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Information sovereignty and GIS: the evolution of "communities of interest" in political redistricting

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Abstract

Geographic information systems (GIS) first gained a prominent role in US political redistricting following the 1990 Census. Yet, this new technology—combined with a series of political and legal developments—raised a host of difficult questions about the nature of representation, identity, and community. In litigation, courts often referred to "communities of interest" (rather than racial groups) as appropriate political units to use in redistricting, but seldom defined these entities or described their characteristics explicitly. During the late 1990s, GIS practitioners responded to these qualitative judicial guidelines by attempting to identify, quantify and incorporate different measures of "communities of interest" in GIS redistricting databases. The evolution of this technology reflects such legal requirements and, more generally, the social and political systems in which GIS are embedded. Drawing on a set of in-depth interviews with legislative staff members in Texas, I argue that the state practices associated with the development of redistricting GIS created a system that reproduced a limited, conventional, geographically bounded conception of communities of interest. The case illustrates how "political representation" is both enabled and constrained by the kinds of graphical and conceptual representations that are possible with modern GIS. More broadly, the article uses Foucault's principle of "governmentality" and James Scott's idea of "legibility" to develop the concept of information sovereignty. The state filters out certain kinds of knowledge in order to maintain its legitimacy as a rational, unbiased observer, and thus helps create a GIS that offers only "thin" representations of community.

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Introduction

> The courts have articulated rules, but applying them on the ground means that you still have judgments to make (Archer, 2002).

Increasingly powerful geographic information systems (GIS) used for redistricting enable political cartographers to rapidly draw and evaluate a large number of possible plans to find ones that, for example, create optimal partisan balances within and among districts. Consequently, although such systems have not changed the fundamental goals of redistricting, they have given practitioners unprecedented power to create districts with specific political and demographic characteristics (Eagles, Katz, & Mark, 1999, 2000). In the past 15 years, scholarship in this area has typically focused either on the political effects of districting designs or on the legal reaction to them (Johnston, 2002; Rush, 2000; Webster, 2000). Researchers have paid relatively less attention to the relationship between the legal reactions to these developments and the practice of GIS.

In this study, I analyze how routine state practices and the technical constraints of GIS interacted with partisan redistricting politics to shape the representation of "communities" in a GIS database. Specifically, I examine the development of a GIS by the Texas Legislative Council (TLC), the non-partisan state agency responsible for creating and maintaining the state's redistricting GIS. During the late 1990s and early 2000s, the agency translated an abstract judicial charge to consider "communities of interest" in redistricting into a concrete, technical representation in its GIS. This analysis draws primarily on in-depth interviews with members of the TLC staff in 2002, which were part of a broader series of interviews about the development and use of redistricting GIS that I conducted between 2001 and 2003 with Federal officials, GIS vendors, and legislators and legislative staff members in eight states. This approach frames the analysis of GIS as a set of practical activities that occur within more encompassing technical, political, and legal systems (Curry, 1998). As such, it analyzes the broader impacts and effects of GIS on our conceptions of identity, community, democracy, and the state.

I find that the growing use of GIS limits the kinds of communities that can in principle achieve political representation through redistricting because the process excludes "communities of interest" that cannot be "mapped". In short, state practices ultimately narrowed the conceptual horizon of what communities might be represented politically.

The TLC responded to guidelines laid down by a Federal court, but the agency's primarily mission is to provide technical and administrative support to the state legislature. The Council and its staff members have a professional, non-partisan orientation, but operate in the increasingly partisan milieu of redistricting. Indeed, in 2003, Democrats in the Texas legislature twice fled to other states in an attempt to block Republican-led redistricting efforts (Halbfinger, 2003; Walsh, 2003a). The technical expertise of the TLC and the rancorous partisan conflict in the state make Texas an especially good case study of the interplay of redistricting technology, political conflict and legal reasoning.

My approach follows work in political geography that characterizes the state as a complex set of institutional and social relationships, rather than as a monolithic entity (Mountz, 2003; Painter, 1995). I examine the functioning and decision-making process within a state bureaucracy to see how diffuse decisions by state actors produce a particular outcome. Moreover, the federal structure of the Untied States means that the TLC operates within an institutional hierarchy that includes the State of Texas and the Federal state. Although I focus on a single agency and its staff, their position within this hierarchy means that their actions are representative of state practices more generally.

Defining communities of interest

New computer technology introduced novel questions and practices into the 1990s redistricting process, which Federal courts in turn interpreted and regulated in a series of decisions, particularly *Vera v. Richards* (1994). Courts wrote in general rhetorical terms about the appropriate bases of political representation, and especially celebrated the idea of the ''community of interest''. Although opinions mentioned ''community of interest'' frequently, they never defined the term precisely or gave states specific guidelines for incorporating this concept into redistricting (see Leib, 1998). This problem was particularly acute in Texas, where the *Vera* court held jurisdiction.

The state's Legislative Redistricting Board offers only the most general statement about ''communities of interest''.[1] The LRB's guidelines for both the state House and Senate state that:

> There are a virtually unlimited number of such communities of interest and no redistricting plan possibly can be drawn so as to recognize the boundaries of all such communities of interest. The importance of particular types of communities of interest may vary around the state according to local circumstances (Legislative Redistricting Board, n.d.)

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Even if this can be taken as the state's official position, it is so vague as to be virtually meaningless, and may be designed principally to forestall legal claims made on behalf of ''communities of interest''.

Consequently, TLC staff members had to decide how such vague legal and political rhetoric could be interpreted and incorporated into a functioning GIS

[1] The Legislative Redistricting Board is composed of the state's Attorney General, Lieutenant Governor, Speaker of the House, Comptroller, and Land Commissioner. It is responsible for redrawing House and Senate districts if the legislature fails to do so (http://www.lrb.state.tx.us/redistricting/index.html).

redistricting system. After considerable inter- and intra-agency discussions in the late 1990s, the TLC described ‘‘communities of interest’’ (or ‘‘Communities Defined by Shared Interests’’) in the following way:

> While there is no consensus as to what constitutes a community defined by shared interests, the term generally refers to a grouping of people, such as in a city or neighborhood, that shares common political, social or economic traits (Texas Legislative Council, 2001a: p. 7).

However, the TLC's reliance on existing data sources that could be easily imported into their current system meant that the system ultimately defined ‘‘communities of interest’’ as ones enclosed by territorial boundaries. These boundaries (limited to the 34 largest cities in the 23 most populous counties) were of ‘‘single-member city council districts, police beats, and neighborhoods... [and] high school attendance zones’’ (Texas Legislative Council, 2001a: p. 7).[2] Such practices thus reproduced and reinforced a relatively narrow concept of a ‘‘community of interest’’, one limited to spatially defined, territorially bounded communities about which the state already possessed a great deal of systematized information.

This is not meant as a criticism of the TLC staff, but as an observation about the inevitable braiding of state practices and knowledge (Foucault, 1980, 1994), and the inherent limitations of GIS in representing the everyday practices that constitute communities (Curry, 1998).[3] The TLC operated under numerous constraints, including state and Federal legal requirements for redistricting, instructions from the state legislature, and time and budget limitations. My argument is not that the TLC made incorrect decisions, or should have included more or different data in their system. Rather, I argue that the kind of decisions made by the TLC staff were significantly shaped by the institutional demands and structural constraints of a redistricting GIS.

The evolution of ‘‘communities of interest’’ in Texas' redistricting GIS illustrates a more general pattern of governmentality whereby state practices establish the ‘‘rules’’ for redistricting by creating and identifying particular knowledge as relevant to the debate (Foucault, 1994). At the most basic level, communities that were not included in the GIS would find it more difficult to achieve electoral power because they could not use this technological representation to claim that they

[2] The Texas constitution requires that state House districts use whole counties whenever possible (Texas Legislative Council, 2000: p. 4). Consequently, the TLC only collected information on ‘‘communities of interest’’ for counties that were populous enough to be split by a House district (Archer, 2002; Dyer, 2002). According to the 2000 Census, Texas has a total population of 20,851,820. Its 32 Congressional districts have just over 650,000 people, its 31 state Senate districts average just over 670,000, and its 150 state House districts average just below 140,000. Thus, the legislature could easily keep counties with populations much smaller than 140,000 within a single Congressional, Senate or House district.

[3] I found the staff members of the TLC to be dedicated, highly skilled professionals facing a daunting set of legal, political, and technical problems. Nothing in this article should imply any personal or professional shortcomings, limitations, or failures on their part.

deserved political representation. Similarly, the restrictions on the use of race and ethnicity in redistricting imposed by *Vera* and subsequent Supreme Court decisions limit minorities' political power by constraining the use of census data. Thus, the kinds of GIS used for redistricting have consequences beyond redistricting because these GIS are representations of the state itself. By examining the process and decisions made by state officials about what information to include and to exclude, I develop the concept of *information sovereignty*, in which the state filters out certain kinds of knowledge to maintain its legitimacy as a rational, unbiased observer. As a consequence, the process ultimately excludes certain ways of conceiving and representing communities of interest.

Representation in "political space" and "GIS space"

The 1990s produced a flurry of litigation challenging electoral redistricting. Of these cases, the 1994 *Vera v. Richards* decision had the greatest impact on the redesign of the Texas redistricting GIS. This district court opinion argued that Congressional districts drawn by Texas in the early 1990s were flawed because they were based predominantly on racial and ethnic communities, a practice that the Supreme Court deemed unconstitutional in the *Miller v. Johnson* (1995) case (Forest, 2001). The Supreme Court ultimately upheld the district court's decision in *Bush v. Vera* (1996), and indeed, some of the arguments made by the Texas district court in *Vera* (1994) foreshadowed ones subsequently made by the Court in the *Miller* case. The *Vera* court argued that Texas ignored non-racial "communities of interest" that have an important stake in political representation. According to a staff attorney with the TLC, the *Vera* decision was "a major factor in our thinking" as they redesigned and upgraded the state's redistricting infrastructure in the 1990s (Archer, 2002). Among other steps, the TLC tried to incorporate several different "communities of interest" into the GIS used for the 2001 round of redistricting.

Consequently, the potential for a community's *political representation* depended to some degree on its *representation in the GIS*.[4] As the court cases of the 1990s showed, the way in which communities are represented in GIS can sometimes dramatically, albeit indirectly, affect their political representation. For example, if a redistricting GIS omits the political boundaries of a city, it is likely that residents of the municipality would be split among several districts, which could

[4] The relationship between representation in "GIS space" and "political space" is not a simple or direct one. Typically, the ultimate configurations of political districts are determined by raw political considerations as legislators vie to obtain a favorable set of voters in particular districts, and parties seek an optimal partisan balance among districts (Johnston, 2002). Consequently, the representation of communities of interest in a GIS probably does not have a direct effect on the political representation of these groups as measured by their voting power. In short, the success or failure of a particular community to gain representation in the GIS would likely not lead to a significant difference in the state's ultimate redistricting plan.

consequently dilute their electoral power.[5] Similarly, the inclusion of election results in a GIS allows users to create districting plans that deliberately enhance (or diminish) the electoral power of partisan communities of interest.

Analyzing the process through which the state reified a vague and abstract concept like "community of interest" into a GIS advances our understanding of the more subtle relationships between "GIS space" and "political space". Such an analysis reveals the uses and limitations of this technology, and the interplay between the technical and social systems in which it is embedded. The TLC changed its redistricting GIS in response to imprecise and abstract legal rhetoric that nevertheless required it to incorporate objective, factual, quantifiable information on communities of interest into its GIS. Consequently, in seeking to give users "objective ways to identify a community of interest", the designers of the GIS infrastructure needed to characterize such communities as existing objectively in the world, as capable of representation in a GIS, and therefore, as having the capacity for political representation.

GIS and governmentality

Pickles (1995: p. 24) argues that Foucault provides a useful starting point for the critical analysis of GIS, and for grounding such technological developments in contingent, historically instituted practices. Indeed, Foucault's work on governmentality is now a standard framework for analyzing the production of knowledge about a state's population and the practices used to govern a given territory (Burchell, Gordon, & Miller, 1991; Foucault, 1994; Rose & Miller, 1992). Governmentality, or the "art of government", provides a conceptual structure for understanding how states (and liberal democracies in particular) extend their power, control, and influence without the direct application of coercive power (Hannah, 2000). In particular, states use various practices, techniques, and technologies to develop knowledge or information about their subjects and territories. By controlling the production of such information, the state maintains authority over the objects in question. More subtly, by producing information about previously hidden, unrecognized and invisible activities—or activities of civil society previously considered outside the government's purview—the state extends its power into new realms.

Murdoch and Ward (1997), for example, show how the British state extended its power over agriculture, leading to the eventual development of a national farm policy, through the creation and use of agricultural statistics through the 19th and 20th centuries. Similarly, MacKinnon (2000) argues that the contemporary British

[5] This example is admittedly an oversimplification. If the hypothetical city in question has an especially large population relative to the population of the districts, splitting the city between two districts might mean that urban voters dominate both, and thus splitting the city enhances urban voting power. However, if a redistricting GIS does not include municipal boundaries, such gerrymandering would always be "accidental". A cartographer cannot deliberately diminish or enhance the electoral power of the city without knowing the location of its boundaries.

state has used “managerial technologies” to extend its monitoring and control over local governments and their policies. Turning specifically to the use of maps and mapping technology, Häkli (1998) analyzes the historical invention, definition, and mapping of regions in Finland to argue that this project was fundamental to the development of an administrative state during the 18th century. Similarly, Hannah’s (2000) detailed study of the 19th century Census and mapping projects in the United States shows how governmentality was central to the process of state formation. In all four cases, the extension of control did not originate in a formal modification of the structural relationship between the central state and local authorities. Rather, the creation of statistical data and management practices allowed the state to first represent, and then claim authority over previously unregulated social, economic, and political activities.

Governmentality involves the use of what Rose and Miller (1992) term the “technologies of government”. Drawing on the work of Latour (1986, 1987), they describe these varied techniques and practices as

> the humble and mundane mechanisms by which authorities seek to instantiate government: techniques of notation, computation and calculation; procedures of examination and assessment; the invention of devices such as surveys and presentational forms such as tables; the standardization of systems for training and the inculcation of habits; the inauguration of professional specialisms and vocabularies (Rose and Miller, 1992: p. 183).

Notably, these “mechanisms” are often not mechanisms in the literal sense, but what one might describe more accurately as techniques, procedures, or practices. As physical technology, however, a redistricting GIS can be considered an “inscription device” because it renders objects, “immutable, presentable, readable and combinable” (Latour, 1986: p. 7). This transformation of objects into graphically rendered information means that they can be manipulated and evaluated, but also that the “inscriptions” themselves become the objects of debate and analysis.[6] For example, Texas limited the conceptual and empirical varieties of “communities of interest” by importing and representing them in a GIS. By doing so, the state creates a new field of knowledge, a set of experts to manage the information, and establishes its authority over what might “count” as a community of interest.[7]

[6] Curry (1998: pp. 39–56) questions whether GIS in general can be described as “inscription devices”. I would argue, however, that my more limited characterization of redistricting GIS as inscription devices conforms to Latour’s sense of the term because the design and use of such systems often seek to create optically consistent representations and maps. Furthermore, legislators must produce and use static physical copies of redistricting plans when they actually introduce them as proposed legislation. Indeed, the use of inscriptions to “mobilize allies” in scientific research (Latour, 1986: pp. 20–22) in some ways mirrors the bargaining process that legislators use to gather support for particular districting plans.

[7] The arguments in this section can arguably apply much more broadly to the use of GIS by local and Federal states. Even the most extensive redistricting GIS are typically only part of a much larger GIS infrastructure maintained by various state agencies for land use planning, economic development, tax collection, police work, and the like.

Identifying, recoding, and representing such information always involves the active transformation of the object of interest in ways that render this transformation invisible and unnoticed.

The effort by states to formally control the kind of information used in redistricting, and to set constraints on the configuration of districts did not begin with GIS. For example, in Morrill's account of computer-aided (but non-GIS) redistricting in the 1970s, a Federal court set down six explicit and one implicit criteria for him to follow in the redistricting of Washington state (Morrill, 1973: p. 468). (Notably, the criteria corresponding to "communities of interest" was the sixth, and least important explicit criteria.) The fundamental difference between this example and redistricting GIS is that decisions about how to apply the non-quantitative criteria were left to the judgment of the "Special Master" and not built into a durable inscription device.

The governmentality framework also offers a way to analyze the more general evolution of political redistricting since the Voting Rights Act of 1965. Although the extension of Federal control over local jurisdictions arose from a social movement formalized by the legislative process, the subsequent systemization of voter registration records and the standardization of the redistricting process brought previously anarchic processes under (Federal) surveillance. Full development of such an argument is beyond the scope of this article. Nonetheless, it is important to note that the creation of redistricting GIS extends from a general ideological transformation where "democracy" claims legitimacy through the political inclusion of a generalized, universal citizen rather than a raced, gendered one (Keyssar, 2000; cf. Scott, 1998: p. 32). The social construction of such a universal citizen is arguably the consequence of the current phase of governmentality in the United States.

Seeing like a state: from legibility to information sovereignty

A governmentality perspective suggests that GIS is the latest step in the process of constructing a national population by identifying, quantifying, and "inscribing" information through programs like the census. Further, Latour's work offers a way to analyze the daily activities of GIS practitioners and the use of GIS in redistricting debates. These, however, are incomplete as theoretical accounts of redistricting GIS. In particular, a Foucauldian approach is less successful in explaining why the state *leaves out* certain kinds of information. A standard application of Foucault's "panopticonic gaze" would suggest that the state strives to be all-seeing, all-knowing (even if it accepts some limits on its own power), and would thus try to maximize the type and volume of data in a redistricting GIS. In fact, the TLC made a series of important decisions about the information (and thus potential political communities) that they would include *and exclude* from their redistricting GIS. In explaining these exclusions, I draw upon Scott's (1998)) analysis of the modern state's management and planning practices to develop the concept of *information sovereignty*.

The explanation for these exclusions lies in the state's need to maintain its authority, legitimacy, and sovereignty. The type of information in redistricting GIS indicates how a state sees itself, and can either undermine or support its authority. Modern states seek "legibility" and "simplification" in their efforts to administer their population and territories (Scott, 1998: pp. 11–52). Simplification involves imposing centralized standards of measurement, land tenure, laws, and the like over practices that are "*local, interested, contextual* and *historically specific*... [and that offer] a hopelessly bewildering welter of local standards" [emphasis in the original] (Scott, 1998: p. 27). Legibility is the effort to render complex systems and relationships in ways that facilitate administrative functions by allowing a centralize authority to "read" or see information previously confined in and defined by local practices. For example, standardizing the measurement used for grain allows state officials to compare the productivity of different regions and to assess taxes systematically.

Scott's discussion of cadastral maps offers clear parallels with the TLC's effort to map communities of interest. For Scott, the cadastral map offers the archetypal technique of legibility because outsiders (state officials) can literally "read" information about ownership, productivity, and resources from them. All such maps, however, exclude far more than they include. "Governed by a practical, concrete objective, the cadastral lens also ignored anything lying outside its sharply defined field of vision" (Scott, 1998: p. 47). The state "sees" in a particular way that systematizes, simplifies, and thins social, political, and economic relations. This filtering process is even more acute in GIS than in traditional cartography (Curry, 1998). Although Scott's principal concern is with the effect on the mapped objects (people, nature, social relationships), his study shows how the identity of modern states is bound to particular claims about information. Having defined and collected such data, the state has asserted that it knows and controls all relevant information. Thus, I define the concept of *information sovereignty* as the assertion by a state of complete or controlling knowledge of its territory and population.

It is difficult for the state to admit partial knowledge of information that it has deemed relevant to its operation because conceding incomplete knowledge would be to acknowledge incomplete sovereignty. With *political sovereignty*, the (successful) state makes a general claim of authority within a particular territory, and suppresses challenges to the legitimacy of its rule (Weber, 1946). A state cannot acknowledge competing sources of political authority within its borders without losing some or all of its legitimacy.[8] The state can assert *information sovereignty*, or complete knowledge of its territory, in two ways. First, it can expand its actual level or supply of knowledge in an attempt to achieve total awareness. Second, and more subtly, the state can define "legible" information as the only kind of knowledge that is legitimate or relevant to particular issues. Consequently, the state

[8] Conversely, the liberal state's disavowal of *economic sovereignty* suggests how the state can adopt the opposite strategy by declaring that certain realms of social life are both too complex and inappropriate for regulation (Gordon, 1991: p. 16; Scott, 1998: p. 101).

selectively rejects representations of information that would reveal the partial and incomplete status of its information sovereignty.

The concept of information sovereignty helps to explain why the TLC decided not to include certain types of information in its redistricting GIS, particularly those types that were clearly incomplete when compared with the systematic statewide coverage of census information. State officials occasionally justified these decisions explicitly as efforts to uphold the state's privileged status as a rational observer of all objective knowledge in its territory. More often, however, officials made such choices based on routine bureaucratic principles and cost–benefit analyses. In particular, the TLC sought to maintain its identity as neutral, non-partisan, and professional. As a TLC Program Director stated, "we try not to get into any kinds of opinions on the data, on what this is telling you, other than this is the best way to represent it in a neutral manner" (Ware, 2002). Thus, information sovereignty emerges from routine state practices rather than from a single, top-down decision-making process, and like other aspects of governmentality, it is neither fully planned nor spontaneous.

Technical and legal background

My principal focus here is on the interaction between the technological and legal infrastructure of GIS, rather than the functional details of either one. Nonetheless, some background on redistricting GIS and on redistricting law in Texas is necessary to understand the relationship between them.

Redistricting GIS

One informant aptly described redistricting as "baby GIS". Relative to the packages and approaches used in academia and industry, redistricting GIS do not use cutting-edge techniques nor are most redistricting practitioners interested in sophisticated spatial analysis.[9] At its most basic, a redistricting GIS helps its users to put together a jigsaw puzzle. More formally, it helps agglomerate a large number of pre-defined polygons into a set of spatially contiguous districts. The basic polygons (or jigsaw pieces) are typically census blocks associated with demographic

[9] This is not to say that developers of redistricting GIS are less sophisticated, less creative, or lack the technical skills of other GIS programmers. Nor should this imply that complex and sophisticated spatial analysis has no place in redistricting. Indeed, the programming requirements of automatic districting functions can be highly demanding, and the challenges of managing the multi-year, large scale databases generated by election results require considerable skill, creativity and training. States like Texas and California have devoted considerable financial and technical resources to maintaining statewide election databases (Greer, 2001; McCue, 2002; Ware, 2002). Moreover, legal challenges can produce voluminous, sophisticated analyses of plans by expert witnesses in an effort to demonstrate legal flaws in one districting plan or another. Such analyses, however, typically occur after the basic redistricting process has been completed. The end users of redistricting GIS—legislators, legislative and party staff, attorneys, etc.—are typically interested in only a very limited set of functions, and generally hire technical consultants when going beyond these tasks. "Baby GIS" refers to the limited set of functions required by most end users.

information. The GIS then calculates and displays the aggregate demographic and social data for each district based on the set of blocks assigned to it. Current systems also generally include features that check the contiguity of districts and identify areas that the user has left unassigned.

The most popular current redistricting GIS packages, Maptitude for Redistricting (produced by the Caliper Corporation), and various systems based on ARCInfo (produced by the Environmental Systems Research Institute, or ESRI Corporation)—including Texas' RedAppl (REDistricting APPLication)—have graphic interfaces that allow users to "point and click" to add various units of geography (existing districts, counties, census blocks, census tracts, election precincts, etc.) to a particular district. A user can select a "layer" of geography to display, build up districts using those units, and then modify districts using a different unit of geography. One might, for example, begin by creating districts using counties, switch to census tracts to balance population, and then switch to census blocks or election precincts to achieve minimum population deviation among districts. In addition, users can simultaneously display different physical features (roads, rivers, etc.) and different political and social features (city boundaries, etc.), giving them tremendous flexibility in choosing the boundaries between districts.[10]

The most technically challenging aspect of redistricting GIS typically involves the overlay of political information, such as voter registration and election results, onto census geography (tracts, blocks, etc.) and data. Demographic data for redistricting from the Census Bureau come at the census block level and include total population as well as racial and ethnic data (PL94-171 information). Similarly, apart from election precincts, the census identifies most of the geographic features typically displayed in redistricting GIS.

Ideally, census blocks nest neatly within election precinct boundaries, much as they nest neatly within census tracts. In such cases, it is possible to calculate the precise population and demographic characteristics of election precincts and to match this demographic information with election results. The match between precincts and blocks is not perfect, however, because the boundaries of tracts and blocks are defined by the census once every 10 years, while precinct boundaries are defined by local jurisdictions and may change with each election.[11]

The greatest problem for redistricting GIS, however, is assigning political information and election results gathered at the precinct level to census blocks. Assigning such political data "down" the scale from precincts to blocks always requires approximations, and is akin to an ecological inference problem (see King, 1997).

[10] A user could not build districts directly from every layer of information in RedAppl, however. For example, although the system could display the boundaries of police beats, these boundaries were not tied directly to demographic and political data (Ware, 2002). Consequently, a user could not select the boundaries of a police beat and add it to an existing district. Rather, a user would need to display the beat boundaries, and then select and add voting precincts or census blocks within that area.

[11] One goal of the Census Bureau's Block Boundary Suggestion Program has been to create a closer match between election precincts and census geography, but there has been variation in participation and results (Turner & Lamacchia, 1999).

Although some current systems provide algorithms for allocating political data down to the block level, the errors introduced in this process means that most systems and practitioners do not do so. Thus, a tradeoff occurs between an optimal partisan composition and an optimal demographic composition of districts. More exactly, there may be a tradeoff in the precision of political and demographic information. Greater precision in the population balance among districts, for example, may produce less certainty about their precise partisan composition.

More generally, compared with the GIS available for the 1991 round of redistricting, current systems are more stable, have more intuitive graphical interfaces, and—of greatest concern for this study—have ‘‘thicker’’ databases associated with them, with more variables and greater temporal depth. In principle, the TLC effort to add ‘‘communities of interest’’ to the RedAppl system meant that users would have several new ‘‘layers’’ of data available to them while drawing electoral districts. Although computer technology improved exponentially during the 1990s, legal guidelines laid down during that period—not technological changes—shaped the redesign of GIS for the 2001 round of redistricting.

*Legal interventions: **Vera v. Richards** (1994)*

The 1994 *Vera v. Richards* case was one of a series of important decisions in the 1990s that overturned some Congressional districts as racial gerrymanders. In this case, courts ruled against three African-American and Hispanic majority Congressional districts that had fairly extraordinary boundaries (Forest, 2001; Monmonier, 2001). Located in densely populated areas of Houston and Dallas, the districts’ jagged boundaries were drawn along census block lines, rather than the larger units of tracts or voter precincts.

The 1994 *Vera* decision carried tremendous weight in Texas as the state prepared its GIS for the 2001 round of redistricting. The court ruled that the state ‘‘can and must exhibit respect for neighborhoods, communities, and political subdivision lines’’ and that efforts to create non-white majority districts cannot trump these concerns (*Vera v. Richards*, 1994: p. 1310). The court created a stark opposition between communities based on racial identity and those based on other characteristics by conceptually separating the notion of a ‘‘neighborhood’’ or a ‘‘community’’ from race.

Throughout the opinion, the court remained skeptical of the claims made by legislators involved in redistricting, particularly testimony that justified districts in non-racial terms. This evidence included testimony from state representatives that they examined various elections and referenda on public transportation and school funding. Legislators asserted that they used such information, along with the ‘‘natural and commercial land use boundaries’’, to identify non-racial communities of interest (*Vera v. Richards*, 1994: pp. 1322–1323). The court dismissed this testimony and evidence as self-serving ‘‘post hoc descriptions’’.

The court argued that the testimony of these state legislators was unreliable, but also based its judgment on the kind of information available in the redistricting process. For example, when the state introduced a demographic study of District

30 that discussed the socioeconomic and geographic similarities of its residents, the court stated "there is no evidence that the information it contains was available to the Legislature in any organized fashion" (*Vera v. Richards*, 1994: p. 1338). The phrase characterizing information as relevant only if it is available "in an organized fashion" is especially interesting in this context. The state legislators were legally astute enough to characterize their actions in non-racial terms, and so the court was probably justified in viewing their testimony with skepticism. At the same time, such skepticism devalues the informal ("disorganized"?) knowledge that the representatives may have had about those areas. The emphasis the court placed on formal, structured information foreshadowed subsequent developments in the redistricting GIS.

In particular, the way the RedAppl system organized its demographic and political data drew the court's attention. As discussed above, demographic information and political data are available at different scales. In 1991, RedAppl could display the results of single elections at the scale of an election precinct (represented in the GIS as a Voter Tabulation District or VTD). Critically, these VTDs in Texas are larger than census blocks.[12] The court focused on this difference. "The critical feature of RedAppl is that it allowed the operator to "split" a VTD and work on a block-by-block level... Racial/ethnic breakdown was available on a block level on RedAppl" (*Vera v. Richards*, 1994: p. 1318). TLC staff members expressed particular frustration with this finding, arguing that the court did not seem to appreciate that block-level demographic data simply reflected the form of the PL94-171 data supplied by the Census Bureau (Archer, 2002).

The *Vera* court's analysis of the redistricting GIS even extended to the *perception* of its user. "In fact, because the software constantly displayed racial and ethnic data on the screen anytime an operator used the system, a would-be map drawer would affirmatively have to ignore the data" (*Vera v. Richards*, 1994: pp. 1318–1319). The court also quoted testimony from one of the GIS technicians involved in the process to support this conclusion: "The problem is when you draw on this computer, it tells you the population data, racial data. Every time you make a move, it tabulates right there on the screen. You can't ignore it" (*Vera v. Richards*: 1319). Although the court's interpretation of the user's interaction with the display was clearly strategic within the context of the opinion, its reasoning suggests how courts are concerned not simply with the technical capacities of GIS, but with their use.

Whatever the merits of the court's technical analysis, or its understanding of census data, this decision placed redistricting GIS in the middle of questions about political representation. Indeed, the discussion of the data displayed in the user interface forged a surprisingly close link between issues of graphic and political

[12] For the 2001 round of redistricting, the RedAppl system used VTDs based on the election precincts used in the 1998 general election because the Census Bureau's 2000 Redistricting Data Program needed these boundaries by early 1999. There were 8285 VTDs and 675,062 census blocks (Texas Legislative Council, 2001a: p. 5). The only difference between a precinct and a VTD is that the latter is always composed of whole census blocks while a few precincts were not (Ware, 2002).

representation. In short, the *Vera* court's analysis raised questions concerning redistricting practices that include, but are not limited to, the technical systems themselves.

Practicing rhetoric: redesigning RedAppl

The rhetoric in the *Vera* opinion and the decision itself presented the TLC with a number of challenges in developing its redistricting GIS for 2001. The principal problem was redesigning RedAppl to reduce the prominence of racial and ethnic identity in the drafting process. Yet, Texas could not simply eliminate racial and ethnic census data because the Voting Rights Act still requires the state to demonstrate that its redistricting plans do not dilute the voting power of minorities (Texas Legislative Council, 2001b: pp. 47–106). Some of the TLC's basic strategies were to increase the amount and detail of non-demographic data available to the user and to remove race and ethnicity from their allegedly privileged positions in the system.

During the redesign process, the TLC staff considered suppressing block-level data in favor of larger units like census tracts or VTDs, but ultimately rejected this idea. They found this unattractive because districting at the block level typically makes it easy to balance district populations and to prepare the evaluations required by the Department of Justice under the Voting Rights Act (Hanna, 2002). Conversely, the staff did not try to display political information at the census block level. As noted earlier, the accurate disaggregation of election results to blocks is a difficult technical problem, and it can introduce considerable error into the data. As a kind of compromise, the graphical display of RedAppl did not provide such disaggregated political data dynamically, but it appeared in the printed reports generated after a plan had been created (Hanna, 2002).

In short, the RedAppl system used for the 2001 redistricting retained the basic split in scale between demographic and political data. In practice, however, problems associated with using blocks rather than VTDs were limited because most plans in 2001–2002 kept the vast majority of VTDs whole (Archer, 2002).

More is better: adding data to RedAppl

The growth in computer technology during the 1990s enabled the TLC to address some of the concerns raised by the court. For example, the current RedAppl system includes data from as many as 17 different election contests from the general elections in 1998 and 2000. Data from primary and runoff election contests are also available for 1998 and 2000 (*RedAppl Statistics*, 2001). In addition, RedAppl for 2001 included voter registration data, turnout, and partisan indexes for general elections between 1994 and 2000. (Partisan indexes are useful in creating districts that will reliably yield Democratic or Republican majorities.) The graphic display was more sophisticated in 2001. For example, a user could customize the shading and colors of thematic maps, and could display up to three layers of data simultaneously (Dyer, 2003).

In comparison, the 1991 RedAppl system included statewide data for primary, runoff, and general elections for 1988, and 1990, turnout and Spanish-surname voters. The TLC collected data on a large variety of local election contests (county judges, school district elections, etc.), but for relatively few years. For 2001, RedAppl had fewer kinds of local elections, but for more years (Dyer, 2003). Even if the spatial scale of political data remains cruder than that of census data, it has greater temporal depth and detail.

Likewise, modifying the user interface to reduce the prominence of race and ethnicity was relatively straightforward. The current system uses a standard ARC-Info type interface that allows users to select and display any field of data. In the words of the Senior Legislative Counsel, "we consciously made it so that you can turn off the racial data... We made it so that you had to affirmatively decide to display those data" (Archer, 2002). This was perhaps the easiest "technical fix" to objections raised by the *Vera* court.

The addition of compactness measures for districts is a good illustration of the TLC's general strategy. In the early 1990s, courts often engaged in detailed discussion and analyses of district compactness (see Niemi, Grofman, Carlucci, & Hofeller, 1990; Pildes & Niemi, 1993). Late in the decade, courts and law review articles still discussed compactness often enough to lead the TLC staff to include compactness measures in the revised RedAppl system (the 1991 version had none).[13] Moreover, the TLC selected three measures cited approvingly in *Vera* (1994: 1329; 1340). Nonetheless, the TLC staff felt at the time that compactness might not be especially significant in 2001. As one staff member stated, "we weren't sure if compactness would be a "growth industry" in Texas" (Hanna, 2002). The TLC included three gauges because in their view no single measure of compactness had been widely accepted by courts and no single measure captured a district's capacity for good-quality representation (Texas Legislative Council, 2001a: pp. 7–9). The TLC was also acutely aware that different calculations could characterize the same district in ways that might favor a particular party or interest group. Claims about the merits of compactness measures were politically strategic; the TLC sought to avoid endorsing any particular standard by including the three that seemed to have some legal sanction.

The TLC staff generally expressed at least some skepticism about these modifications, acknowledging that they were largely in response to actual or anticipated legal standards, and that they might not be effective tools for the creation of "better" districts. Indeed, one staff member described compactness as a "beauty

[13] Two of these compactness indices measure area and one measures population. The three measures are: (1) the ratio of the perimeter of a district to its area ("Schwartzberg measure"); (2) the ratio of area of the smallest circle that can inscribe the district to the area of the district itself ("Reock test"); and (3) a population "rubber band" that compares the population of a district to the population contained within the smallest convex polygon that can be drawn around the district (Texas Legislative Council, 2001a: p. 8). Through mid-2003, courts have not accepted any of these three measures as the single, appropriate standard.

contest'' that neither bore a relationship to the quality of representation in a district, nor provided a particularly useful way to evaluate competing district plans.

Communities of interest

The TLC went to great lengths to respond to the court's instruction to incorporate different measures and representations of communities of interest into its GIS. Unlike the court's remarks concerning block level versus VTD level data, its commentary on communities of interest provides relatively vague guidance for modifying the RedAppl system. The 1994 opinion invoked the phrase ''community (or communities) of interest'' a number of times, but never offered a definition. For example, when one proposed redistricting plan claimed that Hispanics in Harris County constitute a ''community of interest'', the court wrote,

> One must question how citizen and non-citizen Hispanics comprise a community of interest—many obvious sociological issues, such as relative educational attainment, competition for similar jobs, taxpayer versus non-taxpayer status, and even linguistic differences were not plumbed before this court (*Vera v. Richards*, 1994: p. 1341).

In this passage, the court described several social and economic categories that (presumably together) could constitute a community of interest, but did not offer an explicit definition. Note that none of these categories necessarily define geographically bounded communities.

Likewise, in a related decision two years later by the same court, and authored by the same judge, the court again referred to ''communities of interest'' obliquely. For example, the opinion stated that it modified a proposed plan ''with an eye to smoothing the boundaries and maintaining communities of interest'' (*Vera v. Bush*, 1996: p. 1351). In this instance, the court again implied that geographic boundaries can define communities of interest without making this claim explicit.

Despite the court's failure to provide an explicit definition of community of interest, the TLC felt bound by the *Vera* decisions. According to the Senior Legislative Counsel, the legal and technical staff at the TLC made a ''conscious effort to react to it (the *Vera* decision)... We spent all kinds of time in 1997, 1998, and 1999 trying to identify what was a community of interest'' (Archer, 2002).[14] Similarly, the Program Director in charge of redistricting stated:

> We went round and round trying to interpret what the court meant by a community of interest... We struggled with that quite a bit, trying to look at it. I think the bottom line is that the court used community of interest to say that you can't use the block level to go in and out of neighborhoods in total disregard for people on the ground, and regard them as a number (Ware, 2002).

[14] Indeed, I first met some of the TLC staff when they asked questions about communities of interest at October 1997 NCGIA redistricting conference at SUNY Buffalo, on *Geographic Information Systems and Political Redistricting: Social Groups, Representational Values and Electoral Boundaries*.

This suggests that TLC staff clearly saw the incorporation of "communities of interest" as a direct response to the court's concern over block-level redistricting. Nonetheless, they sought representations of community that would reflect the multi-dimensional complexity of "people on the ground". In this respect, their goal was to capture "everyday practices and contexts" or mêtis ("practical knowledge") that comprise community (Curry, 1998: pp. 3–4; Scott, 1998: pp. 309–341). As Curry argues, however, GIS is fundamentally limited in its ability to represent such practices. Therefore, unlike the court's concerns about racial and ethnic data, there was no obvious or simple technical solution to the problem posed by the representation of "communities of interest".

In addition to addressing the concerns raised regarding the use of racial and ethnic data, the TLC staff "expanded our database and stuck on all kinds of information, (such as) high school attendance zones, (and) police beats (areas patrolled by a police car)" (Hanna, 2002). School attendance zones and police beats are not absurd proxies for communities of interest. Indeed, the TLC staff had articulate justifications for their utility; for example, police beats typically represent an area that is easily accessible by car (Archer, 2002). Nonetheless, the primary reason such information appears in RedAppl is that the TLC had access to this information in conventional digital form, and not because the staff thought these were necessarily the "best" or most useful representations (Ware, 2002).

Two senior members of the legal staff described the process for selecting communities of interest data in the following way.

> We had to find what was out there, what could we get ahold of, and then we had to make a subjective decision of whether it did anything for us, and whether it could be rendered onto our system (Hanna, 2002).

> There were a lot of meetings and discussions... It was a big process (that included) the leadership (of the Texas legislature), technicians, us, and the other agencies that have data (Archer, 2002).

.

The evaluation of "communities of interest" was not a matter of arbitrary decision-making by a few isolated staff members, but involved an extensive consultation process with a broad cross-section of the state's political and technical agencies, personnel and institutions. As such, one can characterize the ultimate representation in the redistricting GIS as what the state "sees" when it looks for such communities.

The exclusive use of information that was already available in digital form was an obvious outcome of this process. TLC staff members explain this as the result of practical and financial restrictions, rather than as a failure to think about communities of interest in other ways. In the following exchange, for example, two TLC staff members discuss proposals to incorporate the "mental maps" of neighborhoods by importing maps drawn by residents of various cities.

> We did consider that (having residents draw their neighborhoods)... We knew of efforts in Los Angeles where people would identify their communities and distill those maps... We thought about doing that... but it just turned out not to be workable... (Hanna, 2002).

> It is unmanageable at the state level. (Archer, 2002).

> Yes, I think that is the main thing... it was just a prioritization (Hanna, 2002).

This decision reflects a number of competing concerns, rather than a simple judgment that such "mental maps" represent communities of interest inadequately. The state personnel evaluating this proposal were faced with the prospect of gathering consistent, original data for a large part of the state and then processing it into a form usable in the redistricting GIS. Such a task would have required significant funding from the state legislature, and simply organizing this effort would have required enormous planning and staff time.

Such practical difficulties were not limited to data a state agency would need to gather especially for redistricting. The TLC staff was acutely aware that importing even existing data into a GIS involves considerable effort and is subject to numerous legal restrictions.

> For example... you could get welfare data with addressed-linked information... but the Federal government has lots of regulations controlling the use of that sort of information... there were a lot of barriers to acquiring the data, getting it computer ready... Let's say you could get data in 25 counties of where people reside who have gotten state benefits. First of all, that data are old. Thirty percent of it doesn't match an address. It's fraught with problems of that sort before you even got down to how you are going to display it. And which of the 20 kinds of available data do you start with? Some of those things present such cost and other practical barriers that they didn't get past the drawing board (Archer, 2002).

Notably, the decision process also excluded certain systematic data that were readily available—digitized aerial photographs. Interviewees specifically mentioned that the state's planning department gave users access to such images.

> We probably could have... worked aerial photographs into the system,... but then you think, so what?... The cost–benefit analysis is what drove a lot of those decisions (Hanna, 2002).

In this case, the cost was not necessarily prohibitive; rather, the staff decided that there would be only minimal benefits to having aerial images in RedAppl. This decision is particularly interesting because such data are literally a picture of "what is on the ground". Although states typically value such "objective" data, Texas did not "see" these photographs as corresponding to communities of interest. More precisely, staff members with intimate knowledge of the redistricting process judged that such information was relatively irrelevant to how legislators construct political districts in relationship to communities of interest.

My analysis to this point has suggested that the state's evaluation of communities of interest excluded everything other than geographical boundaries. Yet, the staff applied the same practical considerations to data on minor political boundaries.

> Texas has lots of political lines and we couldn't put them all in. There are water districts, subsidence districts, and mosquito control districts... We toyed with those too, but they are metes and bounds, we don't have them on maps, they are not computerized. It would have taken ten years to get them computerized. But we can't justify just putting the ones on the computer that are on a GIS disk that they can just give us—then it is just hit and miss. (Archer, 2002).

In this case, the TLC decided against incorporating such information in part because of the expense and effort required. However, the last sentence also reflects other, ideological, concerns.

As a state agency, the TLC has an ostensible obligation to provide *uniform* information throughout the state. In a sense, the state consists of a patchwork of information, where spatial knowledge varies unsystematically. Just as some nation-states do not have effective political sovereignty over portions of their territory, the State of Texas (or indeed any state) does not exert complete information sovereignty over its territory. A state can rarely acknowledge such unevenness in the representation of itself in its own GIS. The state's legitimacy as a modern liberal institution is rooted in its claim to act in a rational manner. The state must justify the inclusion of data in the GIS on rational grounds, not simply because it is available. Hence, the state does not include all available political boundaries because doing so would involve clearly arbitrary criteria. Such ideological concerns exist in tension with the state's effort to incorporate all of the data available within a cost–benefit framework.

Communities as bounded territories

The state ultimately displayed a clear preference for boundary data as proxies for communities of interest, as it rejected data sources that did not define bounded territories. As suggested by Scott (1998), this outcome was not the result of a simple decision to exclude other types of information. Rather, it represents a series of both pragmatic concerns and conceptual decisions that excluded data for a variety of reasons. Staff members thought some kinds of information were too detailed and "non-geographical". For example,

> I had considered using marketing surveys to try to identify communities of interest, and at some point you looked at it and said, well, here are people under 40 who like to go to movies on weekends, and have a big-screen TV. They really were into these sort of substrata... What possible good would these data do us? (Hanna, 2002)

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Although this type of highly detailed, systematic information might be used to produce a compelling justification for a particular plan, the staff's knowledge of the districting process suggested that legislators were unlikely to do so. Here, Hanna's colleague responds to his statement, and ties the definition of communities of interest to the goals of the districting process.

> And if it (information) wasn't geographically-based, (we didn't see how you could use it to draw a district)... We put more geographic data in terms of county commissioners precincts, JP (Justice of the Peace) districts, more local geographic data because clearly that can be used to... divide the north from the south (of a particular area). (A legislator could say) well look, here is a pre-existing (division). (Archer, 2002).

This is perhaps the clearest instance where the state staff members tied the idea of a community of interest explicitly to pre-existing boundaries ("geographically-based" data). Similarly, the state staff rejected the use of statewide property appraisal data because they determined that although these data might have relevance for communities of interest, they would not be especially useful in the actual process of drawing districts.[15]

> We talked about the property appraisal... it had a wealth of information. It was just more than we knew what to do with, and we thought about it, and asked, "well, is this really useful to anyone?" We are not trying to figure out where to put a shopping mall, or a new franchise for a restaurant, so maybe this is too much. Let's give people what they know and understand, and people understand where their kids go to high school—it has some significance (Hanna, 2002)

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Here, the TLC staff draws an explicit comparison between information that varies continuously over space (like property values), and information that defines clear territorial boundaries (like school attendance zones).

Nothing in the language of the various court decisions favors the representation of communities based on territorial boundaries over communities defined by factors that vary continuously over space. Indeed, the examples of social divisions listed by the *Vera* court (citizenship status, education, employment, etc.)—and by the Supreme Court in other major cases (e.g. *Shaw v. Reno*, 1993)—typically have continuous variation rather than clearly defined boundaries. Such examples show that state agencies do not create GIS that reflect the literal language of the court. Rather, they operationalize legal rhetoric through a set of technical and bureaucratic practices that ultimately define "communities of interest" in ways that reflect both technical considerations and constraints of time, cost, and resources. In this case, the TLC staff preferred boundary data both because they were easily

[15] The property appraisal data show land values by parcel. Such parcels correspond to neither census geography nor election precincts, and do not in themselves define recognizable boundaries.

available to them and because in their view, such data would be most helpful to the users of the system.

The importance of boundary data for defining communities of interest is evident negatively in the rejection of data like property assessments, but also positively in the TLC's effort to incorporate "neighborhood maps" into the RedAppl system. As the Program Director in charge of redistricting stated, "we didn't try to go out and define what the neighborhoods were in Dallas or Houston, but some government organizations like the city of Dallas or the city of Houston had neighborhoods or police beats. We would incorporate those, put in those boundaries, and put them in the system" (Ware, 2002). As discussed earlier, the staff decided that they did not have the resources to systematically gather and incorporate the "mental maps" of neighborhoods throughout the state. Nonetheless, the TLC used various existing neighborhood boundary maps in major cities, in a direct response to the *Vera* litigation.

> We looked at neighborhood associations because in the trial court litigation a lot of the plaintiffs... complained that their neighborhood organization... which was traditionally the Republican neighborhood group... (which) historically had been in one city council district... was suddenly in three Congressional districts. They couldn't organize in the same way, and they found that offensive. So we were very attuned to that idea (of representing neighborhood organizations), and we made sure that we collected the neighborhood maps. Most cities have informal neighborhood lines for purposes of looking at zoning issues and those sort of things. So we got those from cities like Houston, Dallas and Austin. (Archer, 2002).

This passage illustrates how legal, political, and technical factors interacted to produce the representation of particular kinds of communities of interest in the RedAppl system. Existing political organizations (local Republican committees) articulated a geographic argument (division between districts) to advance a legal claim (such districts were unconstitutional). The *Vera* suit had clearly partisan consequences. The "neighborhood" argument is strategic because the districting plan challenged in *Vera* was favorable to Democrats. Republican neighborhood groups would not have aggressively challenged a districting plan that favored the Republican Party.

The TLC needed to respond to this type of argument at face value once these claims became an important part of redistricting litigation. What began as a partisan legal strategy (Republican organizations should not be split among districts) evolved into a much more general ontological claim for representation in redistricting GIS. Legal reasoning requires argument from abstract principles (e.g. communities in general deserve representation, not that these particular partisan organizations deserve representation), so the plaintiffs in the case articulated their claims in generalizable terms. Moreover, the state was especially receptive to the use of boundary data for redistricting GIS because it was available and familiar as the kind of information that belongs in such systems. The fact that partisan political groups organized territorially—within bounded areas—meant that other *non-political territories* (e.g. "informal neighborhood lines") were imported into GIS space as entities (potentially) deserving political representation.[16]

Although this example seems to indicate that GIS broadens the kind of communities that can claim political representation, boundaries ultimately offer a very "thin" conception of community. Communities of propinquity are communities of interest to the extent that they facilitate practices that create common interests. Such practices, however, are only imperfectly represented and contained within particular boundaries. By selecting boundaries as the sole representation of community, such systems freeze dynamic practices and processes, and substitute territories for the social relations within those territories (cf. Sack, 1986).

In summary, the kinds of communities represented in the RedAppl system were limited to information that could be imported into a conventional GIS: systematic data describing boundaries, which in turn identify a geographically defined community of interest. This situation was not the result of a single, deliberate decision to exclude any other measure of communities of interest, but rather arose from interactions among legal reasoning, bureaucratic practices, and technical and cost considerations. Although the state technicians and users were well aware of alternative conceptions of communities of interest and devoted considerable thought to their definition, the practices that developed around redistricting GIS led to a progressively narrower meaning. More generally, the communities of interest that were ultimately represented in the RedAppl system reflect the way in which the state "sees" its population as "legible" information.

The social practices and consequences of GIS

If the TLC had not included any metric for communities of interest in RedAppl, or had found radically different ways to represent them, it would not have changed the ultimate configuration of electoral districts in Texas. After the Texas Assembly failed to pass a redistricting plan in 2001, the task passed to the state Legislative Redistricting Board, and then to state and Federal courts (Copelin, 2001; Ratcliffe, 2001). Although all of these organizations used the RedAppl system (Dyer, 2002), the limited GIS representation of communities of interest appears to have had little systematic effect on the proposed plans. Rather, like redistricting plans in the previous decade, partisan concerns, incumbency protection, Constitutional requirements, and the constraints of the Voting Rights Act exercised the greatest influence.

Indeed, the extraordinary mid-decade redistricting undertaken by the Texas legislature during 2003 illustrates the degree to which partisan interests drive redistricting. A Federal court created the original 2001 Congressional districts after a

[16] "I use the term "non-political" here in a narrow sense to mean territories that are not defined by formal partisan politics or institutional political structures. In a broad sense, various political processes operating at a variety of scales produce "informal neighborhood lines".

closely divided Texas legislature failed to adopt a plan. Under this plan, Democrats won 17 of the state's 32 Congressional seats in the 2002 elections. Republicans, however, won solid majorities in both chambers of the state legislature, given them the ability to pass legislation—including redistricting bills—without Democratic support. Republican Governor Rick Perry called two special sessions in addition to the regular 2002—2003 session to design a new Congressional districting plan. This strategy was openly acknowledged as an effort instigated by Republican Congressional House majority leader Tom DeLay to increase the Republican majority in the US House of Representatives (Garrett & Slover, 2003; Walsh, 2003a). The Republican-dominated legislature in Colorado, for example, also engaged in a similar, albeit less dramatic mid-decade redistricting (Halbfinger, 2003). Democrats representatives in Texas temporarily frustrated attempts to redistrict by fleeing to Oklahoma and New Mexico, thereby dropping the number of legislators below quorum (Associated Press, 2003; Ratcliffe, 2003a; Walsh & Brulliard, 2003). After a Democratic Senator returned from New Mexico, however, the Texas legislature succeeded in passing a redistricting plan that gives Republicans a good chance of winning five to seven more districts in the 2004 election (Eilperin, 2003).

The Department of Justice still needs to approve the plan under the Voting Rights Act, and Democrats immediately challenged it on both legal and Constitutional grounds (Ratcliffe, 2003b; Walsh, 2003b). Whether or not the new plan survives these legal challenges, the 2003 Texas re-redistricting affair reveals the partisan character of such struggles in an unusually dramatic fashion.[17] These developments illustrate that when partisan interests are at stake, "communities of interest" seldom have much practical influence in the redistricting process.

The lack of tangible impact in redistricting does not mean, however, that the representation of "communities of interest" in GIS-space is irrelevant to their representation in political-space. Rather, this experience reveals the conceptual limitations of GIS in representing community, the mutual constitution of technical and social infrastructures, and the way in which the concern for information sovereignty shapes state practices.

The case of Texas and the RedAppl system illustrates some of the non-technical limitations of GIS. A legally and technically sophisticated staff with extensive experience in both redistricting and GIS created the relatively conventional representations of community in RedAppl. They—like many in government service—had ties to the academic GIS community and were eager to learn what academic geographers had to say about "communities of interest". Furthermore, they all maintained a healthy skepticism of their own efforts and of how well these data might represent actual, functioning communities of interest. Yet, despite this relatively sophisticated approach, they ultimately created a GIS that reproduced a very conventional, geographically bounded definition of "communities of interest". Although it might be possible to think of a GIS with "better" or more complex

[17] Although the 2003 Texas redistricting was instigated by Republicans, Democrats also engage in vigorous partisan gerrymandering when given the opportunity.

representations of community (see for example, Kwan, 2002), the social routines associated with GIS mean that such representations are not developed in practice.

This case study also illustrates the need to look beyond computer technology to conceptualize GIS as a set of practices that are themselves part of larger systems (Curry, 2002; Pickles, 1995). Improvements in computer technology during the last 10 years enabled the developments evident in redistricting GIS, but the use and consequences of systems like RedAppl are deeply embedded in a host of political and legal frameworks. In this instance, the reproduction of "communities of interest" as geographically bounded communities was not the result of technological determinism, nor of the technical limitations of GIS. Rather, the representation of community in RedAppl was structured by the production of the GIS within a particular legal framework that privileges abstract principles and objective, quantifiable information.

As Curry (1998) further observes, only a few things—conventional "computerized maps" like RedAppl for example—tend to count as GIS. State practices, legal reasoning, and technical representations that devalue "subjective" local knowledge marginalize alternative systems of geographic information (which might be as simple as a representative's notes for constituent servicing or knowledge of the route voters take to polling places). The influence accorded to conventional GIS reflects the process of governmentality and the mutual construction of power, state practices, and knowledge (Foucault, 1994; Scott, 1998).

The failure of "communities of interest" to have a tangible effect on redistricting also shows that GIS do not operate autonomously and do not simply provide "technical" solutions to social and political problems. It is conceivable that a court, the legislature, or the Legislative Redistricting Board could have used the boundaries identified by the TLC either strategically (to advance a partisan goal) or genuinely (to empower particular communities with shared interests). The fact that this did not happen suggests that despite the rhetoric of the *Vera* opinion, the representation of communities of interest is not a central principle or practice in redistricting. RedAppl may have contained information on communities of interest, but this portion of the GIS was not tied to the infrastructure of institutional practices (partisan politics, legislative interests, local political knowledge, the legal system, etc.) that create redistricting plans. In the sense that one must position GIS as a part of such larger systems and practices, "communities of interest" actually never became part of the redistricting GIS.

More generally, RedAppl, and similar redistricting GIS, illustrate the growing importance of information and information technology, and the attempts by states to regulate these activities. Although the rapid spread of GIS technology makes it possible, in principle, for interest groups, organizations and citizens to create their own redistricting plans, only large, well-funded organizations like political parties can typically afford to create *and implement* such plans successfully. Although GIS have the capacity to create and evaluate many different district configurations, this does not mean that every configuration has the same chance to be passed into law. Control over information and its use is thus not confined to the technical aspects of GIS, but extend to broader systems of power.

Redistricting GIS reveal the state's need for systematic, comprehensive and consistent information about its territory to maintain information sovereignty. Although the state seeks out previously hidden or private realms, and constructs "data" about previously unclassified knowledge, this study suggests that the state also seeks to *exclude* partial knowledge about itself because such incomplete representations would challenge its status as rational, orderly, and sovereign. The impulse to exclude partial information might preserve or even create new spaces of privacy, civil society, and community. However, it is more likely that the use of GIS for redistricting will make it more difficult to politically represent all of the activities that can constitute "communities of interest".

While the traditional process of redistricting was often deeply flawed and corrupt, its informal and flexible nature meant that it created the potential for the political representation of many types of communities and activities. GIS have made the redistricting process more systematic and "rational", but at the price of excluding from consideration the full range of activities and interests that form communities.

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