

Broadband²⁰¹⁵

The Connection to
New Hampshire's Future

NEW HAMPSHIRE
broadband
MAPPING & PLANNING
PROGRAM



University of
New Hampshire



ACKNOWLEDGMENTS

The New Hampshire Broadband Mapping & Planning Program (NHBMPP) is managed by the New Hampshire Geographically Referenced Analysis and Information Transfer System (NH GRANIT) within the Earth Systems Research Center at the University of New Hampshire (UNH), and is a collaboration of multiple partners. These include the New Hampshire Office of Energy and Planning (OEP), the New Hampshire Department of Resources and Economic Development (DRED), University of New Hampshire Cooperative Extension (UNHCE), University of New Hampshire Information Technology (UNHIT), and the state's nine regional planning commissions (RPCs).

The NHBMPP is a comprehensive initiative that began in 2010 with the goal of understanding where broadband is currently available in the state, how it can be made more widely available in the future, and how to encourage increased levels of broadband adoption and usage. The Program is an American Recovery and Reinvestment Act of 2009 (ARRA) project funded through the National Telecommunications and Information Administration (NTIA) of the U.S. Department of Commerce.

This report is based on the findings and recommendations of the regional broadband plans developed for the NHBMPP by New Hampshire's nine regional planning commissions:

- Central New Hampshire Regional Planning Commission
- Lakes Region Planning Commission
- Nashua Regional Planning Commission
- North Country Council
- Rockingham Planning Commission
- Southern New Hampshire Planning Commission
- Southwest Region Planning Commission
- Strafford Regional Planning Commission
- Upper Valley Lake Sunapee Regional Planning Commission

We extend a sincere thank-you to the more than 150 New Hampshire residents who participated in the focus groups and forums held as part of the regional planning process.

Thank you also to the Central New Hampshire Regional Planning Commission and to Donahue, Tucker and Ciandella, PLLC, for their efforts and input in drafting Appendix E: How Is Broadband Regulated in New Hampshire?



TABLE OF CONTENTS

Executive Summary.....	2
Introduction	6
Priority Broadband Recommendations for New Hampshire.....	7
Broadband and Prosperity in New Hampshire.....	10
Broadband Opportunities and Challenges by Sector.....	12
Broadband in New Hampshire and Its Regions.....	24
Conclusion.....	49
Appendix A: Recommendations and Implementation Table.....	50
Appendix B: What Is Broadband?.....	56
Appendix C: Broadband Planning in New Hampshire.....	64
Appendix D: Broadband Authorities in New England.....	68
Appendix E: How Is Broadband Regulated in New Hampshire?.....	70
Endnotes.....	78



What is broadband?

Put simply, broadband is high-speed Internet access. Broadband is often measured by how fast a user's computer can download from and upload information to the Internet, and that speed is usually measured in Kbps (kilobits per second), Mbps (megabits per second), or Gbps (gigabits per second). Typically, download speeds are faster than upload speeds, a state referred to as "asymmetrical."

EXECUTIVE SUMMARY

New Hampshire's citizens and businesses increasingly require high-speed Internet access to conduct their daily activities. Broadband is now critical infrastructure for business, education, health care, public safety, and government operations.¹ Every New Hampshire resident, business, and organization should have access to fast, reliable, and affordable broadband to ensure our current and future prosperity and quality of life.

In New Hampshire, broadband is widely available at basic speeds. But not everywhere—there are communities and neighborhoods throughout the state with limited or no broadband access. This disparity in broadband access leads to disparities in economic opportunity, education, community vitality, public health and safety, and quality of life for New Hampshire residents. And the basic speeds that are available in much of the state today may limit the applications that can be effectively utilized now and in the future.

Broadband availability, affordability, and adoption can be affected by many factors, including a region's geography and demographics. For example, in areas with low population density, fewer potential subscribers can mean a low return on infrastructure investment, making it more difficult to attract providers.² The lack of competition can in turn lead to higher prices for broadband consumers. This report summarizes the characteristics of New Hampshire's planning regions, including geography and demographics, and presents the broadband issues and priorities identified in each of nine regional broadband plans.

The report also describes the current status of and future needs for broadband specific to six sectors: economic development, education, health care, community support/local government, public safety, and residents. For New Hampshire businesses, broadband helps improve efficiency, expand markets, and increase revenue. In education, broadband can provide more customized learning opportunities and extend learning beyond the classroom. Broadband can help improve patient health outcomes while controlling costs and extending the reach of providers. Broadband allows local government to deliver services more efficiently and cost-effectively, and can enable robust public participation in community decision making. Public safety personnel need the ability to communicate quickly with each other, access online resources via personal computers or mobile devices, and transfer important video and information during emergencies. And residents use broadband for education, social interaction, commerce, entertainment, and working remotely.

Broadband: The Connection to New Hampshire's Future presents the combined findings and recommendations of the state's regional broadband plans, developed by the regional planning commissions with extensive input from local committees, focus groups, public forums, and interviews with local stakeholders. The report is the culmination of a five-year effort by the University of New Hampshire, the New Hampshire Department of Resources and Economic Development, the New Hampshire Office of Energy and Planning, and the nine regional planning commissions in New Hampshire. It is a product of the New Hampshire Broadband Mapping & Planning Program (NHBMP), an American Recovery and Reinvestment Act of 2009 (ARRA) initiative funded by the National Telecommunications and Information Administration (NTIA). The NHBMP began in 2010 with the goal of understanding where broadband is currently available in the state, how it can be made

more widely available in the future, and how to encourage increased levels of broadband adoption and use.

The 37 recommendations in this report seek to ensure that high-speed broadband is available to everyone in the state, that it is affordable, and that people know how to use it effectively. Implementing the necessary policies and changes will require a willingness to act and invest now. All recommendations will take effort and resources to implement. Some require state agency activity, some require legislation, others require private market activity, and many require a combination. The recommendations can be broadly summarized as follows:

Establish a Broadband Authority and Broadband Council

New Hampshire needs an official entity that is responsible for developing and advancing the state's strategic broadband plan, for continuing to collect data and map broadband use, and for seeking funding to support infrastructure expansion—a state-wide authority. It also needs a broadly representative stakeholder group to advise the authority and other public officials—a broadband council. Creating an official state authority and an advisory council to plan, promote, finance, assess, and support expanded broadband deployment and adoption efforts is a critical first step to ensuring that all New Hampshire residents and businesses have access to affordable broadband.

Eliminate Barriers to Broadband Availability

Currently about 70% of New Hampshire residents, and less than half of households in rural areas, have access to broadband at speeds greater than 100 Mbps, the speed necessary for the simultaneous use of multiple devices, cloud-based business applications, telemedicine, etc. In addition to increasing speeds in areas that are currently served, New Hampshire needs to extend broadband service to areas of the state that are currently unserved or underserved. Ensuring that fast, reliable broadband service is accessible to all New Hampshire residents, businesses, and organizations who want it is essential to a prosperous New Hampshire with a high quality of life.

One way to encourage broadband expansion is to eliminate barriers to broadband availability. This includes working with service providers, utility pole owners, regulators, and legislators to 1) streamline the pole attachment and tower siting processes; 2) improve the use of highway rights-of-way; and 3) streamline utility pole licensing procedures.

Encourage Competition to Improve Broadband Affordability

The cost of broadband service makes it unaffordable to a significant number of New Hampshire residents. Much of the state has coverage from only one or two wire-line broadband providers, and this lack of competition can lead to higher prices. New Hampshire needs to encourage competition among providers to bring the lowest possible cost to consumers.

One way to accomplish this is to amend New Hampshire law (RSA 53-C:3-b) to remove the requirement that new service providers build out an entire network identical to the existing cable provider in order to provide new and competitive services in a given franchised community. At the national level, New Hampshire officials should support policies that give the Federal Communications Commission (FCC) the tools to encourage broadband competition.



Coordinate, Promote, and Sponsor Trainings to Increase Broadband Adoption

New Hampshire needs to coordinate, promote, and sponsor trainings for residents, businesses, and organizations on the benefits of broadband usage. Increased skills and knowledge of broadband applications encourages broadband use and will lead to a well-educated, prosperous, healthy, and safe New Hampshire.

Monitor Broadband Availability and Adoption

New Hampshire needs to monitor, inventory, and evaluate its broadband availability, affordability, adoption, and competitive position on an ongoing and regular basis. Grant funding from the NTIA for the NHBMP will end in early 2015. Continuing to collect statewide broadband availability and adoption data is necessary in order to measure the effectiveness of broadband efforts and to provide a clear picture of New Hampshire's broadband competitive position in comparison to other states and countries.



Broadband: The Connection to New Hampshire's Future was written to highlight the importance of broadband to New Hampshire's prosperity and quality of life. New Hampshire cannot afford to accept the status quo while other states, and the world, move forward. It must continue to be a leader. The time to act to improve broadband availability, affordability, and adoption in New Hampshire is now.





What do unserved, underserved, and served mean?

In this report, “unserved” means no broadband service is available or the available service is characterized by slow download and/or upload speeds (< 768 Kbps), inadequate for most uses other than sending or receiving simple text e-mails. “Underserved” means that moderate download and upload speeds are available (768 Kbps to < 6 Mbps), sufficient for e-mail, social media applications and web browsing, but limited when streaming content, participating in online gaming, or transferring files over the Internet. “Served” means that faster download and upload speeds are available (6 Mbps or greater), sufficient for a wide range of web browsing, e-mail use, social media, HD-quality video conferencing, telehealth/telemedicine, and file sharing. And while the minimum definition of “served” is 6 Mbps (download speed), advanced applications may require speeds of 100 Mbps and greater. For more information, see Appendix B: What Is Broadband?

INTRODUCTION

Every New Hampshire resident, business, and organization should have access to fast, reliable, and affordable broadband. It is now critical infrastructure for business, education, health care, public safety, and government operations.³ The United Nations Broadband Commission asserted in a September 2013 report that “affordable broadband connectivity, services, and applications are essential to modern society, offering widely recognized social and economic benefits.”⁴ In New Hampshire, broadband is widely available at basic speeds. But not everywhere—there are communities and neighborhoods with limited or no broadband access. Over the long term, this disparity in broadband access will lead to disparities in economic opportunity, education, community vitality, public health and safety, and quality of life for New Hampshire residents.

New applications for businesses, organizations, and residents emerge constantly, and within years and sometimes months move from the category of “nice to have” to “absolutely essential.” The broadband speeds currently available in most of New Hampshire (> 6 Mbps download— see side) will not be adequate for the future. Today, the simultaneous use of multiple devices, cloud-based business applications, telemedicine, etc., already require faster broadband speeds (25–100 Mbps download/upload). And increasingly, businesses and institutions are looking for ultra-high-speed broadband (> 1 Gbps download). *To meet the current and future demands of businesses, residents, and organizations, and to remain prosperous in the future, New Hampshire needs to improve broadband availability across the state while encouraging faster broadband speeds than are now generally available.*

Broadband: The Connection to New Hampshire’s Future presents the combined findings and recommendations of the state’s nine regional broadband plans, developed by the regional planning commissions with extensive input from local committees, focus groups, public forums, and interviews with local stakeholders. These findings are presented in the context of additional research compiled by the New Hampshire Office of Energy and Planning. The report includes a summary of the opportunities and current status of broadband for six sectors: economic development, education, health care, local government, public safety, and residents. Further, it summarizes the unique geographic and demographic characteristics of the nine regions as they relate to broadband and presents each of their priority actions. (To read the regional plans in full, go to <http://iwantbroadbandnh.org/planning>.)

The report is the culmination of a five-year effort by the University of New Hampshire, the New Hampshire Department of Resources and Economic Development, the New Hampshire Office of Energy and Planning, and the nine regional planning commissions in New Hampshire. It is a product of the New Hampshire Broadband Mapping & Planning Program (NHBMPP), an American Recovery and Reinvestment Act of 2009 (ARRA) initiative funded by the National Telecommunications and Information Administration (NTIA). The NHBMPP began in 2010 with the goal of understanding where broadband is currently available in the state, how it can be made more widely available in the future, and how to encourage increased levels of broadband adoption and use. (For more information about the NHBMPP, see Appendix C: Broadband Planning in New Hampshire.)

PRIORITY BROADBAND RECOMMENDATIONS FOR NEW HAMPSHIRE

This report recommends 37 specific policies, initiatives, and actions that collectively seek to ensure that broadband is available to everyone in New Hampshire, that it is affordable, and that people know how to use it effectively. The recommendations are organized into five categories:

- 1 Authority** – creating an official state entity and an advisory council to plan, promote, finance, assess, and support affordable broadband and adoption efforts
- 2 Availability** – ensuring that fast, reliable broadband service is accessible to all New Hampshire residents, businesses, and organizations who want it
- 3 Affordability** – reducing the cost of Internet service relative to the financial means of the user
- 4 Adoption** – promoting the increased utilization of broadband where it is available and affordable
- 5 Assessment** – using a variety of methods on an ongoing basis to inventory and evaluate the availability, affordability, and adoption of broadband

The five highest priority recommendations for broadband in New Hampshire are presented below; for the full set of recommendations, including subsequent and supportive policies and actions, see Appendix A: Recommendations and Implementation Table.

1 BROADBAND AUTHORITY ESTABLISH A STATE BROADBAND AUTHORITY AND STATE BROADBAND COUNCIL

New Hampshire needs an official Broadband Authority *that is responsible for developing and advancing the state's strategic broadband plan, for continuing to collect data and map broadband use, and for seeking funding to support infrastructure expansion.*

This entity should be comprised of state agency representatives, and be staffed by the state broadband director. It should seek funding from federal, state, and other sources to support New Hampshire's broadband efforts, including infrastructure expansion, and should create state and local mechanisms to incentivize broadband deployment. The entity should propose state policy initiatives and support federal policy initiatives that advance broadband availability and adoption. (See Appendix A for all of the subsequent and supportive policies and actions.)

A New Hampshire Broadband Council should also be established, similar to the existing Telecommunications Advisory Board (see side bar), with representatives from various stakeholder groups including economic development, education, health care, local government, public safety, and the regional planning agencies. The Council should act in an advisory role to the official state broadband entity. It should adopt a broadband vision for the state, set broadband speed and availability targets, and monitor broadband metrics to ensure that New Hampshire remains competitive in the region, nationally, and globally.

Broadband Authority

Most New England states have established governmental or quasi-governmental entities to coordinate state broadband initiatives and leverage federal, state, local, and private funds to expand broadband infrastructure. In several states, these entities have access to the state's bonding authority to assist in financing major broadband infrastructure expansion projects.

New Hampshire currently has a Telecommunications Advisory Board (TAB) that is advisory only. Appendix D further defines the TAB, and describes the structure and authorities employed in other New England states. New Hampshire should research each model to determine the most effective practices and then define an authority specific to New Hampshire's needs.



2 BROADBAND AVAILABILITY **ELIMINATE BARRIERS TO BROADBAND AVAILABILITY**

Currently about 70% of New Hampshire residents, and less than half of households in rural areas, have access to high-speed broadband at speeds greater than 100 Mbps, the speed necessary for a wide range of web browsing, e-mail use, social media, HD-quality video conferencing, telehealth/telemedicine, and file sharing.⁵ In addition to increasing speeds in areas that are currently served, New Hampshire needs to extend broadband service to areas of the state that are unserved or underserved (see page 5 for definitions).

One way to encourage broadband expansion is to *eliminate barriers to broadband availability*. This includes working with service providers, utility pole owners, regulators, and legislators to 1) streamline the pole attachment and tower siting processes; 2) improve the use of highway rights-of-way; and 3) streamline utility pole licensing procedures.

In addition, New Hampshire should work with ISPs (Internet service providers) to provide faster broadband speeds, and to promote the connection of fiber technology (or other fixed infrastructure) to wireless infrastructure to increase the reach and capacity of wireless mobile service.

Finally, New Hampshire should support communities in their efforts to expand broadband availability, including the incorporation of broadband chapters in local master plans.

3 BROADBAND AFFORDABILITY ENCOURAGE COMPETITION **TO IMPROVE BROADBAND AFFORDABILITY**

The cost of broadband service makes it unaffordable to a significant number of New Hampshire residents. Much of the state has coverage from only one or two wireline broadband providers, and this lack of competition can lead to higher prices. New Hampshire needs to encourage competition among providers to bring the lowest possible cost to consumers.

One way to accomplish this is to *amend New Hampshire law (RSA 53-C:3-b Franchises; Administration by Municipality) to remove the requirement that new service providers build out an entire network identical to the existing cable provider in order to provide new and competitive service in a given franchised community*. At the national level, New Hampshire officials should support policies that give the Federal Communications Commission (FCC) the tools to encourage broadband competition.

New Hampshire should also support public/private partnerships that offer reduced rates for broadband services and computers to low-income residents.

To improve the affordability of broadband to New Hampshire schools, New Hampshire also needs to work with the state's Congressional Delegation to expand and reform the E-rate program (otherwise known as the Schools and Libraries Program of the Universal Service Fund).

4 BROADBAND ADOPTION COORDINATE, PROMOTE, AND SPONSOR TRAININGS TO INCREASE BROADBAND ADOPTION

New Hampshire needs to *coordinate, promote, and sponsor trainings for residents, businesses, and organizations on the benefits of broadband usage.*

The availability of a broadband connection at a given location does not ensure that it will be used. It is not always clear to individuals and organizations what the benefits of broadband are, so they often do not take full advantage of the many opportunities broadband affords. New Hampshire needs to help its residents, businesses, and organizations improve the rate at which they use broadband.

This includes developing marketing materials for the general public that describe the importance of broadband for personal communication, economic development, and quality of life. It includes working with schools, libraries, and adult and higher education programs to increase availability of affordable and accessible community-based broadband digital literacy programs. Finally, it includes developing targeted sector-based training sessions focusing on how broadband can help businesses and organizations meet their administrative and communication needs, as well as the needs of their customers.

5 BROADBAND ASSESSMENT MONITOR BROADBAND AVAILABILITY AND ADOPTION

New Hampshire needs to *monitor, inventory, and evaluate its broadband availability, adoption, and competitive position on an ongoing and regular basis.* Grant funding from the NTIA for the NHBMPP will end in early 2015. Continuing to collect broadband availability and adoption data is necessary in order to measure the effectiveness of broadband efforts and to provide a clear picture of New Hampshire's broadband competitive position in comparison to other states and countries.

Since 2010, the NHBMPP has mapped and inventoried where broadband is available in New Hampshire. This data, along with newly collected broadband availability and speed data, should be used to communicate progress to the New Hampshire public and policy makers.





BROADBAND AND PROSPERITY IN NEW HAMPSHIRE

Why does broadband matter to New Hampshire?

Universal high-speed broadband is an essential element of a thriving future New Hampshire economy and quality of life. New Hampshire has experienced tremendous economic growth over the last few decades. But the University of New Hampshire Center for Public Policy cautions that the future may not look like the past.⁶

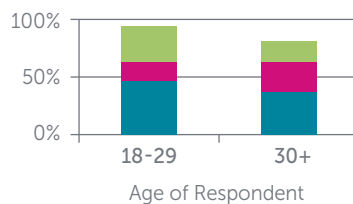
For several decades, New Hampshire has stood out as an economic anomaly in the Northeast. With a highly educated workforce, high rates of in-migration, and a high median per-capita income, New Hampshire boasted a strong, vibrant economy that gave it distinct advantages over its neighbors.

Here, as elsewhere in the country, the Great Recession has disrupted much of the state economy. But it is a mistake to assume that the recession is the sole reason for the recent slowdown in New Hampshire's economic engine, or that, once the impacts of the recession are behind us, New Hampshire will return to the pattern of steady, reliable growth of years past.

A more expansive analysis of the state's economic and demographic trends—with a time frame of decades, not months or years—shows that the forces that helped create New Hampshire's advantage have largely run their course. As a result, the model that defined the state's economy since the 1980s—consistent population growth, increased productivity, and a more resilient economy than our competitors—no longer holds. After benefiting from nearly three decades of economic tailwinds, New Hampshire now faces a strong headwind: net out-migration, an aging population, and decreased labor productivity.

Importance of Internet to Young People

Pew Research Center Internet and American Life,
January 2014 Omnibus Survey



■ Use, can give up ■ Use, can't give up for other reasons ■ Use, essential to job

The state is going to have to work to create the conditions necessary for prosperity in the future.

New Hampshire needs to attract young in-migrants. Survey data from the Pew Research Center shows that 90%+ of people aged 18–29 use the Internet; that 60%+ can't give it up; and that around half rely on the Internet for their jobs. An area without access to high-speed broadband has little chance to attract young working people to move or stay in their town.

New Hampshire needs job growth. A study conducted in 2011 by the McKinsey Global Consulting Group found that 21% of economic growth in mature countries in the last five years was due

to the Internet.⁷ But the job growth wasn't solely in Silicon Valley technology companies. Fully 75% of the Internet-related growth was in traditional industries—industries such as wood products, banking and financial services, health care—where the Internet helped make those businesses more efficient and competitive. Businesses with high Internet use have growth rates double those of businesses with low Internet use.

In short, high-speed Internet (or broadband) today is what electricity was in the 1930s—an economic necessity.

So how is New Hampshire doing ?

While a frequently cited minimum definition of broadband is 6 Mbps (download speed), today's advanced applications require 100 Mbps. When looking at the percentage of the population with access to high-speed broadband, New Hampshire is in the middle when compared to the U.S. and other New England states, ranking 23rd. About 70% of New Hampshire residents can access high-speed broadband (see Table 1). This is compared to a national rate of 60%.

But access to high-speed broadband (> 100 Mbps) in rural New Hampshire is lower than in the state's urban areas. Fewer than half of households in rural New Hampshire have access to high-speed broadband (see Table 2).

And while New Hampshire rates well nationally in terms of access to broadband speeds of 100 Mbps, in the future, even that is not going to be fast enough. Businesses and institutions increasingly need ultrafast transmission speeds—1 Gbps or more (1 Gbps = 1,000 Mbps). Ultra-high-speed broadband reduces the time necessary for high-speed communication, data transmission and analysis, and other capabilities that once were luxuries and now are necessities. Ultra-high-speed broadband is currently available to less than 1% of New Hampshire residents.⁸

Further, the measure of comparison for New Hampshire in the future is not just other states, but the world. The United States is lagging behind competing countries in Asia and northern Europe in its availability and adoption of broadband. New Hampshire must improve its infrastructure not just to keep pace with neighboring states, but to be competitive in the global marketplace.

Table 1:
Access to Download Speed \geq 100 Mbps

State	Rank	% Population
Rhode Island	1st	99.30%
Connecticut	4th	96.60%
Massachusetts	5th	95.80%
New Hampshire	23rd	69.90%
Vermont	45th	19.80%
Maine	47th	9.30%

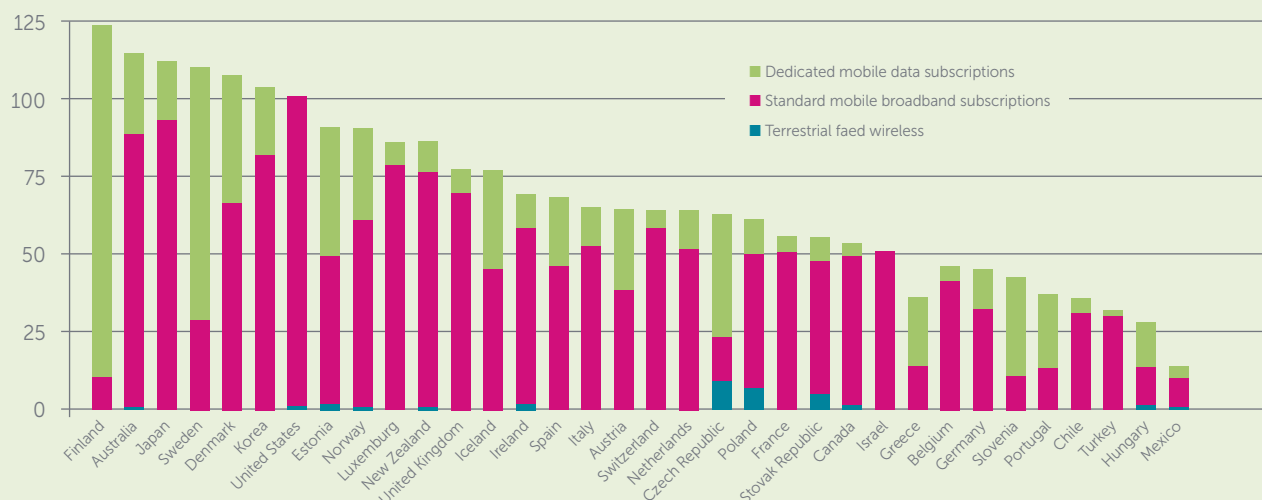
Source: NTIA's National Broadband Map rankings as of December 2013

Table 2:
Access to Download Speed \geq 100 Mbps
Rural vs. Urban

State	% Rural Population	% Urban Population
Rhode Island	93.10%	100%
Connecticut	90.00%	97.40%
Massachusetts	72.90%	97.30%
New Hampshire	46.60%	85.50%
Vermont	9.30%	36.10%
Maine	7.00%	13.00%

Source: NTIA's National Broadband Map rankings as of December 2013

OECD wireless broadband subscriptions per 100 inhabitants, by technology, December 2013





BROADBAND OPPORTUNITIES AND CHALLENGES BY SECTOR

This section describes the current status and future needs of broadband specific to six sectors: economic development, education, health care, community support/local government, public safety, and residents. The sectors were identified by the NHBMP based on guidance from the Federal Communications Commission (FCC) and the NTIA (see Appendix C: Broadband Planning in New Hampshire).

Telework

“I work for an IT company out of Boston. I’m a quality assurance manager there, so I’m frequently logging into network equipment, servers, and that type of thing. So it’s pretty much mandatory that I have fast and reliable service. And the only way we were able to move here and purchase this property was because of FastRoads. Due to their service, it [was] possible to live here and work from here.”

Robert West, Resident,
Enfield, NH

- **Economic development** and business includes chambers of commerce; economic development corporations; travel and tourism; recreation; food and agriculture; arts and culture; media; commercial real estate; ISPs/telecom; banking/finance; and industry.
- **Education** includes K–12; higher education; community/continuing education; museums; and science centers.
- **Health care** includes hospitals; doctor’s offices; clinics; nursing/residential care facilities; human service agencies; laboratory services; home care services; and adult day care.
- **Community support /local government** includes local and state government and administrative services; libraries; community centers; and land trusts/open space.
- **Public safety** includes fire; police; emergency management; and mutual aid.
- **Residents** and consumers include homeowners; households; residential real estate; and home businesses.

For New Hampshire businesses, broadband helps improve efficiency, expand markets, and increase revenue. In education, broadband can provide more customized learning opportunities and extend learning beyond the classroom. Broadband can help improve patient health outcomes while controlling costs and extending the reach of providers. Broadband allows local government to deliver services more efficiently and cost-effectively, and can enable robust public participation in community decision making. Public safety personnel need the ability to communicate quickly with each other, access online resources via personal computers or mobile devices, and transfer important video and information during emergencies. And residents use broadband for education, social interaction, commerce, entertainment, and working remotely.

But in 2012, sector surveys conducted by the University of New Hampshire Cooperative Extension⁹ showed that 26% of New Hampshire small businesses reported they do not have sufficient broadband speeds. Only 53% of educators surveyed indicated that their educational institutions have sufficient broadband speeds. Health-care institutions in underserved areas of the state reported broadband speeds that are insufficient to provide medical services utilizing today’s advanced technology. New Hampshire residents, businesses, and organizations need access to affordable, reliable, high-speed



broadband to realize the many possibilities of emerging technologies. Too many are unserved or underserved with slow broadband connections, and there is frustration about limited provider options.

In focus groups and interviews conducted as part of the NHBMP research program, stakeholders across all six sectors identified the need for increased high-speed broadband availability, including choice of provider and multiple network options to minimize service disruptions. They also identified the need for training to keep up to date with fast-changing technology.

Broadband and Economic Development

In 2009, it was estimated that American jobs related to the Internet contributed approximately \$300 billion of economic activity to the national Gross Domestic Product.¹⁰ Jobs related to broadband and information technology are expected to grow by 25% between 2008 and 2018, a rate 2.5 times faster than the average for other occupations and industries.¹¹ It has been estimated that in New Hampshire, significantly increasing broadband availability and adoption could create more than 11,000 jobs and \$634 million in economic impact.¹²

It is not just big businesses that benefit from broadband. Small businesses with a broadband connection have higher annual revenues than those that do not.¹³ Broadband allows small businesses to increase efficiency, improve market access, and reduce costs. According to the National Broadband Plan, "By using web-based technology tools, 68% of businesses surveyed nationally boosted the speed of their access to knowledge, 54% saw reduced communications costs, and 52% saw increased marketing effectiveness."¹⁴

Access to broadband is particularly important for businesses in rural areas because it enables them to participate fully in the global economy, regardless of how remote their location. A 2010 analysis conducted by the Public Policy Institute of California found a positive relationship between broadband expansion and economic growth, and determined that the relationship is stronger in areas with lower population densities. "Smaller or more isolated areas may benefit more from high-speed connections, giving businesses in these areas access to larger markets."¹⁵

The 2014 report *Broadband's Contribution to Economic Growth in Rural Areas: Moving Towards a Causal Relationship* found that a higher level of broadband adoption in rural areas is associated with lower unemployment and higher incomes. Importantly, when the same analysis was repeated using broadband availability as opposed to adoption, the report found only limited impacts. This suggests that future broadband policies should seek to increase not only the availability of broadband but also broadband adoption.¹⁶

Broadband benefits not only businesses, but also their employees. Teleworking, which involves employees working remotely from home using a computer or other Internet-connected device, is an important opportunity for New Hampshire. According to the 2010 American Time Use Survey,¹⁷ 24% of employed Americans report that they work at least some hours from home each week.

Small Business

"We need a high-speed system to help track our product from net to market and get New Hampshire seafood on the map locally."

Bob Campbell, Former Manager,
Yankee Fishermen's Coop





Tourism

“Offering wireless access ensures [that] guests won’t hesitate to visit northern NH. Knowing they can stay connected to business and personal matters allows them to maximize their recreational time. It is also beneficial for the businesses of the region, enabling travelers to locate the attractions and services they desire while here.”

Karl Stone, Marketing Manager at Northern Community Investment Corporation

Current Status of Broadband in Economic Development

The 2012 survey conducted by UNH Cooperative Extension found that 26% of New Hampshire small businesses do not have sufficient broadband speeds.

Other key findings of the survey include:

- Half of the small business survey respondents (50%) indicated that they have a cable Internet connection; 19% have DSL; 14% have wireless; and 8% have fiber optic;
- 85% of small businesses surveyed have a website, and 70% are using social media for their business;
- Small businesses are using the Internet to conduct research, advertise, sell products, and access support services;
- The key challenge for small business is keeping up with new options in the uses of technology; and
- Small businesses are interested in training in web marketing, search engine optimization, social media for business, website development, E-commerce, and market analysis.

In NHBMPSP-sponsored focus groups and interviews, small businesses identified two key broadband issues.

The first issue is inadequate broadband infrastructure, which includes both the need for redundant networks to ensure uninterrupted service, and the challenge of limited choice for service providers. For businesses in underserved areas, DSL or mobile broadband are often the only options available. Businesses want more broadband options, including fiber service. Access to cloud-based data storage and applications was also identified as critical for small business start-ups without the financial resources to invest in servers and other hardware,¹⁸ and utilizing those services requires high-speed broadband.

The second issue is the need for broadband training to keep up to date with fast-changing technology and how best to use broadband for business research, marketing, and sales.



Broadband and Education

Reliable broadband technology is an important tool for education at all levels. Broadband can extend learning beyond the classroom, provide more customized learning opportunities, and increase the efficiency of school systems.¹⁹ A wide range of Internet-based resources—such as distance learning programs, online learning modules, and digital textbooks—allows students to engage in multimedia lessons, take virtual trips, and communicate with classrooms in other parts of the world. Broadband provides adult learners easy access to online professional development and educational opportunities. It offers educators a platform to share curricula.

Not only is the availability of reliable broadband important in the classroom, it is also important when students leave school and enter the workforce.²⁰ Participation and competition in the global economy requires twenty-first-century skills, including the ability to effectively use technology and navigate the digital world.²¹

Current Status of Broadband in Education

Although most New Hampshire schools have some level of Internet access, too often the connection speeds fall short of what is necessary.²² According to the 2012 survey conducted by UNH Cooperative Extension, only 53% of the 47 responding educators indicated that their educational institutions have Internet connectivity that meets their needs.

Other key survey findings include:

- In the education sector, the Internet is used for professional development and training (83%); student/parent access (83%); communications via website (77%); professional networking (62%); data management (60%); and e-newsletter communication (49%); and
- The biggest technology-related challenge faced by educational institutions is having the time, expertise, and funds to keep up with the latest technology.

Significant progress was made to expand broadband into unserved and underserved areas of the state through the **Network New Hampshire Now**²³ (NNHN) program, managed by the University of New Hampshire through an ARRA grant from the NTIA. Completed in December 2013, the project connected 327 Community Anchor Institutions (such as schools, hospitals, and libraries) to expanded broadband capacity. Forty-eight K–12 schools were connected along with 41 institutions of higher education including the University System of New Hampshire and the Community College System of New Hampshire. Third-party providers have begun to attach to the open access network and provide high-speed bandwidth to nearby businesses and residents.

In NHBMPP-sponsored focus groups and interviews, educators identified two key broadband issues.

The first issue is that the high cost of broadband means that not all schools can afford it. The second issue is that disparities in broadband service can impact student performance.

Providing broadband to educational institutions is expensive. Costs include infrastructure investments and ongoing service expenses, Information Technology (IT) staff and teacher training, and keeping up to date with ever-changing technology. When budgets are lean, school district decision makers often view technology as a lower priority than other needs.

Science Education

“In science teaching, high-speed access to Internet resources is critical for students to be able to utilize the tools necessary to develop and apply the 21st-century skills they will need in the future. Students in my environmental science class make extensive use of geospatial technologies, and whether working with ArcGIS Online or ArcGIS Desktop, the speed of access to data—both that streamed in and that downloaded to our local network—makes the difference between enthusiasm and frustration. Given reasonable access, both at school and at home, these students can produce amazing projects that allow them to demonstrate their knowledge and skills, as well as share their knowledge with others.”

Ina Ahern, Science Teacher,
Plymouth Regional High School
and co-founder, NHEdGIS
Partnership





FCC E-rate program

Under the current E-rate program, a portion of taxes collected on monthly phone services is used to expand telecommunications, including telephone, broadband, and other technologies, in rural and high-cost areas of the United States. Unfortunately, New Hampshire is last in the nation when it comes to return on E-rate investment, getting just 25 cents back for every dollar residents pay into the program through the universal service charge.

According to U.S. Senator Kelly Ayotte, (NH), “We need a student-centered E-rate program. That starts with simplifying the process by reducing the paperwork needed to apply for funding and distributing aid to schools on a more equitable per-student basis (rather than the complex discount formula that the program now uses).” In July 2014 the FCC adopted the E-rate Modernization Order³⁴ to direct more of the available funding to broadband connectivity and less to older telecommunications services and technologies. (Additional E-rate modernization orders were under consideration at the time of this publication.)

Many (but not all) New Hampshire school districts receive free or reduced pricing for broadband service as part of their municipality’s cable franchise agreement. (For more information about cable franchise agreements, see side bar on page 19.) However, the broadband speed delivered varies from town to town, depending on the service provider. Even when faster service is available to purchase, the additional cost may not be affordable for the district. The FCC E-rate program²⁴ helps subsidize the cost for schools and libraries to connect to broadband, but many school districts don’t apply for the E-rate subsidy because the process is too laborious insert (see side bar on the left).

As broadband technology becomes increasingly important in education, students at schools lacking access to adequate broadband are likely to fall behind. The State Education Technology Directors Association (SETDA) recommends that K–12 schools have access to broadband download speeds of 100 Mbps per 1,000 students and staff by the 2014–2015 school year and 1 Gbps per 1,000 students and staff by the 2017–2018 school year.²⁵ As of March 2014, only 6.5% of the schools in New Hampshire reported broadband download speeds of 100 Mbps or greater.²⁶

In addition to broadband at school, students need access to broadband at home. Without adequate high-speed Internet connections at home, students will have difficulty completing homework assignments, accessing digital learning content such as videos and applications, and engaging in collaborative learning with peers.

Broadband and Health Care

Emerging health-care technologies can improve health outcomes while controlling costs and extending the reach of providers.²⁷ Many of these technologies depend on broadband. They include online billing systems, data management, electronic health records, prescription management, health information exchanges, and providing information and services to patients online.²⁸ Patients can benefit from remote consultations with specialists and the high-speed transmission of medical images and records without having to leave their community health center or, in some cases, their home.²⁹

New Hampshire, with its rural geography, scarcity of local specialty medical services, and high percentage of elderly residents, can benefit enormously from telehealth.³⁰ Telehealth can increase patient access to care and help residents age in place. For example, video conferencing allows physicians to conduct video consultations and monitor the treatment of patients remotely. It also increases the reach of specialized physicians and research.³¹ With an improved broadband connection, a health clinic could provide services via live video conferencing to patients who might not otherwise have access. Local examples include Northern Human Services³² Telepsychiatry Program and the Dartmouth-Hitchcock Center for Telehealth³³ Remote Patient Monitoring (RPM).

Current Status of Broadband in Health Care

The New Hampshire Department of Health and Human Services (DHHS) received a \$5.5 million federal ARRA grant to promote the Health Information Exchange (HIE) and advance mechanisms for sharing information across the health-care system. As part of that effort, the New Hampshire Health Information Organization (NHHIO) was created in 2011 to work alongside DHHS to create a long-term HIE solution for New Hampshire. NHHIO’s vision is “to design and implement a secure and robust health information exchange that will lead to reductions in health-care costs and improve quality, efficiency, and safety of patient care.”³⁵

Another initiative in which New Hampshire is participating is the Rural Health Care Pilot Program (RHCPP), announced by the FCC in 2006. The goal of the initiative is a nationwide broadband network of health-care sites. More than 500 health-care sites throughout Northern New England have formed the New England Telehealth Consortium (NETC), which in 2007 received its requested funding of approximately \$24.6 million, representing the largest award of this type in the country. The funds are being used to build a sustainable broadband health-care network to greatly improve the capability and efficiency of health care in Maine, New Hampshire, and Vermont through improved telecommunications. Goals of the project include developing telehealth infrastructure, providing access to Internet2³⁶ and improving the transmission of electronic health records in one of the nation's most rural regions.³⁷

As part of NETC, in the Upper Valley region, the Alice Peck Day Memorial Hospital, New London Hospital, and Valley Regional Hospital have been connected along with many other institutions in rural parts of New Hampshire.³⁸ In addition to participating in the Telehealth Consortium, Dartmouth-Hitchcock Medical Center established an Office of Telehealth in 2012 to advance the integration of interactive technology into medical treatment, including remote emergency medicine, consultations, and televisits.

In NHBMPP-sponsored focus groups and interviews, health-care providers identified two key broadband issues:

The first issue is that health care requires secure, high-speed broadband, which is not available in all areas of the state. The second issue is even in areas where broadband is sufficient to support telehealth, smaller providers in particular are challenged by the costs to keep up with rapidly changing technology.

Secure and constant (24 hours a day, 7 days a week) high-speed broadband is fundamental to successful telehealth efforts. Health-care institutions in underserved areas of the state report broadband speeds that are insufficient to provide medical services utilizing today's advanced technology. Telemedicine, and transferring diagnostic information between providers, requires symmetrical broadband (equal upload and download speeds; see Appendix B: What Is Broadband?), which is not widely available. The security of confidential patient information is a top concern of health-care providers.

Redundant broadband networks are necessary for the secure and instant facility-to-facility transfer and tracking of patient medical records and vital medical information. As of January 2014, digital record-keeping is required of public and private health-care providers as part of federal mandates enacted by the Affordable Care Act. Currently, any health-care provider funded through the state is required to maintain electronic health records (EHR). However, unreliable broadband connections and lack of bandwidth impact the ability of health-care facilities and agencies to connect to EHR software systems.

The second major concern raised by New Hampshire health-care providers is similar to one faced by small businesses and other organizations with limited resources: keeping up with rapid changes in technology. New telehealth applications emerge constantly. In addition to equipment expenses, health-care providers must invest in ongoing technology training for their staffs.

Health Care

“Nearly 500,000 New Hampshire residents live in rural parts of the state, so a viable broadband infrastructure is crucial for delivering first-rate telehealth services. With high-speed Internet, a stroke victim at a distant community hospital can receive timely, life-saving medication because she can be evaluated via live video by a specialist at Dartmouth-Hitchcock’s Lebanon campus. Broadband connections enable X-rays and medical records to be transferred quickly between local clinics and acute care hospitals, and also allow health care workers to remotely monitor patients with chronic conditions in their homes.”

Dr. Sarah Pletcher, MD, MA,
medical director of the Dartmouth-Hitchcock Center for Telehealth





Local Government

“Robust broadband is an absolute ‘must have’ for rural NH. Our residents, businesses, and institutions are clamoring for it...”

Julia Griffin, Town Manager
Hanover, NH



Broadband and Local Government

Broadband helps local government to deliver services efficiently and cost-effectively. Most towns in New Hampshire now host websites providing immediate remote access to public notices, event calendars, applications, forms, ordinances, and regulations. The most complete municipal websites include town news and announcements, meeting agendas and minutes, public meeting calendars, and the ability to pay utility bills, pay property taxes, register motor vehicles, and obtain dog licenses online. New Hampshire citizens have come to expect a certain level of online interaction with government. While constituents benefit from easy access to the information they need, governments save time and money when routine requests are handled online.

As important as the administrative efficiencies, broadband can also be a powerful communication tool for local government, enabling more robust public participation through eGovernment³⁹ or eDemocracy.⁴⁰ Online meetings and surveys offer new ways for a larger percentage of the population to watch and participate in community decision-making processes. Many towns broadcast public meetings via public access television or video streaming online. Posting meeting audio and video on the web provides “anytime, anywhere” access to municipal proceedings.

Another benefit of broadband for New Hampshire municipalities is the ability to store electronic documents online via cloud-based storage, saving physical space in crowded municipal offices and offering redundancy in the event of a fire, flood, or other disaster.

Local governments can also save time and money by utilizing videoconferencing to replace in-person meetings with municipal staff, consultants, and lawyers. Some municipalities are using videoconferencing tools to interview prospective job candidates, which can also expand the pool of applicants without incurring travel expenses.

Current Status of Broadband in Local Government

The 2012 survey conducted by UNH Cooperative Extension found that in the municipal sector:

- 73% of survey respondents report that they have sufficient Internet connectivity for their work;
- More than half (57%) indicated that their municipality has cable Internet connection; 17% of communities have DSL and 7% have fiber optic;
- Communications and research are the most common uses of the Internet;
- Only 35% have part- or full-time staff dedicated to technology, while 44% use consultants; and
- Key challenges include keeping up with new options in the uses of technology, and resources for technology and staff training to expand the various uses of broadband.

In NHBMP- sponsored focus groups and interviews, municipal representatives identified the importance of having reliable, redundant broadband connections for both the municipality and its residents as a key broadband issue.

At town offices, lost productivity and frustration from Internet connections that time out or frequently drop are common experiences. Sending and receiving large files can be difficult for many municipalities with slower broadband connections. Municipal long-range technology plans could help address technology training and capability needs, including pursuing nontaxpayer funding sources.

Increased local broadband planning efforts would help improve broadband availability for residents. These include adding broadband planning chapters to municipal master plans; revising municipal ordinances and regulations to reduce barriers to broadband expansion (such as for cell tower siting); making use of technical assistance provided by regional planning commissions for grant applications and other broadband funding opportunities; and participating in broadband stakeholder meetings and training programs to advocate for community needs.

Creating a public access Wi-Fi network is one way to increase local resident access to broadband. Several New Hampshire municipalities have created, or are in the process of creating, free public Wi-Fi hotspots. The City of Manchester, through a Chamber of Commerce and private-sector effort, established free Wi-Fi in the downtown area 10 years ago. The city continues to pursue a city-wide free Wi-Fi program with the goal of attracting more businesses and customers. The Town of Newmarket provides free wireless Internet in its downtown district as a result of the combined efforts of the Newmarket Business Association, the Newmarket Community Development Corporation, and municipal government. Portsmouth has had free Wi-Fi in their downtown for 10 years.⁴¹

Public libraries already play an important role in providing free public access to broadband, as well as digital literacy support and training to library patrons. Partnerships to expand their broadband services would benefit community members. Some local libraries leave their wireless router on after hours so that people may access the Internet from the parking lot.

A local approach to financing broadband infrastructure expansion is through the development of mechanisms similar to Tax Increment Financing (TIF) districts,⁴² which would generate committed revenue streams for broadband. Another approach is to establish a fund through local cable franchise agreements. The Town of Moultonborough, located in the Lakes Region, established a Community Broadband Fund in 2007 through franchise fees paid to the town by its cable provider. Annually, this fund accrues approximately \$22,500. The fund is intended “to promote the development of communications infrastructure to underdeveloped parts of Town.” Currently the town is considering how to spend the fund. One idea that emerged from work of the town and the NHBMP capacity building team is to conduct an analysis of three underserved areas of town to develop a cost estimate and plan for expansion of broadband services in those areas.

Cable Franchise Agreements

Per RSA 53-C, if a cable provider wishes to operate in a community, they are required to enter into a cable franchise agreement (CFA). This CFA will outline not only cable television service, but also the provisions under which broadband is offered. Additionally, the CFA will provide language as to the build-out agreement between the town and provider to bring services to unserved areas of the town. The technical terms and legal language of a CFA can make it difficult for town government employees to negotiate. Some municipalities and school districts have begun to pool their resources to hire legal assistance specializing in CFAs. The NHBMP has created a CFA inventory to allow New Hampshire towns to compare and contrast their CFA to others (see iwantbroadbandnh.org/resources).

Additional information on CFAs is presented in Appendix E: How Is Broadband Regulated in New Hampshire?



Broadband and Public Safety

In New Hampshire, firefighters, law enforcement, and emergency medical personnel often cover wide geographic areas. They frequently have to make potentially life-saving decisions in the field, despite the rugged terrain and natural and man-made disasters that may limit their ability to communicate. Public safety personnel need the ability to communicate quickly with each other, access online resources via personal computers or mobile devices, and transfer important video and information during emergencies.

Broadband can enable first responders to share information digitally and in real time with hospitals and emergency facilities from the ambulance or point of response. Broadband supports mobile command-post operations and remote access to databases, such as criminal history and medical records. The capacity of New Hampshire broadband networks to handle emergency communications and data transfer is critical. For example, the ability to use real-time, high-quality video in a remote location or to send building blueprints to first responders requires a high level of broadband capability.⁴³

Redundancy is vital in times of natural disaster and other emergencies. Using multiple modes of communication, including fiber, microwave, cable, telephone, wireless, and HAM radio, provides options should one or more segments of the communications network become inoperable.

Broadband can also enhance communication with the public in times of emergency through online emergency notification systems, reverse 911, and social media.

Current Status of Broadband in Public Safety

The Middle Class Tax Relief and Job Creation Act of 2012 created the **First Responder Network Authority**⁴⁴ (FirstNet) as an independent authority within NTIA to provide emergency responders with the first nationwide high-speed broadband network dedicated to public safety. New Hampshire has recently formed a committee to develop the state's FirstNet network (see insert on page 21).

In NHBMP-sponsored focus groups and interviews, public safety stakeholders identified limited financial resources and keeping up with rapidly changing technology as key challenges.

Technology costs are a factor for many municipal emergency-response departments, limiting the speed of their broadband connection and network redundancy. Even in municipalities where the current broadband connection is considered sufficient, there is a need to increase capacity to accommodate emerging technologies. Public safety personnel need up-to-date information and training to keep current with new technology. As one local police department representative noted, "As with most projects, [the challenge is] money and time. I can't stay on top of the new technology, so we [would] need to pay someone to be paying attention to what we should be purchasing."

Some municipalities, such as Bedford and Londonderry, are currently looking to implement wireless broadband connections between dispatch centers and emergency-response vehicles. However, these systems are costly for smaller municipalities to implement. One way to reduce costs could be to regionalize dispatch centers, allowing the costs to be shared among several towns.

Finally, in order to take full advantage of the many broadband-enabled devices and technologies that are available to enhance emergency-response communication, broadband needs to be available everywhere in the state, and it needs to be reliable. For example, the Southwest NH Fire Mutual Aid Dispatch Center, which dispatches fire and ambulance service in 78 communities in southwest New Hampshire and southeastern Vermont, is currently unable to transmit live feeds despite having the technology to do so due to limited broadband connectivity at its monitoring locations.



NHSafeNet

A significant element of the **Network New Hampshire Now**⁴⁵ (NNHN) project was to improve and consolidate existing public-safety microwave networks of the New Hampshire State Police, New Hampshire Department of Transportation, New Hampshire Department of Resources and Economic Development, New Hampshire Public Television, and the New Hampshire Army National Guard with one new system called NHSafeNet. The project was completed in December 2014 and operates 25 times faster than the old networks, with more bandwidth using current digital broadband communications. NHSafeNet also condensed five emergency network operations budgets into one shared by all five state agencies. Another element of the NNHN project expanded the capacity of the New Hampshire Department of Transportation's **Intelligent Transportation System**⁴⁶ (ITS). Under the expanded ITS, the I-93 corridor from Manchester to Concord has been integrated with the Salem to Manchester fiber segment within the limited-access right-of-way.

FirstNet⁴⁷

New Hampshire FirstNet will provide emergency responders with the first nationwide high-speed network dedicated to public safety. FirstNet will be a force multiplier, increasing collaboration to help emergency responders save more lives, solve more crimes, and keep our communities safer. The broadband data network fulfills a fundamental need of the public safety community and a key recommendation of the 9/11 Commission. Creating FirstNet will require an unprecedented level of public-private partnership, collaboration, and shared commitment to the well-being of all Americans.

Using a nationwide spectrum license, FirstNet will provide a single platform for daily public safety communications. When natural disasters, threats to our nation's security, or other emergencies occur anywhere in the country, FirstNet will enable local, state, regional, and national emergency responders to communicate at the direction of the incident commander. FirstNet will be built to public-safety grade standards using Long-Term Evolution (LTE) wireless technology, the most advanced available today. It will deliver greater coverage, capacity, connectivity, cybersecurity, and resiliency than the current multiplicity of diverse public safety wireless systems.

Police, firefighters, and emergency medical service personnel will still rely on their land mobile radio (LMR) networks for mission-critical voice with FirstNet providing high-speed data, supplemental commercial grade voice, and eventually mission-critical LTE voice. FirstNet also will support the integration of LMR networks with LTE voice.

*SPOC Spotlight: New Hampshire Takes Key Next Steps for Planning, Governance*⁴⁸ (Friday, July 18, 2014)
In the latest SPOC (Single Point of Contact) Spotlight Feature, New Hampshire's John Stevens talks to FirstNet about how the state is leveraging its interoperability governance structure to coordinate planning for the nationwide public safety broadband network.



Real Estate

“Broadband access is in the top five questions if not the #1 question that prospective owners ask.”

Laura Hallahan, Real Estate Broker,
Bradford, NH



Broadband and New Hampshire Residents

Broadband enables new possibilities in the way individuals interact in commerce, governance, and personal services. The United Nations Broadband Commission asserted in a September 2013 report that “affordable broadband connectivity, services, and applications are essential to modern society, offering widely recognized social and economic benefits.”⁴⁹

In New Hampshire, access to fast, affordable, and reliable broadband is becoming increasingly important to residents across the state. Residents and consumers use broadband for education, social interaction, commerce, entertainment, and working remotely.

New Hampshire real estate professionals report that questions about broadband connections are among the first to be asked by potential home buyers and businesses looking to locate in a community. To remain competitive as a desirable place to live and work, many areas will need to improve broadband access.

Current Status of Broadband and New Hampshire Residents

The 2012 NHBMP telephone survey found that 84% of New Hampshire adults subscribe to the Internet at their home. Of those who do not have Internet at home, 31% said it is too expensive, 26% said they don’t know how to use it, and 7% said it is not available where they live.

In terms of use, 81% of survey respondents use their Internet at home to check e-mail, 69% shop, 46% watch online videos, and 26% connect to another computer using a Virtual Private Network (VPN). Nearly all New Hampshire residents (93%) consider their Internet connection at home “adequate.”

Of the respondents, three-quarters of New Hampshire residents (73%) have a broadband connection such as cable or DSL, 15% a dial-up connection, 10% have Internet through satellite, and 2% were not sure.

New Hampshire residents expressed frustration about limited provider options. When asked why they are using their current provider, 39% said it is the only option available to them, 23% said they are happy with their current provider, 7% said it is too much effort or too costly to change, 2% did not know of other options available, and 29% gave some other reason or did not know.

In NHBMP-sponsored focus groups and interviews, residents said they want more options for broadband service. In many communities, there is only one broadband provider. When service is slow, or in neighborhoods where broadband is unavailable from that provider, residents feel they have few or no options.

Related to the issue of availability is the “take rate,” or the rate at which households adopt broadband when it is available to them. While basic-level broadband is currently available to 98% of New Hampshire households (wireline availability of at least 6 Mbps download speed, based on data submitted by NH providers, as of March 31, 2014), not all households currently have an Internet connection. Increasing the state’s broadband adoption rate can encourage service providers to expand the infrastructure by increasing the return on their investment.

Adoption: Framing the Issue

(Excerpts from “Broadband 2020: Achieving Ubiquity” by Dr. Rouzbeh Yassini, UNH Broadband Center of Excellence, November 2013)

The availability of a broadband connection does not by itself indicate how or whether a broadband network is used. Other factors including interest level, presence of computing devices, digital literacy levels, and income vs. cost considerations play into the bigger picture of adoption and usage. Those dynamics help to explain why roughly 70% of U.S. households subscribe to a broadband service, despite the availability of broadband in more than 95% of U.S. homes, according to the NTIA...

[A] 2013 finding from Pew Research...reported that among U.S. adults who do not use the Internet, almost half said the main reason they don't go online is because they don't think the Internet is relevant to them.

Additionally, many non-adopters are unfamiliar with, and/or skeptical about the Internet at large. They may have concerns about privacy, security, and other issues that dissuade its usage, and may lack skills or knowledge about how to safely use the Internet. The NTIA, addressing adoption issues in a document titled the *Broadband Adoption Toolkit*, observed that “nearly 47% of people who do not subscribe to broadband say that they do not need it—there is nothing of interest online for them, or the way they do things now is working fine. These individuals are not aware of the benefits of broadband access or do not understand how Internet use can improve their daily lives...”

Beyond addressing affordability issues...near-ubiquitous penetration and usage of broadband may be encouraged through combinations of:

- Community and local-market training in digital literacy;
- Subsidized (public or private) access to computing devices;
- Continued advertising and marketing programs promoting broadband end-user benefits;
- Education and outreach efforts designed to share information about Internet/broadband benefits point to available public computing resources and overcome objections;
- Exposure to public broadband resources from libraries, universities, and other institutions; and
- Improved utility for low-use population segments including disabled individuals, the elderly and minority groups.





New Hampshire Broadband Surveys

*The New Hampshire Broadband Mapping & Planning Program (NHBMP) conducted two statewide telephone surveys through the UNH Survey Center, in the spring of 2012 and the spring of 2013. The regional planning commissions contributed to funding for the second poll, which focused on the Granite State Future project (<http://granitestatefuture.org>) and included several questions about broadband. Results of the 2013 survey are presented in this section of the report called *Broadband in New Hampshire and Its Regions*.*

*In addition to the statewide surveys, NHBMP partner, University of New Hampshire Cooperative Extension, conducted targeted broadband surveys of the business, education, and municipal government sectors in 2012. Those sector survey results are presented in the section of the report called *Broadband Opportunities and Challenges by Sector* (page 12).*

BROADBAND IN NEW HAMPSHIRE AND ITS REGIONS

While basic broadband speeds (> 6 Mbps down) are available to most New Hampshire residents, lower percentages of the population have access to the faster speeds required today for simultaneous use of multiple devices, cloud-based business applications, telemedicine, etc. Table 3 and statewide availability maps in this document present broadband availability for wireline and fixed wireless technologies, e.g. exclusive of cell and satellite technologies, at download speeds of 6+ Mbps, 25+ Mbps, and 100+ Mbps based on data submitted by providers. Per NTIA guidelines, the provider data are aggregated and reported at the census-block level. This may overstate coverage in some areas, as a single household in a census block identified as having broadband available will result in the full block being represented as “served.”

The maps demonstrate that broadband tends to be more widely available in the more densely developed areas of the state, and less available in the rural areas. However, there are unserved and underserved neighborhoods and communities throughout New Hampshire (see page 5 for definitions).

Broadband availability can be affected by many factors, including a region’s geography. New Hampshire’s challenging topography, including hills, granite, and mountains, can make it more difficult (and expensive) to develop broadband infrastructure in some areas.

In areas with low population density, particularly in the southwestern and northern parts of the state, fewer potential subscribers can mean a low return on infrastructure investment, making it more difficult to attract providers.⁵⁰ The lack of competition can in turn lead to higher prices for broadband consumers.

As with broadband availability, there are also regional differences in broadband adoption or use attributable at least in part to demographic trends. Lower-income households may not be able to afford broadband service, and older residents may be less likely to subscribe to broadband at home even if it is available.

The remainder of this section summarizes the characteristics of New Hampshire’s nine planning regions, including geography and demographics, and presents the broadband issues and priorities identified in each of their regional broadband plans. The full regional plans are available at <http://www.iwantbroadbandnh.org/planning>.

**Table 3:
Broadband Availability in New Hampshire by Speed**

Available to % of population	6+ Mbps down	25+ Mbps down	100+ Mbps down
State as a whole	98%	87%	72%
Central New Hampshire Regional Planning Commission	98%	90%	86%
Lakes Region Planning Commission	98%	41%	6%
Nashua Regional Planning Commission	99%	99%	98%
North Country Council	91%	86%	6%
Rockingham Planning Commission	99%	99%	99%
Southern New Hampshire Planning Commission	100%	98%	97%
Southwest Region Planning Commission	95%	87%	43%
Strafford Regional Planning Commission	98%	70%	53%
Upper Valley Lake Sunapee Regional Planning Commission	94%	86%	85%

Based on March 2014, data. Figures reflect data submitted by providers that deliver both residential and commercial services; reported speeds may not be available to residential customers.

THE REGIONAL BROADBAND PLANNING PROCESS

In 2010, New Hampshire's nine regional planning commissions, with support from other NHBMP partners, undertook a multiyear planning effort to better understand the current availability of broadband in each planning region and to plan for increased broadband adoption and utilization.

Each planning commission developed a Broadband Stakeholder Group (BSG) comprised of individuals representing a wide range of sectors, including health care, education, local government, economic development, and public safety. The BSGs met regularly and played a vital role in assisting each planning commission to assess the need for improved broadband capability, availability, and affordability. They helped the planning commissions develop a list of broadband needs and identify barriers to broadband adoption and utilization. They also assisted with developing goals, objectives, and strategies to overcome challenges to fuller broadband access and use in each region.


The planning commissions also held focus groups or conducted interviews with representatives from the sectors to better understand the importance of broadband accessibility to each sector. In addition, forums were held throughout the course of the project to share information with the larger public and to receive feedback and input from community members.

Each regional planning commission reviewed and analyzed data collected through the mapping efforts, outreach activities, sector-based assessments, and public forums to develop comprehensive regional plans that highlight the current landscape of broadband availability in New Hampshire and identify ways to increase broadband adoption and utilization. The regional broadband plans serve as guidance documents for municipalities, policy makers, businesses, institutions, and residents to better understand the availability and utility of broadband, now and in the future.






State of New Hampshire

Broadband Availability: Maximum Advertised Download Speed Greater than or Equal to 6 Mbps

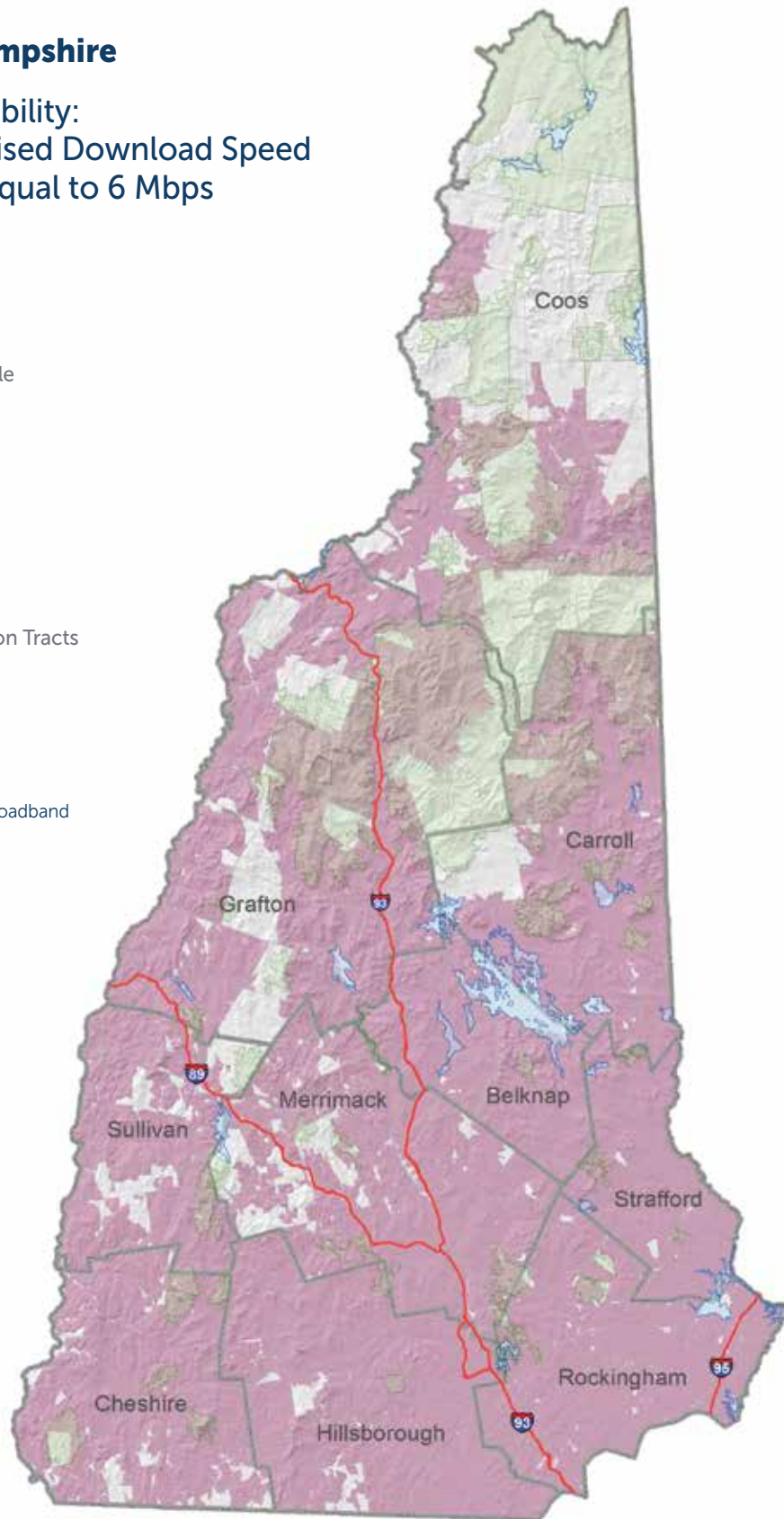
Broadband Coverage

 Coverage Available

Other Map Features

-  County Bounds
-  Town Bounds
-  Major Conservation Tracts
-  Water Bodies
-  Interstates

Based on data submitted by broadband providers as of March 31, 2014.




NEW HAMPSHIRE
broadband
MAPPING & PLANNING
PROGRAM








State of New Hampshire

Broadband Availability: Maximum Advertised Download Speed Greater than or Equal to 25 Mbps

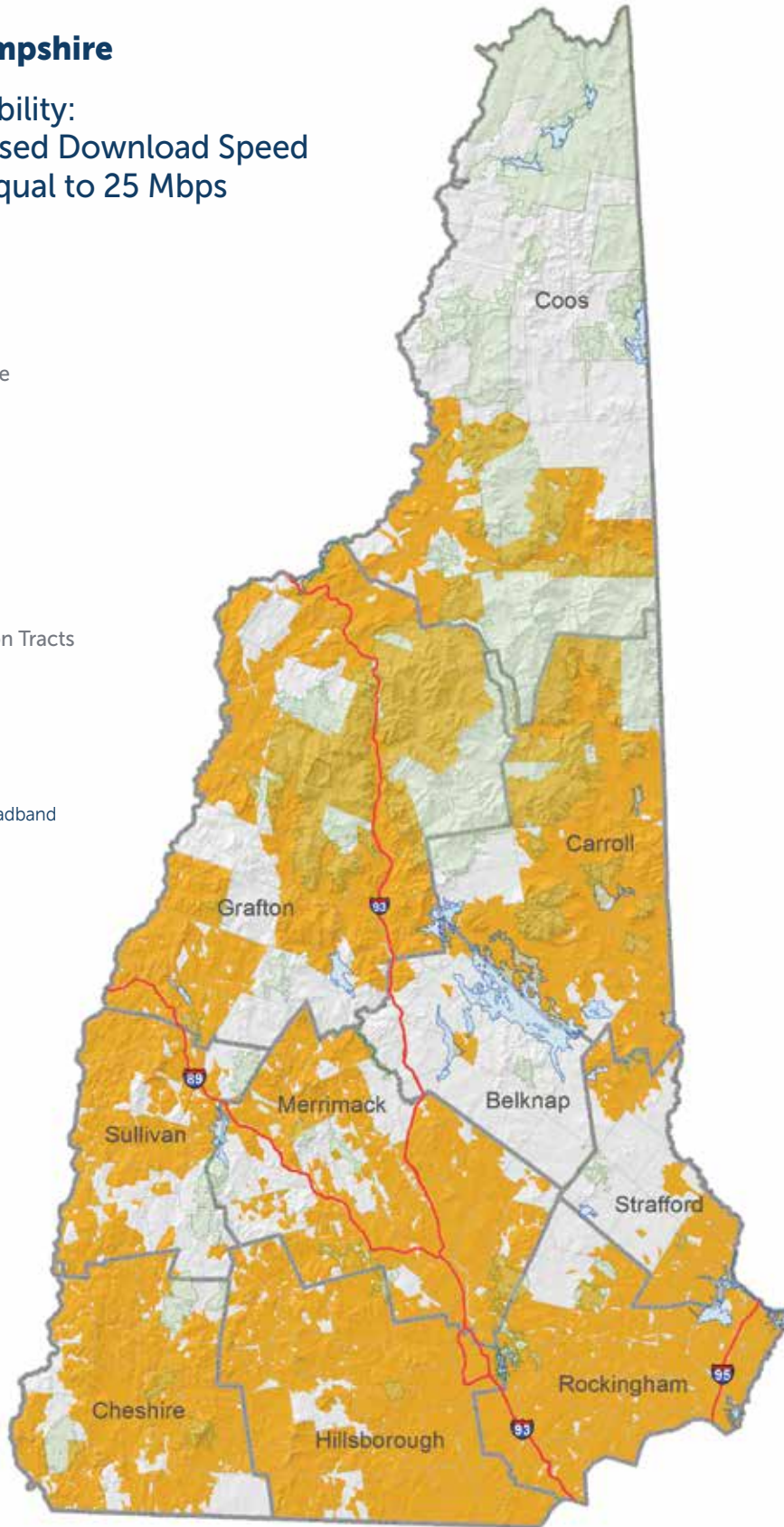
Broadband Coverage

 Coverage Available

Other Map Features

-  County Bounds
-  Town Bounds
-  Major Conservation Tracts
-  Water Bodies
-  Interstates

Based on data submitted by broadband providers as of March 31, 2014.




NEW HAMPSHIRE
broadband
MAPPING & PLANNING
PROGRAM








State of New Hampshire

Broadband Availability: Maximum Advertised Download Speed Greater than or Equal to 100 Mbps

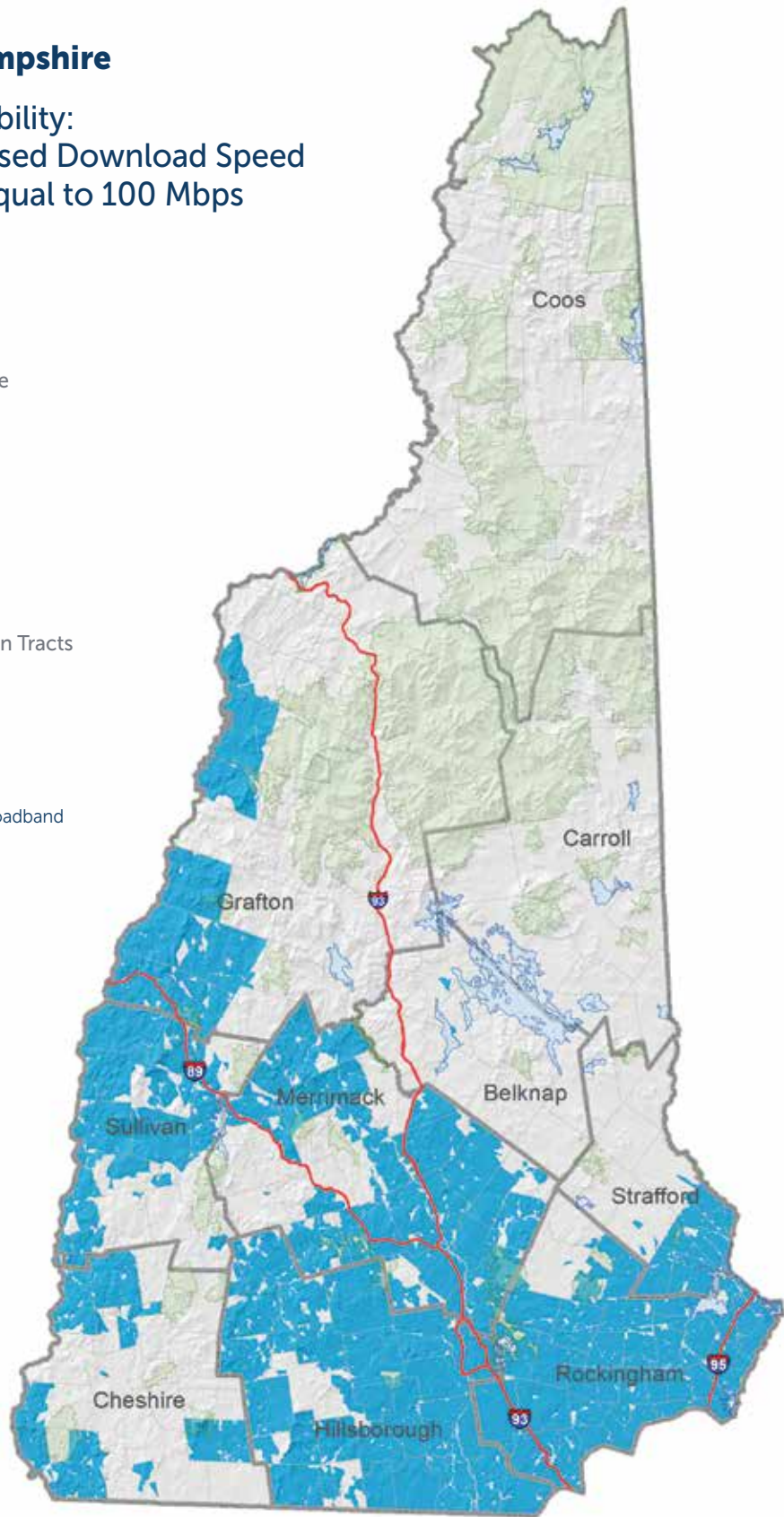
Broadband Coverage

 Coverage Available

Other Map Features

-  County Bounds
-  Town Bounds
-  Major Conservation Tracts
-  Water Bodies
-  Interstates

Based on data submitted by broadband providers as of March 31, 2014.












NEW HAMPSHIRE
broadband
MAPPING & PLANNING
PROGRAM

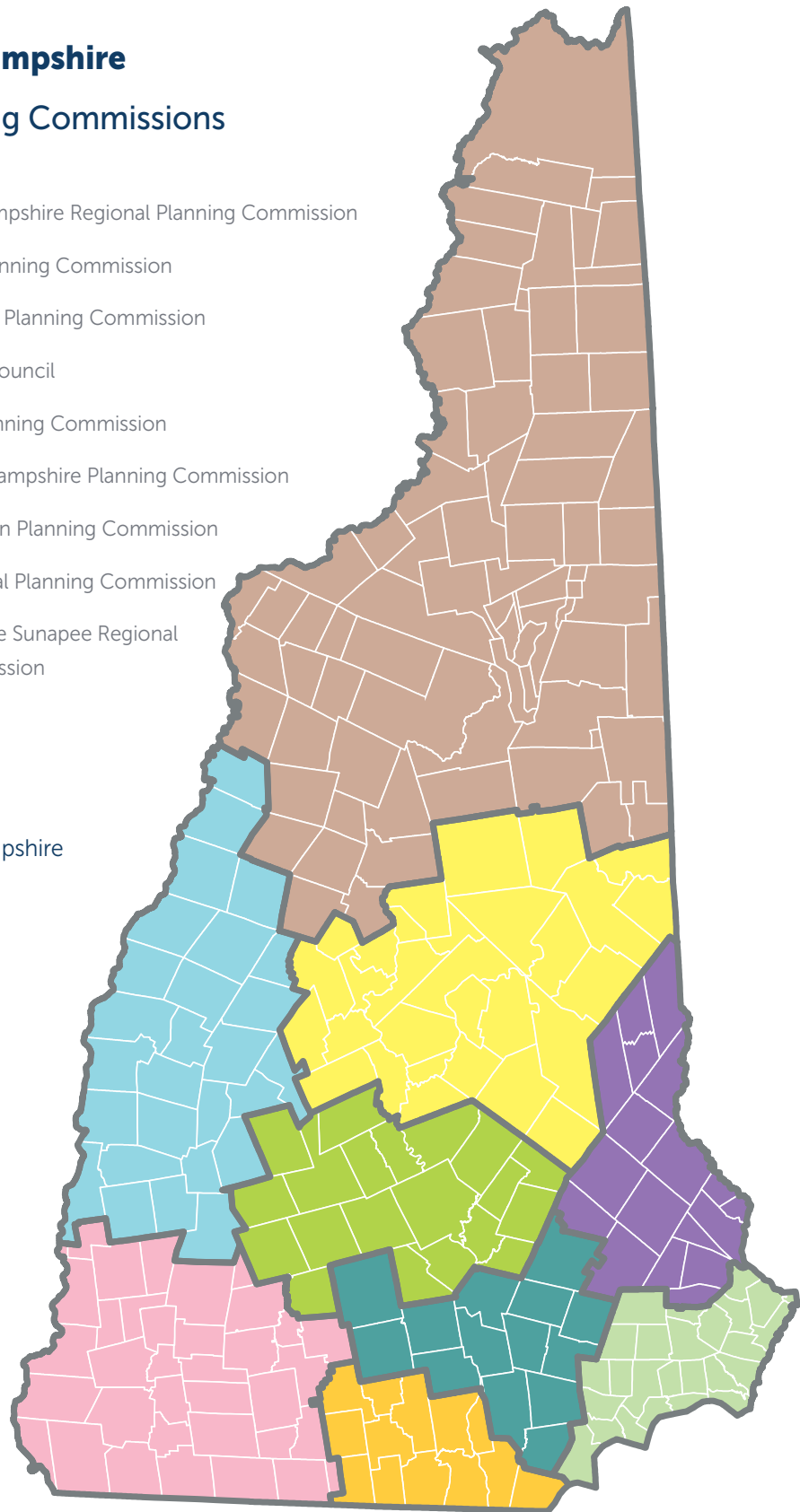


State of New Hampshire

Regional Planning Commissions

-  Central New Hampshire Regional Planning Commission
-  Lakes Region Planning Commission
-  Nashua Regional Planning Commission
-  North Country Council
-  Rockingham Planning Commission
-  Southern New Hampshire Planning Commission
-  Southwest Region Planning Commission
-  Strafford Regional Planning Commission
-  Upper Valley Lake Sunapee Regional Planning Commission

Source:
University of New Hampshire
as of July, 2014



Central New Hampshire Regional Planning Commission

The Central New Hampshire Regional Planning Commission (CNHRPC) includes 20 municipalities with a total regional population in 2010 of approximately 115,000. The City of Concord has the region's highest population with 42,614 people, and is the regional center for employment, business, and health-care services. Many towns in the region are a mix of rural and suburban development with pockets of commercial development near town centers as well as scattered along major roads in the region.

Similar to statewide trends, population growth in the region has slowed recently in comparison to the steady population growth experienced between 1980 and 2000. Slow population growth is forecasted to continue in coming decades.

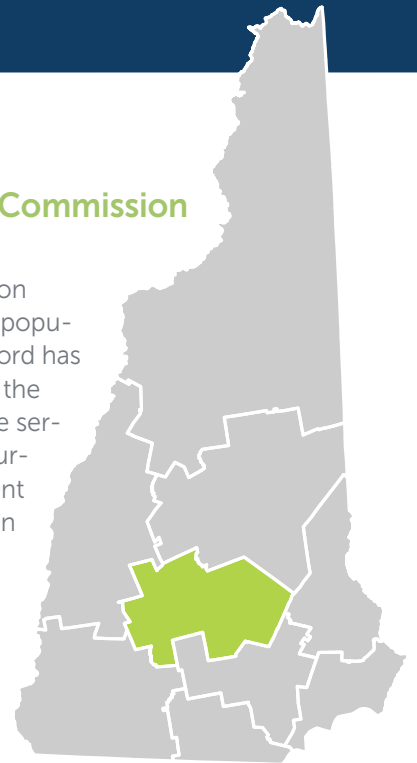
Service-providing industries make up a majority (63%) of employment in the region. As the state capital, the influence of state government in and around Concord is evident, with government positions contributing 26% of overall employment. Goods-producing industries make up a smaller portion of overall employment (11%). The industry cluster analysis conducted as part of the Comprehensive Economic Development Strategy (CEDS) identified the top three employment sectors in the region as government, health care, and retail.

Broadband in the Region

With the exception of Concord, the majority of residents in the region live outside of town centers in a more rural setting. While broadband is available in most of the region, there are gaps where service is unavailable or where the amount of bandwidth is less than what is desired. The rural and less-densely populated areas in the region are a challenge to broadband expansion. Many towns in the region have areas where the population density is not economical for providers to extend coverage. The largest gaps in service in the region are in underserved areas of Bradford, Sutton, Warner, Webster, and Salisbury.

In the 2013 telephone survey conducted as part of the NHBMP, 93% of residents in the region indicated that they have Internet access in their home. However, with the exception of Concord and some of the more populated towns, residents are limited to only one provider. Nearly 50% of region residents with Internet at home reported that their current provider is the only provider available to them, compared to 40% statewide. Among the 7% of residents without Internet access at home, 15% reported a lack of availability as the reason. This is considerably higher than the 5% statewide who gave a similar response.

High-bandwidth, reliable broadband is essential to the economic development strategy of the region. The biggest challenge facing the region is the gap areas where service is unavailable or inadequate. People of all ages and income levels have come to expect broadband access for daily use, conducting home business, and telecommuting. Area realtors report that questions about broadband connections are among the first questions asked by potential home buyers or businesses, especially



Facts:

2010 Population
115,160

% of State Population
9

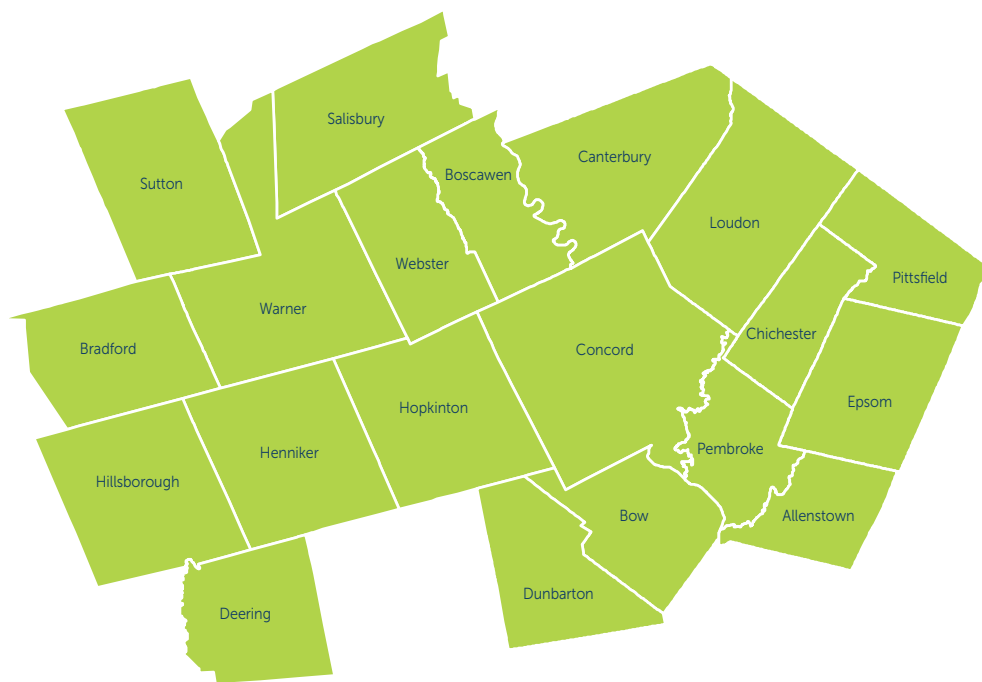
Square Miles
737

% of State Square Miles
8

from prospective buyers looking to move to the area from more urbanized areas in the Northeast. The availability of broadband is an important factor to the future success of the economic, health services, local government, and public safety sectors as well as meeting the needs of the public in the region.

Broadband priorities for the region include:

- **Support the formation of a regional or subregional broadband advocacy group:**
 - Advocate for improved broadband services in underserved areas;
 - Create better transparency for local municipalities on issues related to cable franchise agreements, pole attachments, financing, and other information;
 - Investigate other options, including emerging technologies, for extending broadband to areas that are underserved;
 - Encourage municipalities to identify broadband as a key element in municipal planning; and
 - Develop guidance on how to incorporate broadband into local master plans.
- **Encourage municipalities to organize technology committees to plan and prioritize for improved broadband.**
 - Provide information to municipalities on funding strategies for long-term investments in broadband improvement projects.
- **Work with other partners to seek funding to maintain and update broadband availability mapping and inventory in the region:**
 - Continue collecting broadband data on Community Anchor Institutions (CAIs);
 - Monitor broadband service availability for mapping purposes; and
 - Promote participation in the NHBMPP broadband speed test.

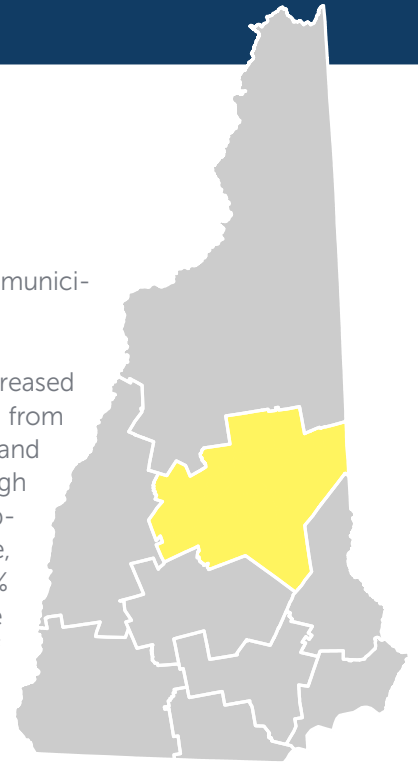


Facts:
2010 Population 112,735
% of State Population 9
Square Miles 1,279
% of State Square Miles 14

Lakes Region Planning Commission

The Lakes Region Planning Commission (LRPC) serves 30 municipalities in central New Hampshire, covering 818,000 acres.

From 1970 to 2010, the population of the LRPC region increased by 86%. The “baby boom” generation, the in-migration from southern New England states, the tax climate in the state, and the overall attractive lifestyle in this region fueled this high level of growth. But from 2000 to 2010 the region’s population growth rate was less than for the state as a whole, while the percentage of persons over 65 was higher—17.5% compared to 13% statewide. The region’s population rose from 106,428 in 2000 to 112,735 in 2010 for an increase of 5.92%. The state as a whole grew from 1,235,786 in 2000 to 1,316,470 in 2010 or 6.53%.



Economically, the LRPC region is dominated by tourism and recreation, and, to a lesser extent, by manufacturing. The region experienced a significant loss of private-sector jobs from 2006 to 2011: 9.2% of manufacturing jobs were lost, compared with 5.2% in the U.S. as a whole. The professional sector, including accounting, consulting, and computer services, is growing. Anecdotal information suggests that telecommuting has occurred in the areas where broadband speeds are adequate.

Broadband in the Region

Overall, the LRPC region is well serviced with basic broadband speeds, but there are significant gaps in some rural areas. Communities around Lake Winnepesaukee and along the Tilton, Northfield, and Franklin corridor (the core area) generally have good Internet service. Some of the hilly and mountainous rural areas in the northeast and northwest sections lack high-quality broadband service. Providers have not extended wired infrastructure in these areas because of low population density.

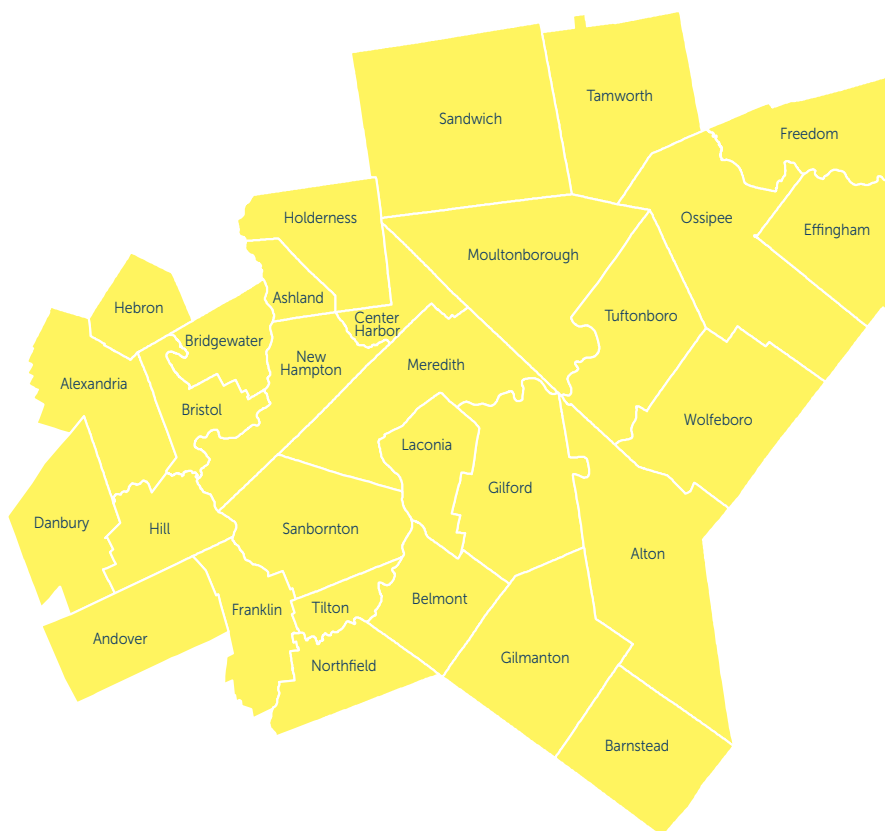
The rural nature of the region encourages broadband use for shopping and communications with friends and relatives. For many residents, large box-store chains are a 30- to 60-minute drive, and specialty stores are even farther. The distance to specialized medical care, in Concord and Lebanon, creates an increasing demand for telemedicine, especially for the elderly and those with children.

The lack of broadband also affects the marketability and real estate value of property in some areas. Families want broadband when they rent vacation homes, and professionals with second homes demand high-speed broadband so that they can work away from the office. People who can telework full time want broadband so they can move to the area.

Finally, with the changeover to digital over-the-air television, there are few to no stations available except through cable offerings. With cable expense and limited availability in some areas, the Internet is a primary method of getting video and music entertainment.

Broadband priorities for the region include:

- Establish a broad goal of 100% availability, and work with member municipalities and UNH to maintain an inventory of areas that lack service or are underserved.
- Create maps that show where business-grade broadband services are available.
- Encourage local governments to include the availability of broadband as a component on property assessment records and to include a broadband chapter in their master plans.
- Educate businesses, local government, and citizens on the uses of broadband and its importance as an economic development tool using regional planning commissions as a resource.
- Assist communities with cable franchise agreements, especially as they relate to broadband availability.
- Continue existing and establish additional local broadband committees and stakeholder groups.
- Establish dedicated funding sources for expansion of broadband services.
- Ensure that existing and new broadband infrastructure is both resilient and redundant.



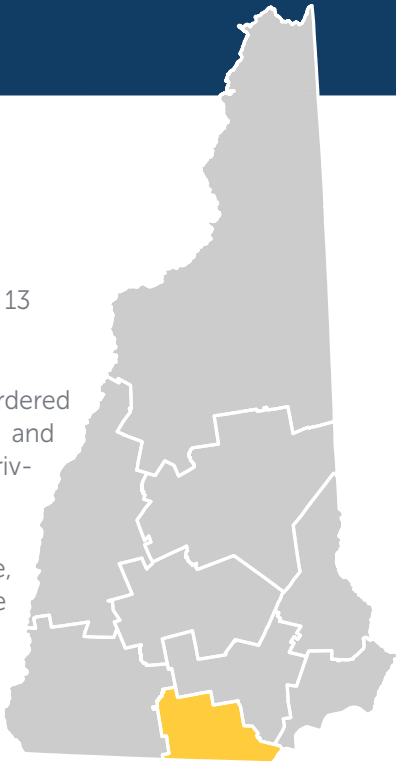
Facts:
2010 Population 205,765
% of State Population 16
Square Miles 346
% of State Square Miles 4

Nashua Regional Planning Commission

The Nashua Regional Planning Commission (NRPC) serves 13 municipalities.

The region is characterized as an urban center (Nashua) bordered by suburban communities of varying degrees of density and uses, encompassing urban development, colonial villages, river-bottom farmland, and forested hills in outlying towns.

Top industries in the region by employment are retail trade, manufacturing, and the health-care and social-assistance industry.



Broadband in the Region

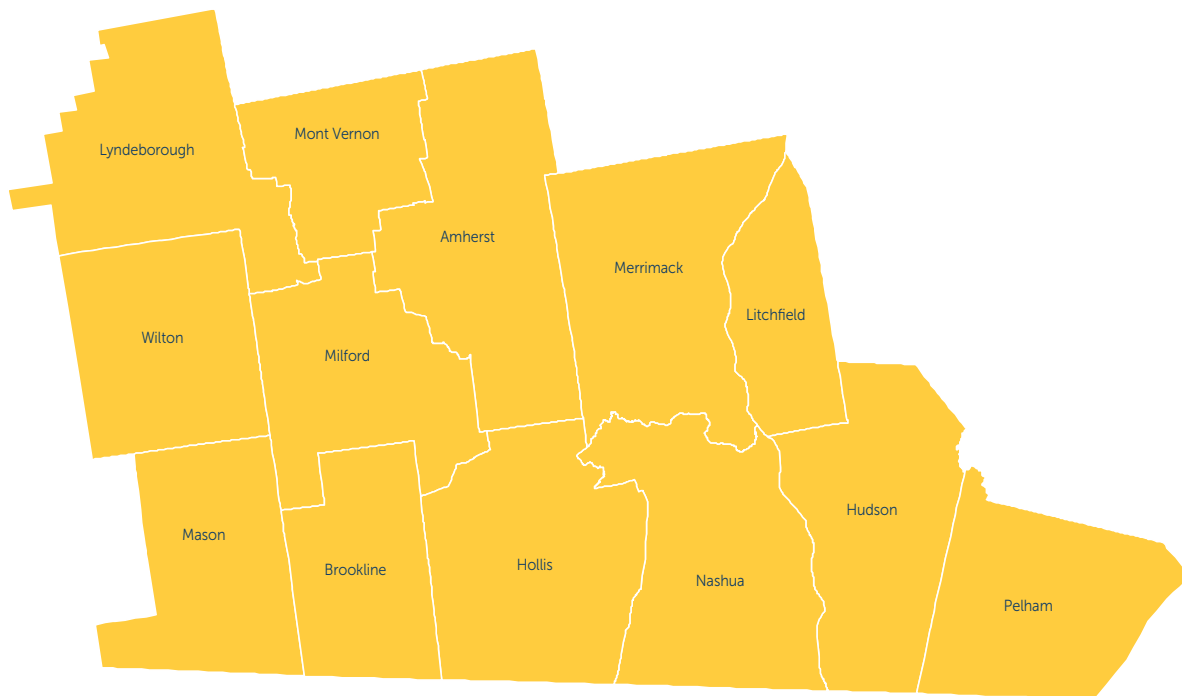
Overall, the region is generally well-served by broadband, with some unserved and underserved pockets in the western and more rural parts of the region. The topography of the landscape in some of the more rural areas is a challenging environment for infrastructure development.

The 2013 NHBMP telephone survey found that 96% of respondents in the region have broadband access at home. The general consensus by stakeholders across sectors on whether broadband connectivity meets current needs was that it is sufficient but there is room for improvement. High cost and lack of provider choice were identified as barriers. When asked if current connectivity would meet future needs, most indicated that it would not.

One overall broadband need identified by regional stakeholders is the ability to conduct research everywhere, which would eliminate the need for traveling to a location with free Wi-Fi for people who cannot afford to have broadband in their homes. A second overarching need across all sectors is data management. The third identified overall need is professional development and training to ensure employees are educated in the newest technologies. The lack of funding for middle- and last-mile infrastructure is seen as a prevalent issue among those small pockets of unserved and underserved communities.

Broadband priorities for the region include:

- Identify funding sources to implement the regional broadband plan.
- Coordinate among sectors and with providers to develop service maps with full disclosure of service line locations.
- Encourage broadband innovation and inclusion in town master plans.



Facts:
2010 Population 90,813
% of State Population 7
Square Miles 3,418
% of State Square Miles 37

North Country Council

The North Country Council (NCC) planning region is the largest by area in New Hampshire, totaling 3,418 square miles with 90,813 people living in 51 towns and 25 unincorporated areas in three counties - Coos, Grafton, and Carroll. People living in the North Country, about 7% of the state population, occupy over a third of the state, and much of the region remains lightly populated.

The physical landscape of the region is mostly mountainous and tree-covered, with large tracts of federal, state, and privately held conservation lands. There are numerous opportunities for outdoor recreation and tourism, and these industries have recently moved to the forefront of the region's economic development activities.

Top industries by employment in the region are retail trade, accommodation and food services, and health care and social assistance. The traditional industries of logging, manufacturing, and trucking have lost some prominence; however, they remain a vital part of the economy.

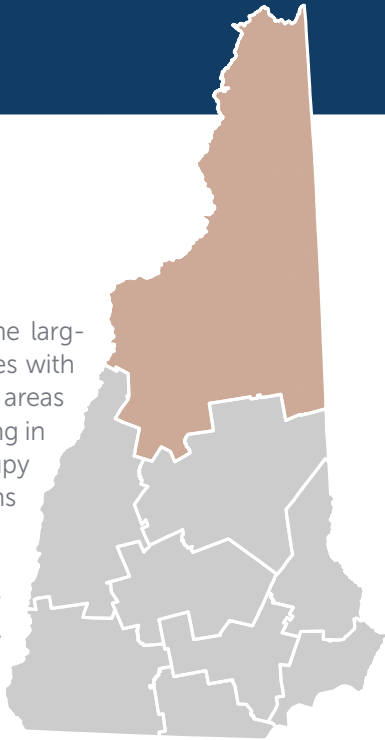
Population has changed much in the region since 1980. In Coös County, population has decreased by about 6%, a trend that seems to follow the slowdown of the timber and pulp mill industries.⁵¹ Conversely, the population of the North Country portion of Carroll County has grown 58%, and population of the North Country portion of Grafton County has grown by about 39%. This population increase in the southern portion of the region is likely influenced, at least in part, by the influx of persons 65 and older. In 2010, persons 65 years of age and over represented 18% of the region's population, which is 4.3 % higher than the state average.

Broadband in the Region

According to the 2013 NHBMPP telephone survey, only 77% of North Country Council residents stated that they subscribed to a broadband service, compared to 84% of New Hampshire residents overall. In the Coös County towns within the region, the percentage drops to around 69%.

The rural nature and difficult topography of the region affect the cost of broadband infrastructure and the willingness of providers to expand particular broadband technologies. It is often the case that only one type of technology or provider is available in many of these rural locations, thereby limiting choice and value to the user.

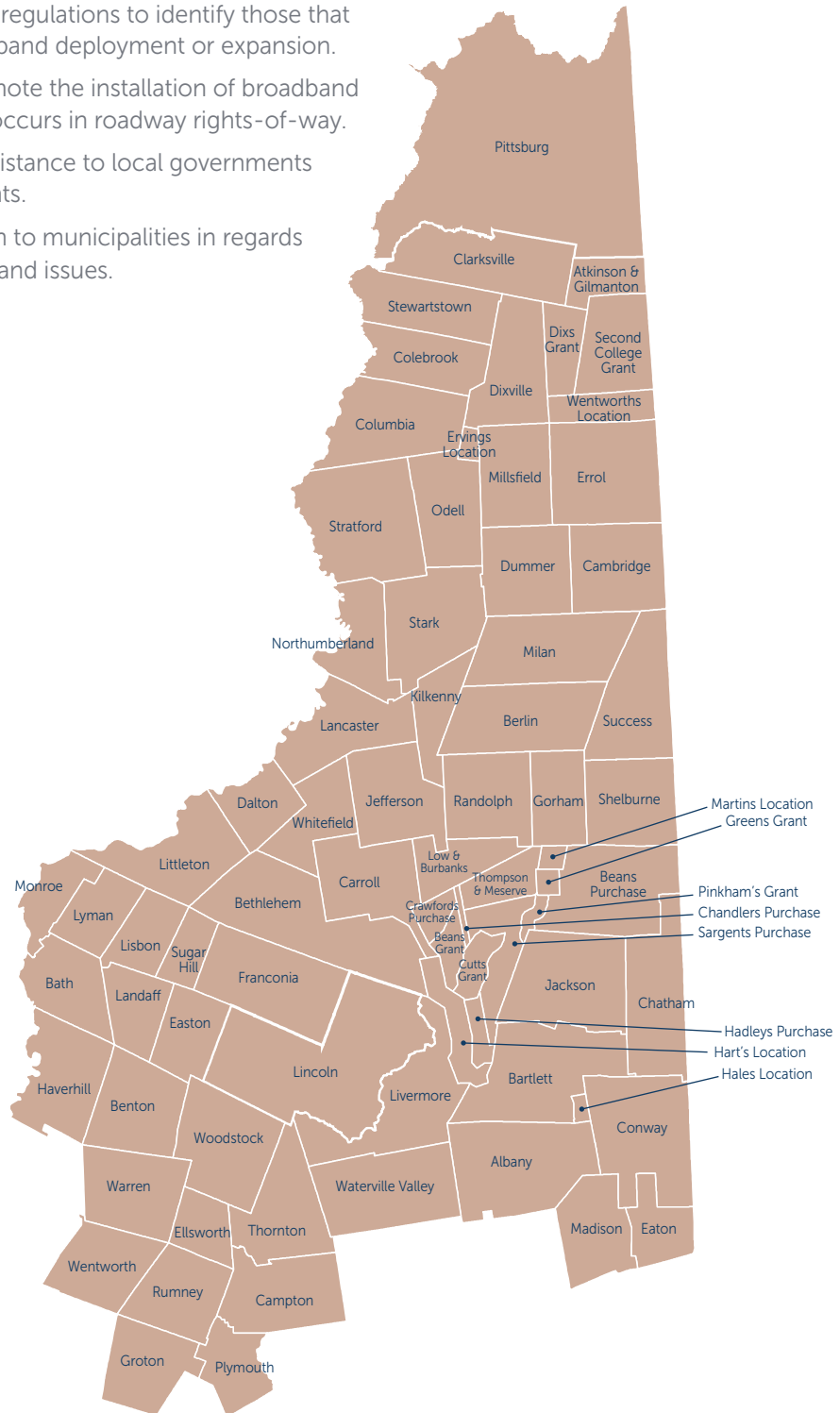
Cable-based broadband is available in most of the southern portion of the region. However, much of the region is underserved and there are significant service gaps. Mobile broadband can be a solution for reasonable download and upload speeds, but as with satellite broadband, wireless service often comes with a data cap. According to the 2013 NHBMPP telephone survey, of those who have a dial-up or satellite connection, most (60%) say it is the only option available.



Although the North Country Council region does have reasonable broadband coverage at lower speeds, there is a need for high-speed broadband coverage throughout the region.

Broadband priorities for the region include:

- Conduct audits of municipal regulations to identify those that impede or discourage broadband deployment or expansion.
- Encourage policies that promote the installation of broadband conduit when construction occurs in roadway rights-of-way.
- Provide legal and general assistance to local governments on cable franchise agreements.
- Provide continuing education to municipalities in regards to current and future broadband issues.



Facts:	
2010 Population	178,383
% of State	14
Square Miles	361
% of State Square Miles	4

Rockingham Planning Commission

The Rockingham Planning Commission (RPC) region is comprised of 26 municipalities that encompass 361 square miles of land in the southeast section of New Hampshire, including the entire New Hampshire seacoast. The region is rather urban in comparison to the rest of New Hampshire.

The top industries by employment in the region are retail trade, health care and social assistance, and accommodation and food services.

Broadband in the Region

All communities in the region have at least one wireline broadband provider, either cable, DSL, or fiber. There is also widespread cell coverage, which is often of high enough quality to be considered broadband. The region has significant fiber deployment. There is some offering of fiber-based Internet service in 22 of the RPC's 26 communities.

Most sectors of the region's economy perceive broadband service to be adequate. However, lack of competition is seen as preventing consumer choice and creating high costs for service. Demand for high-speed broadband is ever increasing as websites become more graphics-intensive and services such as on-demand video and VOIP phone service become more prevalent. Service and bandwidth need to continue to increase.

The 2013 NHBMPP telephone survey found that in the RPC region:

- 94% have Internet access at home;
- 75% have a cable Internet connection;
- 30% pay \$50 to \$99 per month for Internet service;
- 83% pay for a bundled Internet service, which includes phone, cable, and Internet services;
- 94% state that their Internet access is adequate for their uses; and
- 87% would not be willing to pay more for faster Internet speeds.



Broadband priorities for the region include:

- Ensure a high level of service to all areas in the region by encouraging communities to actively participate in the development of broadband service currently and into the future.
- Encourage competition and diversity among broadband providers.
- Simplify the pole attachment process.
- Ensure that ISP capacity planning is adequate to serve future needs.
- Ensure that the broadband network is sufficiently resilient and redundant to serve in times of crisis.



Southern New Hampshire Planning Commission

The Southern New Hampshire Planning Commission (SNHPC) region consists of 15 municipalities located within south-central New Hampshire, not far from the Massachusetts border, and includes Manchester, the largest city in the state.

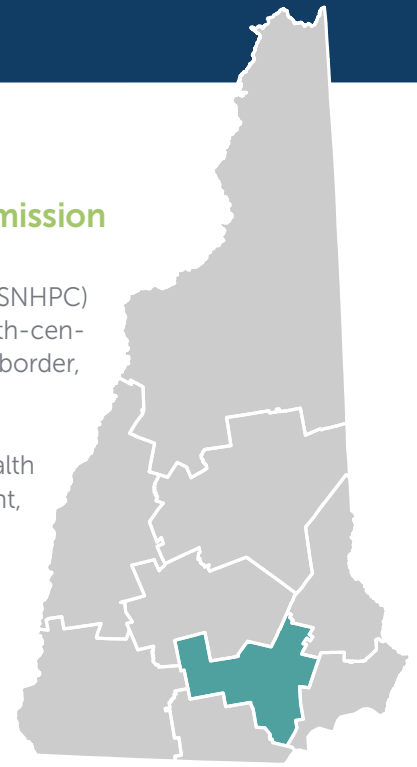
The largest employment sectors in the region are health care and social assistance, retail trade, local government, and manufacturing.

Broadband in the Region

Cable is currently the broadband service of choice within the majority of the communities in the region. Broadband has also been made available through optical carrier/fiber to the end user, and there are several communities where terrestrial fixed and mobile wireless provide broadband service. The isolated and remote areas lacking broadband in the region are mainly due to geography or technological limitations that are often related to the "last mile," or the physical distance between the area and the closest available broadband service or infrastructure.

The Town of Deerfield is the only underserved town in the region (see page 5 for definition). However, the cost of high-speed Internet services is often beyond the economic reach of many marginalized and underrepresented populations in the region, including veterans, senior citizens, people with a disability, immigrants and refugees, and lower-income families and households. This is particularly true in the City of Manchester and within low-income census tracts.

The 2013 NHBMP telephone survey found that those within the SNHPC region who are 70 or older, the unemployed and looking for work, those with a high school education or less, and households earning less than \$20,000 are less likely to have Internet access at home. The survey identified several reasons why 7% of the region's residents do not have Internet access at home: 1) 29% of those respondents claimed they don't need the Internet; 2) 10% said they don't know how to use it; 3) 13% do not have a computer that can adequately handle Internet connections; and 4) 17% reported Internet service is too expensive.



Facts:

2010 Population
276,416

% of State Population
21

Square Miles
550

% of State Square Miles
6

Broadband priorities for the region include:

- Consider and treat broadband as a utility and a necessity for economic growth and development.
- Assist planning boards and municipal planners to develop broadband master plan chapters.
- Continue to review and update community anchor institution broadband data for mapping.
- Seek ways to assist local governments in establishing backup power supply systems and generators to power broadband and governmental functions.
- Assist planning boards and municipal planners to update local site-plan regulations to require installation of conduit for fiber optics in new construction.
- Seek continuation of and participation in UNH Cooperative Extension's Broadband Community Readiness Program.
- Assist City of Manchester IT staff to facilitate conversations with industry experts to expand existing, and develop new, free Wi-Fi networks in Manchester and surrounding towns.
- Encourage Internet service providers to offer faster broadband speeds—1 Gbps.
- Encourage Internet service providers to offer affordable Internet services for refugees, homeless and unemployed veterans, home-based businesses, students, and employees who telework.
- Seek funding to support computer and Internet training of underrepresented populations and refugees to advance in the workplace.
- Develop or update local public works department policies to include regulations for broadband installation.
- Develop a policy manual to assist municipalities in negotiating cable franchise agreements.

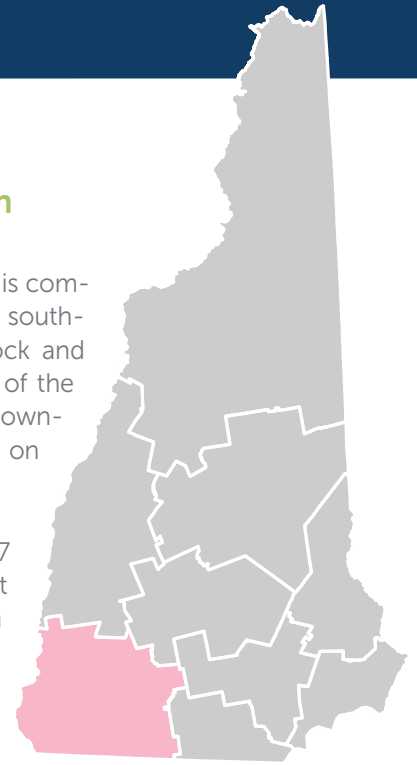


Facts:
2010 Population 100,751
% of State Population 8
Square Miles 977
% of State Square Miles 11

Southwest Region⁴³ Planning Commission

The Southwest Region Planning Commission (SWRPC) is comprised of 35 municipalities covering 1,007 acres in the southwestern corner of New Hampshire. Mount Monadnock and its highlands shape the landscape. Forests cover 83% of the region. With the exception of Keene and other small downtown centers, much of the development is dispersed on relatively large lots.

Approximately 65% of the working population (23,267 people) lives and works in the region. The predominant industry sectors include educational services and health care and social assistance, which employs 28% of the region's workforce. This sector grew by 35.6% between 2000 and 2011.



The segment of the region's population over the age of 65 is forecast to increase from 15% to 26% between 2010 and 2040.

Broadband in the Region

Broadband access varies from good coverage and availability in more densely developed areas to rural parts of communities that are either unserved or underserved by broadband.

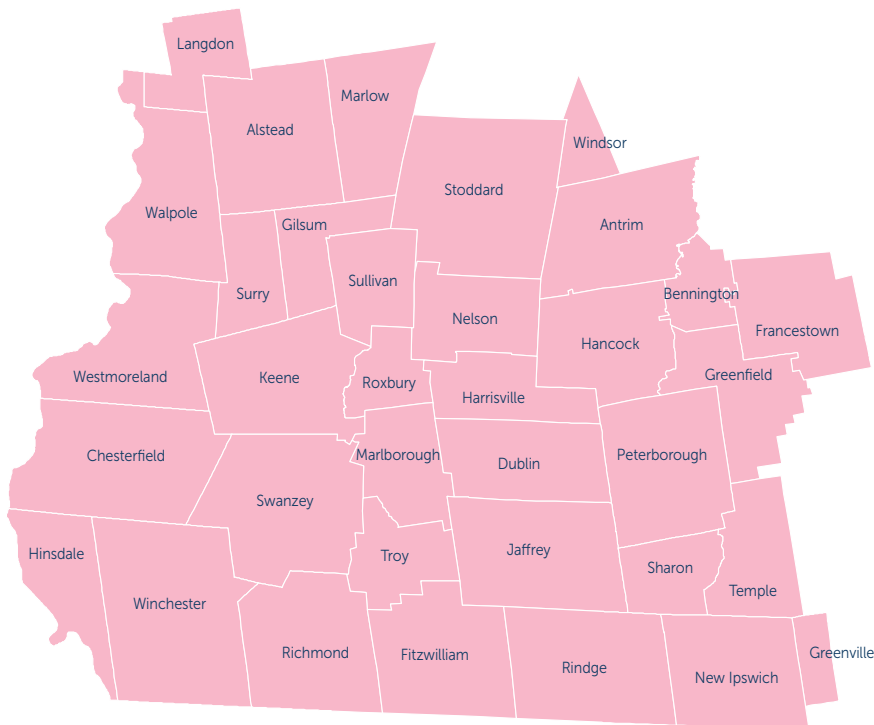
Broadband service information has been collected from 572 discrete address locations through the online speed test. These speed test numbers revealed that there are significant gaps in access to adequate Internet speeds around the region. Analysis of speed test results shows that approximately 20% of those who conducted the test are at locations considered unserved, 59% are considered underserved, and 21% are served.

The region's challenging topography and low population density present technological and economic barriers to deploying broadband infrastructure and services. While deployment costs can vary significantly by technology type and location, it is generally more expensive to deploy fixed-wireline infrastructure (e.g., fiber, cable modem, DSL) in areas with greater physical distances between customers.

In addition to high infrastructure costs, the low volume of potential subscribers along these routes presents limited economic incentive for private service providers to deploy infrastructure in rural areas. There is a need for innovative technology solutions that can navigate challenging terrain and distance with greater ease and less expense than fixed-wireline solutions. Advanced wireless technologies, which are generally less sensitive to population density and easier to install than fixed-wireline, present an opportunity for expanded broadband deployment in rural areas.

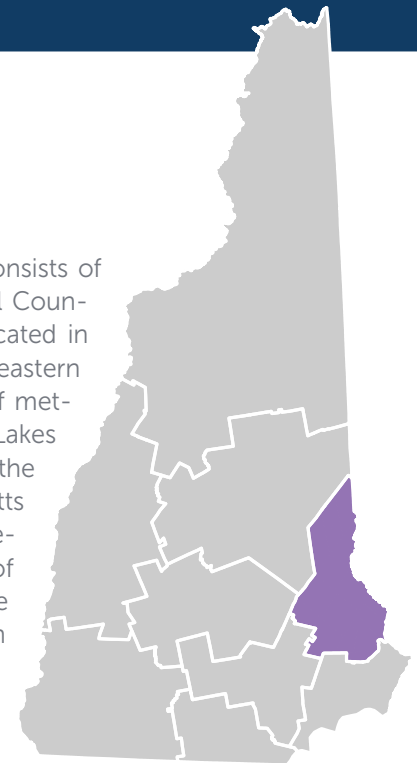
Broadband priorities for the region include:

- Work with educational institutions to inventory and map broadband availability:
 - Inventory CAIs to better understand their plans and projects regarding increasing broadband access and speeds;
 - Establish and maintain a public database on broadband availability at the address level for the region and state; and
 - Promote participation in the NHBMPP Broadband Speed Test and Household Survey and encourage service providers and others to share these links on their respective websites.
- Identify existing or potential financial or regulatory incentives such as subsidies, tax credits, or grant opportunities to support broadband expansion efforts:
 - Identify incentives and support for CAIs and residents to access affordable and adequate broadband service and technology; and
 - Identify funding programs for CAIs to update, maintain, and expand broadband technology and devices.
- Develop educational materials that generally describe the importance of broadband to quality of life and the range of applications in which broadband can be utilized.
- Share information with NH legislators and other state and local officials on the importance of improving access to affordable and adequate broadband services.



Strafford Regional Planning Commission

The Strafford Regional Planning Commission (SRPC) consists of the 13 municipalities in Strafford County, two in Carroll County, and three in Rockingham County. The region is located in the southeastern corner of New Hampshire, along the eastern border with Maine. The region is located equidistant of metropolitan Boston and Portland, Maine (60 miles). The Lakes Region and the White Mountains are directly north, and the seacoast is directly southeast. As a result, Massachusetts has a strong influence on the southern portion of the region, providing employment for thousands of residents of Strafford County, while the northern communities in the region are influenced by the recreational opportunities in the lakes and mountains.



The region supports a population of nearly 150,000 residents, 49% of which live in the Tri-Cities (Dover, Rochester, and Somersworth). Much like the broader New Hampshire population, the region's population is increasing in age. However, the region, according to population projections, is expected to be the fastest-growing area of the state over the next 30 years, at a rate of almost 13%.

Employment growth and trends have been perhaps the most profound factor in shaping the region's communities in recent decades. The recession of the 2000s slowed employment growth in the region, but an economic rebound signals lower unemployment rates and higher per-capita incomes. According to the New Hampshire Economic and Labor Market Information Bureau (ELMI), the regional unemployment rate was 4.4% as of November 2013, a 1.7% decrease from the peak in 2009. Total employment is also expected to increase by 9.8% over the decade between 2012 and 2022.

Broadband in the Region

The region's broadband-related challenges are often a result of geographic, technological, or administrative barriers related to providing service to consumers in the "last mile" from the existing infrastructure to homes or businesses. Each of the region's 18 municipalities is marked by pockets of unserved and underserved streets or neighborhoods where broadband connectivity is limited, unreliable, or nonexistent. The southern municipalities, ranging from Newmarket to Rochester, tend to have higher rates of broadband penetration, as well as higher-speed connections. In contrast, those municipalities to the north, with lower population density and more variable terrain, often face challenges related to broadband access and quality.

The 2013 NHBMP telephone survey found that 12% of respondents in the region did not have Internet access at home, compared to 9% statewide. A third of respondents who do not have Internet cited it as unnecessary.

Facts:

2010 Population
146,895

% of State Population
11

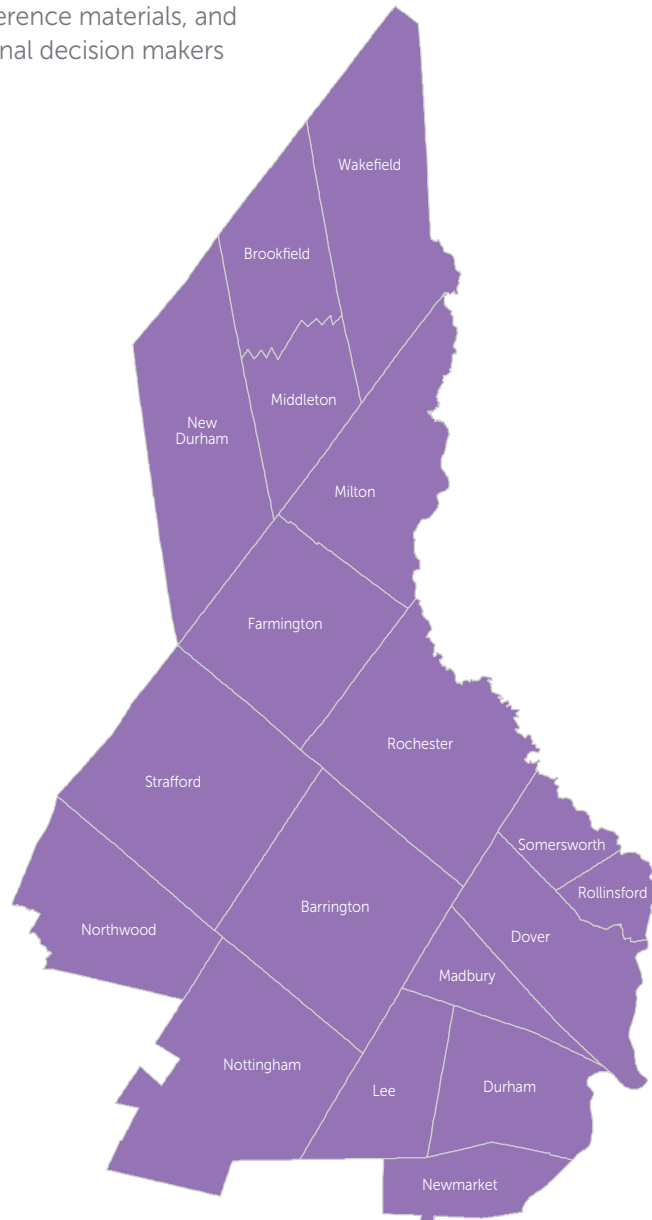
Square Miles
544

% of State Square Miles
6

Personal uses included surfing the web and the use of services such as Netflix. Many individuals indicated adequate Internet for their at-home uses. The price of adequate service, slow speeds at times of heavy use, and storm-related service interruptions were identified as barriers. Residents don't seem willing to pay more for faster speeds.

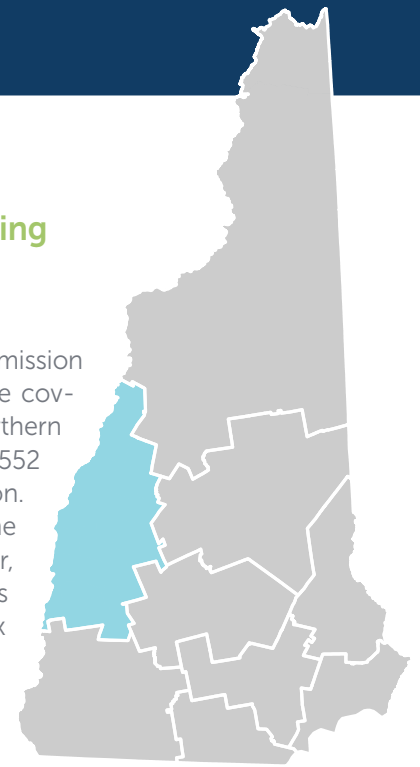
Broadband priorities for the region include:

- The development of a broadband infrastructure component in SRPC Regional Master Plan.
- Working with the NH Municipal Association and the NH Department of Resources and Economic Development to promote or sponsor education, trainings, and other opportunities focused on broadband capacity-building for municipalities.
- Developing a web-based clearinghouse of NHBMPP products, information, reference materials, and meeting minutes for regional decision makers and stakeholders.



Upper Valley Lake Sunapee Regional Planning Commission

The Upper Valley Lake Sunapee Regional Planning Commission (UVLSRPC) is located in the western portion of the state covering 27 municipalities in parts of southern Grafton, northern Sullivan, and western Merrimack counties. In 2010, 89,552 people resided in the Upper Valley Lake Sunapee Region. Approximately half of the region's population lives in the four largest communities (Claremont, Lebanon, Hanover, and Newport). Fifteen of the region's 27 municipalities have populations under 2,000 residents, and there are six towns with fewer than 1,000 residents.



Comparatively, the region has a lower population density than anywhere in the state except the NCC region. The population density of the region is not expected to change considerably over the next 25 years; population growth projections through 2040 for Grafton, Merrimack, and Sullivan counties are nearly flat.

The top industries in the region by employment are health care and social assistance, retail trade, higher education, and manufacturing.

Broadband in the Region

The region is unevenly served by high-speed broadband service. The rural areas of the region are predominantly lacking Internet access. However, residents have reported gaps in service in nearly all of the region's municipalities.

According to the 2013 NHBMP telephone survey, among residents in the region who have Internet access, many are underserved due to the lack of robust broadband. Of the served population, 7% use technology that does not provide reliable high-speed broadband connectivity. Of those who reported using dial-up or satellite, 59% said that it was the only option available.

Of the 16% of residents who do not have Internet at their homes, 23% do not have service because it is too expensive. While most residents consider their service adequate (88%) and would not be willing to pay more for faster Internet speeds (84%), a significant minority (9%) find their service to be inadequate. Twelve percent of survey respondents would be willing to pay 25% more per month for faster speeds, and 3% would be willing to pay 50% more per month.

Regional stakeholders across sectors identified three major broadband themes:

- Employees and students are increasingly working at home, in satellite locations, and traveling for business locally and globally. Both employers and employees face challenges to achieving a connected workforce because there is limited high-capacity broadband service in residential and rural neighborhoods.
- Businesses and organizations report a growing dependence on online interaction

Facts:

2010 Population
89,552

% of State Population
7

Square Miles
1072

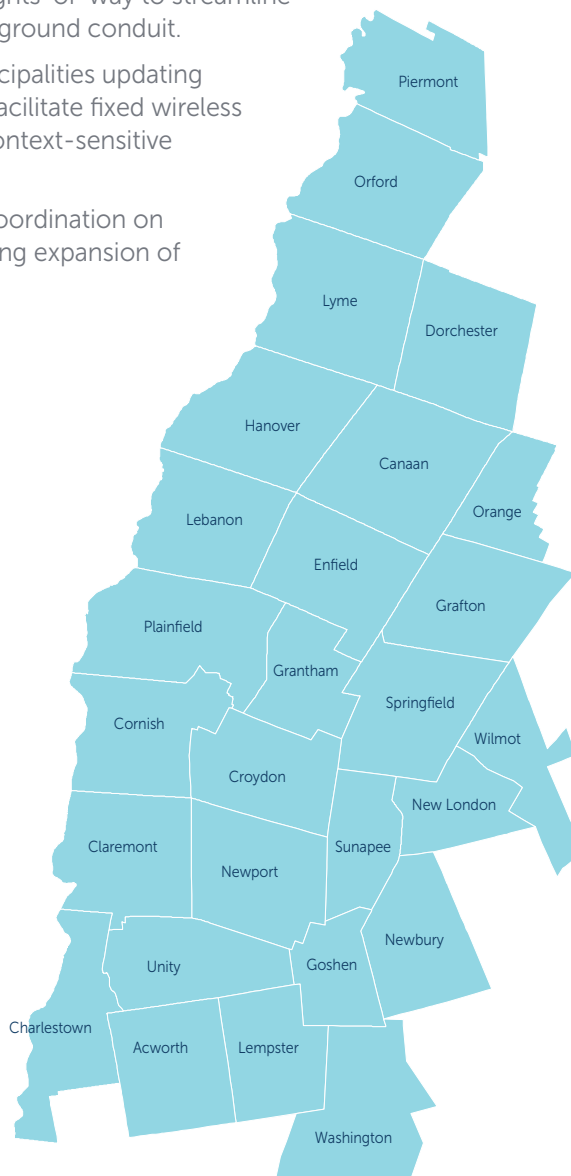
% of State Square Miles
12

with external companies or organizations. It is essential to have sufficient broadband service to conduct online business with suppliers, customers, accounting/billing services, electronic medical records firms, off-site IT/security backups, and partners.

- There is a need for access to training and professional development online, including keeping up to date with training in the use of ever-changing technology.

Broadband priorities for the region include:

- Support reform of the federal Connect America Fund (part of the Universal Service Fund) to allow more funds to be available to New Hampshire broadband providers for expansion.
- Support state legislation that promotes new options for broadband financing, such as tax credits for companies that extend service to underserved areas and permitting municipalities to bond for broadband expansion.
- Support reforms to state legislation governing utility pole attachments and the use of public rights-of-way to streamline providers' access to poles and underground conduit.
- Provide technical assistance to municipalities updating telecommunications ordinances to facilitate fixed wireless and cellular service expansion in a context-sensitive manner.
- Support intermunicipal or regional coordination on broadband expansion efforts, including expansion of the FastRoads⁵² consortium.





CONCLUSION

Broadband, or high-speed Internet access, is critical infrastructure to ensure that the state's residents and businesses are connected locally, nationally, and globally. While broadband is widely available at basic speeds in New Hampshire, there remain some areas of the state with limited or no broadband access. And further, the basic speeds that are available in much of the state today may limit the applications that can be effectively utilized now and in the future. To ensure that New Hampshire provides high-quality education, economic opportunities, vital communities, and critical public health and safety services to all, comprehensive planning followed by aggressive implementation actions are required.

Broadband: The Connection to New Hampshire's Future presents the status of broadband in New Hampshire along with statewide, regional, and sector challenges and recommendations. The findings and recommendations were developed in conjunction with the nine regional planning commissions in the state and extensive input from committees, focus groups, public forums, and interviews with local stakeholders. They provide critical short-term and mid-term policies, initiatives, and actions to ensure that broadband is available to everyone in New Hampshire, that it is affordable, and that people know how to use it effectively. Implementing the policies and changes will take effort and resources along with a willingness to act and invest now. It will also require the cooperation and dedication of state agencies, municipalities, legislators, and private entities.

Broadband: The Connection to New Hampshire's Future was written to highlight the importance of broadband to New Hampshire's prosperity and quality of life. New Hampshire cannot afford to accept the status quo while other states, and the world, move forward. New Hampshire must continue to lead—and the time to act to improve broadband availability, affordability, and adoption in New Hampshire is now.

APPENDIX A: RECOMMENDATIONS

The following table provides the broadband recommendations for New Hampshire, presents a general time frame for their implementation, and identifies agencies, organizations, and other stakeholders who should be involved. The recommendations in **bold are the priority recommendations**. Other recommendations include subsequent and supportive policies and actions. All are a culmination of the recommendations found in the nine regional broadband plans. The full regional plans are available at <http://www.iwantbroadbandnh.org/planning>.

Key to Acronyms

CDFA – New Hampshire Community Development Finance Authority

DHHS – New Hampshire Department of Health and Human Services

DOE – New Hampshire Department of Education

DOS – New Hampshire Department of Safety

DOT – New Hampshire Department of Transportation

DRED – New Hampshire Department of Resources and Economic Development

OEP – New Hampshire Office of Energy and Planning

RPC – Regional Planning Commission

UNH – University of New Hampshire

BROADBAND AUTHORITY AND COUNCIL ... RECOMMENDATION: 1

	Recommendation	Timeline	Who is Responsible
1a	ESTABLISH A STATE BROADBAND AUTHORITY that is responsible for developing and advancing the state's strategic broadband plan, for continuing to collect data and map broadband use, and for seeking funding to support infrastructure expansion.	Short-term	DRED and the NH State Legislature
1a1	Funding: Obtain and distribute funding from federal, state, and other sources to support a variety of broadband efforts, including infrastructure expansion projects involving state, regional, and local efforts.	Short-term	NH Broadband Authority, DRED, UNH, RPCs, municipalities, and public/private partners
1a2	Funding: Work with New Hampshire's Congressional Delegation to encourage proposals to create a national infrastructure development bank, a stand-alone entity that would make loans or loan guarantees to leverage private dollars for infrastructure projects.	Mid-term	NH Broadband Authority, DRED, NH U.S. Congressional Delegation
1a3	Funding: Create state and local mechanisms to incentivize further broadband deployment through financing mechanisms, including: <ul style="list-style-type: none"> • Develop a revolving broadband loan fund to support broadband expansion in unserved and underserved areas; • Offer state tax incentives to providers that expand broadband in underserved and unserved areas; and • Develop mechanisms similar to Tax Increment Financing (TIF)⁵³ districts to generate committed revenue streams to support local broadband initiatives. 	Mid-term	NH Broadband Authority, DRED, NH State Legislature
1a4	Policy: Monitor and promote federal legislative policy initiatives that advance broadband availability and access.	Short-term	NH Broadband Authority, DRED, NH U.S. Congressional Delegation
1a5	Policy: Initiate state legislative policy mechanisms to promote broadband availability and access.	Short-term	NH Broadband Authority, DRED, NH State Legislature
1a6	Policy: Recommend regional and local policies that advance broadband availability, access and adoption.	Short-term	NH Broadband Authority, DRED, RPCs, municipalities, and public/private partners
1a7	Policy: Seek amendments to enabling statutes that restrict municipal financing of broadband expansion projects, particularly RSA 33:3g, which governs municipal bonding authority for broadband expansion.	Short-term	NH Broadband Authority, DRED, RPCs, municipalities, and public/private partners

APPENDIX A: RECOMMENDATIONS

BROADBAND AUTHORITY AND COUNCIL ... RECOMMENDATION: 1

	Recommendation	Timeline	Who is Responsible
1a8	Policy: Establish policies to ensure that New Hampshire's broadband infrastructure has reliability and redundancy so that it meets the needs of all sectors of New Hampshire's economy and society.	Mid-term	NH Broadband Authority, DRED, RPCs, municipalities, and public/private partners
1b	ESTABLISH A NEW HAMPSHIRE BROADBAND COUNCIL, to include state agency officials as well as representatives from higher education, regional planning agencies, and economic development authorities, to work with sector representatives from business, health, public safety, education, local government, and residents to address current and future broadband needs in the state.	Short-term	NH state agencies including DRED, DOE, DOT, OEP, DHHS, RPCs, UNH, sector representatives
1b1	Adopt a broadband vision for the state that builds upon and is consistent with the National Broadband Plan ⁵⁴ , setting goals for availability and adoption that promote a globally competitive environment for all citizens and businesses and public institutions. Coordinate with a broad range of stakeholders, including representatives from higher education, RPCs, CDFA, and all sectors of the state economy, to make expanded broadband availability, adoption, and use a reality.	Mid-term	NH Broadband Council
1b2	Encourage the integration of broadband strategies into statewide, regional, and municipal strategic plans that define clear goals for broadband availability and adoption with actionable steps.	Mid-term	NH Broadband Council, RPCs, municipalities
1b3	Set upload and download speed recommendations that will allow all New Hampshire citizens and businesses to access broadband for business, education, health, government, public safety, and enhancing their quality of life. Publish speed recommendations and other goals on a statewide broadband website. ⁵⁵	Mid-term	NH Broadband Council
1b4	Monitor broadband metrics to assure New Hampshire remains competitive in the region and nationally.	Mid-term	NH Broadband Authority and Broadband Council, UNH
1b5	Routinely monitor and revise the minimum upload and download speed recommendations and other goals as needed in order to keep up with demand and new technology.	Mid-term	NH Broadband Authority and Broadband Council, UNH

BROADBAND AVAILABILITY ... RECOMMENDATION: 2

	Recommendation	Timeline	Who is Responsible
2a	<p>ELIMINATE BARRIERS TO BROADBAND ACCESS by working with service providers, utility pole owners, regulators, and legislators to:</p> <ul style="list-style-type: none"> • Streamline the pole attachment and tower siting processes; • Improve the use of highway rights-of-way; and • Streamline utility pole licensing procedures. 	Short-term	NH Broadband Authority and Broadband Council, DOT, RPCs, municipalities, and public/private partners
2a1	Work with ISPs (Internet service providers) to increase bandwidth and provide faster broadband speeds.	Mid-term	ISPs, NH Broadband Authority and Council, RPCs, municipalities, and public/private partners
2a2	Work to promote opportunities for connecting fiber technology, or other fixed infrastructure, to wireless infrastructure to increase the reach and capacity of wireless mobile service for voice and data service.	Short-term	ISPs, NH Broadband Authority and Council, RPCs, municipalities, and public/private partners
2a3	Work with regional planning commissions and municipalities to promote the inclusion of broadband chapters in local master plans.	Short-term	RPCs, municipalities, NH OEP
2a4	Work with municipalities, businesses, libraries, schools, and others to establish and encourage high-capacity broadband connection centers and/or public Wi-Fi networks.	Short-term	NH Broadband Authority and Council, municipalities, RPCs, UNH, public/private partners
2a5	Work with communities to form broadband stakeholder groups interested in expanding broadband access in their areas, and support these groups through educational programs, workshops, etc.	Short-term	RPCs and municipalities
2a6	Work with decision makers and service providers to form public/private partnerships focused on expanding broadband access through innovative funding models.	Mid-term	ISPs, NH Broadband Authority and Council, RPCs, municipalities, and public/private partners

APPENDIX A: RECOMMENDATIONS

BROADBAND AFFORDABILITY ... RECOMMENDATION: 3

	Recommendation	Timeline	Who is Responsible
3a	ENCOURAGE COMPETITION TO IMPROVE BROADBAND AFFORDABILITY. For example, New Hampshire law (RSA 53 C:3 b) should be amended to remove the requirement that new entrants build an identical network to the cable plan in a given franchised town.	Short-term	NH Broadband Authority and Council, Legislature, RPCs, municipalities
3a1	Support policies that give the FCC tools to encourage competition in the broadband markets of network services, devices, applications, and content.	Mid-term	NH Broadband Authority, NH U.S. Congressional Delegation
3a2	Work with New Hampshire's Congressional Delegation to expand and reform the E-rate program (otherwise known as the Schools and Libraries Program of the Universal Service Fund ⁵⁶).	Mid-term	NH Broadband Authority, NH U.S. Congressional Delegation
3a3	Facilitate the development and expansion of public/private partnerships that offer reduced rates for broadband services and computers to low-income residents.	Mid-term	NH Broadband Authority and Council, public/private partners
3a4	Support entities applying for FCC Connect America Funds.	Short-term	NH Broadband Authority and Council, public/private partners
3a5	Further research technology programs that address broadband access and adoption issues including terrain challenges, low population density, low-income areas, rural communities, and New Hampshire's changing demographics.	Short-term	NH Broadband Authority and Council, UNH, public/private partners

BROADBAND ADOPTION ... RECOMMENDATION: 4

4a	COORDINATE, PROMOTE, AND SPONSOR TRAININGS on the techniques and benefits of broadband usage in order to increase broadband adoption.	Short-term	NH Broadband Authority and Broadband Council, UNH, RPCs, public/private partners
4a1	Develop marketing/advertising materials for multimedia distribution to the general public that describe the importance of broadband for communication, economic development, and quality of life.	Mid-term	Broadband Council, UNH, RPCs, public/private partners
4a2	Work with schools, libraries, and adult and higher education programs to increase availability of affordable and accessible community-based broadband digital literacy programs.	Short-term	Broadband Council, DOE, UNH, RPCs, public/private partners
4a3	Develop targeted sector-based training sessions focusing on how broadband can help businesses and organizations meet their administrative and communication needs.	Short-term	Broadband Council, DOE, UNH, RPCs, public/private partners

BROADBAND ASSESSMENT ... RECOMMENDATION: 5

	Recommendation	Timeline	Who is Responsible
5a	CONTINUE TO MONITOR broadband availability, adoption, and New Hampshire's competitive position.	Short-term	UNH, NH Broadband Authority, public/private partners
5a1	Develop and maintain broadband websites that measure and report on broadband expansion progress; communicate progress to the public and policy makers by updating broadband benchmarking and mapping information through the New Hampshire Broadband Mapping & Planning Program website and toolkit.	Short-term	UNH, NH Broadband Authority
5a2	Promote public access to existing address data collected by the state to support enhanced resolution of broadband maps.	Mid-term	UNH, NH Broadband Authority, NH State Legislature
5a3	Monitor broadband adoption rates and affordability and compare to rates from other states to help insure NH remains competitive.	Short-term	UNH, NH Broadband Authority
5a4	Assess progress made on the recommendations outlined in this report.	Mid-term	NH Broadband Authority, Broadband and Council, UNH, public/private partners

APPENDIX B: WHAT IS BROADBAND?



CATEGORY	DOWNLOAD SPEED	UPLOAD SPEED	TYPICAL FUNCTIONS/USE <i>(functions additive to level above)</i>
Unserviced	< 768 Kbps	< 200 Kbps	<ul style="list-style-type: none"> • Email (Client/Server-based; POP)
Underserved	768 Kbps to < 6 Mbps	200 Kbps to < 1.5 Mbps	<p>Minimum Download Speed: 768 Kbps : Minimum Upload Speed: 200 Kbps</p> <ul style="list-style-type: none"> • Web-based email • Limited web browsing and shopping • Minimal social media use • Sending/receiving small documents/files (photos, word processing, invoices) • Use of Internet not integrated in daily life function • Single user Internet device
			<p>Minimum Download Speed: 1.5 Mbps : Minimum Upload Speed: 768 Kbps</p> <ul style="list-style-type: none"> • Web browsing and shopping • Medium social media use • Sending/receiving medium-sized documents/files (photos, word processing) • Limited streaming content; buffering a concern Standard Definition (SD) content • VPN access possible, but speed of operation not critical to job function • Internet integrated in daily life, and "always" connected • 1-3 simultaneous Internet devices possible • Multiple functions working simultaneously possible (e.g. web browsing, streaming video/music, downloading content). Not concerned with speed of transmission. • VoIP (Voice over IP, i.e. telephone over the Internet)
			<p>Minimum Download Speed: 3 Mbps : Minimum Upload Speed: 768 Kbps</p> <ul style="list-style-type: none"> • Medium to high social media use • Sending/receiving medium to large-sized documents or files (photos, word processing) • Streaming SD content; buffering not a concern; downloading High Definition (HD) content (movies, video) • 3-5 Internet devices possible • VPN access needed, speed of operation important but not critical to job function • Multiple functions performed simultaneously required (e.g. web browsing, streaming video/music, downloading content), but not concerned with speed of downloads • Low quality, small window frame videoconferencing (Skype) • Cloud-based computing and data storage
Served	6 Mbps to 25+ Mbps	1.5 Mbps to 6+ Mbps	<p>Minimum Download Speed: 6 Mbps : Minimum Upload Speed: 1.5 Mbps</p> <ul style="list-style-type: none"> • Heavy social media use • Sending/receiving large documents or files (photos, word processing, small videos) • Streaming HD content (movies, video); buffering not a concern • 5+ Internet devices possible • VPN access needed, speed of operation critical to job junction • Higher quality, codec-based videoconferencing • Multi-player online gaming
			<p>Minimum Download Speed: 10 Mbps : Minimum Upload Speed: 3 Mbps</p> <ul style="list-style-type: none"> • Sending/receiving large files and small to medium-sized databases • HD quality, codec-based, large frame videoconferencing; multiple (bridged) sites/users • Remote synchronous education, professional development, workshops, etc., facilitated simultaneously at multiple classrooms and/or other locations • Telehealth/telemedicine applications possible
			<p>Minimum Download Speed: 25+ Mbps : Minimum Upload Speed: 6+ Mbps</p> <ul style="list-style-type: none"> • Sending/receiving medium to large-sized databases • HD quality, codec-based, large frame videoconferencing (Telepresence) connecting multiple (bridged) sites/users • High speed end to end network and business to business applications • Telemetry-based applications (rely critically on the ability of broadband to continuously monitor and multiplex data, i.e. remote patient monitoring, sensing systems, etc.) • Real-time HD medical imaging and consultation (remote dermatology, etc.) • "Internet 2" connectivity and applications

WHAT IS BROADBAND?

Broadband, also called “high-speed Internet,” is the umbrella term referring to Internet access that is always on and is faster than dial-up Internet access. The National Telecommunications and Information Administration (NTIA) defines broadband as “advanced communications systems capable of providing high-speed transmission of services such as data, voice, video, complex graphics, and other data-rich information over the Internet and other networks.”

Broadband is typically measured by how fast a user’s computer can download and upload information from the Internet. Download speed is the rate that a computer receives data from the Internet, while upload speed is the rate a computer can send data. The speed at which information can be transmitted depends on “bandwidth,” or the transmission capacity of an electronic pathway. That capacity can be described in terms of how much data, measured in bits, can be transmitted per second, and is reported in kilobits (Kbps = 1,000 bits per second), megabits (Mbps = 1,000,000 bits per second), and gigabits (Gbps = 1,000,000,000 bits per second). When download and upload speeds are the same, that is called “symmetrical,” and when download and upload speeds differ, that is “asymmetrical,” with upload speeds typically being more limited.

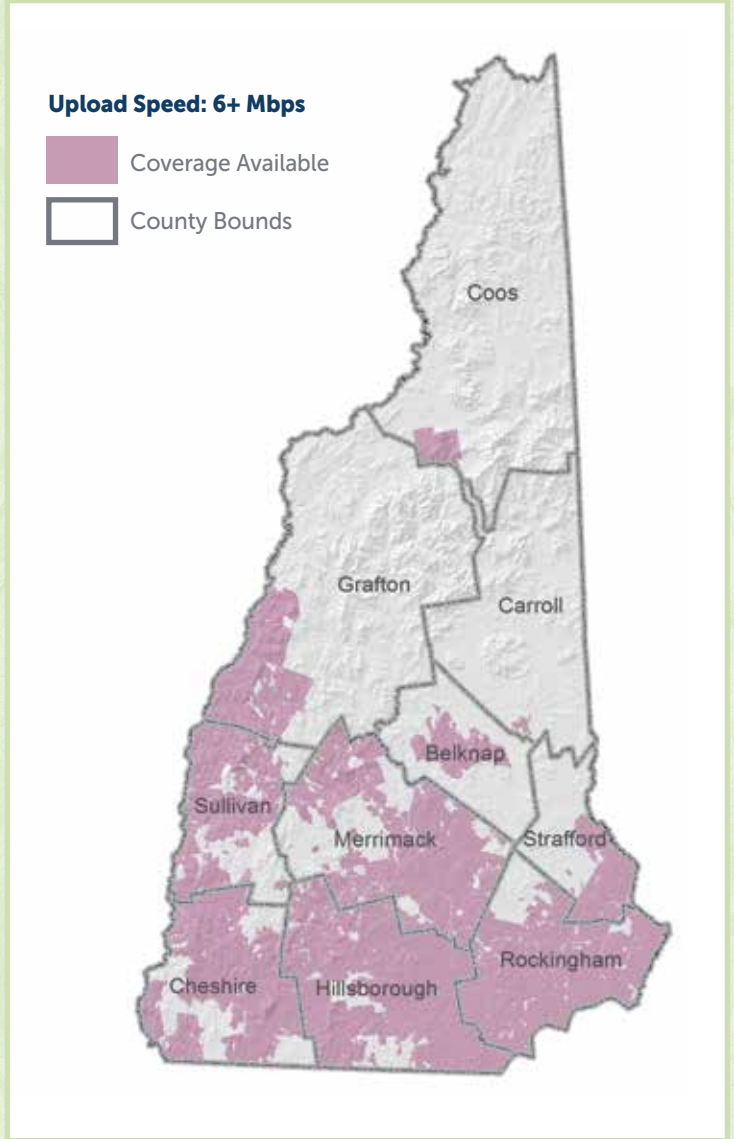
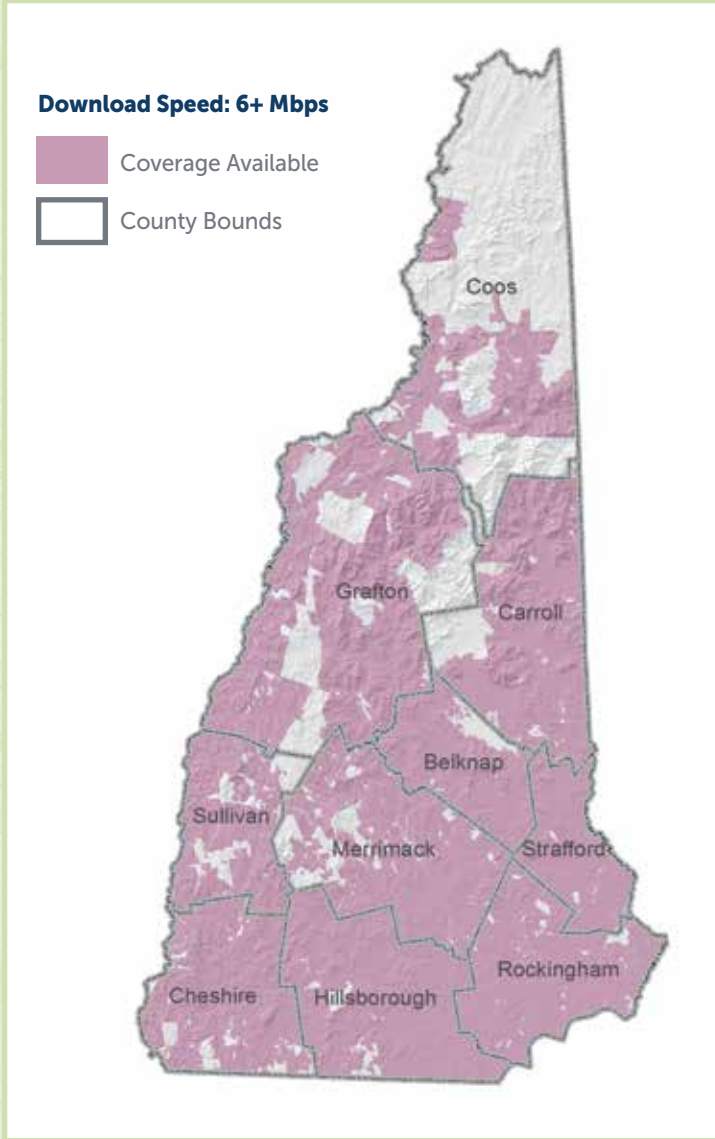
When the New Hampshire Broadband Mapping & Planning Program (NHBMPP) began, NTIA defined broadband as providing minimum speeds of 768 Kbps download and 200 Kbps upload; however, in order to use many Internet applications successfully, much faster download speeds are required. As Internet technology and applications continue to advance, faster speeds will be needed to operate successful businesses, take advantage of relevant education, and provide quality health care. “While basic broadband service—which we define as advertised speeds of 3 Mbps download and 768 kbps upload—is often adequate for sending and receiving e-mail and other services, more of today’s applications, such as video streaming, require much faster speeds.”⁵⁷

The NHBMPP developed the following matrix to assist in understanding the typical functions a user might be able to perform within a range of download and upload speed tiers. Using these tiers, the NHBMPP has established broadband availability categories (“unserved,” “underserved,” and “served”) to describe access to broadband service. “Unserved” means you have slow download and upload speeds that are inadequate for most uses other than sending or receiving simple text e-mails. “Underserved” means that you have moderate download and upload speeds sufficient for e-mail, social media applications, and web browsing, but speeds may be limited when streaming content, participating in online gaming, or transferring files over the Internet. “Served” means you have faster download and upload speeds sufficient for a wide range of web browsing, e-mail use, social media, HD-quality video conferencing, telehealth/telemedicine, and file sharing. As speeds increase in this range, capabilities increase for gaming, streaming video, the simultaneous use of multiple devices, and sending and receiving large files and documents.

In August 2014, the U.S. Federal Communications Commission (FCC) proposed changing how it measures high-speed Internet to potentially require download speeds of 10 megabits per second (Mbps) or higher for a service to qualify as broadband. U.S. consumers are increasingly using the Internet to stream music and videos, make calls, or use other services that continue to demand faster speeds. For instance, Netflix recommends a 5 Mbps Internet

APPENDIX B: WHAT IS BROADBAND?

State of New Hampshire Broadband Availability at 6+ Mbps



Based on data submitted by broadband providers as of March 31, 2014.

connection speed to stream video in high definition. The FCC’s recent assessments suggested a 10 Mbps download bandwidth benchmark could satisfy moderate but not high Internet use by a household of three.⁵⁸

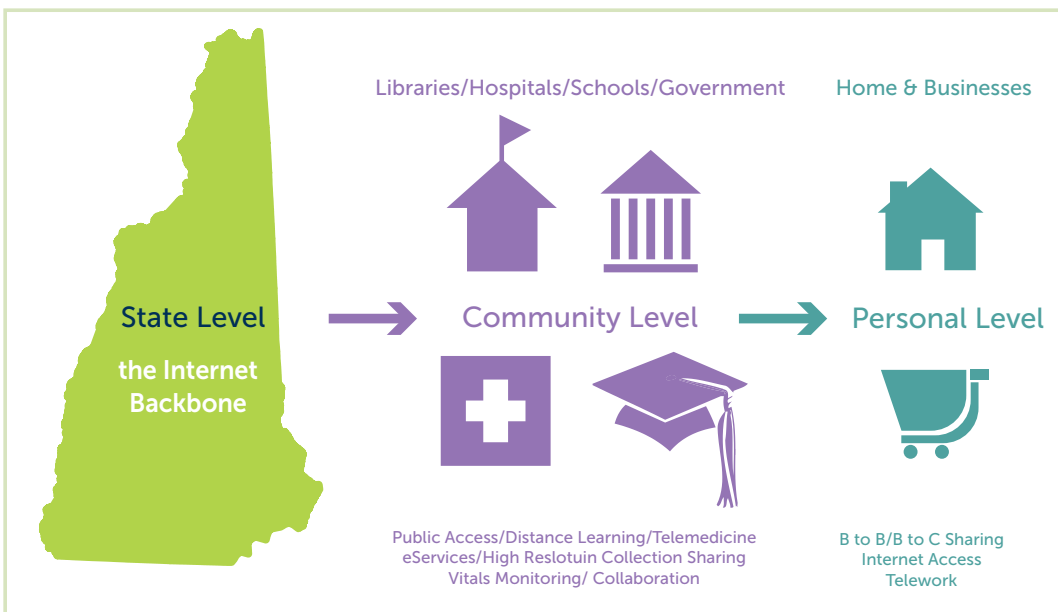
How Is Broadband Delivered?

Broadband infrastructure generally consists of three segments called backbone, middle mile, and last mile.

The Internet “backbone” refers to the main trunk “super highway” connections of the Internet. It is made up of a large collection of interconnected commercial, government, academic, and other high-capacity data routes and routing devices that carry data across the U.S. and the rest of the world. Optical fiber is what actually carries the enormous amounts of data that make up the voice, video, and data communications that are global communications today. From Tokyo to London and across the USA, it is fiber optic networks that deliver the capacity and reliability every network relies on,⁵⁹ including most wireless networks.

A “middle mile” network is broadband infrastructure that provides relatively fast, large-capacity connections between backbone facilities—long-distance, high-speed transmission paths for transporting massive quantities of data—and last-mile projects. It may include interoffice transport, **backhaul**⁶⁰, Internet connectivity, or special access. In other words, the middle mile network is an extension of the Internet backbone that connects last-mile providers (Internet service providers) who ultimately serve the residents, businesses, and governments in our region, to the rest of the world. The middle mile network is typically connected to multiple “access points” along the Internet backbone routes.⁶¹

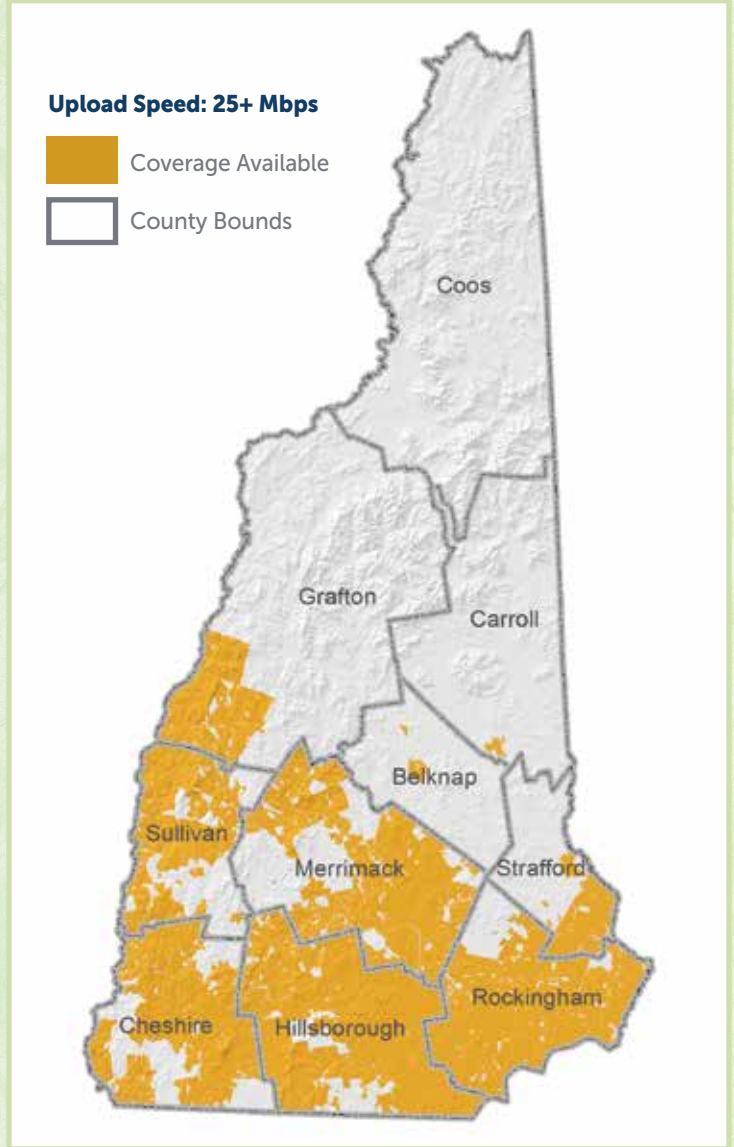
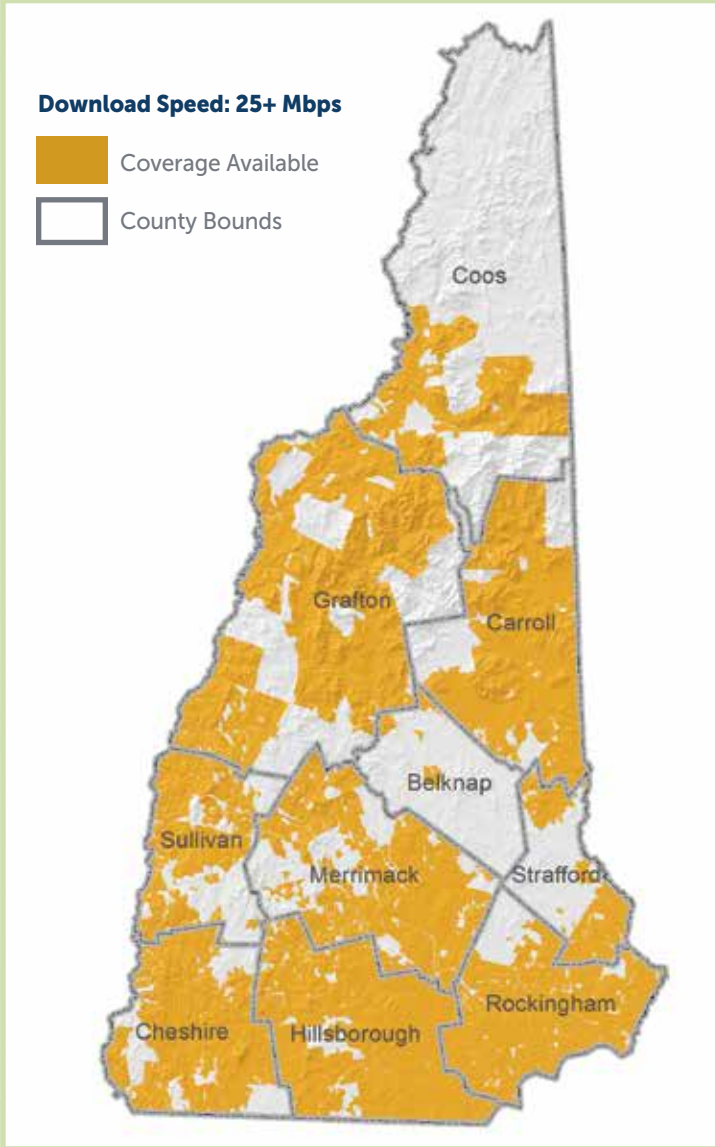
In order to transport the Internet to homes and businesses—the “last mile”—it can be most cost-effective to increase the reach of the middle mile through community anchor institutions. Community anchor institutions are schools, libraries, hospitals and other medical providers, public safety entities, institutions of higher education, and community support organizations



Modified from: <http://www.whitehouse.gov/sites/default/files/20091217-recovery-act-investments-broadband.pdf>

APPENDIX B: WHAT IS BROADBAND?

State of New Hampshire Broadband Availability at 25+ Mbps



Based on data submitted by broadband providers as of March 31, 2014.

that have the means and capacity to access broadband-based services. The majority of home and small business users rely on the last-mile hosts, Internet service providers (ISPs), to obtain broadband services.

Broadband service is delivered to customers using many different technologies, which can be separated into two major categories—wired and wireless—and can complement each other to create available broadband Internet connections.

Wired

Wired technologies include digital subscriber lines (DSL), cable modem, fiber optics, leased lines (T1), and broadband over power lines (BPL). These technologies bring a wire connection to the home or business. Wireless technologies include mobile wireless (or cellular), Wi-Fi, satellite, and wireless Internet service providers (WISPs).⁶² Another method of wireless broadband delivery uses TV “white space.” White spaces are radio frequencies that went unused after the federally mandated transformation of analog TV signal to digital. Television networks leave gaps between channels for buffering purposes, and this space in the wireless spectrum is similar to what is used for 4G (short for fourth generation of mobile telecommunications technology), so it can be used to deliver widespread broadband Internet.⁶³

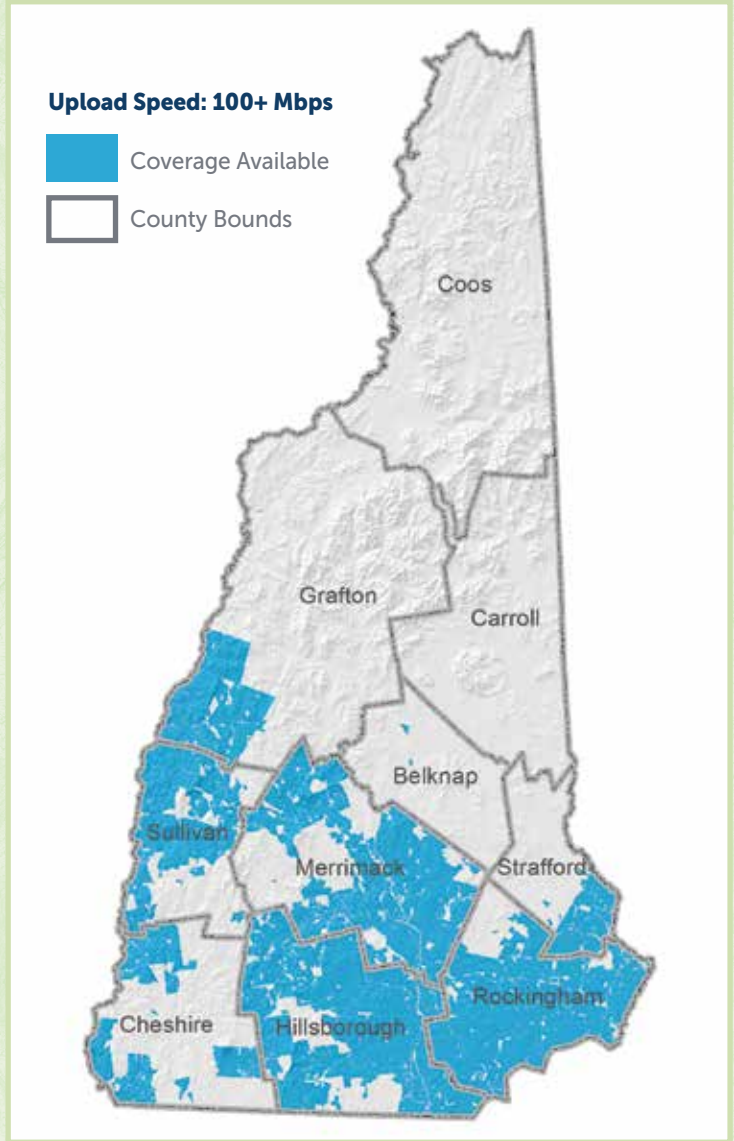
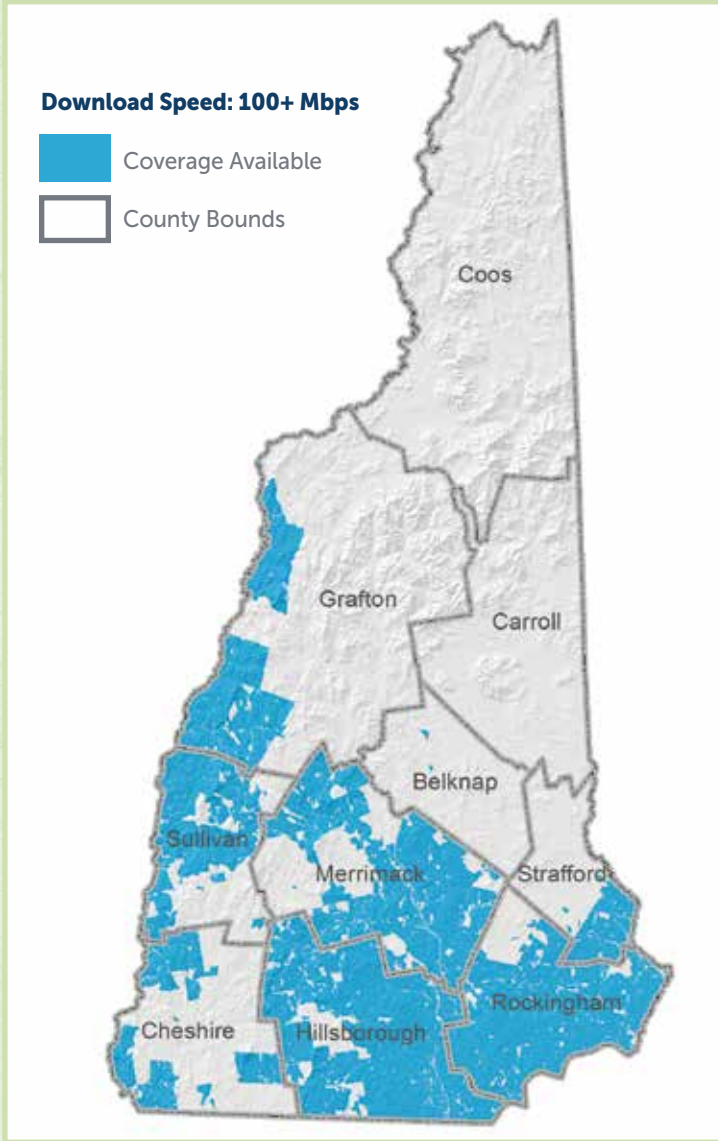
Digital subscriber lines (DSL) and cable modem are wired technologies commonly used by residential users and small businesses. DSL uses copper phone lines to deliver direct, one-on-one connections to the Internet, eliminating the need to share bandwidth with neighbors. Users must be located within 18,000 feet (3.4 miles) of a phone company’s central office, which means service is often unavailable in rural areas.⁶⁴ The most common DSL connections are asymmetric, with networks offering more bandwidth and faster speeds for download compared to upload, since residential users are predominately downloading more information from the Internet than uploading. Symmetric types of DSL provide equal bandwidth for uploading and downloading speeds, and are sometimes marketed as “business DSL,” as companies often have greater needs for uploading, or transmitting data.

Cable modem, which is typically faster than a common asymmetric DSL connection, uses the cable network to deliver broadband to users. Cable networks are a shared connection, so access speeds may slow during peak usage times due to congestion when people in the same neighborhood are online. Fiber optic systems use lasers across very thin strands of glass, creating reliable, resilient technology that has an extremely high capacity for speeds and data transmission. There is a high cost associated with laying out the fiber network, but once in place the system can be easily upgraded and maintained, with lower operating costs than DSL, cable, or wireless networks.⁶⁵ Building out the fiber network is currently the most effective means of providing the highest capacity broadband Internet.

Broadband over power lines (BPL) is an emerging technology in the competitive world of broadband Internet service. It offers high-speed Internet access through a common electrical outlet. With BPL, a computer can be plugged into any electrical outlet and instantly have access to high-speed Internet. By combining the technological principles of radio, wireless networking, and modems, developers have created a way to send data over power lines and into homes at speeds between 500 kilobits and 3 megabits per second. BPL is already being tested in several cities around the United States and the United Kingdom.⁶⁶

APPENDIX B: WHAT IS BROADBAND?

State of New Hampshire Broadband Availability at 100+ Mbps



Based on data submitted by broadband providers as of March 31, 2014.

Wireless

Unlike wired technologies, which bring wires directly to a location, wireless technologies use radio frequencies through transmitters and receivers to deliver broadband. Wireless broadband can be categorized as wireless networks or satellite. Cell phones and other mobile devices use mobile wireless licensed technologies such as 3G, 4G, LTE, WiMax, and other networks. Wi-Fi, or “hotspots,” are designed to broadcast the Internet for several hundred feet. They are used by public and private networks, including businesses for their employees or retailers for their customers, who connect to the Internet using built-in Wi-Fi cards in their mobile devices (e.g., laptops, tablets, cell phones, etc.).

Wireless Internet service providers (WISPs) use point-to-multipoint networks to broadcast wireless data up to 20 miles. A signal is broadcast from a base station and is received by a fixed wireless antenna mounted on a customer’s premises. A combination of a WISP and a Wi-Fi hotspot can enable a neighborhood Internet service provider (NISP) or a Wi-Fi “hot-zone” covering an area such as a neighborhood, a shopping mall, or a campground.⁶⁷ WISP networks can provide last-mile solutions and broadband availability to rural areas where it is often cost-prohibitive to build wired networks.

Satellite Internet service is provided through the same small dishes used to deliver video services such as DirecTV and Dish Network. Users send and receive information to the Internet via a satellite dish to a receiver on a satellite in space. The satellite retransmits the signal to and from the network operation center that is connected to the Internet. Satellite broadband service is available to nearly any location in the United States that has a clear view of the southern sky.⁶⁸

“Wireless Internet providers often impose data caps that discourage subscribers from using certain applications, most notably streaming video. These are generally business decisions, not technical limitations. Nonetheless, they are a reason wireless is not replacing wireline connections at home. Exceeding data caps results in overages or interruptions in service that make wireless alone an expensive solution for businesses that regularly transfer large amounts of data. Wireless providers justify data caps as a means of managing congestion, but consumer advocate groups argue [that] the real motivation is maximizing revenue. An analogy is trying to manage rush-hour traffic jams by limiting how many miles one can drive per month.”⁶⁹

Asymmetrical vs. Symmetrical Circuits

For many users, uploading (sending) files is quite a bit slower than downloading (receiving) files. This is because most high-speed Internet connections, including cable modems and DSL, are asymmetric—they were designed to provide much faster speed for downloading than uploading. Since many users spend much more time downloading (which includes viewing web pages or multimedia files) than they do uploading, high-speed Internet providers have designed their systems to give priority to downloading.⁷⁰

However, many of today’s applications work best with symmetrical circuits. Symmetrical means that the upload speed is the same as the download speed. As applications like high-definition videoconferencing and those that back up large databases to the Cloud become more prevalent, the need for symmetrical circuits will increase.

“A symmetrical service of a minimum of 10 Mbps per household should be the baseline for broadband offerings to all Americans,” according to Rouzbeh Yassini, UNH Broadband Center of Excellence (BCOE). “Today’s two-way utilization requirements have rendered the use of asymmetrical broadband connections unacceptable.”⁷¹

BROADBAND PLANNING IN NEW HAMPSHIRE

The New Hampshire Broadband Mapping & Planning Program (NHBMPP)⁷² is a comprehensive initiative that began in 2010 with the goal of understanding where broadband is currently available in the state, how it can be made more widely available in the future, and how to encourage increased levels of broadband adoption and usage.

It is an American Recovery and Reinvestment Act of 2009 (ARRA) project funded by a National Telecommunications and Information Administration (NTIA) State Broadband Initiative (SBI) grant to improve broadband access and use in the state by assessing broadband availability, and by engaging communities and other stakeholders in conducting planning, capacity building, technical assistance, and training initiatives.

The NHBMPP is comprised of several components, including a broadband availability inventory and mapping effort as well as a suite of technical assistance and planning initiatives. Following are brief descriptions of these components.

Inventory and Mapping

In 2010, the New Hampshire Geographically Referenced Analysis and Information Transfer System (NH GRANIT), the Regional Planning Commissions (RPCs), and other partners began an inventory and mapping effort aimed at better understanding and monitoring the current availability of broadband throughout the state. The mapping program encompasses a number of activities, including:

- Collecting data semiannually from public and commercial entities that provide broadband services in New Hampshire on the location, type, and speed of broadband technology available;
- Refining the information collected on broadband availability via a series of verification efforts, including map verification with community collaborators, online speed tests and user surveys, a statewide cell phone reception study, and other related activities;
- Surveying and mapping broadband availability at community anchor institutions (CAIs) such as schools, libraries, hospitals, public safety facilities, and municipal buildings;
- Developing the first public master address file of households located in rural census blocks;
- Collecting and hosting a statewide inventory of cable franchise agreements (CFAs); and
- Sharing information and data on broadband availability with the National Telecommunications and Information Administration (NTIA) and the Federal Communications Commission (FCC) on a semiannual basis for inclusion in the National Broadband Map.

Technical Assistance and Training

University of New Hampshire (UNH) Cooperative Extension took the lead in developing and administering technical assistance and training opportunities to help businesses, local governments, organizations, and individuals better understand the importance of and applications for broadband in today's world. The activities undertaken by the UNH Cooperative Extension through the NHBMPP include:

- Assessing the broadband training and technical needs of stakeholder groups including educational institutions, small businesses, municipalities, health-care providers, and organizations to determine topics stakeholders would like to receive training on, and functions/applications that would be of use to them;
- Developing tools and learning modules on topics related to broadband utilization and adoption;
- Delivering workshops, training, and technical assistance to broadband stakeholder groups to support increased broadband adoption and use; and
- Developing learning modules to improve broadband access and use in the state by assessing broadband availability and by engaging communities and other stakeholders in conducting planning, capacity building, technical assistance, and training initiatives.

Capacity Building

A third component of the NHBMPP, capacity building is focused on the development of tools and resources necessary to implement broadband expansion projects within communities and regions across the state. The New Hampshire Department of Resources and Economic Development (DRED), UNH Cooperative Extension, and UNH Information Technology (UNHIT) are working together to enhance broadband knowledge and develop community resources by:

- Establishing best practices in policy management, financial resources, and advocacy for business and residential broadband;
- Tracking and reviewing legislation related to broadband and telecommunications;
- Working with the New Hampshire Telecommunications Planning and Development Advisory Committee (formerly the Telecommunications Advisory Board and still commonly referred to as TAB) to analyze and assess the state's broadband infrastructure and promote access to affordable and reliable advanced telecommunications services;
- Researching successful community broadband solutions and funding options and aggregating them into a toolkit for New Hampshire; and
- Establishing a Resource Team that will work with the RPCs and regional stakeholders to identify communities ready to initiate their broadband plans and provide them with assistance for community broadband decision making.

Planning

In 2010, NHBMPP partners engaged in a five-year effort aimed at incorporating the information and momentum gained during the mapping activities to better understand current broadband availability in New Hampshire and plan for increased broadband adoption and utilization through outreach, community engagement, and surveying activities .

As part of an effort to gain a better understanding of broadband at the regional level, each RPC developed a Broadband Stakeholder Group (BSG) comprised of individuals representing a wide range of sectors. The quarterly BSG meetings played a vital role in assisting RPCs to assess the need for improved broadband capability, availability, and affordability. The BSGs helped the RPCs develop a list of broadband needs and barriers to broadband adoption and utilization.

A major undertaking of the broadband planning component was a sector-based analysis. This activity involved developing and facilitating focus group meetings, conducting structured interviews, and utilizing other methods to identify sector-specific broadband needs and challenges for the following six sectors:

- Education (K–12; higher education; community/continuing education; museums; science centers);
- Health care (hospitals; doctors' offices; clinics; nursing/residential care facilities; human service agencies; laboratory services; home care services; adult day care);
- Community support/government (local and state government and administrative services; libraries; community centers; land trusts/open space);
- Public safety (fire; police; emergency management; mutual aid);
- Economic development/business (chambers of commerce; economic development corporations; travel and tourism; recreation; food and agriculture; arts and culture; media; commercial real estate; ISPs/telecom; banking/finance; industry); and
- Residential/consumers (homeowners; households; residential real estate; home business).

Additionally, each RPC held broader public forums throughout the course of the project. These forums were an opportunity to share information regarding ongoing broadband efforts in the region and progress of the NHBMPP, and to receive feedback from community members regarding broadband availability.

NHBMPP sector identification

The six sectors were identified by NHBMPP project directors based on guidance from the Federal Communications Commission (FCC) and the NTIA.

The FCC has a statutory obligation to ensure that schools, libraries, and health-care providers have access to advanced telecommunications and information services. In the USF/ICC Transformation Order, the Commission established a performance goal of ensuring "universal availability of modern networks capable of delivering broadband and voice services...to community anchor institutions." Community anchor institutions are defined by the Order to include such entities as schools, libraries, hospitals and other medical providers, public safety entities, institutions of higher education, and community support organizations that facilitate greater use of broadband by vulnerable populations, including low-income, the unemployed, and the aged.

Launched in 2009, NTIA's State Broadband Initiative implements the joint purposes of the American Recovery and Reinvestment Act of 2009 and the Broadband Data Improvement Act, which envisioned a comprehensive program, led by state entities or nonprofit organizations working at their direction, to facilitate the integration of broadband and information technology into state and local economies. Economic development, energy efficiency, and advances in education and health care rely not only on broadband infrastructure, but also on the knowledge and tools to leverage that infrastructure.

BROADBAND AUTHORITIES IN NEW ENGLAND

CT — **Connecticut Broadband Internet Coordinating Council**⁷³. Section 4d-100, the statutory provision establishing the Connecticut Broadband Internet Coordinating Council, was repealed effective July 1, 2011, by section 140 of Public Act 11-80. The CBICC has ceased operations if and until it is reinstated.

ME — **ConnectMe Authority**⁷⁴ was established in 2009 as a unit of state government. It includes a five-member board with an executive director and associate executive director, and is assisted by the state Office of Information Technology. It also works with an advisory council. Its goal is to facilitate universal availability of broadband and help citizens understand its value.

MA — **Massachusetts Broadband Institute (MBI)**⁷⁵. Its mission is to expand affordable high-speed Internet or broadband access across the state. The MBI, a division of the Massachusetts Technology Collaborative, was created in 2008 with the authority to invest up to \$40 million in state capital funding for broadband-related infrastructure and improvement projects through the Broadband Act. The MBI works closely with municipalities, broadband service providers, and other key stakeholders to create new economic opportunities and bridge the digital divide in Massachusetts.

NH — New Hampshire does not currently have a broadband authority and should establish one to: 1) be responsible for developing and advancing the state's strategic broadband plan; 2) continue to collect data and map broadband use; and 3) seek funding to support infrastructure expansion, as recommended in this report. New Hampshire does have a **Telecommunications Advisory Board (TAB)**⁷⁶, established by the state legislature in 2000. TAB is currently tasked with advising and assisting the Director of Broadband Technology at the Division of Economic Development to analyze and assess the State of New Hampshire's broadband infrastructure and needs to promote access to affordable and reliable advanced telecommunications services.

RI — **RI Department of Digital Excellence**⁷⁷ works to create new opportunities by expanding broadband use and digital literacy across Rhode Island.

VT — **Vermont Telecommunications Authority**⁷⁸ was established by the Vermont General Assembly in June 2007 (**Act 79**)⁷⁹ with the mission to ensure that residences and businesses in all regions of the state have access to affordable broadband, mobile voice, and data communications. During the 2011–2012 legislative session, the legislature created **Act 53**⁸⁰, which reconfigured the board of directors and amended the "Purposes, Powers and Duties" section of the 2007 Act. The VTA is focused on unserved and underserved areas and the overall long-term goal of broadband and mobile phone infrastructure throughout the state.



HOW IS BROADBAND REGULATED IN NEW HAMPSHIRE?

Telecommunications

Telecommunications law is shaped by a mix of federal, state, and local laws and regulations, and a developing body of case law. The federal Telecommunications Act of 1996 (TCA) was the first major overhaul of communications law in over 60 years, amending the Communications Act of 1934. The goal of the law was to ensure that all communication businesses are allowed to compete with each other in any market and to promote such competition. Broadly, the Act preempts all state and local laws that would prohibit or have the effect of prohibiting an entity from providing telecommunications services. The TCA sets boundaries for local land-use decisions on wireless tower applications and for management of public rights-of-way. The Act also creates separate regulatory tracks for cable and telecommunications—the telephone industry, not broadband per se, but there are implications for broadband since much of the infrastructure necessary for the provision of broadband overlaps with telecommunications, cable, and, increasingly, wireless facilities.

FCC Determines Broadband Is an Information Service, Not Telecommunication

The Federal Communications Commission (FCC) regulates interstate and international communications by radio, television, wire, satellite, and cable. As an independent U.S. government agency overseen by Congress, the FCC is the United States' primary independent authority for communications law, regulation, and technological innovation. In 2004, the FCC ruled that broadband service is classified as an information service under Title II of the TCA, not a telecommunication service, subject only to the jurisdiction of the FCC and preempting federal, state, and local government from regulating the industry. As long as ISPs are classified as information service providers, not telecommunication service providers, there is no broad regulation of the industry.

Should broadband be regulated as a public utility?

At the time of this document's preparation, there is continuing and active debate on the question of whether broadband should be considered a public utility. If broadband is reclassified as a public utility, Internet service providers (ISPs) would be subject to stricter and more comprehensive regulations. Many consumer advocacy groups, public entities, and some private Internet companies believe that doing so would help protect consumer rights and contain prices on Internet content and services. Others disagree and feel that ISPs should be regulated via antitrust and consumer protection laws only, arguing that a minimal regulatory framework fosters investment and innovation in the rapidly changing broadband market.

Management of Public Rights-of-Way

The TCA sets the boundaries for state and local laws regarding telecommunications services, including management of public property, zoning, and permitting. The Act preserves for communities all state and local laws that involve the management of local rights-of-way and laws that require telecommunications providers to pay taxes and compensation for use of local rights-of-way, as long as the laws are nondiscriminatory and compensation is fair, reasonable, and competitively neutral. In New Hampshire, RSA 231:160 allows placement of poles and conduits in the public right-of-way only as permitted or licensed by the municipality, and not otherwise. However, if a local land-use board approves locations of such facilities as part of the approval of a development, and if the locations of the facilities are provided to the municipality to record, they are deemed legally licensed (RSA 231:160-a). The statute also allows changes to any licenses, upon petition and hearing, whenever "the public good requires" (RSA 231:163).

The interpretation of the law regarding the extent of regulation and compensation allowable is evolving. Regarding taxation for use of the public right-of-way, RSA 72:23 requires that agreements with private entities to use public real estate include the requirement that the user

Quick Tips: Rights-of-Way

Municipalities manage public rights-of-way and are permitted to collect compensation from all companies for private use of a public asset. Action items for municipalities include:

- Inventory all existing licensing permits and occupants of rights-of-way for the purposes for property tax calculations under RSA 72:23;
- Review all licenses and permits or agreements and consider globally amending them to impose property tax in "the public good," and obtain information on other users (attachers) to poles and conduits;
- Amend cable TV franchise agreements to require payment of taxes; and
- Consider requiring installation of municipal conduit for broadband within public rights-of-way, at the same time that sewer and water infrastructure systems are placed, for future use.

pay property taxes. A line of cases, beginning with *New England Telephone and Telegraph Co. v. City of Rochester*, 144 NH 118 (1999), known as "Rochester I," has established that 1) this requirement for payment of property taxes when a private party uses public property covers pole and conduit licenses issued by municipalities; and 2) municipalities may universally amend those licenses to require payment of property taxes as being in "the public good." Following that case were two additional cases in which the telephone company claimed that its rights to equal protection under the law had been violated because it was singled out as the only user of the public rights-of-way to be taxed: *Verizon New England, Inc. v. City of Rochester*, 156 NH 263 (2004)—"Rochester II"—and *Verizon New England, Inc. v. City of Rochester*, 156 NH 624 (2008), called "Rochester III."

In the past few years, the number of cases in which the telephone company, now FairPoint, has challenged municipal taxation for its use of the public rights-of-way has increased.

Pole Attachments

Pole attachments are governed by Section 224 of the Communications Act of 1934 (47 U.S.C. 224), RSA 374:34-a (the New Hampshire Public Utilities Commission [PUC] has jurisdiction to regulate pole attachments), and New Hampshire Code of Administrative Rules, PUC 1300. Originally enacted to address issues related to cable TV companies seeking access to utility poles, the laws and regulations on pole attachments have evolved to address an era in which there is competition for limited space on poles or in conduits, and an increasing number of competitive telephone companies and Internet service providers vying for that space. Pole owners understandably do not want to shoulder the cost of erecting bigger poles or laying additional conduit, so the costs must instead be paid by the new attachers. This can require existing attachers to move their facilities, or to erect new poles, with the costs associated with such work being absorbed by the attachers (i.e., “make-ready”).

Those current laws and rules require:

- A utility pole owner shall provide a cable television system or any telecommunications carrier with nondiscriminatory access to any pole, duct, conduit, or right-of-way owned or controlled by it (47 CFR Sec 1.1403(a); PUC 1303); and
- NH PUC regulations control the rates, terms, and conditions of attachments to poles and conduits. Private negotiations for such attachments occur in the context of a tariff-based regulatory regime. NH Code of Administrative Rules, PUC 1300. NH PUC rules follow the 2007 FCC formula for pole attachment fees.

Recently, sweeping FCC revisions to pole attachment rate formulas and regulations were ordered to ensure that attachers to poles have fair and rationally priced access to utility poles.⁸¹ At present, those revisions are not applicable to New Hampshire, where the PUC is developing its own body of decisions applying New Hampshire pole attachment rules in a variety of contexts. Importantly, attachers with facilities already on poles may over-lash new facilities on existing wire or cable without any make-ready, delay, or additional pole attachment costs.

Zoning and Permitting of Wireless Telecommunications Facilities

Local zoning laws are preserved under the TCA for new wireless towers; however, new state and federal laws now in effect do not preserve such authority for new antennae on existing towers, base stations, or other structures capable of supporting them.

The TCA provides local land-use boards in New Hampshire and across the country with a framework for their review of applications for personal wireless communications facilities

Zoning of Personal Wireless Telecommunications Services

Municipalities have the power to enact zoning regulating the placement of personal wireless service facilities within the boundaries of the municipality. It is recommended that municipalities be proactive about this and carefully assess where and how these facilities should be sited. Once the municipality establishes favorable locations, the municipality should establish a hierarchy of siting values so that the siting most favored by the municipality is the easiest siting for the wireless applicant to obtain.

(PWCFs, or commonly called “cell towers” or “wireless towers”). All decisions must be made within the context of the limitations and requirements of the federal law. The TCA sets the following general requirements for local land-use boards when reviewing PWCF applications for new towers:

- Timeliness in rendering of decisions;
- Basing denials of applications on “substantial evidence” in a written record; and
- Not prohibiting the regulations of wireless antennae or towers due to environmental effects of radio frequency emissions.

The TCA also requires that boards: may not “unreasonably discriminate” among “providers of functionally equivalent services”; a board’s decision cannot “prohibit or have the effect of prohibiting” the provisions of personal wireless services; and boards must act “within a reasonable period.” The FCC issued an order in 2009 to add the so-called “shot clock” requiring that decisions must be made within 150 days on applications for construction of new wireless towers.

Quick Tips: Cable Franchise Agreements

Develop a negotiating agenda for renewal of cable franchise agreements as part of comprehensive telecommunications planning:

- Inventory existing obligations of franchise agreement and determine compliance;
- Ascertain future cable-related needs and interest of community;
- Negotiate renewal to meet needs of larger telecommunications planning goals; and
- Monitor cable operator’s compliance with new franchise obligations.

In the last five years, there have been shifts in federal and state laws that affect how local land-use boards review PWCF applications. Executive Order 13616 in 2012⁸² created a federal initiative to streamline procedures, requirements, and policy across agencies to promote faster deployment of broadband infrastructure. A new federal law, described as part of the “Co-Location as of Right,” requires local approval of eligible facilities requests, defined as:

- Co-locating new antennae on any existing tower or base station; and
- Modifications of an existing wireless tower or base station that are not “substantial.”

New Hampshire has adopted the policy of facilitating the deployment of broadband infrastructure and goes further than the federal requirements. New Hampshire law allows by building permit only placing new wireless facilities on existing towers or mounts, including water and transmission towers as well as any existing building or structure that can support such installation. The New Hampshire statute regulating personal wireless service facilities (PWSFs) RSA 12-K, states that carriers wishing to build PWSFs in the state should consider commercially available alternatives to tall cellular towers. The alternatives are:

- Lower antenna mounts that do not protrude far above surrounding trees’ canopies;
- Disguised PWSFs such as flagpoles, artificial tree poles, light poles, etc., that blend with the surroundings;
- Camouflaged PWSFs mounted on existing structures and buildings;
- Custom-designed PWSFs to minimize visual impact; and/or
- Other available technologies.

Recent Changes: RSA 12-K and §6409 of Federal Spectrum Act

As discussed above, federal policy and law changes also led to changes at the state level to facilitate deployment of broadband infrastructure quickly and efficiently. The New Hampshire law regarding wireless facilities, RSA 12-K: Deployment of Personal Wireless Service Facilities, was amended in 2013 to incorporate and extend the federal changes. The following types of applications can be reviewed for compliance with building permit requirements, but are not subject to local land-use review, zoning, or land-use requirements, including design or public-hearing review:

- Co-location applications, for placing new PWSFs on existing towers or mounts, *including* electrical transmission towers, water towers, existing buildings, and “structures capable of structurally supporting the attachment of PWSFs in compliance with applicable codes”; and
- Modifications of existing equipment compounds or mounts that are not “substantial.”

Under RSA 12-K, the definition of “substantial” is an increase of 10% of the vertical height of the tower or mount, or 20 feet, whichever is greater. Municipalities have a 45-day timeline to review the application, make a final decision, and communicate with the applicant. RSA 12-K law affirms and goes beyond the requirements of the FCC “shot clock” order, and, if the municipality does not act on the application within the 45-day time frame, the application is deemed approved. If additional information is required, it must be requested within 15 days,

Quick Tips: Wireless Antennae and Facilities

The TCA and RSA 12-K outline the boundaries for local municipalities and land-use boards when considering applications for personal wireless service facilities.

- Cell tower and antenna applications have different requirements than other applications seeking zoning board or planning board approvals.
- For co-location and modification applications for adding antennae that do not amount to “substantial” modifications, the applications should only be reviewed for compliance with building permit requirements. The zoning board of appeals (ZBA) and planning board have no jurisdiction, and zoning does not apply.
- Create a specialty form for cell tower and antenna applications. The NH Office of Energy and Planning offers resources and sample forms available at: <http://www.nh.gov/oep/planning/resources/wireless/introduction.htm>
- The time for determining application completeness is 15 days for co-location and modification applications and 30 days for applications for new tower facilities or “substantial modifications.”
- Time for acting on application: 45 days for co-location; 150 days for application for new tower or facility, or for a “substantial modification.”
- Create a checklist to determine completeness of applications; keep track of deadlines.
- Appoint a “quarterback” or person to help the municipality and its boards stay on track with timelines for different types of applications.

and if so, the applicant has the right to correct the deficiencies and the timeline is extended. The decision on whether the application is exempt may be appealed to the zoning board of appeals.

It is important for local boards to move quickly on applications for co-location or modifications that are not considered substantial. Within 15 days the board must determine the completeness of the application, exemption status, and whether more information is needed from the applicant. The changes to RSA 12-K reflect a new balance between public policy promoting local planning and decision making with public policy promoting accelerated access to broadband.

Cable TV Services

A cable franchise is an essential element of the municipality's telecommunications infrastructure. Video, telephone, and Internet services are all provided by cable TV companies.

One of the strategic benefits of a cable franchise renewal can be to include extension of the cable TV system, and hence access to the Internet for businesses and residents within the municipality. The Federal Communications Commission (FCC) has ruled that Internet services are not covered in the definition of "cable services." However, because of the business model of cable operators, the practical effect of enhancing the cable TV system's coverage in a municipality also increases the availability of Internet services since they are delivered over the same facilities.

The cable franchise renewal process involves looking backward at the cable TV operator's compliance with the specific terms of the current franchise agreement. Even if it has passed its expiration date, cable TV companies will continue to provide services pursuant to an expired franchise agreement, unless and until 1) the franchise is renewed, or 2) the municipality denies renewal of the franchise, an extremely difficult thing to do, which requires building a record for denial that would be successfully reviewed by a federal court. The renewal process also involves looking forward to identify the future cable TV (not Internet) needs and interests of the community. Both tasks must be done comprehensively to provide communities with the most available leverage in their negotiations with cable companies. By way of example, if the cable operator is not in compliance with a specific element of the franchise agreement, it may be willing to provide benefits to the municipality, without cost, to resolve the noncompliance. As another example, if there is strong community support for extension of the cable system to reach new areas, the cable company may be willing to absorb some of the cost.

The renewal of a cable TV franchise should be based on:

- Cable operator substantially complying with the terms of the existing franchise;
Quality of the operator's service, including signal quality, response to consumer complaints, billing practices;
- The operator has the financial, legal, and technical ability to provide the services, facilities, and equipment as set forth in the operator's proposal for renewal;
- The operator's proposal is reasonable to meet the future cable-related community needs and interests, taking into account the cost of meeting those needs and interests; and
- Length of agreement should relate to the satisfaction with the proposal; for example, negotiate a shorter-length agreement if municipality is not satisfied with terms proposed by the cable company.

Recent Legislative Activity

Bonding for Broadband Infrastructure: HB286 (2014 Legislative Session)

Municipal bonds are a typical funding source for municipalities to finance capital projects such as building schools, sewer systems, and other large infrastructure projects. Currently in New Hampshire, the majority of broadband infrastructure is financed by private-sector broadband service providers. There are gap areas across the state where there is no service or inadequate coverage and commercial broadband providers are unable or unwilling to invest. One of the potential options for providing better broadband coverage is to allow a municipality to bond for broadband infrastructure projects to fill those gaps.

In early 2014, the New Hampshire legislature considered a bill that would broaden the ability of municipalities to bond for broadband infrastructure projects. House Bill 286 (HB286) amends language that allows municipalities to bond for broadband projects for any areas that are without “adequate” coverage, removing the more restrictive language that currently allows bonding only for broadband infrastructure under strict criteria that apply to just a fraction of the state. The bill states that governments are only allowed to build the infrastructure or equipment, such as cables, needed to deliver broadband. Municipalities cannot *provide* broadband service. The bill has supporters and also vocal opponents. After the House passed the bill, the Senate sent it to interim study at its last action on May 15, 2014. The bill may be reintroduced in the next session.⁸³

Assessment Districts: HB1458 (2014 Legislative Session)

- HB 1458 would allow a municipality to establish a special assessment district in the name of economic development that could be used for broadband expansion.
- The bill would allow a governing body to draw up the district, though a majority from the designated area would still have to approve any spending.
- The House sent this bill to interim study, but it may be reintroduced in the next session.

Competitive Cable TV Franchises: SB 344 (2014 Legislative Session)

SB 344 would have ended a requirement in RSA 53-C:3,b that currently ensures that competitive cable TV franchises be no “more favorable or less burdensome” than the franchise agreement of an incumbent cable operator in the same municipality. Existing law protects incumbent cable operators from competition from a new entrant seeking market share. The practical effect of the legislation would be to enhance competition, which could have positive impacts for consumers.

SB 344 was opposed by incumbent cable TV companies (Comcast, Time Warner Cable, etc.). It was sent to interim study in March 2014, effectively killing the bill for the last session, but it may be reintroduced in the new session.

In summary, municipalities should have a practical agenda for addressing their telecommunications infrastructure needs within the regulatory framework. This involves an iterative process of assessing needs, planning, executing on plans, and reviewing implementation as part of a new round of assessing, planning, and acting. It will benefit communities to be proactive, to create master plans and zoning ordinances that put broadband infrastructure at the center of municipal goals and decisions. Zoning ordinances should encourage strategic deployment of broadband to meet the needs of the community. Planning board regulations should encourage additional capacity through required conduit placements for future use. Cable TV franchises should maximize broadband benefits for communities.



- 1 *Building Community Capacity through Broadband (BCCB) Initiative*, University of Wisconsin Extension, November 2010: http://www.uwex.edu/broadband/documents/BCCBUWEXFAQ_rev_11_18_10withmap.pdf (accessed June 2013).
- 2 Southwest Region Planning Commission *Broadband Plan*, March 2014 (page 42).
- 3 *Building Community Capacity through Broadband (BCCB) Initiative*, University of Wisconsin Extension, November 2010: http://www.uwex.edu/broadband/documents/BCCBUWEXFAQ_rev_11_18_10withmap.pdf (accessed June 2013).
- 4 "Broadband 2020: Achieving Ubiquity," Rouzbeh Yassini, Ph.D., UNH Broadband Center of Excellence, November 2013: <http://www.unhbcoe.org/research/white-papers-and-reports/broadband-2020-achieving-ubiquity> (accessed June 25, 2014).
- 5 NTIA's National Broadband Map rankings as of December 2013.
- 6 Executive Summary, *From Tailwind to Headwind: New Hampshire's Shifting Economic Trends*, the University of New Hampshire Center for Public Policy Studies, September 28, 2012.
- 7 Executive Summary, *Internet matters: The Net's sweeping impact on growth, jobs, and prosperity*, McKinsey Global Institute, 2011: http://www.mckinsey.com/insights/high_tech_telecoms_Internet/Internet_matters. For graphic, see <http://www.Internetinnovation.org/small-biz/>.
- 8 NTIA's National Broadband Map rankings as of December 2013.
- 9 NHBMP Sector Surveys 2012 Final Report, August 2012, UNH Cooperative Extension: http://extension.unh.edu/GISGPS/documents/Broadband_report_20Aug2012.pdf.
- 10 *Economic Value of the Advertising-Supported Internet Ecosystem*, June 10, 2009, Hamilton Consultants Inc., with Dr. John Deighton, Harvard Business School, and Dr. John Quelch, Harvard Business School.
- 11 Federal Communications Commission: *Connecting America: The National Broadband Plan*, 2010 (page 265): <http://www.fcc.gov/national-broadband-plan> (accessed July 17, 2013).
- 12 *The Economic Impact of Stimulating Broadband Nationally*, A Report from Connected Nation, Inc. February 21, 2008.
- 13 Anna Read and Damon Porter: "Building High-Speed Communities," in *APA Planning Magazine*, March 2013.
- 14 *How Companies Are Benefiting From Web 2.0: McKinsey Global Survey Results*, McKinsey Quarterly, Sept. 2009; 2010 National Broadband Plan, Section 13.1, page 266.
- 15 Jed Kolko, PPIC: *Does Broadband Boost Local Economic Development?* January 2010 (page 24).
- 16 B. Whitacre, et al.: *Broadband's contribution to economic growth in rural areas: Moving towards a causal relationship*, in *Telecommunications Policy* (2014).
- 17 *American Time Use Survey—2010 Results*, USD11-0919, U.S. Bureau of Labor Statistics, June 22, 2011 (accessed September 22, 2014).
- 18 Ryan Barton, CEO, MainStay Technologies, NH Broadband Conference, May 16, 2014.
- 19 Understanding Broadband Work Group, August 2013.
- 20 Ibid.
- 21 Ibid.
- 22 Ibid.
- 23 <http://networknknow.org/>
- 24 <http://www.fcc.gov/encyclopedia/e-rate-schools-libraries-usf-program>
- 25 Understanding Broadband Work Group, August 2013.
- 26 NHBMP, Community Anchor Institution data set, March, 2014.
- 27 Understanding Broadband Work Group, August 2013.

28 Ibid.

29 Broadband Transforms Rural Health Care, in *Broadband Communities Magazine Online*, September 2013 (accessed March 14, 2014).

30 Understanding Broadband Work Group, August 2013.

31 Ibid.

32 <http://www.northernhs.org/>.

33 <http://med.dartmouth-hitchcock.org/telehealth.html>.

34 <http://www.fcc.gov/page/summary-e-rate-modernization-order>

35 <http://www.nhhio.org/about-us> (accessed June 5, 2014).

36 Internet2 is a not-for-profit United States computer networking consortium led by members from the research and education communities, industry, and government: <http://www.Internet2.edu/about-us/> (accessed September 22, 2014).

37 <http://www.netelc.org/index.html> (accessed June 5, 2014).

38 <http://netelc.org/documents/NETC%20Sites%202010A-Map.pdf> (accessed June 5, 2014).

39 eGovernment, or electronic Government, means the use by the government of web-based Internet applications and other information technologies, combined with processes that implement these technologies, to (A) enhance the access to and delivery of government information and services to the public, other agencies, and other government entities; or (B) bring about improvements in government operations that may include effectiveness, efficiency, service quality, or transformation. E-Government Act of 2002, Pub. L. No 107-347 § 3606, 116 Stat. 2899 44 U.S.C. § 3606 (2002).

40 eDemocracy (a combination of the words electronic and democracy) incorporates 21st-century information and communications technology to promote democracy. That means a form of government in which all adult citizens are presumed to be eligible to participate equally in the proposal, development, and creation of laws. eDemocracy encompasses social, economic, and cultural conditions that enable the free and equal practice of political self-determination. Wikipedia (accessed August 11, 2014).

41 Founders celebrate decade of Wi-Fi in downtown, in *Seacoastonline* (accessed August 13, 2014).

42 TIF is a method of financing public improvements with the incremental property taxes created by new construction, expansion, or renovation of property within a defined portion of the community as a result of the public improvements.

43 Federal Communications Commission, Public Safety Tech Topic #22: <http://www.fcc.gov/help/public-safety-tech-topic-22-application-emerging-wireless-broadband-technology-public-safety-co> (accessed February 19, 2014).

44 <http://www.firstnet.gov/>

45 <http://networknknow.org/>

46 <http://www.nh.gov/dot/media/2014/pr-2014-05-27-advanced-regional-rraffic.htm>

47 <http://www.ntia.doc.gov/category/firstnet>

48 SPOC Spotlight: New Hampshire Takes Key Next Steps for Planning, Governance

49 "Broadband 2020: Achieving Ubiquity," Rouzbeh Yassini, Ph.D., UNH Broadband Center of Excellence, November 2013: <http://www.unhbcoe.org/research/white-papers-and-reports/broadband-2020-achieving-ubiquity> (accessed June 25, 2014).

50 Southern New Hampshire Planning Commission, March 2014 (page 42).

51 The town of Frankestown moved from the SWRPC region to the Southern Region in July 2014.

52 The New Hampshire FastRoads network extends from Orford, New Hampshire, through to Rindge, New Hampshire, connecting 220 community anchor institutions in 19 towns along its path. The network will provide fiber broadband access delivering speeds from 5 Mbps to 100 Mbps. It is funded by the federal Broadband Technology Opportunity Program with match funding by eight community banks and various economic development loans and grants. For more information, see <http://www.newhampshirefastroads.net/>.

- 53 TIF is a method of financing public improvements with the incremental property taxes created by new construction, expansion, or renovation of property within a defined portion of the municipality as a result of the public improvements.
- 54 <http://www.broadband.gov/plan/>.
- 55 <http://www.iwantbroadbandnh.org/>.
- 56 http://en.wikipedia.org/wiki/Universal_Service_Fund
- 57 NTIA Explores Broadband Availability in New Report Series, May 13, 2013, by Anne Neville, Director, NH State Broadband Initiative (accessed August 26, 2013).
- 58 U.S. FCC asks if broadband should mean faster Internet speeds: Reuters, August 5, 2014.
- 59 Oconee County South Carolina FOCUS Project.
- 60 http://en.wikipedia.org/wiki/Backhaul_network
- 61 Oconee County South Carolina FOCUS Project.
- 62 Understanding Broadband Work Group, August 2013.
- 63 White Space, the next Internet disruption: 10 things to know, in *TechRepublic*, March 12, 2014 (accessed August 26, 2014).
- 64 Understanding Broadband Work Group, August 2013.
- 65 Ibid.
- 66 How Broadband Over Powerlines Works, on HowStuffWorks.com, July 9, 2004 (accessed August 26, 2014).
- 67 Understanding Broadband Work Group, August 2013.
- 68 Ibid.
- 69 Wireless Internet 101 Fact Sheet, Institute for Local Self-Reliance, June 9, 2013 (accessed August 26, 2014).
- 70 Why is uploading slower than downloading? on Fetch5.7 (accessed August 26, 2014).
- 71 Services, not just speed, should determine broadband classification, Rouzbeh Yassini, UNH BCoE.
- 72 <http://www.iwantbroadbandnh.org/>
- 73 <http://www.ct.gov/cbicc/site/default.asp>
- 74 <http://www.maine.gov/connectme/>
- 75 <http://broadband.masstech.org/>
- 76 <http://www.nheconomy.com/business-services/broadband-telecommunications/telecommunications-advisory-board.aspx>
- 77 <http://broadband.ri.gov/Default.aspx>
- 78 <http://www.telecomvt.org/>
- 79 <http://www.leg.state.vt.us/docs/legdoc.cfm?URL=/docs/2008/acts/ACT079.HTM>
- 80 <http://www.leg.state.vt.us/docs/2012/Acts/ACT053.pdf>
- 81 Implementation of Section 224 of the Act; A National Broadband Plan for Our Future, WC Docket No. 07-245, GN Docket No. 09-51, Report and Order and Order on Reconsideration, 26 FCC Rcd. 5240 (2011), aff'd sub nom. American Elec. Power Service Corp. v. FCC, 708 F.3d 183 (D.C. Cir. 2013), cert. denied, Am. Elec. Power Serv. v. FCC, 2013 U.S. Lexis 6513 (U.S. Oct. 7, 2013).
- 82 <http://www.presidency.ucsb.edu/ws/index.php?pid=101030>.
- 83 Community Broadband Networks. HB 286 Refined for New Hampshire Legislature, November 14, 2013 (posted by lgonzalez): <http://www.muninetworks.org/content/hb-286-refined-new-hampshire-legislature>



© 2015 University of New Hampshire Broadband Mapping & Planning Program
For more information, visit

iwantbroadbandnh.org



University of
New Hampshire



The Connection to New Hampshire's Future

iwantbroadbandnh.org

UNH programs and policies are consistent with pertinent Federal and State laws and regulations on non-discrimination regarding age, color, handicap, national origin, race, religion, sex, sexual orientation, or veteran's status.



University of
New Hampshire