



This Report is prepared for the North Carolina General Assembly and the people of North Carolina by the e-NC Authority, formerly the Rural Internet Access Authority (RIAA), as a part of its compliance with Session Law 2003-425.

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Please visit the [www.e-nc.org](http://www.e-nc.org) website to view data and maps on each of North Carolina’s 100 counties. Select Research Projects and 100 County Reports.

Also under Research Projects are our GIS Infrastructure Map and the GIS Training Manual.

## 1.1 Purpose

One of the goals set by the NC General Assembly for the e-NC Authority is “to maintain a web site with accurate, current, and complete information about the availability of the present telecommunications and Internet services with periodic updates on the deployment of new telecommunications and broadband Internet services, as well as information on public access sites and digital literacy training programs in North Carolina,” Session Law 2003-425.

The purpose of this project is to: (a) evaluate the technologies that are available to provide high-speed Internet access, (b) develop a profile for each county showing the high-speed technologies that are available, (c) determine the percentage of households that can have access to high-speed Internet access and the percentage of households that can have access to each technology as a percentage of the total households in each county.

The study addresses high-speed Internet access for residential and small office/home office (SOHO) customers. High-speed Internet access required by large business customers is provided by PRI ISDN, T-1, ATM, Frame Relay, MPLS and business class cable modem services. These services are usually distance sensitive, requiring a specific address to determine pricing, and so are not covered in this study. Generic information for business customers can be found in KPMG’s RIAA North Carolina Telecommunications Infrastructure and Services Assessment and Recommendations Report, 2002, located at: [http://www.e-nc.org/eImprovement/tool/tech\\_inventory.asp](http://www.e-nc.org/eImprovement/tool/tech_inventory.asp).

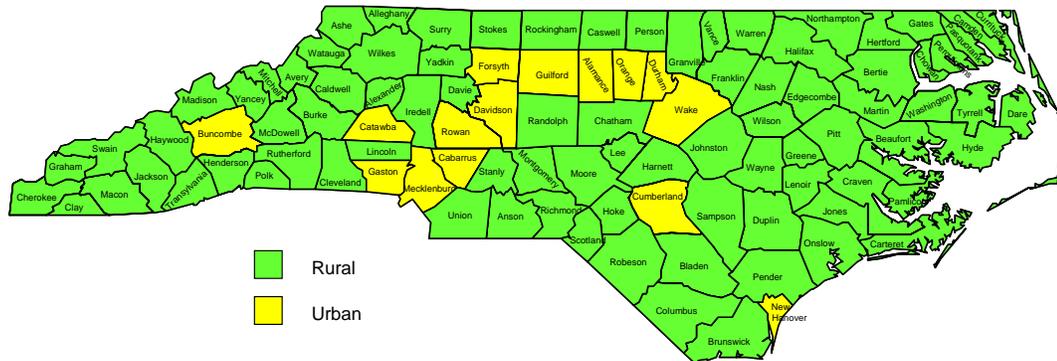
The statistics in this report indicate the percentage of households that have access to high-speed Internet services, not the number of households that are subscribing to the services. For information on citizens’ use of the Internet, go to: <http://www.e-nc.org/pdf/NCsOnline.pdf>. This report from e-NC, *North Carolinians Online, Trends from the Citizen Surveys 1999-2004*, looks at Internet usage rates among citizens in North Carolina.

For information on the usage of broadband service, got to <http://www.fcc.gov/wcb/iatd/recent.html>.

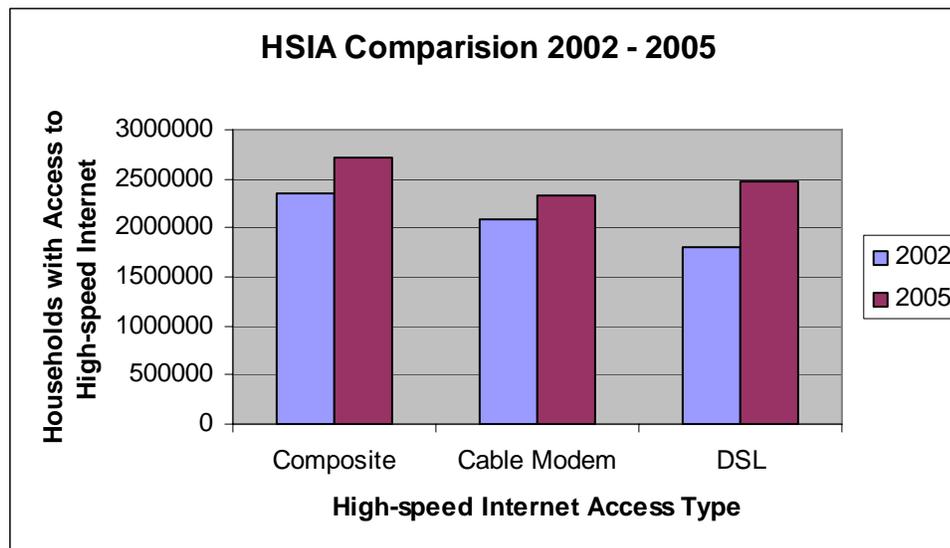
## 1.2 Executive Summary

### 1.2.1 High-Speed Internet Access

According to the US Census Bureau, North Carolina has 3,320,090 households, of which 1,663,642 or 50.11% are located in the 85 rural counties and 1,656,448 or 49.89% are located in the 15 urban counties.

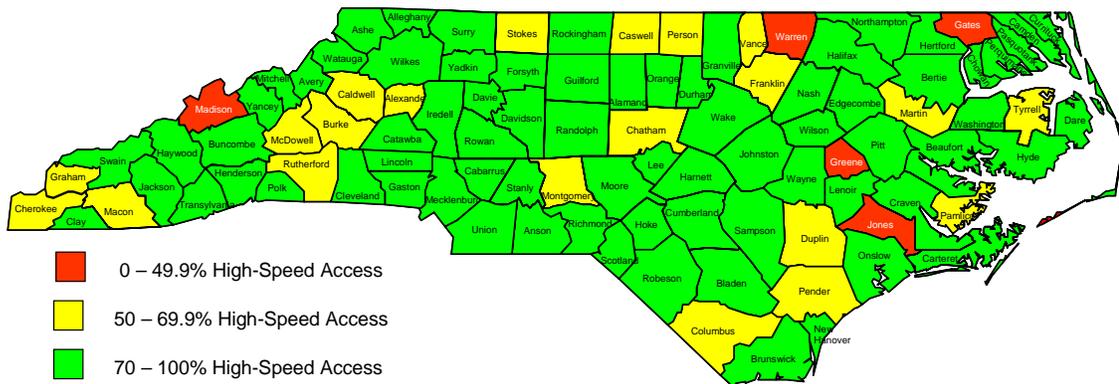


By the end of 2005, 82.01% of the households in North Carolina had the ability to access high-speed Internet services via cable modem or DSL services compared to 74.88% in 2002.



High-speed Internet is available to 2,722,737 of the households in North Carolina. High-speed access is available to 1,293,975 or 77.78% of the rural households and 1,428,762 or 86.25% of the urban households.

## 2005 Households with Access to High-Speed Internet Service

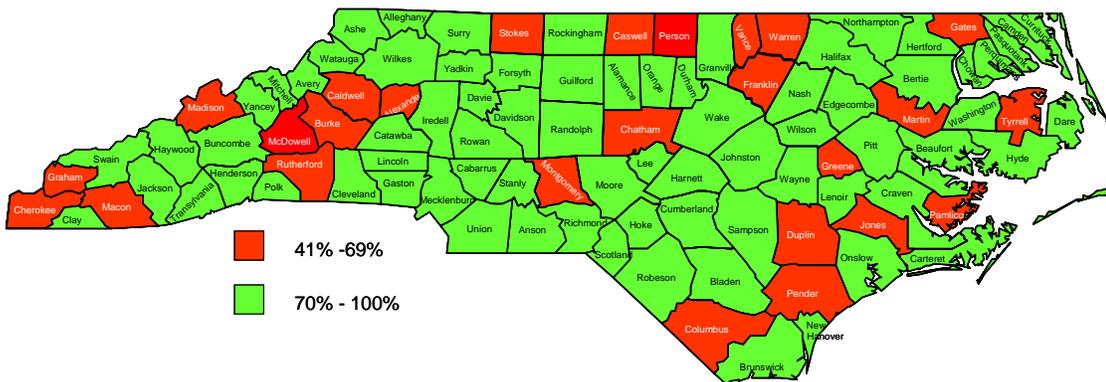


DSL deployment exceeded cable modem deployment in 2005. Growth will continue in 2006. The Telcos will continue the deployment of DSL in their rural areas. Time Warner has purchased the Adelphia Communications areas in North Carolina and will begin upgrading the Adelphia network for digital TV and cable modem service. Charter Communications and Cox Communications, Northland Communications and a number of the other cable companies will continue to upgrade and expand their systems.

## Counties with Less Than 70% High-Speed Internet Availability

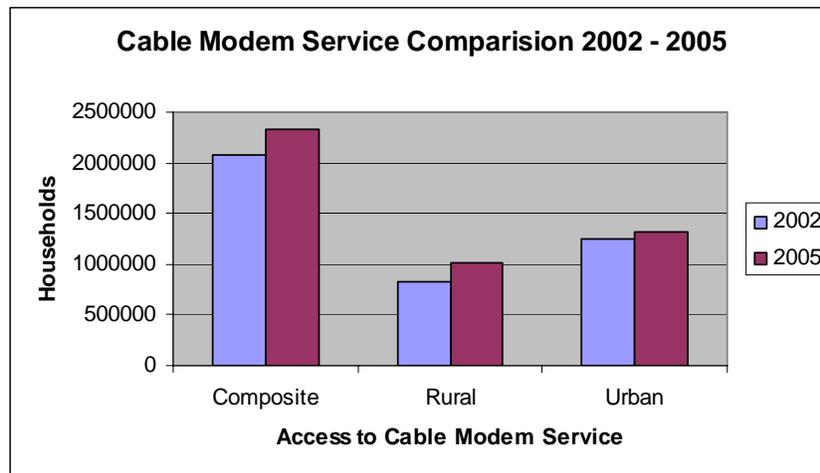
2005 DSL and Cable Modem Composite

State Average – 82%

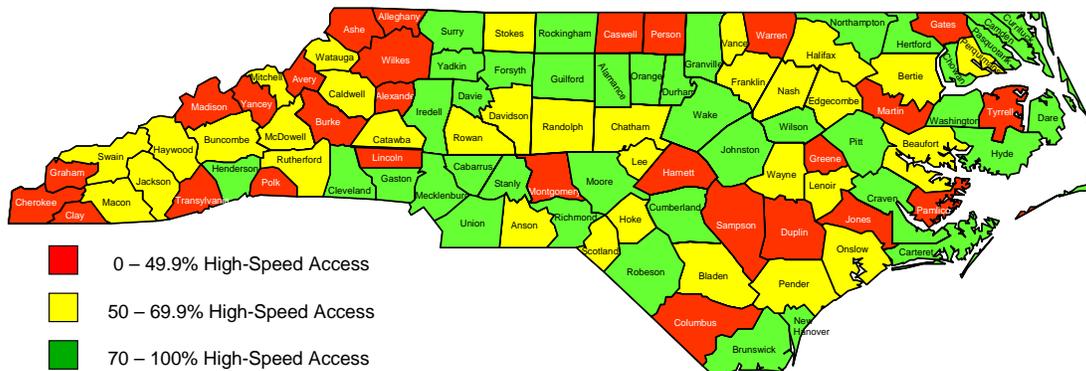


## 1.2.2 Cable Modem Access

Cable companies will continue to upgrade their infrastructure to handle digital TV and will offer cable modem Internet as a vertical service. Cable modem service is available to 2,338,460 households or 70.43% of the households in North Carolina, with 1,019,310 or 61.27% of the rural households and 1,319,150 or 79.64% of the urban households having access.

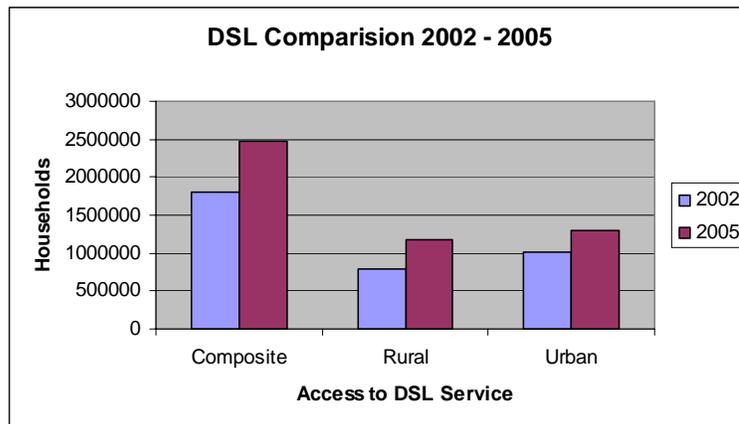


### 2005 Households with Access to Cable Modem Internet Service

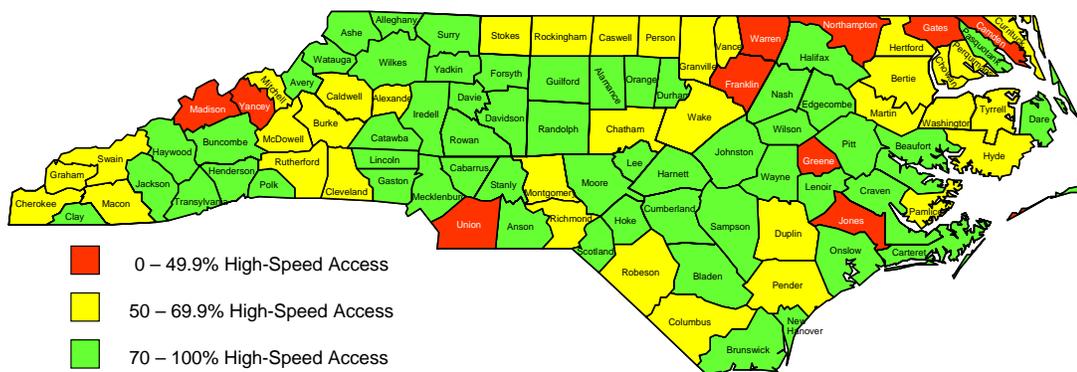


## 1.2.3 DSL Access

The Rural Telephone Membership Corporations (RTMCs) and the independently owned companies provide access to 80 - 100% of their subscribers now, with most already providing DSL service to 100% of their subscribers. Bellsouth and Sprint have deployed DSL in all of their central offices. Verizon still has several without DSL service. It is expected that they will continue to deploy DSL in their rural areas.



**2005 Households with Access to DSL Internet Service**



Overall, 2,467,865 or 74.33% of the households in North Carolina have access to DSL service with 1,166,696 or 70.13% of the rural households and 1,301,169 or 78.55% of the urban households having access.

### 1.2.4 Satellite Access

Satellite is considered the ubiquitous service, although it requires a clear view of the southern sky for service. It can be purchased from numerous resellers and is available from chains such as Best Buy and Circuit City. Satellite service normally requires an upfront purchase of hardware and a professional installation. Satellite, along with wireless, will be the only means of obtaining high-speed Internet service for some of the rural areas of North Carolina for many years to come. Satellite providers declined to share subscriber data for North Carolina. Therefore satellite service is not included in the high-speed Internet access data.

### 1.2.5 Wireless Access

Broadband wireless is being deployed to provide high-speed Internet service in a number of areas in North Carolina. It is normally a line of sight service and uses unlicensed frequencies in most cases. A number of Internet Service Providers (ISPs) are using it to expand their service offerings and to eliminate the “last mile charges” incurred in providing service.

Many areas of North Carolina have wireless service providers, but deployment is rather spotted. Most providers cover a county or only a portion of a county. A few have networks that cover several counties. Some companies would provide subscriber data, but could not provide households that have access. Therefore wireless service is not included in the high-speed Internet access data. Wireless, along with satellite, will be the only means some areas of North Carolina have of obtaining high-speed Internet access.

Staff is available to talk with interested parties.

### 1.2.6 Conclusions

In 2002, twenty-five counties had less than 50% access to high-speed Internet service with three counties, Clay, Graham and Swain having 0%. In 2005, that number was reduced to five counties with less than 50% access and 26 counties having less than 70% access to high-speed Internet service.

The cable companies continue to upgrade their networks and are deploying cable modem Internet service upon completion. Time Warner has purchased the Adelphia Communication properties in North Carolina. (Adelphia has been in bankruptcy proceedings for several years.) Time Warner has begun the process to rebuild these areas with cable modem capable facilities. Cable companies have also begun to build into the 100 home plus subdivisions that are being built in some counties. Most companies still maintain their 20 homes per mile (approximate) requirements and therefore have not begun deploying in the most rural areas of North Carolina.

With the exception of Verizon, the telcos have equipped all of their central offices with DSL. The Telephone Membership Corporations and the independent telcos are serving 90 to 100% of their customers. The larger telcos are serving 40 to 60% of most of their rural areas. They are increasing their deployment in pair gain systems, but will require several years before they reach the 90 –100% bracket in the rural areas.

### 1.3 Recommendations

There are many ways for North Carolina to address the remaining gaps in high-speed Internet access across the state. It is essential that all these paths be pursued in order to see that the opportunity for technology-based economic development, which requires a high-speed Internet platform for success, is available to all North Carolina communities and businesses.

In increasing cable modem access, it is essential that local governments are well informed when negotiating their contracts with cable television companies. Normally, these franchise agreements provide for annual or bi-annual reviews of required reports, or reports can be requested at certain intervals during the contract. Municipal and county managers should address deployment issues such as upgrading infrastructure to handle digital and high definition television and deployment of cable modem service, and timelines for upgrades. High-speed Internet deployment should definitely be a consideration in cases of franchise renewals.

In increasing DSL and other telecommunications services, it is essential for citizens, businesses, and federal, state and local governments to continually push the telecommunications companies to expand their services. The companies must be constantly encouraged to provide service to the unserved

rural areas. In conjunction with this process, government leaders must remain abreast of the issues and needs around telecommunications infrastructure, and the benefits of high-speed Internet as an economic development tool. Citizens and businesses, especially in rural areas, must be engaged in technology expansion and adoption, and have comprehensive digital literacy training available so that they will not be left behind. A need for increased broadband speed will be essential for rural communities to compete in a regional, national and global economy. It is also required for education, healthcare, and entertainment. They must also contact their legislators and remind them of the importance of high-speed access to all of their constituents. This awareness in turn, will increase demand and create business cases for the deployment of additional infrastructure.

Finally, in regards to satellite and wireless access, support for and knowledge of emerging technologies is essential in increasing the affordability, quality and accessibility of these technologies.

Encourage elected local, state and federal officials to meet with the service providers and express the need for high-speed Internet access in their areas. Political persuasion normally receives attention by service providers.

The e-NC Authority, mandated by the North Carolina General Assembly to provide leadership, coordination and support for telecommunications policy assessment as it relates to providing high-speed Internet access to rural and urban distressed areas, continues to work to see that affordable high-speed access becomes available to all areas of the state. The e-NC Authority fills a role occupied by no other state entity. Continued support for e-NC is essential in ensuring the voice for rural and urban distressed areas of the state is heard.

## 1.4 Definitions

### High-speed Broadband Internet Access

“Internet access with transmission speeds of at least 128 kilobits per second for residential customers and at least 256 kilobits per second for business customers.”

Defined by North Carolina Session Law 2000 - 149.

Since the Session Law did not state whether the rates are symmetrical (up and down rates are the same) or asymmetrical (up or down rate are different) the RIAA (the original name of the Authority post 2004) Technical Committee determined that if the service provided the 128 or 256 kilobits per second asymmetrical rate, it met the requirements of the Session Law.

### Rural/Urban

Rural County – A county with a density of fewer than 250 people per square mile based on the 1990 United States decennial census.

Defined by North Carolina Session Law 2003-245.

### Tiers

As provided in the William S. Lee Quality Jobs and Business Expansion Act, the N.C. Department of Commerce annually evaluates North Carolina’s 100 counties and assigns each a tier designation ranking from 1 to 5.

Designations are based on each county’s ranking in unemployment, per capita income, population growth, and population size. Counties in tiers 1, 2, and 3 are considered “distressed” and are eligible for business incentive programs offered through the N.C. Department of Commerce.

### Percentage

All percentages indicate the percentage of households that have access to the services, not the number of households that are subscribing to the services. The only public information about subscription rates appear in the FCC report “High-Speed Services for Internet Access located at <http://www.fcc.gov/wcb/iatd/recent.html>.

## 1.5 Methodology

1. High-Speed Internet access is defined by Session Law 2000 - 149 “Internet access with transmission speeds of at least 128 kilobits per second for residential customers and at least 256 kilobits per second for business customers”. The RIAA Technical Committee determined that any

service that provides 128 KB – residential or 256 KB - business either transmitting or receiving (asynchronous) complies with the Session Law 2000 - 149 definitions.

2. To assess the availability of high-speed Internet access in North Carolina, the e-NC Authority collected data from the cable, telephone, and wireless companies. The Authority then verified the data when possible, compared deployment by the different providers and derived an overall percentage of deployment.
3. Satellite and wireless companies provide access to a large area of North Carolina, especially the rural areas. Satellite companies would not provide information on the number of customers served in North Carolina.
4. Wireless technology is a relatively new service in providing high-speed Internet access. Only a few providers serve more than one county. Information on the number of households with access is hard to determine because wireless is a line of site service. Because of these reasons, satellite and wireless households are not included in the composite ratings. Never the less, the e-NC Authority works with the wireless providers and monitors their deployments.
5. The composite rating is the percentage of households that have access to cable modem, DSL, or both services. In locations having access to both services, only the households of the service covering the largest number of households is used.

## 1.6 Technologies

The following technologies are used to provide high-speed Internet access in North Carolina: cable modem, DSL, satellite, and wireless.

### 1.6.1 Cable Modem

Cable Modem service is normally available in areas in which the cable TV company has upgraded its coax system to a Hybrid Fiber Coax (HFC) system. This upgrade provides bi-directional communications channels and increased

channel capacity. Utilizing a broadband cable modem at the subscribers premise, the cable company can provide high-speed Internet access.

HFC is a shared medium and up to 2000 cable modems can share a set of upstream and downstream TV channels. Expect download speeds in the range 400Mbps to 2.9 Mbps. Uploads are advertised as “capable of 128KB to 384KB, expect less. Most companies limit upload speeds, but a number of the companies are offering higher download and upload speeds for an additional charge.

Deployment of cable modem service first occurred in the metropolitan areas and then spread to the larger towns. As the cable companies upgrade their systems, they have started to pick up smaller communities and crossroad areas, especially along their trunk routes. Cable companies usually require 15 to 20 households per route mile before installing service. This prohibits some rural areas of North Carolina from having access to cable modem service.

A number of North Carolina’s cable companies, Charter, Cox, Multimedia, Murphy, etc. have or are in the process of converting their systems to Hybrid Fiber Coax systems. With the exception of Pamlico County, Time Warner provides cable modem service in its other franchised areas. Time Warner has also purchased the Adelpia properties in North Carolina and will be upgrading those areas in the future. Charter and Cox are expanding their cable modem service in a number of areas. Mediacom has most of its systems updated with a few exceptions in the western part of the state. A number of the smaller companies such as Andrews/Murphy, Country Cable and Northlands Communications are upgrading and expanding their systems.

### **1.6.2 ADSL/DSL**

Broadband or high-speed service, normally offered by the Incumbent Local Exchange Carrier, is known as Asynchronous Digital Subscriber Loop (ADSL or DSL) service. DSL provides high-speed digital services on the existing twisted copper network without interfering with the traditional analog telephone service.

DSL has a maximum distance of 18,000 ft. from the central office or Digital Subscriber Line Access Multiplexer (DSLAM). Upstream/downstream speeds range from 1.7Mbps/76Kbps at 18,000 ft. to 8Mbps/1.5 Mbps at 9,000 ft, but are limited by most companies to 1.5Mbps to 384 KB on the downstream and 60KB to 512KB on the upstream. A number of the companies are now offering higher

bandwidths for an additional charge. The subscriber has unshared access to the central office or the DSLAM, but service from that point is shared with many other subscribers and is therefore dependent upon trunk engineering, the number of other subscribers vying for access, and network conditions. DSL's limiting factors are its range of 12,000 to 18,000 ft. from the central office or DSLAM and the limited number of rural areas in which it is presently deployed.

Internet service is usually provided with the DSL service by the telephone company, but can be provided by other ISPs. The ISPs may sell Internet service only or may resell the DSL and Internet service as a package.

Deployment of DSL greatly increased in 2005. With the exception of Verizon, the Telcos in North Carolina have installed DSL in all of their central offices. Customers within 18,000 feet of these locations can usually receive DSL service. Deployment of DSL equipment into smaller remotes, DSLAMs, and digital subscriber carriers located further from the central offices has increased in 2005 and will continue to see increase deployment in 2006.

Customers in counties being served by most of the Rural Telephone Membership Corporations (RTMC) and Independent Companies have 80% to 100% coverage. The other companies are in the planning or implementation stages and should raise total coverage to the 50% to 100% range.

### **1.6.3 Satellite**

Satellite is considered the ubiquitous service, capable of providing service everywhere. In actuality, Satellite requires an unobstructed view of the southern sky, making it unsuitable in some areas of the mountains, some metropolitan areas, and heavily wooded areas. Service is often affected by the weather.

Satellite companies have improved their service by adding a transmitter to their product. Previously, customers had to use their telephone line to upload their request. Upon verification of subscription, their requested information was downloaded to them via satellite. With the addition of a transmitter, uploads and downloads are provided over the satellite service.

Direway and Starband are the providers of satellite service and sell through Best Buy, Circuit City, Earthlink, and numerous independent resellers. Wild Blue offers a slightly faster service and can be contacted at [www.wildblue.com](http://www.wildblue.com).

Speeds of 60KB for upload and 400KB for the download are the norm. Higher speeds are available for business customers.

Satellite's limiting factors are the initial cost; a clear view of the southern sky and service is affected by weather. Even considering these factors, high-speed Internet access via satellite may still be the only means of service for some rural areas of North Carolina for several years.

### **1.6.4 Wireless – Unlicensed Frequencies**

In September of 1999, the FCC allocated 300 MHz of spectrum for unlicensed operation in the 5-GHZ and 2-GHz block. Fast deployment, inexpensive equipment and IEEE 802.11 standards make unlicensed wireless attractive to ISPs.

Deployment of wireless service is in the early stage. Many are dial-up ISPs expanding their customer base by providing wireless high-speed Internet service in areas, which have neither cable modem, nor DSL service. In total, a number of areas of North Carolina are covered by wireless service, but deployment is rather spotted throughout the state. Most providers cover only a county or a portion of a county. Only a few have networks that serve several counties.

Wireless is a line of site service with trees, buildings and weather being its most limiting factors. Multiple systems in an area can degrade service. Other forms of interference are also a problem. Customers may have to purchase hardware and in some cases, a professional installation is required. In a few cases, non-line of site has been deployed in the last 2 years.

Wi-Fi has been out for a number of years. Wi-Max is the newest technology with promises of more bandwidth and greater range. Wi-Max equipment is in the early stages of deployment. A wait and see attitude would be prudent until there is documentation available on real world deployments of WiMAX. The reason for this is that the cost of equipment change out will be expensive until IEEE standards are completed.

Wireless customers have the least pricing options of all services. Few areas are covered by more than one provider. Although wireless has several limitations, it may be the only choice of service in some areas of North Carolina.

### **1.6.4 Broadband Over Powerline – BPL**

Broadband over Power Line (BPL) is a technology that allows Internet data to be transmitted over utility power lines. (BPL is also sometimes called Power-line Communications or PLC.) In order to make use of BPL, subscribers use neither a phone, cable nor a satellite connection. Instead, a subscriber installs a modem that plugs into an ordinary wall outlet and pays a subscription fee similar to those paid for other types of Internet service.

BPL works by modulating high-frequency radio waves with the digital signals from the Internet. These radio waves are fed into the utility grid at specific points. They travel along the wires and pass through the utility transformers to subscribers' homes and businesses. Little, if any, modification is necessary to the utility grid to allow transmission of BPL. This mode has not yet been widely deployed in the United States, but it has been implemented in a few other countries, with varying results. The Federal Communications Commission (FCC) is currently working on a set of rules according to which BPL may be implemented in the United States. If it is put into use, BPL will be an unlicensed service, and will be governed by rules similar to those that apply to cordless telephones, television remote controls, and other consumer electronic devices.

Some people say BPL represents an ideal solution for people in rural areas. But many engineers, along with officials in the National Telecommunications and Information Administration (NTIA) and the Federal Emergency Management Administration (FEMA), fear that BPL will interfere with fire, police, shortwave, land mobile, and other radio systems important to national security. Amateur radio operators have voiced their concerns as well. BPL subscribers may also be adversely affected by the electromagnetic fields that radio transmitters generate in the course of their normal and licensed operations. The utility power lines are not shielded, as is coaxial cable, and some of the frequencies suggested for BPL operation lie within the spectra assigned to essential wireless services. (Source: Whatis.com)