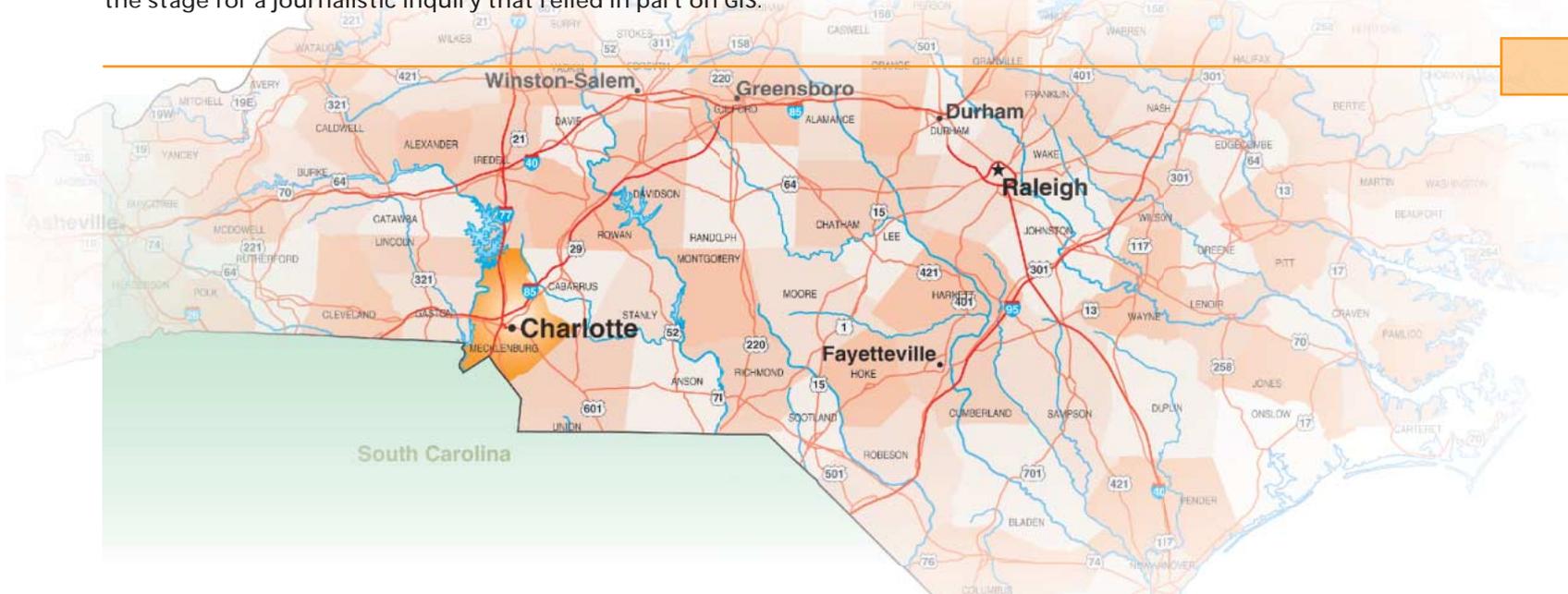


3 *Seeing schools in black and white*

Education news is a staple of every newspaper. Parents want to know whether their children are getting a quality education, and they want to be assured their kids are safe in school. Property owners want to know about school budgets and whether their tax bills will rise. In the Charlotte–Mecklenburg, N.C., public schools, parents had something else to think about: the busing of students to achieve racial integration.

For more than three decades, busing had been a hot-button issue. In a 1971 landmark decision, the U.S. Supreme Court upheld the busing of Charlotte–Mecklenburg students as a way to desegregate schools unconstitutionally divided along color lines. By the mid-1980s, busing had lost some of its public support. That eroded even further during the 1990s as newcomers unaccustomed to busing flooded Mecklenburg County and raised the population 36 percent. In 1997, a Charlotte–Mecklenburg parent sued the school district in federal court, contending that the school system had become integrated and busing was no longer needed. Several other parents later signed onto the suit as plaintiffs and asked the court to order an end to the district's race-based school assignment policies. That set the stage for a journalistic inquiry that relied in part on GIS.



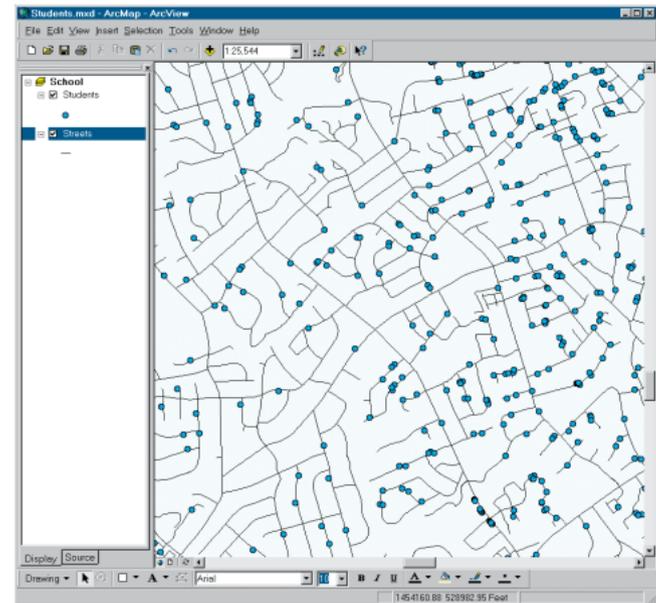
Acquiring information

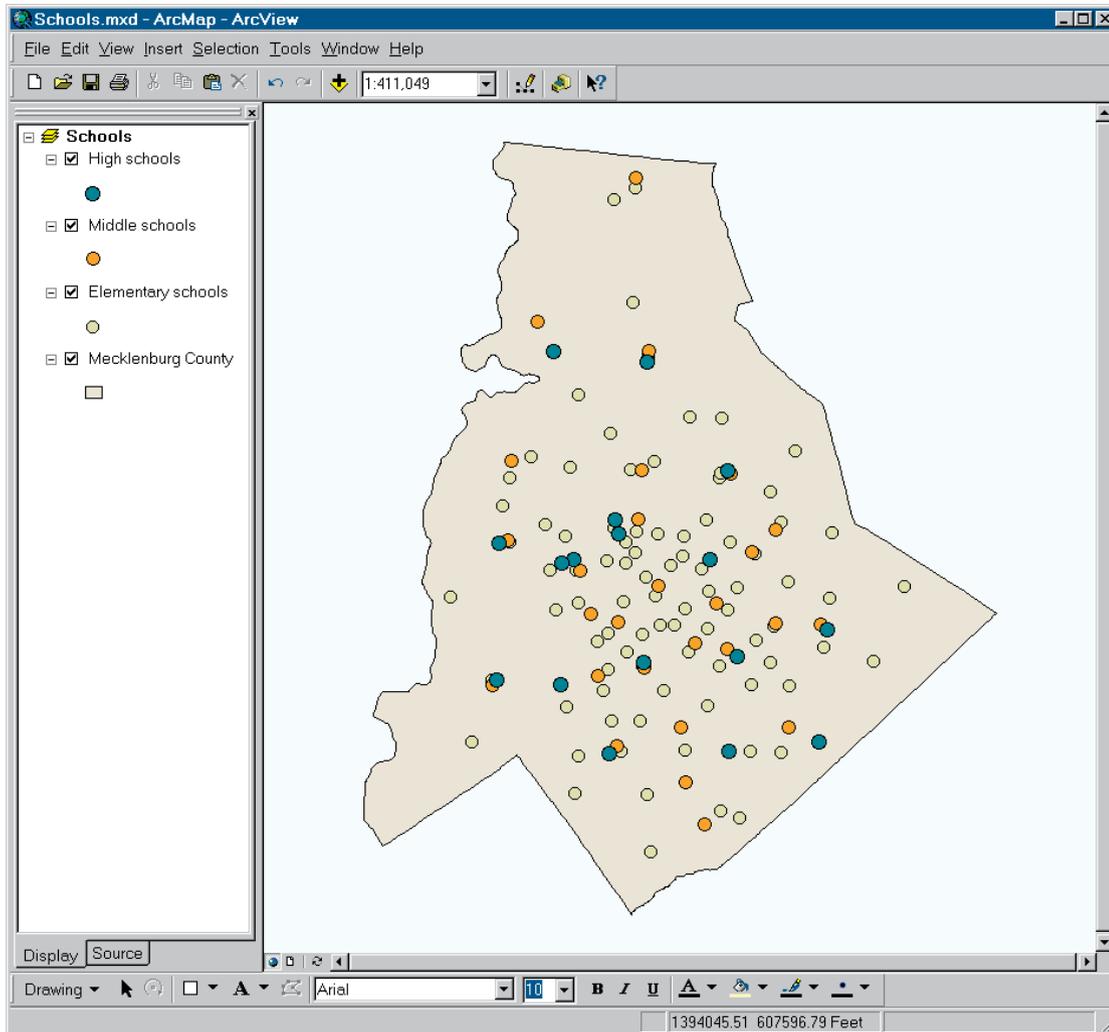
Reporters at *The Charlotte Observer* had been watching the case develop and were curious about a simple question: What would happen to more than 90,000 students if a federal judge ordered the district to dismantle its system of busing and assign students to neighborhood schools? GIS provided the answers that in turn laid the foundation for a five-part series that ran in the newspaper during January 1999, before a judge had even ruled upon the parents' suit.

One of *The Observer's* reporters had been negotiating with school district administrators, attempting to get a file from the district's GIS system that showed the residences of 94,000 students for the 1997–1998 school year. The school administrators also kept data about each student's name, race, gender, grade level, school attended, and home address. The reporter had used GIS regularly since the early 1990s—when he reported the results of the 1990 Census for *The Observer*—and knew that he could measure the effect of busing black and white children to school if he had the file.

After three or four months of discussion, the reporter and school administrators compromised: The administration agreed to release the data, minus the students' names and exact home addresses. Instead, district officials created a point for each student that approximated the true home address. The district provided the data as an ArcInfo export file that the reporter opened in Atlas GIS. The school district also provided a point file that displayed the locations of all the schools in the district. (ArcInfo is an ESRI software product. Atlas GIS is a software product available from Retail Profit Management (RPM), an ESRI business partner; it's Web address is <http://rpmconsulting.com>.)

| FID | Shape | SCHL0102 | CONTCHOICE | ASSIGNEDCH | GRD0203 | Xs | Ys |
|-------|-------|----------|------------|------------|-----------|----------|----|
| 22341 | Point | 9128 | 0 | 314.00 | 1523650.4 | 528194.4 | |
| 22342 | Point | 9050 | 0 | 314.00 | 1501209 | 504045.8 | |
| 22343 | Point | 4326 | 200 | 314.00 | 1472238 | 538637 | |
| 22344 | Point | 9121 | 0 | 314.00 | 1493206.3 | 531165.5 | |
| 22345 | Point | 9071 | 0 | 314.00 | 1500963.9 | 502600.7 | |
| 22346 | Point | 9122 | 0 | 314.00 | 1497716.2 | 505126.4 | |
| 22347 | Point | 9128 | 0 | 314.00 | 1519476.2 | 519623.5 | |
| 22348 | Point | 9128 | 0 | 314.00 | 1523659.5 | 528780.8 | |
| 22349 | Point | 4326 | 200 | 314.00 | 1497566.1 | 502340.9 | |
| 22350 | Point | 0 | 0 | 314.00 | 1499935.3 | 509361.5 | |
| 22351 | Point | 9071 | 0 | 314.00 | 1499260 | 510362.2 | |
| 22352 | Point | 9122 | 0 | 314.00 | 1506203.4 | 512005 | |
| 22353 | Point | 9131 | 0 | 314.00 | 1490874.3 | 540112.8 | |
| 22354 | Point | 9121 | 0 | 314.00 | 1491764.9 | 530483.1 | |
| 22355 | Point | 9128 | 0 | 314.00 | 1506490.1 | 524324.4 | |
| 22356 | Point | 9149 | 0 | 314.00 | 1492438.9 | 534958.9 | |
| 22357 | Point | 9149 | 0 | 314.00 | 1492438.9 | 534958.9 | |
| 22358 | Point | 9149 | 0 | 314.00 | 1498203.1 | 503501.5 | |
| 22359 | Point | 9149 | 0 | 314.00 | 1496746.4 | 521581.4 | |
| 22360 | Point | 9100 | 0 | 314.00 | 1492686.9 | 529197.3 | |





The Observer obtained an ArcView shapefile from the school district that contained a record for each student (table, previous page) and included points that marked their approximate home address locations (map, previous page). The school district also provided a shapefile with the locations of all the public schools (above).

Analyzing the data

For each student record in the database, the reporter used Atlas GIS to calculate information that would be essential to the stories: First, he performed a function in Atlas GIS that calculated the nearest appropriate school (elementary, middle, or high school) for each student and automatically entered the school identification numbers in a new field. Second, he calculated the straight-line distance that each child actually traveled to school, and the distance that the child would have to travel if the student attended the closest appropriate school. Also, the reporter

calculated a poverty weight for each student, based on the child poverty percentage in the surrounding census block group.

That analysis yielded some powerful findings for the series: Nearly half of the students were bused past their nearest school, the reporter found. Almost 28,000 students—most of them black—were bused (photo below) to desegregate or because the nearest schools were packed. Another 20,000 children took the bus to magnet schools, which offer special programs and attract students from across the district.

| SUMLEV | STATEFP | CNTY | TRACTBNA | BLCKGR | AbovePoverty | BelowPoverty | Total | PovertyRate |
|--------|---------|------|----------|--------|--------------|--------------|-------|-------------|
| 150 | 37 | 119 | 0007 | 1 | 531 | 161 | 692 | 23.3% |
| 150 | 37 | 119 | 0007 | 2 | 97 | 73 | 170 | 42.9% |
| 150 | 37 | 119 | 0008 | 1 | 1136 | 860 | 1996 | 43.1% |
| 150 | 37 | 119 | 0008 | 2 | 145 | 743 | 888 | 83.7% |
| 150 | 37 | 119 | 0009 | 1 | 1083 | 176 | 1259 | 14.0% |
| 150 | 37 | 119 | 0009 | 2 | 439 | 244 | 683 | 35.7% |
| 150 | 37 | 119 | 0009 | 3 | 229 | 152 | 381 | 39.9% |
| 150 | 37 | 119 | 0010 | 1 | 748 | 51 | 799 | 6.4% |
| 150 | 37 | 119 | 0010 | 2 | 615 | 99 | 714 | 13.9% |
| 150 | 37 | 119 | 0010 | 3 | 730 | 198 | 928 | 21.3% |
| 150 | 37 | 119 | 0011 | 1 | 860 | 152 | 1012 | 15.0% |
| 150 | 37 | 119 | 0011 | 2 | 841 | 128 | 969 | 13.2% |
| 150 | 37 | 119 | 0011 | 3 | 525 | 46 | 571 | 8.1% |
| 150 | 37 | 119 | 0011 | 4 | 150 | 52 | 202 | 25.7% |
| 150 | 37 | 119 | 0012 | 1 | 2024 | 271 | 2295 | 11.8% |
| 150 | 37 | 119 | 0012 | 2 | 1077 | 65 | 1142 | 5.7% |
| 150 | 37 | 119 | 0012 | 3 | 884 | 40 | 924 | 4.3% |
| 150 | 37 | 119 | 0012 | 4 | 361 | 62 | 423 | 14.7% |
| 150 | 37 | 119 | 0013 | 1 | 205 | 15 | 220 | 6.8% |
| 150 | 37 | 119 | 0013 | 2 | 169 | 5 | 174 | 2.9% |
| 150 | 37 | 119 | 0013 | 3 | 1720 | 260 | 1980 | 13.1% |
| 150 | 37 | 119 | 0013 | 4 | 907 | 123 | 1030 | 11.9% |



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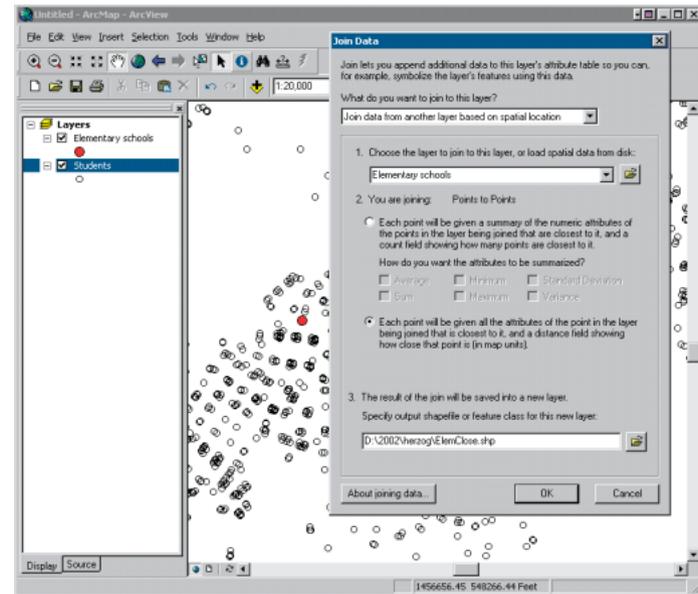
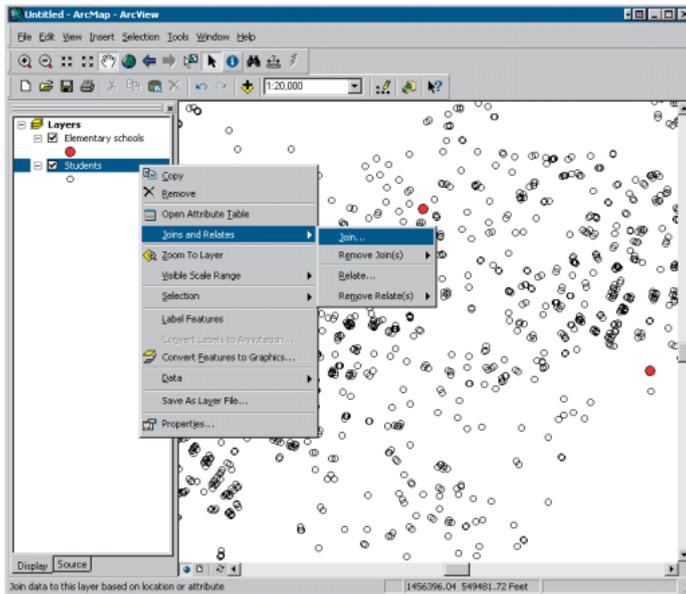
Using data from the 2000 Census, *The Observer's* reporter calculated poverty rates for the block groups in Mecklenburg County. The Poverty Rate field, at the right side of this table, shows the calculated percentage.

More questions

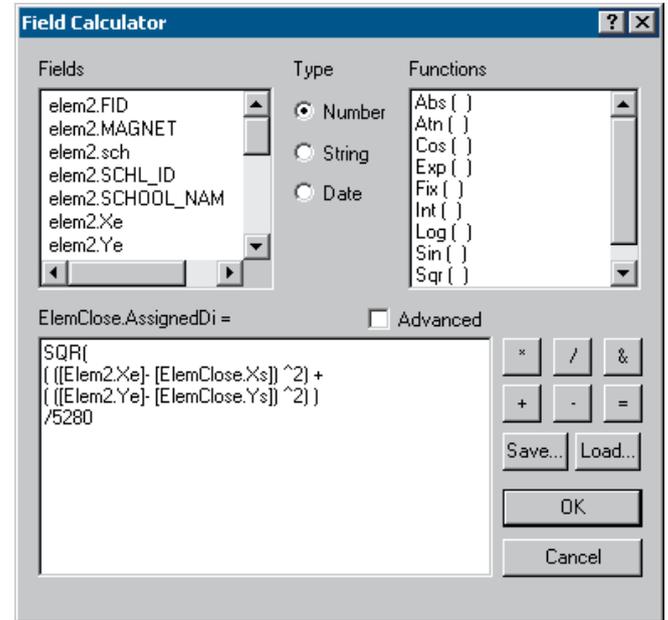
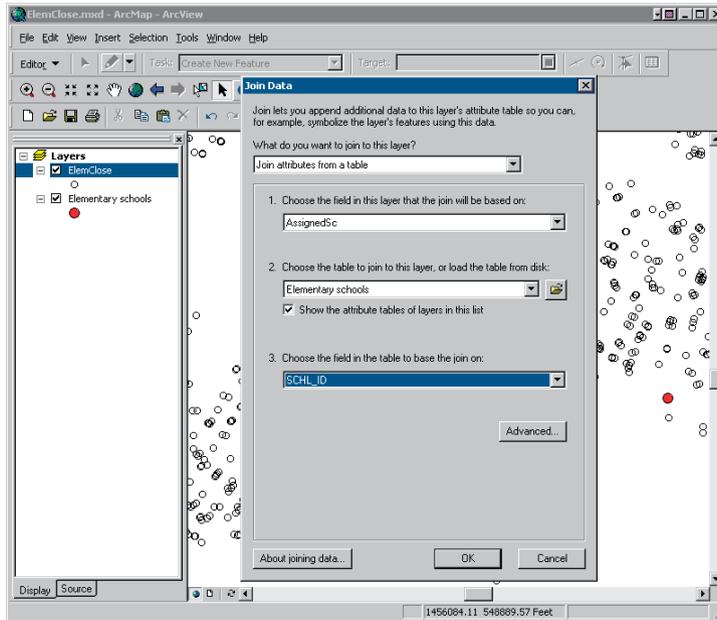
There was more: the reporter found that switching to a neighborhood school system would reduce the distance non-magnet school children travel to school, especially black children. Around 42 percent of black children were bused past their nearest schools, compared to 23 percent for white children. Further, the reporter used the GIS to find that moving to a neighborhood school system would cut the median travel distance for blacks to .6 mile from 1.9 miles, and for whites to .5 mile from 1 mile.

Next the reporter wanted to answer some questions about schools: What would a neighborhood school system do racial diversity? How impoverished would each school's student body be? And what effect would the change have on school crowding?

To answer the first question, the reporter began by calculating a racial-diversity score, a number that measures the probability that two students picked at random from a school would be of a different race, for each school.



The *Observer's* reporter had to calculate the distances that students would travel to school under a nearest-school assignment system and then under the system of busing in place at the time. The reporter used Atlas GIS software to do this; the illustrations on this page show how to achieve the same results in ArcView 8. The first step is to show the nearest school assignments. That starts with what's called a "spatial join" (left) between the school points and the student points layers. The spatial join determines which school is the closest for each student and calculates the distance to that school (right).



The second step is calculating the actual school assignments. In ArcView 8 that begins with joining the data in the school point layer to the student points layer table (top). Then, a new field is created to store the distance from school using a formula (top, far right). The resulting table (right) lists for each student the closest school in the first column and the distance to that school in the second column. The third column lists for each student the actual school and the fourth column contains that distance. These basic steps create the data needed to compare average travel times to school in the Charlotte–Mecklenburg district.

| ElemClose.CloseName | ElemClose.CloseDista | ElemClose.AssignedNa | ElemClose.AssignedDi |
|---------------------|----------------------|----------------------|----------------------|
| REEDY CREEK | 1.176685 | FIRST WARD | 8.30438396459 |
| REEDY CREEK | 1.150084 | REID PARK | 13.7962510377 |
| REEDY CREEK | 1.010377 | DEVONSHIRE | 4.4164639802 |
| REEDY CREEK | 1.467485 | FIRST WARD | 9.77330145847 |
| REEDY CREEK | 1.902327 | REID PARK | 14.7463978323 |
| REEDY CREEK | 1.217960 | DRUID HILLS | 7.76925387 |
| REEDY CREEK | 0.356058 | REEDY CREEK | 0.356057921066 |
| REEDY CREEK | 0.356058 | REEDY CREEK | 0.356057921066 |
| REEDY CREEK | 0.582060 | COLLINSWOOD | 12.1899873205 |
| REEDY CREEK | 0.970388 | BRUNS AVE | 11.0123469887 |
| REEDY CREEK | 1.327262 | NATHANIEL ALEXANDER | 7.14385281899 |
| REEDY CREEK | 1.219293 | OAKLAWN | 10.5870760143 |
| REEDY CREEK | 0.809996 | LINCOLN HEIGHTS | 9.64649990782 |
| REEDY CREEK | 1.458599 | HICKORY GROVE | 3.27627432903 |
| REEDY CREEK | 0.726125 | REEDY CREEK | 0.726124984241 |
| REEDY CREEK | 0.726125 | REEDY CREEK | 0.726124984241 |
| REEDY CREEK | 0.774784 | VILLA HEIGHTS | 7.22143393937 |
| REEDY CREEK | 0.983850 | VILLA HEIGHTS | 8.28170030238 |
| REEDY CREEK | 0.326540 | VILLA HEIGHTS | 7.73310275274 |

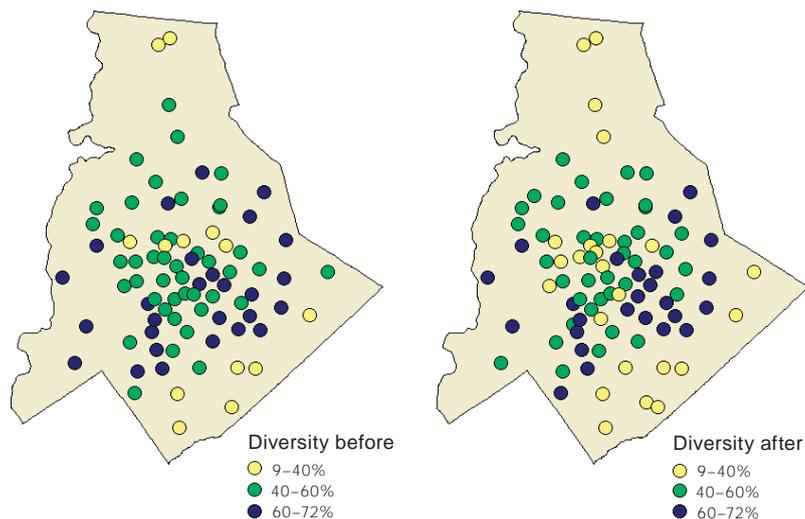
Stark conclusions

After running census figures through the racial-diversity index, the reporter found that the Charlotte–Mecklenburg schools were twice as integrated as the neighborhoods in the county. About half of the county’s schools would have little or no racial diversity if desegregation ended and students were assigned to their closest schools, *The Observer* found. And the number of schools ranking low on diversity or having none would jump to 64 from 19.

By analyzing the student poverty weights, *The Observer* found that neighborhood assignments would create a group of super-poor schools in the inner cities. By comparing the student assignments to school capacity figures, the reporter found that about 39,000 students would attend overcrowded schools, with the problem being particularly severe in the inner-city neighborhoods.

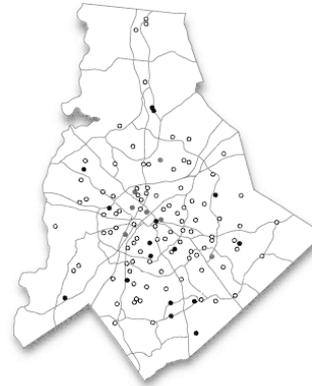
To help readers understand the impact of the findings, *The Observer* published side-by-side maps comparing schools by the different variables in 1998 and under the neighborhood schools plan. Readers could easily see, for instance, how poverty would differ by school.

A federal judge that September ruled that the school system no longer was unconstitutionally segregated as it had been decades before. He ordered an end to the school system’s policy of using race to make school assignments. The ruling forced the district to abandon the busing of children to achieve integration. Many of the findings published by *The Observer* in the January 1999 series became central issues in the public debate surrounding the design of a new school system. Community leaders, during public meetings, cited the paper’s findings.



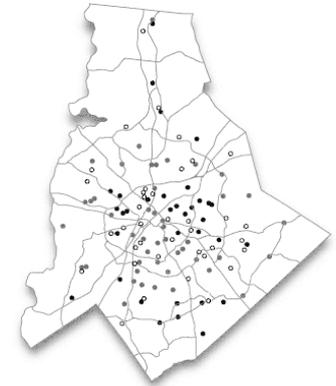
These ArcView maps compare school diversity under busing (left) and under a system of neighborhood student assignments (right). Schools shown as yellow dots have diversity scores of 9 to 40 percent; schools shown with green dots have diversity scores of 40 to 60 percent, and schools shown with blue dots have diversity scores of 60 to 72 percent. The maps show that the number of low-diversity schools (yellow dots) would increase if the district assigned students to neighborhood schools.

The Observer bolstered some of its “Deciding Desegregation” coverage by publishing maps that illustrated the characteristics of the schools under busing and how they would be under a new student assignment system. The top set of maps compares crowding as it was (left) with how it would be (right) if the district shifted students to their closest schools. Gray dots show the schools at less than 80 percent capacity; white dots show those at 80 to 120 percent, and the black dots show those at 120 percent and above. The maps showed that inner-city schools would become more crowded if the district assigned children to neighborhood schools. The set of maps at bottom shows that many inner-city schools would have greater rates of poor students if children attended neighborhood schools. The map at bottom left shows schools with busing in place; the map at bottom right shows a greater number of black circles indicating poverty levels increasing.



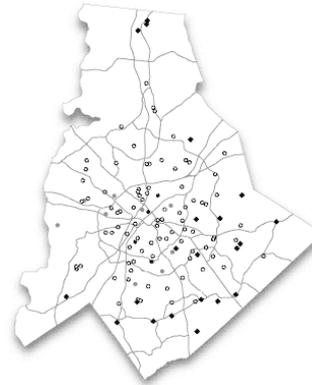
School crowding 1

- 120% and more
- 80-120%
- less than 80%



School crowding with neighborhood schools

- 120% and more
- 80-120%
- less than 80%



Poverty

- 22-28%
- 16-22%
- 6-16%
- ◆ 2-6%



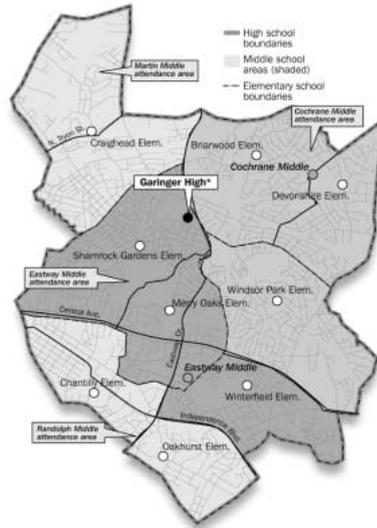
Poverty with neighborhood schools

- 22-50%
- 16-22%
- 6-16%
- ◆ 1-6%

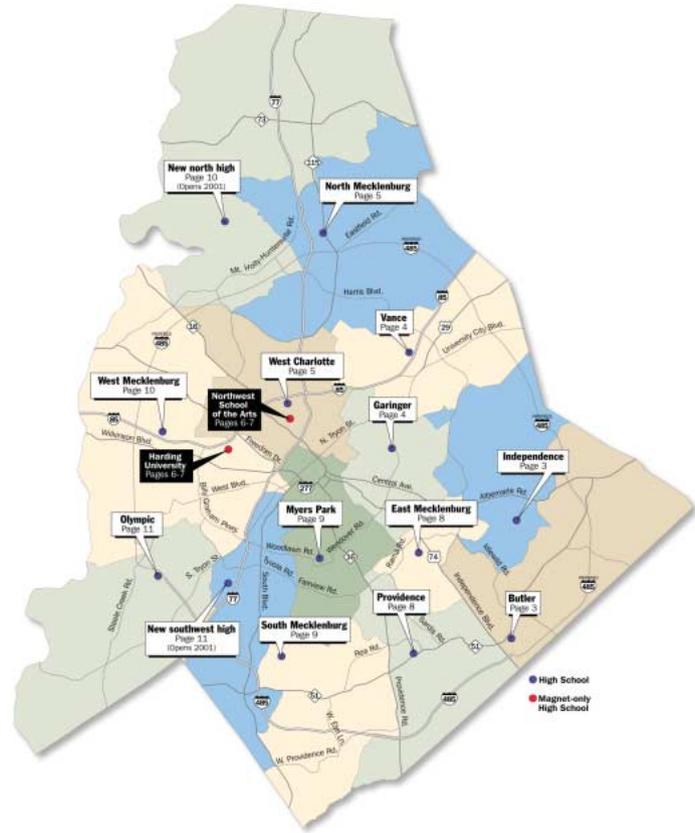
Joanne Miller and Jacob Piercy, The Charlotte Observer. Copyright owned by The Charlotte Observer.

GIS in service

The Observer used GIS again when the school administration proposed a new system of neighborhood schools that aimed to assign children to the closest schools. As a public service the newspaper in November 1999 published a 12-page special section that showed all fourteen proposed high school attendance areas and, inside each, the attendance areas for the middle and elementary schools. *The Observer's* reporter generated the maps using ArcView GIS. He overlaid a streets shapefile, a point file showing the location of schools, and an area file showing the attendance zones. Parents attending the public hearings about the proposed school zones took copies of the section along as a reference. When the district revised the attendance areas the following month, *The Observer* published another special section with maps created in ArcView.



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A map showing the Charlotte–Mecklenburg School District (top) ran on the cover of *The Observer's* November 1999 special section explaining the district's proposed student assignment plan. Inside the section, *The Observer* published maps (example at left) showing the boundaries of each assignment zone and the schools within them.

Award-winning coverage

The Observer's reporting, bolstered by GIS, played a key role in informing parents as the school system went through enormous, historic change. The series published in January 1999 was part of the "Deciding Desegregation" continuing coverage that won first prize for breaking or hard news in the 1999 national Education Writers Association contest.

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The Education Writers Association (EWA) was founded in 1947 and is based in Washington, D.C. The Web address is www.ewa.org.

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Lisa King

Executive Director of the Education Writers Association

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