends

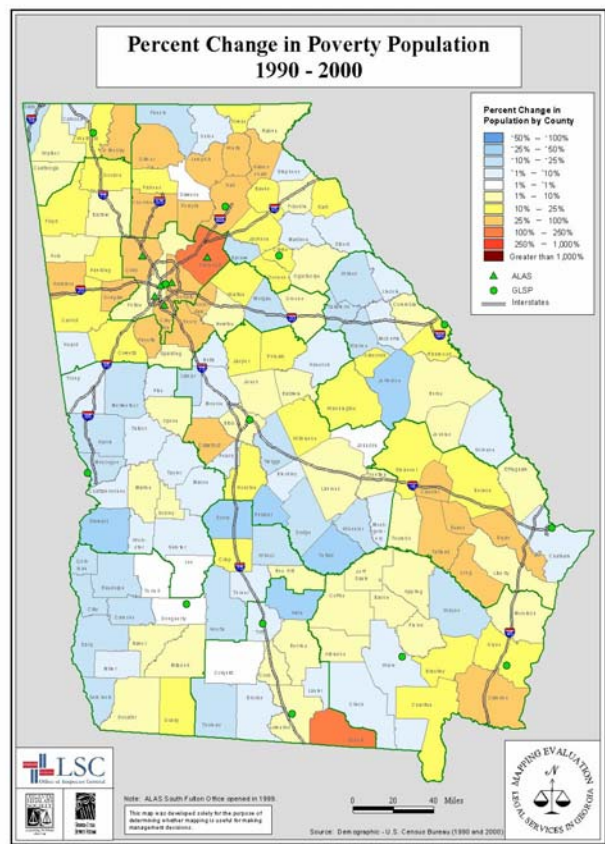
and highlighting areas of success or challenge. States or grantees identified as extremes can be used as models or targeted for special attention.

Changes and Movements in the Poverty Population

Mapping the poverty population distribution creates a new visual perspective that enables significant questions, observations and insights that would not be apparent in any other format or medium – transforming data into management information to be factored into the decision-making process.



Map SL-35b



Map SL-35c

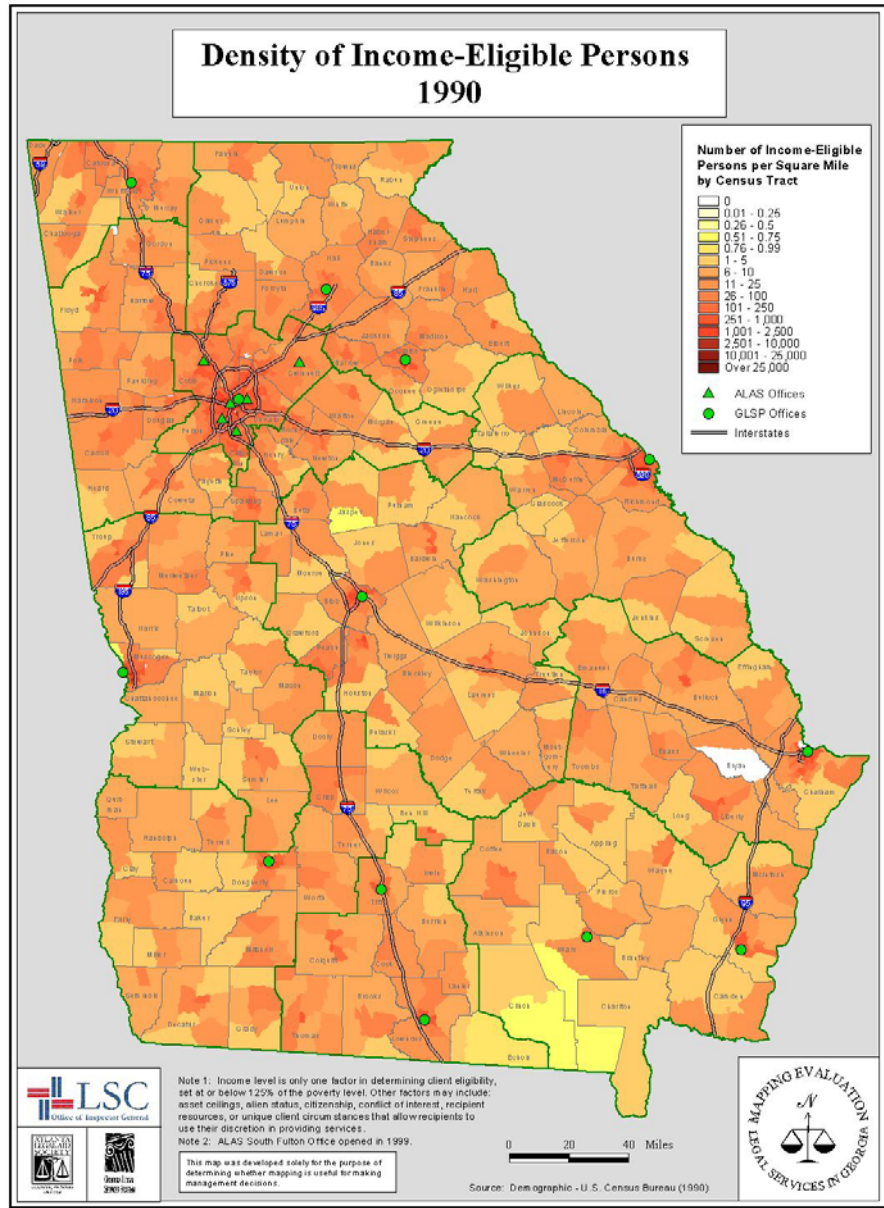
Map SL-35b shows the 2000 Georgia poverty distribution by county. The heavy concentrations of persons in poverty (darker reds) are in metropolitan Atlanta and the urban areas of Augusta, Savannah, Macon and Columbus. Map SL-35c shows the percentage change or rate of growth in the numbers of persons in poverty by county between the 1990 and 2000 Census. Shown together these maps show the distributions and trends of the poverty population within the GLSP and ALAS service areas.

At the county, city and community levels, changes or movements in poverty populations are potentially far more dramatic than at the state level. Over the ten-year period, the poverty population of Georgia increased by over 110,000 persons. GLSP's service area experienced an average increase over 6%, but the individual county increases (shown in yellow, brown and red) and decreases (blue) varied greatly. The five county ALAS service area experienced a 30% increase in the poverty

population. Within the ALAS service area, Gwinnett county, shown in red, experienced a 137% growth rate in poverty population from nearly 14,000 to 33,000 persons. ALAS has used map SL-35C to help demonstrate the need for expanding the part-time Gwinnett office into a full-time office to better serve the expanding legal needs of the community. In a local fund-raising effort to support the operational change, ALAS has provided the map to local judges, lawyers, community leaders and county leadership. The map effectively communicates that Gwinnett County is experiencing an abnormally intense growth in the poverty population and corresponding increase in the need for legal services.

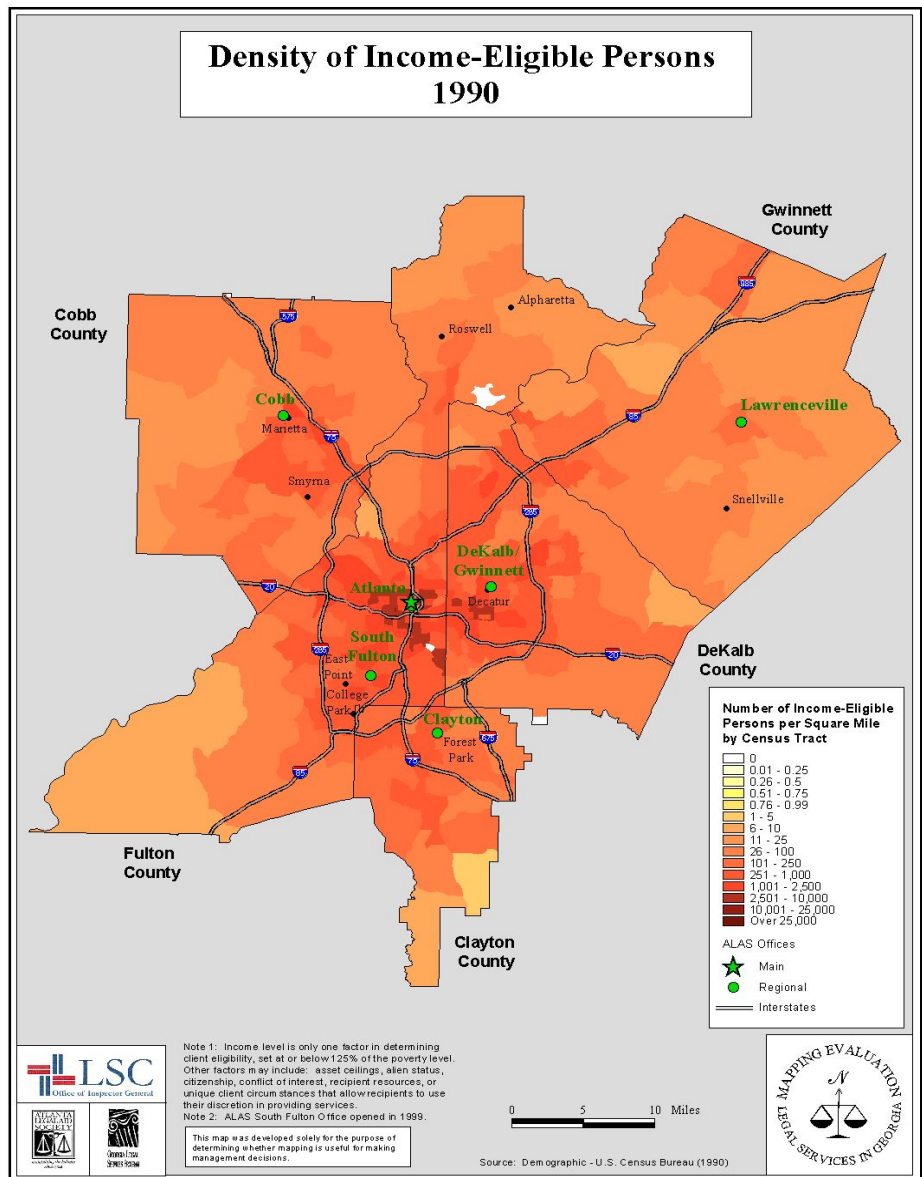
Income-Eligible Populations

Before the evaluation, the grantees had only a Georgia poverty table listing the individual county poverty totals. This project mapped the distribution of LSC income-eligible persons, defined as those in households having annual incomes at or below 125% of the Federal Government's defined poverty threshold. Statewide map SL-6b shows almost 1.2 million income-eligible persons in 1990 by Census tract, showing more detail than county aggregated maps. Maps at smaller aggregation levels, such as ZIP Code, Census tract, block group or block, support not only state and county but also neighborhood level analysis. Smaller geographic areas also more accurately represent the actual communities and neighborhoods. County level data is appropriate for promotion efforts and regional analyses, while detailed community planning requires the use of smaller geographies.



Map SL-6b

Map ML-1b is a close-up of the ALAS service area. It aggregates data by the same geographic boundary (Census tract) and uses the same standard color scale as the state level map SL-6b, making the two maps directly comparable. Fulton and DeKalb counties together have over 210,000 income-eligible persons. The deep red areas found in inner-city Atlanta represent concentrations greater than 2,500 income-eligible persons per square mile. The calculated measure of income-eligible persons, as defined by the Census, per square mile is an important standardized measure of the income-eligible persons. It supplies vital information on the location, size and concentration of the low-income population in an easily communicated format. Maps such as these enhance the credibility of the presenter or fundraiser by providing high quality visual support, rich in content. One of the main uses of these maps is to educate funding partners and other influential decision makers on the extent of the problems faced in their region. When presented with statistics and numbers, information is often glossed over; but with a map, the data is more credible and local in nature. Maps show communities and populations, not a number on a spreadsheet.



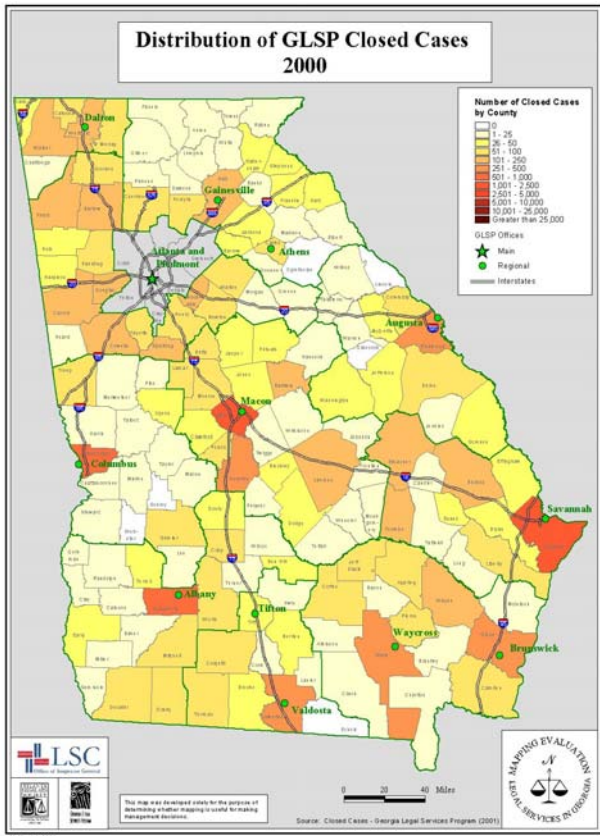
Map ML1b

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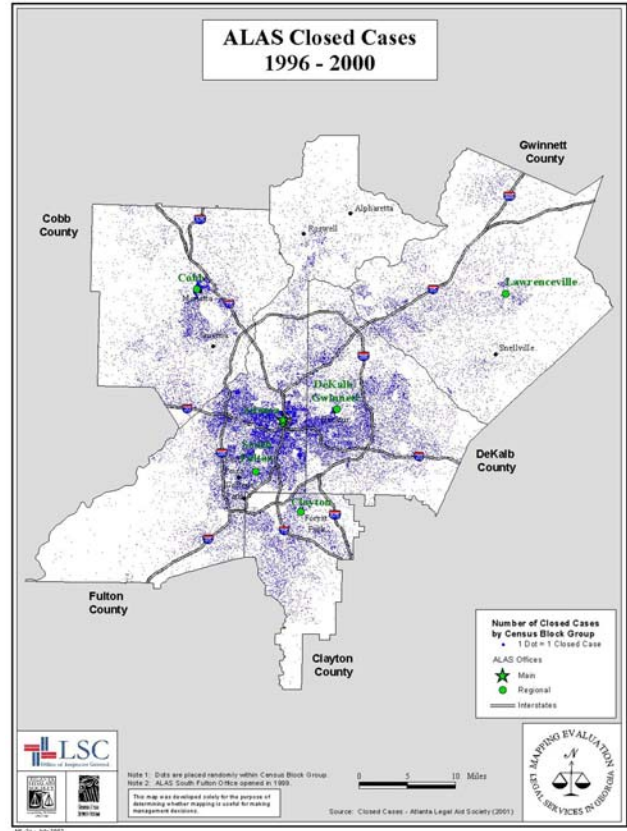
To bring greater content and context to the maps, a small set of universal overlays was created that can be found at the end of Appendix C. The overlays display locations of county courthouses, city boundaries, and large establishments (military bases, airports, parks and rivers). The white areas on both maps are the locations of a military base, golf course and federal prison as explained on the Establishments maps. The Establishments maps identify significantly sized places where no or very low numbers of income-eligible persons are counted by the Census.

Service Delivery

This series of service maps helps to assess delivery from different perspectives including coverage, trends and targeted outreach programs. Map SL-9b shows GLSP closed cases³ by county.



Map SL-9b

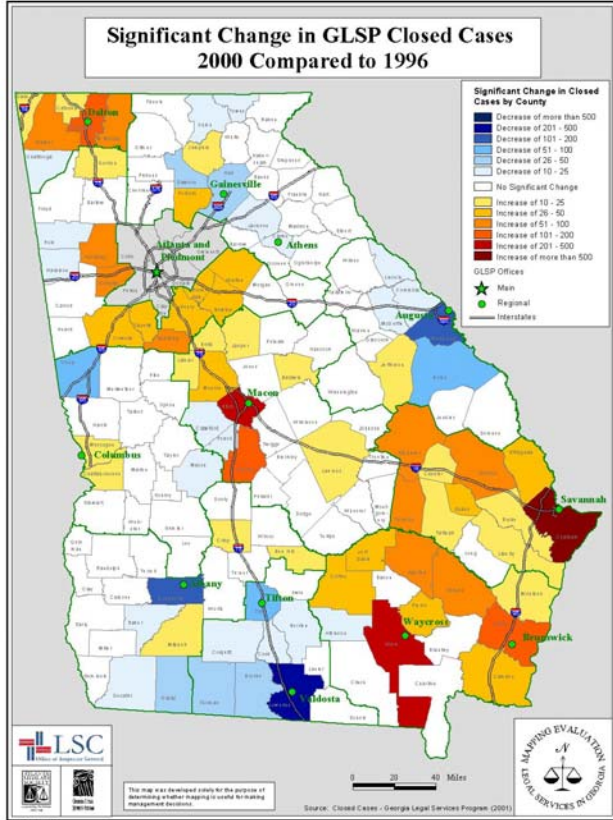


Map ML-3c

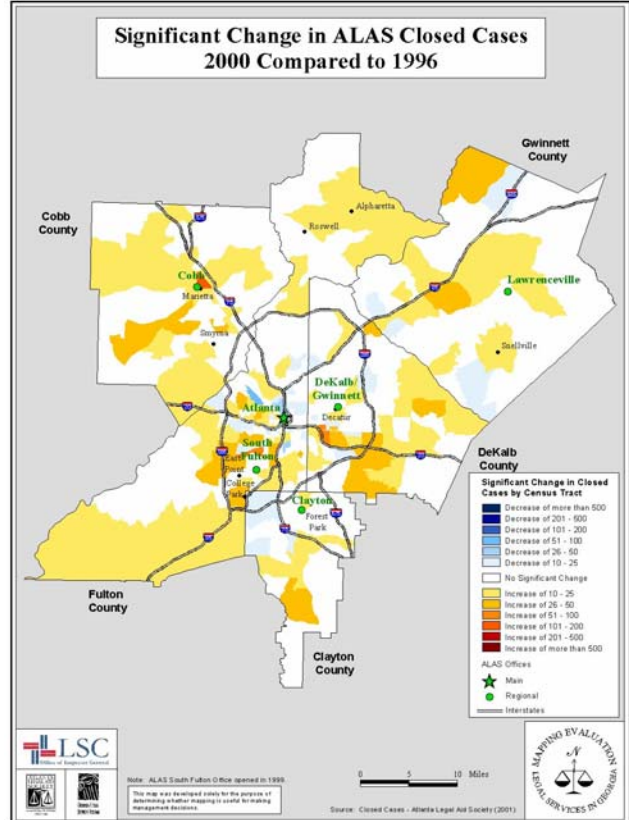
This one-year map is a good baseline map for annual review and is useful to garner program support with county representatives. Map ML-3c displays five-years of ALAS closed cases data illustrated as one case per blue dot randomly distributed within the Census Block Group and shows the volume of the LSC grantees' service to the community.

³ Georgia maps include all geocodable grantee cases (LSC and Non-LSC).

Maps SL-9d and ML-3d display the changes in the number of closed cases from 1996 to 2000. Maps of this type would be helpful for planners and grantee management to review annually on a statewide basis to identify areas of significant change in case closures and service coverage. These maps are merely a starting point leading to further analysis. Often other data or additional maps



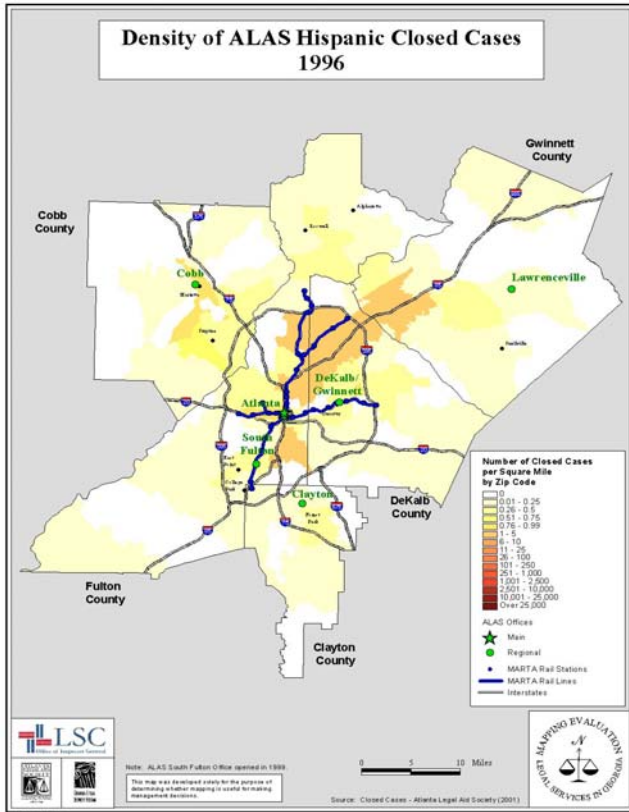
Map SL-9d



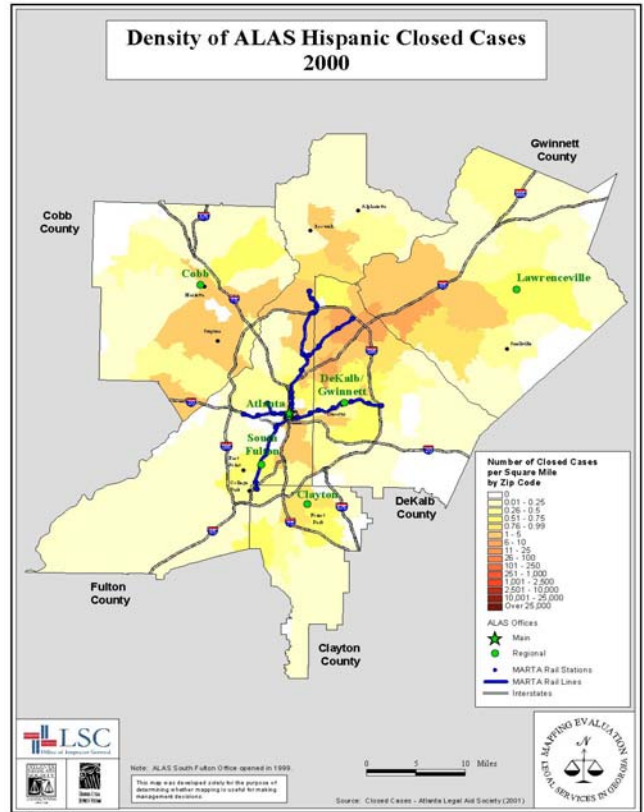
Map ML-3d

showing trends in income-eligible populations, resource availability, service deployment and case access levels need to be examined. However, the use of these maps would ensure that significant events do not go unnoticed or unmanaged.

A quick visual comparison of ALAS maps ML-27a and ML-27b illustrates the dramatic increase in Hispanic persons closed cases from 1996 to 2000. The maps portray a clear growth trend over the



Map ML-27a

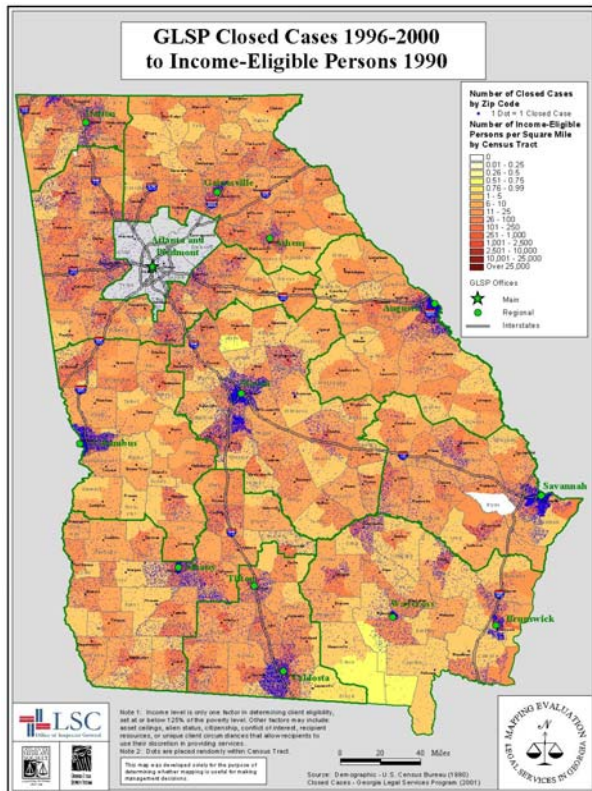


Map ML-27b

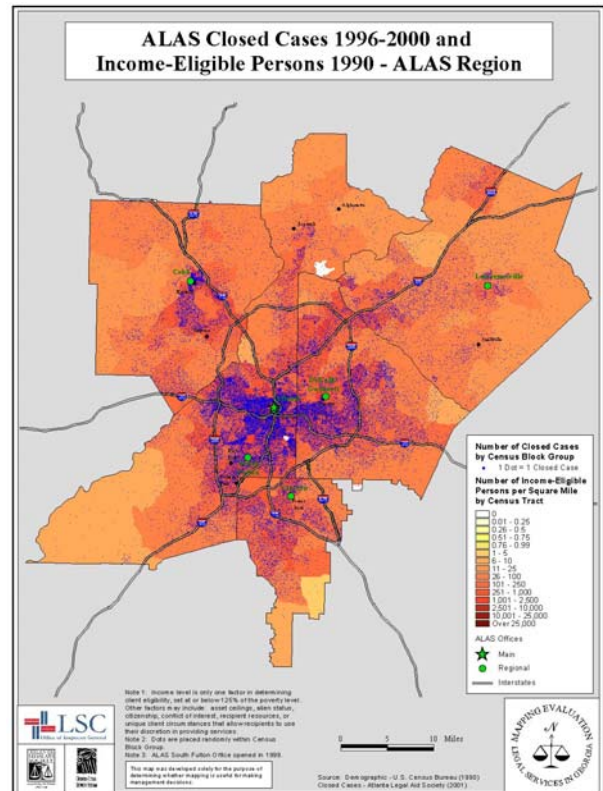
five-year period. Such a map series is useful for management when promoting services to the fastest growing ethnic segment of the population and to aid in identifying growing staffing skill requirements (multi-lingual), and in seeking specialized funding and resources from target jurisdictions.

Access to Legal Services

Combining the income-eligible persons and closed cases (illustrated by blue dots) data, creates a series of maps that depict a perspective on access to legal services. These maps are tools to identify potentially under-served and relatively over-served populations. For example,



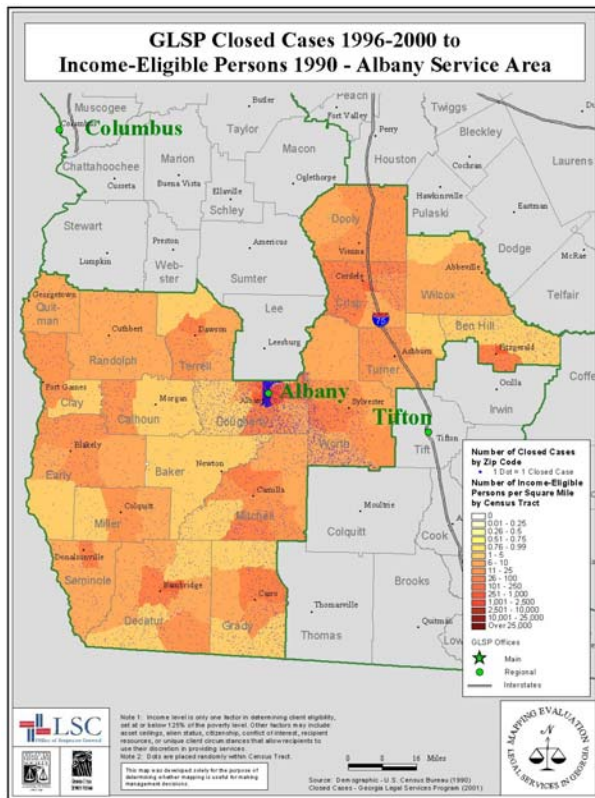
Map SL-17k



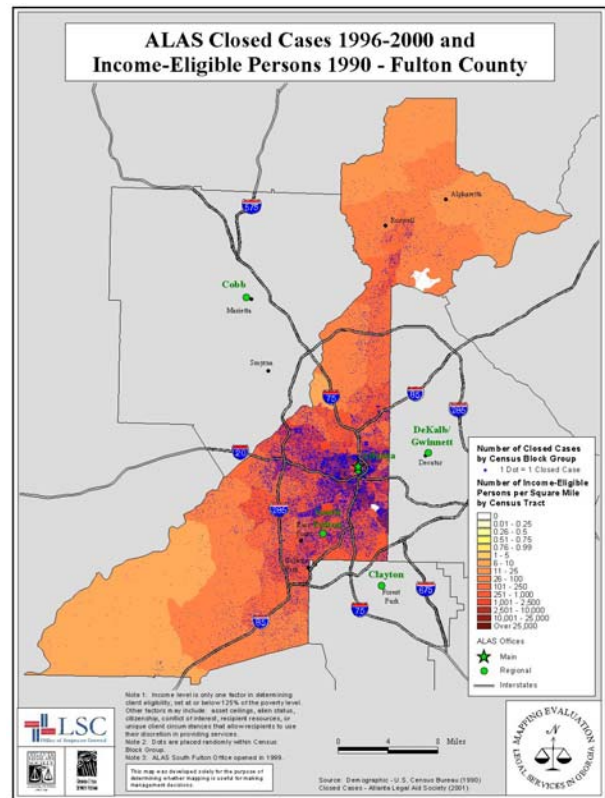
Map ML-8g

concentrations of closed cases (dots) should correlate closely with concentrations of income-eligible persons (darker reds) within a defined geography, as shown on maps SL-17k and ML-8g.

Close up maps SL-17a and ML-8e illustrate the technique of focusing or zooming on a specific service area or county. This technique allows managers to maintain the statewide perspective, while refining the analysis of target areas within a region. Regional office managers can zoom in even

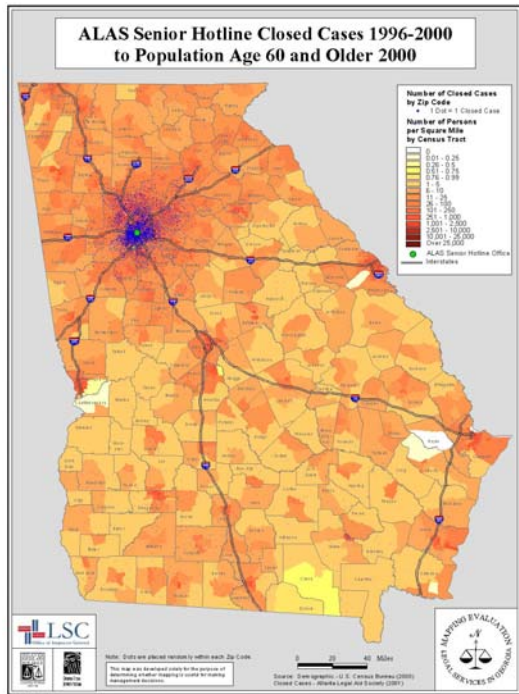


Map SL-17a



Map ML-8e

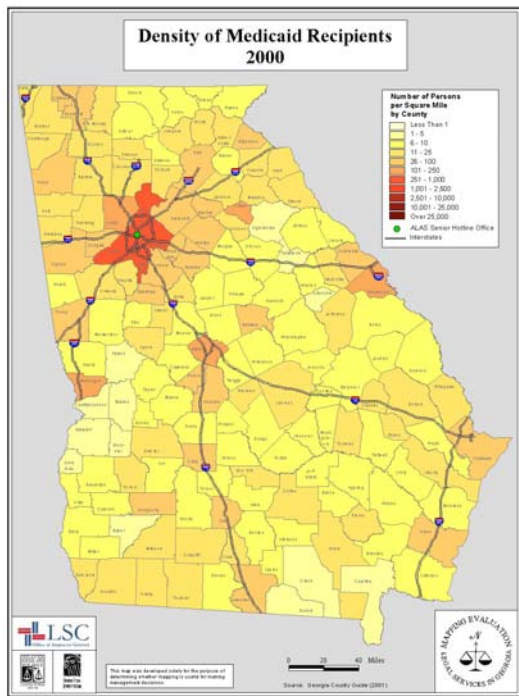
further to locate communities and neighborhoods that potentially are under-served, or perhaps determine if services are reaching the clients equitably or as intended. This type of map-enhanced analysis may also help identify areas to which resources need to be re-directed.



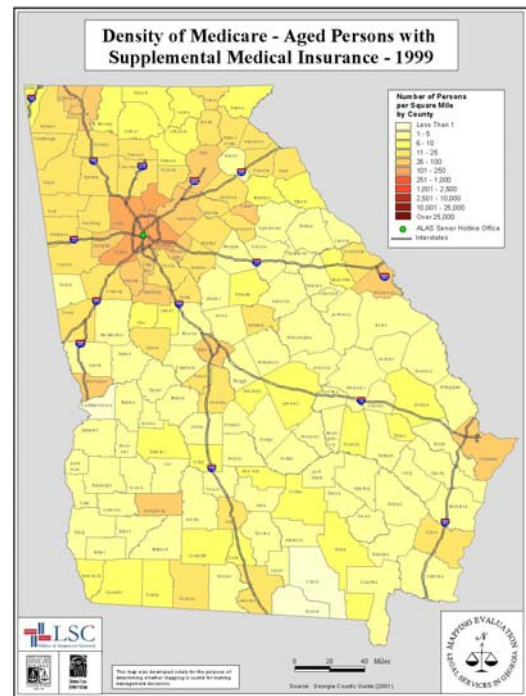
Map SH-3a

Map SH-3a shows the service coverage of the statewide Senior Hotline run by ALAS from Atlanta. ALAS was interested in the distribution of the hotline's cases relative to elderly populations and suggested analyzing the situation with maps. The map displays five years of Senior Hotline closed cases (dots) overlain on the density of persons age 60 and older per square mile shown by Census Tract in 2000. The map shows a large clustering around the Atlanta area. The noticeable white areas are the locations of major military bases.

A complete analysis requires a review of the distribution of cases relative to the distribution of the low-income senior population. Maps SH2a and b display the density of Medicaid recipients and Medicare insured persons. Medicare recipients are generally eligible based on age of 65 years or older, whereas Medicaid recipients are generally eligible based on low-income. Combined, these two maps give a better estimator of the low-income, senior distribution to compare the hotline cases distribution. Both maps reveal the same clustering of low-income seniors in the Atlanta area. For instance,



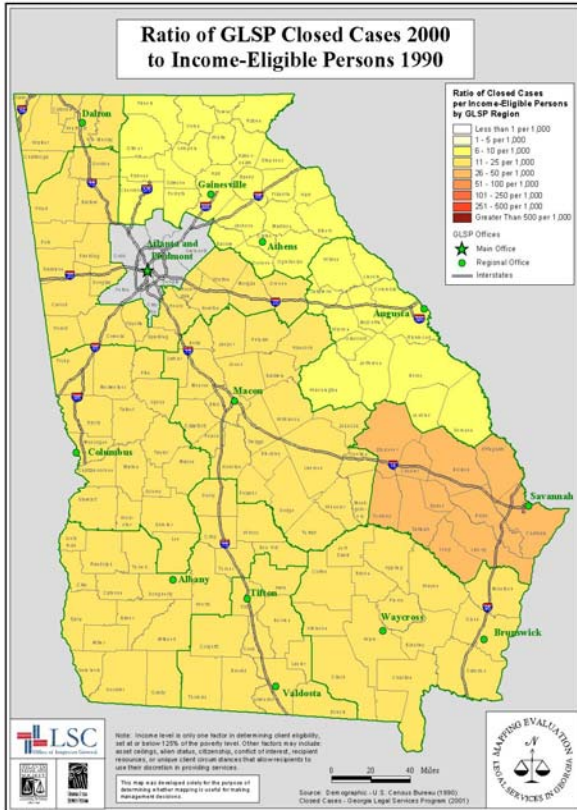
Map SH-2a



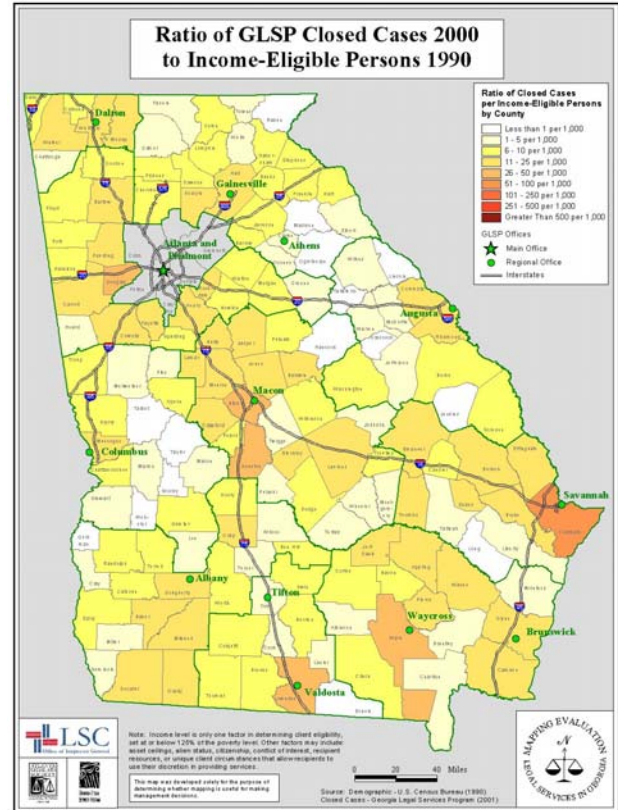
Map SH-2b

four-fifths of ALAS normal service area has a distribution of over 251 Medicaid recipients per square mile by county, whereas the majority of the southern half of the state has a density of just six Medicaid recipients per square mile. The Medicare distribution map reveals that the Medicare insured is at least 50 times more concentrated in the Atlanta area than in the southern half of the state. This analysis shows that often a series of maps must be interpreted together to arrive at a correct conclusion.

The previous examples of case overlays on income-eligible person maps are easily understood; however, they have a flaw in that densely clustered case closure dots can cover and obscure the underlying income-eligible distributions. The ratio maps presented here solve the problem by plotting the result of the number of closed cases divided by income-eligible persons. The



Map SL-12



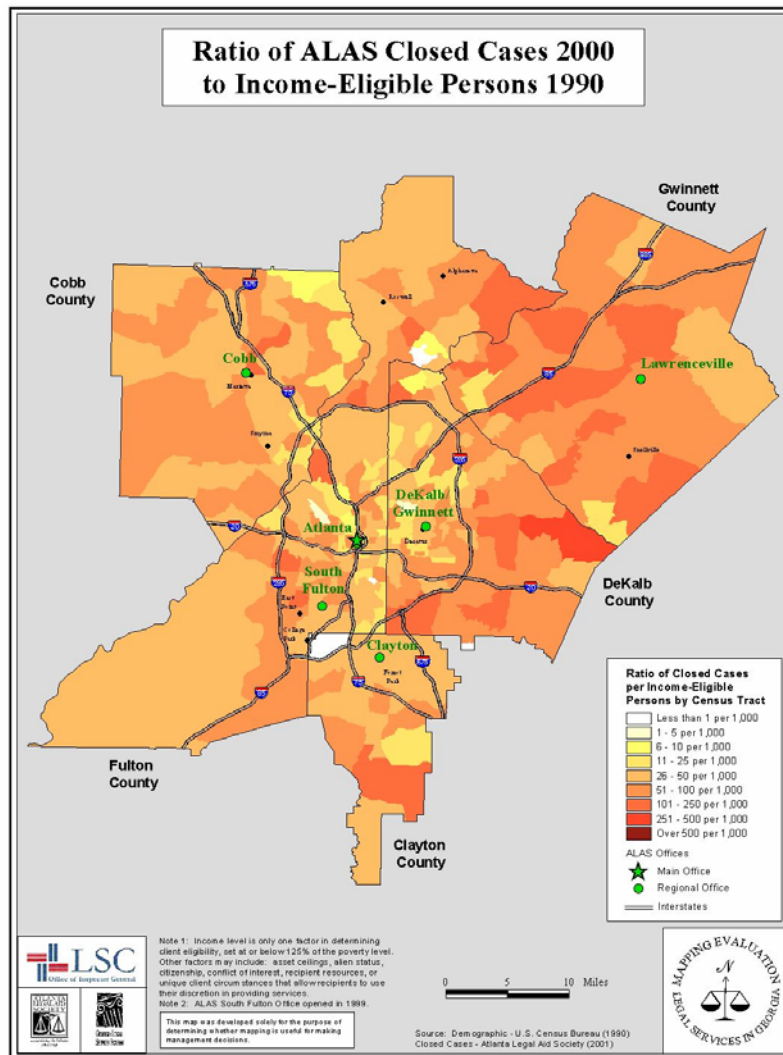
Map SL-13

resulting ratios are the number of closed cases per 1,000 income-eligible persons within a given geographic area. These maps represent an effort to use mapping to develop a standardized measure of access to legal services by plotting legal services rendered relative to the underlying income-eligible population throughout the service area.⁴ These maps are simple to read – the closer to red the greater the level of access, while the closer to white the lower the access.

GLSP regional map SL-12 shows that a high level of service is provided in the Savannah region. Overall, the results range from greater than six cases per 1,000 income-eligible in Gainesville/Athens and Augusta, to over 25 closed cases per 1,000 in the Savannah region. Map SL-13 applies the access measure at the lower county level, showing that the local urban areas around Savannah and Macon have greater access levels, partially due to large private attorney involvement programs.

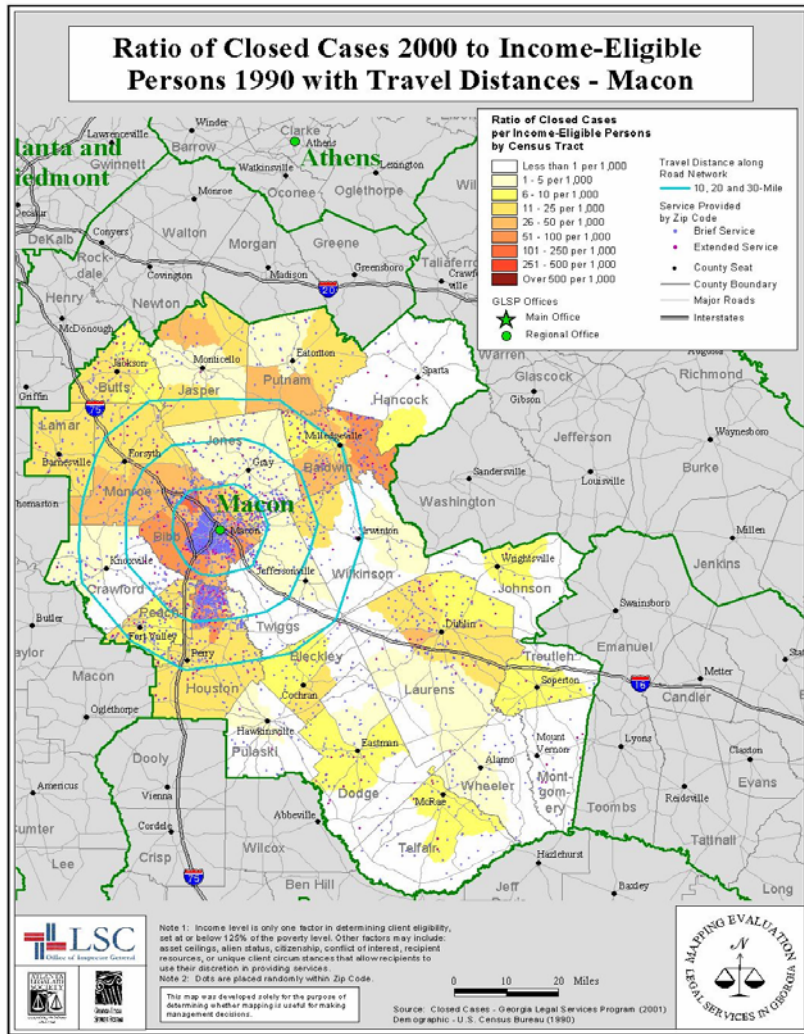
⁴ Phase I maps do not include “matter” services as defined by LSC.

Map ML-6 shows the ALAS service area by Census tract. The access ratio varies more, because of the smaller analysis level, ranging from more than six cases per 1,000 to over 250 closed cases per 1,000 income-eligible persons. These maps used in conjunction with the income-eligibility density maps shown earlier gauge the size of the underlying income-eligible population and relationship to access levels.



Map ML-6

These sample maps are a valuable asset for managing individual offices, keeping in mind each office and case has its own special context. All the sample maps show a wide variation in the levels of access to legal services across the service areas. These maps provide the ability to see, measure, and analyze the access to legal services in a standardized manner in Georgia for the first time. These maps raise valuable questions about access to these services, questions that are important for legal services managers to pursue.



Map SL-16f

Map SL-16f displays the GLSP Macon region access map, with two additional layers of information overlain. The travel distance lines take into account available roadway systems to identify possible travel barriers that may inhibit clients from reaching services. The different colored closed cases identifiers (dots) show the extent and the distribution of services received. Brief services are in blue and extended services are in red. The red dots representing extended services cases reach far out into rural areas removed from the Macon office, demonstrating that GLSP does provide extended services to outlying rural clients in the region.

The access maps represent a new and powerful analytical tool for measuring and visualizing access to legal services and identifying potentially under-served and relatively over-served populations – critical for assuring effective and equal coverage of the service area. The maps provide a tool for managing and tracking service performance over time. That is not to say the measure is without short-

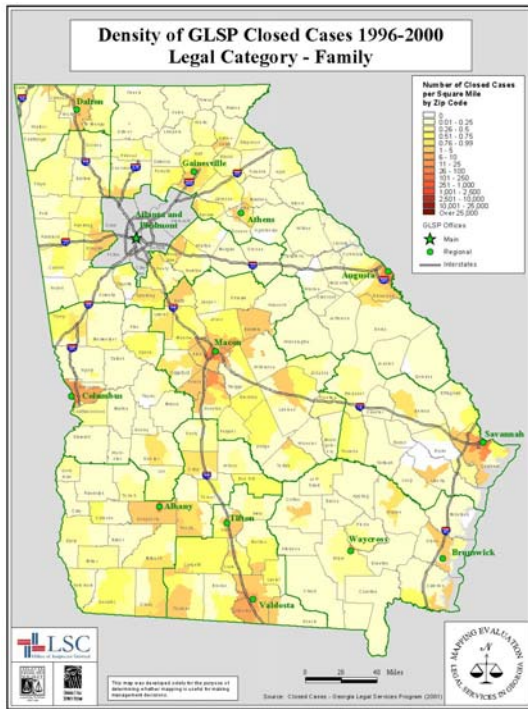
comings. The developed service measure can include other types of services such as matters if location identifiers (addresses and zip codes) are collected in the future. In addition, low numbers of income-eligible persons in a defined area inflates the measure.

Note:

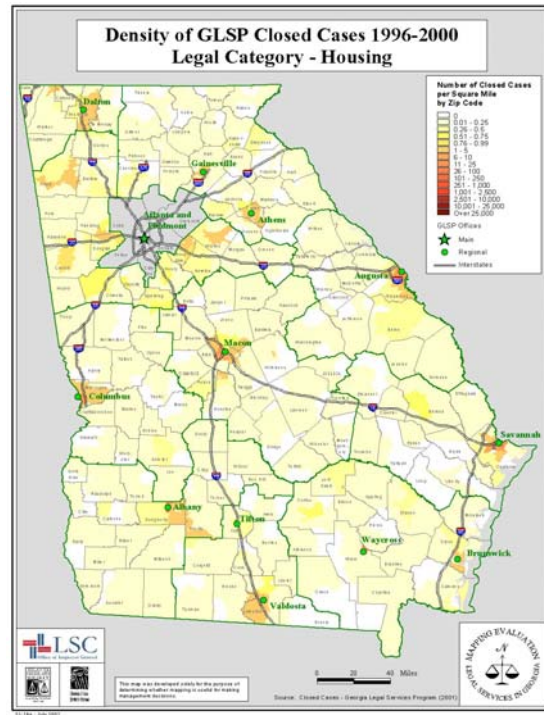
- The displayed ratio maps in this section overlay 2000 closed case data over 1990 income-eligible populations in Georgia. The year mismatch makes these current samples unsuitable for immediate management application, but does display the concept of applying mapping to the question of access to legal services. Phase II of the evaluation will incorporate the 2000 Census numbers and 2001 and 2002 cases.
- The sample access maps show that urban income-eligible persons have higher access to legal services than do the rural income-eligible persons. The difficulties the grantees face in outreach to isolated rural populations is only partially responsible for this. The rural underserved are magnified on these maps, because addresses of cases with post office boxes and rural routes were not mapped below the ZIP code level. The issue is under review and the mapping team is working on a solution before creating the phase II map series.

Grantee Management

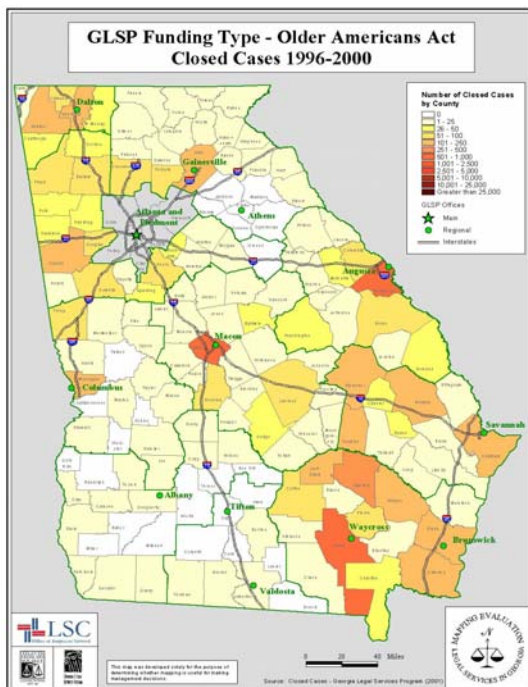
Each of the 132 developed maps in some way supports LSC grantee decision-making. Several other example maps were created to support priority setting, funder relations, allocation of office and staff resources and case administration.



Map SL-19d



Map SL-19g



Map SL-27d

Priority Setting

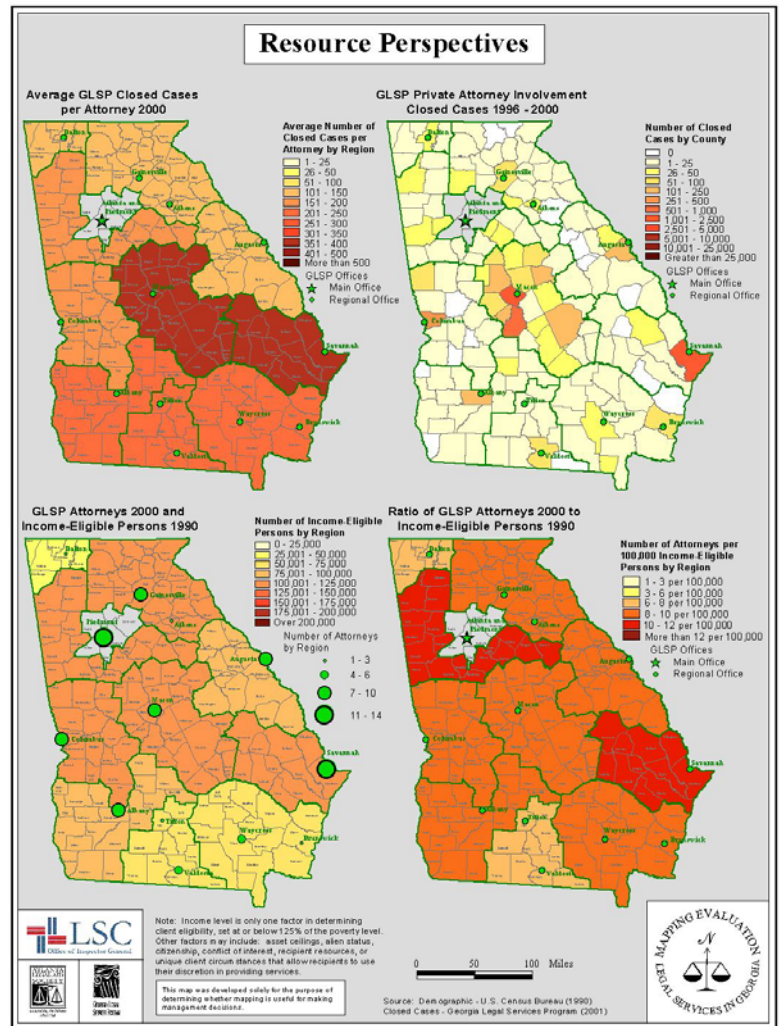
Nationwide, LSC grantees annually establish case priorities because the legal needs of income-eligible client populations greatly exceed available resources. Potential cases are screened against various factors and a grantee's priorities to determine if it is appropriate to handle the case. Map SL-19 series is an example map enabling program managers to assess how priorities are being distributed across their service or regional area and communicate their work in these areas. Developed annually, such a map series would help assess trends and patterns in case priorities, which could assist in delivery strategies and garner program support.

Funder Relations

Map SL-27d is an example of a map used to build stronger program support by showing funding partners, in this case the Older American's Act Administration on Aging, visible results of the use of their funding. This reporting capacity is a promotional asset to track and report in new informative ways on targeted programs.

Resource Management

Map SL-36 is an overview the GLSP office and staff resource allocations. The collection of maps gives various views of resources and workload within the regional areas. The upper left map shows the average cases closed divided by the number of GLSP attorneys in each region as a volume measure. The figures range from just under 150 cases per attorney in the northeast to over 350 in Macon and Savannah (dark reds). To the right, we see the map of private attorney involvement cases closed, which is primarily the reason that the closed case levels are consistently high in the Savannah and Macon regions. The map on the lower right shows the number of attorneys per 100,000 income-eligible persons. The Dalton and Valdosta regions have a ratio of seven attorneys per 100,000 income-eligible. That is over 14,000 income-eligible persons per attorney. SL-36, like many of the other maps, will lead to questions, research, and modifications. This type of map appears highly effective in demonstrating to planners, partners, funders and future funders what resources the organization has and just how resource-constrained LSC funded legal services are.

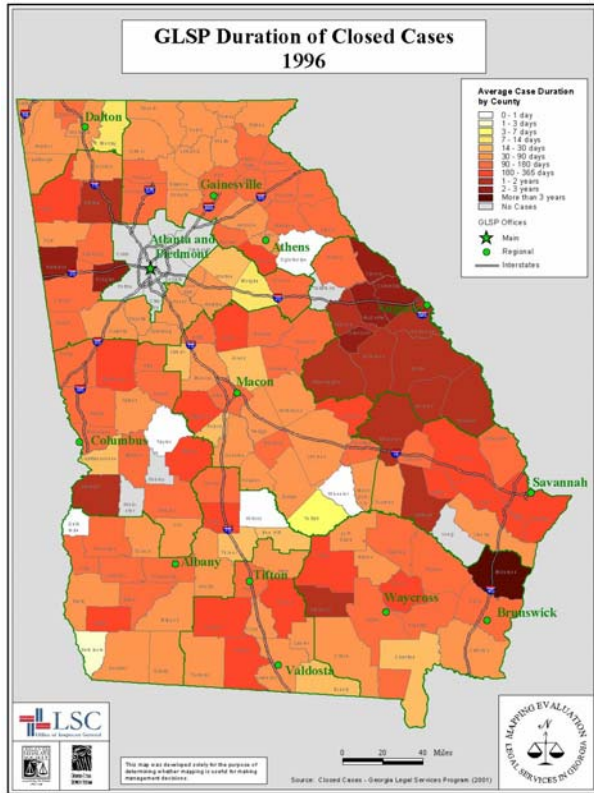


Map SL-36

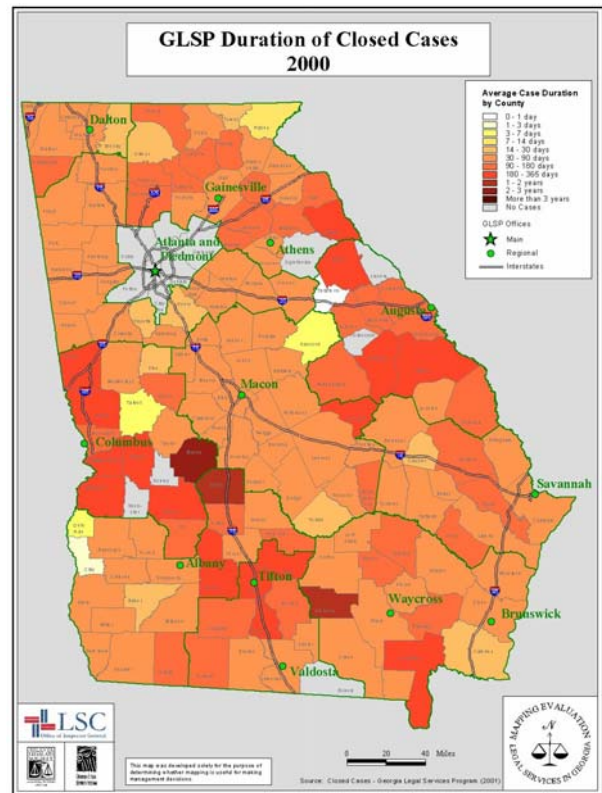
Additional maps were created to analyze the possible move of a GLSP office from Dalton to Rome working under the premise that Rome offered greater private bar resources. However, a review of the income-eligible population determined that the office was better placed in Dalton to be more accessible to the low-income community.

Case Administration

Maps SL20a and b, demonstrate that case administration could be improved if grantee management were informed of administration issues and operating trends on a regular cycle. In this instance, the duration of case closures was unexplainably long in the Augusta region in 1996. The



Map SL-20a



Map SL-20b

2000 picture shows vast improvement. Management can only address such issues after the problems have been identified and brought to their attention – that is the role of a good management system.

Grantees' Evaluation

Many of the long-term, tangible benefits from this project will not be known for some time; however, the general consensus is that the sample maps represent mapping as a useful tool for legal services, both from a management decision support and a program promotion standpoint. The major caveat is the Income-Eligible Person numbers need to be updated to the Census 2000 standard in approximately 35% of the Phase I maps so they can be made suitable to support management decision-making. From a program promotion viewpoint, the maps can be used as one-page program promotional hand-out to demonstrate to legislative, court, social services and funding partners the extent of the problems faced in their region and the success of the programs in place. To support general management and efficient service provision, the grantees believe an annual production cycle for most maps with timely information would be beneficial in spotting trends, evaluation, planning and goal assessment; and, only when addressing specific issues, maps would be generated on an ad-hoc basis. The grantees felt that in order to minimize the impact of an odd one-year occurrence it would be wise to use multi-year map comparisons for decision-making.

All parties agree that training will be essential for the development of mapping technologies in legal services. Users need a certain level of sophistication or map data could be poorly interpreted or even misused.

GLSP and ALAS see the benefit of continuing the project by incorporating data from the 2000 U.S. Census and 2001 and 2002 case data and await the OIG Mapping Evaluation – Legal Services in Georgia Phase II project proposal.

GLSP Evaluation

“These maps are the starting point that prompts you to look at other information and ask additional questions about why things are the way they are.”

In the view of Ms. Phyllis Holmen, Executive Director of GLSP, the use of maps as a legal services management tool has benefit based on her experience with the project. “These maps are the starting point that prompts you to look at other information and ask additional questions about why things are the way they are. Current census data would (only) make these maps even better in serving as a management tool.” These maps will assist with strategic management decisions. However, it will require more analysis,

education, and time in working with the maps, understanding them, and comparing them to each other to grasp their full potential.

GLSP has used them as a tool when addressing the GLSP Board of Directors and program mid-managers. Ms. Holmen felt that the use of these maps in the Georgia state planning process is possible although more review is needed to determine how or which maps to integrate into the state planning process. One possible use is resource allocation. The maps definitely show a disparity in resources between the GLSP service area and Metropolitan Atlanta.

Historically, GLSP had only county tables and charts for analysis of the same information as in the maps. However, the maps were constructed using lower level data, vividly depicting the differences that exist between regions, counties, census tracts and communities in the way that only maps can. The maps generate useful views and subsequent questions that probably would not come to mind otherwise. Ms. Holmen expressed that “currently office managers use their experience,

common sense and local knowledge to target their services, but this is not anything that has been analyzed or communicated in a visual way. The maps could be useful in making proposals to funding partners.”

Although GLSP sees the benefit of employing the maps in strategic planning and deploying services, more information, design work and time is needed for the maps to identify legal trends. One innovative use of these maps that surfaced during these discussions was the potential for initiating outreach projects. The maps could be shown to local law schools to identify needs in their areas. The schools could then organize their students in serving those target areas.

To analyze the sample maps Ms. Holmen divided the maps into five categories based on use and selected those maps she and her regional managers considered most beneficial. These categories are demographics, service data, funding codes, problem codes and miscellaneous.

GLSP found the demographic maps containing case closure data much easier to interpret than data tables or charts. Poverty population maps are very useful in showing concentrations of people and GLSP's office locations in relation to potential clients. This type of information aids in deploying resources. The Medicaid and Supplemental Medicare maps can assist GLSP with applying for a grant from a new foundation in Georgia that is interested in looking at access to healthcare around the state. They help to show the level of activity and participation in these respective programs.

“This type of information would be hard to come by any other way than a map.”

The service data maps ensure that the right areas are targeted and the right services are delivered in the right locations, in the right proportions. “To sum it up, it is self-evident that maps assist with identifying concentrations and distributions of populations – this is what they do.” For a rural program such as GLSP, however, the service data on a statewide map can be spread so thinly that the map loses impact. This, in part, is due to small numbers involved and a function of rural populations being so scattered. As for the rural area aggregations, zip code proved to be more useful in this case, but there did not appear to be much of a difference between the zip code and census tract aggregations.

The ratio or access to case services maps, were very useful in analyzing proportional access to services. GLSP was pleased to find that extended services were fairly distributed within each region – not just concentrated around each office's city location. More brief service cases were expected outside the 30-mile radius on the ratio maps because of their 800 numbers, but this proved to be unfounded. Ms. Holmen said, “This type of information would be hard to come by any other way than a map.”

The problem code maps probably would be more beneficial on a local level than statewide. Their sparse data and small sample sizes diminish their impact. This is due primarily to rural areas being so spread out. On the other hand, this dispersion of rural population underscores the problem with resource allocation. Although resources are distributed the same way in rural areas as in urban areas, the outreach costs associated with rural areas, such as long distance phone calls and travel time, are much higher. Finally, there is some risk that viewers of these maps may draw inaccurate or improper conclusions based on these maps given the dispersion of the data. Care must be taken to assure that additional explanation would be provided about the weaknesses of the presentation.

The funding code maps and significant change maps will be useful for management as well as funders. The resource perspective map raised many questions relating to disparities – questions that have good explanations that are not reflected by the maps themselves. For example, a difference in

case closure statistics from region to region may be a function of a difference in the complexity or type of cases accepted between offices or the size of the region and geographic barriers (such as travel over mountains to reach clients). As stated earlier, however, the maps raise questions that generate further useful program management discussion about these issues. Care must be taken that the maps are not used improperly by funders or other interested parties.

The miscellaneous maps and the duration of closed cases map each focus on a single management issue. These maps revealed a disparity in case duration in two offices and resulted in further analysis of the issue. Later maps indicated that the situations were being addressed.

ALAS Evaluation

Mr. Steven Gottlieb, Executive Director of ALAS, said that maps can be a useful management tool and having the right information, with the right presentation at the right time is certainly of great value. "If you can think of something that you want to demonstrate in a map, then it can be a useful tool. My problem is not having too little information, most of the time it is having too much. Relevance of the information is the key. The challenge is how do you decide what needs to be targeted. More times that not, maps generate more questions, thus generating more strategic discussions on deployment of resources."

"... More times than not, maps generate more questions, thus allowing more strategic discussions on what needs to be targeted."

Mr. Gottlieb commented he planned to use the current maps as a marketing tool for supporting funding initiatives and educating constituents on the issues in their service area. One of the toughest issues facing ALAS is a 30% growth of the poverty population in its service area since 1990. According to Mr. Gottlieb, "the maps supported what we (ALAS) already knew, and they served to demonstrate our work in a graphical way." For example, ALAS knew that a potential office expansion may be required in Gwinnett County. The 2000 Census data and the SL-35c map confirmed the conclusion in a convincing way by displaying the rapid growth of low-income persons in that county as compared to the other counties in the state. In addition, the low-income data ALAS had historically used was county level data, so the income-eligible maps generated at zip or census tract level were new and helpful in identifying concentrations of the low-income population within counties.

Mr. Gottlieb pointed out that a most beautifully crafted map is only as useful as its supporting data is complete, timely and accurate. The maps provide a fair representation of how mapping can be applied to legal services. Although to be meaningful, the maps need to encompass all of Georgia's resources – not just those of ALAS and GLSP. For example, the Hispanic population in Atlanta has other legal resources it uses, besides those provided by ALAS.

"The maps supported what we (ALAS) already knew, and they served to validate our work in the region in a graphical way that easily conveys our successes."

From the perspective of an urban-area legal services manager, Mr. Gottlieb felt that the sample maps that were produced generally provided too much general information on too large of scale. The maps often displayed a micro-scale analysis of a large population in a relatively small area of space where more detailed, lower level maps would help target specific areas or anomalies within those counties. ALAS needs to focus on where the anomalies (concentrations or lack thereof) exist and attend



to those. ALAS is interested in local level mapping efforts that could aid in research and litigation support of local issues, such as those involving predatory mortgage lending.



Conclusions

Maps are a powerful and credible decision support and reporting tool to help managers evaluate access to legal services, promote legal services and deploy resources. The OIG, working closely with the Georgia grantees, has determined that the use of maps as a management tool has potential long-range programmatic benefits in the following areas:

- ♦ **Increasing access to legal services for low-income persons** – Maps offer a picture of the geographic distribution and movements of poverty and LSC income-eligible populations. When compared with clients served and legal services provided, the under-served can be identified and addressed;
- ♦ **Strengthening planning, resource and performance management** – Mapping provides a visible model of the legal services environment supporting service provision, priority setting, and deployment of office locations and staff. Maps have promise for measuring the success of grantees' various programs and outreach initiatives; and,
- ♦ **Improving program promotion** – Maps show potential funders the extent of the legal services contribution to the low-income community and clearly document the unmet need for legal services. Maps effectively communicate the disproportionate size of the income-eligible population compared to the available resources. They are a persuasive tool that managers can use when seeking additional funding from federal, state, local and private sources.

Maps are powerful management tools because they illustrate the social changes in communities over time with a visual presentation that can not be achieved with data tables or graphs. Low-income demographics and legal services operating trends become visible and communicate valuable management information. With this information, managerial focus and decision-making can be sharpened on strategic issues such as increasing access to legal services for low-income persons. The inherent ability of maps to summarize and display legal services performance factors critical to strategic planning and allocation of resources makes them a useful asset for design and management of state justice communities.

Important Concepts

The evaluation identified several key concepts or lessons in the application of mapping in the legal services environment.

1. Mapping as a management tool requires the same basic elements of any good management system. The data must be relevant, credible and the level of accuracy well defined if the maps are to be applied appropriately and work credibly. The maps must be clear and encourage further analysis, use and action.
2. In legal services mapping there will always be incorrect or partial addresses that cannot be located on a map. A useful map displays a distribution that is representative of the total population's distribution and shows no bias in that representation. The maps produced in Phase I attempted to locate the maximum number of cases possible and have no significant bias. Future legal services maps should include an address accuracy rating score on the face of each map so the reader understands the completeness and accuracy of the representations. The next generation of case/services management systems should assign mapping

coordinates upon data entry to each address and ensure the completeness and correctness before the address is accepted. Mapping could then become a dynamic tool for use in daily or weekly operations management support rather than an after-the-fact planning device.

3. This project employed the U.S. Postal Service ZIP Code and the U.S. Department of Commerce, Bureau of the Census geographical area systems. Census level mapping is preferred for demographic maps because all of the Census data, including poverty numbers, are stored under this system. The Census level mapping most accurately represents the distribution of legal services clients but it requires a complete address. The ZIP Code system was created to ease the delivery of mail through a 5-digit identification of the individual post offices. ZIP Codes change or migrate on occasion and ZIP Code boundaries can cross county and state boundaries, making jurisdictional counts inaccurate. ZIP Codes are useful for mapping the geographic distribution of cases across large areas like states, metropolitan counties and rural regions.

This phase used ZIP Codes for mapping the more rural communities of Georgia because in these areas address matching to Census geography was inadequate. Rural populations could only be mapped at ZIP Code or county levels without introducing bias into the maps. Future legal services mapping should accommodate both geographical location systems.

Rural areas generally have lower numbers of addresses locatable in Census geography due primarily to the large numbers of PO Boxes and rural route addresses. Maps for rural areas were drafted using Census geography but were unreliable and not finalized. These draft maps under-represented the quantity of legal services available to those in the most rural areas. Methods that overcome the problems of PO Boxes and rural route addresses were developed, but must be tested. They include:

- ♦ Providing for the conversion of Census data to ZIP Codes, so it can be combined with case data and mapped at the ZIP Code aggregation levels; and,
 - ♦ Placing rural addresses that have PO Boxes, rural routes or other non-specific addresses into the statistically most likely zip code, county, Census tract and block group by using income-eligible poverty population distributions as a guide.
4. This phase of the evaluation aggregated the case closure data at a variety of geographic levels. Based on feedback from the grantee map assessments and a literature review non-aggregated geographic coordinates should be used to achieve the accuracy and detail needed for the neighborhood application of mapping.
 5. For manageability sake the 132 maps in this project must be reduced to a core set that are key to management decision-making and useful in a variety of circumstances nationwide. Year 2000 historical services baselines should be created and maintained where possible as a reference point where the Census and Case data overlap.

The Next Steps

Over the 3 to 5 year time period further preparatory and analysis work must be accomplished to develop mapping into a usable, affordable and accepted legal services management tool. The OIG has identified the following evaluation areas that need to be addressed:

1. The preliminary map styles need to be evaluated in a variety of grantee circumstances, including areas with dense poverty, areas with extreme changes, and very rural areas so that standard for legal services maps can be established.
2. The Georgia maps need to be updated with the comprehensive 2000 Census poverty and income-eligible persons data and corresponding cases, so that grantee management's use of the maps can be further evaluated.
3. Future mapping projects should include non-LSC legal services providers and the courts to better represent the full scale of legal need and the service availability on a statewide basis. LSC defined "matters" and other non-case legal services need to be reflected in maps to more accurately represent access and services available to the low-income community. The services provided that are not applicable to mapping should be noted.
4. Mapping of neighborhood-scale legal services needs to be further explored. At the local level, mapping has the potential to help identify neighborhood needs and access to services, and support the planning and managing of initiatives and potentially provide litigation support.
5. Methods for reducing the cost of mapping and a means of making mapping widely available to legal services managers and providers need to be explored. Means of ensuring proper address entry, automated generation of map coordinates, access to complied income-eligible Census data, bulk pricing on mapping software and internet-mapping tools need to be developed.
6. An educational process to spread technical know-how and spur acceptance of mapping as a legal services management resource is needed for planners, managers and technical leaders in the legal services community.
7. Future projects should involve LSC management and state justice communities in order to cultivate and fully understand their mapping interests and needs.

OIG PLANS

The OIG is continuing the mapping evaluation project, leveraging the Phase I work to improve standards and methodologies and refine the core set of maps. The OIG is working with the Georgia grantees to update a core set of the Georgia maps with the recently released Census 2000 demographic information and 2001 and 2002 case data. Five California grantees and the OIG are testing maps in the nation's most extreme urban and rural low-income environments. The OIG is evaluating cost effective ways to economically procure mapping software and data, and generate maps using Internet-mapping technologies.



Technical Appendices

The technical appendices are included to give the interested reader information on the technical aspects of the Mapping Evaluation and to assist other legal services mapping projects.

Appendix A – Geocoding of Legal Services Populations in Georgia

Appendix B – Statistical Analysis

Appendix C – Map Production

Appendix D – Categorizations

Appendix E – Cartographic Standards



Appendix A – Geocoding of Legal Services Population in Georgia

Introduction

The Office of Inspector General (OIG) of the Legal Services Corporation (LSC), in cooperation with LSC's two grantees in the State of Georgia, Atlanta Legal Aid Society (ALAS) and Georgia Legal Services Program (GLSP), is undertaking an evaluation of mapping. In the statewide Georgia evaluation, LSC/OIG will seek to determine the usefulness of conventional and electronic maps in supporting operational and strategic planning at the local, state and national levels.

The first step in the project was to geocode address data for cases closed/clients served by the grantees. This report documents the geocoding work as required by the June 1, 2001, Geocoding Contract and Statement of Work entered into among the OIG, the two Georgia grantees and the geocoding contractor. Peachtree Geographics of Marietta, GA is the geocoding contractor and the author of this document.

Background

Geocoding is the process by which street address and ZIP Code data are converted into latitude and longitude coordinates, and ultimately assigned geographic identifiers stored in a database that can be geographically represented on a map.

For the purposes of the evaluation of mapping the OIG is employing both the U.S. Postal Service Zone Improvement Plan (ZIP) Code and the U.S. Department of Commerce, Bureau of the Census (Census) Geographical Area systems.

The ZIP Code® system was created in 1963 by the U.S. Postal Service to ease the delivery of mail through a 5-digit identification of the individual post offices. All case records sharing the same ZIP Code are mapped to the same location, the location of the population centroid of the ZIP Code (which approximates where the population is concentrated). ZIP Code level geocodes are useful for mapping the geographic distribution of cases across large regions like states, metropolitan areas and counties.

The Census Geographical Hierarchy system, was created to support the collection, tabulation and dissemination of U.S statistical data including accurate population count used for apportionment of the seats in the U.S. House of Representatives, State level congressional redistricting, and more general social and economic charting. The Census statistical system includes hierarchy levels at State, County, Named Place, and low level Tract, Block Group and Block level identification units. Using Census level geocoding, case records sharing the same Block level generally can be identifiable within the smallest geographic area formed by streets, roads, railroads, streams and other visible, cultural and legal boundaries. Census level geocodes allow accurate representation of the distribution of clients across and within small areas like sections of large cities, small towns, neighborhoods and even a city block.



Objective

In this project, the contractor employed commercial geocoding software to match each case closed from 1996 to 2000 that had a usable address to the following geographic identifiers:

- ZIP Code (2000 standard)
- County Code (1990 standard)
- Named Place Code (1990 standard)
- Census Tract number or Block numbering area (1990 standard)
- Census Block Group identifier (1990 standard)
- Census Block number (1990 standard)

Note: Peachtree will complete Geocoding to the 2000 Census standards when the required standards become commercially available. The Census currently estimates release of Summary File 3 with Poverty data at the Block Group level between June and September 2002.¹

The geocoding methodology used attempted to maximize the number of cases geocoded at each level independently, not at any predetermined analysis level. Only automated geocoding processes were employed and therefore, additional manual intervention on the part of the grantees was not required.

The actual client street address data was retained by the two grantees and was not removed from their locations nor shared with the OIG at anytime.

Geocoding Results in Brief

The two grantees provided 165,409 case records for the five-year period from 1996 to 2000. Of these, 160,623 or 97% have a verified ZIP Code, and can be used for high-level state, county and rural area mapping. A total of 118,345 case records or 72% were successfully geocoded to 1990 Census Block Group level, and can be used for low-level city, neighborhood and urban area mapping.

Geocoding Results

Of the 165,409 total case records provided by the grantees, 160,623 cases or 97% contained at least a ZIP Code and can be mapped at that level. At the County level, 148,926 records or 90% were geocoded.

To geocode at the Census levels, cases records need to contain a usable residential street address, City or ZIP Code, and State. At the Census Tract and Block Group levels; 118,345 cases or 72% were geocoded; and, 117,102 cases or 71% were geocoded to the Census Block level. (The chart on the next page displays the Geocoding results.)

¹ <http://www.census.gov/population/www/censusdata/c2kproducts.html>



Appendix A – Geocoding of Legal Services Population In Georgia

Mapping Evaluation Phase I -- Legal Services in Georgia

Geocoding of Cases Summary for Residential Addresses								
Geocoding Status	Address Status	ALAS	GLSP	Total	ALAS %	GLSP %	Total %	
A. Cases in Case Management System		72,831	92,578	165,409	100%	100%	100%	
B. Cases with Zip Codes	B1. Geocoded to Zip Code	71,105	89,518	160,623	98%	97%	97%	
Census Levels Geocoding								
C. Rejected Addresses	C1. PO Box	1,312	7,277	8,589	2%	8%	5%	
	C2. No Address Provided	688	3,996	4,684	1%	4%	3%	
	C3. Rural Route	82	3,890	3,972	0%	4%	2%	
	C4. Homeless	71	2,506	2,577	0%	3%	2%	
	C5. Insufficient Address	727	1,466	2,193	1%	2%	1%	
	C6. Out-of-State	634	1,533	2,167	1%	2%	1%	
	C7. In-Care-Of	75	1,477	1,552	0%	2%	1%	
	C8. Only Facility Name Given	800	761	1,561	1%	1%	1%	
	C9. Total Rejected Addresses	4,389	22,906	27,295	6%	25%	17%	
D. Geocoding Failed Addresses	D1. Failed to Geocode to County (2)	3,833	12,650	16,483	5%	14%	10%	
	D2. Failed to Geocode to Census Tract	7,233	12,536	19,769	10%	14%	12%	
	D3. Failed to Geocode to Census Block Group	7,233	12,536	19,769	10%	14%	12%	
	D4. Failed to Geocode to Census Block	7,775	13,237	21,012	11%	14%	13%	
E. Census Geocoding Success	E1. Geocoded to County (2)	68,998	79,928	148,926	95%	86%	90%	
	E2. Geocoded to Census Tract (1)	61,209	57,136	118,345	84%	62%	72%	
	E3. Geocoded to Census Block Group (1)	61,209	57,136	118,345	84%	62%	72%	
	E4. Geocoded to Census Block (1)	60,667	56,435	117,102	83%	61%	71%	
<p>(1) Geocoding Success, block and block group (BG), and tract levels: These groups include "candidates" with a Census Block, Block Group, or Tracts that has been assigned based on a residential street address match. Assignments to a Census geography based on a ZIP+2 centroid, for example, are not considered a success.</p> <p>(2) Geocoding success, County level: includes geocoding of PO Boxes and Rural routes and counts candidates that have been assigned a County code based on a street address match or a ZIP+2, ZIP+4, or ZIP Code Centroid.</p>								



At the Census Tract and Block Group levels, 47,064 cases failed to geocode. Of those, 12,561 records contained only PO Boxes or Rural Routes as addresses, 14,734 records contained incomplete, non-existent or otherwise unusable addresses, and, 19,769 addresses failed to match against a Census Block Group in the commercial geocoding software. For a further discussion of the non-geocoded records, please see the ***Pre-geocoding Procedures\Identification of Geocoding Candidates*** section below.

There are large differences in the numbers of rejected cases and geocoding success rates between ALAS and GLSP. For every category, ALAS cases had a higher degree of Census levels geocoding successes. The greater success rate ranges from 18 to 22 percentage points above the GLSP numbers; for example 84% of ALAS cases were Geocoded at the Census Tract and Block levels as compared to only 62% of GLSP cases. This is attributable to some degree to the rural nature of the GLSP service area as compared to the urban setting of the ALAS service area, (e.g., the high number of PO Boxes and Rural Routes associated with GLSP's cases).

Data Preparation

Data Extraction Process

Both grantees use Kemp's Caseworks case management system, built on the Microsoft Access 2 database management system. Standard query language was used to extract the needed case records and data fields, and to copy the selected records and fields into "extract tables" (created in Microsoft Access 2000). The data was transferred from the grantees' computer systems to the contractor's notebook computer where the geocoding software was loaded. At GLSP, the transfer was accomplished via ZIP disk; at ALAS, it was via direct network connection.

Once the data reached the contractor's notebook PC, the case record tables were imported into a pre-built Microsoft Access 2000 database. In particular, Peachtree appended the grantee's extract to a "master" table. This table contained all the necessary output fields (e.g., Census Place, Block number, etc). More importantly, the use of a standard table structure allowed construction in advance of certain procedures (e.g., to identify PO boxes) and negated any differences in the grantees' case management systems (e.g., different field names in the extract tables).

Pre-geocoding Procedures\Identification of Geocoding Candidates

Peachtree geocoded records at six levels of geography, the ZIP Code and the before mentioned Census identifier levels. Prior to geocoding, extensive efforts were made to identify all the cases that contained enough data to attempt geocoding at a Census level, thus a Census level geocoding candidate. Candidates for Census level geocoding must have a house number, street name, City or ZIP Code, and State. ZIP Code level geocoding candidates consist of all case records that either have a ZIP Code already present on the case record, or have sufficient data such as street address, City and State by which the geocoding software can assign a ZIP Code.

To identify the candidates, the case records were passed through a set of filters, each one designed to detect a particular situation with the address that would prevent it from being geocoded. The filters were database queries that searched the address field for certain key words and patterns. All case records that met the criteria used in the query/filter were assigned an "address status" value (see the table below).



Address Status Values

Address Status	Description
Geocoding Candidates	
• Sufficient	The case record contained a street address, City or ZIP Code, and State. Attempts were made to geocode these records to the Census Block, Block Group, Tract and County.
• Repaired	These case records contained a street address but had a minor but systematic problem that would trip up the geocoding software if left uncorrected. (See discussion below of the repair process.) Attempts were made to geocode these records to the Census Block, Block Group, Tract and County.
• PO Box or Rural Route	For these case records, the address was a PO Box or Rural Delivery Route.
Geocoding Not Attempted	
• No address provided	The case record did not contain an address.
• Homeless	The recorded address is “homeless.”
• Insufficient Address	With these case records, some sort of address was collected. It was anticipated that these case records would fail geocoding. Examples of these are addresses that contain a street or highway name but lack a house number, or addresses listed as a motel or apartment complex (but with no street address provided).
• Out of State	The recorded address is not in Georgia.
• In Care Of	With a small number of records, the case record clearly indicated the use of a forwarding address (i.e., a home other than their own).
• Only Facility Name Given	The case records record a facility or institution as the address. These range from hospitals and nursing homes, to shelters and county jails. Peachtree scanned the address fields for key words like “hospital,” “hosp,” “nursing,” “convalescent,” “crisis,” “rescue,” “mission,” “safe,” “shelter,” “DFACS” (Department of Family and Children Services), and known facility names (e.g., Salvation Army, Union Mission, Battered Women’s Shelter, Safe House.). Please note that it is likely that some of case records that were coded as “insufficient” should really have been categorized as a “facility” but could not be because a facility name was not readily recognizable in the address. For example, old motels are often used as shelters.

Distribution Of Rejected (Filtered) Cases

The distribution of cases records rejected or filtered by the queries, is shown below.

Address Status	ALAS	GLSC		
		Cases	Percent	
• PO Box	1,312	7,277	8,589	5%
• No Address Provided	688	3,996	4,684	3%
• Rural Route	82	3,890	3,972	2%
• Homeless	71	2,506	2,577	2%
• Insufficient Address	727	1,466	2,193	1%
• Out-of-State	634	1,533	2,167	1%
• In-Care-Of	75	1,477	1,552	1%
• Only a Facility Name Given	800	761	1,561	1%
Total Rejected Address	4,389	22,906	27,295	17%

Only address records categorized as “sufficient” or “repaired” (i.e., that had a street address) were geocoded and included Geocoding of Cases Summary for Residential Addresses table on page 4. For the purposes of this project a residential address is one where the "Address status" is "sufficient" or "repaired." In other words, the case address is a normal residential address as opposed to a shelter, nursing home, homeless, PO Box, etc.

Geocoding Candidates: Address Cleansing and Standardization

Generally, the contractor did not find it necessary to carry out extensive repairs to the “sufficient” case addresses prior to geocoding. Addresses were organized properly into distinct fields: house number and street address, City, State, and ZIP Code. The addresses did not contain widespread, systematic, readily identifiable errors. Indeed, it is fair to characterize the case addresses as being of better quality than those Peachtree has observed with some of its corporate clients.

A nominal number of repairs were performed on the 1996 case records from GLSP. In their old case management system, apartment and mobile home addresses followed a format like the following address:

- Apt #1 / 123 Main Street
- Lot #10 / 123 Hwy 28

Using standard query language (SQL), Peachtree rearranged the addresses to place the apartment and lot numbers at the end of the address for 512 cases.

Other types of repairs were possible but were not performed because the potential benefits were deemed negligible. Some case records from GLSP used abbreviated City names; e.g., Mlgville for Milledgeville. In almost all such cases, the case records contained a ZIP Code, thereby negating the need for the City name (since the geocoding software would default to the ZIP Code if the City name was not recognizable).

With some ALAS case records (but not those from GLSP) the address was a shelter, nursing home, or other type of facility, and the name of the facility and its street address were sometimes mixed in



the same address field. Because the Contractor could not identify a pattern to these addresses, it was not practical to parse the field into a separate facility name and address components. If the facility name followed the street address in the field, so that the leading character of the field was house number, then the case was included with the geocoding candidates; otherwise, it was excluded and not geocoded.

In the geocoding phase, the geocoding software performed additional standardization and cleanup tasks. ZIP Codes were validated, updated and edited if necessary. Street addresses were edited to conform to U.S. Postal standards and correct obvious spelling mistakes (e.g., “123 Main Str.” was changed to “123 Main ST”). Because all of these steps occur internally in the geocoding program, the edited street address values were not captured. However, the corrected and validated ZIP Code values were captured and included in the transmittal files.

Assignment of Geographical Identifiers - Geocoding

Peachtree attempted to assign standard Census geographies from the 1990 Census to the geocoding candidate case records. Case records are assigned or geocoded to a Census Block and Block Group based on the house number, street name, City or ZIP Code, and State. Therefore, only residential address records categorized as “sufficient” or “repaired” (i.e., that had a street address) were geocoded this way.

Census Geographies

Standard Census geographies consist of a hierarchy of Counties, Places, Tracts, Block Groups, and Blocks. The Census Block is smallest level of geography in the Census hierarchy, but is less location specific than an actual street address. Census Blocks are small statistical areas bounded by features such as streets, streams, railroads, and city limits. All territory in United States is assigned to a Block. Census Blocks are aggregated to form Census Block Groups, which in turn are aggregated to form Tracts. Blocks, Block Groups, and Tracts never cross County boundaries, and at least with the 2000 Census, Blocks never crossover Place boundary lines. (Please see Appendix 5 for a diagram illustrating the relationships between Census geographies.)

Census Blocks are identified by a Census Block identity number (ID), which consists of State, County, Tract, Block Group, and Block component. Therefore, once a case is assigned to a Census Block, the State, County, Tract, Block Group components are known. For example:

Full Census ID	County FIPS	Tract	Block Group	Block
130670304011022	13067	030401	1	022

Case records were assigned to 1990 Census geographies using standard geocoding software, namely MapMarker Plus (version 6.5) from the MapInfo Corporation, a widely used, commercially produced, production geocoding software. MapMarker Plus performs two functions: First, it standardizes, corrects, and validates address and Postal values. Second, it assigns Postal ZIP Code and ZIP+4 values, map coordinates (latitude and longitudes), and Census identifiers. To keep the software current, MapInfo issues updates to the “address dictionary” quarterly. Updates capture everything from new construction to discontinued addresses, and changes to house numbers, street name, and ZIP Codes. The address dictionary in the version used for this project is the April/May 2001 version.



Assignment of case records to 1990 Census geographies is a simple process. Essentially, MapMarker Plus looks up the street address in its address dictionary and assigns the corresponding Census Block ID from the appropriate entry.

Peachtree also generated preliminary 2000 Census identifiers using a different process. The required 2000 Census data release and subsequent MapMarker Plus update will not be available until early 2002. The Contractor will revisit ALAS and GLSP at that time to finalize the 2000 geocoding. However, Peachtree believes that the preliminary 2000 are reasonably accurate for mapping down to the Census Block Group level, but not so for demographic analysis. Please see Appendix 6 for methodology.

Place Assignment

A Place boundary is a special Census Bureau construction. It consists of consolidated cities, incorporated places, and statistical units known as Census Designated Places. The latter relate to concentrations of population that are identifiable by name but are not legally incorporated by the state in which they are located. By definition only a percentage of the Georgia area is a Census designated Place. For that reason the Place geocoding statistics were excluded from the Geocoding table found on page 3 of this report. For more information about places, please refer to section 4-43 of the Redistricting Census 2000 TIGER/Line® Files Technical Documentation.

To assign case records to a Place boundary (for both 1990 and preliminary 2000), the contractor used a process known as a “point-in-polygon operation.” During the geocoding process, case records were assigned a temporary map coordinate (in addition to the 1990 Census Block ID). Such map coordinates allow one to plot case records on a map. Once this is done, those cases that fall inside a Place boundary can be identified and the Place ID assigned to the case record. For GLSP cases, 64 percent of cases records were assigned to a Place; at ALAS, 58 percent of cases were assigned to a Place.

The contractor obtained the 2000 Census Place boundaries from the *2000 Redistricting TIGER Files* from the Bureau of the Census. To make the 1990 Place boundaries the 1992 TIGER files containing Place boundaries for 1990 were used. (These boundary sets, as well as the mapping of the case records to map points, were taken from the NAD 83 Datum reference.)

Geocoding Parameters

Geocoding software can match addresses and assign geocodes at the house (or street address), ZIP+4, ZIP+2, and ZIP Code levels. To assign Census geographies to a case record, a street address was required. Therefore, the contractor tuned the geocoding software to emphasize street level geocodes, using the following settings (which would be considered typical for a geocoding project).

- Accept only street address level geocodes and do not “fallback” to ZIP Code or Zip+4 centroids when the street address is not found.
- Require exact match on house number.
- Allow a fuzzy match on the street name (to correct for misspellings).
- Allow flexibility in the ZIP Code if the City name is also provided, to account for ZIP Code changes.
- Do not accept the first of multiple matches. (When the geocoding software finds several possible matches, the software can be instructed to automatically pick the top ranked candidate.)



In an attempt to geocode additional records not matched in the first pass, two additional passes were made. For the second pass, two changes to the settings were made from those used in pass #1. The exact match on the street name was still required, but MapMarker Plus was allowed to automatically select the closest match of multiple candidates when more than one possible match was found – provided the candidate was a street address and not a ZIP + 4 level assigned geocode.

In the third attempt to improve County level geocodes only, the Contractor relaxed the requirement for a street level match and allowed geocoding of PO Boxes, Rural Routes and allowed ZIP+4, ZIP+2, and ZIP Code centroid matches. Geocodes at this level are useful for spatial analysis across a state but not for low-level demographic analyses. Geocoding successes at this level were counted only in the County level successes.

Geocoding Accuracy

Our commercial geocoding software assigned an accuracy code to every record passed through it. The code represents the success or failure of the geocoding operation, plus conveys information about the quality or accuracy of the geocode assignment. In the transmittal tables, the code values can be found in the column labeled “Geo-result.”

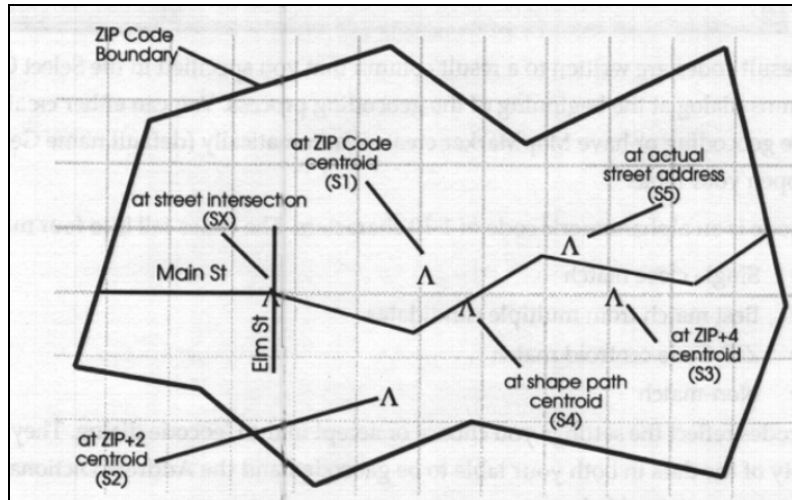
The Geo-result codes fall into four major categories, as indicated by the first letter of the code.

- S: The geocoding software found a single close match for the case record to a record in the software’s “Address Dictionary.” This is the best possible result.
- M: Best match of multiple candidates, which means that the case record matches against several records in the address dictionary. (This is not an unusual occurrence because it is often the case that the address dictionary will contain a record for the street address plus a separate record for the ZIP+4 of the same street address.)
- Z: ZIP Code centroid match means the address of the case record did not match against anything in the address dictionary but the ZIP Code or ZIP+4 did match.
- N: No match (therefore the case record failed to geocode).

From there the codes fall into sub-categories, as indicated by the second letter of the Geo-result code.

- 5: The case record is matched to a specific street address position (which is the highest accuracy)
- 4: Matched to the center of the street segment.
- 3: The case record is matched to the ZIP+4 centroid.
- 2: The case record is matched to the ZIP+2 centroid.
- 1: The case record is matched to a ZIP Code centroid.

For example, a case record assigned a Geo-result code of “S5” means that the geocoding software matched the case address to a single unique record in the software’s address dictionary and that the address dictionary mapped the address to a specific location. It is the best result possible, mapping the case record to a point close to the actual location. In contrast, if the same case record was geocoded to a Z1 geocode, then its mapping would be to a location some distance away from the actual location, specifically to the centroid of the ZIP Code. The following diagram illustrates the relative accuracy of different Geo-result codes for the same address.



(Source: MapMarker for Windows Version 7 Users Guide, MapInfo Corp., page 34.)

For the purpose of assigning Census Tract, Block Group and Block identifiers to the case records, only case records with a Geo-result code of S5, S3, M5, or M3 are considered sufficient quality. Only these records are matched to a street address (or possibly a ZIP+4 centroid), which is a minimum requirement for assignment to Census geographies.

The complete accuracy table with Census and lower quality geocodes is shown on the next page.



Geocoding Accuracy

Census Quality Geocodes

Accuracy Code	Description	ALAS	GLSP	Block Group Count
S5	Single Close Match - Point located at the street address position (Highest accuracy)	57,642	54,404	112,046
M5	Best Match From Multiple Candidates - Point located at the street address position (Highest accuracy)	3,025	2,031	5,056
S3	Single Close Match - Point located at ZIP+4 centroid	493	680	1,173
M3	Best Match From Multiple Candidates - Point located at ZIP+4 centroid	49	21	70
Total		61,209	57,136	118,345
Lower Quality Geocodes				
Z3	Postal Centroid Match - Point located at ZIP+4 centroid	16	21	37
S4	Single Close Match - Point located at center of the shape point path	-	31	31
NX	No-match - Point located at street intersection	1	-	1
S2	Single Close Match - Point located at ZIP+2 centroid	1,652	3,882	5,534
M2	Best Match From Multiple Candidates - Point located at ZIP+2 centroid	7	23	30
Z2	Postal Centroid Match - Point located at ZIP+2 centroid	-	1	1
S1	Single Close Match - Point located at ZIP Code centroid	190	1,212	1,402
M1	Best Match From Multiple Candidates - Point located at ZIP Code centroid	-	5	5
Z1	Postal Centroid Match - Point located at ZIP Code centroid	-	6,673	6,673
Total		1,866	11,848	13,714

Data Output

As specified in the Statement of Work, case records were separated into individual Microsoft Access 2000 files and tables, with one file and table for each case year and grantee. All files and tables follow the naming convention of GGGG_YYYY, where GGGG is the abbreviation for the grantee and YYYY represents the case year. File name extensions are “MDB.” See Appendix 1a and 1b, Transmittal Documents, for a list of the files and sizes and Appendices 2 and 3 for a record layout, data dictionary, and explanation of the codes found on the file (e.g., legal problem codes).

Prior to transmittal, some minor editing of the case records was performed to standardize certain data fields. One of the project requirements was to divide the cases by year. The grantees themselves assigned most records in advance to a case year. A small number of records not assigned to a year by the grantees, were done based on the Date Closed value.



Also, the 1996 case records from GLSP came from a case management system that is no longer in use. It used numeric codes for demographic descriptors such as race and age. The data formats were converted to match those used in all the other case records.

On reviewing the data within the output files all appropriate data is complete and in agreement with the original source files including ALAS files which contained numerous missing age data values.

Recommendations and Lessons Learned

Bias In Demographic Profiles

With a fair number of non-geocoded records, it is legitimate to ask if a demographic profile derived from Census demographics would be biased. To help evaluate this possibility, Peachtree recommends undertaking two analyses.

- **Distribution of Non-Geocodes Rural (GLSP) vs. Urban (ALAS) Service Areas**

Determine whether the Census-level differential (20%) between successful rural and urban geocoding distributions causes any particular bias. P.O. Boxes and rural route addresses represent the most common reason for rejection, accounting for almost 7% of all cases and 12% of GLSP cases. A review should be conducted to determine if they are concentrated among a few legal problem types, a few geographic areas, or if they represent mostly rural clients of the Grantees.

- **Distribution of Legal Problem Types**

Determine whether some types of legal problems are more affected by rejected records. For example, cases related to nursing home problems (problem code 59.1) would be more likely than most to record a nursing home as the address. Besides being difficult to geocode in the absence of a street address for the nursing home, one can question whether the neighborhood surrounding the nursing home provides a meaningful basis for attributing demographic characteristics to the case.

Upgrade the Case Management Systems

If mapping were a long-term initiative, then two modifications to the existing case management systems would greatly facilitate future geocoding.

- Add a field to the case management system to differentiate the type of address (e.g., permanent residence vs. a shelter) and another field to capture non-residence data such as the name of a shelter (and therefore separate it from the address). This way, more knowledge can be gained as to which addresses represent permanent residences.
- It is more than feasible to install the geocoding software in-line with the case management system. That way, at the same time an address is keyed into the case management system, the geocoding software could evaluate, standardize, and geocode it *before* the record is written into the case management table. Besides greatly improving the quality of the addresses and raising the match rate, such a modification would enable the implementation of new practices. One such practice could be an “early warning system” for detecting problems that are prevalent in a given geographic area, e.g., some types of consumer finance problems like predatory lending.



Appendix B - Statistical Analysis

Introduction

A statistical analysis of the map data used in the Mapping Evaluation was performed to ensure that the maps represent the data fairly and show little or no bias in those representations. The analysis evaluated the potential of bias in location, map representation and/or aggregation, and offered recommendations for future mapping efforts. For example, the maps representing demographic counts and counts of legal cases were reviewed to determine whether the underlying data supported the visual representation that the maps appeared to depict. The review was conducted by William Bachman, Ph.D., from the Center for Geographic Information Systems at Georgia Institute of Technology.

There was no evidence of statistically significant bias in the way the data was being represented on the produced set of maps.

Results and Recommendations

There was no evidence of statistically significant bias in the way the data was being represented by the produced set of maps; however, some anomalies in the original case data (pre-geocoding) indicate that care should be given in future mapping efforts. Specifically, address location information for Hispanic clients was generally poorer than other ethnicities. In addition, minimum match-rate geocoding levels need to be established for future efforts to prevent misrepresentation at less than the ZIP Code levels in extreme rural areas. All rural area maps for this phase were produced at aggregations of ZIP Code level or and higher for this reason. Alternative approaches will be attempted in Phase II to improve results.

In general, bias issues are not substantial, as long as all of the applicable case data is initially included in the analysis. Bias issues are much more substantial when 'samples' are used to represent information or evaluate trends. As long as future mapping efforts access all the available case data, bias issues will only occur when map representations rely on a subset of the data. Since the client's ZIP Code is available in almost all cases, sample bias will only occur for lower than ZIP Code level mapping and only when the geocoding match rates have dropped below a certain statistical determined level. The following recommendations arise from the various discussions and data analysis and are intended to improve the legal services mapping process by preventing any misrepresentation of information.

- ♦ Bias in geocoding success rate by Closure Code, Problem Code and Ethnicity should be evaluated before mapping begins.
- ♦ Any maps representing 'count' data at U.S. Census or ZIP Code geography levels should be presented as density maps due to an 'area weighting problem'. An example is when two counties have the same count of cases or income-eligible persons, but one county is much larger than the other. In count maps the large counties would visually dominate the map, over-representing the importance of their areas. This is overcome by using density maps, or count-per-square-mile which serves to normalize the data and produces a fair visual representation.
- ♦ In order to map at smaller than ZIP Codes levels, at least 10 successful address-level geocodes per ZIP Code must be present where the ZIP Code match rate is less than 30 percent. In addition, a street-level address match rate of at least 10 percent is required.

Representation Cautions

All maps were evaluated for representation bias. Comments were noted on each map's individual description document. A number of maps had comments intended as interpretation cautions, not criticisms. The following cautions appear:

1990 Census Data

A number of the Phase I maps use and compare 1996-2000 case closure data to 1990 U.S. Census data, because the 2000 Census data was unavailable below the state level at map production time. Technically, the comparisons are well represented and fine for creating sample maps; however, the applied use of the comparisons is not recommended because the time differences and the speed of demographic change is swift in some parts of Georgia.

Dot Density Maps

For Phase I, a computer algorithm randomly distributed the dots throughout a geographic area to represent the total data value, such as the number of closed cases in a region. Dot densities can have a potentially misleading effect, since a user may assume that the dot is placed at the actual geographic location of the data point. Each dot density map is noted with a disclaimer stating that dots are placed randomly and the maps are correctly titled and effective in describing the density of the region.

Empty ZIP Codes

Certain maps contain ZIP Codes with values close to zero that are drastically different from their neighbors. These ZIP Code's value differences are likely due to alternative land use. For instance, an airport or military base may occupy an entire Zip Code, but have reported demographic counts of zero. Caution needs be taken in these cases to verify that there is no problem with ZIP Code misidentification and use of the Establishments maps found in Appendix C is recommended.

Scope

The requirement for the evaluation of bias was outlined in the original project scope of work, "Of the 166,000 closed cases by ALAS and GLSP in the 1996 through 2000 time period, approximately 161,000 had or were assigned ZIP Codes. For U.S. Census level geocoding, of the original 166,000 cases, 27,000 had incomplete addresses and were rejected. An additional 21,000 cases could not be geocoded to the census block level using the geocoding software, despite having an apparent address. The geocoding rates for ALAS were consistently higher than those of GLSP. Possible bias in the address-deficient cases should be examined."

The original approach to the bias evaluation was to examine the incidence of geocoding failures and missing addresses in relation to closure codes and legal problem categories. Maps showing addresses that were geocoded only to a ZIP Code were intended to identify geographic areas that had low geocoding match rates. As the bias evaluation proceeded, the bias map and chart designs were revised to better evaluate the geocoding bias within the client base. Charts were produced that compared each closure code and ethnicity by geocoding type. The bias map was amended to show the percentage of addresses successfully matched to a Census block-group, within the state's ZIP Codes. This tested whether mapping at lower than ZIP Code level was representative in various locations across the state.

Location Analysis

There is evidence to suggest that Census block and block group geocoding could be negatively biased for rural cases. This is a well-known problem in wide area mapping efforts due to the variability in the quality of street and address data for many rural areas. Public and private organizations that create the road network and address-range databases, which are used as a geocoding reference, have prioritized their data collection efforts using population density; therefore, rural areas often do not have the same quality of map coordinates as urban and suburban areas. The problems with rural addresses are further complicated by the increased use of PO Box and rural-route addressing. All rural area maps produced in Phase I were done at the ZIP Code level to prevent this problem from affecting the produced maps.

The bias evaluation identified the total number of cases and their address-based match rates for each ZIP Code (Table 1). For a statewide effort, the overall match rates compared favorably with rates typically seen in such projects. The highest match rates (>80%) exist within the Metro areas. Lower match rates occur in rural areas due to the known problem with address information and the increased use of 'Rural Route' or 'PO Box' addresses.

In Table 1, those areas with Census level match rates less than 10 percent represent areas with potential geocoding bias. With low match rates, it is likely that misrepresentation of the data will occur if maps use lower than ZIP Code map aggregation levels, such as U.S. Census Blocks or Block Groups. This is a concern if there are less than 100 cases closed in a particular ZIP Code, and less than 10 cases can be geocoded or assigned map coordinates. In these areas, lower than ZIP Code level mapping should not be used. Figure 1 (on the next page) demonstrates the rural bias effected areas with low address matching rates. Overall, 49 ZIP Codes had case-address match rates of less than 10 percent with only 2,670 closed cases, a mere 1.6% of the total cases closed.

Table 1
Address-based Match Rate by Number of Cases

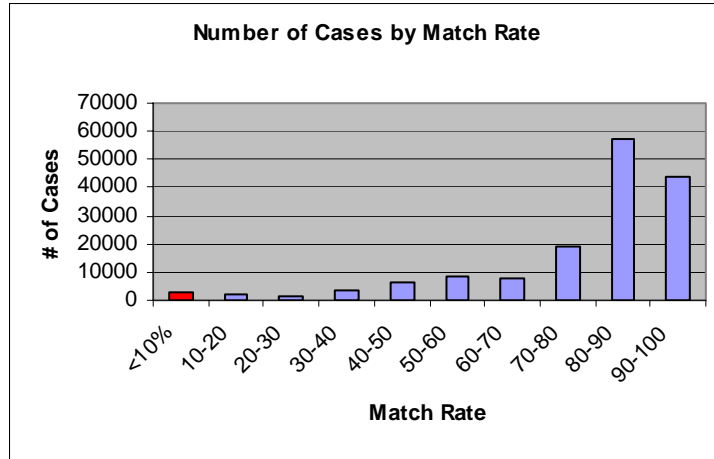
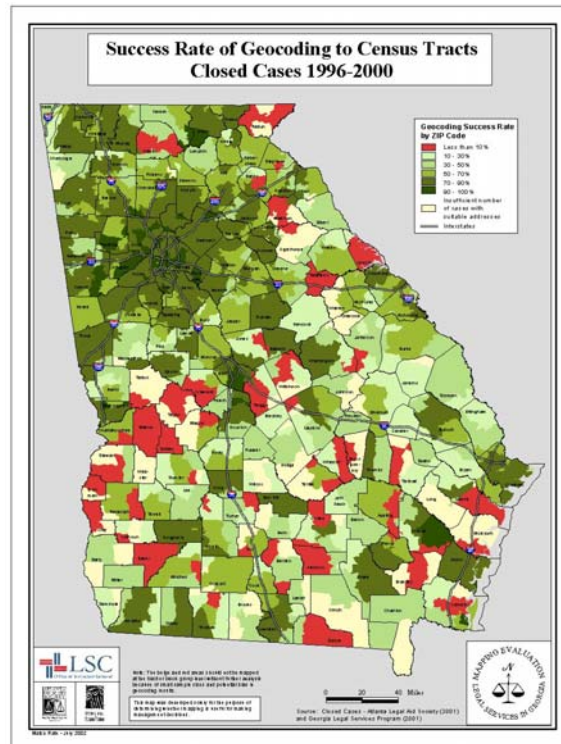


Figure 1
Successful Geocoding Match Rates of Closed Cases



To evaluate the potential geocoding bias in the case database, percentages of address-based geocoding successes were compared across the LSC standard closure codes (legend shown below). If a geocoding bias were present, some closure codes would have significant differences from the average and from each other.

Closure Code Code Description

A	Counsel and Advice
B	Brief Service
C	Referred After Assessment
D	Insufficient merit to Proceed
E	Client Withdrew
F	Negotiated Settlement without Litigation
G	Negotiated Settlement with Litigation
H	Agency Decision
I	Court Decision
J	Client Eligibility Change
K	Other
L	Administrative Closure

In Table 3, geocode rates for street address and ZIP Code level or where no geocoding was possible is displayed for each case closure code. Table 4 shows the geocoding rate differences from the average (by street address - 68%, ZIP Code -19%, none -13%).

Table 3

Closure Codes and the Percentage of Each Geocoding Type

	Address	ZIP Code	None
A	73%	16%	11%
B	68%	15%	17%
C	75%	14%	11%
D	73%	16%	11%
E	75%	12%	13%
F	64%	21%	16%
G	65%	17%	18%
H	61%	29%	11%
I	69%	21%	10%
J	76%	16%	9%
K	66%	24%	9%
L	61%	19%	20%

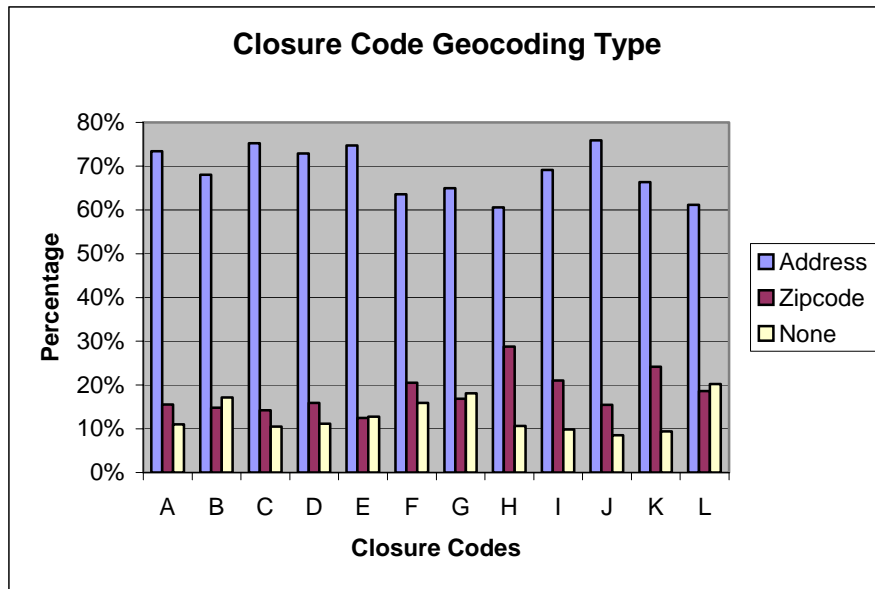
Table 4

Departure from Mean of Table 1 Data

	Address	ZIP Code	None
A	-5%	3%	2%
B	0%	4%	-4%
C	-7%	5%	2%
D	-5%	3%	2%
E	-7%	7%	0%
F	4%	-2%	-3%
G	3%	2%	-5%
H	7%	-10%	2%
I	-1%	-2%	3%
J	-8%	3%	4%
K	2%	-5%	4%
L	7%	0%	-7%

The results indicate that no statistically significant bias exists. However, closure code 'H – Agency Decision' has address-based match rates slightly lower than average and higher-than-average ZIP Code matches. Table 5 displays a bar chart of the results.

Table 5
 Chart of Closure Codes and the Percentage of Each Geocoding Type



Geocoding bias was evaluated by client ethnicity. The ethnicity codes in the data were summarized by geocoding type, as shown in Table 6. The data suggests that Hispanic case's low geocoding success rate demonstrates bias. This may be due to migrant farm worker populations, problems associated with rural addresses, or other unknown factors. Future efforts should endeavor to better characterize the reasons for the bias and attempt to correct for it at the address collection point. The impact of the bias would only be felt in lower than ZIP Code level maps in areas with low numbers of cases. In this mapping effort no such rural area maps were produced. Hispanic cases accounted for less than 5,000 total cases, and therefore did not distort the overall representation of the data.

Table 6
 Geocoding Percentage by Ethnicity

	Address	ZIP Code	None
Asian	77%	12%	11%
Black	76%	13%	12%
Hispanic	56%	21%	23%
Other	73%	13%	13%
White	65%	22%	13%



Appendix C – Map Production

After completion of the geocoding phase, the mapping services team at Atlanta-based Jordan Jones and Goulding (JJG) was provided with the case data with accompanying map coordinates. The data was placed into a Microsoft SQL database and was extracted for specific maps using queries based on the map requirements. The resulting data tables were then joined to the geography data files by the mapping software to generate the maps. Phase I mapping production was an interactive process, so that several methods could be explored and map styles iteratively refined. With further definition, mapping procedures can be developed for fully automated map production.

Mapping Software

JJG used Environmental Systems Research Institute's (ESRI) ArcView 3.2a program to complete this mapping evaluation project. The reasons for choosing ArcView 3.2a were three-fold. First, ArcView allows for the creation of professional quality maps and is specialized for a variety of map types with interpretable color schemes that permit the user to analyze trends in the data. Second, ArcView allows the user to create multiple maps from the same dataset quickly, increasing efficiency and reducing duplication in effort. Third, ESRI is an industry leader and has a record of supporting societal-benefit mapping projects.

Cartographic Characteristics

JJG established map layout standards to assist in the creation of a consistent mapping product. The colors, legends, logos, disclaimers, scale, and layout are key components in creating accurate, comparable and useful maps. By working from the same style sheets and templates, multiple team members could generate the maps and substantially reduced the possibility of error. The map templates ensured that map components were consistent on maps across the project (see Appendix D for layout standards).

Initially, the OIG requested that all maps be designed utilizing colors that could be distinguished when reproduced in a black and white format on an 8.5 x 11 inch sized paper. After lengthy discussions, and multiple color scheme samples, it was unanimously determined that creating maps that adhered to a distinguishable black and white print out did not allow enough data classes to be represented. A decision was made to go with full-color maps, allowing for many more data classes, thus more interpretable maps. Based on the decision to go with maps that fit to 8.5 x 11 paper sheets, the legend occasionally had to be moved to different places on the layout and the font sizes for the sources and disclaimers were adjusted so as to maximize the map content.

Aggregation Levels

The evaluation used different levels by which to sum and present data called aggregation levels. Separate geographic data layers were created for each grantee at the different aggregation levels, e.g., GLSP – Census tract and ALAS - ZIP code. Any calculations required, such as density calculations or ratios of cases to income-eligible persons, were performed in ArcView. Blank or null cells were set to zero before performing any calculations.

The raw geocoded data was evaluated for potential bias first, before mapping production began (covered in Appendix - B). Any suspect areas or high bias populations need to be clearly identified and the impacts need to be considered as map requirements are being determined. Evaluating these possible biases in the data could make some maps misleading and inappropriate for management decisions.

Map Types

The following five types of maps were used for this project:

Choropleth

Choropleth (solid color variation) maps represent data within a specific geography or aggregation (e.g., Zip Code) that is grouped into established class ranges to reflect the quantity or density of the mapped feature. Choropleth maps were, by far, the most common map type used for this project. Distribution, density and access to service ratio maps were all choropleth maps designed to examine Legal Services mapping in Georgia.

Dot Density

Dot density maps use dots to represent the quantity of a specific entity (e.g., closed cases) within an aggregation so the user can at a glance determine the concentration of the subject. For this mapping project, one dot represented one case. Each address dot was randomly placed within a specific aggregation (e.g. Census Block Group) and because the cases were not mapped to a specific address location in this phase – cases were only placed within a geographic aggregation such as a Census tract or a Zip Code.

Graduated Symbol

Graduated symbol maps use the dot or symbol size to show the location and the relative size or quantity of the subjects. Graduated symbol maps were used to show the relative size of the number of attorneys per GLSP region (Map SL-36).

Chart

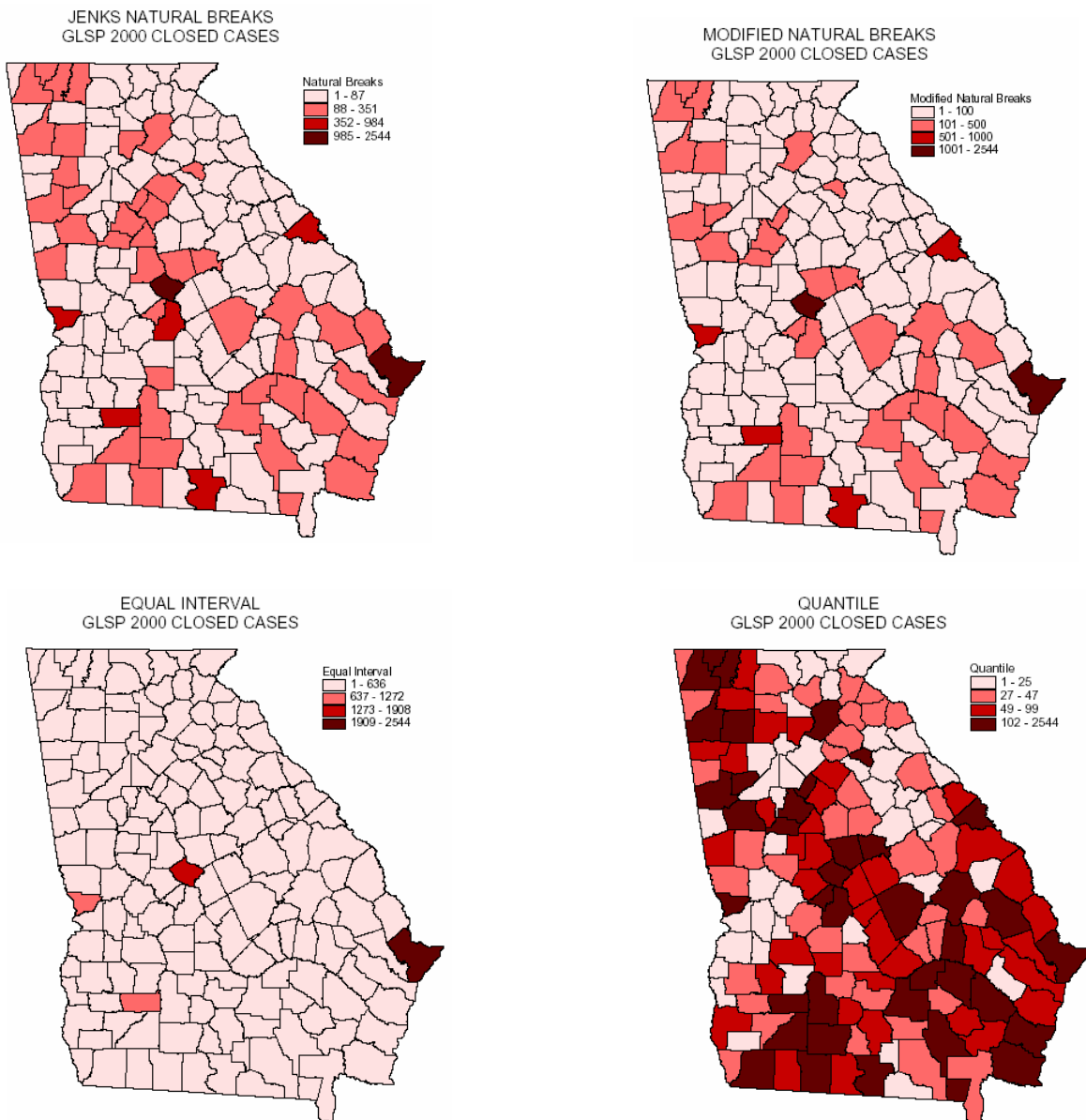
Chart maps use graphic images to represent changes in data from multiple years on a single map (Map ML-21). A small bar chart was placed in the center of each county in the Metro Atlanta region, showing the annual increase/decrease in total cases by county very effectively.

Isoline

Isoline maps are maps with lines that connect points of equal value along a surface (Map SL-16h). Travel isolines were created along a road network at specific distances from each regional office. These isolines were overlain on choropleth maps to show the relation between income-eligible persons and their travel distance to nearest legal services office.

Classification Breaks

The categorizations for the legal services maps were created after reviewing numerous classification schemes. The selected system standardizes the map legend within a subject area (i.e., Distribution, Density (non-dot) and Access maps), making them immediately comparable to each other across the various aggregations – Census block group, tract, county, state and national. Great effort was made to develop legend classes or classifications that could be applied in Georgia, but could also serve in any LSC service area. The variation in population density and legal services caseloads across the United States requires that legends contain more classes than would be necessary if producing only a single map of population and legal services in Georgia. JJG provided the OIG with sample legends using a variety of statistical classification methods, including Jenks Natural Breaks, Modified Natural Breaks, Equal Interval and Quantile (shown below). The OIG was seeking an easily understandable classification system that provided an effective scale for analysis. The graphic below depicts the same data by the suggested methods.



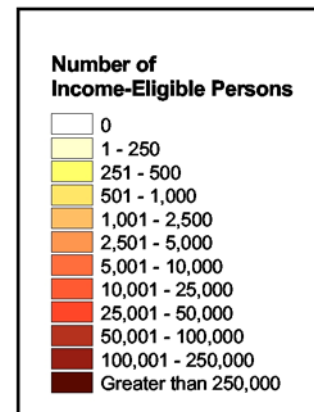
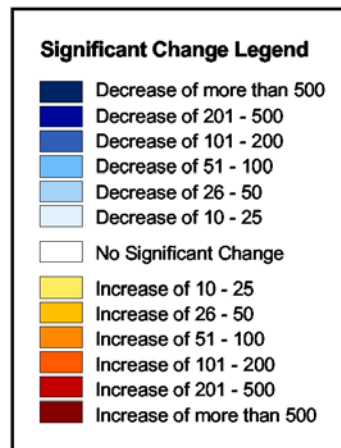
After numerous classification discussions, the OIG provided JJG with specific standardized legal services legend schemes (in Appendix E). These legends are data-specific classifications with logical breaks that could serve as a standard. The classifications follow an approximate logarithmic scale. Not all legend classes were used on many of the maps. Some reviewers noted that occasionally the number of classes made interpretation of Georgia data difficult and required familiarization with the legend scheme. This was judged to be an acceptable trade-off for the benefits of the general application of the legend system across regions of the country creating the ability to compare maps over-time and from region-to-region that is gained with standard classification schemes.

Aggregation: County, ZIP Code, Census Tract, Block Group

Aggregation: County

Colors

The color scheme selected for Distribution, Density (non-dot) and Access/ratio maps ranged from shades of blue representing cold-spots or areas of negative growth; to white representing zero or neutral growth; through yellow, orange, red and brown representing hot-spots of change or extreme activity. For informational maps showing demographics not related to income-eligibility, a light green to dark green color scheme was used. The purpose of using a different color scheme was to highlight the difference in the nature of the maps.

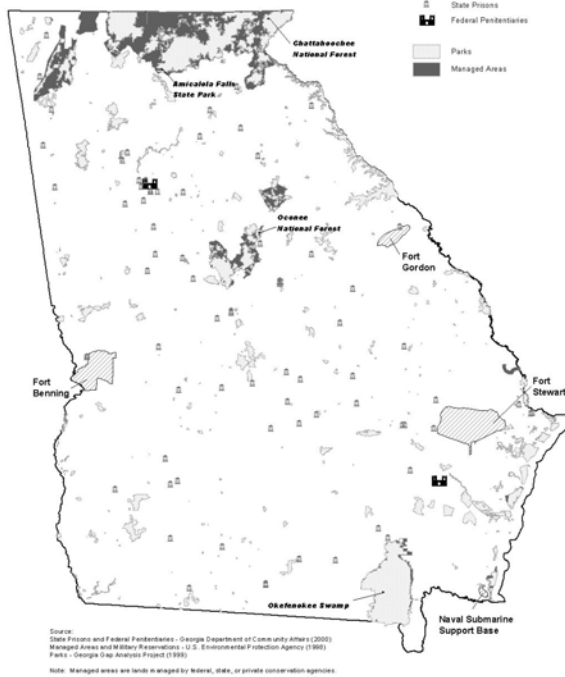


Dot-density maps used dark blue dots. The colors chosen for reference data, such as county lines, major roads, and office locations were selected so as not to distract from the map's purpose while providing sufficient contrast to stand apart. Ranges of greens and gray colors were chosen for these reference features. Middle to dark green was selected for office locations, office names and service area boundaries. Other reference data, such as county lines and roads, are presented in varying shades of gray. The same standards were maintained for the maps created throughout the project.

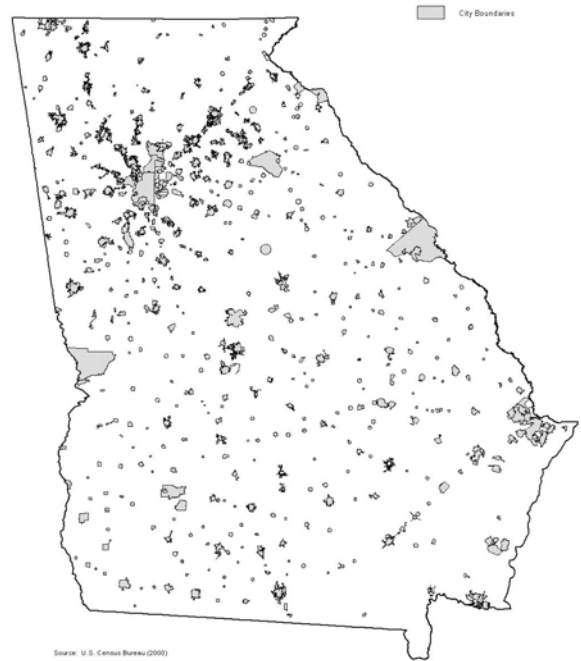
Overlays

To bring greater content and context to the maps, a small set of universal overlays were created for each grantee. The overlays can be placed on the top of each map to display the locations of county courthouses, city boundaries, and large establishments (military bases, airports, parks and rivers). Examples of these overlays follow.

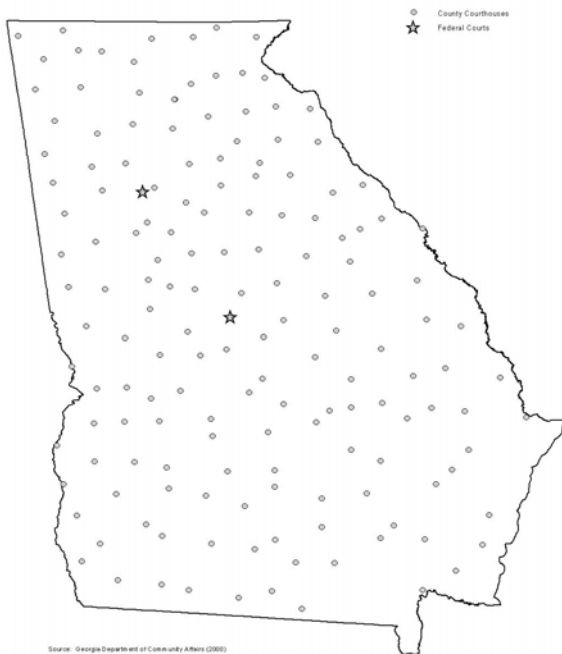
Establishments



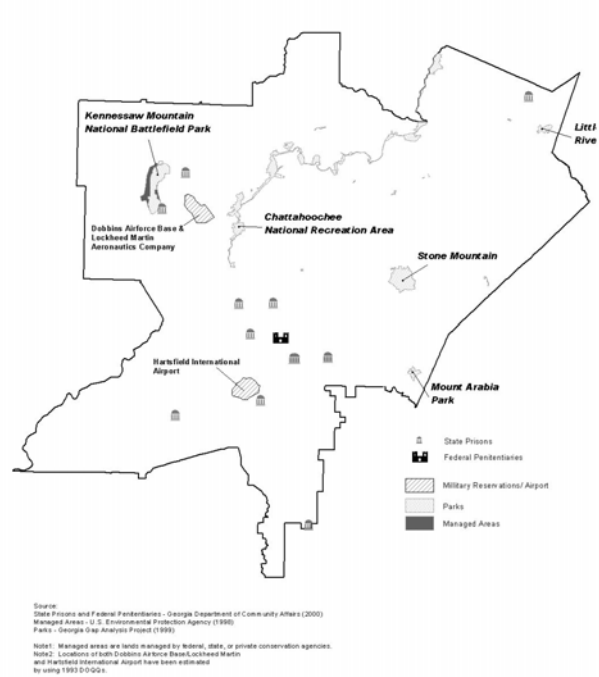
City Boundaries



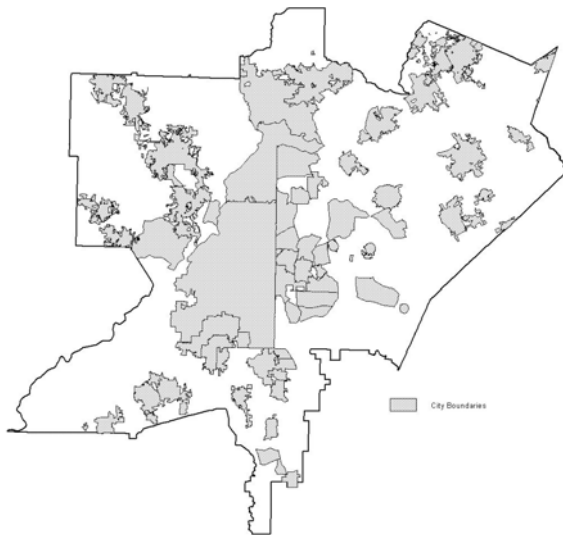
Federal and County Courthouses



Establishments



City Boundaries



Source: U.S. Census Bureau (2000)

Federal and County Courthouses



Source: Georgia Department of Community Affairs (2000)

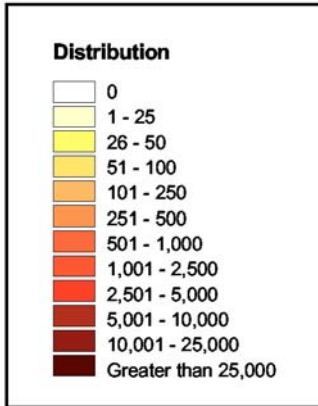


Appendix D - Categorizations

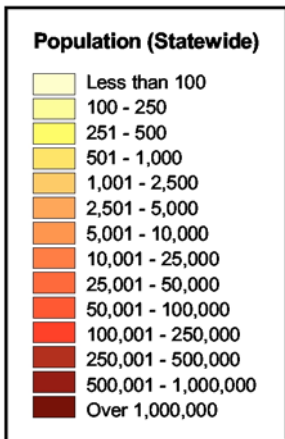
Choropleth Maps

Distribution/Population/Totals Legends

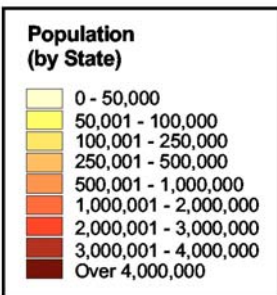
The following legends were used when presenting data with real numbers of persons, cases or monetary values and how they were distributed in the various levels of aggregation. Most were used only for presenting data in aggregations at county level and lower.



Aggregations
County and Zip Code



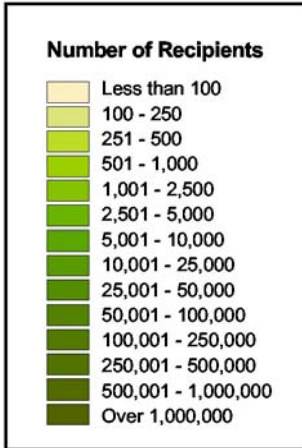
Aggregation
County



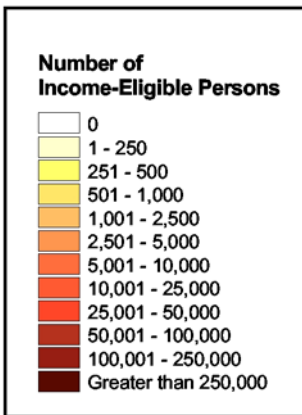
Legend was only used on National Map series. Classifications were also used for number of closed cases.

Aggregation
Both population and closed cases were by State

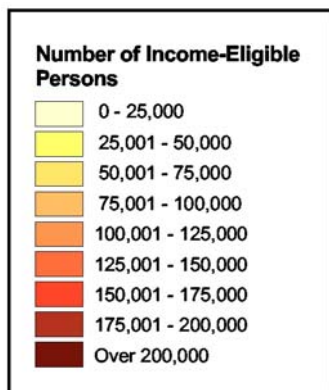
Legend was only used on Demographic Map series.



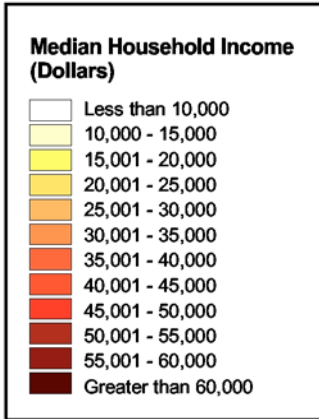
Aggregation
County



Aggregation
County

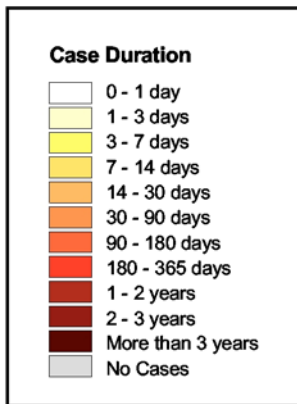


Aggregation
Service Area (Region)

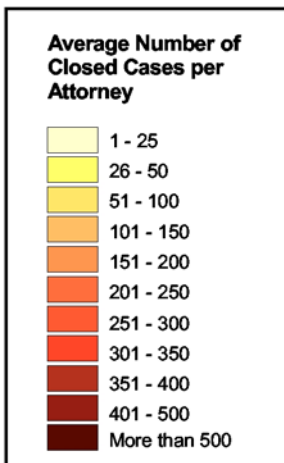


Aggregation
County

Averages



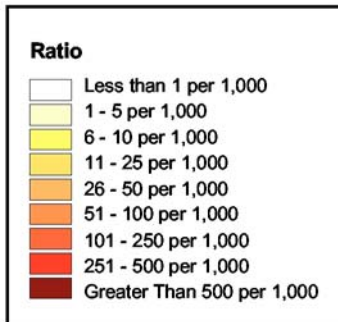
Aggregation
County



Aggregation
Service Area (Region)

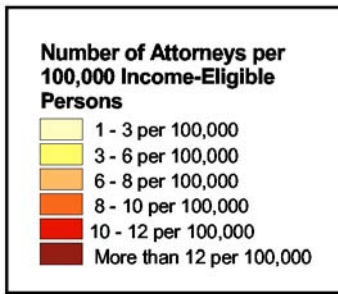
Ratio/Access Legends

The next two legends were used on maps that depicted the number of closed cases or attorneys per either 1,000 or 100,000 income-eligible persons.



Aggregation

State, Service Area (Region), County, Zip Code, and Tract

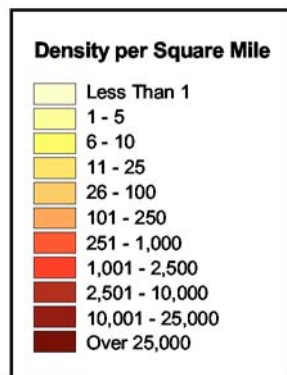


Aggregation

Service Area (Region)

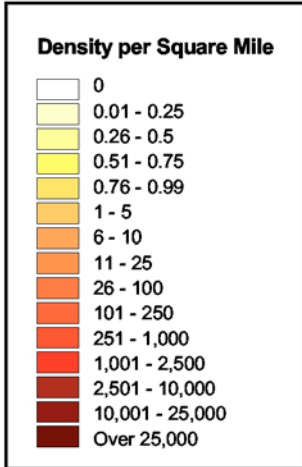
Density Legends

The following legends were used when displaying persons or closed cases per square mile at a variety of aggregation levels.



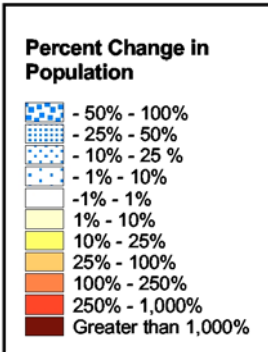
Aggregation

State and County



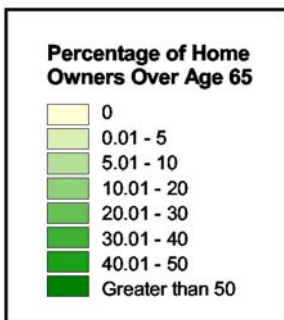
Aggregation
County, Zip Code, Tract, and Block Group

Percent Legends



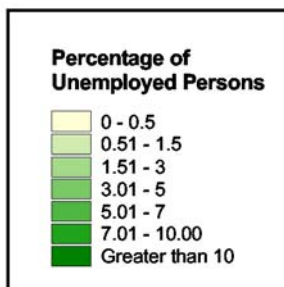
Legend was used for both population and median household income.

Aggregation
State and County



Legend was only used on Demographic Map series.

Aggregation
County

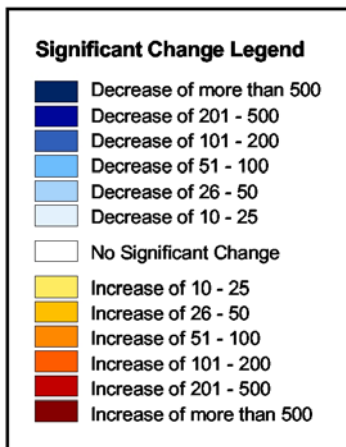


Legend was only used on Demographic Map series.

Aggregation
County

Significant Change Legend

Legend used for showing the significant change in closed cases between 1996 and 2000.

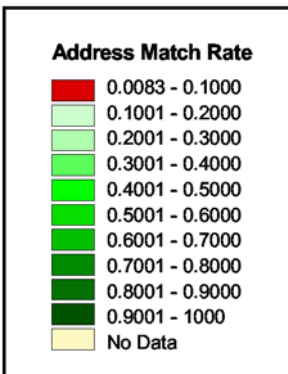


Aggregation

County, Zip Code, Tract, and Block Group

Address Match Legend

Legend was only used for match rate by Zip Code.



Aggregation

Zip Code

Dot Density Maps

Like the choropleth maps, dot density maps were another way to display distribution or density of closed cases, though the dots were placed randomly within the aggregation level used.

Distribution

Number of Closed Cases by Census Tract

- 1 Dot = 10 Closed Case

Aggregation

Census Tract

Number of Closed Cases by Census Block Group

- 1 Dot = 1 Closed Case

Aggregation

Zip Code, Census Tract, and Census Block Group

Service Provided

- Brief Service
- Extended Service

The dots in this legend show the dispersion of brief and extended service within the aggregation level.

Aggregation

Zip Code

Graduated Symbol Maps

Number of Attorneys

- 1 - 3
- 4 - 6
- 7 - 10
- 11 - 14

Increasing dot size represents the number of attorneys that serve in the LSC service regions.

Aggregation

Service Area (Region)



Appendix E – Cartographic Standards

Layout Standards

A significant part of the effort of this mapping evaluation project entailed the development of a series of standards for the uniform display and presentation of various cartographic elements. In addition to demographic and legal services cases, a wide array of supporting information, reference graphics and ancillary data needs to be displayed on each legal services map. These cartographic presentation standards emerged from the project are listed below.

<u>Feature</u>	<u>Presentation</u>
General	
Outer Most Neatline	Black Outline, 2pt Width; Transparent Fill
Inner Neatline	Black Outline, 1pt.; LSC Grey Fill
Title Box	Black Outline, 2pt. Width; White Fill
Title Text	Black, 22pt. Times New Roman – Bold
Title Alignment	Both need to be center aligned with margin.
Legend Box	Black Outline, 1pt. Width; White Fill
Legend Title	Black, 9pt. Arial – Bold
Legend Body	Black, 8pt. Arial – Normal
Density Dot	4pt. Blue Dot
Choropleth Boxes	Colored boxes need to be outlined with a 0.1pt. black line.
Disclaimer Box	Black Outline, 1pt. Width; White Fill
Disclaimer Text	Black, 6pt. Arial – Normal
Disclaimer text:	<i>"This map was developed solely for the purpose of determining whether mapping is useful for making management decisions."</i>
Logo Boxes	Black Outline, 1pt. Width; White Fill
Notes	Black, 7pt. Arial – Normal
All Income-Eligible maps require the Income-Eligibility note:	<i>"Income level is only one factor in determining client Eligibility, set at or below 125% of the poverty level. Other factors may include: asset ceilings, alien status, citizenship, conflict of interest, recipient resources, or unique client circumstances that allow recipients to use their discretion in providing services."</i>
All Dot Density maps must have the Dot Density note:	<i>"Dots are placed randomly within <Appropriate Aggregation Level Here>."</i>
Sources	Black, 7pt. Arial – Normal
All maps must have a source note that matches the data presented on the map along with the date of when the data was collected by that source.	
Footnotes	Black, 6pt. Arial – Normal; Left justify at the bottom of the layout outside of outer most neatline.



ALAS Maps

Page Layout	8.5" x 10"; Portrait
Page Margins	All margins should be set at 0.5"
Scale	1: 550,000; 1" = 40 Miles

The area outside of 5-county region needs to be masked out unless otherwise stated. Use the LSC Grey color.

All Metro-level maps must have the ALAS South Fulton Office note:

ALAS South Fulton Office opened in 1999.

GLSP Maps

Page Layout	8.5" x 10"; Portrait
Page Margins	All margins should be set at 0.5"
Scale	1: 2,534,400; 1" = 10 Miles

The ALAS area needs to be masked out unless otherwise stated. Use the LSC Grey color.

Service Area Maps

Scale Scale will vary greatly.

Try to keep the scale bar around the 1" size.

Be consistent when zooming into the same area for multiple maps by using the same scale each time.

National Maps

Page Layout	8.5" x 10"; Landscape
Page Margins	All margins should be set at 0.5"
Scales: Conterminous U.S.	1: 20,000,000
Inset Maps	Scale varies greatly and will not be to scale.

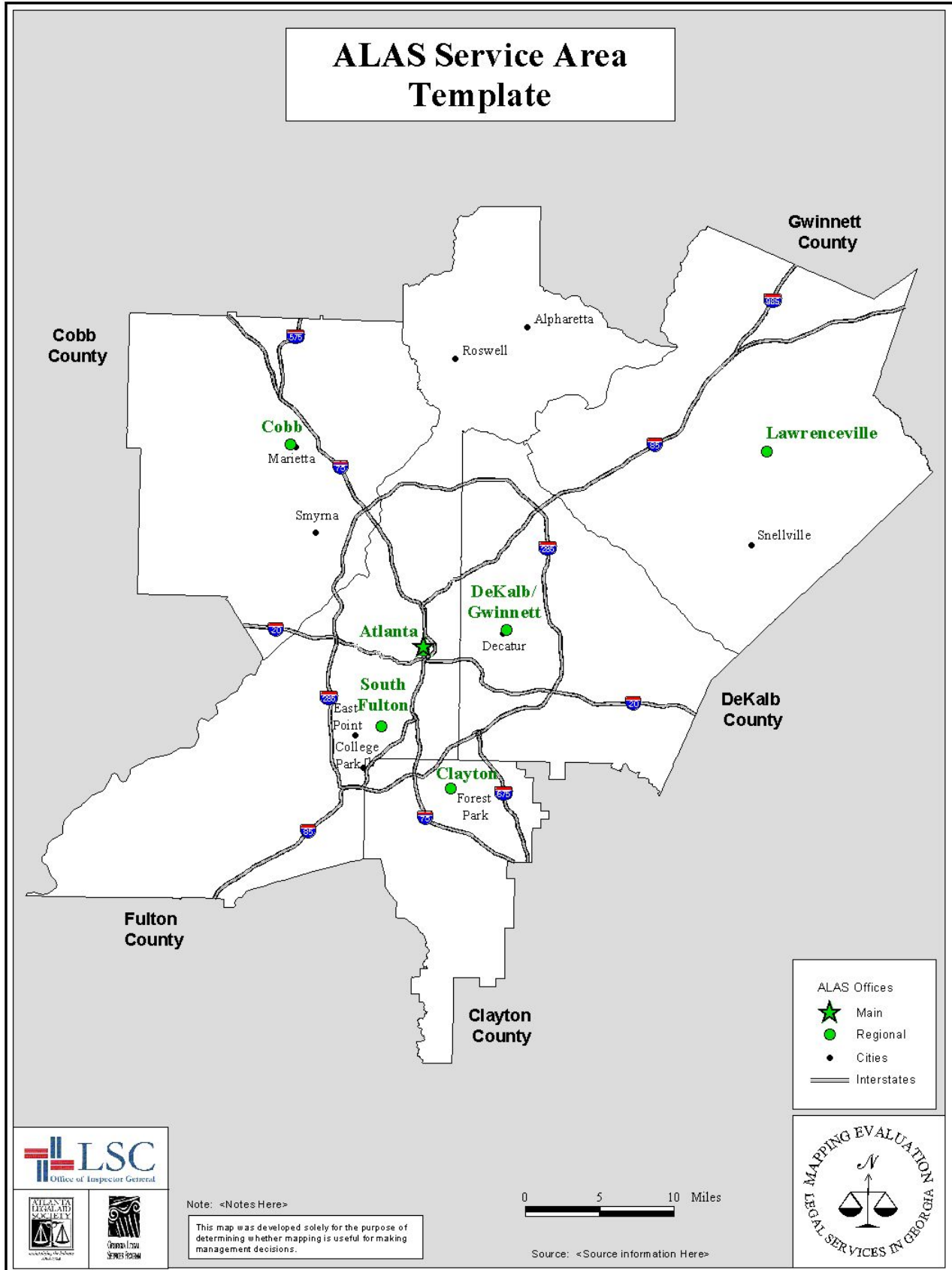
All maps need the Inset Map note:

Inset Maps are not to Scale.

All maps need the Office Location note:

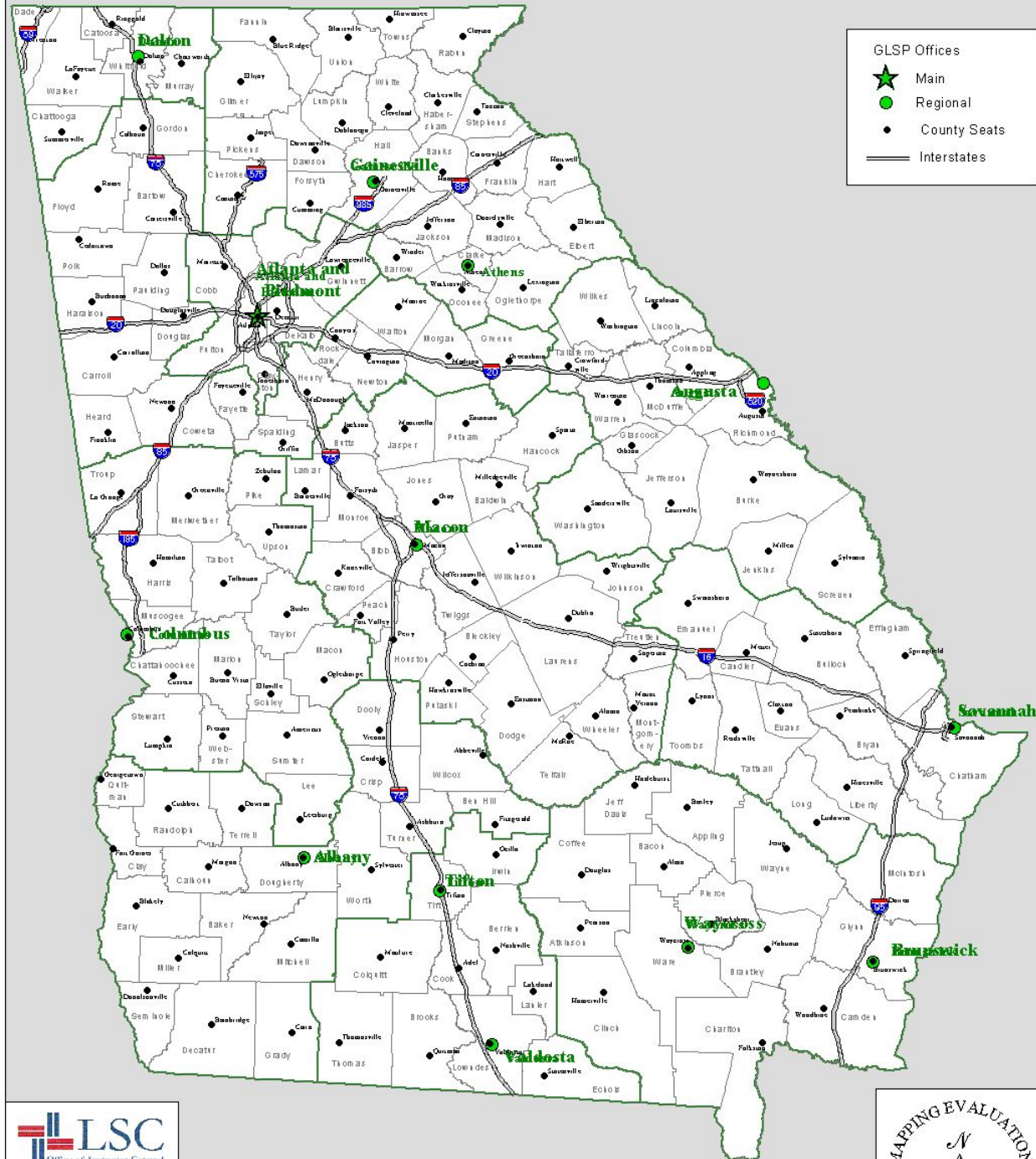
Office Locations – Legal Services Corporation (2002)

Object alignment and placement in the layout is represented on the attached templates. These can be used as a reference tool when setting up new layouts for maps.



ML-XX - July 2002

GLSP Service Area Template



GLSP Offices

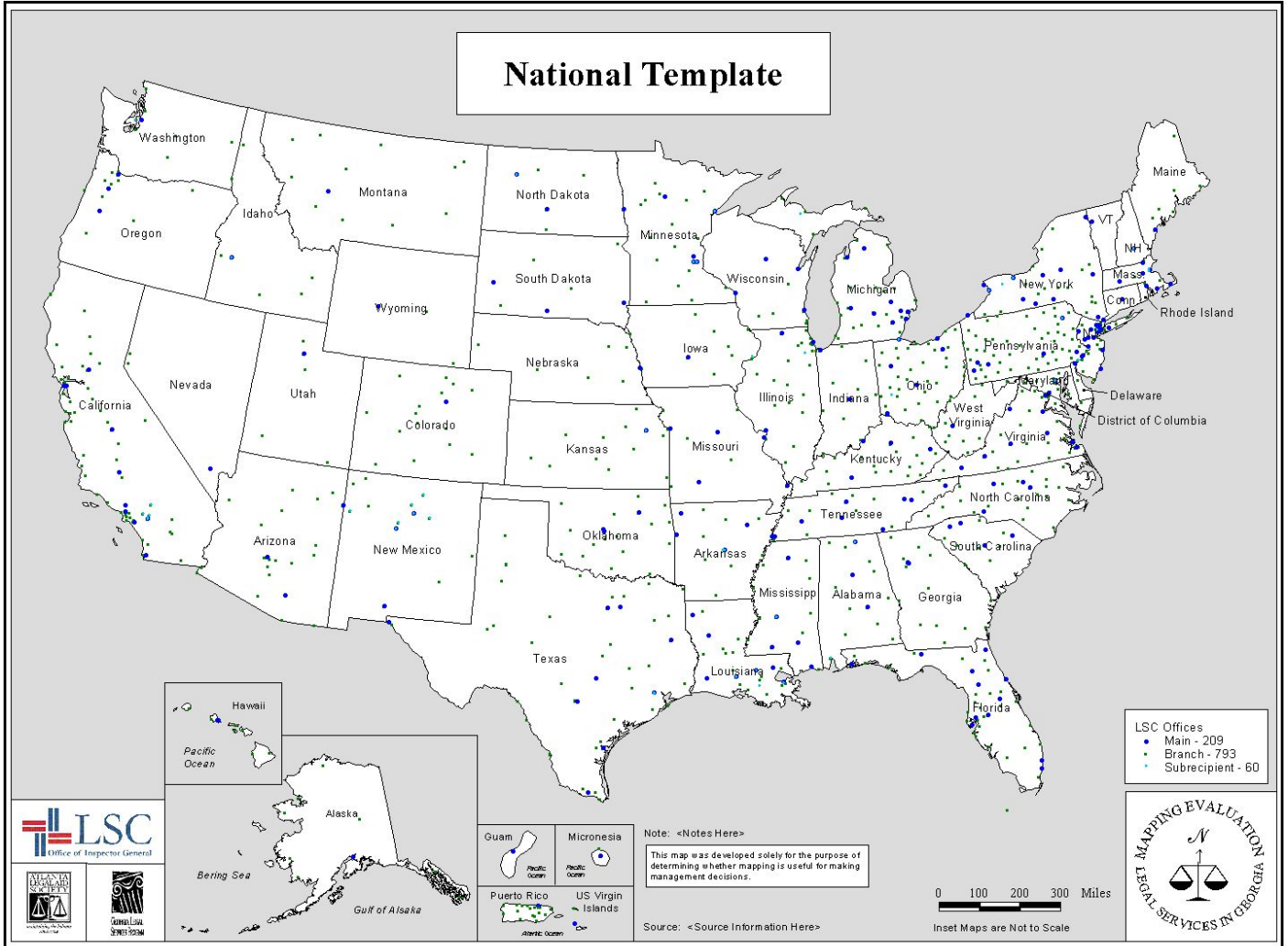
- Main
- Regional
- County Seats
- Interstates

Note: <Notes Here>

This map was developed solely for the purpose of determining whether mapping is useful for making management decisions.



Source: <Source information Here>



NL-XX - July 2002



View Standards

Color Definitions: (Standard Palette in ArcView)

LSC Grey Background	(0, 0, 220)
Forest Green Color	(85, 255, 130)
Lime Green Color	(85, 255, 220)
Black	(0, 0, 0)
Dark Grey	(0, 0, 120)
Medium Grey	(0, 0, 165)
Blue	(170, 255, 255)
Cyan	(130, 255, 220)

Do not outline aggregation levels on the map, e.g. Census Tract, Census Block Group or Zip Codes (including “No Data”).

ALAS Views

Projection:	Lambert Conformal Conic
Spheroid	Geodetic Reference System (GRS) 80
Central Meridian	-83.5
Reference Latitude	0
Standard Parallel 1 st	31.416666666666
Standard Parallel 2 nd	34.283333333333
False Easting	0
False Northing	0
Distance Units	Feet

Main Icon	Lime Green, 20pt. Star (with outline)
Main Text	Forest Green, 10pt. Times New Roman - Bold
Regional Icon	Lime Green, 10pt. Circle (with outline)
Regional Text	Forest Green, 10pt. Times New Roman – Bold
City Icon	8pt. Black Dot
City Text	Black, 5pt. Times New Roman – Normal
County Boundaries	Solid Black Line, 0.5pt Width
County Text	Black, 4pt. Arial – Bold
MARTA Lines	Solid Blue Line, 2.5pt. Width
MARTA Stops	7pt. Blue Hexagon with outline
Interstate Lines	Black Outline with Medium Grey Fill, 1pt. Width
Interstate Symbols	Use Special Font Symbols, 10pt.
State Highways	Solid Grey Line, 0.5pt.
Travel Time Lines	Solid Cyan Line, 2pt. Width
Dot Density Themes	1pt Blue Dot; Calculate: Dot always equals 1 Case, Person, etc., Null Symbol is White, Background Symbol is Transparent – Aggregate dots at Block Group Level unless stated otherwise.



GLSP Views

Projection:	Lambert Conformal Conic
Spheroid	Geodetic Reference System (GRS) 80
Central Meridian	-83.5
Reference Latitude	0
Standard Parallel 1 st	31.416666666666
Standard Parallel 2 nd	34.283333333333
False Easting	0
False Northing	0
Distance Units	Feet
Main Icon	Lime Green, 20pt. Star (with outline)
Main Text	Forest Green, 8pt. Times New Roman - Bold
Regional Icon	Lime Green, 10pt. Circle (with outline)
Regional Text	Forest Green, 8pt. Times New Roman – Bold
Service Area Boundaries	Solid Forest Green Line, 1.5pt Width
City Icon	8pt. Black Dot
City Text	Black, 5pt. Times New Roman – Normal
County Boundaries	Solid Dark Grey Line, 0.5pt Width
County Text	Dark Grey, 4pt. Arial – Normal
County Seat Icons	9pt. Black Dot
County Seat Text	Black, 3pt. Arial - Normal
Interstate Lines	Black Outline with Medium Grey Fill, 1pt. Width
Interstate Symbols	Use Special Font Symbols, 10pt.
Travel Time Lines	Solid Cyan Line, 2pt. Width
Dot Density Themes	0.5pt (1pt if dots are sparse) Blue Dot; Calculate: Dot always equals 1 Case, Person, etc., Null Symbol is White, Background Symbol is Transparent – Aggregate dots at Block Group Level unless stated otherwise.

Views with ALAS and GLSP Offices

Do not show main office for either grantee.
Do not show office names.

ALAS Icons	Lime Green, 20pt. Triangle (with outline)
GLSP Icons	Lime Green, 10pt. Circle (with outline)



Service Area Views or Zoom in Views

Projection:	Lambert Conformal Conic
Spheroid	Geodetic Reference System (GRS) 80
Central Meridian	-83.5
Reference Latitude	0
Standard Parallel 1 st	31.416666666666
Standard Parallel 2 nd	34.283333333333
False Easting	0
False Northing	0
Distance Units	Feet
Main Icon	Lime Green, 20pt. Star (with outline)
Main Text	Forest Green, 8pt. Times New Roman - Bold
Regional Icon	Lime Green, 10pt. Circle (with outline)
Regional Text	Forest Green, 8pt. Times New Roman – Bold
Service Area Boundaries	Solid Forest Green Line, 1.5pt Width
City Icon	8pt. Black Dot
City Text	Black, 5pt. Times New Roman – Normal
County Boundaries	Solid Dark Grey Line, 0.5pt Width
County Text	Dark Grey, 4pt. Arial – Normal
County Seat Icons	9pt. Black Dot
County Seat Text	Black, 3.09pt. Arial - Normal
Interstate Lines	Black Outline with Medium Grey Fill, 1pt. Width
Interstate Symbols	Use Special Font Symbols, 10pt.
Travel Time Lines	Solid Cyan Line, 2pt. Width
Dot Density Themes	1pt (1.5pt if dots are sparse) Blue Dot; Calculate: Dot always equals 1 Case, Person, etc., Null Symbol is White, Background Symbol is Transparent – Aggregate dots at Block Group Level unless stated otherwise.

Note: Keep in mind that labels and symbols will appear larger or smaller depending on the map scale. To keep a level of consistency when making such maps, use the same scale for multiple maps produced for a certain zoomed-in region. For example, if zooming into Dalton Service Area, use a scale of 1: 700,000 for every map that is focusing on that area.



National Views

Conterminous U.S.

Projection:	Albers Equal-Area (Conterminous U.S.)
Spheroid	Clarke 1866
Central Meridian	-96
Reference Latitude	37.5
Standard Parallel 1 st	29.5
Standard Parallel 2 nd	45.5
False Easting	0
False Northing	0
Distance Units	Meters

Alaska

Projection:	Albers Equal-Area (Alaska)
Spheroid	Clarke 1866
Central Meridian	-154
Reference Latitude	50
Standard Parallel 1 st	55
Standard Parallel 2 nd	65
False Easting	0
False Northing	0
Distance Units	Meters

Hawaii

Projection:	Albers Equal-Area (Hawaii)
Spheroid	Clarke 1866
Central Meridian	-157
Reference Latitude	13
Standard Parallel 1 st	8
Standard Parallel 2 nd	18
False Easting	0
False Northing	0
Distance Units	Meters

Puerto Rico and Virgin Islands, Guam, Micronesia

Projection:	Geographic
Distance Units	Decimal Degrees

LSC Office Icons:

Main – 204	4pt., Blue Dot
Branch – 766	3pt., Forest Green Dot
Subrecipient – 59	2.5pt., Cyan Dot
State/Island Boundaries	Solid Black Line, 0.1pt Width
State/Island Text	Black, 7pt. Arial – Normal



Contributors

Special appreciation goes to the following individuals for their commitment and dedication to this project.

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