

**Quick Response Report #99
GEOGRAPHIC
INFORMATION SYSTEMS
(GIS) IN SMALL
COMMUNITIES:
APPLICATION OF GIS IN
EMERGENCY MANAGEMENT**

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1997

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This material is based upon work supported by the National Science Foundation under Grant No. CMS-9632458. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National

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GEOGRAPHIC INFORMATION SYSTEMS (GIS) IN SMALL COMMUNITIES: APPLICATION OF GIS IN EMERGENCY MANAGEMENT

The snow began to fall in the early evening on Saturday January 6, 1996; by noon Sunday, over eighteen inches had accumulated throughout the Shenandoah Valley. On Monday the snow finally stopped leaving Washington, D.C. with over 28 inches and 36 inches in the northern Virginia's Shenandoah Valley. Federal, state, and local government agencies were closed for at least three days and most school systems in the region were closed for the week. Television and radio broadcasters along with emergency service agencies urged residents to stay home and enjoy the unplanned break. For most residents, the extensive snow presented difficulties in cleaning their autos, clearing a path to the street, and ensuring that their refrigerators were stocked. Time was needed to allow road crews to clear the streets and roads. For many communities, a state of emergency was declared limiting access to highways to road cleanup crews and emergency service personnel. The dilemma for many local governments was in providing adequate support for snow clearing crews who were working overtime to make major and minor roads safe for travel. A major concern for local officials and residents was the possibility of power outages caused by storm. Fortunately, the storm covered the area with a light snow that resulted in no significant buildup of ice on power lines. Residents avoided a

situation in which they lost power and heat with no possibility for access to a public shelter.

By early February, little melting had occurred until heavy rainfall passed through the area. The heavy rains along with the melting snow caused significant flooding in northern Virginia especially in the Shenandoah Valley. Federal disaster areas were declared in Virginia as flooding damaged homes and businesses. Although many local governments had developed good emergency response plans and geographic information decision support systems, the utility of their systems proved to be disappointing. The following summary is focused on a small rural county in northern Virginia and its attempts to use its geographic information system in emergency response, recovery, mitigation and planning activities associated with the Blizzard of '96 and the resulting flooding.

Description of Clarke County

Clarke County lies in the northern tip of the Shenandoah Valley between the Blue Ridge and Allegheny mountains, 50 miles west of Washington, D.C. The county has a total population of 12,101 as reported in the U.S. Department of Commerce 1990 census. Of these residents 3,097 are in the urban areas (25.6%) and 9,004 (74.4%) classified as rural population. Three major state routes (7, 50, and 340) cut through the small towns of Berryville with 3,097 residents and Boyce which has 512 residents. According to the 1990 census, 115 households had no telephone service. Of the 4,236 households in the county, 327 had no vehicles. The median household income for the 4,185 housing units totaled \$34,636; 8.7% of the population were below the poverty level. The county has a total school enrollment of 2,433 with 181 in preprimary, 1,859 in elementary or high school and 393 in college. Residents attending private school included 10.6% of the school enrollment.

The 1990 census data for Clarke County included a summary of non-

institutionalized persons. [Table 1](#) reflects the disability status of persons in the county. For all age groups, 584 residents have a mobility or self-care limitation. In a small rural community such as Clarke County, providing emergency services to these residents poses a significant challenge. Accurate identification of the residents with mobility or self-care limitations would be most useful in emergency planning and response efforts.

Clarke County has a total of 4,531 housing units with 834 homes built since 1980. The area has experienced slow growth even though it lies within 60 miles of Washington, D.C. Twenty-six residents use utility gas; 202, bottled gas; 1,738, electricity; 1,507, fuel oil or kerosene; and 733, wood. A loss of electric utilities would affect the 55% of local residents who are dependent on electricity.

Table 1 - Disability of Civilian Non-institutionalized Persons

Persons 16 - 64 Years	7,785	
With a mobility or self-care limitation		316
With a mobility limitation	144	
With a self-care limitation	213	
With a work disability	623	
With a work disability but in labor force	294	
Prevented from working	268	
Persons 65 years and over	1,560	
With a mobility or self-care limitation		268
With a mobility limitation	213	
With a self-care limitation	147	

Residents 16 years and over who are employed totaled 6,190. Of these residents, 8.2% were in agriculture, 14% in construction, 15% in manufacturing, 11% in retail trade, 27% in services. Approximately 13% of the workers were employed by the government and 600 residents

were self-employed. For the workers 16 and over, 420 worked at home and 2,600 (42%) traveled more than 30 minutes to work. For even a rural community, commuting to work is a significant factor. [Appendix A](#) provides detailed summary 1990 census information for Clarke County, and the towns of Berryville and Boyce.

The county uses a manager / administrator form of government with planning, economic development, social services, and recreation agencies reporting to the county administrator.

The County Geographic Information System

In an attempt to ensure that information would be available to county officials to make sound decisions on land use planning and zoning, the county developed a mapping unit with a geographic information system. The mapping unit is staffed by two employees who use a Sun Micro Station running arcinfo (Ver.7.0). At the time of the storm and the flooding, the GIS included the following coverage's:

- Highways, streets and roads drawn from the U.S.G.S. 1:24,000 quad sheets;
- Flood zones;
- Parcel layouts with ownership information;
- Rivers, water features, pipelines, power lines, topographical contours, and benchmarks from the U.S.G.S. quad sheets;
- 5-digit ZIP code boundaries from the Postal Service;
- Agriculture districts and easements;
- Historic districts;
- County zoning areas;
- Soils by type;
- Agricultural stabilization Districts;
- Sinkholes;
- County boundaries.

Map files missing from the Clarke County GIS system were detailed

information on street names, address ranges, or data reflecting business or resident locations. Information relating to residents drawn from the U.S. Department of Commerce, Bureau of the census Tiger files was not available on the system. Boundary data files for the county census tracks, block groups, or blocks and the associated 1990 census data were not in the system.

Local officials lacked adequate information on the characteristics of the county's population in areas most affected by the 36 inch snow or the flooding along the Shenandoah River and the Opecen Creek. In addition, data were not available on residents located along the major water features or the level of flooding in the county. For emergency service personnel, response to calls to the 911 Center were complicated by a lack of information on high water along roads, bridges, or areas inaccessible because of the snow. In addition, local officials had no local information to predict the extent of flooding or information on which to base warnings to residents on high water in their area. Although the GIS had U.S.G.S. contour lines and water features drawn from the 1:24,000 quad sheets, information was not included on resident locations, phone numbers of residents or businesses that could be affected by the rising water.

The county 911 Emergency Notification System included information provided by the local phone company on the location of each resident in the county. Directions to each resident had been provided either by the phone company (directions for service installation) or by a Clarke County 911 employee who confirmed directions to a resident's home. The 911 Center maintained the directions to the resident in a computerized database. Although emergency service personnel could find a residence in the county, an actual address for the resident was not available. The lack of accurate addressing for residents outside the small towns in the county made resident geocoding of addresses very limited. The Shenandoah River flows through Clarke County, and warm weather, which melted snow along with heavy rains in February caused the Shenandoah to flood several local roads.

Enhancing the County Geographic Information System

U.S. Department of Commerce Tiger files (1994) were provided to Clarke County by Louisiana State University's Public Administration Institute. Data in these files were imported into the ArcInfo GIS.

Coverages included roads and streets, water features, railroads, census tracks, census block groups, and census blocks. The value of these data to Clarke County was to add street, road, and water feature names to line segments. Within the towns of Berryville and Boyce, the streets included address ranges. Rural roads were identified by a numbering system for the county.

Resident and business phone listings were obtained for the county from the local phone company and "select phone" listings. These listings included resident addresses with ZIP+4 files when available. Accurate geocoding was accomplished for residents in the towns. Determining the location of the remaining residents would need to be accomplished using another method.

The county manager and the GIS staff stressed the value of accurate locations for residents and businesses in the county. Emergency 911 operations could be enhanced by knowing the actual location of distressed callers. Routing of emergency vehicles could be improved by knowing exact destinations and potential problem areas such as bridges or roads. Warning systems could be adapted to notify residents affected by rising water, chemical spills on state highways or rail lines. Other public agencies could use accurate resident locations for school bus routing, zoning decision, or permit applications.

Interest in creating accurate addresses in the county was shared by James King, postmaster for the town of Berryville. He agreed to assist the county in verifying the location of rural delivery route boxes by ZIP+4 designations. Since the ZIP+4 system follows county road carrier routes, carriers could identify the approximate location on county maps of resident's mail boxes. County staff could verify these address files by direct observation and use portable geo-positing devices for accurate

coordinate positioning. Address ranges for rural route boxes were thus linked to the post office route box number. Priority areas were identified which were vulnerable to either natural or chemical hazards. Addressing for these priority areas were to be completed by the county staff.

The county manager and the postmaster both expressed a concern that many local residents wanted to avoid accurate addressing of residents. Avoiding the public eye and maintaining privacy in a rural culture was a major factor that had limited prior addressing efforts. The postmaster noted that many patrons were offended when clerks asked for identification when their personal checks did not have an address. Clerks, however, could often avoid this conflict by recognizing the patron from past contacts.

Both the county manager and postmaster commented that local residents might resist efforts by the county or the post office to identify their residence in a database. Experience from other local communities to name roads and have accurate locations of residents had met resistance from rural residents. Both the postmaster and county manager agreed that initiatives to name rural roads and use a numbering system to identify resident locations should be coordinated. Linking local addressing to enhancing the 911 system where residents would benefit from change could be critical in avoiding conflict with residents.

Expanding GIS Users

A critical factor in making the GIS more useful in emergency management was the expansion of the system to personal computers. By using ArcView2, the county could use all existing county coverages, including the new street and road census Tiger files. This GIS could be used on personal computers in the 911 dispatch office, volunteer fire stations, the Clarke County school board, town planning and zoning offices, and the county emergency management office. Using ArcView2 on either a desktop or portable computer would extend the county's GIS applications beyond the current two staff members. With a minimum of

16MB of RAM and 100 MB of hard disk space, ArcView2 provides other county and town agencies with current map files from the Clarke County GIS. ArcView2 provides an easy to use map display and query system. For emergency management, the personal computer GIS provides agencies with the ability to identify residents, to notify residents in a specific area of a risk, to make informed zoning or permitting decisions, or to route emergency service vehicles. Networking of the county offices will allow agencies taking advantage of the PC based GIS to use or copy current map files without taking the valuable time of the GIS county staff. Decision making can be enhanced by this easy-to-use GIS tool.

Future Initiatives

The county manager noted several initiatives that would enhance the use of GIS in emergency management decision making. Although flooding had not been an extensive problem in the past ten years, the snowfall and rain of January and February 1996 left the county uninformed on where flooding would occur. Shenandoah River levels were available from sites over 25 miles from the county. Information on local river and creek levels would have been very helpful in warning residents of flooding dangers or in suggesting evacuation routes. In addition, elevation points along the Shenandoah River and county creeks would allow county officials to more accurately predict areas vulnerable to flooding.

Verification of FEMA flood maps would also ensure that permitting and zoning decisions would be accurate.

Accurate identification of residences and buildings was considered by the county as a high priority. The initial step in linking post office rural delivery routs to county road segments (thus creating address ranges similar to more populated area) was an important step. Naming rural roads and assigning addresses would be the next step and easier to accomplish with accurate location of rural delivery box identification.

Conclusions

County officials in this small rural jurisdiction overwhelmingly cited the value of GIS in supporting decision making at the local level. GIS with resident information, resource data, hazard information, and road data would be valuable in enhancing emergency planning, response, mitigation, and recovery efforts by the county or other state or local organizations. Changes to the Clarke County GIS were seen as natural steps to the evolution of their system. The additions to the county GIS were easy to accomplish with a greater knowledge of available data files and the cooperation of other government agencies such as the post office.

Local governments should view GIS as a useful tool that can be obtained on even a small budget. Early initiatives into GIS may have cost local governments large sums of money. Personal computers that can run 32 bit operating systems with large storage capacity make GIS affordable and easy to establish, even in a small community such as Clarke County. The uses of the Clarke County GIS will expand as more agencies become involved and as the cost of computers and programs continue to drop. Clarke County found that their GIS had benefits for emergency management and even more so for other applications within the jurisdiction.

APPENDIX A

1990 Census Population Data

Virginia

Clarke County

STF 3A Files

1992

1990 Census of Population and Housing

040 Virginia

050 Clarke County

URBAN AND RURAL RESIDENCE

Total
 population.....
 12,101

Urban
 population.....
 .3,097

Percent of total
 population.....25.6

Rural
 population.....
 .9,004

Percent of total
 population.....74.4

Farm
 population.....
769

SCHOOL ENROLLMENT

Persons 3 years and over enrolled in
 school.....2,433

Preprimary
 school.....18

1
 Elementary or high
 school.....1,859

Percent in private
 school.....10.6

College.....
393

EDUCATIONAL ATTAINMENT

Persons 25 years and
 over.....8,348

Less than 9th
 grade.....987

9th to 12th grade, no
 diploma.....1,100

High school graduate.....	2,853
Some college, no degree.....	1,532
Associates degree.....	32
6 Bachelor's degree.....	1,134
Graduate or professional degree.....	416
Percent high school graduate or higher.....	75.0
Percent bachelor's degree or higher.....	18.6

RESIDENCE IN 1985

Persons 5 years and over.....	11,338
Lived in same house.....	6,342
Lived in different house in U.S.....	4,966
Same State.....	4,190
Same county.....	1,372
Different county.....	2,818
Different State.....	776
Lived abroad.....	30

DISABILITY OF CIVILIAN NONINSTITUTIONALIZED PERSONS

Persons 16 to 64 years.....	7,785
With a mobility or self-care limitation.....	316

With a mobility limitation.....	144
With a self-care limitation.....	213
With a work disability.....	623
In labor force.....	294
Prevented from working.....	268
Persons 65 years and over.....	1,560
With a mobility or self-care limitation.....	268
With a mobility limitation.....	213
With a self-care limitation.....	147

CHILDREN EVER BORN PER 1,000 WOMEN

Women 15 to 24 years.....	366
Women 25 to 34 years.....	1,102
Women 35 to 44 years.....	1,646

VETERAN STATUS

Civilian veterans 16 years and over.....	1,388
65 years and over.....	349

NATIVITY AND PLACE OF BIRTH

Native population.....	1,913
Percent born in state of residence.....	65.1
Foreign-born population.....	188
Entered the U.S. 1980 to 1990.....	56

LANGUAGE SPOKEN AT HOME

Persons 5 years and
over.....11,338
Speak a language other than
English.....321
Do not speak English 'very
well'.....54
Speak
Spanish.....
....91
Do not speak English 'very
well'.....15
Speak Asian or Pacific Island
language.....72
Do not speak English 'very
well'.....21

ANCESTRY

Total ancestries
reported.....7,695
Arab.....
.....0
Austrian.....
.....31
Belgian.....
.....0
Canadian.....
.....37
Czech.....
.....99
Danish.....
.....7
Dutch.....
.....219
English.....
.....1,454
Finnish.....
.....0
French (except
Basque).....242
French
Canadian.....
...57
German.....
.....1,859

Greek.....	10
Hungarian.....	18
Irish.....	1,081
Italian.....	144
Lithuanian.....	31
Norwegian.....	41
Polish.....	58
Portuguese.....	4
Romanian.....	5
Russian.....	39
Scotch- Irish.....	305
Scottish.....	229
Slovak.....	12
Subsaharan African.....	0
Swedish.....	9
Swiss.....	7
Ukrainian.....	14
United States or American.....	701
Welsh.....	101
West Indian (excluding Hispanic origin groups).....	8
Yugoslavian.....	0
Other	

ancestries.....
....87

1990 Census of Population and Housing 040 Virginia 050 Clarke County

Total housing units.....4,531

YEAR STRUCTURE BUILT

1989 to March

1990..... 134

1985 to

1988.....
. 388

1980 to

1984.....
. 446

1970 to

1979.....
.1,091

1960 to

1969.....
. 522

1950 to

1959.....
. 459

1940 to

1949.....
. 124

1939 or

earlier.....
.1,367

BEDROOMS

No

bedroom.....
..... 35

1

bedroom.....
..... 137

2

bedrooms.....
.....1,070

3

bedrooms.....2,334
 4
 bedrooms..... 688
 5 or more
 bedrooms.....
 267

SELECTED CHARACTERISTICS

Lacking complete plumbing
 facilities..... 147
 Lacking complete kitchen
 facilities..... 105
 Condominium housing
 units..... 22

SOURCE OF WATER

Public system or private
 company.....1,705
 Individual drilled
 well.....2,521
 Individual dug
 well..... 142
 Some other
 source.....
 163

SEWAGE DISPOSAL

Public
 sewer.....
 ..1,228
 Septic tank or
 cesspool.....3,115
 Other
 means.....
 ... 188

Occupied housing
 units.....4,236

HOUSE HEATING FUEL

Utility
 gas.....
 . 26

Bottled, tank, or LP
gas..... 202

Electricity.....
.....1,738

Fuel oil, kerosene,
etc.....1,507

Coal or
coke.....
. 16

Wood.....
..... 733

Solar
energy.....
... 8

Other
fuel.....
... 0

No fuel
used.....
. 6

YEAR HOUSEHOLDER MOVED INTO UNIT

1989 to March

1990..... 586

1985 to
1988.....
.1,209

1980 to
1984.....
. 637

1970 to
1979.....
. 923

1960 to
1969.....
. 396

1959 or
earlier.....
. 485

TELEPHONE

No telephone in
unit..... 115

VEHICLES AVAILABLE

Occupied housing
 units.....4,236
 None.....
 327
 1.....
 972
 2.....
1,786
 3 or
 more.....
1,151

MORTGAGE STATUS AND SELECTED MONTHLY OWNER COSTS

Specified owner-occupied housing
 units.....2,288
 With a
 mortgage.....
 1,371
 Less than
 \$300..... 88
 \$300 to
 \$499.....
 173
 \$500 to
 \$699.....
 265
 \$700 to
 \$999.....
 474
 \$1,000 to
 \$1,499..... 278
 \$1,500 to
 \$1,999..... 83
 \$2,000 or
 more..... 10
 Median
 (dollars).....
 779
 Not
 mortgaged.....
 ... 917
 Less than
 \$100..... 59

\$100 to	
\$199.....	417
\$200 to	
\$299.....	346
\$300 to	
\$399.....	62
\$400 or	
more.....	33
Median	
(dollars).....	196

SELECTED MONTHLY OWNER COSTS AS A PERCENTAGE OF HOUSEHOLD INCOME IN 1989

Specified owner-occupied housing	
units.....	2,288
Less than 20	
percent.....	1,316
20 to 24	
percent.....	206
25 to 29	
percent.....	224
30 to 34	
percent.....	120
35 percent or	
more.....	390
Not	
computed.....	32

GROSS RENT

Specified renter-occupied housing	
units.....	848
Less than	
\$200.....	64
\$200 to	
\$299.....	

59

\$300 to \$499.....

292

1990 Census of Population and Housing 040 Virginia 050 Clarke County

INCOME IN 1989

Households.....

.....4,185

Less than

\$5,000.....

224

\$5,000 to

\$9,999.....

221

\$10,000 to

\$14,999.....

337

\$15,000 to

\$24,999.....

584

\$25,000 to

\$34,999.....

745

\$35,000 to

\$49,999.....

917

\$50,000 to

\$74,999.....

611

\$75,000 to

\$99,999.....

294

\$100,000 to

\$149,999.....

173

\$150,000 or

more.....

79

Median household income

(dollars).....34,636

Families.....	3,243
Less than	
\$5,000.....	80
\$5,000 to	
\$9,999.....	131
\$10,000 to	
\$14,999.....	217
\$15,000 to	
\$24,999.....	428
\$25,000 to	
\$34,999.....	603
\$35,000 to	
\$49,999.....	756
\$50,000 to	
\$74,999.....	551
\$75,000 to	
\$99,999.....	272
\$100,000 to	
\$149,999.....	129
\$150,000 or	
more.....	76
Median family income	
(dollars).....	38,096

Nonfamily	
households.....	942
Less than	
\$5,000.....	151
\$5,000 to	
\$9,999.....	93

\$10,000 to
 \$14,999.....136
 \$15,000 to
 \$24,999.....187
 \$25,000 to
 \$34,999.....155
 \$35,000 to
 \$49,999.....127
 \$50,000 to
 \$74,999.....78
 \$75,000 to
 \$99,999.....0
 \$100,000 to
 \$149,999.....12
 \$150,000 or
 more.....3
 Median nonfamily household income
 (dollars).....20,216

Per capita income
 (dollars).....15,657

INCOME TYPE IN 1989

Households.....
 ...4,185
 With wage and salary
 income.....3,282
 Mean wage and salary income
 (dollars).....39,160
 With nonfarm self-employment
 income..... 710
 Mean nonfarm self-employment income
 (dollars).....21,965
 With farm self-employment
 income..... 228
 Mean farm self-employment income

(dollars).....13,558
 With Social Security
 income.....1,292
 Mean Social Security income
 (dollars).....6,529
 With public assistance
 income..... 217
 Mean public assistance income
 (dollars).....3,604
 With retirement
 income..... 752
 Mean retirement income
 (dollars).....10,544

POVERTY STATUS IN 1989

All persons for whom poverty status is
 determined.....11,711
 Below poverty
 level.....1,021

Persons 18 years and
 over.....9,048
 Below poverty
 level..... 740
 Persons 65 years and
 over.....1,560
 Below poverty
 level..... 247

Related children under 18
 years.....2,648
 Below poverty
 level..... 266
 Related children under 5
 years..... 753
 Below poverty
 level..... 65
 Related children 5 to 17
 years.....1,895
 Below poverty
 level..... 201

Unrelated
 individuals.....1
 ,452

Below poverty level..... 303

All families.....
...3,243

Below poverty level..... 213

With related children under 18 years.....1,499

Below poverty level..... 118

With related children under 5 years..... 631

Below poverty level..... 44

Female householder families..... 517

Below poverty level..... 44

With related children under 18 years..... 225

Below poverty level..... 23

With related children under 5 years..... 30

Below poverty level..... 8

Percent below poverty level:

All persons.....
..... 8.7

Persons 18 years and over..... 8.2

Persons 65 years and over..... 15.8

Related children under 18 years..... 10.0

Related children under 5

years..... 8.6
 Related children 5 to 17
 years..... 10.6
 Unrelated
 individuals.....
 20.9

All
 families.....
 6.6
 With related children under 18
 years..... 7.9
 With related children under 5
 years..... 7.0

Female householder
 families..... 8.5
 With related children under 18
 years..... 10.2
 With related children under 5
 years..... 26.7

**1990 Census of Population and Housing 040 Virginia 050 Clarke
 County**

LABOR FORCE STATUS

Persons 16 years and
 over.....9,648
 In labor
 force.....
 6,352

Percent in labor
 force..... 65.8
 Civilian labor
 force.....6,344

Employed.....
6,190

Unemployed.....
 154

Percent
 unemployed..... 2.4
 Armed
 Forces.....

. 8
Not in labor
force.....3,296

Males 16 years and
over.....4,719
In labor
force.....3,505

Percent in labor
force..... 74.3
Civilian labor
force.....3,501

Employed.....3,431

Unemployed..... 70

Percent
unemployed..... 2.0

Armed
Forces.....

. 4
Not in labor
force.....1,214

Females 16 years and
over.....4,929
In labor
force.....2,847

Percent in labor
force..... 57.8

Civilian labor
force.....2,843

Employed.....2,759

Unemployed..... 84

Percent

unemployed..... 3.0
 Armed
 Forces.....
 . 4
 Not in labor
 force.....2,08
 2

Females 16 years and
 over.....4,929
 With own children under 6
 years..... 627
 Percent in labor
 force..... 62.2
 With own children 6 to 17 years
 only..... 719
 Percent in labor
 force..... 81.8

Own children under 6 years in families and
 subfamilies... 860
 All parents present in household in labor
 force..... 538

Own children 6 to 17 years in families and
 subfamilies.....1,637
 All parents present in household in labor
 force.....1,222

Persons 16 to 19
 years..... 608
 Not enrolled in school and not high school
 graduate..... 114
 Employed or in Armed
 Forces..... 63
 Unemployed.....
 2
 Not in labor
 force..... 49

COMMUTING TO WORK
 Workers 16 years and
 over.....6,084
 Percent drove

alone.....	70.8
Percent in carpools.....	17.9
Percent using public transportation.....	0.4
Percent using other means.....	0.4
Percent walked or worked at home.....	10.5
Mean travel time to work (minutes).....	29.3

OCCUPATION

Employed persons 16 years and over.....	6,190
Executive, administrative, and managerial occupations.....	543
Professional specialty occupations.....	673
Technicians and related support occupations.....	195
Sales occupations.....	671
Administrative support occupations, including clerical.....	857
Private household occupations.....	65
Protective service occupations.....	79
Service occupations, except protective and household.....	692
Farming, forestry, and fishing occupations.....	403
Precision production, craft, and repair occupations.....	1,030
Machine operators, assemblers, and inspectors.....	381
Transportation and material moving occupations.....	246
Handlers, equipment cleaners, helpers, and laborers.....	355

INDUSTRY

Employed person 16 years and over.....	6,190
Agriculture, forestry, and fisheries.....	511
Mining.....	11
Construction.....	854
Manufacturing, nondurable goods.....	506
Manufacturing, durable goods.....	443
Transportation.....	211
Communications and other public utilities.....	140
Wholesale trade.....	147
Retail trade.....	995
Finance, insurance, and real estate.....	368
Business and repair services.....	270
Personal services.....	207
Entertainment, and recreation services.....	76
Health services.....	296
Educational services.....	429
Other professional and related services.....	420
Public administration.....	306

CLASS OF WORKER

Employed persons 16 years and

over.....	6,190
Private wage and salary workers.....	4,700
Government workers.....	824
Local government workers.....	408
State government workers.....	139
Federal government workers.....	277
Self-employed workers.....	600
Unpaid family workers.....	6

1990 Census Of Population And Housing Summary Tape File 3A
040 Virginia 050 Clarke County

INDUSTRY

Universe: Employed persons 16 years and over

Agriculture, forestry, and fisheries (000-039).....	511
Mining (040-059).....	11
Construction (060-099).....	854
Manufacturing, nondurable goods (100-229).....	506
Manufacturing, durable goods (230-399).....	443
Transportation (400-439).....	211
Communications and other public utilities (440-499).....	140
Wholesale trade (500-579).....	147
Retail trade (580-699).....	995
Finance, insurance, and real estate (700-720).....	368
Business and repair services (721-	

760).....	270
Personal services (761-799).....	207
Entertainment and recreation services (800-811).....	76
Professional and related services (812-899):	
Health services (812-840).....	296
Educational services (842-860).....	429
Other professional and related services (841, 861-899).....	420
Public administration (900-939).....	306

1990 Census Of Population And Housing Summary Tape File 3A
040 Virginia 050 Clarke County

OCCUPATION

Universe: Employed persons 16 years and over

Managerial and professional specialty occupations (000-202):	
Executive, administrative, and managerial occupations (000-042)...	543
Professional specialty occupations (043-202).....	673
Technical, sales, and administrative support occupations (203-402):	
Technicians and related support occupations (203-242).....	195
Sales occupations (243-302).....	671
Administrative support occupations, including clerical (303-402)..	857
Service occupations (403-472):	
Private household occupations (403-412).....	65
Protective service occupations (413-432).....	79
Service occupations, except protective and household (433-472)....	692
Farming, forestry, and fishing occupations (473-502).....	403
Precision production, craft, and repair occupations (503-	

702).....1,030
 Operators, fabricators, and laborers (703-902):
 Machine operators, assemblers, and inspectors (703-802)..... 381
 Transportation and material moving occupations (803-863)..... 246
 Handlers, equipment cleaners, helpers, and laborers (864-902)..... 355

**1990 Census of Population and Housing 040 Virginia 160
 Berryville town**

URBAN AND RURAL RESIDENCE

 Total
 population.....3,097
 Urban
 population.....
 ...3,097
 Percent of total
 population.....100.0
 Rural
 population.....
 ... 0
 Percent of total
 population..... 0.0
 Farm
 population.....
 .. 0

SCHOOL ENROLLMENT

 Persons 3 years and over enrolled in
 school..... 541
 Preprimary
 school.....
 32
 Elementary or high
 school..... 450
 Percent in private
 school..... 4.0
 College.....
 59

EDUCATIONAL ATTAINMENT

 Persons 25 years and

over.....2,184
 Less than 9th
 grade..... 303
 9th to 12th grade, no
 diploma..... 343
 High school
 graduate.....
 773
 Some college, no
 degree..... 356
 Associates
 degree.....
 70
 Bachelor's
 degree.....
 224
 Graduate or professional
 degree..... 115
 Percent high school graduate or
 higher..... 70.4
 Percent bachelor's degree or
 higher..... 15.5

RESIDENCE IN 1985

Persons 5 years and
 over.....2,908
 Lived in same
 house.....1,698
 Lived in different house in
 U.S.....1,208
 Same
 State.....
 ..1,019
 Same
 county.....
 468
 Different
 county..... 551
 Different
 State.....
 189
 Lived
 abroad.....
 ... 2

DISABILITY OF CIVILIAN NONINSTITUTIONALIZED PERSONS

Persons 16 to 64	
years.....	1,863
With a mobility or self-care	
limitation.....	75
With a mobility	
limitation.....	49
With a self-care	
limitation.....	41
With a work	
disability.....	123
In labor	
force.....	50
Prevented from	
working.....	60
Persons 65 years and	
over.....	507
With a mobility or self-care	
limitation.....	69
With a mobility	
limitation.....	68
With a self-care	
limitation.....	34

CHILDREN EVER BORN PER 1,000 WOMEN

Women 15 to 24	
years.....	385
Women 25 to 34	
years.....	954
Women 35 to 44	
years.....	1,793

VETERAN STATUS

Civilian veterans 16 years and	
over.....	327
65 years and	
over.....	90

NATIVITY AND PLACE OF BIRTH

Native	
population.....	

..3,074

Percent born in state of residence.....	70.4
Foreign-born population.....	23

Entered the U.S. 1980 to 1990.....	6
------------------------------------	---

LANGUAGE SPOKEN AT HOME

Persons 5 years and over.....	2,908
Speak a language other than English.....	63
Do not speak English 'very well'.....	22
Speak Spanish.....	24
Do not speak English 'very well'.....	15
Speak Asian or Pacific Island language.....	3
Do not speak English 'very well'.....	0

ANCESTRY

Total ancestries reported.....	1,789
Arab.....	0
Austrian.....	0
Belgian.....	0
Canadian.....	0
Czech.....	18
Danish.....	7
Dutch.....	49
English.....	337

Finnish.....	0	
French (except Basque).....		63
French Canadian.....	19	
German.....	373	
Greek.....	3	
Hungarian.....	2	
Irish.....	244	
Italian.....	31	
Lithuanian.....	4	
Norwegian.....	0	
Polish.....	3	
Portuguese.....	0	
Romanian.....	0	
Russian.....	0	
Scotch-Irish.....	94	
Scottish.....	46	
Slovak.....	4	
Subsaharan African.....	0	
Swedish.....	2	
Swiss.....	2	
Ukrainian.....	0	

United States or American.....	185
Welsh.....	30
.....	30
West Indian (excluding Hispanic origin groups).....	2
Yugoslavian.....	0
.....	0
Other ancestries.....	271
...	271

1990 Census of Population and Housing 040 Virginia 160 Boyce town

URBAN AND RURAL RESIDENCE

Total population.....	512
Urban population.....	0
Percent of total population.....	0.0
Rural population.....	512
Percent of total population.....	100.0
Farm population.....	7
..	7

SCHOOL ENROLLMENT

Persons 3 years and over enrolled in school.....	121
Preprimary school.....	12
Elementary or high school.....	87
Percent in private school.....	4.6
College.....	22
.....	22

EDUCATIONAL ATTAINMENT

Persons 25 years and over.....	338
Less than 9th grade.....	47
9th to 12th grade, no diploma.....	58
High school graduate.....	97
Some college, no degree.....	88
Associates degree.....	7
Bachelor's degree.....	32
Graduate or professional degree.....	9
Percent high school graduate or higher.....	68.9
Percent bachelor's degree or higher.....	12.1

RESIDENCE IN 1985

Persons 5 years and over.....	479
Lived in same house.....	300
Lived in different house in U.S.....	179
Same State.....	164
Same county.....	68
Different county.....	96
Different State.....	15
Lived	

abroad.....
... 0

DISABILITY OF CIVILIAN NONINSTITUTIONALIZED PERSONS
Persons 16 to 64

years..... 314
With a mobility or self-care
limitation..... 0
 With a mobility
 limitation..... 0
 With a self-care
 limitation..... 0
With a work
disability.....
23

 In labor
force.....
12

 Prevented from
working..... 8

 Persons 65 years and
over..... 75
With a mobility or self-care
limitation..... 16
 With a mobility
 limitation..... 2
 With a self-care
 limitation..... 14

CHILDREN EVER BORN PER 1,000 WOMEN

Women 15 to 24
years..... 294
Women 25 to 34
years.....1,500
Women 35 to 44
years.....1,463

VETERAN STATUS

Civilian veterans 16 years and
over..... 62
 65 years and
over..... 17

NATIVITY AND PLACE OF BIRTH

Native

population.....
 .. 507
 Percent born in state of
 residence..... 82.2
 Foreign-born
 population.....
 5
 Entered the U.S. 1980 to
 1990..... 0

LANGUAGE SPOKEN AT HOME

 Persons 5 years and
 over..... 479
 Speak a language other than
 English..... 16
 Do not speak English 'very
 well'..... 1
 Speak
 Spanish.....
 . 12
 Do not speak English 'very
 well'..... 0
 Speak Asian or Pacific Island
 language..... 1
 Do not speak English 'very
 well'..... 1

ANCESTRY

 Total ancestries
 reported..... 265
 Arab.....
 0
 Austrian.....
 0
 Belgian.....
 0
 Canadian.....
 0
 Czech.....
 0
 Danish.....
 0
 Dutch.....
 18
 English.....

.....	35	
Finnish.....		
.....	0	
French (except		
Basque).....		0
French		
Canadian.....		
..	9	
German.....		
.....	73	
Greek.....		
.....	0	
Hungarian.....		
.....	2	
Irish.....		
.....	35	
Italian.....		
.....	0	
Lithuanian.....		
.....	8	
Norwegian.....		
.....	0	
Polish.....		
.....	8	
Portuguese.....		
.....	0	
Romanian.....		
.....	0	
Russian.....		
.....	0	
Scotch-		
Irish.....		
..	1	
Scottish.....		
.....	3	
Slovak.....		
.....	0	
Subsaharan		
African.....		
0		
Swedish.....		
.....	0	
Swiss.....		
.....	0	
Ukrainian.....		

.....	1	
United States or		
American.....		25
Welsh.....		
.....	0	
West Indian (excluding Hispanic origin		
groups).....	0	
Yugoslavian.....		
.....	0	
Other		
ancestries.....		
... 47		

\$500 to		
\$749.....		
221		
\$750 to		
\$999.....		
25		
\$1,000 or		
more.....		
0		
No cash		
rent.....		
187		
Median		
(dollars).....		
441		

GROSS RENT AS A PERCENTAGE OF HOUSEHOLD INCOME IN 1989

Specified renter-occupied housing

units.....	848
Less than 20	
percent.....	298
20 to 24	
percent.....	
122	
25 to 29	
percent.....	
97	
30 to 34	
percent.....	
37	
35 percent or	
more.....	105

Not
computed.....
... 189

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October 6, 1997

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