



February 2014

TELECOMMUNICATIONS

Federal Broadband Deployment Programs and Small Business

Why GAO Did This Study

Increasingly, small businesses rely on Internet-based applications to improve efficiencies and expand market access. Although broadband Internet access is widely available to businesses, areas of the country remain that still have little or no access. Since 2008, federal programs have provided over \$15 billion in funding to help deploy broadband to these areas. Additionally, some municipal governments have begun to build and operate networks to provide broadband access to their communities.

GAO was asked to describe issues related to broadband availability for small businesses. This report addresses (1) the federal government's efforts to ensure the availability of broadband services for small businesses, and (2) the effect of selected federally funded and municipal networks on broadband service and small businesses. GAO reviewed documents and interviewed officials from five federal agencies that support broadband deployment and research on broadband availability. GAO interviewed service providers that received federal funding, municipal network operators, and small businesses in four states, and collected speeds and prices for broadband services in selected communities in these states. The states, communities, and businesses were selected based on the presence and use of a federally funded or municipal network.

GAO is not making any recommendations. In commenting on this report, the agencies provided technical comments, which GAO incorporated as appropriate.

View [GAO-14-203](#). For more information, contact Mark Goldstein at (202) 512-2834 or GoldsteinM@gao.gov

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Federal Broadband Deployment Programs and Small Business

What GAO Found

Federally funded programs to expand broadband access encompass but do not specifically target small businesses. These programs—the Broadband Initiatives Program (BIP), Broadband Technologies Opportunities Program, Community Connect Grants, Connect America Fund, Rural Broadband Access Loan and Loan Guarantee Program, and Telecommunications Infrastructure Loan Program—have eligibility requirements based on the need of an area, as well as deployment requirements that can maximize the number of businesses served. For example, the Community Connect grants require providers to serve all businesses and residences in deployment areas. Since these federal programs do not target deployment to small businesses, they do not measure the impact on small businesses. However, BIP has a specific goal to increase access to rural Americans and provide broadband speeds to businesses, and in August 2013, the United States Department of Agriculture reported BIP's funding had resulted in over 5,800 businesses' receiving new or improved broadband service since 2009. Other programs have broader goals and measures related to the program's purpose, such as serving schools and libraries.

Improvements to broadband service have resulted from federal funding and the existence of municipally operated networks. Service providers have used federal funding for expansions and upgrades, such as building out to previously unserved areas and replacing old copper lines with fiber optic cable, resulting in faster and more reliable broadband connections. GAO examined broadband services for 14 federally funded and municipal networks and found they tended to have higher speeds than other networks. For example, in 9 of the 14 communities where GAO collected information on broadband speeds and prices, federally funded or municipal networks offered higher top speeds than other networks in the same community and networks in nearby communities. Additionally, prices charged by federally funded and municipal networks were slightly lower than the comparison networks' prices for similar speeds. Prices for lower to mid-range speed tiers available from federally funded and municipal networks in nonurban areas also compared favorably to prices in urban areas in the same state. However, providers in urban areas were more likely than those in nonurban areas to offer higher speeds. According to small businesses GAO met with, the speed and reliability of their broadband service improved after they began using federally funded or municipal networks. Furthermore, according to small business owners, the improvements to broadband service have helped the businesses improve efficiency and streamline operations. Small businesses that use the services of these networks reported a greater ability to use bandwidth-intensive applications for inventory management, videoconferencing, and teleworking, among other things.

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Abbreviations

BIP	Broadband Initiatives Program
BTOP	Broadband Technology Opportunities Program
Commerce	Department of Commerce
DSL	digital subscriber line
EDA	Economic Development Administration
EPB	Electric Power Board
FCC	Federal Communications Commission
Gbps	gigabits per second
kbps	kilobits per second
Mbps	megabits per second
NTIA	National Telecommunications and Information Administration
RUS	Rural Utilities Service
SBA	Small Business Administration
SBDC	Small Business Development Centers
USDA	United States Department of Agriculture
USF	Universal Service Fund

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February 7, 2014

The Honorable Nancy Pelosi
Democratic Leader
House of Representatives

The Honorable Henry Waxman
Ranking Member
Energy and Commerce Committee
House of Representatives

The Honorable Anna G. Eshoo
Ranking Member
Subcommittee on Communications and Technology
Energy and Commerce Committee
House of Representatives

Small businesses are a critical part of the United States' economy, contributing substantially to job and revenue creation. E-commerce and online applications for accounting, payroll, and other aspects of business operations are becoming an important tool for helping small businesses increase efficiency, improve market access, reduce costs, and increase the speed of transactions. However, even in areas where Internet service is available, it may not be broadband and may not provide speeds fast enough to support the applications that some small businesses need.

The term "broadband" commonly refers to Internet access that is high speed and provides an "always-on" connection, so users do not have to reestablish a connection each time they access the Internet. The telecommunications infrastructure that supports broadband access is, by and large, built and operated by private industry. Since 2008, the federal government has provided over \$15 billion in grants and loans to telecommunications providers to build or improve broadband networks to further the national goal of universal broadband access. In addition, public entities such as municipal governments are stepping in to build and operate broadband municipal networks in some communities.

You asked us to provide information on the availability of broadband to small businesses and the impact of federal programs on broadband access for small businesses. This report describes (1) the federal government's efforts to ensure the availability of broadband services for

small businesses, and (2) how selected federally funded and municipal networks have affected broadband service and small businesses.¹

To address our reporting objectives, we reviewed documents from and interviewed officials at the U.S. Department of Agriculture's (USDA) Rural Utilities Service (RUS), the Department of Commerce's (Commerce) National Telecommunications and Information Administration (NTIA) and Economic Development Administration (EDA), the Federal Communications Commission (FCC), and the Small Business Administration's (SBA) Office of Advocacy. To determine the effect of federally funded and municipal networks on broadband services for small businesses, we interviewed Internet service providers that received federal funds, municipal network operators, and small businesses in four states. We selected the states based on several factors, including the presence of a network that received federal funding for infrastructure in the past 5 years. In identifying small businesses to interview, we chose those that were users of the federally funded or municipal networks and that had fewer than 500 employees, based on FCC's National Broadband Plan, which addresses recommendations to support broadband growth in small and medium-sized enterprises of this size.² Additionally, we collected information from wireline service providers on broadband speeds and prices in communities in four states where federally funded or municipal networks are present, in similar areas without federally funded or municipal networks, and in urban areas. For more information, please see the detailed methodology in appendix I.

We conducted this performance audit from February 2013 to February 2014 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings based on our audit objectives. We believe that the evidence

¹Throughout this report we refer to federally funded networks and municipal networks. Federally funded networks are networks that received monetary support from one of the federal programs discussed in this report. These federal programs do not entirely pay for the networks. Municipal networks are eligible to receive federal funding but not all municipal networks discussed in this report received federal funding.

²There is no standard definition of small business. SBA's definition of small business varies according to industry, generally based on either the number of employees or revenues, and broadband service providers have their own guidelines for the size and type of business that qualifies for their small business services.

obtained provides a reasonable basis for our findings based on our audit objectives.

Background

Broadband Transmission Technologies

Broadband speeds are described in upload and download capabilities measured by the number of bits of data transferred per second and include kilobits (1 thousand bits per second), megabits (1 million bits per second), and gigabits (1 billion bits per second). Download speed refers to the speed at which data is transferred from the Internet to the consumer. Upload speed refers to the speed at which data is transferred from the consumer to the Internet. FCC currently considers speeds of 4 megabits per second (Mbps) download and 1 Mbps upload or greater to be broadband. The speeds required by small businesses vary depending on how the business uses its Internet connection, the number of users, and the number of applications running concurrently, among other factors. Examples of uses supported by different download speeds are described in table 1.

Table 1: Example Uses of Different Broadband Speeds

Download speed	Example of use at this speed
3 Mbps	Download a 100-page text document with graphics in about 6 seconds
10 Mbps	Host a multi-point videoconference for a group of five
100 Mbps	Download a 2 gigabyte high-definition video in about 3 minutes

Source: Columbia Telecommunications Corporation.

Note: This table is drawn from Columbia Telecommunications Corporation, *The Impact of Broadband Speed and Price on Small Business* (Kensington, MD: United States Small Business Administration, Office of Advocacy, November, 2010).

Broadband service is provided through a variety of technologies, including:

- *Digital subscriber line (DSL)*. This service is delivered by local telephone companies over their copper-wire telephone networks used by traditional voice service.
- *Cable modem*. This service is delivered by cable operators through the same coaxial cables that deliver sound and pictures to television sets.

-
- *Fiber optic.* Fiber optic technology converts electrical signals carrying data to light and sends the light through transparent glass fibers about the diameter of a human hair.
 - *Satellite.* This wireless service transmits data to and from subscribers through a receiver dish to a satellite in a fixed position above the equator, eliminating the need for a copper wire or coaxial cable connection.
 - *Wireless.* Land-mobile or terrestrial broadband service that connects a business or home to the Internet using a radio link.

Broadband access can be shared or dedicated. Shared access means users share the connection to the Internet, and thus speeds can be variable based on the number of users accessing the network at one time. Dedicated access provides a reliable point-to-point connection with guaranteed speeds. For some small businesses with the need to send sensitive or large amounts of data, such as financial institutions or medical centers, a dedicated connection or special access line may be beneficial. However, most small businesses do not need such a connection.

Broadband Availability and Access

Broadband Internet access is widely available throughout the United States to both residences and businesses. According to the National Broadband Map,³ which measures national access to broadband, as of December 2012, approximately 98 percent of the U.S. population had access to wireline or wireless broadband service of 3 Mbps download and 768 kilobits per second (kbps) upload.⁴ A study completed for SBA's Office of Advocacy in 2010 similarly found that over 96 percent of urban

³See, accessed January 14, 2014, <http://www.broadbandmap.gov>. The map represents the most comprehensive nationwide data on broadband availability and is a joint effort of NTIA and FCC to report broadband speeds and technology available across the United States.

⁴While FCC's broadband speed benchmark is 4 Mbps download and 1 Mbps upload, FCC and NTIA report on the 3 Mbps download and 768 Kbps upload speed because it is the closest speed to the FCC benchmark about which data is collected for the National Broadband Map.

small businesses and approximately 92 percent of rural small businesses reported access to wireline or wireless broadband.⁵

Still, some areas of the United States remain underserved or unserved by broadband infrastructure.⁶ Service gaps exist primarily in nonurban areas.⁷ For example, according to data used in the National Broadband Map, nearly 100 percent of urban residents have access to 3 Mbps or higher download speeds, and about 94 percent of nonurban residents have access to such speeds. Likewise, wireline broadband access is available to 99 percent of urban populations and 82 percent of nonurban populations. The unserved and underserved areas that remain in the United States tend to be where conditions increase the cost of broadband deployment, and the difficulty in recouping deployment costs makes it less likely that a service provider will build out or maintain a network. These conditions include:

- *Low population.* The limited number of potential subscribers in an area makes it difficult for providers to recoup the costs of building a network.

⁵Columbia Telecommunications Corporation, *The Impact of Broadband Speed and Price on Small Business* (Kensington, MD: United States Small Business Administration, Office of Advocacy, November, 2010).

⁶The definitions of unserved and underserved were part of a Notice of Funds Availability announced by NTIA and designed to implement grant programs under the American Recovery and Reinvestment Act of 2009 (*74 Fed. Reg. 33104, July 9, 2009*). The speeds in these definitions are much lower than the FCC's broadband benchmark of 4 Mbps download and 1 Mbps upload. According to the Notice of Funds Availability, an unserved area is one in which at least 90 percent of households cannot subscribe to the minimum broadband speed and service, defined as advertised speeds of at least 768 Kbps download and at least 200 Kbps upload. An underserved area is one in which (1) 50 percent or less of households have access to the minimum broadband speed, (2) no provider offers service speeds of at least 3 Mbps, or (3) 40 percent or less of the households choose to subscribe to a broadband service. The availability of, or adoption rates for, satellite broadband service are not considered in determining whether an area is unserved or underserved.

⁷The definitions of urban and nonurban are based on the Census Bureau's urban and rural classification. Within this classification, the Census Bureau identifies two types of urban areas: (1) urbanized areas of 50,000 or more people; and (2) urban clusters of at least 2,500 and less than 50,000 people. Rural areas encompass all population, housing, and territory not included within an urban area. For purposes of this report, we refer to urbanized areas as urban areas and we refer to urban clusters and rural areas as nonurban areas.

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- *Difficult terrain.* Challenging terrain, such as mountains, may increase construction costs for wireline service and can affect wireless service by creating physical barriers or otherwise limiting the ability to transmit data.
 - *Natural Disasters.* Areas that experience severe weather or natural disasters may lose broadband access temporarily, which increases costs because of the need to repeatedly repair or replace infrastructure. For instance, Hurricane Sandy took down a service provider's copper lines that provided DSL service for Fire Island, New York. The service provider decided to replace the copper lines with a more costly but resilient fiber network.

Federal and Municipal Support for Broadband Deployment

The federal government provides support in the form of grants and loans for the construction and upgrade of broadband infrastructure. Much of this support facilitates broadband deployment to underserved and unserved areas. Table 2 describes the federal programs that have provided the most funding for broadband deployment in the past 5 years.^{8, 9}

⁸SBA does not provide funding for broadband deployment. However, it does provide funding to nonprofit Small Business Development Centers (SBDC). SBDCs provide training and education to encourage greater use of broadband. SBA also supports research by its Office of Advocacy on the use and availability of broadband.

⁹The Department of Commerce's Economic Development Administration also had programs in fiscal years 2008-2012 that support the construction of public infrastructure, which may include broadband infrastructure. Programs include Economic Adjustment Assistance, Public Works, Disaster Supplement Appropriations, Global Climate Change Mitigation Incentive Fund, Community Trade Adjustment Assistance Program, and the Disaster Relief Opportunity Fund. The focus of these programs is to support economic recovery, promote regional competitiveness, or to help areas recover from a natural disaster, rather than explicitly fund the construction of broadband infrastructure.

Table 2: Federal Programs Providing Funding for Broadband Infrastructure Deployment (2008 to 2012)

Program	Agency	Description
Broadband Initiatives Program (BIP) ^a	Rural Utilities Service (USDA)	Awarded approximately \$3.5 billion in competitive grants and loans to public and private sector entities in 2010. Funding targeted last-mile infrastructure projects that provide service directly to end users, including satellite and technical assistance programs, as well as middle mile projects.
Broadband Technology Opportunities Program (BTOP) ^b	National Telecommunications and Information Administration (Commerce)	Awarded approximately \$4 billion in competitive grants to public and private sector entities in 2009 and 2010. Projects focus on building middle mile infrastructure ^c and providing broadband services to schools, medical providers, public safety agencies, and other community anchor institutions.
Community Connect Grants	Rural Utilities Service (USDA)	Awarded approximately \$48 million over the past 5 years for grants to applicants proposing to provide broadband service on a “community-oriented connectivity” basis. Funding must be appropriated annually.
Connect America Fund ^d	FCC	Has made available up to \$4.5 billion annually since 2012 for ongoing support of voice and broadband-capable networks. Aims to provide universal availability of modern networks capable of providing voice and broadband service to homes, businesses, and community anchor institutions, among other goals.
Rural Broadband Access Loan and Loan Guarantee Program	Rural Utilities Service (USDA)	Awarded about \$625 million in loans over the past 5 years for facilities and equipment providing broadband service in rural communities. Targets rural communities with populations under 20,000.
Telecommunications Infrastructure Loan Program	Rural Utilities Service (USDA)	Awarded about \$2.9 billion in loans over the past 5 years to improve, expand, build, and acquire infrastructure to support broadband service in rural areas. Loans are available to incumbent telephone providers, cooperatives and non-profits, among others.

Source: GAO presentation and analysis of information from Commerce, FCC, and USDA.

^a Congress appropriated funds for the BTOP and BIP programs under the American Recovery and Reinvestment Act of 2009 (Pub. L. No. 111-5, 123 Stat. 115 (2009)). All funds were obligated prior to the end of fiscal year 2010. In the joint Notice of Funds Availability, NTIA and RUS provided that projects should be completed within 3 years of receiving an award. 74 Fed. Reg. 33104, July 9, 2009.

^b As part of BTOP, in support of broadband adoption, NTIA awarded grants to public computing centers and sustainable broadband adoption projects that funded access to broadband, computer equipment, and job training.

^c Middle mile infrastructure provides a link from the Internet backbone to the last mile networks of local providers (such as cable or phone companies) that provide broadband service to end users. The availability of broadband service to end users depends upon access to adequate middle-mile facilities, which can be costly to deploy in rural areas.

^d The Connect America Fund is part of ongoing Universal Service Fund reform aimed at eventually replacing existing high-cost support mechanisms. The high-cost program within the Universal Service Fund (USF) provides subsidies to telecommunications carriers that serve rural and other remote areas with high costs of providing telephone service. GAO has ongoing work on the USF reforms and their impact on broadband deployment and other issues.

Some municipalities also support broadband deployment by funding, building, and operating networks to provide broadband access to their communities, much as some cities offer utilities such as water and electricity. The municipal entity providing this service may be, for example, a department within the city government, or a cooperative formed among several communities. Communities have used federal funds, issued bonds, and taken out loans to fund the construction of municipal broadband networks. In some instances, voter referendums have been required for the city to take out loans or bonds for this purpose.

Municipal networks have achieved varying degrees of public acceptance and financial success. In some communities, these networks have been welcomed because they are the only broadband service provider. In other communities, the municipality functions as a competitor to cable and DSL providers and lawsuits have been filed by incumbent service providers to prevent municipalities from building networks. Some states have passed legislation to prevent communities from becoming service providers. Nevada, for instance, prohibits cities with a population of 25,000 or more from selling telecommunications services to the general public.¹⁰ Nebraska prohibits any political subdivision that is not a public power supplier from providing broadband or Internet services.¹¹ Financially, some municipal networks have been successful while others have struggled to pay off bonds or loans used for capital investment.

Federally Funded Efforts to Expand Broadband Encompass but Do Not Specifically Target Small Businesses

Federal broadband programs do not target deployment to small businesses. As previously discussed, federal programs target deployment to areas that are unserved or underserved. Many programs do, however, have requirements that can result in networks maximizing the number of small businesses and residences served. For example, USDA's Community Connect grants require that the service provider offer broadband services to all residences and businesses in the proposed service area. To be eligible for the Rural Broadband Access Loan and Loan Guarantee Program at least 25 percent of the households in an area must currently be underserved. Thus, the program's funding supports providers who will serve residences and small businesses in

¹⁰Nev. Rev. Stat. Ann. § 268.086 and Nev. Rev. Stat. Ann. § 710.147

¹¹R.R.S. Neb. § 86-594

areas of need. Table 3 shows selected federal funding requirements related to eligibility and infrastructure deployment for the six federal programs previously described.

Table 3: Selected Federal Program Requirements Related to Eligibility and Deployment of Broadband Infrastructure

Federal program	Eligibility requirement related to area's need	Service deployment requirements
Broadband Initiatives Program (BIP) (USDA)	Required that 75 percent of a funded area be rural and without access to high-speed broadband service.	Required that service is provided to the entire territory of each census block in the proposed service area for last mile projects unless waiver is sought and approved.
Broadband Technology Opportunities Program (BTOP) (Commerce)	Required that proposed service areas were unserved or underserved.	None.
Community Connect Grants (USDA)	Requires that the proposed service area is rural and does not have broadband service available.	Requires that the network offer service to all residences and businesses in the proposed service area.
Connect America Fund (FCC)	Requires that the proposed service areas are high-cost census blocks or within the provider's service area.	Requires that service providers certify that they are taking reasonable steps within 5 years to offer broadband throughout their service area or provide service upon request.
Rural Broadband Access Loan and Loan Guarantee Program (USDA)	Requires that proposed service areas are rural and at least 25 percent of the households are underserved.	Requires that a minimum of 5 Mbps (download plus upload speeds) is available to every customer in the proposed service area.
Telecommunications Infrastructure Loan Program (USDA)	Requires that the proposed service areas are rural.	Requires that borrowers provide evidence that service will be made available to the widest number of rural users.

Source: GAO analysis of information from USDA and USDA statutes and regulations.

Since these programs do not focus on deployment to small businesses, they do not measure their impact on small businesses, including the broadband speeds and prices available to them. However, each program has broader goals and measures, some of which encompass the impact on businesses. For example, BIP supports USDA's goal to increase the number of rural Americans with access to broadband service and provide the speeds needed by business, health care, public safety, and others. Consistent with this goal, RUS reported in August 2013 that more than 5,800 businesses had received new or improved service as a result of BIP funding since passage of the Recovery Act in 2009, even though BIP does not have specific performance targets regarding services to businesses. BTOP supports NTIA's strategic goal of driving innovation through policies that enable broadband growth and support e-commerce. Accordingly, NTIA measures the number of community anchor institutions, such as schools and libraries, that received broadband

connections through BTOP and the miles of broadband network deployed. NTIA also collected data on interconnection agreements that allow small internet service providers to provide broadband service.

According to service providers we spoke with, federal funding was instrumental in their network expansion or upgrade. For example, officials from Monroe Telephone Company in Oregon stated that without the federal support they received through BIP, they would not have expanded their network due to the area's low population density and mountainous terrain. Monroe officials stated that they used the loan of \$1.4 million and grant of \$4.2 million, both from BIP, to expand broadband access to 1,200 households and small businesses in two counties that previously only had dial-up or satellite service. In another example, officials at Paul Bunyan Telephone Cooperative in Minnesota stated that the RUS loan they received enabled them to expand their broadband service years earlier than otherwise would have been possible.

Selected Federally Funded and Municipal Networks Have Improved Broadband Service for Small Businesses

Service Improvements

Federal programs have supported improvements to broadband networks through grants and loans for expansions, upgrades, and building of new networks, according to the service providers we spoke with. Providers expanded their existing networks by laying new fiber optic lines or using other technologies to make broadband available in areas that were previously unserved or underserved. For example, Intermountain Cable in eastern Kentucky used a Community Connect grant to expand its broadband network to Hurley, Virginia. According to officials at Intermountain Cable, Hurley previously only had satellite broadband service. SandyNet, a municipal broadband provider in Sandy, Oregon, used BIP funding to build fiber optic lines, allowing SandyNet to expand its wireless service further into rural areas. Providers also used federal funds to upgrade and improve the reliability and speed of their existing networks. For example, in northwest Minnesota, Garden Valley Telephone Company used an RUS Telecommunications Infrastructure loan to upgrade the copper lines in the rural areas it serves with fiber

City of Windom, Minnesota, and Windomnet

In 2002, a referendum passed in the City of Windom, Minnesota, authorizing construction of a fiber broadband network to be operated by Windomnet, the municipally owned cable operator. At the time, there was one other broadband provider serving Windom. Construction of Windomnet's 35-mile fiber network around the city was completed in 2005. The network was funded by revenue bonds worth \$9.4 million and additional credit of \$1 million. Windomnet offers fiber-to-the-home service to the entire community of residents and businesses. As of 2013, Windomnet had over 1,800 subscribers, including about 200 business subscribers, most of them small businesses. Windomnet offers download speeds ranging from 1.5 Mbps to 1 gigabit per second (Gbps).

Source: GAO presentation of information from Windomnet.

optic lines, which provide a faster and more reliable connection. For homes and small businesses in these areas, speeds have gone from approximately 1 Mbps download to a top advertised speed of 30 Mbps. In other areas it serves, Garden Valley used portions of the loan to make smaller scale improvements, loan to make smaller scale improvements, changing some of the hardware attached to existing copper lines to increase speeds. Finally, federal funds or, in the cases of some communities, other sources of funding such as municipal bonds, have been used to build new broadband networks. The North Georgia Network used a \$33 million BTOP grant to build a 260-mile fiber optic network that provided broadband to businesses and residences. MiNet, a municipal network operated by the cities of Monmouth and Independence, Oregon, used city funds and a loan from the state of Oregon to build a fiber optic network that provides download speeds of up to 1 Gbps.

According to some providers, these federal and municipal investments have stimulated competition. In some areas that received federal funds or where a municipal network was built, other broadband providers took steps to improve the speed and reliability of their service. For example, following the construction of a fiber-to-the-home municipal network in Monticello, Minnesota, the two other broadband providers in the area made investments in their infrastructure to improve their broadband speeds. One of these providers stated that all of its networks undergo periodic upgrades to improve service, but upgrade schedules can change in order to stay competitive when there is a new service provider in a particular market.

Speeds and Prices

To assess the potential effect of federal funding or municipal support on broadband availability, we collected information on speeds and prices offered by federally funded and municipal networks in 14 nonurban communities (subsequently referred to as "funded" communities.)¹² We compared this information with speeds and prices offered by other service providers in those same communities and service providers in 14 similar

¹²Of the 14 funded communities in our analysis, 10 were served by 7 networks that received federal funding. The remaining 4 communities were served by 3 municipal networks that did not receive federal funding. A list of the service providers that were part of this analysis, as well as the prices and speeds they offer, and the type of federal funding they received is provided in appendix II.

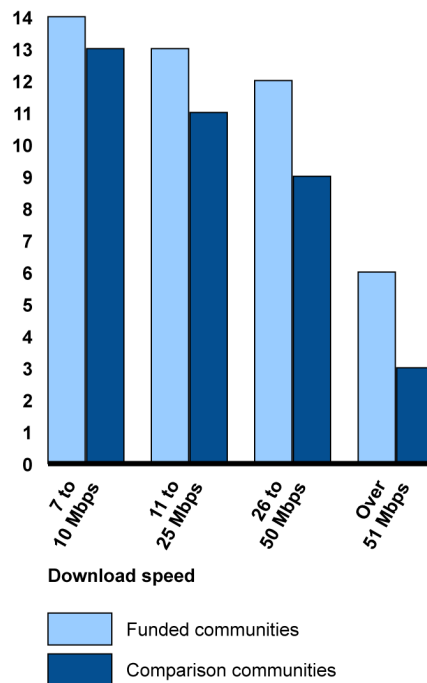
Speed

nonurban communities (subsequently referred to as “comparison” communities) without federally funded or municipal networks.^{13, 14}

We found that more service providers in funded communities offered service at higher speed ranges than providers in comparison communities, as shown in figure 1. For example, twice as many funded communities as comparison communities have a provider that offers speeds of 51 Mbps or higher. However, among the 14 funded communities and 14 comparison communities included in our analysis, all have at least one service provider that offers download speeds of at least 4 Mbps, which is FCC’s current benchmark for broadband.

Figure 1: Number of Communities with Available Download Speeds in Selected Ranges, as of September 30, 2013

Number of communities with at least one service provider that offers service in each speed range



Source: GAO analysis of advertised Internet speeds in 14 funded communities and 14 comparison communities.

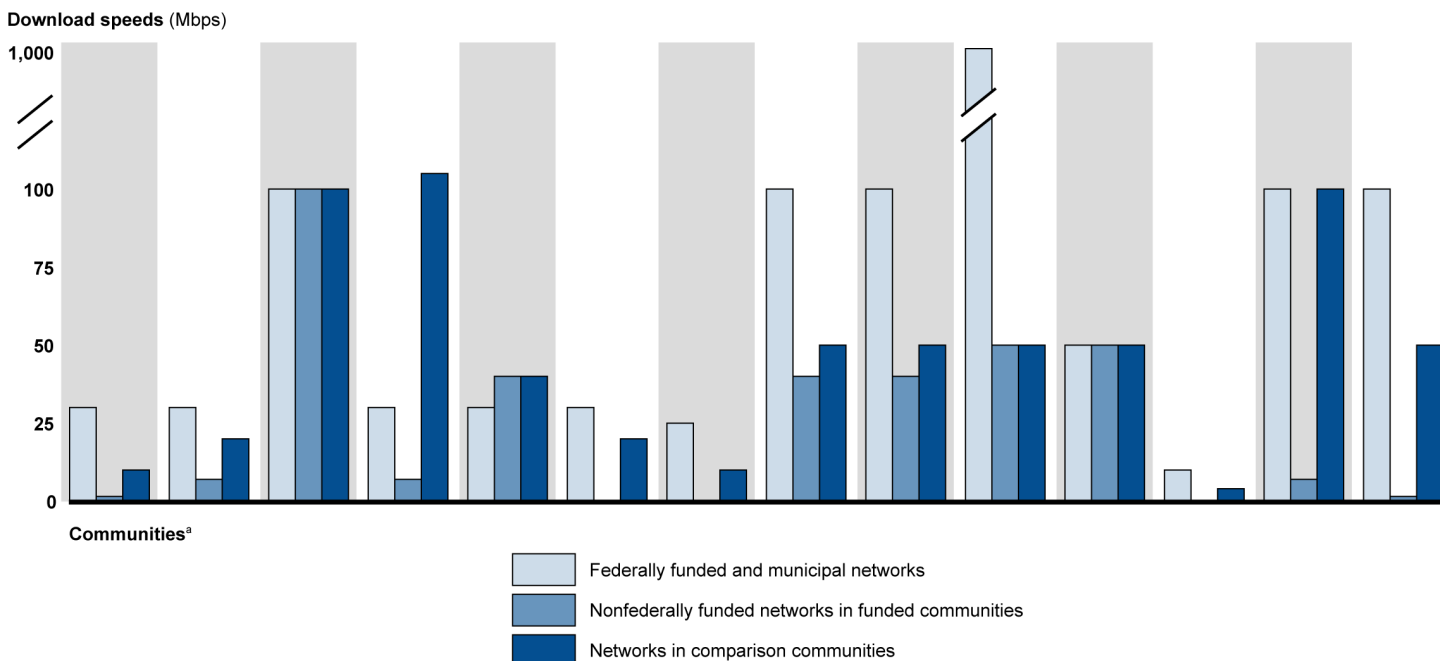
¹³Our analysis was conducted based on advertised speeds collected during the time period of July 1, 2013, through September 30, 2013.

¹⁴A list of communities included in our analysis is shown in appendix I.

Note: Each cluster of bars reports on the availability of speeds within each range for the same 28 communities. Thus, the maximum number of communities for each bar is 14.

We also compared the highest speed offered by service providers. Our analysis found that federally funded and municipal networks most often had the highest advertised top speed when compared with top speeds offered by nonfederally funded and non-municipal networks in the same community, and networks in nearby comparison communities. In 9 of the 14 sets of communities included in this analysis, federally funded or municipal networks had the highest advertised top speeds, as shown in figure 2. For example, a federally funded network in a community in northeast Georgia advertised a top download speed of 100 Mbps, while the highest speed advertised by other providers in the same community and in the nearby comparison community was 40 Mbps. In the five other cases, networks in nonfederally funded communities offered speeds that were equal to or higher than speeds available in funded communities.

Figure 2: Comparison of Highest Advertised Download Speeds, as of September 30, 2013



Source: GAO analysis of advertised Internet speeds in 14 funded communities and 14 comparison communities.

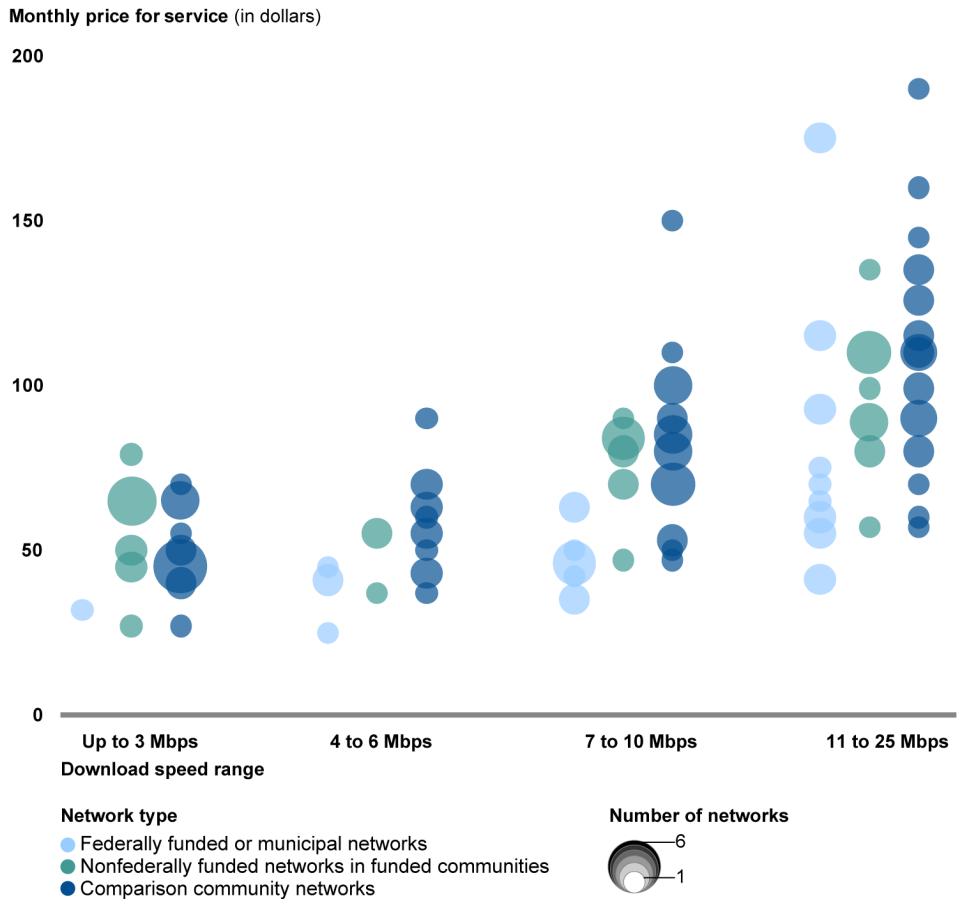
Note: Three of the federally funded communities only have federally funded networks, thus no bar appears in the graph for nonfederally funded networks in these communities.

^a Each cluster of bars represents a set of communities included in our analysis.

Price

We found that prices offered by federally funded and municipal networks were slightly lower than prices offered by nonfederally funded networks in the same community and networks in comparison communities. For example, for speeds of 4 to 6 Mbps, federally funded and municipally operated networks charged prices that were on average about \$11 per month less than nonfederally funded networks in the same community and about \$20 less per month than networks in comparison communities. The price differences are greater in the 7 to 10 Mbps download range, where federally funded and municipally operated networks' prices were on average about \$30 less per month than nonfederally funded networks in the same community and about \$35 less per month than networks in comparison communities. There were some cases where federally funded or municipal networks offered substantially lower prices than networks in comparison towns, such as the municipal network in Windom, Minnesota, which offered 10 Mbps download service for approximately \$38 a month, while two networks in a comparison town offered the same speed for about \$100 to \$110 per month. Figure 3 illustrates the prices for selected speed ranges offered by all the providers included in our analysis and is broken out by federally funded and municipal networks, nonfederally funded networks in the same community as a federally funded or municipal network, and networks in comparison communities. As this figure shows, prices in all the ranges are generally lower for federally funded or municipal networks, and at the 4 to 6 Mbps and 7 to 10 Mbps download ranges, networks in comparison communities tend to have higher prices than both federally funded and municipal networks and nonfederally funded networks located in the same community.

Figure 3: Comparison of Broadband Service Prices at Selected Speeds, as of September 30, 2013



Source: GAO analysis of advertised Internet speeds and prices in selected communities.

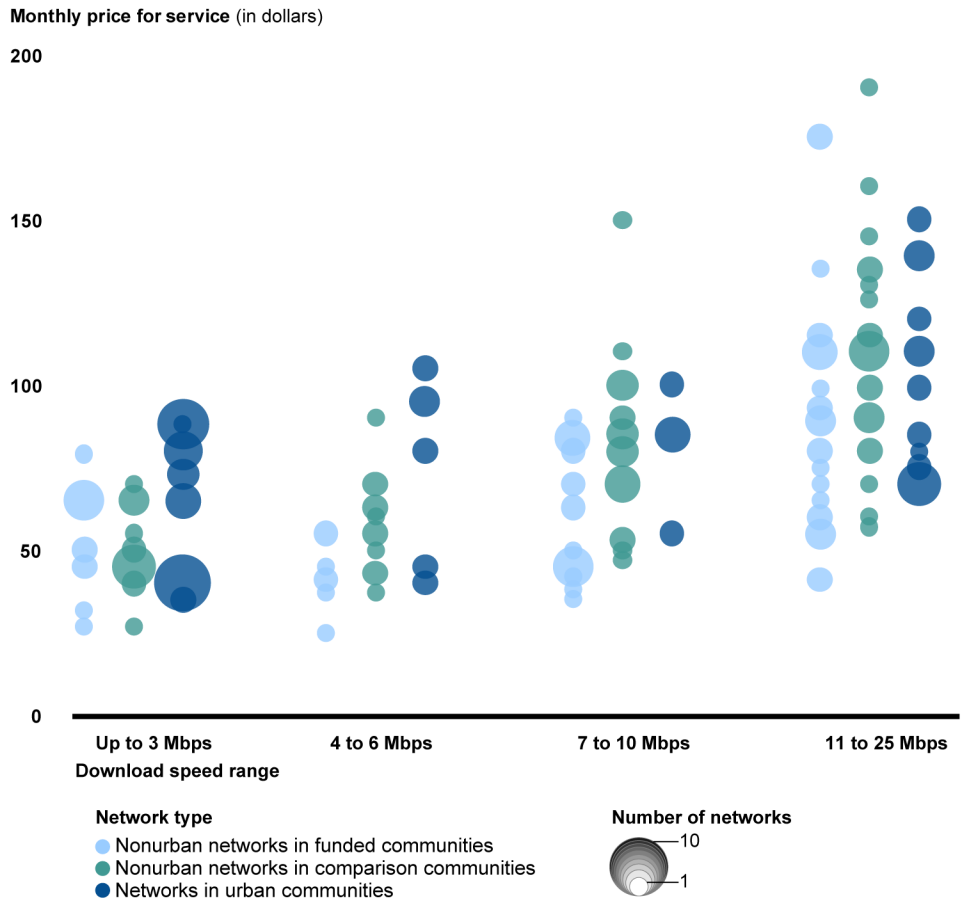
Comparison with Urban Communities

We also compared broadband speeds and prices in the nonurban funded and comparison communities with the speeds and prices in urban areas. For download speeds below 10 Mbps, average prices in nonurban areas were lower than average prices in urban areas. For example, for speeds of 4 to 6 Mbps, the average price was about \$23 less in nonurban areas than in urban areas, and for speeds of 7 to 10 Mbps the average price was about \$9 less. The lower prices offered by networks in nonurban communities could be due to providers having lower costs to recoup because some receive federal or municipal support or due to the limits imposed by weak market demand, typical of many nonurban areas. In this analysis it is difficult to identify the exact reason for the lower prices in the

nonurban communities. For speeds of 11 to 25 Mbps, urban areas offered prices that were on average \$21 less than nonurban areas.

Furthermore, nonurban communities with federally funded or municipal networks tended to have lower prices than nonurban comparison communities and urban communities. For example, in the 4 to 6 Mbps download range, nonurban networks in funded communities offered average prices that were about \$16 less than the prices offered by networks in comparison communities and \$32 less than networks in urban communities, and \$20 and \$19 less, respectively, in the 7 to 10 Mbps speed range. In the 11 to 25 Mbps range, nonurban funded communities offered lower average prices than comparison communities, but urban areas offered lower average prices than both the nonurban funded and comparison communities. Figure 4 illustrates the prices that service providers offer for selected speed ranges in urban and nonurban areas.

Figure 4: Comparison of Monthly Broadband Service Prices at Selected Speeds for Urban and Nonurban Areas



Source: GAO analysis of advertised Internet speeds and prices in selected communities.

Chattanooga's Gigabit Network

The municipally operated electricity provider in Chattanooga, Tennessee, used its federally funded smart grid to provide fiber-to-the-home broadband service. Coupled with \$290 million in bonds the Electric Power Board (EPB) received a Department of Energy Recovery Act grant to improve its electricity infrastructure by building a smart grid with fiber to the home. A smart grid is a network that uses information technology to deliver electricity efficiently, reliably, and securely. In planning to build the electricity smart grid, EPB realized that with additional investment it could use the smart grid fiber to provide broadband service as well. As a result, all homes and businesses in the 600 square miles served by EPB now have fiber connections to monitor electricity, and each business and home can now receive broadband service up to 1 Gbps across this same fiber network. According to some small businesses, this has resulted in a number of small startups and small business incubators in Chattanooga, drawn by the high speed network, the low cost to operate a small business, and a culture that supports entrepreneurs.

Source: GAO presentation of information from EPB and selected Chattanooga small businesses.

We found that providers in urban areas generally offer higher speeds than those in nonurban areas.¹⁵ Among the locations included in our analysis, providers in all 8 of the urban areas offered download speeds of 100 Mbps or higher, whereas providers in only 7 of the 28 nonurban areas offered download speeds of 100 Mbps or higher. Six of the 7 nonurban areas were funded communities with speeds of 100 Mbps provided by a federally funded or municipal network.¹⁶ However, in one funded community one competitor also offered speeds of 100 Mbps.

Impact of Network Improvements on Small Businesses

Small businesses we spoke with reported improvements in the speed and reliability of their broadband service after they began using federally funded or municipal networks. Of the 27 small businesses we spoke with who are customers of federally funded or municipal networks, 20 reported an improvement in their broadband speeds.¹⁷ For example, in southwest

¹⁵For more information on rural and urban broadband availability, access January 14, 2014, <http://www.ntia.doc.gov/report/2013/broadband-availability-beyond-ruralurban-divide>. National Telecommunications and Information Administration. *Broadband Availability Beyond the Rural/Urban Divide*. (Washington, D.C.: May 2013).

¹⁶These six funded communities were served by four federally funded or municipal networks.

¹⁷The remaining seven small businesses either did not address the question because they did not know the speed of their previous service or did not have a previous broadband provider.

Cities of Monmouth and Independence, Oregon, MINET Fiber Network

MINET is a fiber optic network in Monmouth and Independence, Oregon. The two cities decided in 2004 to build their own fiber network for economic development purposes. City officials believed that availability of broadband services would help to keep existing jobs and attract new employers. The fiber network was built with city funds and a state loan. MINET passes 6,400 businesses and homes at the curb. In June 2013, MINET's customers included about 500 local, mostly small businesses, according to MINET officials, a number that comprises about 90 percent of local businesses. Most businesses subscribe to download speeds of 7 Mbps or 10 Mbps, although MINET can offer download speeds up to 1 Gbps.

Source: GAO presentation of information from MINET.

Minnesota, a farm equipment sales and service company reported that it switched from its previous broadband provider because the provider's service could not supply the desired broadband speeds. Now the farm equipment company has broadband speeds nearly twenty times its previous speeds. Similarly, 18 of 27 small businesses we spoke with told us that their new service is more reliable than the service of their previous provider.¹⁸ These small businesses said they experienced less network downtime and no significant slowdowns in speed at points in the day when usage increased. Many service providers told us that they used fiber optics for their expansions or upgrades, contributing to greater reliability and speed.

While reliability and speed were reported as improving, small businesses we spoke to reported that the effect of the new network on price varied. Several reported the price of broadband service went down, particularly a few businesses that previously relied on satellite service for broadband. However, some small businesses we spoke with reported that the price for the new service was similar to or more than their previous service. For example, an information technology company in northeast Georgia told us that it pays approximately \$20 more per month but stated it was worth the additional cost because of the increased reliability and additional speed.

Small business owners we met with who use the services of federally funded or municipal networks told us that they made improvements to their business operations, often because the speed of online applications was improved, which allowed them to operate more efficiently. Table 4 describes some of the improvements that small businesses told us they experienced due to the enhancements to their broadband service.

¹⁸The remaining nine small businesses either did not address the reliability of the new network or did not have a previous broadband provider.

Table 4: Operational Improvements That Small Businesses Attributed to Broadband Service Enhancements

Operational improvements	Examples
Online inventory management	<p>A hardware store in Dawsonville, Georgia, uses its broadband connection to access online manuals for its small engine repair service. This allows the store to more quickly review parts manuals, and identify and order the correct part.</p> <p>An oil company in Windom, Minnesota, uses the broadband service provided by the municipal network to remotely monitor the fuel levels at its gas stations. This was previously handled by the station manager faxing in reports twice a day. Fuel levels are now updated every 15 minutes.</p>
Customer service	<p>The owner of a computer support business in Monmouth, Oregon, stated that he can now have up to six computers connected to his network. This allows him to more quickly update software and clear viruses from customers' computers and, as a result, serve more customers.</p> <p>The owner of a resort in northern Minnesota told us that his customers are able to access the Internet from the resort now. This enables them to work from the resort without having to commute to a town to get Internet access.</p>
Technical capabilities	<p>A manufacturer of countertops for private airplanes, located in northeast Georgia, stated that the improved broadband service allows the company to conduct videoconferences to discuss design issues. This is particularly beneficial because they can look at the designs or any problems with the product.</p> <p>A lamb distributor in Junction City, Oregon, uses the high speed broadband capabilities to hold video conferences. He uses this for sales calls with restaurants, meetings with his employee in Portland, and meetings with the farmers that raise his sheep.</p>
Telework	<p>High speed broadband has allowed a radiologist in Chattanooga, Tennessee, to read x-rays, MRIs, CAT scans and ultrasounds from home. The speed of the network allows the radiologist to create a final report from home, which can be critical in emergency situations, but previously could only be completed in the office.</p> <p>A print shop in Monmouth, Oregon, has been able to allow its graphic designer to work from home more frequently and allow the owners to work from their home office.</p>
Other operational improvements	<p>A developer of aircraft technical manuals in Sandy, Oregon, can now send and receive large data files using a high speed broadband connection. Prior to obtaining the high speed connection, the developer sent the files to the aircraft manufacturer in Germany via overnight delivery.</p> <p>A small convenience store in northern Minnesota where the owner also operates a restaurant, gas station, motel, and campground at the same location, uses the high speed broadband for many purposes including obtaining hunting and fishing licenses for customers. Previously, obtaining a single license could have taken 20 to 30 minutes but now can be completed in only a few minutes.</p>

Source: GAO presentation of information obtained from interviews with small businesses.

Small business owners we spoke with said that the operational efficiencies they experienced as a result of better broadband service have not yet resulted in increased revenues. Only one small business we met with sought to improve their revenue potential by relocating to an area with better Internet service. Rather than relocate, a different small business owner stated he would pay more to get a dedicated line for faster or more reliable service. Other small businesses stated that broadband service would not alone determine where they set up their

business but might be one of many factors considered. Similarly, the communities that built high speed broadband networks did so to attract some new businesses, as well as retain existing businesses.

Agency Comments

We provided a draft of this report to NTIA and EDA within the Department of Commerce, USDA, SBA, and FCC for review and comment. NTIA and FCC provided technical comments, which were incorporated, as appropriate. The other agencies reviewed the draft but had no comments.

As agreed with your offices, unless you publicly announce the contents of this report earlier, we plan no further distribution of it until 30 days from the date of his letter. At that time, we will send copies of this report to the Secretary of Commerce, the Secretary of Agriculture, the Administrator of the U.S. Small Business Administration, and the Chairman of the Federal Communications Commission. We will also make copies available to others on request. In addition, the report will be available at no charge on the GAO Web site at <http://www.gao.gov>.

If you or your staff have any question, please contact me at (202) 512-2834 or goldsteinm@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff that made major contributions to this report are listed in appendix III.



Mark L. Goldstein
Director, Physical Infrastructure Issues

Appendix I: Objectives, Scope, and Methodology

This report describes: (1) the federal government's efforts to ensure the availability of broadband services for small businesses, and (2) the effect of federally funded and municipal networks on broadband service and small businesses.

To address both reporting objectives, we reviewed documents from and interviewed officials at the U.S. Department of Agriculture's (USDA) Rural Utilities Service (RUS), the Department of Commerce's (Commerce) National Telecommunications and Information Administration (NTIA) and Economic Development Administration (EDA), and the Federal Communications Commission (FCC) about their efforts to ensure the availability of broadband services for small businesses. We also reviewed documents and interviewed officials at the Office of Advocacy within the Small Business Administration (SBA) about its research on the availability and use of broadband by small businesses. We reviewed program rules regarding funding applicability and eligibility for FCC, RUS, NTIA, and EDA programs that provide funding for broadband infrastructure; status reports for the Broadband Technology Opportunities Program (BTOP) and the Broadband Infrastructure Program (BIP); SBA's Office of Advocacy's study on small business access to broadband; and reports from FCC and NTIA on broadband deployment and availability. We also reviewed reports and surveys from academic institutions, think tanks, and trade associations on the topics of broadband deployment, economic development, and small business. We interviewed representatives of a telecommunications trade association, representatives of small business interests, and large and small broadband service providers in an effort to obtain a variety of viewpoints on issues related to small business and broadband services. To identify the strategic objectives, goals, and performance measures of federal broadband infrastructure programs, we reviewed budget summaries and performance plans, performance and accountability reports, and other agency documents for these programs from USDA, NTIA, RUS, and FCC.

To describe the effect of federally funded and municipal networks on broadband service and small businesses, we obtained and analyzed information from a variety of sources. We visited towns in Oregon, Minnesota, Tennessee, and Georgia, where we interviewed a nongeneralizable selection of Internet service providers that received federal funds, municipally operated network providers, and small

businesses that use the services of these providers.¹ We selected these states and the specific locations within the states on the basis of the presence of at least one project that received federal funding for broadband infrastructure in the last 5 years; the presence of a municipally operated broadband network, which also may have received federal funding; and geographic diversity, i.e., sites were in different regions of the county. The locations were chosen to collectively include at least one project from each of the major federal broadband infrastructure programs.² We selected small businesses to interview that were users of the federally funded or municipal networks and that had fewer than 500 employees, based on FCC's National Broadband Plan, which addresses support for broadband growth in small and medium enterprises of this size.³ While the results of our interviews cannot be projected to all service providers and small businesses because they were selected using a nonprobability approach, they illustrate a range of possible views and experiences.

¹Although most interviews were conducted in person, some were conducted via telephone.

²These programs are the Broadband Technology Opportunities Program, the Broadband Initiatives Program, the Rural Broadband Access Loan and Loan Guarantee Program, Community Connect Grants, and the Telecommunications Infrastructure Loan Program. EDA also has programs that may support the construction of public infrastructure, including broadband infrastructure. Programs include Economic Adjustment Assistance, Public Works, Disaster Supplement Appropriations, Global Climate Change Mitigation Incentive Fund, Community Trade Adjustment Assistance Program, and the Disaster Relief Opportunity Fund. We interviewed a Community Trade Adjustment Assistance grantee; however, we did not interview others because the focus of these programs is to support economic recovery, promote regional competitiveness, or to help areas recover from a natural disaster, rather than explicitly fund the construction of broadband infrastructure. We did not include projects that received funding from FCC's Connect America Fund because funding was dispersed in December 2012, and carriers have 3 years to fulfill their obligation to deploy infrastructure. Two locations included in our analysis that we did not visit in person are Hurley, Virginia, and McMinn County, Tennessee. We spoke with one broadband provider that received a RUS Community Connect Grant to provide broadband service in Hurley, Virginia. As previously mentioned, we spoke with a grantee that received a Community Trade Adjustment Assistant from EDA to provide broadband infrastructure to two industrial parks in McMinn County, Tennessee.

³There is no standard definition of small business. SBA's definition of small business varies according to industry, generally based on either the number of employees or revenues, and broadband service providers have their own guidelines for the size and type of business that qualifies for their small business services.

We collected information on broadband speeds and prices offered by all wireline providers in the locations we visited where federally funded or municipal networks were present. We only included wireline broadband service in our analysis because unlike some wireless service (e.g., satellite and mobile broadband), wireline broadband generally offers higher speeds and greater reliability that businesses require.⁴ For comparison purposes, we also collected speed and pricing information for all wireline providers in nearby towns that were similar to these locations in terms of population, income levels, and number of wireline service providers, but where federally funded or municipal networks were not present;⁵ and in two urban areas in each of the same states. Table 5 lists the locations visited, the nearby towns, and the urban areas visited in each state. In total we collected pricing information on fourteen nonurban towns that received federal funding or have a municipal network, 14 nonurban comparison towns, and 8 urban areas.⁶ We used the National Broadband Map, a joint effort of NTIA and FCC to analyze and map broadband speeds, and comparable efforts managed by the states to identify wireline service providers in these locations.⁷ For each service provider identified, we collected information on advertised download and

⁴One network, SandyNet, provides wireline and wireless service. SandyNet received federal funding to expand wireless access in rural areas.

⁵Our criteria for the selection of comparison towns were (1) similar population as defined by the Census Bureau's Urban and Rural Classification where urbanized areas are 50,000 or more people, urban clusters are at least 2,500 and less than 50,000 people and rural encompasses all other areas not included within an urban area (i.e. rural areas are less than 2,500 people), (2) per capita income within 20 percent of the site visit town, when feasible, (3) location in the same state and within 65 miles of the federally funded or municipally operated network in an effort to ensure the comparison town has similar terrain and geography to the site visit town, (4) town received no federal funding for broadband infrastructure in the past five years and do not have a municipally operated network, and (5) number of wireline providers that is similar to the number offering service in the site visit towns.

⁶The definitions of urban and nonurban are based on the Census Bureau's urban and rural classification. Within this classification, the Census Bureau identifies two types of urban areas: (1) urbanized areas of 50,000 or more people; and (2) urban clusters of at least 2,500 and less than 50,000 people. Rural areas encompass all population, housing, and territory not included within an urban area. When referring to urban areas, we are referring only to urbanized area. When referring to nonurban areas, we are referring to urban clusters and rural areas.

⁷Accessed January 14, 2014, <http://www.broadbandmap.gov>, <http://www.connectmn.org/>, <http://www.connectedtn.org/>, <http://digital.georgia.gov/map/>, and <http://broadband.oregon.gov/StateMap/>.

upload speeds offered to small businesses and the monthly rate charged. We collected unbundled, month-to-month pricing when available. Some service providers required a customer to have a telephone line and some required a contract ranging from 2 months to 2 years. If the service provider did not provide separate pricing for small businesses, we collected residential speed and pricing information. We obtained this information from service providers' websites or if not available online by calling the company directly. We requested speed and pricing for each city and town in the sample—either by the town's name or by a specific address if the service provider required one.⁸ We analyzed the information collected to identify difference in speeds and prices between the locations with federally funded or municipal networks and similar towns without such networks, as well as between urban and nonurban locations. Because this information is drawn from a nonprobability sample, it cannot be generalized to all locations with federally funded or municipal networks, all urban locations, or all nonurban locations.

⁸If a service provider required an address, we used the address of a post office in the town because they are generally centrally located in the town and each town in our analysis had a post office.

Table 5: Communities Included in Speed and Pricing Analysis

State	Communities with a federally funded provider or a municipal network	Nearby communities used for comparison	Urban locations
Georgia	Dawsonville	Jasper	Atlanta
	Dahlonega	Toccoa	Savannah
Minnesota	Bingham Lake	Hanska	Minneapolis
	Jackson	Blue Earth	St. Cloud
	Monticello	Buffalo	
	Windom	Sleepy Eye	
	Red Lake Falls	Warren	
	McIntosh	Audubon	
	Two Inlets	Osage	
Oregon	Sandy	Silverton	Portland
	Gervais	Mt. Angel	Eugene
	Monroe	Halsey	
	Monmouth	Dallas	
	Independence	Aumsville	
Tennessee ^a	Chattanooga	Knoxville	(not applicable)

Source: GAO.

^aIn Tennessee, because Chattanooga and Knoxville are both urban communities, we did not include additional urban communities from Tennessee in our analysis. Chattanooga was part of the urban and rural speed pricing analysis but not part of the other speed and pricing analysis.

We conducted this performance audit from February 2013 to February 2014 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings based on our audit objectives.

Appendix II: Speeds and Prices Offered by Federally Funded and Municipal Broadband Service Providers That Were Part of GAO's Analysis, as of September 30, 2013

Network	Location	Federal program providing funding	Top available advertised speed (Mbps)		Most common speed subscribed to by businesses (Mbps) ^a		Monthly price of most common speed
			Download	Upload	Download	Upload	
Fibernet Monticello	Minnesota	None	100	100	10	10	\$41.95
Garden Valley Telephone Company	Minnesota	Telecommunications Infrastructure Loan Program	30	0.512	5	0.512	\$40.95
Gervais Telephone Company	Oregon	Broadband Initiatives Program	50	25	5	1.5	\$44.95
MINET	Oregon	None	100	50	20	10	\$41.00
Monroe Telephone Company ^b	Oregon	Broadband Initiatives Program	10	2.5	10	2.5	\$44.95
North Georgia Network ^c	Georgia	Broadband Technology Opportunities Grant	100	100	15	15	\$115.00
Paul Bunyan Telephone Cooperative	Minnesota	Rural Broadband Access Loan and Loan Guarantee Program	25	25	10	10	\$44.95
Sandynet	Oregon	Broadband Initiatives Program	1000	1000	5	2	\$24.95
Southwest Minnesota Broadband Services	Minnesota	Broadband Initiatives Program	30	15	10	5	\$62.95
Windomnet	Minnesota	None	30	20	10	2	\$37.95

Source: GAO presentation of funding and speed information.

^aThe most common speed subscribed to by businesses is based on information gathered during interviews or telephone conversations with each provider.

^bThe speed and pricing information reported is only for areas where Monroe Telephone Company offers fiber optic service.

^c Information for broadband speed and pricing is reported here only for the Georgia Communications Cooperative, a member of the North Georgia Network. Other cooperatives belonging to the North Georgia Network may offer different speeds and prices.

Appendix III: GAO Contact and Staff Acknowledgments

GAO Contact

Mark Goldstein (202) 512-2834 or goldsteinm@gao.gov

Staff Acknowledgments

In addition to the individual named above, Heather Halliwell, Assistant Director; Namita Bhatia Sabharwal; Sharon Dyer; Laura Erion; Eric Hudson; Dave Hooper; Josh Ormond; Amy Rosewarne; and Andrew Stavisky made key contributions to this report.

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