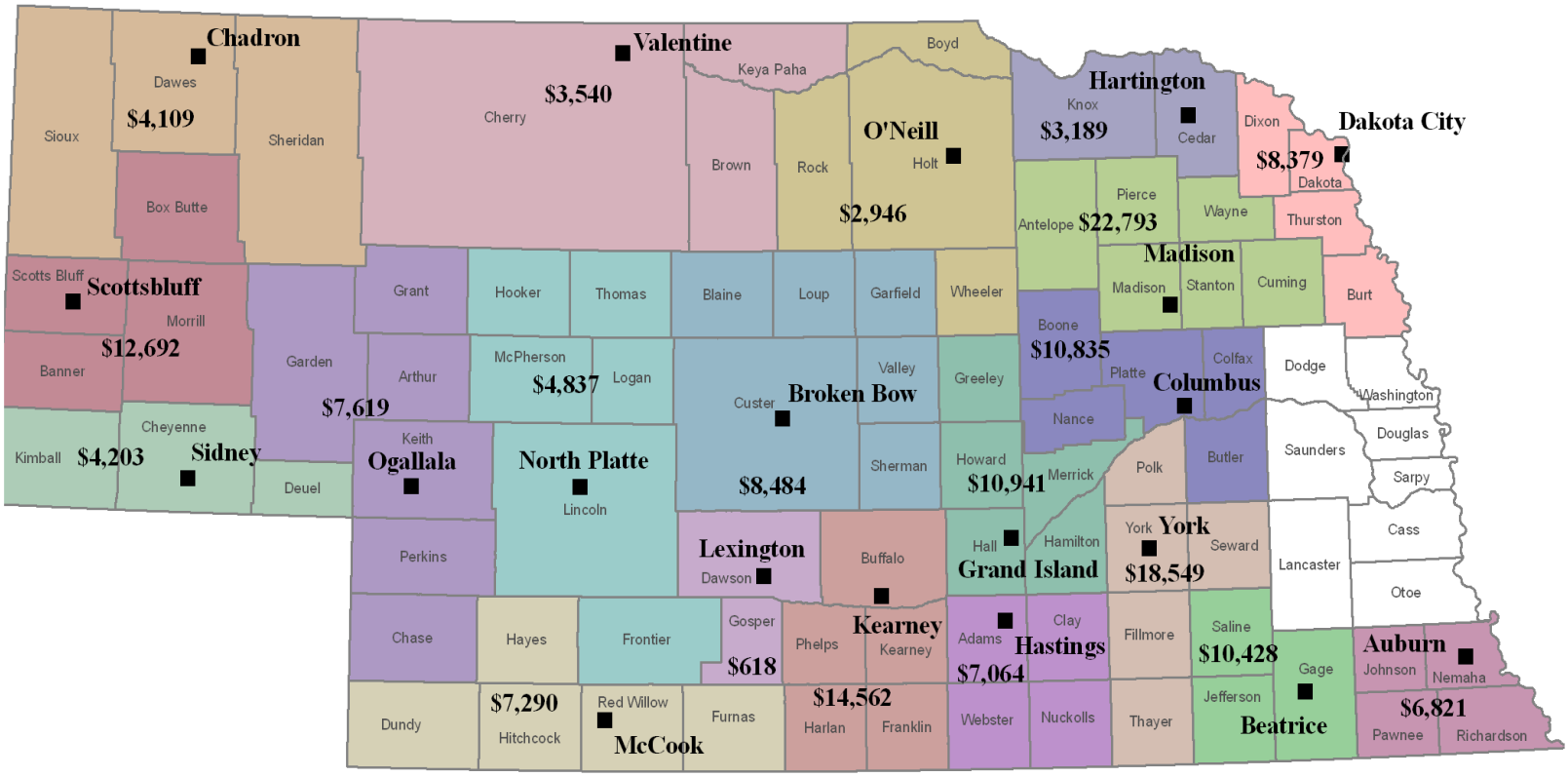
policy STUDY

Platte INSTITUTE for economic research

County Consolidation: Is Less More?



Nebraska's Consolidated County Units 2008—with Increased Transportation Costs to Services

Cartography by Jake McGlade, Tony Reznicek, & Jamie Knuth

November 2009

Authored by Dr. Paul Burger and Dr. H. Jason Combs

A GIScience Approach to the Consolidation of County-Level Services in Nebraska

Introduction

Nebraska's initial settlement pattern was influenced by the Midwest's agrarian society of the mid- to late-1800s. During this time two congressional acts—the Transcontinental Railroad Act and the Homestead Act, both passed in 1862—significantly impacted the state. The Union Pacific Railroad traverses 472 miles from Omaha to the Colorado border and was completed in less than three years. The railroad transformed Nebraska from a "thinly populated corridor of westward expansion into a booming agricultural state that promised to become one of the leading food producers in the nation."[1] The Homestead Act provided pioneers 160 acres of land if they constructed a permanent structure and resided on the land for five years. The act changed the landscape in dramatic fashion and started a "great tide of emigration for the west and especially Nebraska" (*Table 1*).[2] By 1900 "almost sixty-nine thousand people had acquired land in Nebraska under the Homestead Act—the largest number in any state in the Union."[3] Not only did Nebraska's population surge but it shifted to the west as it followed the expanding settlement frontier.

In the early 1900s, Nebraska's population growth exceeded the nation's. Immigrants poured into the state and many rural communities and counties peaked in population during this time. At the county-level, seventy-three of Nebraska's counties peaked in population between 1890 and 1940—the so-called heyday of small town America.[4] Following World War II—primarily as a result of mechanization and the depressed farm economy—population growth declined and Nebraska's westward population movement reversed and shifted east toward Omaha and Lincoln. By the 1980s, Nebraska's 19th-century population concentrations in rural areas had been "seriously eroded."[5] Over half of all Nebraskans lived within fifty miles of the eastern border with Iowa and over 40 percent of its population was located in Douglas, Lancaster, and Sarpy Counties.[6]

Table 1—Nebraska's Population Change, 1860-2000

Year	Total Population
1860	28,841
1870	122,993
1880	452,402
1890	1,058,910
1900	1,066,300
1910	1,192,214
1920	1,296,372
1930	1,377,963
1940	1,315,834
1950	1,325,510
1960	1,411,330
1970	1,483,493
1980	1,569,825
1990	1,711,263
2000	1,768,331

Source: www.census.gov 2009.

The eastward shift of Nebraska's population has continued in recent decades and the larger communities have increased in population while smaller towns have witnessed population declines.[7] For instance, thirty-eight counties—most are located in the southern and western parts of the state—in 2000 had less than half of their peak population.[8] On the other hand, Nebraska's metropolitan areas continued to expand. In 2000, three counties (Douglas, Lancaster, and Sarpy) were home to nearly half of the state's total population. At the city-level, a similar advantage for larger urban areas is also apparent. Nebraska's larger communities—those with populations greater than 10,000—have grown substantially over the last century and so far this decade the urban shift has continued (*Table 2*). Based on current estimates, Nebraska has gained 63,000 residents since 2000; although, the "modest population gains have been skewed overwhelmingly to Nebraska's largest cities and their suburbs."[9] The eight-county Omaha metropolitan area, which includes three counties in Iowa, has increased by 8.2 percent since 2000. Further west on Interstate 80, Lincoln's two-county metropolitan region has jumped 9.5 percent since 2000.

As a result of farm consolidation and larger economic forces, recent population trends will most likely continue in Nebraska and throughout the Great Plains.[10] Lonsdale and Archer (1998) discuss population issues in the Western Corn Belt and the Great Plains—regions that encompass Nebraska—and describe them as "emptying areas." In general, these areas tend to have aging populations with low birth rates and diminishing employment opportunities. In regard to the Western Corn Belt, many of the counties "have a history of population loss dating back to the first half of the century" and that there is a "heavy reliance on agriculture with emphasis on single-family farms producing grain and livestock."[11] Furthermore, the Great Plains "has long been an area of widespread nonmetro depopulation" with many small towns "losing population and central place functions."[12]

Table 2—Percentage of Population in Places by Size, 1900 and 2000

City Size	Percent of Population, 1900	Percent of Population, 2000
100-249	3.4	1.5
250-499	11.6	3.1
500-999	14.1	5.1
1,000-2,499	15.4	7.3
2,500-4,999	8.8	4.3
5,000-9,999	11.7	8.7
10,000-49,999	9.8	23.8
50,000+	25.1	45.8

Source: Drozd 2007.

County Formation and Representation

As dramatic population shifts occurred throughout the United States, representation became an increasingly important issue. Shelley et al. (1996) note, for instance, that "ease of access to governmental officials and policy-making bodies was an important feature of American democracy long before the American Revolution."[13] Predominantly rural, scattered populations "demanded that the institutions of representative government be set up in such a way as to ensure accessibility."[14] As a result, colonial capitols were centrally located and "counties were small enough that any resident of a county could journey to the seat of government on horseback or by stagecoach, transact business, and return home before nightfall."[15]

Population shifts have continued but technological changes have highlighted representation issues in new ways. Wilbanks (2004) contends that technology "affects the meaning of proximity, and thus the significance of location and operational definitions of efficient spatial organization, by helping to determine the effort required to overcome distance."[16] Wilbanks (2004) continues, technology in recent decades has reshaped geographical relationships in two fundamental ways: by "shrinking our globe, so that people who used to be distant from each other are now neighbors . . . and by introducing alternatives for interaction that are (or appear to be) released from constraints of distance and conventional spatial patterns, e.g., cyberspace."[17] Modern information and communication technologies are creating "new opportunities for direct engagement in political activities to new ways to access (and monitor) government services."[18] Regulska (2004) agrees that information and communication technology has reshaped the meaning, understanding, and practices of democracy. It is clear that "information is available faster and in larger quantities, and that contacts are no longer restricted by place and time; being place-independent and of almost instant 24/7 availability."[19] However, some scholars have questioned whether or not "low computer literacy, lack of access to technical infrastructure, and/or high costs of use will contribute to further social stratification and will determine who can become a user."[20]

The pros and cons of consolidating services have been debated for decades.[21] In the early 1950s, Lomax (1952) argued in favor of consolidation to cut spending by re-

moving administrative duplication.[22] More recently, Condrey (1994) explored the impacts of consolidation at various levels (city, county, state, etc.) and noted the cost savings associated with reducing the "duplication of services and associated personnel costs."[23] Not only have population shifts and technological advances created cheaper methods of delivery, but the United States has an abundance of local government units compared to other nations. Boyne (1992), for example, compares the American local government system to a "complex jigsaw" or a kaleidoscope "with overlapping units of varying sizes and functional responsibilities."[24] The United States has over 83,000 local government units which is approximately one for every 3,700 residents. Moreover, "local governments in the USA spend almost 8 per cent of GNP, which is roughly 22 per cent of total public expenditure."[25] In contrast, the United Kingdom has one local government unit for every 115,000 citizens.

Nebraska Consolidation Issues

Impacted by this rural to urban migration are Nebraska's ninety-three counties established to serve a predominantly rural population and agrarian economic structure. Given today's population realities a more efficient distribution of centers may exist to effectively provide various aspects of governmental services. The purpose of this research is to explore the viability of an alternate configuration of First Order Civil Divisions (FOCDs) to provide basic services such as Register of Deeds to their respective populations. GIScience technology is utilized to identify twenty FOCDs, referred to as *Consolidated County Centers* (CCCs), outside of the Omaha and Lincoln metropolitan areas.[26] Counties are then allocated to these CCCs to form *Consolidated County Units* (CCUs) and the impact of transportation costs due to increased distances to services is determined for local populations. The goal is to open dialogue on this issue as a basis for future research on the viability of such an administrative structure that may decrease the cost of local government in Nebraska.

The objectives of this research are threefold. First, identify the number of new CCCs that "best" minimizes the overall transportation cost for the entire system using population at census block group-levels (approximately 1,000 people) given the fol-

lowing parameters.[27] Second, assign each county to the closest CCCs based upon minimized distances of its respective block group populations.[28] Finally, estimate each counties' increased transportation cost using block group-level data that would result from the reassignment of traditional county-level services to new CCCs.

The selection of the CCCs and assignment of block groups is based upon the following guidelines:

- No census block group should have to travel more than sixty miles to a service center.
- The population served by each CCCs should not exceed 60,000 when practical.
- Counties should not be subdivided in their assignment to CCCs.
- More densely populated counties in eastern Nebraska, such as Cass, Dodge, Douglas, Lancaster, Otoe, and Washington are excluded from the analysis.

Data and Methods

The primary GIS data layers for analysis are census block groups, county boundaries, roads, and places—used only as a reference layer. Road networks are acquired from the *National Transportation Atlas Database* (2008) and all remaining layers are from the U.S. Census Bureau's TIGER/Line 2006 files.[29] Population data are obtained from *GeoLytics, Inc.* at the census block group-level and are summarized for 2000, 2006, and 2011.[30] Total population from birth to 17 years of age and 18 and over is then calculated using the available five-year cohorts. Block group data are then added into GIS using ArcMap.[31] County-level demographic data are derived by dissolving block group boundaries based upon the county name and summarizing the relevant population data by county.[32]

County seats are manually defined by adding a column in the block group attribute table and designating them as "1" (yes) or "0" (no) based on whether or not the city's centroid is contained inside of that block group. Block group polygons are converted into a point layer in ArcMap. This designates a single central point representative of the center of the respective block group polygon.[33]

From a geographic perspective, finding a solution to the consolidation of rural governmental services involves location-allocation (LA) and spatially balancing *demand* and *supply.* Block groups have a *demand* in that the population living within them has a need for governmental services that are *supplied* at an existing county seat of the new CCU to which it is allocated. Block groups and their respective populations containing existing county seats are analyzed as potential CCCs while all remaining block groups impact the location of those CCCs in proportion to their population weighted by distance. LA is solved by "computing the best location of centers to service given demand according to the defined criteria. The allocation of demand points to these service centers is also computed."[34] Two heuristics for LA are available in ArcGIS, Global Regional Interchange Algorithm (GRIA) and Teitz and Bart (TB).[35, 36] Matching block group demand to supply at a center requires a group of *candidates* for consideration, in this case eighty-five existing county seats outside of those counties excluded from the analysis. Candidates are one of two types—*mobile* or *fixed*. A *mobile* candidate is utilized based upon whether or not it provides an optimal location for serving demand points, while *fixed* must be used and all subsequent centers are chosen from among mobile candidates based upon the remaining demand. Six places (counties) in Nebraska are selected as *fixed* locations given their obvious geographic advantage as service centers within larger population concentrations—Adams (Hastings), Buffalo (Kearney), Hall (Grand Island), Lincoln (North Platte), Madison (Madison), and Scotts Bluff (Scotts Bluff). It is not feasible to assign these counties to other county seats for their services, thus they are fixed and their respective demand assigned accordingly by LA. The weighted mean centers of population are calculated at the county-level for every ten years of the 20th century and at the block group-level for 2000, 2006, and 2011. [37]

LA of services is computed at the block group-level using the county seats as candidates for centers and all block group centroids as demand points. Candidate status is assigned to each block group by creating a new field in the attribute table and assigning values of "0" (non-candidate), "1" (candidate), or "2" (fixed center). For those block groups within a county in which a center is fixed (value of 2) the remaining block groups are assigned a population demand of "0" for the purpose of the LA.

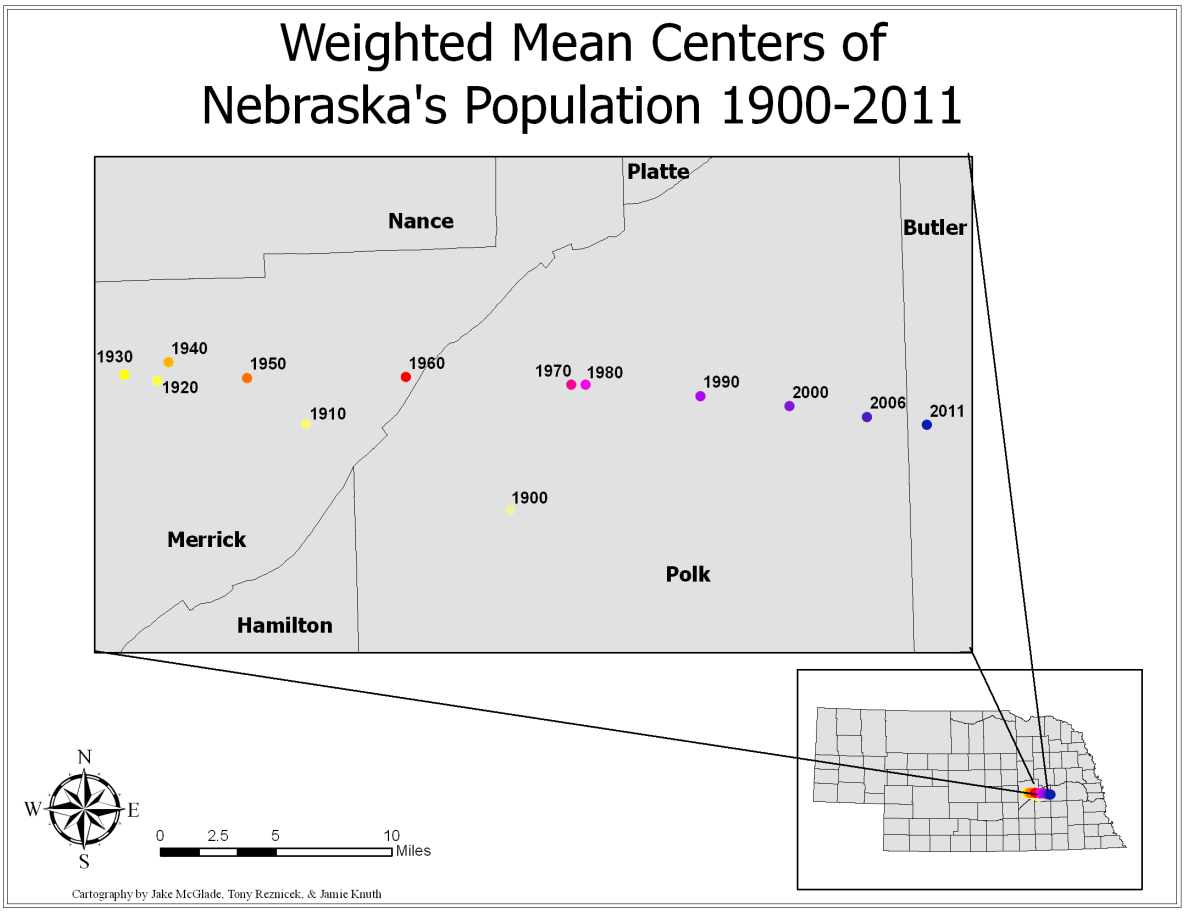
As a practical matter, there is no purpose in allowing the block groups to be factored into the entire LA by impacting the location of other centers that may be closer to them than their current county seat when they will remain with their existing county.

The appropriate range of total centers to be considered—between fifteen and twenty-three—is derived from three output files.[38] Using the allocation file which lists each block group and the center to which it is assigned, CCCs are then defined manually to meet the parameter of not subdividing counties. LA allocates sites based upon the minimum weighted distance to a supply center from each block group demand point with no regard for boundaries. The final objective is to calculate the increased transportation costs necessary for those citizens within a county reassigned to a new center other than their county seat. This involves two distance computations from each block group—one from it to the point representing the county seat and the other to the new CCC. A cost for each block group is determined using a formula and then summarized within each new CCU to calculate the total additional cost for people to travel to new CCCs.[39] Tables depicting the additional expenses are added to ArcMap at the block group-level. Block group boundaries are dissolved and costs summarized by CCCs to produce the additional total costs to all travelers to the new center. The county boundaries are also dissolved and summarized into the new CCUs with an associated total transportation cost for each.

Analysis

Figure 1 depicts the thirteen weighted mean centers of Nebraska's county-level population from 1900 through 2011 and the geographic shifts previously noted by Baltensperger (1985), Hickey (1992), and Combs (2009). From 1900 through 1930 the weighted mean centers rapidly moved westward coinciding with the peak of rural and small town settlement in Nebraska. The gradual yet sustained population shift eastward to urban areas and the decline of rural populations since World War II to the present outlined by Baltensperger (1985) is evident from the remaining nine weighted mean centers. Regardless of one's stance on consolidation, it is clear that Nebraska's counties and their respective services were set up to serve a predominantly rural, agrarian and geographically diffused population that is no longer dominant.

Figure 1



The GRIA heuristic that produces twenty CCCs is selected as the "best fit" by noting where the improvement in total weighted distance (TWD) begins to taper and the location of the heuristic's selection of additional CCUs over successive iterations does not improve their geographic configuration with respect to the population they serve (*Figure 2*). [40] The use of twenty CCCs has several geographic advantages over the spatial configurations for nineteen and twenty-one.[41] *Figure 3* shows the twenty county seats identified as CCCs (black squares) and their corresponding CCUs (colored areas) containing the block groups which they serve. The final allocation of block groups is performed manually to preserve the integrity of county units. Demand is manually assigned to centers using population distribution, distance to center, accessibility, and proximity to major highways. The corresponding total increase in transportation costs is also assigned to the center. Totals for each CCU are given in

dollars in *Figure 3*. Individuals who are driving to a different county for services represent a cost, while those receiving services in their home county have no additional cost because their access to service has not changed. With a twenty center solution each reassigned block group citizen will travel on average 21.4 miles to new CCCs, a distance well under the sixty mile threshold. The total cost for traveling to new CCCs statewide is $169,909, an average of $502 per reassigned block group.[42]

Figure 2

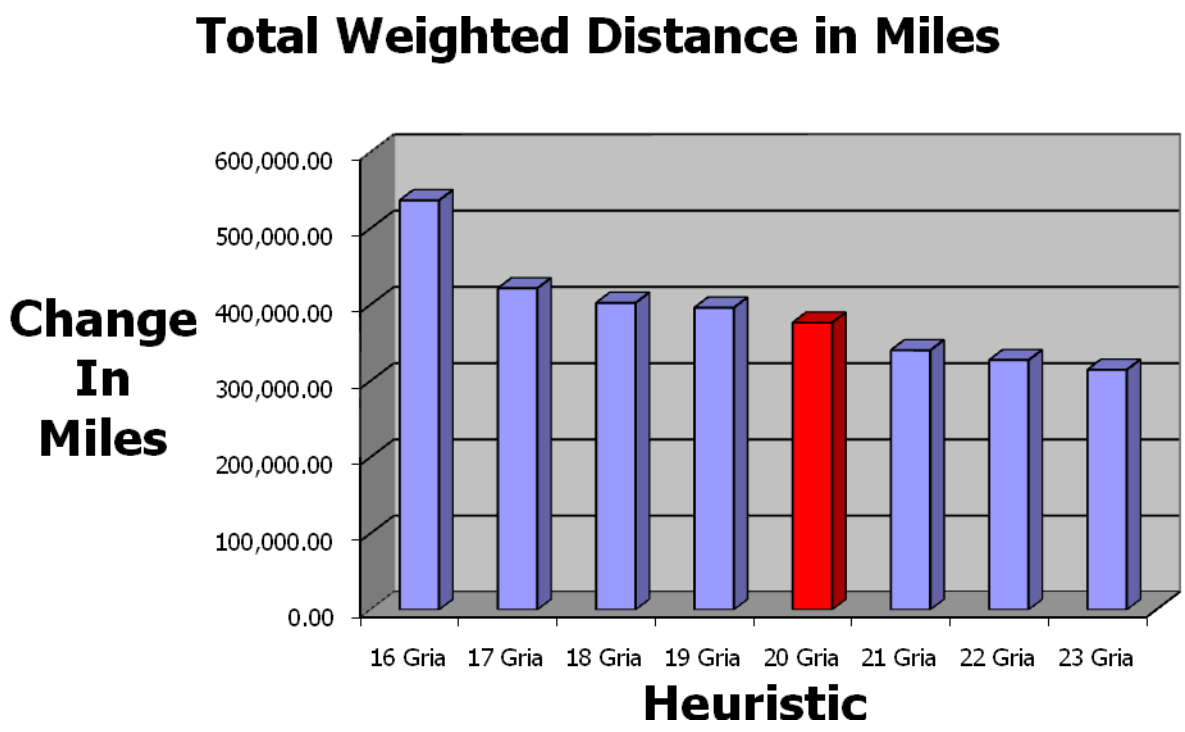
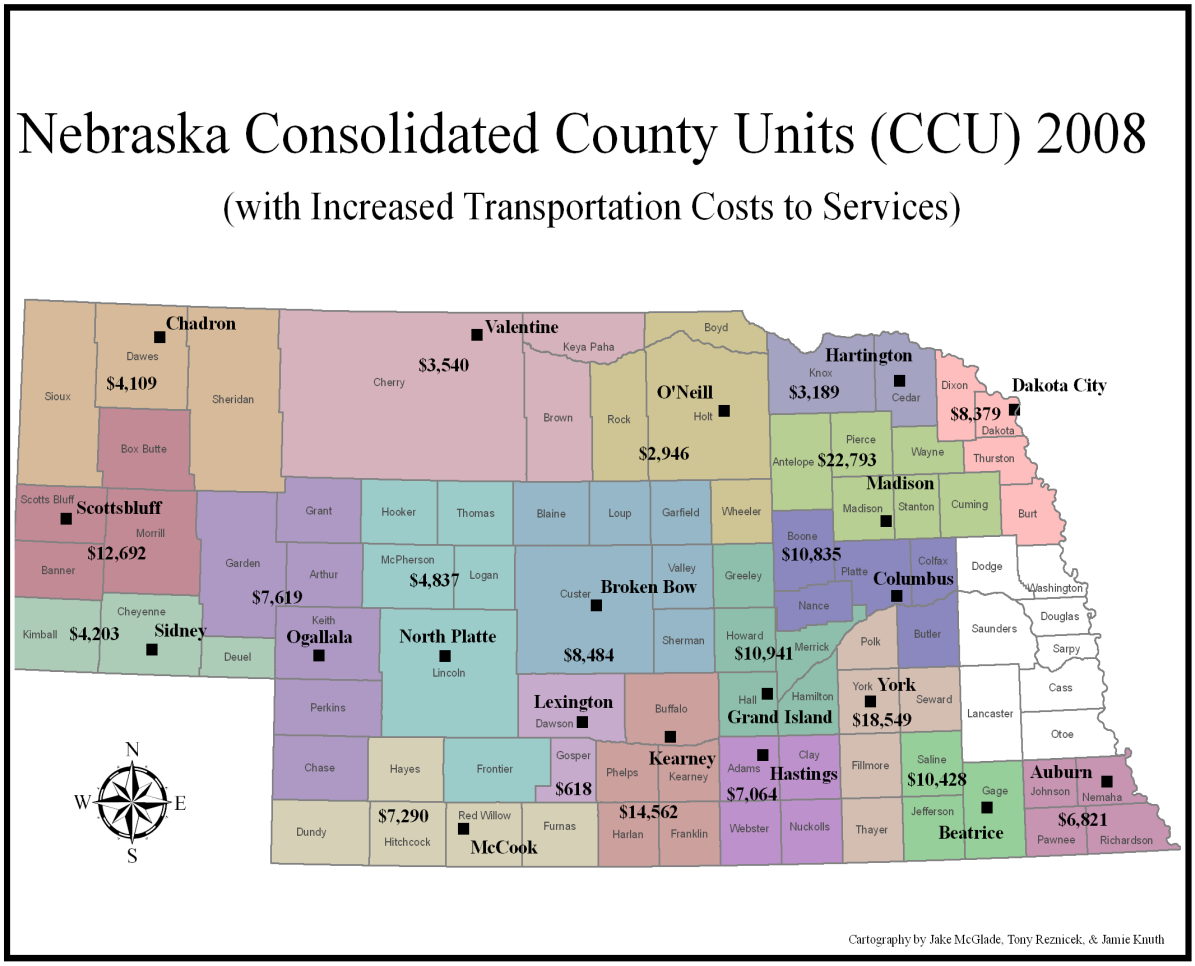


Figure 3


Nebraska Consolidated County Units (CCU) 2008
(with Increased Transportation Costs to Services)
Chadron
$4,109
Valentine
$3,540
O'Neill
$2,946
Hartington
$3,189
Dakota City
$8,379
Madison
$22,793
Scottsbluff
$12,692
$7,619
$4,837
Broken Bow
$8,484
$10,835
Columbus
$4,203
Sidney
Ogallala
North Platte
$10,941
Lexington
Grand Island
York
$18,549
Kearney
$618
Hastings
$7,064
$10,428
Auburn
$6,821
$7,290
McCook
$14,562
Beatrice
Sioux
Dawes
Sheridan
Cherry
Keya Paha
Boyd
Brown
Rock
Holt
Knox
Cedar
Dixon
Dakota
Pierce
Antelope
Wayne
Thurston
Madison
Stanton
Cuming
Burt
Scotts Bluff
Morrill
Banner
Box Butte
Grant
Hooker
Thomas
Blaine
Loup
Garfield
Wheeler
Boone
Garden
Arthur
McPherson
Logan
Valley
Greeley
Platte
Colfax
Dodge
Washington
Nance
Cheyenne
Kimball
Deuel
Keith
Custer
Sherman
Howard
Merrick
Polk
Butler
Saunders
Douglas
Sarpy
Perkins
Lincoln
Dawson
Buffalo
Hall
Hamilton
York
Seward
Lancaster
Cass
Otoe
Chase
Hayes
Frontier
Gosper
Phelps
Kearney
Adams
Clay
Fillmore
Saline
Gage
Johnson
Nemaha
Dundy
Hitchcock
Red Willow
Furnas
Harlan
Franklin
Webster
Nuckolls
Thayer
Jefferson
Pawnee
Richardson
N
W
E
S
Cartography by Jake McGlade, Tony Reznicek, & Jamie Knuth

Conclusions and Future Study

This study utilizes GIScience (LA) technology and block group population data to create twenty new government service centers known as CCCs. Block groups were assigned to new Consolidated County Centers (CCCs) based upon distances computed from LA, the preservation of the entire county unit, and geographic conditions within the state. These conditions include the natural tendency of traveling along paved roads to or through major population centers that offer other amenities in conjunction with a trip requiring government services.

The CCU solution layer (*Figure 3*) is spatially allocated to ensure that few people would have to travel more than sixty miles to a consolidated government center. With a twenty center solution, each reassigned block group resident will travel on average 21.4 additional miles to new CCCs which is well under the sixty mile threshold.[43] There were, however, problems in adhering to the population threshold of serving fewer than 60,000. In Hall and Buffalo Counties (Grand Island and Kearney, respectively) the population of the towns and the surrounding counties is high, thus the population being served by new centers exceeds 60,000 people. The costs are representative of estimates for each block group that has been consolidated with new CCCs. On average, an additional $502 would be spent on traveling to new CCCs per block group. The total cost for all reassigned block groups to travel to new CCCs is $169,909 annually.

This estimate provides a basis for further discussion and possible future research in Nebraska on the viability of such an administrative structure that could pass on any cost savings in tax dollars achieved through the consolidation of services to the local population to offset increased transportation costs. Specific research questions may include: Could county-level services such as Register of Deeds, or any other functions, either be consolidated or moved online? What, if any, cost savings can be realized by such a move? Would any cost savings in tax dollars outweigh increases in transportation costs? Are taxpayers willing to exchange these savings for any potential increase in transportation costs or perceived loss of access to their existing county-level services?

References

ArcInfo 9.3 ArcDoc. 2008a. *Global Regional Interchange Algorithm (GRIA)*. ESRI: Redlands, CA.

_____ . 2008b. *Teitz and Bart (TAB) Heuristic.* ESRI: Redlands, CA.

_____. 2008c. *Locate-Allocate*. ESRI: Redlands, CA.

Baltensperger, Bradley. 1985. *Nebraska*. Westview Press: Boulder, Colorado.

_____ . 1987. Farm Consolidation in the Northern and Central States of the Great Plains. *Great Plains Quarterly* 7(4): 256-265.

Boyne, George. 1992. Local Government Structure and Performance: Lessons from America? *Public Administration* 70: 333-357.

Burger, Paul R., Haack, Ryan, Langrud, Kurt and Stansberry, Joe. 2007. A Location Allocation Approach to Redistricting: A Case Study of the 2010 Nebraska Unicameral. *Geospatial Solutions Online*. Retrieved Oct. 1, 2008, from http://www.geospatialsolutions.com/geospatialsolutions.

Combs, H. Jason. 2009. Pulaski, Iowa: Small Town America's Changing Cultural Landscapes. *Bulletin of the Illinois Geographical Society* 51(1): 1-21.

Conndrey, Stephen. 1994. Organizational and Personnel Impacts on Local Government Consolidation: Athens-Clarke County, Georgia. *Journal of Urban Affairs* 16(4): 371-383.

Drozd, David. 2007. *Nebraska Historical Population Report*. Center for Public Affairs Research, University of Nebraska at Omaha: Omaha, Nebraska.

GeoLytics, Inc., 2006. 2006 Estimates, 2011 Projections. East Brunswick, NS.

Glassner, Martin Ira, and Harm J. De Blij. 1989. *Systematic Political Geography*. 4th Edition. New York: John Wiley.

Goodsell, Paul. 2008. Census: People Leaving Rural Areas for City Life. March 20, *Kearney Hub*.

Lomax, K. 1952. A Criterion of Efficiency in Local Administration. *Journal of The Royal*

Statistical Society 115: 521-523.

Lonsdale, Richard, and Archer, J. Clark. 1998. Emptying Areas of the United States. *Journal of Geography* 97: 108-122.

National Transportation Atlas Database. 2008. Washington DC: Research and Innovative Technology Administration/Bureau of Transportation Statistics.

Nebraska Energy Office. 2008.*Ethanol and Unleaded Gasoline Average Rack Prices*. Retrieved Oct. 28, 2008, from http://www.neo.ne.gov/statshtml/66.html

Regulska, Joanna. 2004. Democracy and Technology. In *Geography and Technology,* eds. Stanley Brunn, Susan Cutter, and J.W. Harrington, 339-362. Kluwer Academic Publishers: Norwell, Massachusetts.

Shelley, Fred, Archer, J. Clark, Davidson, Fiona, and Brunn, Stanley. 1996. *Political Geography of the United States*. The Guilford Press: New York.

United States Bureau of the Census. 2005. *TIGER/Line Metadata: Datum & Projection*. Retrieved Sept. 11, 2008, from http://www.census.gov/geo/www/tlmetadata/metadata.html.

_____ . 2006. TIGER/Line. Washington, DC: U.S. Dept. of Commerce Economics and Statistics Administration.

United States Department of Commerce. 2007. Census Block Groups, Cartographic Boundary File Descriptions and Metadata. Available from: http://www.census.gov.

United States Environmental Protection Agency. 2005 *Emission Facts: Greenhouse Gas Emissions from a Typical Passenger Vehicle*. Retrieved Oct. 28, 2008, from http://www.epa.gov/otaq/climate/420f05004.htm.

Wilbanks, Thomas. 2004. Geography and Technology. In *Geography and Technology,* eds. Stanley Brunn, Susan Cutter, and J.W. Harrington, 3-16. Kluwer Academic Publishers: Norwell, Massachusetts.

www.census.gov. 2009. *United States Census Bureau*. United States Department of Commerce, Economics and Statistics Administration. Date last accessed 1 July 2009.

End Notes

[1]Hickey 1992: 92.
[2]Ibid.: 101.
[3]Ibid.: 102.
[4]Combs 2009.
[5]Baltensperger 1985: 69.
[6]Baltensperger 1985.
[7]Today, Nebraska ranks 16th in land area with 77,538 sq mi and 38th in population at 1,711,263 (www.census.gov 2009).
[8]Drozd 2007.
[9]Goodsell 2009.
[10]Baltensperger 1987.
[11]Lonsdale and Archer 1998: 119.
[12]Ibid.: 118.
[13]Shelley et al. 1996: 3.
[14]Ibid.
[15]Ibid.
[16]Wilbanks 2004: 5.
[17]Ibid.: 6.
[18]Ibid.: 7-8.
[19]Regulska 2004: 340.
[20]Regulaska 2004: 343. Wilbanks (2004) also discusses issues related to equity—elderly, low-income, etc.—and questions whether or not new technologies will make democratic decision-making more or less consensual and integrated.
[21]Glassner and de Blij 1989.
[22]However, consolidated units that are too large "will be subject to diseconomies of scale. Higher costs may arise because of the problems of delivering services to remote areas" (Boyne 1992: 336).
[23]Condrey 1994: 372.
[24]Boyne 1992: 342.
[25]Ibid.: 341.
[26]GIS stands for Geographic Information System.
[27]This is achieved through identifying the appropriate location allocation (LA) heuristic in ArcGIS software that locates centers (CCCs) in such as way as to 'maximize' their relationship to the population distributed across space.
[28]According to the United States Department of Commerce (2007), a block group normally contains "between 600 and 3,000 people, with an optimum size of 1,500 people." Additionally, the "block group is the lowest-level geographic entity for which the Census Bureau tabulates sample data from the decennial census" (United States Department of Commerce 2007).
[29]TIGER/Line files are projected at a 1:100,000 scale and use the North American Datum 1983 (United States Bureau of the Census 2005; 2006). All layers are projected into the Nebraska State Plane (NAD 83) coordinate system to insure more accurate distance calculations (United States Bureau of the Census 2005; 2006). TIGER/Line files are converted into ArcGIS *shapefile* format using the GISTools software.
[30]*GeoLytics* provides block group-level census data for 1980, 1990, 2000, estimates for 2006, and projections for 2011 all within the current 2000 geographical boundaries of the census block groups. This facilitates a longitudinal comparison of population data for similar geographic areas.
[31]A tabular join has been performed between the *GeoLytics* block group demographic data tying it to the geography of the census block group layer.
[32]The result of this aggregation process is a table of county-level data that, similar to the block group data, is joined by common identifier to the geography of the respective county.
[33]Block group polygon *shapefiles* are converted to a point layer using the feature to point command. The block group point layer is then converted into an ArcInfo *coverage* to conform to location-allocation operation require-

ments. These conversions from polygons to points and *shapefiles* to *coverages* (the proprietary names for map-like layers in their respective spatial databases) are necessary since the LA heuristic in ArcInfo operates on point rather than polygon layers in the *coverage* format.

[34]ArcInfo 2008c.

[35]Finding the twenty *optimal* (best of all possible) answers given the choice of eighty-five county seats would require approximately 3.8 quadrillion calculations. To make this problem manageable a heuristic is used. Heuristics search for a *local optimum* by using some mathematic reasoning by substituting candidates from a starting group of solutions until improvements in the total weighted distance (TWD) are no longer achieved. How this substitution is done depends on the specific heuristic algorithm. This allows a heuristic to closely approach the *optimal* answer by doing only a fraction of the actual possible calculations (ArcInfo 9.3 2008a, 2008b).

[36]GRIA is selected over Teitz and Bart because "GRIA's computational time is better for small problems, while TAB is preferred when the demand and candidate locations differ" Burger et al. 2007: 4. The Global Regional Interchange Algorithm (GRIA) is the most consistent model when using between fifteen and twenty-three centers. Also, the GRIA centers better fit population centers and their access to major transportation arteries. A range of between fifteen to twenty-three centers is chosen due to prior attempts being inconclusive or not yielding enough sites to serve the geographic space.

[37]The Weighted Mean Center (WMC) for each decade is calculated from the sum of all *X* and *Y* coordinate pairs for each county's center point weighted by the population. The result is a single point depicting the WMC of Nebraska's population for a given decade. Geographic *shapefiles* for all thirteen of the resulting weighted mean center analyses from 1900 through 2011 are merged into a single file for ease of mapping.

[38]An Arc Macro Language (AML) text script calculates numerous iterations of the LA to determine the optimum number of centers. The locate-allocate process produced three output files. The appropriate number of centers is determined by locating the iteration at which a significant reduction in total weighted distance is not realized by adding an additional center (CCC) for providing traditional county-level services.

[39]The block group transportation cost formula is (((BGCS_Dist – BGAC_Dist) / AMPG) * APPG) * SF)

Where:

BGCS_Dist – distance between a block group and its current county seat.

BGAC_Dist – distance between a block group and its newly Consolidated County Center (CCCs) from the LA.

AMPG – overall average miles per gallon (20.3) in 2003 for the United States (United States Environmental Protection Agency 2005).

APPG – average price per gallon of unleaded gasoline from October 2007 to October 2008 in Nebraska of $2.77 (Nebraska Energy Office 2008).

SF – a service factor calculated as the proportion of population that utilizes Register of Deeds services (one of the most frequently used) in a given year. Data was solicited from county offices based on transactions in a given year compared to population. Transactions per capita were consistent among those counties considered in this study as potential CCCs.

[40]*Figure 2* shows a consistent decreases in the TWD from sixteen to nineteen and again from twenty-one to twenty-three centers. The twentieth iteration marks the point after which this consistent decline decreases making twenty the answer to the number of CCCs.

[41]Nineteen centers split the distance between population centers in the state's northeast corner; however, these nineteen centers do not adequately serve the citizens in that it requires them to travel beyond the sixty mile threshold. A twenty-first center solution adds another center in the middle of an open area in the northeast corner. This twenty-first center not only clusters this region of the state, but it is less efficient due to the location of centers surrounding it and the local transportation networks.

[42]The total cost is simply the difference in travel expenses before and after consolidation of services.

[43]Prior to reallocation the total distance traveled for the reassigned block groups was 0.64 miles. The short distance is due in large part from the county seat being located within the most densely populated block group in the county for which the travel distance from the block group to county-level services is considered zero (0). After reassignment to the new CCCs, the average for all reallocated block groups is 22.04 miles for a net distance increase of 21.04 miles.

Leading the Way: Platte Institute Board of Directors

J. Peter Ricketts: Director and President of Platte Institute. He is the founder of Drakon, LLC, an asset management company in Omaha, Nebraska. He is also a member of the TD Ameritrade Board of Directors.

Gail Werner-Robertson: Director and prominent Omaha businesswoman and philanthropist.

Warren Arganbright: Director and noted north central Nebraska lawyer and water resources activist. He has practiced throughout Nebraska and South Dakota and has represented the Niobrara Council since its creation.

Michael Groene: Director and farm equipment sales representative. He is co-founder of the Western Nebraska Taxpayers Association.

Jay Vavricek: Director and former Mayor of Grand Island. He is the owner of GI Family Radio/ Home Town Family Radio and 15 radio stations serving Grand Island-Hastings-Kearney, North Platte/ Ogallala, McCook/ Imperial and Scottsbluff/Gering.

Platte INSTITUTE *for economic research*

10050 Regency Circle, Suite 120
Omaha, NE 68114
402.452.3737
www.platteinstitute.org

A non-profit foundation, the Platte Institute relies on the resources and innovative thinking of individuals who share a commitment to liberty and the best possible quality of life for Nebraskans.

Platte Institute Executive Director

John S. McCollister: He recently capped a 35 year career with McCollister & Co. and served five terms on the publically elected Metropolitan Utilities District Board of Directors.

Platte Institute Editor

Berk Brown: His journalistic work earned him awards from both the Nebraska Press Association and the Minnesota Newspaper Association prior to joining the Platte Institute.

Our Mission

Advance public policy alternatives that foster limited government, personal responsibility and free enterprise in Nebraska. By conducting vital research and publishing timely reports, briefings, and other material, the Platte Institute will assist policy makers, the media and the general public in gaining insight to time-proven free market ideas.